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Vipac Engineers & Scientists

BORG Manufacturing

Noise Impact Assessment

De-Barker/Shredder Plant at Oberon Panels Facility

29N-14-0049-TRP-472440-3

02 Oct 2014

Report Title: De-Barker/Shredder – Borg Panels Oberon **Job Title: Noise Impact Assessment**	
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EXECUTIVE SUMMARY

Vipac Engineers and Scientists Ltd (Vipac) was engaged by BORG manufacturing to carry out the acoustic assessment of a De-Barker/Shredder Plant at the BORG panel Facility in Oberon, NSW

The following standards and guidelines were used for this assessment:

- Environmental Protection Authority (EPA) NSW *Industrial Noise Policy* (INP),
- EPA NSW Environment Protection Licence(EPL), *Licence number 3035 dated 15 May 2013*

A noise impact assessment has been undertaken to determine the potential noise impact of the proposed De-Barker/Shredder plant operations on noise sensitive receptors in the surrounding area.

Noise prediction modelling has been undertaken for the proposed enclosure construction as outlined in ***Table 11***, taking into consideration two scenarios considering both the neutral and worst-case conditions during daytime and night-time. The predicted noise impact from the proposed De-Barker/Shredder plant taking into consideration the effect of a building construction/enclosure for the De-Barker/Shredder, on the noise sensitive receivers in the surrounding area are reduced to the range from 2 to 26 dB(A) during the day and evening/night periods, (refer to ***Table 16*** and ***Table 17***), which are well below the applicable criteria during day, evening and night time.

It should be noted that these predicted noise levels are associated with operation of the De-Barker/Shredder unit alone, and do not include cumulative noise emissions associated with operations at the existing Borg Oberon facility. It is highly likely that existing plant and equipment operating at the Borg Oberon facility would mask noise emissions from the proposed De-Barker/Shredder unit.

However, this cannot be confirmed without undertaking an additional Baseline/Compliance Noise Survey at the noise sensitive receptors located in the vicinity of the site, to determine the existing ambient noise levels in the vicinity of the site. In the absence of results from a recent baseline/compliance noise survey at the noise sensitive receptors, Vipac has used the indicative noise levels outlined in ***Section 4*** to estimate the potential cumulative noise levels from the existing Borg operations and proposed De-Barker/Shredder unit.

The cumulative noise impact should be assessed, taking into account the noise impact associated with the proposed De-Barker/Shredder unit, in conjunction with existing noise emissions from the Borg Oberon facility. However, at this stage, the predicted noise impact of the proposed De-Barker/Shredder unit can only be assessed against the EPL Licence emission criteria as a recent noise survey to assess the level of specific noise in the area, associated with existing operations at the Borg facility, has not been carried out at this stage. Neither are noise emission levels available for existing plant and equipment operating at the site. ***Section 7*** details the construction noise impact assessment and noise management plan associated with the proposed De-Barker/Shredder plant.

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1 INTRODUCTION

Vipac Engineers and Scientists Ltd (Vipac) was engaged by BORG manufacturing to carry out a noise impact assessment to assess potential impacts associated with a proposed De-Barker/Shredder Plant at the BORG Panel Facility in Oberon, NSW.

The noise impact assessment has been undertaken in accordance with the requirements of the following documents:

- Environmental Protection Authority (EPA) NSW *Industrial Noise Policy* (INP),
- EPA NSW Environment Protection Licence(EPL), *Licence number 3035 dated 15 May 2013*

A list of commonly used acoustical terms (and their definition) used in this report is provided below in ***Appendix A*** as an aid to readers of this report.

2 PROJECT DESCRIPTION

2.1 Site Location

The Borg Panel Oberon facility is located to the east of Lowes Mount Road, Oberon, NSW. The Borg Panels facility is one of the four primary industries that operate in the vicinity of Oberon town, NSW. The other three industries are Highland Pine Products (HPP), Carter Holt Harvey (CHH) and Woodchem (which is part of Borg Panel operations), refer to ***Figure 1***.

