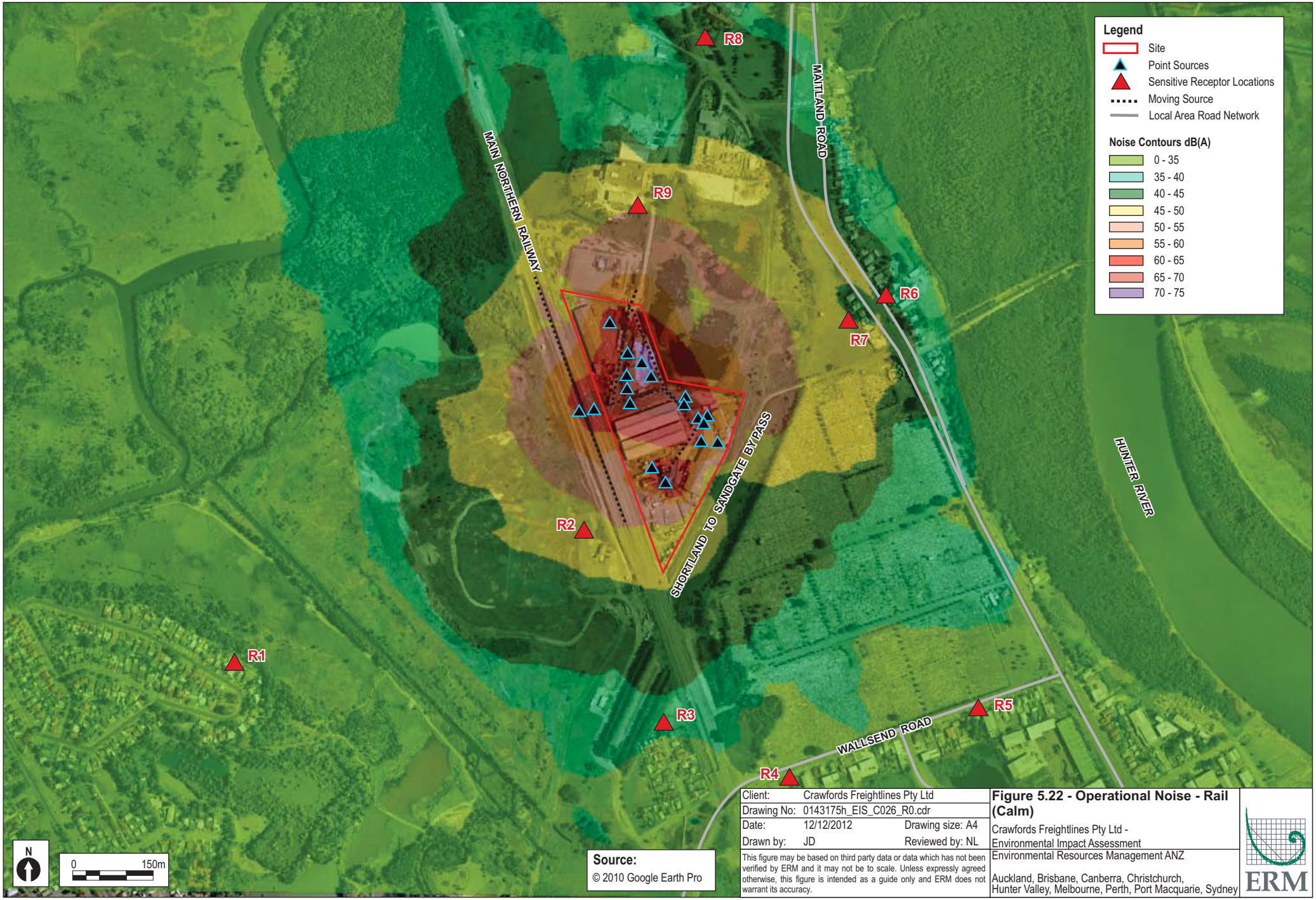


Client:	Crawfords Freightlines Pty Ltd	
Drawing No:	0143175h_EIS_C026_R0.cdr	
Date:	12/12/2012	Drawing size: A4
Drawn by:	JD	Reviewed by: NL

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

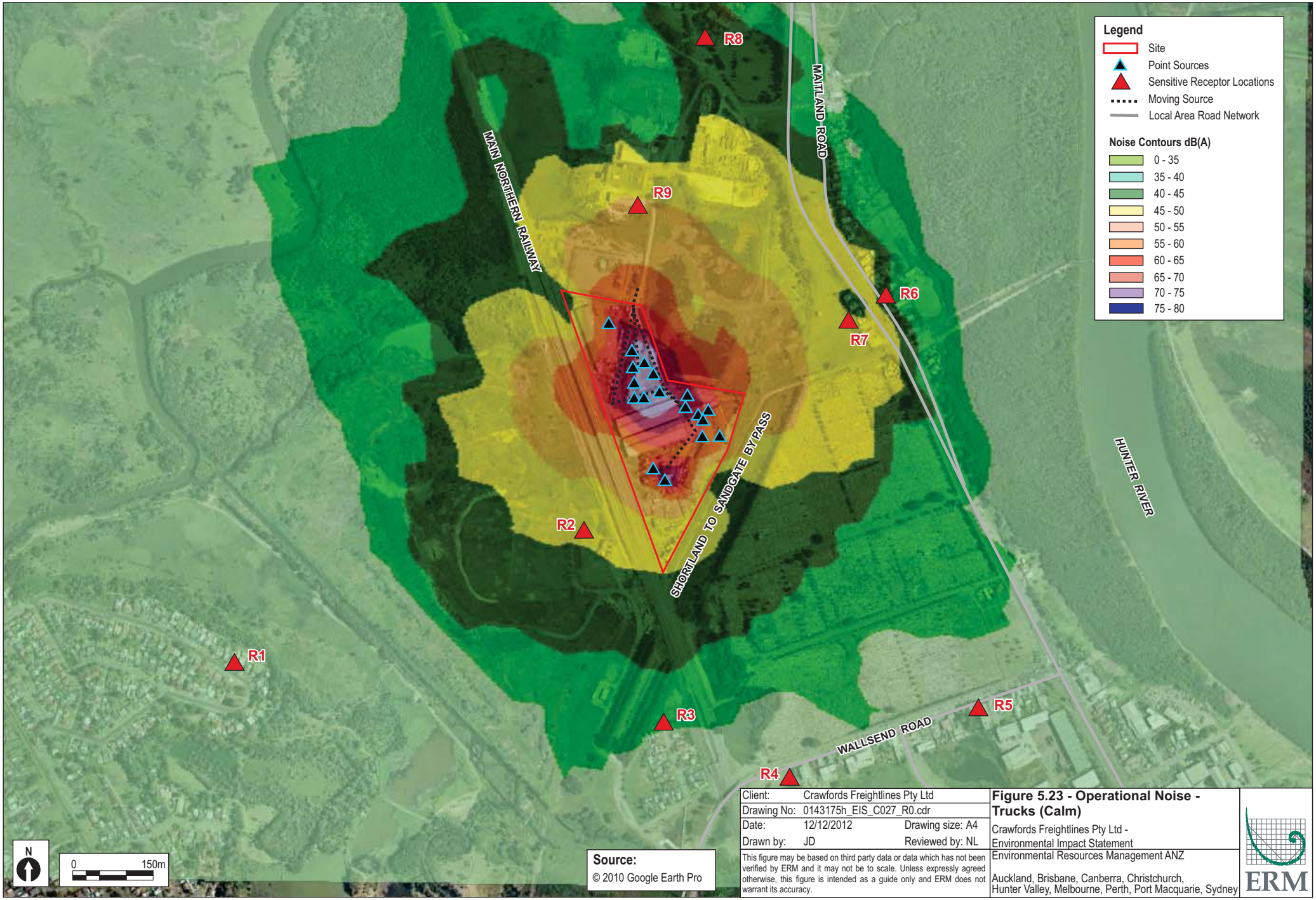
Figure 5.22 - Operational Noise - Rail (Calm)

Crawfords Freightlines Pty Ltd - Environmental Impact Assessment

Environmental Resources Management ANZ

Auckland, Brisbane, Canberra, Christchurch, Hunter Valley, Melbourne, Perth, Port Macquarie, Sydney

ERM



Client:	Crawfords Freightlines Pty Ltd	
Drawing No:	0143175h_EIS_C027_R0.cdr	
Date:	12/12/2012	Drawing size: A4
Drawn by:	JD	Reviewed by: NL

