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BLUESCOPE STEEL LIMITED PORT KEMBLA STEELWORKS

ORE PREPARATION AREA UPGRADE

NOISE IMPACT STATEMENT

REPORT J0029-42-R2

5th MAY 2006

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1. INTRODUCTION

BlueScope Steel Limited (BlueScope Steel) operates a large integrated steelworks at Port Kembla that produces approximately 5 million tonnes of steel per year. The Steelworks includes a number of major processes including two blast furnaces to convert iron ore into metallic iron, a basic oxygen steelmaking process to convert iron into steel slabs, a hot strip mill and a plate mill to produce steel coils and plates from slabs and further downstream processes to produce various finished products.

Blast Furnaces 5 and 6 currently operate on the site to produce iron from a mixture of ore lumps, pellets, sinter, coke, fluxes and other minor additives. Iron ore is the principal ingredient and is fed to the blast furnaces as either lumps or fines. Unprocessed fine ore tends to inhibit gas movement through the furnace and is carried out of the furnace by the upward flowing gases so all fines are introduced into the furnaces as either pellets or sinter. Pellets are principally produced in off-site mills while sinter is produced by the Steelworks in Sinter Machine 3 (the Sinter Plant) from imported fine ore.

The sintering process essentially involves heating the ore to partly melt the particles and cause them to stick together. This is achieved in the Sinter Plant by mixing ore, coke and fluxes, placing this mix in a bed with a porous bottom, igniting the coke and drawing combustion air down through the bed. The bed is carried on a slowly moving steel conveyor (the strand), allowing the Sinter Plant to produce sinter continuously and at a controlled rate. A series of feeders direct unfired ore mix to the start of the strand while hot sinter leaving the end of the strand is broken into pieces and fed to a cooling conveyor. The cooler consists of a steel conveyor running in a circular track with three fans blowing cooling air up through the sinter to remove most of the heat. Sinter leaving the cooler is screened to remove fine particles which are returned to the strand to be refired. Larger particles are stored then fed to one of the blast furnaces.

This report contains an assessment of noise issues associated with the proposed modifications to the Ore Preparation Area. The report has been requested by CH2M HILL Australia on behalf of BlueScope Steel to accompany and form part of an Environmental Assessment for the proposal.

2. THE PROPOSAL

The following sections describe proposed modifications to the Ore Preparation Area.

2.1. Sinter Plant

The proposed Blast Furnace 5 shutdown significantly reduces the daily demand for sinter, although blast furnace 6 would continue to require this material, and potentially allows work to be carried out on the sinter plant that could not easily be completed during normal plant operation. Changes to the sinter plant are proposed to increase its capacity by 20%, in turn increasing the proportion of sinter and reducing the proportion of iron ore pellets normally fed to the blast furnaces.

An increase in the sinter plant's capacity is proposed to be provided by replacing the existing 5m wide strand by a new strand 5.5m wide, including associated pallets and rails. A number of ancillary items near the strand also require replacement to suit the new width, as do the strand feeders.

The sinter cooler requires a substantial rebuild to increase its capacity and one of the three existing cooler fans would be replaced with two larger units to increase air flow through the cooler. A tray conveyor is proposed between the strand and the cooler, in place of the existing hot sinter feeders, and various belt conveyors and motor control centres would be upgraded or replaced.

The waste gas precipitator casing currently allows air to leak into the gas stream through a number of gaps. All such gaps would be filled or covered, increasing the effective capacity of the main exhaust fans without requiring new fans.

Based on the above summary it can be seen that the sinter plant's capacity increase would be achieved with few additional components. Some components such as conveyors and cooler fans would be replaced with higher capacity units while other components such as the feed bins, main fans and waste gas handling system can accommodate the increased capacity with little or no modification.

2.2. Raw Materials Handling System

The raw materials handling system receives, stores and supplies iron ore as lumps, fines and pellets, sinter, coal, coke and fluxes including limestone, quartz and dolomite. Material is delivered to the steelworks site by sea, road and rail and is blended and fed to the blast furnaces as required.

The proposed upgrade to the sinter plant requires additional iron ore fines for processing into sinter and lower quantities of ore pellets, resulting in the same quantity of iron ore fed to the blast furnaces. This change results in removal of iron ore pellets from one stockpile area and replacement with additional fines, with two reclaim hoppers and nine additional conveyors for a combined length of approximately 680m required to transfer fines from this area to the sinter plant or to the blending stockpiles.

Additional repair and refurbishment work is proposed on a number of stockpile machines and conveyors, although most of this work is proposed to improve reliability and provide more automatic control of the process rather than change the function or capacity of the materials handling system. Capacity improvements are proposed for the barrel reclaimer, secondary stacker, ore unloader and for conveyors feeding the fine ore bins in the sinter plant. The dedusting system within the stockhouse is also proposed to be refurbished or replaced.

2.3. Construction

The construction schedule is primarily controlled by the need to maintain sinter production to feed the two blast furnaces. This requires shutdown periods to be minimised and, where possible, to be coordinated with the Blast Furnace 5 Reline Project as this major shutdown will approximately halve the demand for sinter for a period of a few months. Up to 110 construction personnel plus 40 design and management personnel would be required on the site during the major Sinter Plant shutdown period of approximately 32 days, with fewer construction staff required at other times. The majority of construction workers would be sourced from contracting companies that regularly carry out repair and refurbishment work within the Steelworks.