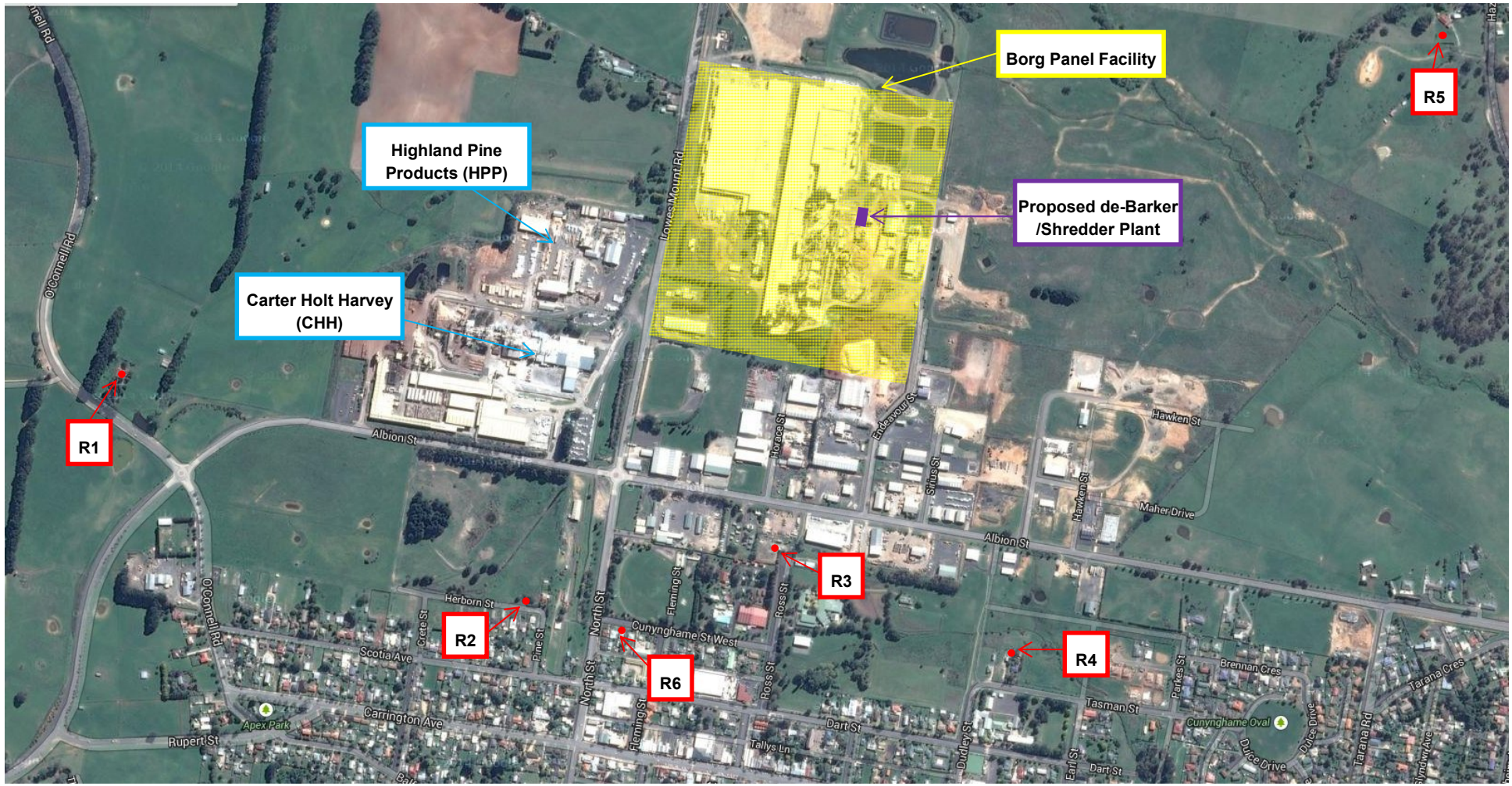

Figure 1: Proposed De-Barker/Shredder plant and noise monitoring locations

2.2 Noise Sensitive Receivers

A list of the nearest potentially affected noise sensitive receivers to the proposed De-Barker/Shredder Plant is provided below in ***Table 1***. The distance is calculated from the boundary of proposed De-Barker/Shredder Plant to the property boundary of noise sensitive receivers.

Table 1: Noise Sensitive Receivers

ID	Property/Address	Approximate Distance (m)	Type of Receivers
R1	Near Albion Street and O'Connell Road	1,550meters to the west of proposed plant	Residential
R2	6 Herborn Street	1,080meters to the south-west of proposed plant	Residential
R3	Ross Street	820 meters to the south of proposed plant	Oberon High School
R4	10 Tasman Street	945 meters to the south-east of proposed plant	Residential
R5	131 Hazelgrove Road	1,250 meters to the north-east of proposed plant	Residential
R6	26 Cunynghame Street West	980 meters to the south-west of proposed plant	Residential