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

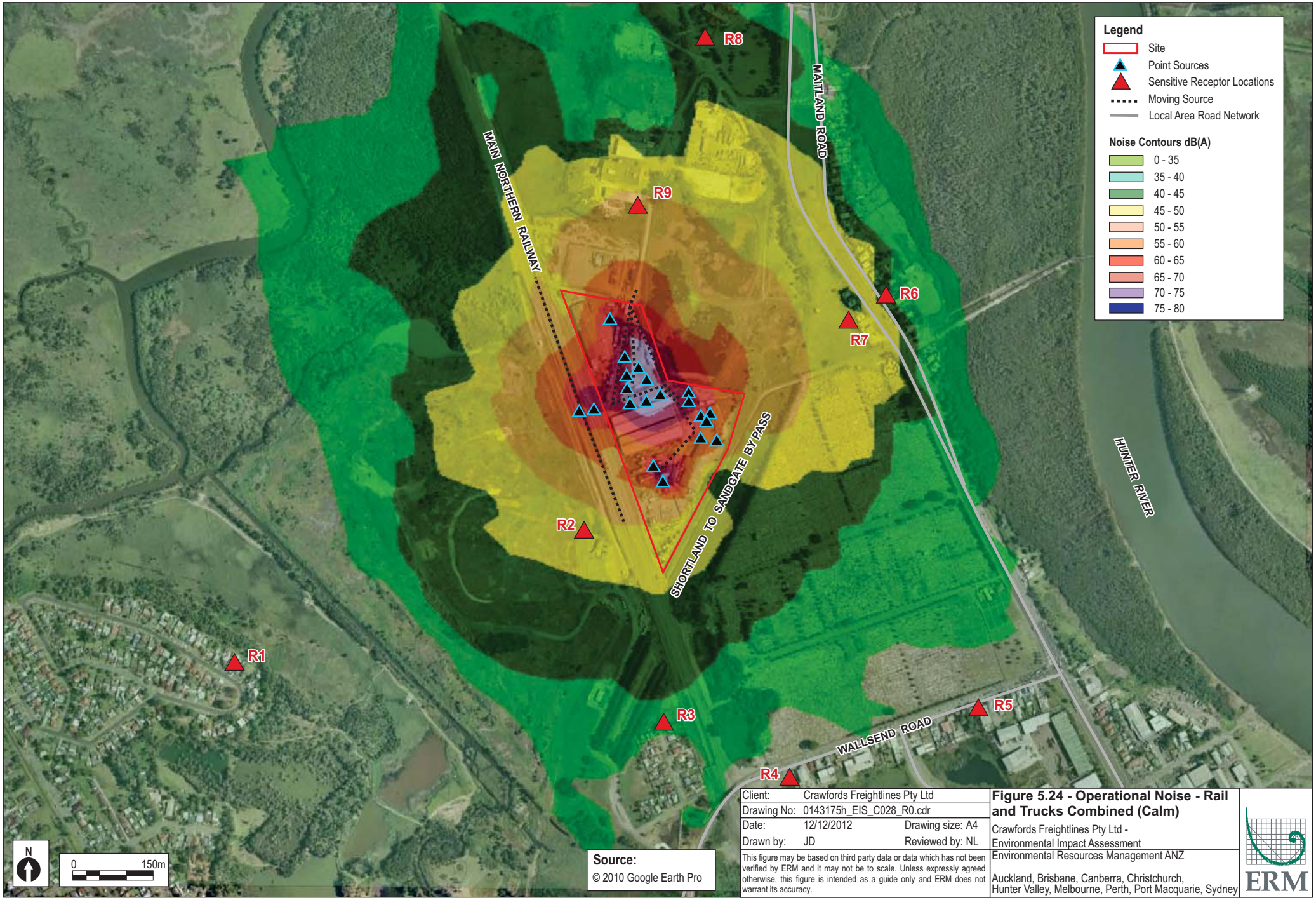
Figure 5.23 - Operational Noise - Trucks (Calm)

Crawfords Freightlines Pty Ltd - Environmental Impact Statement

Environmental Resources Management ANZ

Auckland, Brisbane, Canberra, Christchurch, Hunter Valley, Melbourne, Perth, Port Macquarie, Sydney

ERM



Client:	Crawfords Freightlines Pty Ltd	
Drawing No:	0143175h_EIS_C028_R0.cdr	
Date:	12/12/2012	Drawing size: A4
Drawn by:	JD	Reviewed by: NL

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

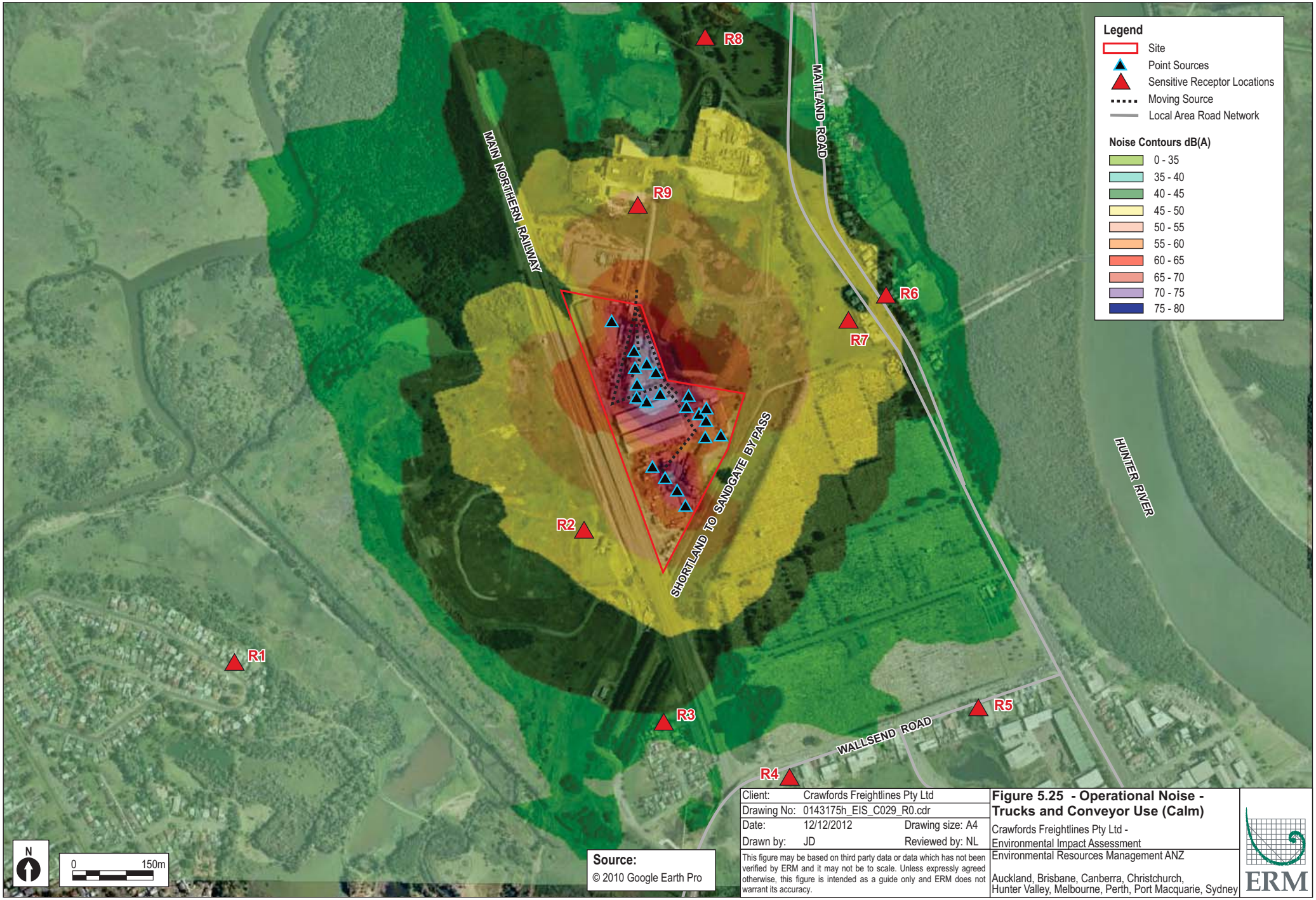
Figure 5.24 - Operational Noise - Rail and Trucks Combined (Calm)

Crawfords Freightlines Pty Ltd - Environmental Impact Assessment

Environmental Resources Management ANZ

Auckland, Brisbane, Canberra, Christchurch, Hunter Valley, Melbourne, Perth, Port Macquarie, Sydney

ERM



Client:	Crawfords Freightlines Pty Ltd	
Drawing No:	0143175h_EIS_C029_R0.cdr	
Date:	12/12/2012	Drawing size: A4
Drawn by:	JD	Reviewed by: NL

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

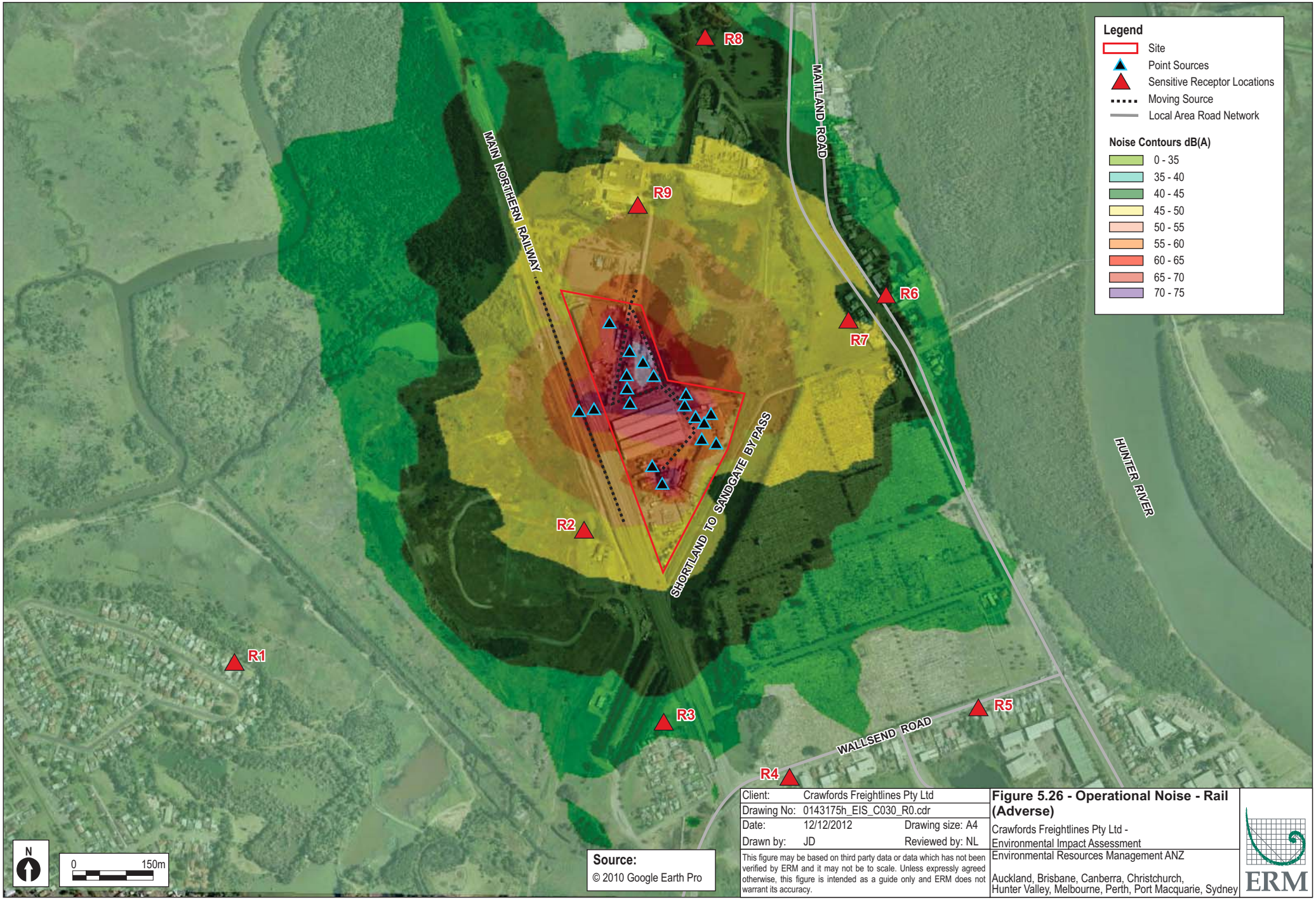
Figure 5.25 - Operational Noise - Trucks and Conveyor Use (Calm)

