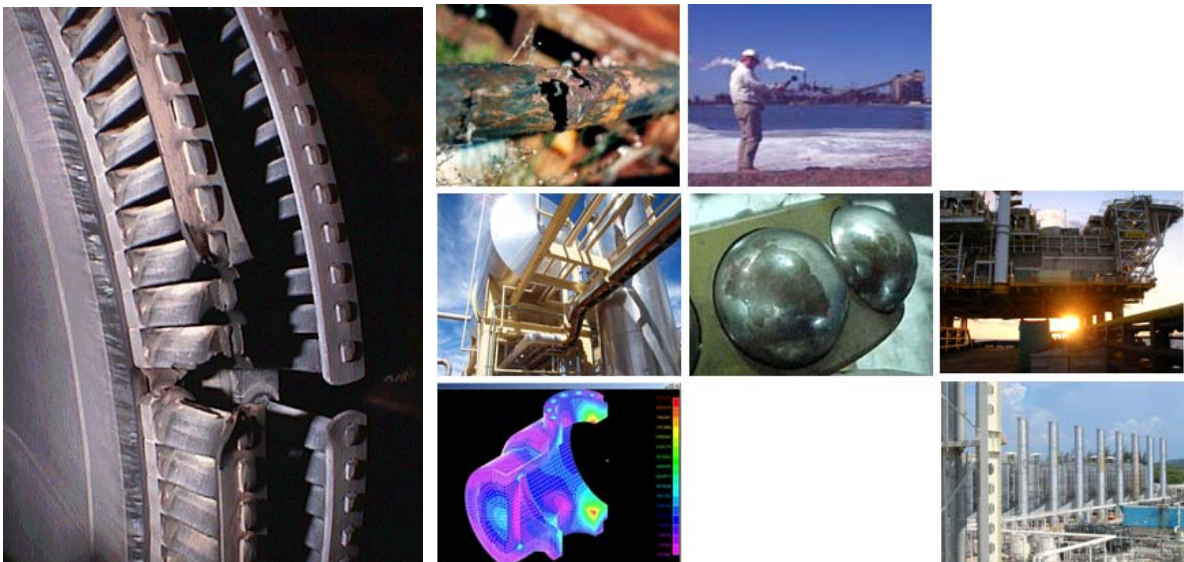


PROPOSED OUTER HARBOUR DEVELOPMENT PILE DRIVING NOISE ASSESSMENT REPORT



BHP BILLITON IRON ORE

075063--6A-100- Rev7-28 June 2010

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SVT Job No: 075063
SVT Document No: 075063--6A-100- Rev7-28 June 2010

| Rev | Description | Prepared | Reviewed | Date |
|-----|------------------------------|-------------|-----------------|--------------|
| 7 | Updated with client comments | Maya Maroef | Granger Bennett | 28 June 2010 |
| 6 | Updated with client comments | Maya Maroef | Granger Bennett | 18 May 2010 |

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EXECUTIVE SUMMARY

Overview

SVT were commissioned by BHP Billiton Iron Ore to undertake an environmental noise impact assessment of piling noise associated with the proposed Outer Harbour Development.

Applicable Regulations

Piling

Piling is considered to be a construction activity. The Environmental Protection (Noise) Regulations 1997 gives requirements on how noise emission from construction sites is to be controlled. For construction work the noise regulations are the most stringent during night time¹ hours (19:00 till 07:00) and the following conditions apply:

- Construction work must be carried out in accordance with control of noise practices set out in Section 6 of Australian Standard 2436-1981 "Guide to Noise Control on Construction, Maintenance and Demolition Sites";
- Equipment used for the construction must be the quietest reasonably available;
- Contractor must advise all nearby occupants or other sensitive receptors who are likely to receive noise levels which fail to comply with the standard under Regulation 7 of the Environmental Protection (Noise) Regulations 1997, of the work to be done at least 24 hours before it commences;
- Contractor must show that it was reasonably necessary for the work to be done out of hours; and
- Contractor must submit to the CEO a Noise Management Plan at least seven days before the work starts, and the plan must be approved by the CEO. The plan must include details of:
 - Need for the work to be done out of hours;
 - Types of activities which could be noisy;
 - Predictions of the noise levels;
 - Control measures for noise and vibration;
 - Procedures to be adopted for monitoring noise emissions; and,
 - Complaint response procedures to be adopted.

¹ The regulatory requirements for construction during night time hours is also applicable for construction on Sundays and Public Holidays.

Assigned Levels

The Regulations specify assigned noise levels, which are the highest noise levels that can be received at noise-sensitive premises, commercial and industrial premises. Assigned noise levels have been set differently for noise sensitive premises, commercial premises, and industrial premises. For noise sensitive premises, i.e. residences, an “influencing factor” is added to the assigned noise levels. Penalties are also applied for noise that has tonal characteristics. The assigned noise levels for the Port Hedland area are given in Table 1-1. Compliance with the regulatory assigned levels is not required for construction activities. The assigned noise levels have therefore been used to determine which part of the community will be affected by noise generated by construction activities.

Table 1-1 Assigned noise levels applicable for piling at noise sensitive premises including 10dB penalty for impulsiveness²

| Position | L _{A10} Assigned noise levels in dB(A) | | |
|------------------------------|---|------------------------|----------------------|
| | Day (0700-1900) | Evening (1900-2200) | Night (2200-0700) |
| Brearley St | 37 | 32 | 27 |
| Hospital | 37 | 32 | 27 |
| Police Station | 52 | 47 | 42 |
| Pretty Pool | 35 | 30 | 25 |
| South Hedland | 45 | 40 | 35 |
| Wedgefield Industrial Estate | 65 | 65 | 65 |

Modelling

An Outer Harbour Development piling noise model has been created. The piling noise sources in the model included a 1400mm pile using an impact hammer. Two scenarios under worst-case meteorological conditions were modelled. The modelling scenarios included five and eight piling barges (see Section 5).