3 CRITERIA

3.1 Environmental Protection Licence (Licence No: 3035) Requirement

3.1.1 Condition L4 – Noise Limits

Noise from the premises must not exceed:

a) 55 dB(A) $L_{Aeq(15mintues)}$ during the day period (7am to 6pm)
b) 50 dB(A) $L_{Aeq(15mintues)}$ during the evening period (6pm to 10pm) and
c) At all other times 45dB(A) $L_{Aeq(15mintues)}$, except as expressly provided by the licence (EPL No. 3035)

The noise emission limits identified in EPL No. 3035 apply under all meteorological conditions except:

a) During rain and wind speeds (at 10m height) greater than 3m/s and
b) Under "non-significant weather conditions"

3.1.2 Condition 8 – Pollution Studies and Reduction Programs

U1 - Internal Noise – Oberon High School

Where internal classroom noise exceeds the recommended maximum L_{eq} 40 dB(A) as per Industrial Noise Policy Table 2.1, the licensee must develop a works program to achieve an internal noise less than or equal to 40dB(A) $L_{Aeq(15minutes)}$.

When internal noise criteria are specified, the external noise level may be 10dB(A) greater for buildings with no adequate ventilation or 20dB(A) for buildings with fixed external windows and mechanical ventilation. To be conservative, Vipac has utilised a 10dB(A) reduction for the break-in noise through the structure. Therefore, the external noise criteria for classroom is 50dB(A) $L_{Aeq(15minutes)}$.

3.2 NSW DECC "Interim Construction Noise Guideline"

The NSW Interim Construction Noise Guideline was developed by the NSW Department of Environment & Climate Change (DECC) and outlines detailed procedures for the assessment and management of construction noise impacts.

The Guidelines present two ways of assessing construction noise impacts – the quantitative method, which is generally suited to longer-term construction projects (usually more than 3 weeks), and the qualitative method, which is generally suited to short-term works (usually not more than 3 weeks) such as infrastructure maintenance.

It is anticipated that the overall period for construction works will be approximately 12 weeks and therefore a quantitative method has been used for this assessment.

3.2.1 Residences and Other Sensitive Land Uses

Table 2 and ***Table 3*** set out the management levels for noise at residences and sensitive land uses, respectively. Restrictions to the hours of construction may apply to activities that generate noise at residences above the 'highly noise affected' noise management level.

Table 2: Noise at residence using Quantitative Assessment

Recommended Hours	Time of Day	Management level [1] $L_{Aeq(15min)}$
Recommended standard hours	Monday to Friday - 7 am to 6pm Saturday - 8am to 1 pm No Work on Sundays or Public holidays	Noise affected RBL [2] + 10dB
		Highly noise affected [3] 75dB
Outside recommended standard hours		Noise affected RBL [2] + 5dB

Table 3: Noise at sensitive land uses (other than residences) using quantitative assessment

Land use	Management Level, $L_{Aeq(15min)}$ Applies when properties are being used
Offices, retail outlets	External Noise Level 70dB
Places of worship	Internal Noise Level 45dB
School	Internal Noise Level 45dB

Where internal noise levels were specified, 10dB was added to approximate an external noise level.

When assessing construction noise it is understood that several types of plant and equipment can be particularly annoying to nearby residents. In those instances a +5dB penalty is applied to the predicted noise level. Examples of the type of machines and operations that typically fit this category are outlined below:

- Use of 'beeper' style reversing or movement alarms, particularly at night time.
- Use of power saws, such as used for cutting timber, masonry, road pavement or steel work.
- Grinding metal, concrete or masonry.
- Rock drilling.
- Line drilling.
- Vibratory rolling.
- Bitumen milling or profiling.
- Jack hammering, rock hammering it rock breaking'.
- Impact piling.

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1 Noise levels apply at the boundary that is most exposed to construction noise and at a height of 1.5 m above ground level. If the property boundary is more than 30m from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30m of the residence. Noise levels may be higher at upper floors of the noise-affected residence.

2 RBL is the Rating Background Level as defined in the EPA Industrial Noise Policy.

3 $L_{Aeq\ 15\text{-}minute} \geq 75$ dB is highly likely to generate strong community reactions and should be avoided.

4 EXISTING NOISE ENVIRONMENT

Vipac previously installed six environmental noise loggers at noise sensitive receivers surrounding the Borg Panel Manufacturing. The unattended noise measurement was undertaken in August 2011 at the noise sensitive receivers listed in ***Table 1***.