Crawfords Freightlines Pty Ltd - Environmental Impact Assessment

Environmental Resources Management ANZ

Auckland, Brisbane, Canberra, Christchurch, Hunter Valley, Melbourne, Perth, Port Macquarie, Sydney

ERM



Client:	Crawfords Freightlines Pty Ltd	
Drawing No:	0143175h_EIS_C030_R0.cdr	
Date:	12/12/2012	Drawing size: A4
Drawn by:	JD	Reviewed by: NL

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

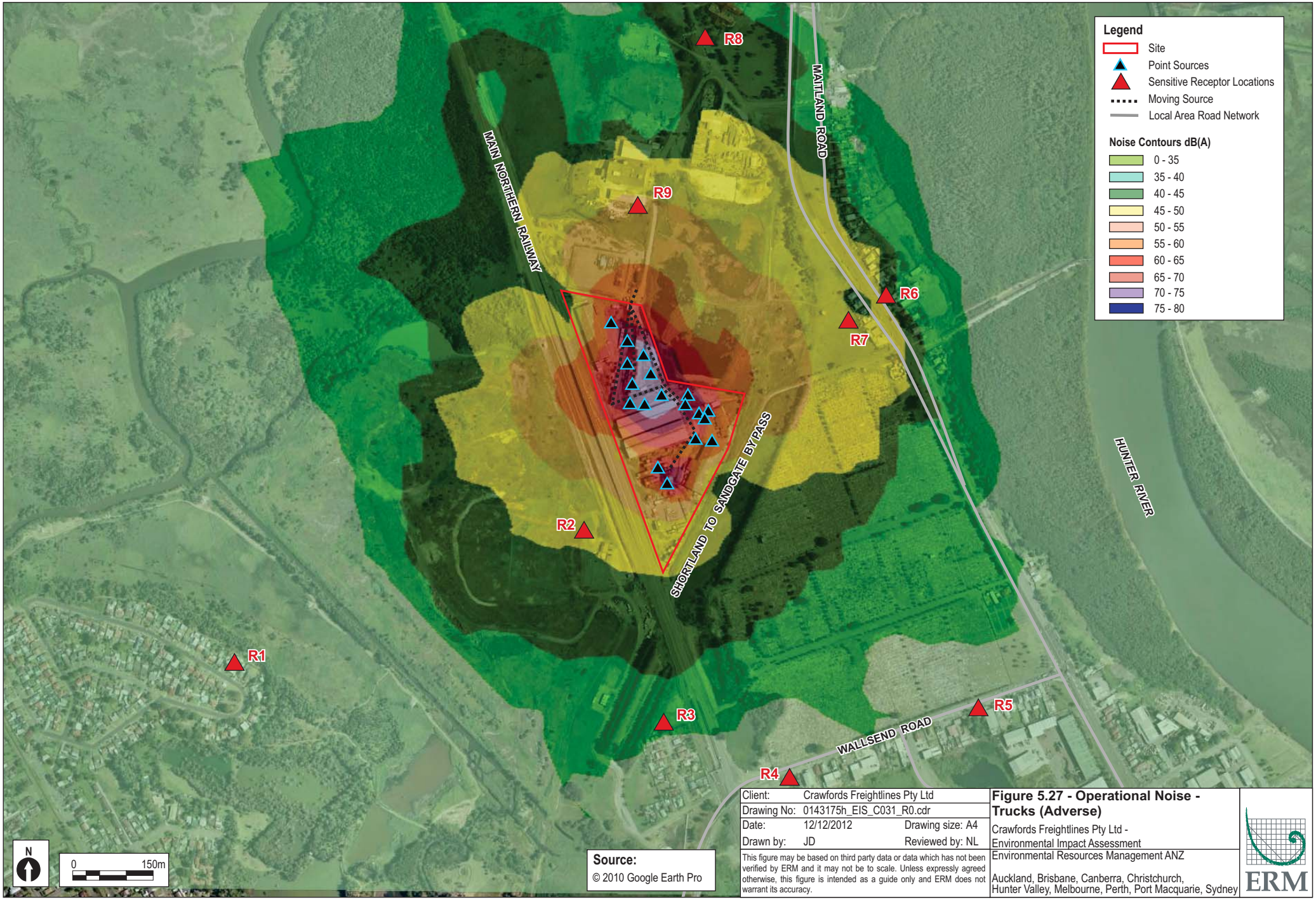
Figure 5.26 - Operational Noise - Rail (Adverse)

Crawfords Freightlines Pty Ltd - Environmental Impact Assessment

Environmental Resources Management ANZ

Auckland, Brisbane, Canberra, Christchurch, Hunter Valley, Melbourne, Perth, Port Macquarie, Sydney

ERM



Client:	Crawfords Freightlines Pty Ltd	
Drawing No:	0143175h_EIS_C031_R0.cdr	
Date:	12/12/2012	Drawing size: A4
Drawn by:	JD	Reviewed by: NL

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

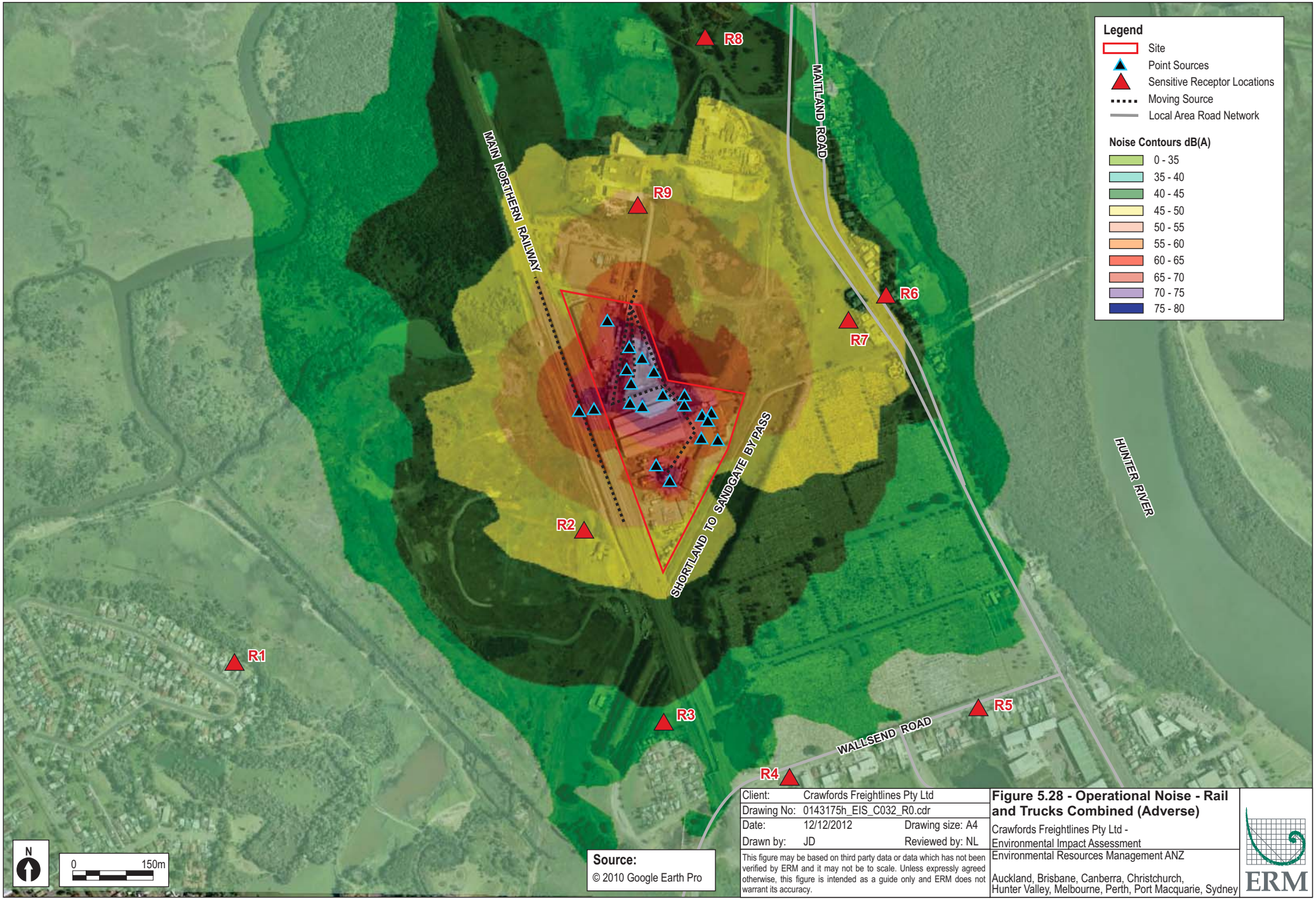
Figure 5.27 - Operational Noise - Trucks (Adverse)