Summary of Piling Noise Levels

A summary of the predicted noise levels at the point receivers due to piling for the proposed Outer Harbour Development are given in Table 1-2. The background, L_{A90}, levels have also been provided in the table. The L_{A90} levels are the most relevant as they are indicative of the ambient noise levels (i.e. the noise levels exceeded for 90% of the time) at the receivers in Port Hedland. As can be seen from the table the predicted levels from the pile driving are above the ambient noise levels in Port Hedland.

² Piling takes approximately 3 to 4 hours for every pile with hammer strikes occurring once every second. With five piling barges this implies 5 strikes every second. As a result the pile strikes will be considered continuous when measured with a slow time weighting as required in the regulations. The L_{A10} metric was therefore considered to be the most appropriate metric for the assessment.

Table 1-2 Summary of receiver noise levels (L_{A10} in dB(A)) as a result of piling

| Receivers | Estimated Noise Level L ₁₀ dB(A) (Worst Case Meteorological Conditions) | | Maximum Allowable Noise Levels | | Measured L _{A90} Background noise levels ³ for evening and night time hours |
|------------------------------|--|-----------------|--------------------------------|-------------------|---|
| | 5 Piling barges | 8 Piling barges | Evening (1900-2200) | Night (2200-0700) | |
| Brearley St | 48.8 | 50.9 | 36 - 37.5 | 27 | 36 - 37.5 |
| Hospital | 54.1 | 56.2 | 45 - 46 | 27 | 45 - 46 |
| Police Station | 52.7 | 54.0 | 41.9 - 42.5 | 42 | 41.9 - 42.5 |
| Pretty Pool | 40.3 | 42.4 | 36 - 37 | 25 | 36 - 37 |
| South Hedland | 32.0 | 34.1 | 44 - 44.5 | 35 | 44 - 44.5 |
| Wedgefield Industrial Estate | 36.2 | 38.3 | 33 - 34.5 | 65 | 33 - 34.5 |

Piling Compliance

In order to determine which activities could be considered noisy and thus determine which communities are affected by the piling activities, the maximum allowable noise levels as calculated in Table 1-1 were used as the baseline for acceptable noise levels. Table 1-3 shows which sensitive receivers are affected by the piling operations in accordance with the criteria given above. As can be seen from the table, all the modelled receptors within Port Hedland are affected in the event that piling occurs outside of 07:00 to 19:00 hours between Mondays and Saturdays.

Table 1-3 Compliancy of sensitive receivers during the Outer Harbour Development piling operations

| Receiver | Above Assigned Level for Evening (1900-2200) (Y/N) | Above Assigned Level for Night (2200-0700) (Y/N) |
|----------------------------------|--|--|
| Scenario: 5 Piling barges | | |
| Brearley St | Y | Y |
| Hospital | Y | Y |
| Police Station | Y | Y |
| Pretty Pool | Y | Y |
| South Hedland | N | N |
| Wedgefield Industrial Estate | N | N |

³ Rpt 11-075063-Rev 2 – 31 August 2009. The measurement was undertaken continuously over two periods from 21 February to 5 March 2008 and from the 6 to the 20th March 2008.

| Receiver | Above Assigned Level for Evening (1900-2200) (Y/N) | Above Assigned Level for Night (2200-0700) (Y/N) |
|----------------------------------|--|--|
| Scenario: 8 Piling barges | | |
| Brearley St | Y | Y |
| Hospital | Y | Y |
| Police Station | Y | Y |
| Pretty Pool | Y | Y |
| South Hedland | N | N |
| Wedgefield Industrial Estate | N | N |

Noise Control and Noise Management Plan

The model predicts that most sensitive receivers in Port Hedland will be affected by pile driving activities for the proposed Outer Harbour Development for evenings, night times and on whole day on Sundays and public holidays. The following noise control measures have been recommended:

- Prepare a Noise Management Plan for all after hours, Sunday and public holiday activities and adhere to the Noise Management Plan,
- As far as possible scheduled pile preparation activities (i.e. all activities that occur before piling commences) will take place during evening, night time hours and piling activities will be scheduled to take place during daytime hours.
- A hammer and pile cushion (rubber) will be used during night time, public holidays and Sunday piling operations to reduce the impact noise of the hammer on the pile. Depending on the thickness of cushion used up to 3dB reduction in noise at the source can be expected⁴.

⁴ The reduction is based on an estimate of the material properties of rubber.

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1. INTRODUCTION

SVT were commissioned by BHP Billiton Iron Ore to undertake an environmental noise impact assessment of piling noise associated with the proposed Outer Harbour Development.

1.1 Applicable Documents

The following lists the applicable documents.

- BHP Billiton Iron Ore Doc: Noise Reduction Management Plan – Port Hedland Rev 2 Sept 2009;
- SVT Doc: Addendum Port Hedland Noise assessment report for RGP6 Configuration changes 075063-9-100 Rev 3 3 February 2010;
- SVT Doc: Port Hedland Noise Assessment Report for RGP6 Car Dumper 5 and Associated Infrastructure – 075063-12-100 rev 4 30 March 2010; and
- SVT Doc: Port Hedland RGP5 Pile driving and landside construction noise assessment-Rpt06-075063-rev1-5 Nov 2009.

1.2 Scope of Work

The major activities undertaken for this report included the modelling of piling activities, using equivalent noise sources from the SVT acoustics database. The modelled predictions were used to determine the potential impact of piling noise on the community of Port Hedland.

1.3 Piling Overview

BHP Billiton Iron Ore is currently assessing two piling scenarios for the proposed Outer Harbour Development construction. The scenarios involve using five or eight piling barges simultaneously.

The following two piling scenarios were modelled:

- 5 piling barges working along the Outer Harbour Development jetty and wharf.
- 8 piling barges working along the Outer Harbour Development jetty and wharf.

According to the piling schedule, 800mm to 1400mm diameter piles will be used in the construction of the wharf. These piles will be driven in using an impact hammer and the pile lengths will be appropriate to the depths of driving.

2. PORT HEDLAND AND SURROUNDING AREA

2.1 Port Hedland

Within Port Hedland there are industrial, commercial and residential areas. The industrial areas are concentrated at Nelson Point and Finucane Island, the commercial area is located at the town centre of Port Hedland and the residential area is located along the northern shore of Nelson Point.