Table 4 – Table 9 show the unattended ambient noise levels (L_{Aeq}) when all the industrial facilities in the Oberon area were operating and when operations at Borg Manufacturing was shut-down temporarily, extracted from Vipac report ref no: 29N-11-0087-TRP-471011-1. Vipac has also performed simple calculations to estimate the specific noise levels emanating from the Borg Manufacturing facility. Where the ambient noise levels during Borg shutdown were higher than all operations' noise levels, noise levels for all operations was chosen to represent the Borg operations. It should be noted that the calculated noise levels are only indicative noise as the industrial contributors to the noise sources were not determined on the basis of attended measurements. In addition, it should be noted that the overall noise levels will not have been influenced by industrial noise sources alone, additional sources such as insects' noise, domestic activities, car pass-bys and etc., are likely to have contributed to the overall noise levels logged during the unattended surveys.

Table 4: Summary of results for R1-Oorong-Albion Street (dB)

Oorong- Albion Street	L_{Aeq}		
	All Operational	Borg shutdown	Borg operations
Day	59	54	57
Evening	54	56	54
Night	53	53	53

Table 5: Summary of results for R2 - Herborn Street (dB)

Herborn Street	L_{Aeq}		
	All Operational	Borg shutdown	Borg operations
Day	59	65	59
Evening	49	50	49
Night	48	59	48

Table 6: Summary of Results for R3 - Oberon High School (dB)

Oberon High School	L_{Aeq}		
	All Operational	Borg shutdown	Borg operations
Day	54	53	47
Evening	51	46	49
Night	50	50	50

Table 7: Summary of Results for R4 - Tasman Street (dB)

Tasman Street	L_{Aeq}		
	All Operational	Borg shutdown	Borg operations
Day	54	53	47
Evening	53	55	53
Night	53	47	52

Table 8: Summary of Results for R5 - Hazelgrove Road (dB)

Hazelgrove Road	L_{Aeq}		
	All Operational	Borg shutdown	Borg operations
Day	47	49	47
Evening	45	-	45
Night	30	43	30

Table 9: Summary of Results for R6 - West Cunynghame Street (dB)

Cunynhame Street	L_{Aeq}		
	All Operational	Borg shutdown	Borg operations
Day	51	-	51
Evening	47	-	47
Night	47	-	47

Note: the noise logger at West Cunyngham Street malfunctioned when Borg Manufacturing was not operating and therefore, to be conservative, all operation's noise levels are used to represent Borg's operations

5 NOISE MODELLING

Noise modelling has been performed using the SoundPLAN® computational noise modelling software package. The use of the SoundPLAN® software and referenced modelling methodology is accepted for use in the state of NSW by the Office of Environment and Heritage (OEH)/Environmental Protection Authority (NSW EPA) for environmental noise modelling purposes. Vipac have undertaken numerous noise modelling and impact assessments previously for a range of projects, including mining and industrial projects using SoundPLAN®.

5.1 Geographical Data

Table 10 below lists the drawings/information received and used in the noise model.

Table 10: List of Drawings

Description	Date	Provided by
Site Plan Layout plan	22.05.2014	Borg Manufacturing
Site building dimension	22.05.2014	Borg Manufacturing
DA01 (Rev A) - Proposed De-barker Building – Site Plan	20.05.2014	Borg Manufacturing
DA02(Rev A)-Proposed De-barker Building – Floor Plan	20.05.2014	Borg Manufacturing
DA03(Rev A) – Proposed De-barker Building – Elevations	20.05.2013	Borg Manufacturing
DA04 (Rev A) – Proposed De-barker building – Roof Plan	20.05.2014	Borg Manufacturing
Ground elevation of the study area	28.05.2014	Land & Property Information, NSW

5.2 Noise Modelling Scenario

Noise prediction modelling was undertaken using the SoundPLAN noise modelling package representative of the proposed building envelope construction to be constructed around the De-Barker/Shredder unit. Details of the building (enclosure) materials are listed in ***Table 11***.

Table 11: Building envelope construction

Wall Construction	Roof Construction
Colorbond/Kingspan Panel with insulated core (or similar performance alternative composite panel)	Colorbond/Kingspan Panel with insulated core (or similar performance alternative composite panel)

5.3 Weather Conditions

Four acoustic modelling scenarios were run for the proposed building envelope construction as outlined in ***Table 11***, within the SoundPLAN program using CONCOWE algorithms under both neutral and worst case weather conditions for the day and night periods. It should be noted that sound will propagate further through the atmosphere under certain weather conditions dependent on air pressure variations, wind speed and direction variations, temperature inversions etc. The 'worst-case' weather conditions chosen were those highly conducive to the propagation of sound.

Table 12 presents the weather parameters used in the CONCOWE calculations based on annual data from the Bureau of Meteorology (BoM) Weather Station at Oberon (Jenolan Caves Road).

