Appendix F

Noise and vibration assessment

30 October 2009

INCITEC COCKLE CREEK REMEDIATION

Phase 2 to 4 Noise Assessment

Submitted to:
Mr Nick Johnson
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REPORT

Report Number: 087623087-002-R-Rev2

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Golder Associates

Executive Summary

Golder Associates Pty Ltd (Golder) was engaged to conduct a noise assessment for Phases 2 to 4 of the proposed remediation works for the Incitec Fertilizers Limited (IFL) Cockle Creek facility site located near the township of Boolaroo, New South Wales. The noise assessment is one component of an Environmental Assessment as required under Part 3(a) of the *Environmental Planning & Assessment Act 1979* (EP&A).

A baseline noise monitoring program was conducted for the proposed Cockle Creek Site remediation project. Baseline data was collected in August 2008 while the IFL site was operational (manufacturing and distribution) and while remediation works were being undertaken on the adjoining Pasminco site. The noise values indicate that the Boolaroo residential area is likely influenced by a constant noise source, such as the highway in the distance or from the small sub-station close by. The Macquarie Hills residential area showed typical noise values for quiet, suburban areas.

Noise management levels are calculated by using the measured baseline $L_{A90(15min)}$ plus an allowance depending on whether the activities are undertaken within or outside recommended standard hours (Monday to Friday 7am to 6pm, and Saturday 8am to 1pm). The NSW DECC Guideline recommends no more than a 10 dB(A) increase in noise levels (above the rating background level [RBL]) for Site works performed during recommended standard hours. This calculated guideline value was used to assess predicted noise values based on modelling of estimated schedules of activities and equipment lists for each stage of the project. Since operations will only be conducted during day-time hours, only day-time criteria were evaluated.

A very conservative approach or “worst case scenario” was used to complete the assessment. The approach identified sets of expected activities occurring concurrently in each phase, compared each set of activities to each other, and identified which set of activities would most likely emit the most noise within that phase of remediation work. The conservative or worst case approach assumes the items of plant and equipment which emit the most noise would be operating in positions closest to the receivers being considered. One conservative model was developed for each phase of work. Modelling scenarios were completed based on an assumed project schedule of activities for each phase developed by Golder. These sets of activities were determined to be the most conservative scenarios and were used for each modelled run. The predicted noise levels should be considered as an estimate of indicative worst case expected noise levels at the receiving locations. It is important to note that the work activities will only take place during day-time hours.

The software used to complete the modelling was SoundPLAN, which calculates noise levels using a number of different standards. SoundPLAN has the ability to simulate noise emission sources such as roads, vessels and industrial facilities. Other parameters, such as building dimensions, frequency of use, hours of operation and enclosure attenuation ratings, also define the nature of sound emissions. The model assumes that all receptors are downwind from the noise source or that a moderate temperature inversion exists. In addition, topography, soft ground cover and atmospheric absorption have been included for this assessment.

The conservative approach (site works programme) chosen for Phase 2 and Stage 3 will be active for only two to three weeks and for Phase 4 activities will be active for approximately five weeks. However, the entire project will take four years to complete. Given that works are proposed to be completed during recommended standard hours, the guideline used for the assessment is the RBL + 10 dB(A).

Background noise measurements concluded that the L_{A90} value during day-time hours (the RBL) was 43 dB in the Boolaroo residential area. Project activities will be occurring during recommended standard hours, therefore, a 10 dB allowance is added to the RBL. This gives a guideline value of $L_{Aeq(15\ min)}$ 53 dB at the Boolaroo residential area. The predicted $L_{Aeq(15\ min)}$ level for this area during Phase 2 activities is 49 dB, and and for Phase 3 and 4 activities is estimated to be 55 dB for each scenario. Hence, the Phase 2 activities are not predicted to exceed the management level, whilst Phases 3 and 4 of the project are expected to exceed the management level.

Background (L_{A90}) measurements collected indicate that sound levels during day-time hours were 40 dB in Macquarie Hills. The guideline management level for the project at this receptor is $L_{Aeq(15\ min)}$ 50 dB during

day-time hours. Predicted $L_{Aeq(15\ min)}$ sound levels from project activities were 38, 35 and 33 dB respectively for Phases 2, 3 and 4. The project activities will not exceed the day-time noise guideline at Macquarie Hills.

Considering modelled noise levels for two of the work phases are higher than the guideline for the Boolaroo area, a noise management plan is required.

In summary, activities from the project will increase noise levels at the Boolaroo residential area but will not exceed the guideline level at the Macquarie Hills residential area. It is recommended that a detailed noise management plan is developed to address the noise generating activities for the proposed programme of works. An outline of a draft noise management plan has been provided in Section 5 for reference.

The management plan is intended to set out written procedures that will, if properly implemented by the identified responsible persons, ensure that the effects of construction noise are controlled as far as practicable. The management plan has been developed based on information provided in the *Roads and Traffic Authority Environmental Noise Management Manual*, and the recommendations for feasible and reasonable noise mitigating work practices in s6 of the *NSW DECC Interim Construction Noise Guideline (July 2009)*.