The industrial activities in Port Hedland are primarily due to port operations associated with the shipping of iron ore and salt. Of these activities, the BHP Billiton Iron Ore facilities at Nelson Point and Finucane Island dominate noise impacts within the town of Port Hedland⁵.

2.2 Wedgefield Industrial area

The industrial area of Wedgefield is some 5.5 km from the BHP Billiton Iron Ore operations at Port Hedland as shown in Figure 2-1. Wedgefield is zoned as an industrial area.

2.3 South Hedland

South Hedland is a suburb of Port Hedland township, consisting of a residential area with a small shopping and office area which is zoned as a commercial area. South Hedland is approximately 9 km from Port Hedland as shown in Figure 2-1.



Figure 2-1 Port Hedland, Wedgefield and South Hedland

⁵ Rpt09 075063 RGP6 Noise Assessment report rev4 14 July 2009

3. APPLICABLE REGULATIONS AND ASSIGNED LEVELS

3.1 Regulation Applicable to Piling Operations

Piling activities are planned to be undertaken from 7:00 up to 22:00 hours on Monday to Sunday. Piling is considered to be a construction activity and therefore needs to be assessed in terms Regulation 13 of the Environmental Protection (Noise) Regulations 1997.

3.1.1 Daytime Construction Activities

- The Environmental Protection Noise Regulations 1997 state that the assigned noise levels for construction work carried out between 7:00 and 19:00 on any day, which is not a Sunday or public holiday do not apply provided that:
 - The construction work is carried out in accordance with control of noise practices set out in Section 6 of Australian Standard 2436-1981 "Guide to Noise Control on Construction, Maintenance and Demolition Sites";
 - The equipment used for the construction is the quietest reasonably available; and
- The Chief Executive Officer (CEO) of the Shire may request that a Noise Management Plan be submitted for the construction work carried out.

3.1.2 Night-time Construction Activities

The following applies for construction work undertaken outside daytime hours:

- The construction work must be carried out in accordance with control of noise practices set out in Section 6 of Australian Standard 2436-1981 "Guide to Noise Control on Construction, Maintenance and Demolition Sites";
- The equipment used for the construction must be the quietest reasonably available;
- The contractor must advise all nearby occupants or other sensitive receptors who are likely to receive noise levels which fail to comply with the standard under Regulation 7, of the work to be done at least 24 hours before it commences;
- The contractor must show that it was reasonably necessary for the work to be done out of hours; and
- The contractor must submit to the CEO of the Town of Port Hedland a Noise Management Plan at least seven days before the work starts, and the plan must be approved by the CEO. The plan must include details of:
 - Need for the work to be done out of hours;
 - Types of activities which could be noisy;
 - Predictions of the noise levels;
 - Control measures for noise and vibration;
 - Procedures to be adopted for monitoring noise emissions; and
 - Complaint response procedures to be adopted.

3.1.3 Construction Traffic

Where construction traffic (particularly from heavy vehicles associated with earthworks) is likely to pass close to residential streets or along quiet country roads then traffic noise impacts should be assessed in accordance with the draft EPA Guidance for EIA No.14 – Road and Rail Transportation Noise. Piling activities for the proposed Outer Harbour Development do not involve the use of heavy vehicle or construction traffic close to residential streets or quiet country roads in Port Hedland. Therefore road construction traffic has not been considered in this assessment.

3.2 Assigned and Maximum Allowable Noise Levels for Port Hedland, South Hedland and Wedgefield

The Regulations specify assigned noise levels, which are the highest noise levels that can be received at noise-sensitive premises, commercial and industrial premises. A detailed summary of assigned noise levels has been given in Appendix B. Compliance with the regulatory assigned levels is not required for construction activities. The assigned noise levels have therefore been used to determine which part of the community will be affected by construction activities.

Impact pile driving is an impulsive noise. The Regulations defines a source to be impulsive at the receiver if the difference between L_{Apeak} and L_{Amax} shows more than 15 dB.

Given the distance (approximately 3km) between the proposed piling activities and Port Hedland, it is expected that the marine piling noise will be impulsive in the town of Port Hedland.

As Wedgefield and South Hedland are 5km-9km from Port Hedland, it is expected that there will be no impulsiveness as a result of marine piling in the received noise from the Port facility due to absorption in the atmosphere. No penalty will therefore be applicable to Wedgefield or South Hedland.

The assigned noise levels that are applicable for the assessment of the Port Hedland marine piling activities, including a 10dB penalty for impulsiveness, are given in Table 3-1. Noise generated by impact pile driving are more severe than the levels generated by drilling, hence the worst case scenario (impact pile driving) has been modelled.

The assigned noise levels that are applicable for the assessment of the proposed piling operations activities are given in Table 3-1. Piling takes approximately 3 to 4 hours for every pile with hammer strikes occurring once every second. With five piling barges this implies 5 strikes every second. As a result the pile strikes will be considered continuous when measured with a slow time weighting as required in the regulations. The L_{A10} metric was therefore considered to be the most appropriate metric for the assessment.

Table 3-1 Assigned noise levels applicable for piling for noise sensitive premises including 10dB penalty for impulsiveness.

| Position | L _{A10} Assigned noise levels in dB(A) | |
|-----------------------------|---|--------------------|
| | Evening | Night ⁶ |
| Brearley St | 32 | 27 |
| Hospital | 32 | 27 |
| Police Station | 47 | 42 |
| Pretty Pool | 30 | 25 |
| South Hedland | 40 | 35 |
| Wedgfield Industrial Estate | 65 | 65 |

⁶ Night time levels are to be used for Sundays and Public Holidays.

4. NOISE MODELLING – METHODOLOGY AND OVERVIEW

A noise model has been developed for the piling activities associated with the proposed Outer Harbour Development. The noise sources in the model were arranged so that they would provide the potential worst case (see section 4.2.4) noise impacts for Port Hedland. The sound power levels for each noise source were obtained from the SVT database and are therefore based on measured data for similar equipment.

The noise modelling calculates noise levels at different receivers, and can also be used to assess noise control recommendations. This information can be used in the Noise Management Plan that is required by regulation for night time operations.