Crawfords Freightlines Pty Ltd - Environmental Impact Assessment

Environmental Resources Management ANZ

Auckland, Brisbane, Canberra, Christchurch, Hunter Valley, Melbourne, Perth, Port Macquarie, Sydney

ERM



Client:	Crawfords Freightlines Pty Ltd		
Drawing No:	0143175h_EIS_C032_R0.cdr		
Date:	12/12/2012	Drawing size:	A4
Drawn by:	JD	Reviewed by:	NL

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

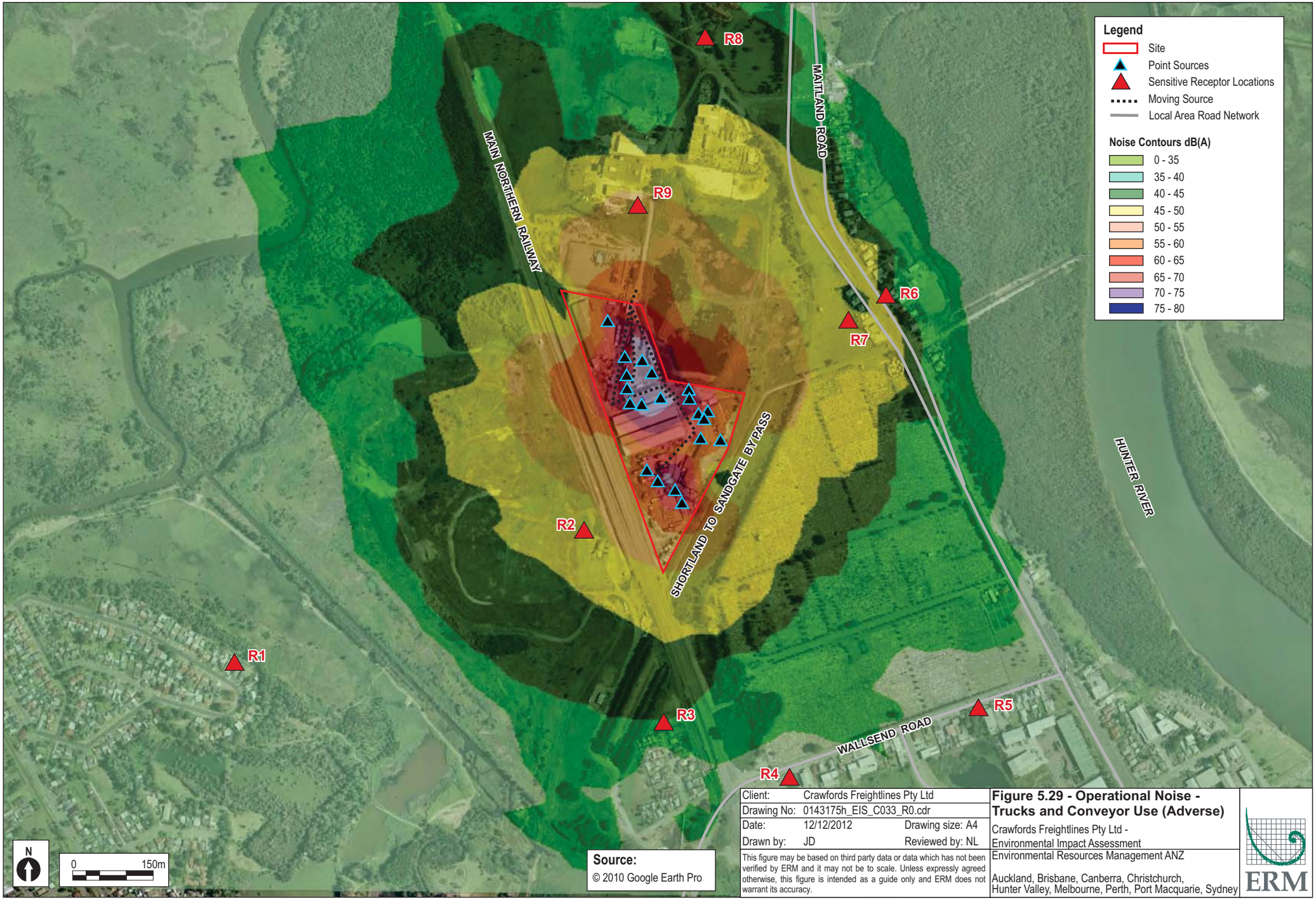
Figure 5.28 - Operational Noise - Rail and Trucks Combined (Adverse)

Crawfords Freightlines Pty Ltd - Environmental Impact Assessment

Environmental Resources Management ANZ

Auckland, Brisbane, Canberra, Christchurch, Hunter Valley, Melbourne, Perth, Port Macquarie, Sydney

ERM



Client:	Crawfords Freightlines Pty Ltd	
Drawing No:	0143175h_EIS_C033_R0.cdr	
Date:	12/12/2012	Drawing size: A4
Drawn by:	JD	Reviewed by: NL

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

Figure 5.29 - Operational Noise - Trucks and Conveyor Use (Adverse)

Crawfords Freightlines Pty Ltd - Environmental Impact Assessment

Environmental Resources Management ANZ

Auckland, Brisbane, Canberra, Christchurch, Hunter Valley, Melbourne, Perth, Port Macquarie, Sydney

ERM

Sleep Disturbance

The noise modelling process has conservatively predicted noise levels for comparison to the PSNL. Consideration must also be given to the potential for sleep disturbance (or awakenings) during the morning shoulder period that may be associated with transient, impulsive or maximum noise level events.

The INP does not specifically address sleep disturbance from high noise level events however from various research, NSW regulators accept the following criterion to address maximum noise events:

- $L_{A1\ (1\ minute)}$ not exceeding the $L_{A90\ (15\ minute)}$ by more than 15 dB(A).

This criterion is adopted to mean that where the criterion is met, sleep disturbance is not likely, but where it is not met, a more detailed analysis is required.

ERM considered all noise logging data collected in the vicinity of the site and determined the lowest overall morning shoulder period RBL (the mid-point between daytime and night time values) to be 39 dB(A). Based on this a representative sleep disturbance criterion of 54 dB(A) $L_{A1\ (1\ minute)}$ may be adopted.

ERM estimates that the predicted values in *Table 5.29* may increase by up to 10 dB(A) for $L_{A1\ (1\ minute)}$ values. A comparison of these estimated $L_{A1\ (1\ minute)}$ values to the adopted sleep disturbance criterion of 54 dB(A) at all residential receptors indicates that maximum noise level events may exceed this criterion by up to approximately 3 dB(A).

This is a general and highly conservative approach but indicates that maximum noise level events may generate impacts during the quietest morning shoulder periods if works are not managed accordingly, indicating a need to consider additional noise control mitigation and/or management measures (refer to *Section 5.8.7*).

Discussion

The findings of the operational noise impact assessment presented in *Table 5.28* and *Table 5.29* may be summarised as below:

- operational noise levels are calculated to be below the daytime PSNL (7am to 6pm) during both calm and adverse meteorological conditions at the majority of receivers. During combined truck and rail operations, noise levels are calculated to marginally (~0.1 dB(A)) exceed the PSNL at R8, although this is not considered significant. Based on this, negligible (low) impacts are anticipated during daytime operations;

- operational noise levels are calculated to be below the evening PSNL (6pm to 10pm) during both calm and adverse meteorological conditions at the majority of receivers. Noise levels are calculated to exceed the PSNL by between approximately 1 dB(A) and 3 dB(A) at R8. Based on this negligible (low) to moderate impacts are anticipated during evening operations; and

- operational noise levels are calculated to be below the morning shoulder period PSNL (6am to 7am) during both calm and adverse meteorological conditions at the majority of receivers. Noise levels are calculated to exceed the PSNL by between approximately 2 dB(A) and 4 dB(A) at R8. Based on this negligible (low) to moderate impacts are anticipated during morning shoulder period operations.

It should be noted that any predicted exceedances are limited to one receptor (R8) located close and north of the site. At this location negligible (low) to moderate impacts are anticipated. High or significant impacts are not anticipated.