Table 12: Sound Plan Weather Parameters

Parameter	Day		Evening/Night	
	Neutral	Worst-Case	Neutral	Worst-Case
Pasquill Stability Category	B	D	D	F
Wind Speed (m/s)	0	3	0	3
Humidity (%)	58	58	79	79
Temperature (deg Celsius)	15	15	10	10
Met Category	3	5	4	6

5.4 Noise Sources

The plant and equipment to be used in the proposed De-Barker/Shredder unit has not been completely finalised at this stage, but it will be similar to a De-Barker/Shredder unit inspected by Borg at a similar facility. Borg Manufacturing has supplied Vipac with a set of sound power levels of similar equipment to be used in the proposed plant and this noise emission level will be incorporated into the noise prediction model.

Table 13 below shows the sound power level of a similar De-Barker unit, extracted from Graeme E. Harding & Associate report (Ref no: 023246) "*Environmental Noise Emission"* dated 6th July 2004.

Table 13: Sound Power Level of De-Barker/Shredder

Description	Sound pressure levels at 10-meters L_{eq} dB(A)	Sound Power Level L_w dB(A)
West side of De-Barker (chipper off)	90	118
West side of De-Barker (chipper on)	91	119
East side of De-Barker (chipper off)	87	115
East side of De-Barker (chipper on)	88	116
Average	**89**	**117**

The De-Barker system will be enclosed within a "building" to be constructed of the building materials listed in ***Table 11***. The sound reduction index of the wall and roof constructions has been taken into account in assessing the break-out noise from the De-Barker/Shredder plant to the outdoor environment.

The break-out noise from each façade is treated as a planar source in the noise model. The calculated noise emission detailed in ***Table 14*** and ***Table 15*** will be assigned to each façade of the proposed building enclosure.

In order to calculate the break-out noise from the proposed building constructions (facades), the following assumptions are made:

- Proposed building dimension of 11m (Width) x 33 m (Length) x 11m (Height);
- Reverberation time of 2s;
- Area of 363m^2 (33m x 11m) for Eastern and Western façade;
- Area of 121m^2 (11m x 11m) for Northern façade;
- Area of 363m^2 (33m x 11m) for roof;
- 3m^2 opening at the Southern façade (intake for logs);
- Proposed door (8m x 5m) at the Southern façade with sound reduction index of R_w 32;
- De-Barker machine with sound power level of 117dB(A).

Table 14 and ***Table 15*** present the break-out noise levels of each building construction at 10meters from the building façade.

Table 14: Break-out noise levels at each façade (Fully enclosed)

Sound Pressure Level @10 meter (outdoor) dB(A)						Sound Power Levels dB(A)
Northern Wall	Southern Wall	Eastern Wall	Western Wall	Door on Eastern façade	Roof	
57	57	57	56	48	50	75

Table 15: Break-out noise levels at each façade (3m^2 opening in southern wall)

Sound Pressure Level @10 meter (outdoor) dB(A)						Sound Power Levels dB(A)
Northern Wall	Southern Wall with 3m^2 Opening	Eastern Wall	Western Wall	Door on Eastern façade	Roof	
57	71	57	56	48	50	84

Table 14 shows that the predicted sound power levels associated with the façade's sound insulation rating, are in the order of 75dB(A). However, taking into consideration the 3m^2 opening in the southern wall (for the intake of logs into the De-barker/Shredder unit), the overall external sound power levels for the unit are raised due to the opening in the façade, and the overall predicted level is 84dB(A), as shown in ***Table 15***. This is due to the logarithmic nature of noise on the decibel (dB) scale and the fact that the level of noise escaping (break-out) from the partially open southern façade by far outweighs the level of noise break-out through the other "closed/sealed" facades and roof of the enclosure. The external noise levels for the enclosure construction is dominated by the level of noise break-out from the partially open southern façade such that the contribution from the closed/sealed facades and roof is negligible in comparison to the level of noise break-out from the other facades.

6 PREDICTED NOISE LEVELS

Noise prediction modelling has been carried out to assess the potential impact associated with the proposed De-Barker/Shredder Plant on the existing noise environment at the nearest noise sensitive receptors located in proximity to the site. The predicted noise levels representative of the operational phase for both neutral conditions and worst-case conditions are presented in ***Table 16*** during the day period and ***Table 17*** during the evening/night periods.