The management plan involves managing schedules, equipment and community consultation. The following scheduling techniques can be incorporated for project activities:

- Scheduled activities remain between Monday through Friday from 7 am to 6 pm and Saturday 8 am to 1 pm. No work is to occur on Sundays or public holidays.
- Perform noisy work during less sensitive time periods, as identified in consultation with the affected community.
- Communicate the types of work, a schedule and equipment details for times when noise levels will potentially exceeded the guideline level.

The contractor can reduce the amount of noise being emitted from his equipment by:

- Training workers and contractors to use equipment in ways to minimise noise. This includes avoiding dropping materials from height.
- Establishing stringent noise emission limits for specific equipment.
- Where available, utilize quieter plant or alternative work approaches to complete high-noise level tasks.
- Implementing a noise monitoring audit program to ensure equipment remains within specified limits.
- If deemed necessary, stagger activities and equipment to reduce noise so only one activity at a time is taking place.
- Where possible, concentrate noisy activities at one location and move to another as quickly as possible.
- Ensure equipment is well maintained and fitted with adequately maintained silencers which meet the design specifications.
- Use only necessary size and power.

It is essential that IFL consult with the community regarding the activities that will affect their area. Community consultation, information, participation and complaint responses are essential aspects of all construction noise management programs. They typically involve:

- A community information program should be developed before construction and/or high risk activities are commenced. This usually involves a leaflet distribution and direct discussions and negotiations with affected residents, explaining the type, time and duration of expected noise emissions.

- The involvement of affected residents in the development of acceptable noise management strategies.
- A nominated community liaison officer with a contact telephone number.
- A complaints and feedback hotline.
- Timely responses to complaints, providing information on planned actions and progress towards the resolution of concerns.

These management strategies should be discussed between Golder, IFL and the designated contractor prior to commencement of work.

The amenity of the area will be greatly improved following closure of the industrial operations that have been carried out at the IFL site and at the adjoining Pasminco site over many years, and the community will recognise the requirement for a temporary noise increase to achieve this outcome. Therefore, the longer term net benefits of the remediation work should also be considered in assessing overall impacts.

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1.0 BACKGROUND INFORMATION

The proposed project relates to an Incitec Fertilizers Limited (IFL) site located within the township of Boolaroo, New South Wales (NSW), known as the Cockle Creek site.

The IFL Cockle Creek site was used to manufacture and distribute fertiliser. Manufacturing operations ceased in January 2009 and distribution operations are expected to cease in late 2009. Through use of the site as a manufacturing facility and the surrounding historical operations, the soil and groundwater is contaminated, primarily with metals.

In 2005 the IFL Cockle Creek site was declared a remediation site under Part 3, Division 3 of the *Contaminated Land Management Act 1997* (CLM Act) by the NSW Environment Protection Authority (EPA), a part of the NSW Department of Environment, Climate Change and Water (DECCW).

Incitec Pivot Limited (IPL), the parent company of IFL, made a commitment to remediate the site and prepared a voluntary remediation plan. The Plan comprises remediation of the site in four phases and was endorsed by the EPA in July 2008.

Phase 1 includes hotspot treatment of groundwater contamination and demolition of a timber gantry. Phases 2 to 4 include the construction of a containment cell, removal and placement of contaminated soil in the cell, demolition of the site buildings and site restoration.

The proposed project addressed in this noise assessment includes Phases 2 to 4 of remediation. Phase 1 is part of a separate major project application.

Golder Associates was engaged to conduct a noise assessment forming part of an Environmental Assessment (EA) as required under Part 3(a) of the *Environmental Planning & Assessment* (EP&A) *Act 1979*.

2.0 PROPOSAL DESCRIPTION

Phase 2 to 4 activities include remediation of contaminated soil and placement in a containment cell and demolition of site buildings and facilities; refer to Figures 4 to 6 (Appendix A) for a general work layout for each Phase. The project is expected to commence in early 2010, and is estimated to take approximately four years. The following lists the general activities for each stage of the project.

Phase 2 activities will be concentrated on the northern end of the site with the following activities being completed:

- constructing soil stockpiles for screening;
- constructing surface water runoff collection and treatment system; and
- excavating and constructing a containment cell.

Phase 3 is primarily in the centre of the facility and includes activities such as:

- demolishing existing structures;
- excavating impacted material and ongoing cell construction; and
- rehabilitating the site.

Phase 4 is generally in the south of the site and includes the following activities:

- installing a stormwater diversionary system;
- continued excavation of impacted materials; and
- cell completion and site rehabilitation.