There is limited risk that site operations will generate significant impacts, however the elevated (and in one case non-compliant) noise levels presented above indicates a need to consider additional noise control mitigation and/or management measures to those already adopted on site. The highest calculated noise levels (and any non-compliance) are associated with rail and truck operations occurring concurrently. These are limited to the evening and morning shoulder period only and as such are the focus of recommended noise control mitigation and/or management measures presented in *Section 5.8.7.*

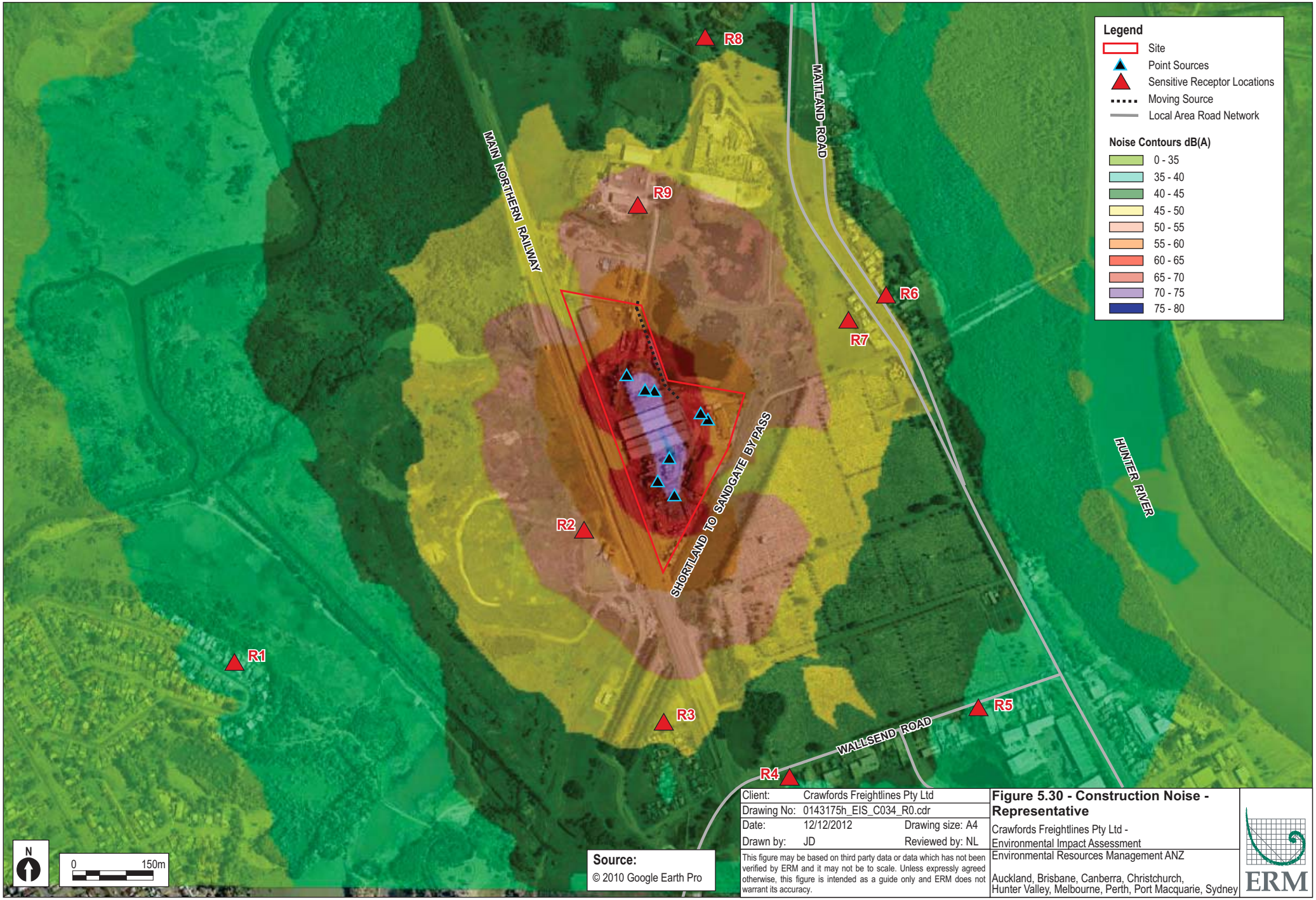
Construction Noise

The results of the construction noise impact assessment and comparison to the noise management levels at each assessment location are presented in *Table 5.30.* These results are visually presented as noise contour maps in *Figure 5.30* and *Figure 5.31.*

Table 5.30 Construction Noise Levels and Compliance Assessment

Scenario	Receptor	Calculated Noise Level[1]	Noise Affected Management Level[1]	Noise Affected Management Level Compliance[1]	Highly Noise Affected Management Level[1]	Highly Noise Affected Management Level Compliance
Representative	R1	36.4	44	-7.6	75	-38.6
	R2	56.5	65	-8.5	*n/a*	*n/a*
	R3	48.1	47	**1.1**	75	-26.9
	R4	41.8	47	-5.2	75	-33.2
	R5	39.8	47	-7.2	75	-35.2
	R6	46.1	65	-18.9	75	-28.9
	R7	47.7	65	-17.3	75	-27.3
	R8	45.1	48	-2.9	75	-29.9
	R9	51.4	75	-23.6	*n/a*	*n/a*
Worst-Case	R1	41.1	44	-2.9	75	-33.9
	R2	60.4	65	-4.6	*n/a*	*n/a*
	R3	52.2	47	**5.2**	75	-22.8
	R4	45.7	47	-1.3	75	-29.3
	R5	44	47	-3	75	-31
	R6	51.5	65	-13.5	75	-23.5
	R7	53.1	65	-11.9	75	-21.9
	R8	50.6	48	**2.6**	75	-24.4
	R9	56.9	75	-18.1	*n/a*	*n/a*

Leq, 15 minute and dB re: 2×10^{-5} Pa; and exceedances to PSNL in **bold** typeset.



Client:	Crawfords Freightlines Pty Ltd		
Drawing No:	0143175h_EIS_C034_R0.cdr		
Date:	12/12/2012	Drawing size:	A4
Drawn by:	JD	Reviewed by:	NL

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

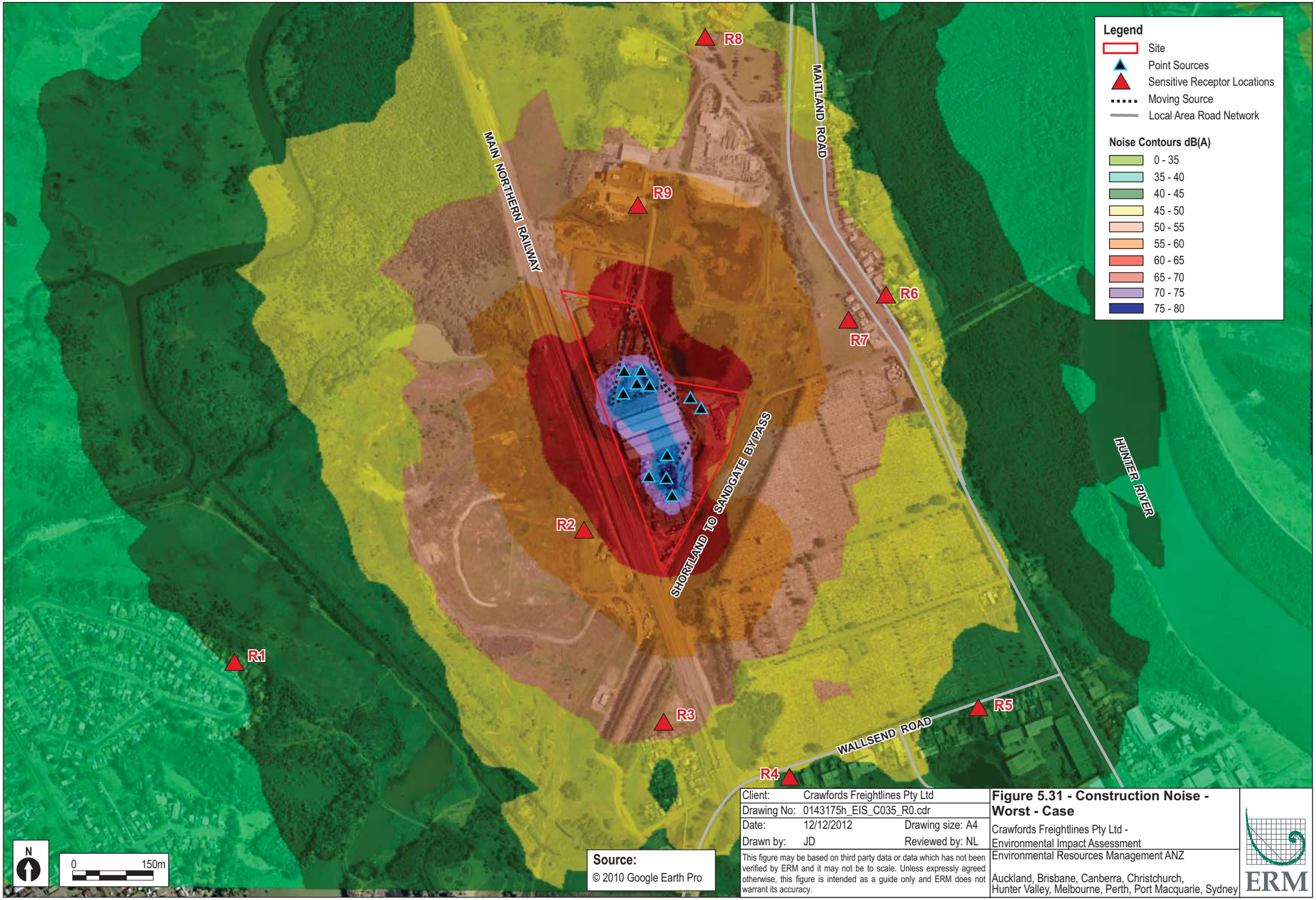
Figure 5.30 - Construction Noise - Representative

Crawfords Freightlines Pty Ltd - Environmental Impact Assessment

Environmental Resources Management ANZ

Auckland, Brisbane, Canberra, Christchurch, Hunter Valley, Melbourne, Perth, Port Macquarie, Sydney

ERM



Client:	Crawfords Freightlines Pty Ltd	
Drawing No:	0143175h_EIS_C035_R0.cdr	
Date:	12/12/2012	Drawing size: A4
Drawn by:	JD	Reviewed by: NL

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

Figure 5.31 - Construction Noise - Worst - Case

Crawfords Freightlines Pty Ltd - Environmental Impact Assessment

Environmental Resources Management ANZ

Auckland, Brisbane, Canberra, Christchurch, Hunter Valley, Melbourne, Perth, Port Macquarie, Sydney

ERM

The findings of the construction noise impact assessment presented in *Table 5.30* and *Figure 5.30* and *Figure 5.31* were:

- during normal construction activity (that may occur as part of civil works within the site) noise levels are expected to comply with the Noise Affected Management Level at the majority of locations. At R3 noise levels are calculated to be approximately 1 dB(A) above this criterion. This is not considered significant. Based on these results negligible (low) impacts are anticipated during normal construction works; and

- during potential worst-case construction activity (civil works) within the site, noise levels are expected to comply with the Noise Affected Management Level at the majority of locations. At R3 noise levels are calculated to be approximately 5 dB(A) above this criterion and at R8 approximately 3 dB(A). Based on these results negligible (low) to moderate impacts are anticipated.