Table 16: Predicted noise levels for proposed enclosure – Day Period

Receiver	Neutral	Worst	Criteria (Day,Night)
R1	7	16	55
R2	13	21	55
R3	18	26	50
R4	16	24	55
R5	2	8	55
R6	11	19	55

Table 17: Predicted noise levels for proposed enclosure – Evening/Night Periods

Receiver	Neutral	Worst	Criteria (Day,Night)
R1	12	16	50/45
R2	17	21	50/45
R3	22	26	50/n.a
R4	20	25	50/45
R5	4	8	50/45
R6	15	19	50/45

Noise prediction modelling has been undertaken for the proposed enclosure construction as outlined in ***Table 11***, taking into consideration two scenarios considering both the neutral and worst-case conditions during daytime and night-time. The predicted noise impact from the proposed De-Barker/Shredder plant taking into consideration the effect of a building construction/enclosure for the De-Barker/Shredder, on the noise sensitive receivers in the surrounding area are reduced to the range from 2 to 26 dB(A) during the day and evening/night periods, (refer to ***Table 16*** and ***Table 17***), which are well below the applicable criteria during day, evening and night time.

It should be noted that these predicted noise levels are associated with operation of the De-Barker/Shredder unit alone, and do not include cumulative noise emissions associated with operations at the existing Borg Oberon facility. It is highly likely that existing plant and equipment operating at the Borg Oberon facility would mask noise emissions from the proposed De-Barker/Shredder unit. In the absence of results from a recent baseline/compliance noise survey at the noise sensitive receptors, Vipac has used the indicative noise levels outlined in Section 4 to estimate the potential cumulative noise levels from the existing Borg operations and proposed De-Barker/Shredder unit.

Cumulative noise levels from the existing Borg Operations and proposed De-barkers/Shredder unit were assessed for worst-case scenarios, during worst-case weather conditions. ***Table 18*** presents the cumulative noise levels.

Table 18: Cumulative noise levels (L_{Aeq}) dB

Receiver ID	Day			Evening			Night		
	Existing Borg Operations	Proposed De-Barker Unit	Cumulative Noise Levels	Existing Borg Operations	Proposed De-Barker Unit	Cumulative Noise Levels	Existing Borg Operations	Proposed De-Barker Unit	Cumulative Noise Levels
R1	57	16	57	54	16	54	53	16	53
R2	59	21	59	49	21	49	48	21	48
R3	47	26	47	49	26	49	50	26	50
R4	47	24	47	53	25	53	52	25	52
R5	47	8	47	45	8	45	30	8	30
R6	59	19	59	47	19	47	47	19	47

Table 18 shows that the noise impact from proposed De-Barker unit is likely to be negligible at each of the noise sensitive receptors (no increase in cumulative noise levels) as the existing Borg Operations would mask the noise emission from the proposed De-Barker/Shredder unit.

It reiterated that the cumulative noise levels presented above are indicative levels, based on the results of the unattended noise logging surveys undertaken at a number of noise sensitive receptors located in Oberon, in August 2011. The results of the unattended surveys have been incorporated into this assessment simply to provide an indication of the potential noise impact associated with the proposed De-Barker/Shredder unit.

7 CONSTRUCTION NOISE MANAGEMENT

Typical noise levels representative of construction plant that may be used on-site during the construction/installation of the De-Barker/Shredder unit were sourced from previous measurements conducted by Vipac, equipment suppliers and sound power levels provided in Appendix A of AS2436:2010 – Guide to Noise Control on Construction, Maintenance and Demolition Sites.

From this information, noise impacts were theoretically propagated at varying distances from the construction site. Propagation calculations take into account sound intensity losses due to distance, with additional minor losses such as atmospheric absorption, directivity and ground absorption ignored in the calculations. As a result, predicted received noise levels are expected to overstate actual received levels by 1 - 2 dB and thus provide a measure of conservatism. Received noise at each assessed distance, produced by each item of plant on the site, can then be added to determine the potential total received noise at that distance from construction activities and compared to the criteria.

Predicted noise levels associated with potential typical construction works, during the construction/installation of the De-Barker/Shredder unit, are shown in ***Table 19***, for a variety of distances to a typical receiver, with no noise barriers or acoustic shielding in place and with each item of plant operating at full power.