The expected timing for Phases 2, 3 and 4 is as follows:

Stage 2 Jan 2010 to May 2014

Stage 3 Jan 2012 to May 2014

Stage 4 Jan 2013 to May 2014

2.1 Site and Surrounds

The IFL site lies immediately to the north-east of the Boolaroo township and is bounded to the north and west by the large Pasminco Cockle Creek Smelter site which is currently being remediated. The residential area of Boolaroo adjoins the south-western boundary of the IFL property on First Street, but the closest residences are approximately 200m from the active working area of the site.

To the east and south-east of the IFL site, the vacant land (part of the Pasminco property holding) rises to Munibung Hill, and further to the east is the newer residential area of Macquarie Hills, over 600m from the site. To the north-east lies the industrial area of Cardiff, over 700m from the site.

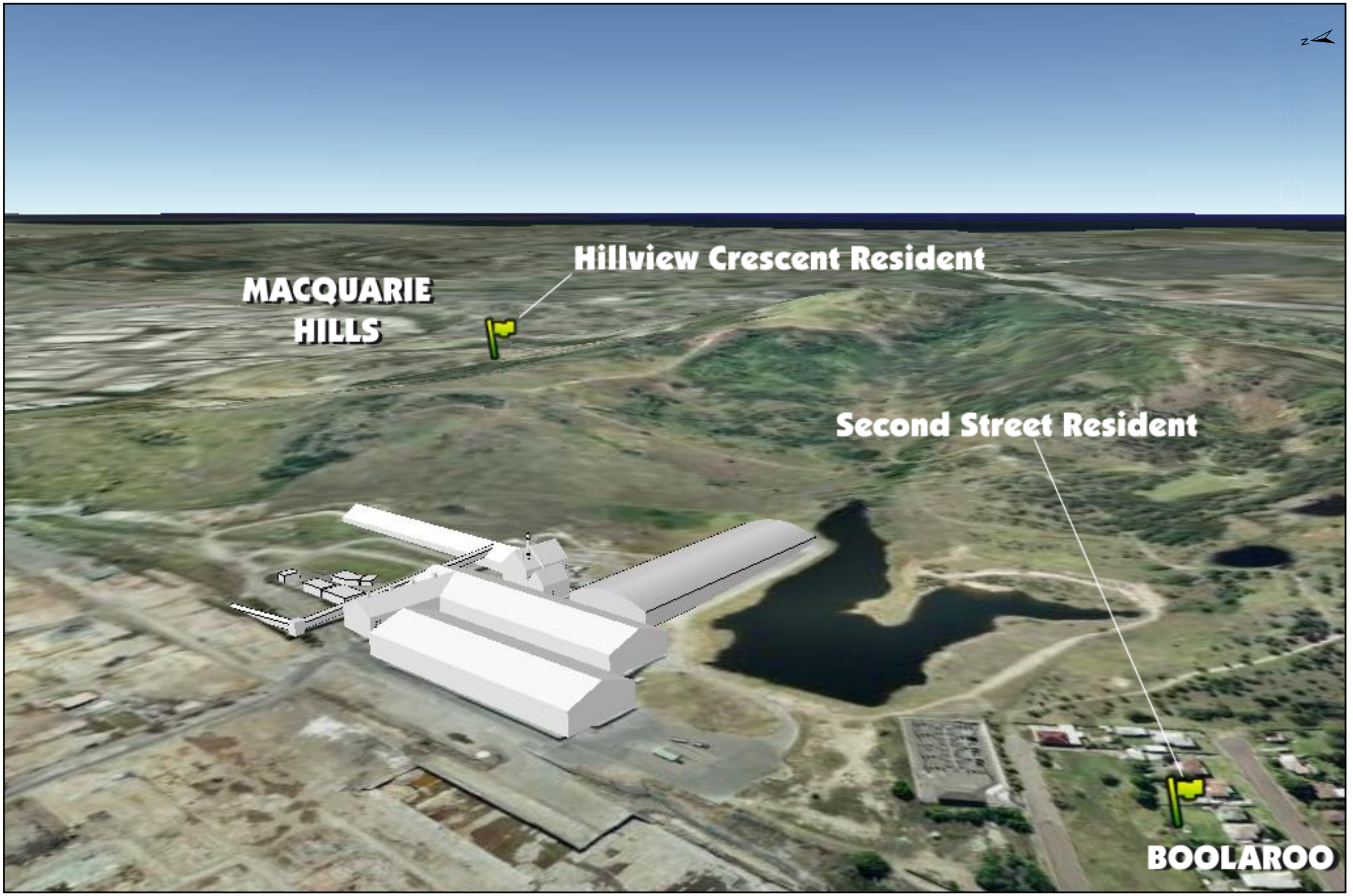
2.2 Baseline Monitoring

A baseline monitoring program was conducted for the proposed Cockle Creek project. The monitoring program started on 14 August 2008 and was completed on 27 August 2008. At the time the baseline data was collected, the IFL site was operational (manufacturing and distribution) and remediation works were being undertaken on the adjoining Pasminco site.