Materials required for the project such as structural steel and mechanical and electrical parts would be stored on the steelworks site before installation. Storage areas are likely to include the following locations:

- No.1 Works, between Five Islands Road and Cringila,
- around the Sinter Plant itself, and
- within the Raw Materials Handling Area.

3. EXISTING ENVIRONMENT

3.1. Receiver Areas

The Ore Preparation Area is located at the south eastern end of the steelworks and has no immediately adjoining noise sensitive neighbours. Closest neighbours not associated with the steelworks include the grain terminal approximately 500m to the north east, the coal loader approximately 450m north east and Incitec's fertilizer plant approximately 1500m to the south east.

The closest residential areas include Coniston and Mt St Thomas approximately 2300m north and north-west, the closest Figtree and Unanderra residences are 3000m to the west and the nearest Cringila residences are located just over 1400m from the site.

Flagstaff Park is the nearest public reserve and is located approximately 1700m south west of the site and north of Flagstaff Road Warrawong. Appendix A includes a plan of the Steelworks site and nearby receiver areas.

3.2. Background Noise Levels

Background and ambient noise levels have previously been measured at a number of locations around the steelworks and have not been resurveyed for the purposes of this assessment.

An environmental noise survey was carried out in Cringila by BHP (now BlueScope Steel) in the year 2000, during preparation of the Illawarra Cogeneration Plant EIS. The Cringila survey used Acoustic Research Laboratories EL-215 loggers providing results to Type 2 accuracy. One logger was installed adjacent to BHP Steel's Merrett Avenue gate in the northern part of the suburb for the period 4th to 17th October 2000. A second logger was installed on the edge of BHP Steel land near the end of Steel Street for the period 7th to 14th December 2000.

Noise loggers were also used to survey environmental noise levels in Mt St Thomas, north of the site, in August 2003 during preparation of the Hot Strip Mill Upgrade EIS. The Mt St Thomas survey used 01dB SIP95S sound level meters operating as loggers, providing results to Type 1 accuracy. One logger was attached to power pole 1181 at the southern end of Hill Street next to 310 Gladstone Avenue, with the other attached to power pole 1120 opposite 3 Milne Crescent, for the period 12th to 22nd August 2003.

Noise logger calibration was checked before and after each survey using an acoustic calibrator producing 94 dB at 1kHz, with all calibration checks showing correct noise logger operation. A summary of all results appears in Table 1.

The Steelworks is the dominant source of background noise in the northern Cringila area, with traffic on Five Islands Road and through the Merrett Avenue gate being the main contributors to ambient Leq noise levels. A number of noise sources on the Steelworks site contribute to the background noise level over the rest of Cringila including the Steel Street monitoring location, with no particular source appearing to be dominant.

Table 1: Summary of Environmental Noise Monitoring Results, dB(A)

Time Period	Day		Evening		Night	
Measurement Result	L90	Leq	L90	Leq	L90	Leq
Merrett Avenue Cringila, 2000	54.0	62.2	52.0	59.5	50.5	58.8
Steel Street Cringila, 2000	50.3	53.0	52.5	56.7	50.5	55.6
Hill Street Mt St Thomas, 2003	46.4	59.4	47.6	54.9	43.5	53.1
Milne Crescent Mt St Thomas, 2003	42.1	51.1	41.2	50.0	39.3	47.2

Both the Steelworks and traffic influence the background noise level over most of Mt St Thomas and Coniston, with traffic being the dominant background noise source during the day and the Steelworks being more dominant at night. As for Cringila, observations in the Mt St Thomas area in 2003 showed a number of Steelworks sources contribute to background noise levels in this area and no source is particularly dominant.

Most Steelworks noise is produced by fixed equipment such as fans, motors and turbines, with some intermittent or variable noise from mobile equipment such as trucks, locomotives and cars. Relief valves and similar noise sources can be heard occasionally but do not usually affect long term ambient noise levels in receiver areas. Based on the above reasoning and observations in the area, the ambient (Leq) noise contribution from the Steelworks is taken to be 2 decibels above the background noise level at each location. Higher ambient noise levels measured by each logger are due to other sources of noise in each area, mainly related to traffic on public roads.

4. CRITERIA

4.1. Operational Noise

Noise criteria have been determined in accordance with guidelines described in the NSW Department of Environment and Conservation’s guideline known as the Industrial Noise Policy (INP) which requires the background noise level and existing industrial noise levels to be considered. Two separate criteria are developed for each location and time period including:

- an intrusive limit set 5 decibels above the background noise level, and
- an amenity limit which depends on existing industrial noise levels and the nature of the receiver area.

The lowest of the intrusive or amenity limits are normally adopted as the criterion for that receiver area and time period. Where the existing level of industrial noise exceeds the acceptable amenity limit for that area, the INP provides two alternatives:

- where existing industrial noise levels are unlikely to decrease in the future, the amenity criterion is set 10 decibels below the existing industrial noise level, and
- where existing industrial levels may decrease in the future, the amenity criterion is set 10 decibels below the acceptable limit for the area.

The DEC’s long term goal is for noise from the Steelworks to achieve the amenity criteria at all residential receivers during all time periods, requiring each source of noise on the site to produce no more than 10 decibels below these criteria. While that goal may take many years to achieve for some receiver areas, the DEC believes it is appropriate to begin working towards the goal with each expansion or upgrade project on the Steelworks site. Accordingly, amenity criteria applied only to new equipment on the site are set 10 decibels below the acceptable limit where existing industrial noise levels are above that limit.