4.1 Noise Model Software

An acoustic model has been developed using the SoundPLAN noise modelling program developed by SoundPLAN LLC. The SoundPLAN software calculates sound pressure levels at nominated receiver locations or produces noise contours over a defined area of interest around the noise sources. The inputs required are noise source data, ground topographical data, meteorological data and receiver locations.

The model has been used to generate noise contours and predict noise levels at noise sensitive locations for the area around Port Hedland, South Hedland and Wedgefield.

4.2 Input Data

4.2.1 Source Sound Power Levels

The sound power levels for piling activities were obtained from the SVT database and are therefore based on measured noise data for a 1400mm pile using an impact hammer (refer section 5.1) which is of a similar diameter to the piles to be used in the proposed Outer Harbour Development.

4.2.2 Topography and Ground Types

Topographical information for the noise model was provided in .DXF format files, which were imported into the noise model directly. Ground absorption for hard and soft surfaces is as specified by the CONCAWE propagation algorithms. The ground absorption for the sea surface has been set to zero (perfectly reflecting) and 0.6 for overland surface, representing a realistic worst-case condition at the frequencies of interest. CONCAWE is a conservative algorithm (over-predicting up to 3dB on average) that is accepted by the DEC.

4.2.3 Receiving Locations

The noise model has been used to predict noise levels at the six locations at which baseline noise levels have been previously established⁷. Those locations are as indicated in Table 4-1.

⁷ BHP Billiton Iron Ore Doc: Noise Reduction Management Plan – Port Hedland Rev 2 Sept 2009

Table 4-1 Noise sensitive receiving locations

| Receiver | GPS coordinates (GDA-95) |
|------------------------------|--------------------------|
| Brearley St | 7753338 N, 667699 E |
| Hospital | 7753424 N, 665799 E |
| Police Station | 7753117 N, 664652 E |
| Pretty Pool | 7752609 N, 671261 E |
| South Hedland | 7742771 N, 667852 E |
| Wedgefield Industrial Estate | 7746567 N, 666048 E |

4.2.4 Meteorology

Certain meteorological conditions can increase noise levels at a receiving location by a process known as refraction. When refraction occurs, sound waves that would normally propagate directly outwards from a source can be bent downwards causing an increase in noise levels. Such refraction occurs during temperature inversions and where there is a wind gradient. These meteorological effects can increase noise levels by as much as 5 to 10 dB depending on the source, receiver geometry and intervening topography.

The SoundPLAN noise model calculates noise levels for user defined meteorological conditions. In particular, temperature, relative humidity, wind speed and direction data, and temperature inversion rates are required as input to the SoundPLAN model.

The noise model has been used to predict noise levels and produce noise contours for the worst case. In all cases the temperature and relative humidity values used were 15°C and 50% respectively. A worst-case scenario with wind speed of 3m/s winds combined with a 2°C/100m thermal inversion has been considered for night time noise propagation. (Wind speeds of 3m/s combined with a thermal inversion rate of 2°C/100m or Pasquil stability F are consistent with the default worst case night-time conditions for sound propagations defined in the EPA's draft guidance note – "Guidance for the Assessment of Environmental Factors (in accordance with the Environmental Protection Act 1986) – Environmental Noise – No.8 Draft".)

5. PILING NOISE MODELLING RESULTS

Two piling scenarios were modelled and evaluated with worst-case meteorological conditions (see section 4.2.4). The results for the different modelling scenarios are presented graphically as noise contour plots in Section 5.2.2. A summary of the point receiver predicted noise levels is provided in Section 5.2.3.

5.1 Noise Sources

Table 5-1 shows the sound power levels for the noise sources associated with the piling activities.

Table 5-1 Piling Noise Source Sound Power Levels

| Equipment | dB(Z) | | | | | | | | | Overall dB(A) |
|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|------------------|
| | 31Hz | 63Hz | 125Hz | 250Hz | 500Hz | 1kHz | 2kHz | 4kHz | 8kHz | |
| 1400mm Pile using Impact Menck Hammer (40 to 50 ton) | 118.3 | 131.3 | 140.2 | 140.2 | 137.2 | 135.7 | 130.5 | 122.4 | 114.3 | 139.8 |

5.2 Piling Activities for the Proposed Outer Harbour Development

5.2.1 Distribution of Noise Sources

Table 5-2 lists the arrangement of the piling activities for the two scenarios modelled for the proposed Outer Harbour Development. These locations represent the worst-case (see section 4.2.4) for noise impact on Port Hedland, South Hedland and Wedgefield. The impact hammer height was set at 20m above the sea surface.

Table 5-2 Coordinates of piling locations

| Scenario | Noise Source | Location (GDA-95) |
|-----------------|-------------------------|---------------------|
| 5 Piling barges | Jetty Pile 1 | 7755116 N, 662507 E |
| | Jetty Pile 2 | 7756826 N, 663173 E |
| | Wharf Pile 1 | 7758611 N, 663907 E |
| | Wharf Pile 2 | 7758965 N, 663512 E |
| | Wharf Pile 3 | 7759305 N, 663218 E |
| 8 Piling barges | Shore End of Jetty Pile | 662365 N, 7754817 E |
| | Jetty Pile 1 | 663080 N, 7756684 E |
| | Jetty Pile 2 | 663447 N, 7757614 E |
| | Transfer Deck Pile | 663813 N, 7758544 E |
| | Wharf Pile 1 | 663848 N, 7758565 E |
| | Wharf Pile 2 | 663516 N, 7758939 E |
| | Wharf Pile 3 | 663183 N, 7759312 E |
| | Wharf Pile 4 | 662851 N, 7759686 E |

5.2.2 Noise Level Contours

Noise level contours for the modelling of the Outer Harbour Development scenario with worst case meteorological conditions are shown in the following section. These contour plots are summarised in Table 5-3.