The equipment used for the monitoring consisted of two Acoustic Research Laboratories model EL - 215, Type 1, noise loggers. The noise loggers were set to log L_{A10}, L_{A90} and L_{Aeq} every 15-minutes, 24-hours per day during the monitoring period. Calibrations were completed at the beginning and end of each monitoring period.

A Kestrel 4500 portable weather tracker was used to determine wind speeds and temperature at time of set up. However, meteorological data was not collected during the remaining monitoring period.

The location of the monitoring sites included a residential home on Second Street in Boolaroo and a residential home on Hillview Crescent in Macquarie Hills. Figure 1 shows the locations of the monitoring sites with respect to the IFL site.



Golder Associates	Incitec		Cockle Creek Project
BTY	22-08-08		NOISE MONITORING LOCATIONS
CD*	22-08-08		
Scale Varies		087623087	1 / 0 / A4

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Note: The * beside the typed initials denotes the original drawing issue was signed or initialled by that respective person.

Boolaroo Site

The monitoring was conducted in the backyard of a residential home on Second Street. A picture of the site is shown in Figure 2. Monitoring was conducted from 12:25pm 14 August 2008 to 3:30pm 27 August 2008. Main noise sources at the time of set up included:

- distant highway traffic;
- local residential traffic;
- minor industrial noise from the Pasminco site;
- wind through the trees;
- birds chirping; and
- humans talking and walking around.

Meteorological conditions during set up were wind speeds of 5 kph with gusts up to 12 kph, wind direction was coming from the southwest, temperatures were around 15°C and skies were clear.

Macquarie Hills Site

The monitoring was conducted in the backyard of a residential home on Hillview Crescent. A picture of the site is shown in Figure 3. Monitoring was conducted from 2:16pm 14 August 2008 to 8:30am 22 August 2008. Main noise sources at the time of set up included:

- distant construction activities (sawing metal);
- wind chimes from resident next door;
- distant highway traffic;
- wind through the trees; and
- earth-moving equipment from the Pasminco site.

Meteorological conditions during set up were wind speeds of 4 kph with gusts of up to 11 kph, wind direction was from the southwest; temperature was 18°C and skies were clear.

Figure 2: Second Street, Boolaroo Resident

Figure 3: Hillview Crescent, Macquarie Hills Resident

Monitoring Results

Day-time, evening and night-time levels were collected and calculated from the two sites described above. The results of the monitoring included calculating daytime (07:00 to 18:00), evening (18:00 to 22:00) and night-time (22:00 to 07:00) L_{A90}, L_{A10} and L_{Aeq} sound levels (AS1055.1-1997, DECC 2008a and DECC 2008b).

Table 1 summarises the results of the two monitoring programs.

Table 1: Summary of the Noise Monitoring Program Results

Location	Period	L_{A90} [(a)]	L_{A10} [(a)]	$L_{Aeq(15\ min)}$ [(a)]
Boolaroo (Second Street)	Day	43	48	46
	Evening	43	48	45
	Night	41	47	45
Macquarie Hills (Hillview Crescent)	Day	40	48	45
	Evening	39	44	41
	Night	36	41	40

(a) Values calculated by taking the median of the specified time period.

The values indicate that the Boolaroo residential area is likely influenced by a constant noise source, such as the highway in the distance or from the small sub-station close by. The Macquarie Hills residential area shows typical values for quiet, suburban areas.

3.0 GUIDELINES

Criteria used for the assessment follows the NSW DECC Interim Construction Noise Guideline (July 2009), and are summarised in Table 2.

Table 2: Construction Noise Guidelines

Period of Construction	Noise Level [dBA]
Within Standard Recommended Hours	$L_{Aeq,\ 15\ min}$ < Background + 10 dB Special management required for noise levels above 75 dB
Outside Standard Recommended Hours	$L_{A10,\ 15\ min}$ < Background + 5 dB

According to the new guideline, noise management levels are calculated by using the measured $L_{A90(15min)}$ plus an allowance depending on the time of day in which the activities are performed. This calculated value is to be used to compare against a predicted value or an operational measured value (once the project is underway). For the purposes of this assessment, a predicted value will be compared to the guideline and assessed. The prediction methods are described in section 4.0 of this report.

4.0 ASSESSMENT

This section identifies the following:

- methods and approaches taken to assess the project
- modelling scenarios
- emissions used
- results of the predictions
- discussion of the results.

4.1 Methodology and Approach

At the time of this report, IFL had not appointed a contractor for the demolition and rehabilitation of Phase 2 to 4 activities. In order to complete the assessment, Golder estimated a likely schedule of activities and equipment list for each stage of the project. Assumptions were made by Golder on scheduling of activities and type and size of equipment to be used.

Since it is not practical to model every set of activities, a very conservative approach or "worst case scenario" was used to complete this assessment. This approach identified sets of expected activities occurring concurrently in each phase, compared each set of activities to each other, and identified which set of activities would most likely emit the most noise within that phase. The conservative or worst case approach assumes the items of plant and equipment which emit the most noise would be operating in positions closest to the receivers being considered. For the purposes of this assessment, Golder assumed that each phase would be completed independently of the others, but the possibility of the phases altering or occurring together is also addressed below. A total of three models were developed; one conservative model per phase.