A high traffic noise criterion also applies to areas exposed to dominant traffic noise. Noise logger results show traffic noise can be intermittent during the more critical evening and night time periods and may not be sufficient to mask the industrial noise at all times. Nevertheless, with traffic being the dominant noise source and producing more than 10 decibels above the amenity limit at closest receivers, there is some justification for the high traffic noise criterion to apply to these receivers during the night. Table 2 shows criteria applied to each residential area with the lowest calculated noise level for each location and criteria highlighted with bold text.

Table 2: Operational Noise Criteria, dB(A)

	Time Period	Cringila		Mt St Thomas	
		Merrett Av	Steel St	Hill St	Milne Cres
Background Level, LA90,15min	Day	54.0	50.3	46.4	42.1
	Evening	52.0	52.5	47.6	41.2
	Night	50.5	50.5	43.5	39.3
Intrusive Criteria, LAeq,15min	Day	59.0	**55.3**	**51.4**	**47.1**
	Evening	57.0	57.5	52.6	**46.2**
	Night	55.5	55.5	48.5	44.3
Amenity Limit, LAeq,period	Day	60.0			
	Evening	50.0			
	Night	45.0			
Existing Industrial Noise, LAeq,period (estimated)	Day	56.0	52.3	48.4	44.1
	Evening	54.0	54.5	49.6	43.2
	Night	52.5	52.5	45.5	41.3
Amenity Criteria, LAeq,period	Day	**58.0**	60.0	60.0	60.0
	Evening	**40.0**	**40.0**	42.0	50.0
	Night	**35.0**	**35.0**	35.0	**43.0**
Existing Ambient Noise, LAeq,period	Day	62.2	53.0	59.4	51.1
	Evening	59.5	56.7	54.9	50.0
	Night	58.8	55.6	53.1	47.2
High Traffic Noise Criteria LAeq,period	Day	N/A	N/A	49.4	N/A
	Evening			**44.9**	
	Night			**43.1**	
Adopted Criteria, LAeq,15min	Day	**58.0**	**55.3**	**51.4**	**47.1**
	Evening	**40.0**	**40.0**	**44.9**	**46.2**
	Night	**35.0**	**35.0**	**43.1**	**43.0**

Table 2 shows the intrusive criterion generally applies during the day and amenity or high traffic criteria generally apply during the evening and night. This situation is common near existing heavy industries operating 24 hours per day.

The DEC's long term goal for the Steelworks to meet the 45 LAeq, night amenity limit at all receivers requires a criterion of 35 LAeq,15min during the night for any new equipment installed on the Steelworks site. As Mt St Thomas receivers already receive industrial noise levels at or below the 45 LAeq amenity limit, the 35 LAeq criterion is considered an ideal goal but not mandatory for these receivers.

4.2. Construction Noise

Work associated with the project would be carried out partly off-site and partly on the site. Off-site work includes fabrication of many components and assemblies which are then transported to the site and installed. On-site work would include the following main tasks:

- Demolition and removal of old equipment using cranes, jackhammers and various powered and unpowered hand tools,
- Civil construction work including pile driving and concrete pouring to upgrade foundations for new equipment,
- Mechanical construction work to remove and replace equipment to be refurbished and to install new equipment,
- Electrical work to replace wiring, transducers and control systems as required, and
- A commissioning period for all new equipment and control systems.

A major shutdown of the sinter plant is expected to take approximately 32 days, although construction work would be required before and after the shutdown to minimise the work required to be completed during the critical shutdown period. Any delays or potential delays beyond the shutdown period would be actively managed and minimised to ensure the No.6 Blast Furnace has a constant supply of sinter. The total construction period is not expected to extend beyond six months, excluding minor tasks that are similar in character to maintenance activities normally carried out on the site.

Noise criteria applying to a construction period of less than six months are therefore applied to this proposal, ignoring extended planning and material delivery periods that are unlikely to cause significant noise before the actual construction period. Noise criteria for the construction period are sourced from Section 171 of the EPA's (DEC's) Environmental Noise Control Manual (ENCM), partly reproduced below:

> <u>*Level Restrictions*</u>
>
> *(i) Construction period of 4 weeks and under:*
>
> *The L10 level measured over a period of not less than 15 minutes when the construction site is in operation must not exceed the background level by more than 20 dB(A).*
>
> *(ii) Construction period greater than 4 weeks and not exceeding 26 weeks:*
>
> *The L10 level measured over a period of not less than 15 minutes when the construction site is in operation must not exceed the background level by more than 10 dB(A).*
>
> <u>*Time Restrictions*</u>
>
> *Monday to Friday, 7am to 6pm*
>
> *Saturday, 7am to 1pm if inaudible on residential premises, otherwise 8am to 1pm.*
>
> *No construction work to take place on Sundays or Public Holidays.*

It is usually accepted that construction work can be carried out at other times of the day or night, or on Sundays or public holidays, providing noise produced by construction work does not exceed normal operational noise criteria for these periods or is inaudible at any residence. Construction criteria for the evening and night are therefore equal to operational noise criteria listed in Table 2.