Table 5-3 Summary of noise level contour plots

| Scenario | Figure |
|----------|------------|
| 5 Piles | Figure 5-1 |
| 8 Piles | Figure 5-2 |

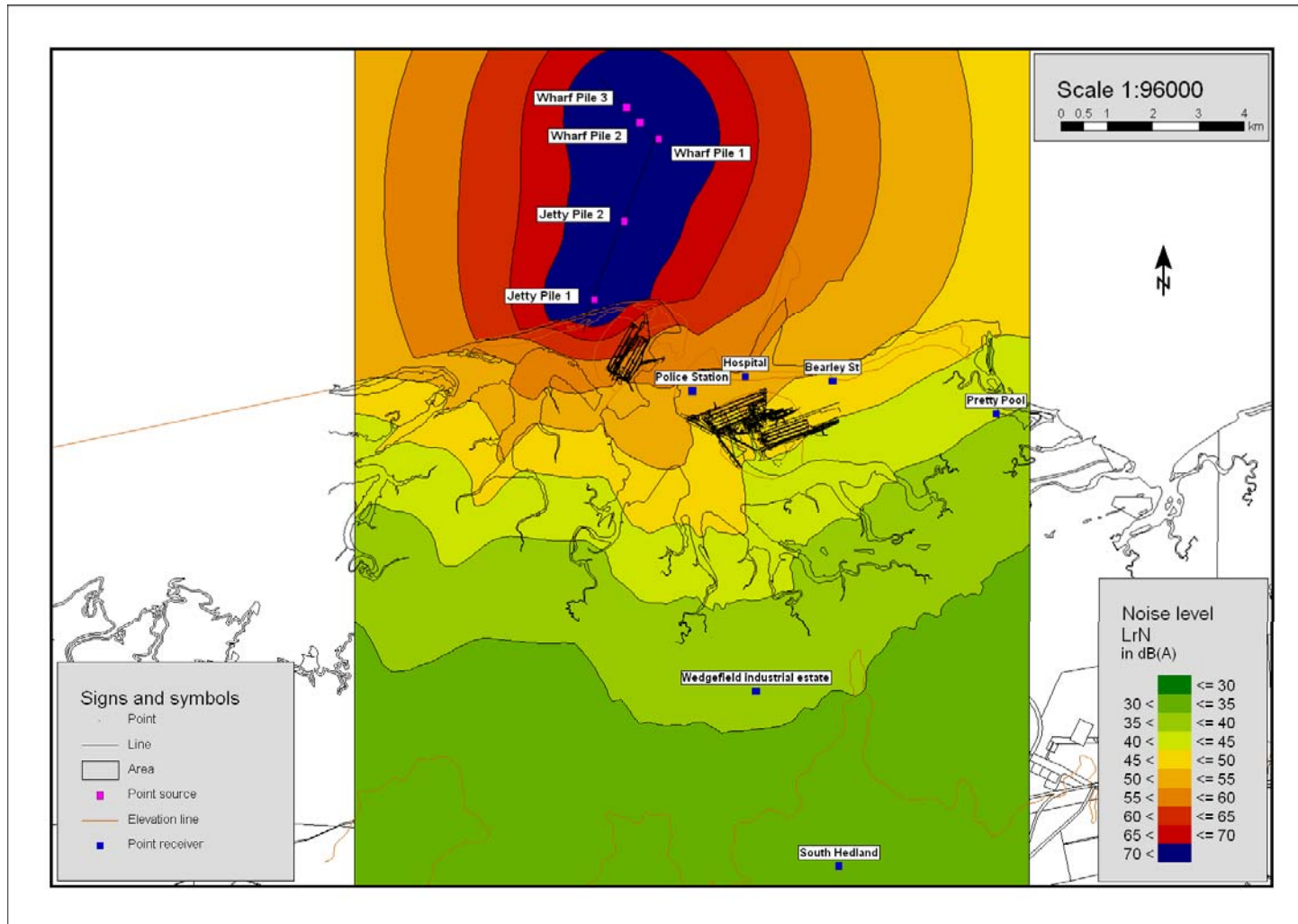


Figure 5-1 Noise level contours for Outer Harbour Development with 5 simultaneous piling activities