The software used to complete the modelling was SoundPLAN. SoundPLAN is noise software that calculates noise levels using a number of different standards. The model algorithms used for this assessment are based on ISO 9613, Acoustics: Attenuation of Sound during Propagation Outdoors (ISO 9613, 1993; 1996).

SoundPLAN has the ability to simulate noise emission sources such as roads, vessels and industrial facilities. Each source can be characterised by entering sound emissions in terms of total sound emitted and a central frequency, or the tonal components of the emission. Other parameters, such as building dimensions, frequency of use, hours of operation and enclosure attenuation ratings, also define the nature of sound emissions. The model assumes that all receptors are downwind from the noise source or that a moderate temperature inversion exists. In addition, topography, ground cover and atmospheric absorption have been included for this assessment. The model assumes that ground conditions are soft unless otherwise defined; for this assessment the ground conditions were soft unless otherwise identified.

The monitoring sites are located on Second Street in Boolaroo and on Hillview Crescent in Macquarie Hills. The Second Street resident is approximately 550 to 600 m south, and the Hillview Crescent resident is approximately 800 m east, from the area of the site where the containment cell is to be constructed. The nearest Boolaroo residences are only about 150 m from the closest area where remediation will take place (Phase 4 area).

Since operations will only be conducted during day-time hours (Monday to Friday 7 am to 6 pm, and Saturday 8 am to 1 pm), only day-time criteria were compared.

4.2 Modelling Scenarios

Modelling scenarios were completed based on an assumed project schedule developed by Golder. The project schedule will be highly dependant on the contractor assigned to complete the work. Since a contractor has not been identified, Golder has made estimates and assumptions of activities and equipment that will be required for each stage of the project.

Table 3 and Figures 4 to 6 identify the assumed activities occurring for each stage of the project. These sets of activities were determined to be the most conservative scenarios and were used for each modelled run.

Table 3: Summary of Activities for each Stage of the Project

Stage	Activities
2	Construction of containment cell. Excavation and screening of impacted material. Placement of impacted material in containment cell.
3	Demolition of buildings and processing plant. Excavation of impacted material and screening. Placement of impacted material in containment cell.
4	Excavation of impacted material and screening. Placement of impacted material in containment cell. Reinstatement of the site, including the containment cell.

IFL has determined the daily and weekly schedule for all phases will continue, Monday through Friday from 7am to 6pm and Saturday from 8am to 1pm. Scheduled works will not continue on Sundays or public holidays.

During the course of the noise assessment study, various assumptions regarding equipment types, work procedures and operating locations were changed and, accordingly, the model results were altered to adjust for the changed assumptions. The predicted noise levels should be looked on as an estimate of indicative of worst case expected noise levels at the receiving locations.

4.3 Noise Emissions

Emissions data for the project were extracted from the following referenced material:

- Australian Standard 2436-1981
- NSW EPA Standard List, 1992
- US Department of Transportation Federal Highway Administration (FHWA).

Golder has estimated the types of machines/equipment used for the assessment. In many cases, equipment sizes are unknown; therefore, assumptions were made based on other projects of similar nature. In addition, the lower end of the range for plant noise was used as newer equipment tends to be quieter than older units and it is reasonable to expect that equipment will be selected for this project with the intent of minimising noise effects. Emissions used to complete each stage of the project are given in Tables 4 to 6.

Table 4: Summary of Emissions used during Phase 2

Machine/Equipment	Type of Source	Sound Power Level [dB]
20-30 tonne excavator	point	108
bulldozer	point	116
20-30 tonne articulate dump truck	point	114
water cart	point	103
internal truck movements	line	114
external truck movements	line	103
mechanical screening plant	point	111

Table 5: Summary of Emissions used during Phase 3

Machine/Equipment	Type of Source	Sound Power Level [dB]
bulldozer (cell area)	point	116
excavator	point	108
water cart	point	103
vacuum truck (20,000L capacity)	point	103
bobcat	point	114
forklift	point	106
20 to 50t crane (very occasional)	point	118
20 to 30t excavator with shears and hydraulic hammer	point	110
30 to 40t articulated dump truck	point	114
front end loader/backhoe	point	115
internal truck movements	line	114
external truck movements	line	103

Table 6: Summary of Emissions used during Phase 4

Machine/Equipment	Type of Source	Sound Power Level [dB]
bulldozer (at cell)	point	116
30t excavator	point	108
dump truck	point	102
water cart	point	103
20 to 30t excavator	point	108
30 to 40 tonne art. dump truck	point	114
water cart	point	103
front end loader/backhoe (at cell)	point	115
dozer/grader	point	114
bobcat with street sweeper	point	114
Compacter (at cell)	point	117
concrete crusher / screen (near cell)	point	118
Internal truck movements	line	114
external truck movements	line	103

4.4 Results

Phase 2

The predicted worst-case $L_{Aeq\ (15\ min)}$ noise results from Stage 2 activities are 49 dB for the Boolaroo residents and 38 dB for the Macquarie Hills residents. Since the activities will not be continuing into the evening or night-time period, only day-time values are provided. Table 7 presents and compares the monitored values to the predicted Phase 2 noise results.