Construction criteria are considered to apply at any residential boundary. Construction work is, by its nature, a relatively short term activity. Occasional exceedances of the above criteria for specific well-defined activities are generally acceptable to the community and the DEC during normal construction hours. Examples would normally include pile driving or large concrete pours. In most cases, community acceptance of any short term ‘excessive’ noise would be greatly enhanced if affected residents are given prior notice of the activity, expected duration and approximate noise level. Table 3 shows adopted construction noise criteria in closest residential areas to the site.

Table 3: Construction Noise Criteria, dB(A)

	Time Period	Cringila		Mt St Thomas	
		Merrett Av	Steel St	Hill St	Milne Cres
Construction Criteria, LA10,15min	Day	64	60	56	52
	Evening	40	40	45	46
	Night	35	35	43	43

4.3. Construction Vibration

Ground vibration is caused by particular construction activities such as pile driving, excavating hard rock, concrete breaking and explosive blasting. Of these activities, pile driving is expected to be required near the sinter cooler and at various locations within the materials handling area.

Chapter 174 of the ENCM contains appropriate building vibration criteria for demolition and construction activities including pile driving. A base acceleration curve over the frequency range 1Hz to 80Hz is included in the ENCM with various multiplying factors depending on the situation. Construction work during the day attracts a multiplying factor of 60 and results in a recommended acceleration level of 0.3m/s^2 root-mean-squared (RMS) in the frequency range 4Hz to 8Hz and higher acceleration levels outside that frequency range.

Vibration levels expressed as a peak velocity, in mm/s, are more commonly understood and can be calculated from the acceleration curve shown in the ENCM. The base curve is equivalent to a velocity of 0.14mm/s above 8Hz with higher velocities allowed below 8Hz, assuming sinusoidal vibration. A multiplying factor of 60 means a recommended limit of 8.5mm/s over 8Hz for construction related vibration. As vibration is not always sinusoidal, a maximum of 5 mm/s is considered more appropriate during the day.

Construction work during the evening and night is subject to significantly lower vibration criteria according to the ENCM. A multiplying factor of 1.4, resulting in a peak vibration level of 0.2mm/s and an RMS level of 0.14mm/s equivalent to the base curve, is recommended for these time periods and would result in vibration generated at the site being imperceptible at any residence.

4.4. Road Traffic Noise

Construction work would generate traffic movements on roads near the steelworks including Masters Road, Springhill Road, Five Islands Road and Flinders Street, and on internal roads within the steelworks. Vehicles moving on internal roads are assessed as site sources, while vehicles on public roads are assessed as road traffic. Changes in noise level due to construction traffic on public roads are assessed to the DEC's Environmental Criteria for Road Traffic Noise (ECRTN) (EPA, 1999).

While the F6 Freeway is an arterial road, defined as a road linking regions and carrying predominately through traffic, the others listed above are considered to be sub-arterial roads which are defined as roads connecting arterial roads to areas of development and carrying traffic from one part of a region to another. The distinction between freeways and arterial roads is not important because the same criteria of 60 dB(A)Leq,15hr during the day and 55 dB(A)Leq,9hr during the night apply to each of these road categories, for case 7 in the ECRTN of "Land use developments with potential to create additional traffic on existing freeways/arterials". A further recommendation, where existing criteria are already exceeded, is "In all cases, traffic arising from the development should not lead to an increase in existing noise levels by more than 2 dB".

5. METHOD OF ASSESSMENT

This assessment must necessarily include theoretical predictions, rather than measurements, of noise levels during the construction and future operational phases of the project. The following sections describe the prediction methods applied to estimate future noise levels emitted during construction and operation of the plant and associated facilities, and by construction traffic. No change to staffing levels and operational traffic flows are anticipated as a result of this project so an assessment of operational traffic flows is not included in this report.

5.1. Site Noise Modelling

Noise sources associated with the construction and operational phases of the project are modelled using RTA Technology Environmental Noise Model (ENM) 3.06 computer software. ENM requires a range of input data to calculate received noise levels, such as:

- Ground contours including information on ground elevation and type,
- Noise source locations and each source's sound power spectrum, and
- Weather conditions including wind speed and direction and vertical temperature gradient.

The program then calculates received noise levels in the form of noise contours in the area around the site, or noise levels at specified receiver points. For this assessment, noise levels have been calculated at the following representative receiver points:

Residential receivers:

1. Gladstone Avenue Mt St Thomas, near the southern end of Hill Street,
2. O'Donnell Drive Figtree, between Burgess Avenue and Cobblers Road,
3. Merrett Avenue Cringila, at the eastern end, closest to the site,
4. Gregory Street Cringila, at the eastern end, closest to the site and on elevated ground,
5. Flagstaff Park, north of Flagstaff Road Warrawong,
6. Horne Street Port Kembla, at the northern end near Five Islands Road,

Industrial Receivers:

7. Grain Terminal, at the southern end of Egret Road,
8. Coal Loader, at the southern end of the berth,
9. Incitec, at the corner of Old Port Road and Foreshore Road.

Terrain

Information regarding ground elevation over the site was sourced from electronic copies of site drawings, supplied by BlueScope Steel, and from a commercially available 1:25000 topographic map of the area. A contour interval of 10m was generally used although intermediate contours have been included in critical areas of the site where available. Ground contours for residential and industrial areas outside the Steelworks site have been included, allowing noise level calculations in these areas.

The Steelworks contains a number of large buildings which in some cases offer significant noise reductions to receivers. Outlines of some of the major buildings, to a height advised by site personnel based on survey or drawing data, have been included in the noise model.