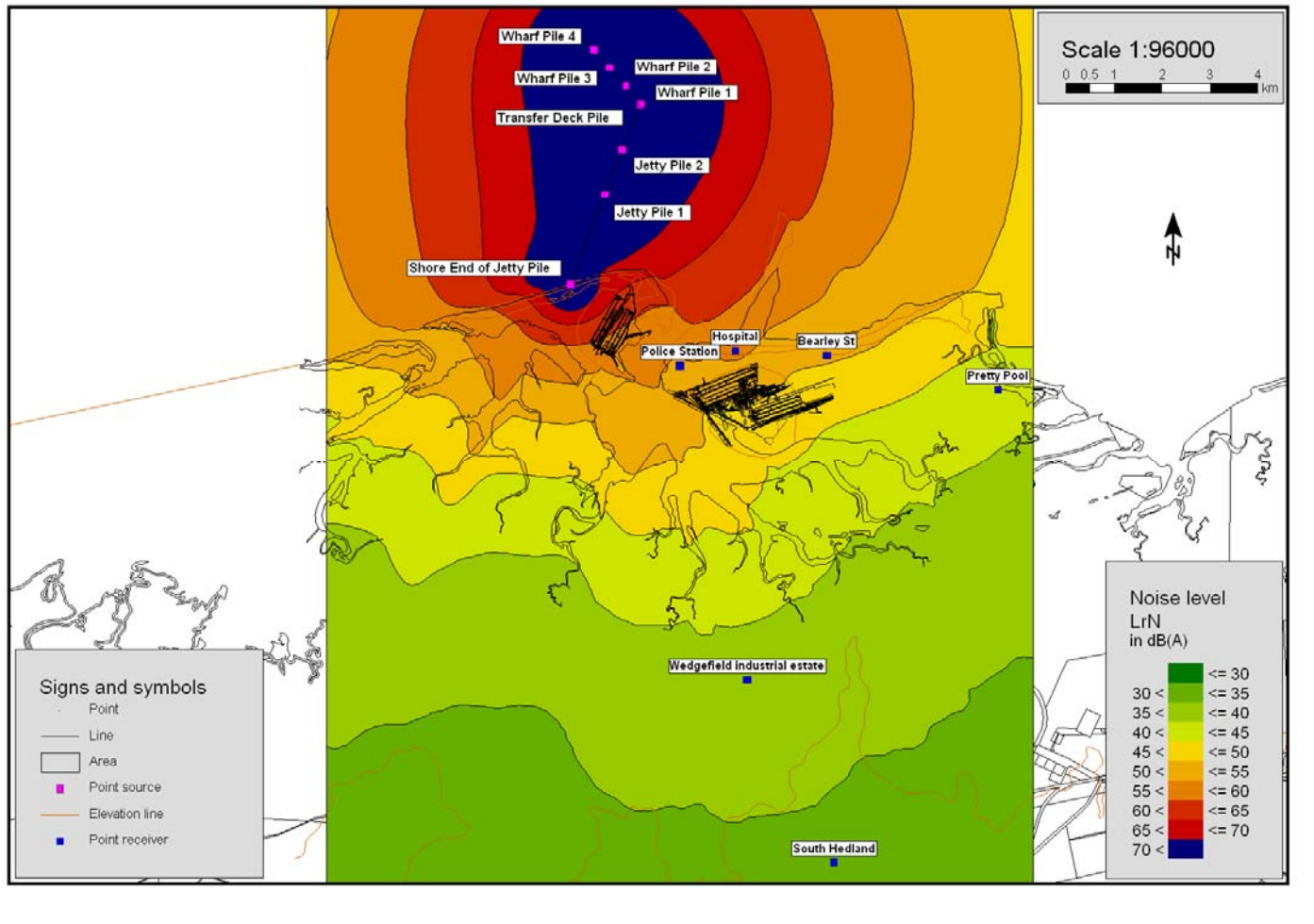


Figure 5-2 Noise level contours for Outer Harbour Development with 8 simultaneous piling activities

5.2.3 Summary of Piling Noise Levels

A summary of the predicted noise levels at the point receivers due to piling activities for the proposed Outer Harbour Development are given in Table 5-4. The background, L_{A90} , levels have also been provided in the table. The L_{A90} levels are the most relevant as they are indicative of the ambient noise levels (i.e. the noise levels exceeded for 90% of the time) at the receivers in Port Hedland. As can be seen from the table the predicted levels from the pile driving are above the ambient noise levels in Port Hedland.

Table 5-4 Summary of receiver noise levels (L_{A10} in dB(A)) as a result of piling

| Receivers | Estimated Noise Level L_{10} dB(A) (Worst Case Meteorological Conditions) | | Maximum Allowable Noise Levels | | Measured L_{A90} Background noise levels ⁸ for evening and night time hours. |
|------------------------------|--|-----------------|--------------------------------|-------|---|
| | 5 Piling barges | 8 Piling barges | Evening | Night | |
| Brearley St | 48.8 | 50.9 | 36 - 37.5 | 27 | 36 - 37.5 |
| Hospital | 54.1 | 56.2 | 45 - 46 | 27 | 45 - 46 |
| Police Station | 52.7 | 54.0 | 41.9 - 42.5 | 42 | 41.9 - 42.5 |
| Pretty Pool | 40.3 | 42.4 | 36 - 37 | 25 | 36 - 37 |
| South Hedland | 32.0 | 34.1 | 44 - 44.5 | 35 | 44 - 44.5 |
| Wedgefield Industrial Estate | 36.2 | 38.3 | 33 - 34.5 | 65 | 33 - 34.5 |

⁸ Rpt 11-075063-Rev 2 – 31 August 2009. The measurement was undertaken continuously over two periods from 21 February to 5 March 2008 and from the 6 to the 20th March 2008.

6. PILING ASSESSMENT AND NOISE CONTROL REQUIREMENTS

6.1 Assessment

Based on the operational methodology, it is considered unlikely that all 5 or 8 piling barges will be operating simultaneously. The scenarios modelled can therefore be considered as conservative. In order to determine which activities could be considered noisy the maximum allowable noise levels as calculated in Table 3-1 will be used as the reference noise levels. Table 6-1 shows which sensitive receivers are above or below the maximum allowable noise levels for piling operations.

Table 6-1 Compliancy of sensitive receivers during the Outer Harbour Development piling operations

| Receiver | Above Assigned Level for Night (Y/N) | Above Assigned Level for Evening (Y/N) |
|----------------------------------|--------------------------------------|--|
| Scenario: 5 Piling barges | | |
| Brearley St | Y | Y |
| Hospital | Y | Y |
| Police Station | Y | Y |
| Pretty Pool | Y | Y |
| South Hedland | N | N |
| Wedgefield Industrial Estate | N | N |
| Scenario: 8 Piling barges | | |
| Brearley St | Y | Y |
| Hospital | Y | Y |
| Police Station | Y | Y |
| Pretty Pool | Y | Y |
| South Hedland | N | N |
| Wedgefield Industrial Estate | N | N |

6.2 Noise Control

The model predicts that most sensitive receivers in Port Hedland will be affected by pile driving activities for the proposed Outer Harbour Development for evenings, night times and on Sundays and public holidays. The following noise control measures are recommended:

- Prepare a Noise Management Plan for all after hours, Sunday and public holiday activities and adhere to the Noise Management Plan,
- As far as possible scheduled pile preparation activities (i.e. all activities that occur before piling commences) will take place during evening, night time hours and piling activities will be scheduled to take place during daytime hours.
- A hammer and pile cushion (rubber) will be used during night time, public holidays and Sunday piling operations to reduce the impact noise of the hammer on the pile. Depending

on the thickness of cushion used up to 3dB reduction in noise at the source can be expected⁹.

6.3 Noise Control Plan Overview

The Noise Management Plan will outline the following activities:

- 1) Stakeholder communication and engagement;
- 2) Complaint registration;
- 3) Noise monitoring and analysis if required; and,
- 4) Noise control plan and implementation.