Table 7: Summary of Noise Guidelines verses Estimated Values for Phase 2 Activities

Residential Area	Monitored L_{A90} **[dB]**	Predicted $L_{Aeq(15\ min)}$ Noise Levels **[dB]**
Boolaroo	43	49
Macquarie Hills	40	38

Phase 3

The predicted worst-case $L_{Aeq\ (15\ min)}$ noise results from Stage 3 activities are 55 dBA for the Boolaroo residents and 35 dBA for the Macquarie Hills residents. Since the activities will not be continuing into the evening or night-time period, only day-time values are provided. Table 8 presents and compares the monitored values to the predicted Phase 3 noise results.

Table 8: Summary of Noise Guidelines verses Estimated Values for Phase 3 Activities

Residential Area	Monitored L_{A90} **[dB]**	Predicted L_{A10} Noise Levels **[dB]**
Boolaroo	43	55
Macquarie Hills	40	35

Phase 4

The predicted worst-case $L_{Aeq\ (15\ min)}$ noise results from Phase 4 activities are 55 dBA for the Boolaroo residents and 33 dBA for the Macquarie Hills residents. Since the activities will not be continuing into the evening or night-time period, only day-time values are provided. Table 9 presents and compares the monitored values to the predicted Phase 4 noise results.

Table 9: Summary of Noise Guidelines verses Estimated Values for Phase 4 Activities

Residential Area	Monitored L_{A90} **[dB]**	Predicted L_{A10} Noise Levels **[dB]**
Boolaroo	43	55
Macquarie Hills	40	33

4.5 Discussion

The NSW DECC Guideline recommends no more than a 10 dB(A) increase in noise levels relative to background levels for activities performed during recommended standard hours, and a 5 dB(A) increase in background levels for activities performed outside of recommended standard hours. Because all work activities are planned to occur within recommended standard hours, the guideline used for the assessment is background + 10 dB(A).

Boolaroo Residential Area

Table 10: Summary of Monitored, Predicted and Management Levels for Boolaroo Residential Area

	Phase 2	**Phase 3**	**Phase 4**
Monitored Daytime [dBA][(a)]	43	43	43
Predicted [dBA][(b)]	49	55	55
Management [dBA][(b)]	53	53	53

(a) values are the measured $L_{A90,\ 15\ min}$

(b) values are the calculated $L_{Aeq,\ 15\ min}$

Background noise monitoring results concluded that the L_{A90} value during day-time hours was 43 dBA. Project activities will be occurring during recommended standard hours, therefore, a 10 dB allowance is added to the background level. This results in a management level of $L_{Aeq(15\ min)}$ 53 dBA at the Boolaroo

residential area. Predicted $L_{Aeq(15\ min)}$ levels for this area during Phases 2, 3 and 4activities are 49, 55 and 55 dBA respectively. Hence, the Phase 2 activities are not predicted to exceed the management level, whilst Phases 3 and 4 of the project are expected to exceed the management level. Evening and night-time levels are not assessed since the activities will not be occurring during evening and night-time hours.

Depending on the location of the equipment, the residents in Boolaroo will distinguish the construction sounds from other sounds in the area. As well, sound levels are expected to be higher than current baseline conditions. Phase 4 activities are closest to the residential area, therefore, there will generally be a potential for higher sound levels. It is important to note that these activities will only take place during day-time hours. IFL activities will not affect evening or night-time levels since operations will only occur Monday to Friday from 7 am to 6 pm and Saturday 8 am to 1 pm. Considering noise levels are higher than the guideline, a suggested outline for a noise management plan has been developed and is provided in Section 5 of this report.

The assessment was conducted with each stage occurring separately; however in reality, it is likely that phases 2, 3 and 4 will overlap to some extent. This is not expected to cause the noise predictions for the worst case (Phases 3 and 4) work at the Boolaroo residential area to approach the highly noise affected threshold of 75 dBA. This is because the remediation approach suggests that the major noise-producing activities and equipment which will operate to produce the worst case scenario for Phases 3 and 4 are unlikely to be happening at the same time.

The production of fertiliser at the site has now ceased, but the trucking out of product material (distribution) continues. This may continue during the early stage of the demolition and remediation programme (and lead to some increase in traffic volumes), but will not affect the most conservative noise level predictions given here.

Much of the Phase 4 works will occur in low elevation areas and this will potentially lessen the impact on Boolaroo residents.