Many noise sources associated with the project are located within buildings or are shielded by other parts of the same structure. Noise reaching residential areas must leave the buildings by passing through doors, walls or the roof, rather than propagating directly to the receiver, and attenuation provided by a typical industrial building is included in the model where appropriate. Noise sources within the Sinter Plant have been modelled with a reduced sound power level depending on their location within the plant and exposure to residential areas, therefore wall cladding or other barriers around or within the Sinter Plant have not been included in the terrain model.

Construction Noise Sources

Noise levels emitted by construction equipment were estimated based on previous noise measurements near similar equipment on other sites. It is not possible at this stage to prepare a list of exact construction machines and processes likely to be required on the site, at least until construction contractors have been engaged for the work and determine their preferred strategy, so a typical list of noise sources has been developed by BlueScope Steel personnel for use in this assessment.

Existing Operational Noise Sources

Noise levels produced by major noise sources within the Ore Preparation Area were measured during a site visit on 2nd December 2005. All noise measurements were taken using a Svan 912AE Type 1 sound level analyser fitted with a 12.7mm polarised condenser microphone and a windshield. Instrument calibration was checked before and after the series of measurements using an 01dB Cal-01 Type 1 acoustic calibrator producing 94 dB at 1kHz, with each reading in the range 93.9 to 94.1 dBA. Copies of current calibration certificates for these instruments, from a NATA-accredited laboratory, are not attached to this report but are available upon request.

The analyser’s microphone was typically traversed at constant speed over accessible areas of a measurement surface around the source generally in accordance with AS1217.5, although in many cases only part of the measurement surface was accessible due to height or other safety restrictions. In these cases the calculated sound power for that source assumes the same average sound level is emitted by all surfaces to allow sound power calculations to procedures in AS1217.

For relatively small sources such as start alarms or conveyor drives, the sound power of each source was determined by measuring sound levels emitted by the source at a known distance from the acoustic centre and applying a spherical or hemispherical distance correction depending on the height of the source and microphone above the ground. In some cases noise levels from a source could be measured in more than one direction but in other cases measurements were only possible in one direction.

All noise level measurements included unweighted 1/3 octave percentile spectra in the range 1Hz to 20kHz, although these data have been simplified to single A-weighted octaves in the range 31.5Hz to 8kHz for presentation in this report. All noise modelling was completed using unweighted octaves in the range 31.5 Hz to 8kHz.

Proposed Operational Noise Sources

Noise levels emitted by most items of equipment affected by the project would not appreciably change, as many items are being refurbished or repaired. Noise levels from some sources may reduce slightly as a result of these repairs, particularly if the source was previously louder than normal due to broken or worn components, but such reductions have not been considered in detail.

Other components are proposed to be replaced and these noise sources can change substantially if new equipment is not exactly the same as the previous components. In these cases, typical sound power levels for the new equipment have been estimated based on experience elsewhere. Section 6.4 contains information regarding proposed noise sources.

5.2. Weather Conditions

An assessment of weather conditions in the area is required to determine appropriate noise modelling parameters, following guidelines in the DEC's Industrial Noise Policy (INP). Such an assessment was included in the EIS prepared in 2003 for the Hot Strip Mill (HSM) upgrade and has not been repeated here.

The HSM EIS assessment of weather conditions was based on data for the entire 2002 calendar year and reached the same conclusions as those described in the year 2000 EIS for the Illawarra Cogeneration Project, which used weather data for the year 1999. Results from these assessments are described in Section 6.1.

5.3. Traffic Noise Calculations

Traffic on the Steelworks site associated with the proposal is assessed as site noise and included in the noise modelling results described in this report, as recommended by the EPA. Traffic on public roads outside the Steelworks site is assessed as traffic noise.

The construction period would generate additional traffic movements on public roads and is included in this assessment. With no change to operations staff resulting from this proposal, no change is expected to traffic conditions during normal steelworks operation and an assessment of operational traffic noise levels is not required.

Traffic noise calculations use the Calculation of Road Traffic Noise (CORTN) method, originally developed by the United Kingdom Department of Transport. The standard CORTN method has been modified for Australian conditions by the NSW RTA and others and has been further modified to account for the current 15 hour daytime and 9 hour night periods referred to in the EPA's Environmental Criteria for Road Traffic Noise.

6. RESULTS

6.1. Weather Conditions

Analysis of weather conditions from January to December 2002, as described in the Port Kembla Hot Strip Mill Upgrade EIS prepared by CH2M HILL in 2003, shows a significant wind vector component occurs mainly towards the north east (a south-westerly wind) during the day but for less than 20% of the time, which is considered insignificant according to the INP. Dominant noise enhancing winds occur towards the east (a westerly wind) during the evening, for up to 32% of the time during autumn and winter and for less time during other seasons. These winds mainly occur during the late evening and are drainage flows heading from high ground west of the site towards the Pacific Ocean.

Westerly drainage flows continue during the night, for more than 30% of the time in all seasons. Noise enhancing winds occur only towards the eastern quadrant, away from or perpendicular to the direction of residences and other sensitive properties, resulting in calm weather conditions being appropriate for noise modelling purposes in this assessment. This result is consistent with an earlier assessment of weather conditions in this area, using data obtained for the 1999 calendar year.