It should be noted that during normal (representative) and worst-case construction activity, noise levels are expected to comply with the Highly Noise Affected Management Level at all locations. Based on this high, or significant high impacts are not anticipated.

There is limited or no risk that construction works would generate significant impacts, however the elevated (and in some cases non-compliant) noise levels presented above indicates a need to consider additional noise control mitigation and/or management measures (refer to *Section 5.8.7*).

Road Traffic Noise

The results of the road traffic noise impact assessment and comparison to the road traffic noise criteria at each assessment location are presented in *Table 5.31.*

Table 5.31 Road Traffic Noise Compliance Assessment

ID	Receptor	Existing Road Traffic Noise Level		Calculated Road Traffic Noise Level[2]		Road Traffic Criteria		Road Traffic Compliance		Predicted Increase in Overall Traffic Noise	
		Daytime	Night	Daytime	Night	Daytime	Night	Daytime	Night	Daytime	Night
R6	Residential receptor located on the eastern side of the Pacific Highway	71 LAeq, (15 hour)	67 LAeq, (9 hour)	45 LAeq, (15 hour)	45 LAeq, (9 hour)	60 LAeq, (15 hour)	55 LAeq, (9 hour)	-20	-10	<0.5 LAeq, (15 hour)	<0.5 LAeq, (9 hour)
R8	St Joseph's aged care and independent living	47 LAeq, (1 hour)	42 LAeq, (1 hour)	43 LAeq, (1 hour)	43 LAeq, (1 hour)	55 LAeq, (1 hour)	50 LAeq, (1 hour)	-12	-7	1.5 LAeq, (1 hour)	3.5 LAeq, (1 hour)

1. dB re: 2×10^{-5} Pa; and
2. current (2012) and future (+10 years, 2022) road traffic noise levels are expected to be similar.

The findings of the road traffic noise impact assessment presented in *Table 5.31* were:

- road traffic noise levels potentially associated with site vehicles (product distribution) on the Pacific Highway were calculated to be significantly below the project-specific road traffic noise criteria during both daytime and night time assessment periods. Furthermore, site vehicle movements are not expected to significantly increase noise levels on this road; and

- road traffic noise levels potentially associated with site vehicles (product distribution) on Old Maitland Road were calculated to be significantly below the project-specific road traffic noise criteria during both daytime and night time assessment periods. Furthermore, site vehicle movements are not expected to significantly increase noise levels on this road.

At the most affected assessment location located on Old Maitland Road (R8) negligible (low) impacts are anticipated (if any at all), moderate, high or significant impacts are not anticipated.

5.8.6 Potential Vibration Impacts

ERM predicted ground-borne vibration levels (Peak Particle Velocity (PPV) in mm/s) for the potential worst-case operational and construction scenarios. The results of the assessment are detailed in *Table 5.32*.

Table 5.32 Calculated Vibration Levels

Sensitive Receptor	Distance from Source, m	Calculated Vibration Level, mm/s	Comply?
R1	907	0.00	Yes
R2	213	0.01	Yes
R3	574	0.00	Yes
R4	726	0.00	Yes
R5	842	0.00	Yes
R6	523	0.00	Yes
R7	448	0.00	Yes
R8	431	0.00	Yes
R9	749	0.00	Yes

The results detailed in *Table 5.32* indicate that perceptible levels of vibration (and any vibration impacts) are unlikely to be generated at the closest and/or potentially most affected receiver locations in the vicinity of the site.

5.8.7 *Mitigation Measures*

Operational Noise

The following operational noise management measures are recommended during the evening and morning shoulder period:

- heavy vehicle drivers should be instructed to quietly enter and exit the site and should be instructed to limit extended periods of vehicle idling time. Where vehicle idling is unavoidable ERM recommends that Crawford's utilise on site structures (eg buildings or shipping containers etc) to obstruct noise sources from the nearest sensitive receptor location, where practical;

- the use of mobile plant motion alarms should be limited. Plant and equipment usage on site should be optimised during these periods to maximise forward motion, which will reduce motion alarms that typically sound in reverse. Where this is not achievable ERM recommends that Crawfords investigate visible alarms (ie flashing lights instead of audible alarms) or installs "squashed duck" type alarms which are known to be less intrusive than standard alarms, although use of such alarms should still be satisfactory to achieve occupational health and safety requirements; and

- the use of large forklifts (ie 36T) should be limited. Where large forklift usage is required, the operators should be instructed to quietly operate the equipment following normal good operational practices.

Based on these recommended management measures, ERM re-calculated operational noise levels at R8 for each of the worst-case adverse scenarios identified in *Table 5.29*. The results of this additional (mitigated) noise modelling are presented in *Table 5.33*.

Table 5.33 Mitigated Operational Noise Levels Scenario

Scenario	Calculated Noise Level (mitigated)	Evening PSNL	Morning Shoulder PSNL	Evening Compliance	Morning Shoulder Compliance
Rail	39.9	40	39	-0.1	**0.9**
Trucks	39.6	40	39	-0.4	**0.6**
Rail and Trucks Combined	40.0	40	39	0.0	**1.0**
Trucks and Conveyor Use	39.6	40	39	-0.4	**0.6**

1. all values are dB(A) re: 2 x 10^{-5} Pa.

The results in *Table 5.33* indicate that operational noise levels at R8 may be reduced to below the evening PSNL and within 1 dB(A) of the most stringent morning shoulder period PSNL (reduction of approximately 3 dB(A)) following the successful implementation of the recommended good practice noise management measures described above.

ERM reiterates that at this location an estimated overall L90 value between 6am and 7am was calculated to be 42.5 dB(A) and an additional shoulder period criteria to evaluate potential impacts between 6am and 7am determined as site noise level contribution $L_{Aeq,\ 15\ minute} \leq 47.5$ dB(A). Based on this, the mitigated operational noise levels presented above are determined to comply with the INP requirements during all periods.

Based on this, negligible (low) impacts are anticipated at R8 during evening and morning shoulder period operations. Furthermore, noise levels potentially affecting the broader community will be further reduced to those presented in *Table 5.28* and *Table 5.29*.

ERM recommends that within three months of the recommencement of operations, operator attended noise measurements be undertaken to verify actual site noise level contributions. The results of these measurements should be compared to the applicable daytime, evening and morning shoulder period PSNL to determine INP compliance. The findings of this INP compliance assessment should be used to verify the effect of noise management measures implemented on site and to identify any additional measures that should be considered.

Vibration

Vibration levels associated with the site are expected to be significantly below the relevant structural damage safe limits and human annoyance guideline values for both construction and operational phases of the project. Based on this, the potential risk of vibration impacts is limited and the magnitude of any impacts will be insignificant. ERM does not recommend any additional vibration control mitigation and/or management measures to those already considered or implemented on site.

To ensure ongoing compliance with the relevant structural damage and human annoyance criteria ERM suggests that vibration generating activities (if they arise) should not be conducted within a distance of 50 m of any significant off-site structure or within 100 m of any occupied off-site residence.

5.9 WASTE CLASSIFICATION AND MANAGEMENT

An assessment of waste streams, volumes and impacts as a result of the proposed development has been undertaken and detailed herein. The

assessment involved identifying potential or likely waste streams and volumes resulting from the project.

The NSW Waste Avoidance and Resource Recovery Strategy 2007 (DECC, 2007) provides a framework for maximising conservation of our natural resources and minimising environmental harm. The Strategy identifies the following waste avoidance and resource recovery goals:

- preventing and avoiding waste;
- increasing recovery and use of secondary materials;
- reducing toxicity in products and materials; and
- reducing litter and illegal dumping.

5.9.1 Existing Environment

Under the Waste Classification Guidelines (WCG) (EPA 2009), waste can be classified into six different classes based on risks to the environment and human health. These classes are:

- special waste;
- liquid waste;
- hazardous waste;
- restricted solid waste;
- general solid waste (putrescible); and
- general solid waste (non-putrescible).