Table 19: Predicted Plant Item Noise Levels

Plant Item	L_W [dB(A) re: 1pwatt]	Predicted Sound Pressure Level (SPL), dB(A)							
		10m	25m	50m	100m	200m	400m	800m	1500m
Circular Saw (on load)	**113**	85	77	71	65	59	53	47	41
Crane	**105**	77	69	63	57	51	45	39	33
Concrete Mixers 24t	**111**	83	75	69	63	57	51	45	39
Concrete Pump	**108**	80	72	66	60	54	48	42	36
Concrete Saw	**113**	85	77	71	65	59	53	47	41
Excavator (Small)	**108**	80	72	66	60	54	48	42	36
Flat-Bed Truck	**109**	81	73	67	61	55	49	43	37
Generator	**104**	76	68	62	56	50	44	38	32
Semi-Trailer	**112**	84	76	70	64	58	52	46	40
Tip Truck	**108**	80	72	66	60	54	48	42	36

Actual cumulative impacts, from several machines operating simultaneously, may be reduced when some machines are operating in shielded areas not wholly visible to receivers. However, it should be noted that, if two or more machines were to operate simultaneously on the site in an exposed location, received noise levels would be increased.

With the nearest sensitive receptor generally located in the order of approximately 820m from the site, potential construction phase noise impacts are expected to fluctuate between 38 and 54 dB(A)L_{eq} depending on the machines being used, their number and location on site.

The predicted noise levels at the nearest sensitive receptor, associated with the construction works on-site would comply with the highly noise-affected level (75dB(A) L_{eq}). However, comparison between the predicted noise levels and standard construction hour's noise criteria has not been performed at this stage. It is not possible to confirm the applicable construction noise criteria at this point, in the absence of additional baseline noise logging survey data at noise sensitive receptors in the area.

Nevertheless, it is likely that the predicted noise levels would exceed the standard construction hour's noise criteria. This is a common issue with construction activities. However, this can be managed proactively, provided that all efforts are undertaken to control and minimise noise impacts. A construction management plan is detailed in ***Section 7.1*** to assist with minimising construction noise on site.

7.1 Construction Noise Management Plan

Construction Noise and Vibration Management Plan		
Component		**Details**
General / Site. Management Issues		All employees, contractors and subcontractors are to receive an environmental induction. The induction should instruct all persons at the site with regard to all relevant project specific and standard noise and vibration mitigation measures detailed herein including permissible hours of work; any limitations on high noise generating activities; location of nearest sensitive receivers; construction employee parking areas; designated loading/unloading areas and procedures; site opening/closing times (including deliveries); and environmental incident procedures.
		A dedicated person will form a point of contact for the dissemination of general information regarding site operations. Contact persons will also be defined to receive comment or complaints from the community – refer to community liaison/complaints handling plan below.
Hours of Work / Respite Periods		Standard Hours for Construction: 07:00 – 18:00 Monday – Friday 08:00 -13:00 Saturday No Work on Sundays or Public holidays.
		Very noisy activities (such as foundation compaction, concrete cutting or surface grinding for example) should be programmed during standard construction hours. If the work cannot be undertaken during the standard construction hours, it should be completed before 11:00 pm.
Source Controls	**General / Work Practices**	Avoid unnecessary revving of engines and turn off plant that is not being used / required.
		Use only non-tonal reverse alarms (broadband alternatives are needed). Where possible organise the site so that delivery trucks and haulage trucks only drive forward to avoid the use of reversing alarms.
		Organise and schedule the equipment operations to limit the noisiest machines operating simultaneously.
		Site set up / movement of plant / delivery of materials / waste removal from the site should be undertaken during daytime hours only.
		Truck drivers are to be informed of site access routes, acceptable delivery hours and must minimise extended periods of engine idling.

Construction Noise and Vibration Management Plan		
Component		**Details**
		Ensure there is no unnecessary shouting or loud stereos/radios on-site. There must be no dropping of materials from heights, throwing of metal items, or slamming of doors.
		Equipment must be inspected on a regular basis and maintained as necessary, to ensure it is in good working order. This must include inspections of the condition and performance of mufflers.
	Equipment Selection and / or Substitution	Where reasonable and feasible the quietest equipment suitable for a task should be used instead of noise-intensive equipment.
		Construction equipment with the most effective mufflers, enclosures and low-noise tool bits and blades must be procured and utilised for the project.
		Where possible mains power should be utilised for temporary work area lighting, dewatering pumps or other temporary power requirements. Where this is not feasible silenced generator sets are to be used instead.
		Vipac recommends that all plant and equipment be certified prior to use.
	Use and Siting of Equipment / activities	Where practical fixed plant should be positioned as far away as possible from sensitive receivers.
		For any concrete cutting works, consideration should be given to having all concrete panels either cast-in-situ or pre-cut to the required dimensions and deliver to site, suitable for erection, without the need for cutting on-site.
Complaints management		Provide a complaints hotline number as a contact point for any complaints regarding the construction work.
Monitoring Requirements	**Vibration**	Vibration monitoring should be undertaken for works within ten metres of sensitive receivers. It is Vipac's understanding that there will not be any construction work associated with the De-Barker/Shredder unit, undertaken within 10m of sensitive receivers.