Similarly, the occurrence of significant F-class and G-class temperature inversions was determined from 2002 weather data for the night period in winter. These inversion strengths can potentially cause significantly enhanced noise from the site to receiver areas. Results from this analysis show F-class inversions occur for 6.2% of the night in winter, while G-class inversions occur for 8.4% of the time. Both inversion strengths combined occur for 14.6% of the time which is considered insignificant according to guidelines in the INP. A low occurrence of inversions is due to the temperature stabilising effect of the Pacific Ocean and Tom Thumb Lagoon.

As noise enhancing winds or temperature inversions do not occur for significant periods of time in this area, all ENM model results are calculated using the following parameters:

- Temperature 20°C
- Relative humidity 70%
- No wind, no vertical temperature gradient.

6.2. Construction Noise Sources

Construction work required to complete the project would vary significantly during the 6 month period and particularly during the proposed 32 day Sinter Plant shutdown. Some components, such as installation of new conveyors within the Raw Materials Handling Area, can be completed at any time and are proposed to be completed before the shutdown.

A reasonable worst-case construction scenario which is likely to occur during the shutdown period includes machines and processes scattered over the site as shown in Table 4.

All listed construction machines are likely to be operating simultaneously and this situation has been modelled to estimate reasonable worst-case received noise levels during the construction phase. Equipment listed in each area has been modelled in that area, with all sinter plant construction equipment modelled within the building or in the area around the cooler and all conveyor construction equipment modelled in the southern half of the Raw Materials Handling Area.

Table 4: Assumed Sound Power Levels, Worst-Case Construction Period, LAeq re 1pW.

	dBA in Octave Band, Hz									Tot. dBA
Octave Frequency Band, Hz	31.5	63	125	250	500	1k	2k	4k	8k	
SINTER PLANT										
Hydraulic concrete breaker	69	85	93	93	103	110	114	108	94	117
Jackhammer	78	91	95	101	104	106	105	104	98	112
Backhoe	67	80	92	95	95	97	95	88	80	102
Pile driver *	85	95	108	114	120	114	112	106	94	123
Truck x4 manoeuvring on site	71	83	88	93	98	101	101	95	87	106
Mobile crane	75	88	92	102	105	111	107	99	87	113
Compressor, welder x4	73	85	90	95	100	103	103	97	89	108
TOTAL FOR SINTER PLANT	87	98	109	115	120	117	117	112	101	125
RAW MATERIALS HANDLING AREA										
Truck x2 manoeuvring on site	74	86	91	96	101	104	104	98	90	109
Mobile crane x2	78	91	95	105	108	114	110	102	90	116
Backhoe	67	80	92	95	95	97	95	88	80	102
Compressor, welder x4	73	85	90	95	100	103	103	97	89	108
TOTAL FOR MATERIALS HANDLING AREA	81	93	98	106	109	115	112	104	95	117

* The pile driver may also be required to work within the Raw Materials Handling Area but would not operate on both sites simultaneously.

6.3. Construction Noise Levels

Noise levels during the construction period include car and truck movements to and from the proposed material storage site within the No. 1 Works, as insufficient storage space for all required equipment exists near the Sinter Plant. The calculations represent a busy trucking period, as would occur during spoil removal from the site and disposal within the No.1 works, with typical trucking noise levels for most of the construction period being significantly lower. Table 5 shows received noise levels at representative receivers listed in Section 5.1 of this report.

Table 5 shows predicted construction noise levels are well within the daytime criteria listed in Table 3 with all proposed machines and activities occurring simultaneously. The Table also shows on-site construction work is expected to produce noise levels within the 35 dBA night noise criterion at all residential receivers, in the absence of the pile driver and an intense truck transport campaign to and from the No.1 works. Occasional truck movements to pick up materials would produce significantly lower noise levels.

Based on the results in Table 5, construction work can continue for 24 hours per day, 7 days per week provided the following noise control measures are implemented:

- The pile driver should be restricted to normal construction hours of 7am to 6pm, although quieter work that does not require hammering such as moving the pile driving machine or setting up the next pile can be carried out at any time of the day or night.
- Periods of relatively intensive truck movements to and from the No. 1 Works should ideally be restricted to the day and evening periods, although the predicted level of 44 LAeq,15min is still within the measured background noise level of 50.5 LA90,15min during the night at nearest

Cringila residences so is considered an acceptable impact for a few hours per night over short durations not exceeding two weeks.

Table 5: Received Construction Noise Levels, dBA.

Receiver	On-site Construction			Transport from No.1 Works	Total Received
	Sinter plant	Raw materials	Pile driver		
1. Mt St Thomas	28.8	15.1	37.8 *	27	39
2. Figtree	12.0	11.9	20.5	23	25
3. Cringila Nth	25.7	18.2	34.2	44 *	45
4. Cringila Sth	21.2	17.5	30.2	29	33
5. Warrawong	16.8	17.9	25.2	24	28
6. Port Kembla	22.0	22.1	31.3	11	32
7. Grain Terminal	43.9	46.3	50.1	39	52
8. Coal Loader	45.6	45.0	50.8	34	53
9. Incitec	26.4	20.2	38.8	7	39

* Indicates noise levels over the 35 dBA night noise criterion in residential areas.

6.4. Operational Noise Sources

A number of components in each of the main working areas are proposed to be replaced with similar or upgraded equipment, as discussed in Section 2. Noise levels from existing major components in each area were measured during a site visit on 2nd December 2005. Sound power levels produced by dominant sources are listed in Table 6.