The waste types generated on site, waste classification and proposed disposal methods are detailed in *Table 5.34.*

Table 5.34 Waste Types and Disposal Methods

Type of Waste	Classification of Waste *In accordance to EPA Waste classification guidelines*	Quantity of Waste	Method of Waste Production	Method of Storage / Disposal
AN	Hazardous Waste	Not classified as waste, security accountable product	Loss of containment through bag handling, conveyor handling	Recovered, accounted for and secured in stores. Despatched to customer for use
Asbestos	Special Waste	As identified in the Asbestos Management Plan (*Annex C*)	Asbestos containing materials within existing site facilities (including fibrous cement sheeting on walls/ceilings, corrugated fibrous roofing products, moulded fibrous facia boards and gutters, compressed fibrous shower screen partitions and vinyl flooring tiles)	Licenced contractor and licenced waste disposal facility
Used bulka bags	Hazardous Waste	Variable, average 1350 x 1-1.2 t bags per week.	Decanting to bulk	Bags emptied, compressed and bailed, collected for off shore recycling by approved contractor – K & S Recycling
Pallets	General solid waste (non-putrescible)	Variable	Container packing	Recycled for transport goods outward bound
General waste / timber offcuts	General solid waste (non-putrescible)	20 m^3 per month	General yard waste	Veolia collection service. Stored in provided bins
Oils	Liquid waste	200 L per week	Vehicle maintenance	Waste oil collection service - Australian Waste Oil. Stored in drums within bunded area
Scrap metal, used truck parts, machinery	General solid waste (non-putrescible)	0.5 t per month	Repairs and maintenance	Scrap metal recycled - used on site
AQIS wash water	Liquid waste	Variable	AQIS quarantine washing	Recycled on site for reuse in AQIS washing
AQIS controlled timber	General solid waste (non-putrescible)	100 kg per month	Container packing materials	AQIS accredited waste contractor – Specialist Waste Treatment Service
Office waste/food	General solid waste (putrescible)	3m^3 fortnightly	General office	Veolia collection service

Type of Waste	Classification of Waste *In accordance to EPA Waste classification guidelines*	Quantity of Waste	Method of Waste Production	Method of Storage / Disposal
products				
Septic system waste	Liquid waste	Not metered	Site personnel only	Settling tanks with overflow to main sewerage line
Sanitary disposal	Liquid waste	25 L	Sanitary products	Accredited service provider – Pink Sanitary Disposal
Oil/fuel filters	Liquid waste	2 x 200 L waste bin per month	Repairs and maintenance	Waste oil collector - Australian Waste Oil
Parts /washer fluid	Liquid waste	200 L per 6 weeks	Repairs and maintenance	Transpacific service agreement
Grass clipping and vegetation	General solid waste (non-putrescible)	Site owner responsible	Not applicable	Not applicable

5.9.2 Potential Impacts

Potential impacts associated with the waste generated at the site may include:

- water pollution as a result of the release of liquid waste into receiving water bodies via stormwater runoff;
- soil and / or water pollution caused by the release of liquid or solid waste as a result of spills or inappropriate storage, handling or transportation;
- impacts on flora and fauna as a result of the release of wastes into adjoining receiving environments; and
- visual amenity impacts associated with inappropriate storage and management of waste.

A number of mitigation measures are proposed to manage waste generated on site as detailed in the following pages.

5.9.3 Mitigation Measures

In accordance with the goals of the NSW Waste Avoidance and Resource Recovery Strategy 2007, waste generated on site will be recycled by licenced waste contractors where possible and feasible, thereby minimising waste disposal. Where recycling is not possible or feasible, waste will be collected by appropriately licenced waste disposal contractors.

An Asbestos Management Plan has been prepared (refer to *Annex C*) which identifies procedures and practices to be implemented for the safe management of asbestos on the site.

A Waste Management Plan will be prepared for the site as part of the Environmental Management Plan (refer to *Chapter 6*), which would include:

- stockpile location and management;
- clear labelling of stockpiles;
- height limits for all waste;
- procedures to minimise waste movements around site;
- measures to minimise leaching of stockpiles;
- waste AN would be recovered as soon as possible following a spill using clean brooms and shovels. To avoid possible contamination use of clean up equipment would be restricted to ammonium nitrate stores only;
- removal of spilt AN by flushing with water would not be permitted;

- where asbestos is mixed with other waste to form asbestos waste, the generator must continue to assess the waste in accordance with the WCG;
- asbestos waste can only be disposed of at a waste facility that can lawfully receive asbestos and the other class of waste with which it is mixed;
- waste contaminated with organic substances shall be treated as Class1 Explosive, removed from the AN store and managed accordingly;
- waste should be seen as hazardous if the content of waste is unknown;
- all sampling and classification results for the life of the project to demonstrate compliance with the EPA Waste classification guidelines must be retained;
- where possible, waste suitable for reuse or recycling would be treated in accordance with the NSW Government's Waste Reduction and Purchasing Policy;
- the site will be maintained and kept free of rubbish and cleaned up at the end of each working day; and
- any noxious plant species removed from the site would be bagged and disposed of at a licensed landfill.

5.10 TRAFFIC AND TRANSPORT

A Traffic Impact Assessment (TIA) has been prepared by Better Transport Futures (BTF, 2012) to assess the potential impacts from the storage and transportation of AN at Crawfords Sandgate facility. The objective of the report was to investigate the potential impacts of the existing development and provide advice on any infrastructure worked needed as a consequence of the development. The scope of the works was to:

- access the impact on the arterial and local road network due to the developments traffic flow;
- access parking requirements of the existing development;
- review the access and service arrangements for the development; and
- access any other transport impacts associated with the development.

The TIA was prepared in consultation with the following guides and publications:

- RTA Guide to Traffic Generating Developments (V2.2. October 2002);
- Newcastle LEP 2012;

- Newcastle City Council Development Control Plan Parking Guidelines; and

- Australian and New Zealand Standard – Parking Facilities Part 1: Off Street Parking.

A copy of the TIA is located in *Annex J*.

5.10.1 Existing environment

The Pacific Highway (locally Maitland Road) is a major through road in the locality, forming part of the State Highway Network. The road is a two-lane dual carriageway in each direction separated by a seven metre median, expanding to approximately 50 m at the intersection with Old Maitland Road. The road is relatively straight with an 80km/h speed limit. The access road to the site is located off Old Maitland Road. Old Maitland Road is a local cul-de-sac with a single travel lane in each direction. The road, which is an approved B-double route, has a 50km/h speed limit. Parking lanes are provided to the north of the site access road, with footpaths, street lighting, kerbs and gutters provided in small sections intermittently along the road.

The intersection of the Pacific Highway and Old Maitland Road is signalised and are programed to provide maximum green time for the high through movements on the Pacific Highway. Access to the Old Maitland Road can be gained from both directions, however access onto the Pacific Highway is left turn only, with a signalised U turn facility located 160 m to the north.

The intersection operates at a relatively safe level with traffic data indicating that since 2009 only one accident has been recorded at or in proximity to the intersection. The sightlines at the intersection exceed the Australian Standard requirements.

There are minimal pedestrian and cycling facilities within the locality of the subject site. Footpaths are placed intermittently along Old Maitland Road, with no footpaths located along the Pacific Highway. An on-road cycle lane is located on the shoulder of the Pacific Highway which forms the regional route (R2) between Newcastle and Maitland, as identified in the Newcastle City Bike Plan. RMS is currently constructing a four-lane divided carriageway extension of the Newcastle Inner City Bypass for 1.8 km between Shortland and Sandgate. The link is part of the Newcastle Inner City Bypass project. The link, located to the south of the site, will intersect the Pacific Highway at a new signalised junction approximately 330 m south of the intersection with Old Maitland Road. The RMS has indicated that the opening of the link road is unlikely to impact traffic volumes utilising the Pacific Highway at this location.

Traffic Survey

A manual traffic survey count was undertaken on the 7 June 2012 at the intersection of Old Maitland Road and the Pacific Highway at typical morning and afternoon peak periods (07:00 am to 09:00 am & 15:30 pm to 18:30 pm). From this survey it was determined that the peak periods at the intersection were from 07:45 am to 08:45 am in the morning and 16:45 pm to 17:45 pm in the afternoon.

Table 5.35 Results of survey traffic count during identified peak periods

Peak Periods	Exiting Old Maitland Road	Entering Old Maitland Road	Observed northbound vehicles on Pacific Highway
AM	25	50	1,513
PM	41	7	2,432

Source: Better Transport Futures (2012)

Table 5.35 shows the observed traffic movements at the intersection during the traffic survey. A maximum of six vehicles were queued on Old Maitland Road waiting to turn left while three vehicles were observed queuing waiting to turn right into Old Maitland Road. A maximum queue of five vehicles was observed at the U turn facility which was well within the storage lane provided.

SIDRA traffic modelling software was used to determine the level of service (LOS) provide by the Old Maitland Road / Maitland Road intersection. The results of the modelling indicated that the intersection operates to a good standard, consistent with LOS 'A'. Traffic turning out of Old Maitland Road experience delays of approximately 75 seconds, consistent with a LOS 'F'. Whilst a LOS 'F' indicates over-saturation, where arrival rate exceeds intersection capacity, the delays are consistent with the existing operation of the intersection which provides maximum green time to the through movements on the Pacific Highway.

Data obtained from the RMS publication '*Traffic Volumes Data for the Hunter and Northern Regions*' indicated that annual average daily flows for the Pacific Highway during 2011 were 55,480 vehicles. A review of previous counts shows that this number is increasing 1.5% per annum. The survey noted that there are a reasonably high percentage of heavy goods vehicles along the Pacific Highway, being 5% of vehicle movements. It was found that the traffic flows along Old Maitland Road are in the order of 400-500 vehicles per day based on the survey results, assuming that the standard typical peak flows represent 10% of the daily flows.