Macquarie Hills Residential Area

Table 11: Summary of Monitored, Predicted and Management Levels for Macquarie Hills Residential Area

	Phase 2	Phase 3	Phase 4
Monitored Daytime [dBA][(a)]	40	40	40
Predicted [dBA][(b)]	35	35	33
Management [dBA][(b)]	50	50	50

(c) values are the measured $L_{A90,\ 15\ min}$

(d) values are the calculated $L_{Aeq,\ 15\ min}$

Background noise monitoring results concluded that the L_{A90} value during day-time hours was 40 dBA. The management level for the project at this receptor is therefore $L_{Aeq(15\ min)}$ 50 dB during day-time hours. Predicted sound levels from project activities show a value of 35, 35 and 33 respectively for Phases 2, 3 and 4 activities. The project activities will not exceed the day-time noise guideline at Macquarie Hills. As stated previously, all activities will only be occurring during day-time hours, therefore, activities will not affect evening or night-time levels.

In summary, activities from the project will increase noise levels at the Boolaroo residential area but will not exceed the management level at the Macquarie Hills residential area. Whilst the predicted values for the Macquarie Hills residential area are below the management level for each phase of work, the predicted noise levels for Boolaroo residents exceeded the management level for Phases 3 and 4 works. As such, it is

recommended that a detailed noise management plan is developed, and that whilst the focus of this plan should be the Boolaroo residential area, it could be extended to the Macquarie Hills residential area if required. A suggested outline of a noise management plan has been provided in Section 5.

4.6 Cumulative Impacts

Cumulative noise impacts may result from demolition works on the adjacent Pasminco site. Both the IFL and Pasminco demolition and remediation projects will occur over extended periods of time, each on a staged basis, and the timing of each cannot be determined precisely at this stage. For this reason it is not possible to quantify potential cumulative noise impacts which could occur.

If concentrated activity (including use of rock hammers etc to break up concrete slabs) was to occur in the south-western part of the Pasminco site at the same time as Phase 4 demolition works on the IFL Site, then the predicted worst case Phase 4 noise levels could be exceeded at nearby residences in Boolaroo. However, our understanding of the current scheduling of remediation and demolition work on the Pasminco site indicates that work will be completed in the areas of the Pasminco site close to Boolaroo prior to the Phase 3 and 4 works on the IFL site.

If active demolition works in the southwest parts of both sites was to occur simultaneously, then joint management and control measures will be required on the part of Site Managers for both projects to ensure impacts to residents at Boolaroo are kept to acceptable levels.

5.0 NOISE MANAGEMENT PLAN

A noise management plan will need to be developed since noise levels do not meet the guidelines at the Boolaroo residential area for Phase 3 and 4 activities. The management plan is intended to set out written procedures that will, if properly implemented by the identified responsible persons, ensure that the effects of construction noise are controlled as far as practicable. The management plan has been developed based on information provided in the *Roads and Traffic Authority Environmental Noise Management Manual*, and the recommendations for feasible and reasonable noise mitigating work practices in s6 of the *NSW DECC Interim Construction Noise Guideline (July 2009)*..

The management plan involves managing schedules, equipment and community consultation. The following scheduling techniques can be incorporated for project activities:

- Scheduled activities remain between Monday through Friday from 7 am to 6 pm and Saturday 8 am to 1 pm. No work is to occur on Sundays or public holidays.
- Perform noisy work during less sensitive time periods.
- Post types of work, a schedule and equipment details for times when noise levels will potentially exceeded the guideline level.

The contractor can reduce the amount of noise being emitted from his equipment by:

- Training workers and contractors to use equipment in ways to minimise noise. This includes avoiding dropping materials from height.
- Establishing stringent noise emission limits for specific equipment.
- Where available, utilize quieter plant or alternative work approaches to complete high-noise level tasks.
- Implementing a noise monitoring audit program to ensure equipment remains within specified limits.
- If deemed necessary, stagger activities and equipment to reduce noise so only one activity at a time is taking place.

- Where possible, concentrate noisy activities at one location and move to another as quickly as possible.
- Ensure equipment is well maintained and fitted with adequately maintained silencers which meet the design specifications.
- Use only necessary size and power.

It is essential that IFL consult the community regarding the activities that will affect their area. Community consultation, information, participation and complaint responses are essential aspects of all construction noise management programs. They typically involve:

- A community information program should be developed before construction and/or high risk activities are commenced. This usually involves a leaflet distribution and direct discussions and negotiations with affected residents, explaining the type, time and duration of expected noise emissions.
- The involvement of affected residents in the development of acceptable noise management strategies.
- A nominated community liaison officer with a contact telephone number.
- A complaints and feedback hotline.
- Timely responses to complaints, providing information on planned actions and progress towards the resolution of concerns.

These management strategies should be discussed between Golder, IFL and the designated contractor prior to commencement of work.

6.0 REFERENCES

Australian Standard (AS) 1055.1-1997. Acoustics-Description and measurement of environmental noise Part 1: General procedures.