Other sources of noise exist within the Sinter Plant but such sources would be significantly quieter than those listed in Table 6. Sources listed for the Raw Materials Handling Area were operating at the time of the site visit and are considered typical for this area. While many other conveyors would operate intermittently, not all conveyors would operate simultaneously and the scenario shown in Table 6 is considered typical for this area. Stackers and reclaimers also operate in this area but their sound power levels are insignificant compared to long conveyors.

Noise from conveyor F51 at a distance of 1m was approximately equivalent to noise levels produced by conveyor F30 at a distance of 7m. Sound power levels produced by these sources have been apportioned from a single noise measurement between the two conveyors.

The sinter cooler currently includes three fans to force air through the sinter bed to remove heat. An increase in cooling capacity is proposed to be achieved by refurbishing and reinstalling two of the fans and replacing the third fan with two larger fans. The four future fans would provide approximately twice the airflow currently supplied by the three existing fans.

The existing fan inlets are located around the perimeter of the cooler and currently expose passing staff to a noise level up to 105 dBA. This assessment assumes noise levels emitted by the fan inlets would be silenced to produce no more than 90 dBA at the ears of a person walking past the fans and such silencers would also reduce fan noise levels at residences.

Noise measurements and observations from above the cooler indicate the dominant sources of noise are the fan casings and motors. The proposed larger fans may produce a higher sound power level from their casings and motors than the single fan being replaced, but the fans are located within the circular cooler and are effectively shielded from any residence. Fan discharge noise is effectively attenuated through the sinter bed so is not a dominant noise source and this situation is expected to continue despite potentially higher noise levels from the larger fans.

Table 6: Measured Sound Power Levels, Existing Sources, LAeq re 1pW.

	dBL in Octave Band, Hz									Tot.
Octave Frequency Band, Hz	31.5	63	125	250	500	1k	2k	4k	8k	dBA
SINTER PLANT										
Strand feeders	73	92	92	94	94	93	91	95	76	102
Ignition furnace	54	69	81	92	91	93	93	92	87	100
Strand	64	76	85	97	99	104	106	105	99	111
Windlegs	66	78	86	97	101	108	112	116	106	118
Sinter breaker	67	75	82	91	92	94	94	95	84	101
Hot feeder	80	85	93	100	101	101	99	98	87	107
Cooler	77	89	99	109	111	111	110	105	99	117
Cooler fan 1 inlet	81	84	101	112	110	108	105	99	89	116
Cooler fan 2 inlet	80	82	100	109	110	109	105	100	90	115
Cooler fan 3 inlet	77	83	100	111	110	109	105	99	90	116
Main exhaust fan casing	75	85	94	106	110	113	113	111	108	119
Room dedusting fan	67	80	94	108	105	100	99	95	83	111
Vacuum truck	78	83	92	99	94	91	93	94	93	103
RAW MATERIALS HANDLING AREA										
Conveyor F24	69	85	92	101	108	106	107	98	90	112
Conveyor F51	65	78	89	97	100	97	95	88	78	104
Conveyor F30	75	88	99	107	110	107	105	98	88	114
Conveyor F37	76	80	88	96	95	92	89	83	78	100
Conveyor alarm	67	89	84	94	98	99	110	109	92	113
F24 drive	56	74	86	94	100	99	94	86	74	104
F29 drive	60	72	84	93	98	97	92	88	86	102
Screen house	73	94	93	99	99	98	95	91	81	105

As the anticipated reduction in fan inlet noise is likely to outweigh any potential increase in casing and motor noise, the rebuilt cooler is likely to produce a similar or lower sound power than the existing cooler. No change in cooler noise levels is assumed to present a conservative assessment.

A vibrating feeder currently operates between the hot sinter breaker and the cooler feed chute to transport sinter over this short distance. The proposal includes replacement of the feeder with a tray conveyor. While noise levels produced by the tray conveyor are not currently known, such a conveyor is a slow speed machine that is expected to produce insignificant noise compared to the existing feeder. With an anticipated sound power level at least 10 decibels below other sinter plant components, noise levels produced by the proposed tray conveyor have been omitted from the model.

6.5. Operational Noise Levels

The existing and proposed future situations have been modelled and results are listed in Table 7, with predicted noise levels over appropriate noise criteria highlighted in bold type. Noise levels produced by these components are assessed to Industrial Noise Policy (INP) noise criteria listed in Table 2.

The results in Table 7 represent combined noise levels from simultaneous operation of the Ore Preparation Area before and after the proposed upgrades are completed. Differences between the existing and proposed situation are very slight and are primarily due to:

- Replacement of the existing vibrating sinter feeders between the strand and the cooler with a slower speed extended strand,
- Installation of an additional seven conveyors totalling 680m of belt within the materials handling area, although the extra 680m is less than 5% of the existing combined belt length of at least 15km within this area so makes only a small difference to received noise levels; and
- Installation of additional fan capacity on the sinter cooler. Silencers would be installed on the fan inlet ducts to minimise occupational noise levels for personnel passing the site and modern fans are expected to be quieter than the existing units. No noise decrease has been modelled for these fans to present a conservative assessment, although a reduction of at least 10 decibels is expected as a result of the proposed inlet silencers.
- Existing cooler fans do not produce tonal noise according to the definitions of tonality in the ENCM, INP and AS1055, although noise from the fans may sound tonal due to a concentration of acoustic energy in a very narrow frequency band. New fans and silencers would be designed to ensure noise from the fans is not tonal at any residential receiver.