6.3.1 Stakeholder Engagement

If BHP Billiton Iron Ore is required to notify all affected residents of piling operations. The following information is supplied to the residents:

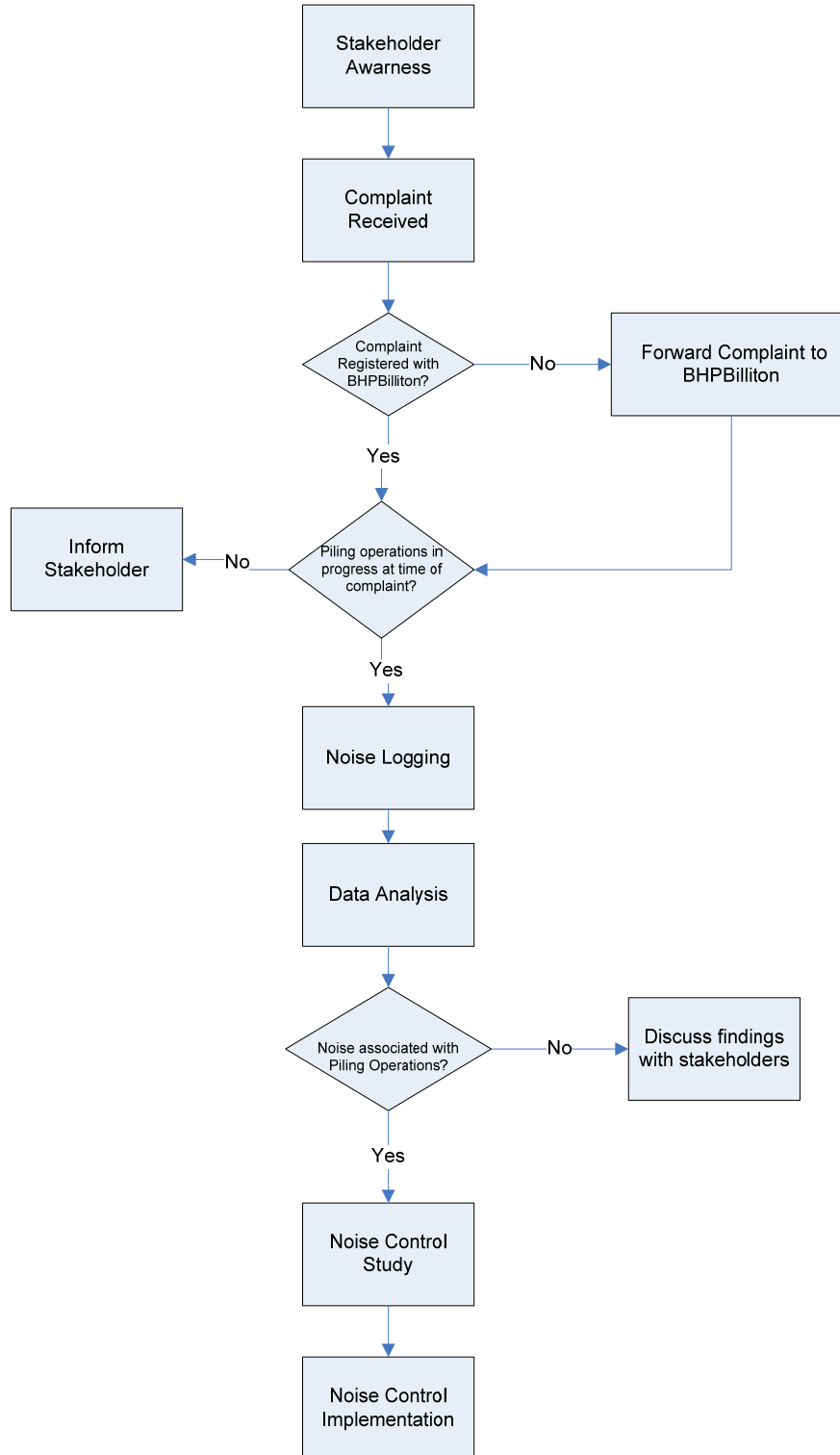
- 1) Information on the piling activities;
- 2) Information on complaint registration; and,
- 3) Inform stakeholders of the intended Noise Management Plan.

6.3.2 Complaint Registration

BHP Billiton Iron Ore will supply residents with a complaints hot-line number. Once a complaint has been registered a noise monitoring and analysis process will be instigated by BHP Billiton Iron Ore. Appendix A contains a flow diagram of the elements of a complaints registration action plan.

⁹ The reduction is based on an estimate of the material properties of rubber.

APPENDIX A : COMPLAINT RESPONSE PROCEDURE PROCESS FLOW DIAGRAM



APPENDIX B : SUMMARY OF ASSIGNED NOISE LEVELS

Noise management in Western Australia is implemented through the Environmental Protection (Noise) Regulations 1997 which operate under the *Environmental Protection Act 1986*. The Regulations specify maximum noise levels (assigned levels), which are the highest noise levels that can be received at noise-sensitive premises, commercial and industrial premises.

Assigned noise levels have been set differently for noise sensitive premises, commercial premises, and industrial premises. For noise sensitive premises, i.e. residences, an "influencing factor" is incorporated into the assigned noise levels.

The regulations define three types of assigned noise level:

- L_{Amax} assigned noise level means a noise level which is not to be exceeded at any time;
- L_{A1} assigned noise level which is not to be exceeded for more than 1% of the time;
- L_{A10} assigned noise level which is not to be exceeded for more than 10% of the time.

Piling takes approximately 3 to 4 hours for every pile with hammer strikes occurring once every second. With five piling barges this implies 5 strikes every second. As a result the pile strikes will be considered continuous when measured with a slow time weighting as required in the regulations. The L_{A10} metric was therefore considered to be the most appropriate metric for the assessment. The L_{A10} noise limit is the most significant for this study.

Table B- 1 shows the assigned noise levels for noise sensitive premises. As can be seen from the table, the time of day also affects the assigned levels for noise sensitive residences.