Department of Environment and Climate Change (DECC) 2009. Interim Construction Noise Guideline, DECC 2009/265 (July 2009). http://www.environment.nsw.gov.au/noise/constructnoise.htm

ISO 1996-1, 2003. International Standard Acoustics-Descriptions, measurement and assessment of environmental noise – part 1: Basic quantities and assessment procedures.

Roads and Traffic Authority (RTA) 2001. Environmental Noise Management Manual. http://www.rta.nsw.gov.au

Report Signature Page

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CD/JC/lbj

A.B.N. 64 006 107 857

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APPENDIX A

Figures

371,200 371,400 371,600 371,800 372,000 372,200 372,400 372,600 372,800

6,354,200 6,354,000 6,353,800 6,353,600 6,353,400 6,353,200

N

STAGE 2 ACTIVITIES

MACQUARIE HILLS RESIDENT

BOOLAROO RESIDENT

LEGEND

- RESIDENT
- ROAD
- STAGE 2 ACTIVITIES BOUNDARY
- CELL AREA*
- STOCKPILE*
- VIRGIN STOCKPILE*
- BUILDING*
- CONCRETE SLAB*

**FEATURES APPEAR TRANSPARENT*

0 100 200 300
metres

Note: Datum WGS84, Projection UTM, Zone 56S

NOTE:
1. Imagery downloaded from GoogleEarth on 10Dec08.

Golder Associates

CLIENT	Incitec	PROJECT	Incitec Cockle Creek Project
DRAWN BT	DATE 10-12-08	TITLE	**STAGE 2 ACTIVITIES**
CHECKED CD*	DATE 10-12-08		
SCALE 1:5,000		PROJECT No 087623087	FIGURE No 4 / REV No 0 / A3

File Location: R:\Spa\2008\087623087_IncitecCockleCreek\Projects\087623087_Stage2Activities-Fig1-Rev0.mxd
Note: The * beside the typed initials denotes the original drawing issue was signed or initialled by that respective person.

371,200 371,400 371,600 371,800 372,000 372,200 372,400 372,600 372,800

6,354,200 6,354,000 6,353,800 6,353,600 6,353,400 6,353,200

N

MACQUARIE HILLS RESIDENT

STAGE 3 ACTIVITIES

BOOLAROO RESIDENT

LEGEND

- RESIDENT
- ROAD
- STAGE 3 ACTIVITIES BOUNDARY
- CELL AREA*
- STOCKPILE*
- VIRGIN STOCKPILE*
- BUILDING*

**FEATURES APPEAR TRANSPARENT*

0 100 200 300
metres

Note: Datum WGS84, Projection UTM, Zone 56S

NOTE:
1. Imagery downloaded from GoogleEarth on 10Dec08.

Golder Associates

CLIENT	Incitec	PROJECT	Incitec Cockle Creek Project
DRAWN BT	DATE 10-12-08	TITLE	**STAGE 3 ACTIVITIES**
CHECKED CD*	DATE 10-12-08		
SCALE 1:5,000		PROJECT No 087623087	FIGURE No 5 / REV No 0 / A3

File Location: R:\Spa\2008\087623087_IncitecCockleCreek\Projects\087623087_Stage3Activities-Fig2-Rev0.mxd
Note: The * beside the typed initials denotes the original drawing issue was signed or initialled by that respective person.

371,200 371,400 371,600 371,800 372,000 372,200 372,400 372,600 372,800

6,354,200 6,354,000 6,353,800 6,353,600 6,353,400 6,353,200

N

MACQUARIE HILLS RESIDENT

STAGE 4 ACTIVITIES

BOOLAROO RESIDENT

LEGEND

- RESIDENT
- ROAD
- STAGE 4 ACTIVITIES BOUNDARY
- CELL AREA*
- STOCKPILE*
- VIRGIN STOCKPILE*

FEATURES APPEAR TRANSPARENT

0 100 200 300
metres

Note: Datum WGS84, Projection UTM, Zone 56S

NOTE:
1. Imagery downloaded from GoogleEarth on 10Dec08.

Golder Associates

CLIENT	Incitec	PROJECT	Incitec Cockle Creek Project
DRAWN BT	DATE 10-12-08	TITLE	**STAGE 4 ACTIVITIES**
CHECKED CD*	DATE 10-12-08		
SCALE 1:5,000		PROJECT No 087623087	FIGURE No 6 / REV No 0 / A3

File Location: R:\Spa\2008\087623087_IncitecCockleCreek\Projects\087623087_Stage4Activities-Fig3-Rev0.mxd
Note: The * beside the typed initials denotes the original drawing issue was signed or initialled by that respective person.

At Golder Associates we strive to be the most respected global group of companies specialising in ground engineering and environmental services. Employee owned since our formation in 1960, we have created a unique culture with pride in ownership, resulting in long-term organisational stability. Golder professionals take the time to build an understanding of client needs and of the specific environments in which they operate. We continue to expand our technical capabilities and have experienced steady growth with employees now operating from offices located throughout Africa, Asia, Australasia, Europe, North America and South America.

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