Calculated noise levels are within the target of 35 LAeq,15min at all except the closest Mt St Thomas residences and are well within the 43 LAeq,15min night criterion at these residences. No operational noise management or mitigation measures are therefore required or have been recommended.

Table 7: Received Operational Noise Levels, Ore Preparation Area, LAeq,15min.

Receiver	Existing Situation	Proposed Situation	Difference
1. Mt St Thomas	35.9	35.8	-0.1
2. Figtree	20.9	20.8	-0.1
3. Cringila Nth	32.8	32.6	-0.2
4. Cringila Sth	29.7	29.6	-0.1
5. Warrawong	31.3	31.2	-0.1
6. Port Kembla	33.8	33.7	-0.1
7. Grain Terminal	52.7	52.7	0
8. Coal Loader	51.9	51.9	0
9. Incitec	36.2	36.0	-0.2

6.6. Traffic Noise Levels

Existing Traffic

Information regarding existing traffic flows on main roads in the area was obtained by CH2M HILL and BlueScope Steel from the RTA for previous years. A traffic study carried out by CH2M HILL during preparation of the Hot Strip Mill EIS in 2003 resulted in traffic projections for the year 2003 for Springhill Road and Masters Road as shown in Table 8 below.

Table 8: Traffic Volume Data, Vehicles Per Day (RTA 2000, 2001, CH2M HILL 2003).

RTA No	Road	Location	1994	1997	2000	2003
7.644	Southern Freeway	North of Five Islands Road	-	47,226	49,718	51,000
7.594	Southern Freeway	South of Five Islands Road (Berkeley)	-	45,876	50,469	52,500
7.237	Springhill Rd	North of Five Islands Rd	38,413	37,899	38,723	36,886
7.218	Springhill Rd	North of Masters Road		35,706	35,226	32,204
7.700	Masters Rd	West of Springhill Rd	24,325	26,259	25,317	25,565

Proposed Construction Traffic

Traffic flows generated by construction activities associated with the proposal have been estimated by BlueScope Steel based on the weight and volume of materials and the number of construction personnel required for the project. It is estimated that less than 30 trucks and buses (60 movements) per day would enter and leave the steelworks, with most of these vehicles entering and leaving the site via Flinders Street or Loop Road.

Less than 200 cars per day carrying construction personnel are expected to enter the site, most likely via Gate 3 (21 Entry Road), with construction staff then conveyed to the work site by bus. This car parking strategy has been proposed in response to limited available parking spaces near the work sites.

Approximately 40% of construction vehicles are assumed to approach and leave the area via Masters Road, with another 40% travelling to and from the south via Springhill Road and Five Islands Road and the remaining 20% travelling to and from the north along Springhill Road. Table 9 shows these anticipated vehicle movements superimposed over existing traffic flows. The Table shows traffic generated by construction activities represents less than 1% of existing traffic flows on all roads.

Table 9: Existing and Construction Traffic Volumes, Vehicles Per Day.

Road	Location	Existing	Construction	Total
Southern Freeway	North of Five Islands Road	51,000	24 trucks, 80 cars	51,104
Southern Freeway	South of Five Islands Road (Berkeley)	52,500	24 trucks, 80 cars	52,604
Springhill Rd	North of Five Islands Rd	36,886	24 trucks, 80 cars	36,890
Springhill Rd	North of Masters Road	32,204	12 trucks, 40 cars	32,256
Springhill Rd	North of Steelworks' Gate 1	16,111	12 trucks, 40 cars	16,163
Masters Rd	West of Springhill Rd	25,565	24 trucks, 80 cars	25,669

A traffic flow increase of less than 1% results in a noise level increase of less than 0.04 dBA at receivers near the road which is insignificant, would not be noticed by residents and is well within the 2 dBA allowance recommended in the ECRTN for situations of this type.

6.7. Construction Vibration

Sources of ground vibration generally include hydraulic hammers on excavators, trucks and excavators moving around on rough ground, vibrating rollers and pile driving. Most of these sources generally produce insignificant ground vibration at distances greater than 50m, although pile driving can produce noticeable vibration at a distance of 150m depending on ground conditions. Predicted vibration levels at the closest Cringila residences 1200m from the work sites are less than 0.1mm/s and would not be measurable or perceptible. Further assessment of ground vibration due to anticipated construction sources is not warranted. Piles in the sinter plant area are likely to be bored rather than driven to minimise vibration levels for nearby operating equipment.

7. CONCLUSION

This assessment of noise associated with the proposed Ore Preparation Area upgrade has shown little potential for excessive noise or vibration during the construction phase provided any impact pile driving is restricted to normal daytime construction hours. More detailed noise mitigation measures for the construction phase are therefore not required and have not been recommended. Construction work, except impact pile driving but including bored or vibrated piling, can therefore continue 24 hours per day if necessary without exceeding appropriate noise criteria or the existing background noise level at any residence.

New items of equipment proposed to be installed within the Ore Preparation Area are unlikely to exceed conservative night noise criteria at any residence under prevailing weather conditions and specific noise management measures are not required. Minor additional traffic noise would be generated during the construction phase but would not be measurable or noticeable at any residence.

Based on the results of this assessment, the proposed upgrade work would generate some noise emissions but these are within acceptable guideline levels and do not represent a significant impact.

APPENDIX A – SITE PLAN SHOWING RECEPTOR LOCATIONS