8 CONCLUSION

A noise impact assessment has been undertaken to determine the potential noise impact of the proposed De-Barker/Shredder plant operations on noise sensitive receptors in the surrounding area.

Noise prediction modelling has been undertaken for the proposed enclosure construction as outlined in ***Table 11***, taking into consideration two scenarios considering both the neutral and worst-case conditions during daytime and night-time. The predicted noise impact from the proposed De-Barker/Shredder plant taking into consideration the effect of a building construction/enclosure for the De-Barker/Shredder, on the noise sensitive receivers in the surrounding area are reduced to the range from 2 to 26 dB(A) during the day and evening/night periods, (refer to ***Table 16*** and ***Table 17***), which are well below the applicable criteria during day, evening and night time.

It should be noted that these predicted noise levels are associated with operation of the De-Barker/Shredder unit alone, and do not include cumulative noise emissions associated with operations at the existing Borg Oberon facility. It is highly likely that existing plant and equipment operating at the Borg Oberon facility would mask noise emissions from the proposed De-Barker/Shredder unit.

However, this cannot be confirmed without undertaking an additional Baseline/Compliance Noise Survey at the noise sensitive receptors located in the vicinity of the site, to determine the existing ambient noise levels in the vicinity of the site. In the absence of results from a recent baseline/compliance noise survey at the noise sensitive receptors, Vipac has used the indicative noise levels outlined in ***Section 4*** to estimate the potential cumulative noise levels from the existing Borg operations and proposed De-Barker/Shredder unit.

The cumulative noise impact should be assessed, taking into account the noise impact associated with the proposed De-Barker/Shredder unit, in conjunction with existing noise emissions from the Borg Oberon facility. However, at this stage, the predicted noise impact of the proposed De-Barker/Shredder unit can only be assessed against the EPL Licence emission criteria as a recent noise survey to assess the level of specific noise in the area, associated with existing operations at the Borg facility, has not been carried out at this stage. Neither are noise emission levels available for existing plant and equipment operating at the site. ***Section 7*** details the construction noise impact assessment and noise management plan associated with the proposed De-Barker/Shredder plant.

Appendix A: GLOSSARY OF TERMS

Decibel, dB:

Unit of acoustic measurement. Measurements of power, pressure and intensity. Expressed in dB relative to standard reference levels.

dB(A):

Unit of acoustic measurement weighted to approximate the sensitivity of human hearing to sound frequency. Sound Pressure Level, Lp (dB), of a sound:

20 times the logarithm to the base 10 of the ratio of the r.m.s. sound pressure to the reference sound pressure of 20 micro Pascals. Sound pressure level is measured using a microphone and a sound level meter, and varies with distance from the source and the environment.

Sound Power Level, LW (dB), of a source:

10 times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power of 1 Pico Watt. Sound power level cannot be directly measured using a microphone. Sound power level does not change with distance. The sound power level of a machine may vary depending on the actual operating load.

Ambient Sound:

Of an environment: the all-encompassing sound associated with that environment, being a composite of sounds from many sources, near and far.

Background noise:

The underlying level of noise present in the ambient noise, excluding the noise source under investigation, when extraneous noise is removed.

Percentile Level - L_{90}, L_{10}, etc:

A statistical measurement giving the sound pressure level which is exceeded for the given percentile of an observation period, e.g. L90 is the level which is exceeded for 90% of a measurement period. L_{90} is commonly referred to as the "background" sound level.

$L_{AEQ,T}$:

Equivalent continuous A-weighted sound pressure level. The value of the A-weighted sound pressure level of a continuous steady sound that, within a measurement time interval T, has the same A-weighted sound energy as the actual time-varying sound.

Rating Background Level – RBL:

Method for determining the existing background noise level which involves calculating the tenth percentile from the LA90 measurements. This value gives the Assessment Background Noise Level (ABL). Rating Background Level is the median of the overall ABL.

R_w – Weighted Sound Reduction Index:

A new single number quantity for airborne sound insulation rating which replaces STC. STC has been traditionally used for the classification of partitions and to define acoustical requirements in the Building Code of Australia.

For majority of partitions, the value for R_w will be similar to the value for STC. Partitions with particularly poor performance at 100Hz may have lower values for R_w than for STC. Conversely, partitions with poor performance at 4kHz may have higher values for R_w than for STC