Table B- 1 Assigned noise levels for noise sensitive premises.

| Type of premises receiving noise | Time of day | Assigned Level dB(A) | | |
|--|--|------------------------|------------------------|------------------------|
| | | L _A 10 | L _A 1 | L _A max |
| Locations within 15m of a building directly associated with a noise sensitive use. | 0700 to 1900 hours Monday to Saturday | 45+ influencing factor | 55+ influencing factor | 65+ influencing factor |
| | 0900 to 1900 hours Sundays and public holidays | 40+ influencing factor | 50+ influencing factor | 65+ influencing factor |
| | 1900 to 2200 hours all days | 40+ influencing factor | 50+ influencing factor | 55+ influencing factor |
| | 2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays | 35+ influencing factor | 45+ influencing factor | 55+ influencing factor |
| Locations further than 15m from a building directly associated with a noise sensitive use. | All hours | 60 | 75 | 80 |
| Commercial premises | All hours | 60 | 75 | 80 |
| Industrial and utility premises | All hours | 65 | 80 | 90 |

Table B- 2 Assigned penalties for intrusive or dominant noise characteristics.

| Adjustment where noise emission is not music these adjustments are cumulative to a maximum of 15 dB | | |
|--|----------------------------|--------------------------------|
| Where tonality is present | Where modulation's present | Where impulsiveness is present |
| +5 dB | +5 dB | +10 dB |

Noise levels at the receiver are subject to penalty corrections if the noise exhibits intrusive or dominant characteristics, i.e. if the noise is impulsive, tonal, or modulated. That is, the measured or predicted noise levels are increased by the applicable penalties, and the adjusted noise levels must comply with the assigned noise levels. Regulation 9 sets out objective tests to assess whether the noise is taken to be free of these characteristics.

Appendix B-1 : Assigned Level Evaluation for Port Hedland

As the assessment is for a multitude of different premises, different assigned noise levels will be applicable to different areas of the town. As can be seen from Table B- 1 different premises zoning classifications have different assigned levels. So industrial premises have an assigned L_{A10} value of 65dB(A), commercial premises have an assigned L_{A10} value of 60dB(A) while residential premises have different assigned levels depending on the day of the week and the time of the day and surrounding land use. The relevant zone to each noise assessment position is shown in Table B- 3.

Table B- 3 Zones relevant to each logging position

| Residential | Commercial (60dB(A)) | Industrial (65dB(A)) |
|---|--|----------------------|
| Darlot Street Hospital Rural Village Pretty Pool South Hedland Golf Course Cook Point Brearley Avenue | Police Station (Influencing Factor = 17dB for residents at police station) Port Hedland Shopping Centre South Hedland Telstra Building | Wedgefield HBI |

The most stringent assigned levels are applicable to residential areas at night time (22:00 to 07:00 hours), on Sundays and public holidays. Residential areas are therefore the focus of the assessment.

Appendix B-2 : Influencing Factors

The influencing factor is calculated at the noise sensitive premises and added to the assigned level as shown in Table B- 4. The influencing factor depends on land use zonings within circles of 100 metres and 450 metres radius from the noise receiver. The value is dependent on:

- the proportion of industrial land use zonings;
- the proportion of commercial zonings; and
- the presence of major roads within the circles.

Due to the large number of noise sensitive premises an influencing factor has not been calculated for each premises, but rather an influencing factor has been calculated for specific areas as shown in Figure 6-1, which is considered representative of the area. As can be seen from the figure, and as expected the influencing factor and therefore the assigned noise level varies within the town area.

Table B- 4 Influencing Factor for various locations in Port Hedland.

| Residential Area | Influencing Factor |
|---------------------------|--------------------|
| Police Station | 17dB |
| Hospital | 2dB |
| Darlot St | 2 to 3dB |
| Brearley Avenue | 1 to 2 dB |
| Pretty Pool | 0 |
| Cook Point | 0 |
| Rural Village | 0 |
| South Hedland Golf Course | 0 |



Figure 6-1 Influencing factors that can be applied to different areas of Port Hedland

Appendix B-3 : Corrections for Characteristic of Noise

Noise levels at the receiver are subject to penalty corrections if the noise exhibits intrusive or dominant characteristics, i.e. if the noise is impulsive, tonal, or modulating.

Piling is an impulsive noise. The regulation defines a source to be impulsive at the receiver if the difference between L_{Apeak} and L_{Amax} shows more than 15 dB. Considering the distance between the pile operation and Port Hedland, it is expected that the pile noise will have impulsive characteristics.

Appendix B-4 : Assigned Level Evaluation for Wedgefield

Wedgefield is classified as an industrial area with no known premises that can be classed as sensitive¹⁰ premises as per the regulations. This implies that Wedgefield has an assigned L_{A10} value of 65dB(A).

Appendix B-4.1 Influencing Factors

As Wedgefield is an industrial area there are no influencing factors that are applicable.

Appendix B-4.2 Corrections for Characteristic of Noise

As Wedgefield is approximately 5.5km from Port Hedland it is expected that there will be no impulsiveness in the received noise from the Port facility due to absorption in the atmosphere. No penalty will therefore be applicable to Wedgefield.

¹⁰ Sensitive premises are defined as premises occupied solely or mainly for residential or accommodation purposes; rural premises; caravan parks and camping grounds; hospitals with less than 150 beds; rehabilitation centres, care institutions; educational institutions; premises used for public worship; hotels; premises for aged and child care; prisons and detention centres.

Appendix B-4.3 Assigned Noise Levels

The assigned levels for Wedgefield will therefore be the same as per the regulations for industrial areas.

Appendix B-5 : Assigned Level Evaluation for South Hedland

South Hedland can be classified as predominantly residential. For the purposes of this report and for evaluation purposes the commercial area of South Hedland will not be considered since the most restrictive assigned noise levels for the town apply at noise sensitive premises. Therefore, South Hedland will be subject to assigned levels as per the regulation for noise sensitive premises.

Appendix B-5.1 Influencing Factors

Since there are large areas of South Hedland which are zoned residential, the influencing factor has been assumed to be 0. The limits as per the regulation for noise sensitive areas will be used as a worst case scenario for all areas in South Hedland.

Appendix B-5.2 Corrections for Characteristic of Noise

As South Hedland is approximately 9km from Port Hedland it is expected that there will be no impulsiveness in the received noise from the Port facility due to absorption in the atmosphere. No penalty will therefore be applicable to South Hedland.

Appendix B-5.3 Assigned Noise Levels

The assigned levels for South Hedland will therefore remain as per the regulations.