Movements to site

The facility operates with 65 employees, the majority of which access the facility in the morning and exit in the evening. The majority of staff access/egress the site from the south in the direction of Newcastle. Public transport is not currently utilised by the staff.

The proposal will not alter the demands for existing pedestrian and cyclists facilities in the area. There is no change to the staff working on site and due to the shift work there is a negligible demand for access to the site from pedestrians or cyclists. These users can be accommodated within the existing network in the vicinity of the site.

Based on the site's current capacity limits of 2,000 t of AN, 100 two-way (inbound and outbound) heavy vehicle movements to the site are generated per day. Approximately half the movements are articulated B-double trucks, with the remaining half being semi-trailers. The majority of heavy vehicles access/egress the site from the north, apart from receiving shipments from the Port of Newcastle.

Site observations from the traffic survey indicated that there are little if any delays for traffic movements at the intersection of the site service road and Old Maitland Road. Traffic entering and exiting the site road were seen to suffer from minimal delays. Delays were only caused be drivers slowing down to negotiate the intersection. No queues were recorded along the site access road during the periods of peak activity.

The character of the access road in its current form is sufficient to handle the heavy vehicles accessing the site. There have been no accidents involving vehicles on the site service road or within the site. All parking for staff and visitors is located on site, with 61 bays provided. This fits with the parking requirements of the Newcastle DCP (2011) for "General Industry" requiring one space per two staff. Parking sizes also comply with Australian Standard requirements.

The site layout allows for trucks to remaining in a forward direction.

Traffic Generation

A ship containing AN arrives at Newcastle approximately once a month containing approximately 3,500 t of material. Based on the B-double maximum capacity of 36 t per load, it would take approximately 100 movements to empty the ship. This would typically involve five B-doubles two days working in concurrent 12 hour shifts. Given delivery occurs over 24 hours, impacts to traffic flow would be most significant during the identified peak traffic periods.

Due to the current reduction in storage volumes, excess AN is delivered to, and stored at, the importers in bulker bags until vacancies become available at the site. All AN would go straight to the site if approval was granted. Positive impacts associated with all AN being transported straight to the site include:

- the removal of the road link between the importer and the site; and
- the intensification of delivery into two delivery days, as opposed to ad hoc deliveries throughout the month.

The movement for AN is completely driven by demand from the mines. As such the proposed movements to the mines would not increase from the increased storage of AN at site.

Historically AN from the Port of Sydney was placed on trains consisting of 40 20 t capacity carriages, and delivered straight to site three times per week. Currently AN received from the Port of Sydney is delivered by rail to an alternative storage facility operated by Toll Group, and delivered by road to the site when storage becomes available.

The increased storage capacity at the site would reduce the need for road movements between the Toll site and the site, equating to a reduction of 20 movements per day (see *Table 5.36*).

Table 5.36 Impact of the development on trip generation

	Current Situation	Proposed Development	Impact
Staff movements	65 inbound / outbound trips per day	65 inbound / outbound trips per day	Nil
Other movements	75 inbound / outbound trips per day	75 inbound / outbound trips per day	Nil
Truck movement associated with shipments arriving into Newcastle Port being stored by importer	100 inbound / outbound truck movements per month. Average 5 two way movements per day	100 inbound / outbound truck movements per month over a 2 day period	No increase in volume. Increase in intensity
Truck movements associated with rail deliveries arriving from Sydney	Average 20 inbound / outbound trips per day	Nil	Reduction of 20 inbound / outbound trips per day
Total	65 inbound / outbound light trips and 100 inbound / outbound heavy trips	65 inbound / outbound light trips and an average of 80 inbound / outbound heavy trips	Reduction of 20 inbound / outbound trips per day

Source: Better Transport Futures (2012)

The capacity of Old Maitland Road is 900 vehicles per hour per lane while the Pacific Highway is 1,900 vehicles per lane.

These figures are based on the RTA Guide to Traffic Generating Developments – Peak Typical mid-block capacities for urban roads with interrupted flows. These figures are significantly higher than those currently experienced.

A worst case scenario of 2% growth of traffic along the Pacific Highway over the next 10 years was analysed using SIDRA modelling. It was found that the intersection would continue to operate an acceptable level of service with a LOS 'C'.

Rail Transport

A rail siding (referred to as the Sandgate Siding) is located on site, which connects to the Great Northern Railway and facilitates transportation of AN and other goods to and from Sydney.

Crawfords is an accredited Rail Infrastructure Manager of the Sandgate Siding under Section 42 of the *Rail Safety Act 2008 (NSW)* and has in place an Interface Agreement with the Australian Rail Track Corporation (ARTC) (as manager of the rail track across NSW) that defines the interface boundary between ARTC and Crawfords rail infrastructure, defines responsibilities for the interface, and the processes for the safe operation and management of rail movements and maintenance across the interface.

In accordance with the interface agreement and ARTCs track management requirements, there is a specific process in place to apply and gain approval for trains to utilise the ARTC managed rail line. When Crawfords have a requirement for a train to move along the ARTC line, a specific path request application is made, and this is only approved by ARTC when the requested path is available subject to other approved rail movements.

ARTC has complete control over allocation of train path requests, and no train can move to/from the Crawfords siding until the required approvals have been received from ARTC. As such, no impact assessment has been undertaken with respect to rail capacity or other potential impacts associated with train movements along the ARTC managed line.

Assessment of the potential impacts associated with the Crawfords dedicated siding has been included in this assessment and is outlined in various chapters as relevant throughout this report.

Conclusion

The proposed activity would be able to be sustained by the local road network. SIDRA analysis of the intersection of Old Maitland Road and the Pacific Highway found that it is currently operating to a good LOS, with an acceptable level of service expected in the 2022 horizon years. The increase in storage space would reduce the required road movements.

The TIA found that traffic and parking arrangements for the development are satisfactory and that there is no traffic or parking impediments to the development.

5.10.2 Mitigation Measures

The following measures would be undertaken to reduce impacts associated with traffic movements to and from site:

- if practical, minimise transport movements during the identified peak periods;
- when practical, maximise loads to reduce truck movements; and
- ensure drivers obey all road rules.

5.11 BUSHFIRE RISK

A Bush Fire Hazard Assessment (BFHA) has been undertaken by ERM (ERM, 2012b) for the proposed storage and distribution site. The methodology of the BFHA addresses the matters listed in Clause 44 of the Rural Fires Regulation 2008 and Planning for Bushfire Protection Guidelines (NSW RFS 2006). The assessment has been undertaken based on site visits, a review of aerial photographs and a review of previous reports into the area. A copy of this report can be found in *Annex K*.

5.11.1 Existing environment

Planning for Bushfire Protection (NSW RFS 2006) has categorised areas of the state into local government areas (LGAs) for ease of determining a Forest Fire Danger Index (FDI). The site is located within the Newcastle LGA within the Greater Hunter fire area which is attributed an FDI of 100 which is classified as catastrophic.

The site, being used as an industrial facility, lacks vegetation and is located on a broad estuarine plain surrounded by standing water bodies in wetlands to the north, east and west. The site is primarily surrounded by managed land such as other industry, a railway line, a cemetery, and roads. The main bush fire hazard is approximately 100 m to the north-west of the site associated with the forested wetland. The surrounding vegetation, topography and landscape features are summarised below in *Table 5.37*.

Table 5.37 Vegetation Formation, Landscape Features and Slope from the Site Footprint

Vegetation Formation Class	Landscape Feature	Direction from Site Footprint	Effective Slope from the Site Footprint
Freshwater Wetland	Industrial and nursing home.	North	Upslope and flat land (0°)
Freshwater Wetland	Freshwater Wetland/Pacific Hwy	North-east	Upslope and flat land (0°)
Cleared and managed vegetation	Sandgate Bypass, Sandgate Cemetery	South-east	Upslope and flat land (0°)
Cleared and managed vegetation	Sandgate Bypass, Sandgate Cemetery, Residential area	South	Upslope and flat land (0°)
Cleared Land	Driving Range and former Astra Street Landfill site	South-west	Upslope and flat land (0°)
Forested Wetlands	Tributary of Ironbark Creek	North-west	Upslope and flat land (0°)

Vegetation Formation Class based upon Table A2.1 in Appendix 2 of Planning for Bush Fire Protection (NSW RFS 2006)

5.11.2 Potential impacts

For the purposes of this assessment and in keeping with Planning for Bush Fire Protection Guidelines (NSW RFS 2006), the site has been assessed as 'other development', as the site is not a residential subdivision, residential infill, or Special Fire Protection Purpose (SFPP). The development is a Class 5-8 building (e.g. shops, warehouses, factories, offices, car parks), and as such, the Building Code of Australia (BCA) does not provide for any bush fire specific performance requirements and thus AS 3959 Construction of Buildings in Bushfire-prone Areas does not apply as a set of 'deemed to satisfy' provisions. The general fire safety construction provisions are taken as acceptable solutions, but the aims and objectives of Planning for Bush Fire Protection (NSW RFS 2006) apply in relation to other matters such as access, water and services, emergency planning and landscaping/vegetation management. These bush fire protection methods are discussed in the following pages.

Asset Protection Zones

Planning for Bush Fire Protection (NSW RFS 2006) requires that where a bush fire hazard exists on or adjacent to a development site, an asset protection zone (APZ) or defendable space should be established on the hazard side of the development. The APZ is seen as a buffer zone and should be located within the site boundary.

No specific minimum APZ requirements are prescribed for developments that do not fit into the classifications of residential/rural residential subdivisions, SFPPs, or residential infill. However, Planning for Bush Fire Protection (NSW RFS 2006) recommends a combination of protection measures with evidence that the intent of each measure is satisfied. The site, being a commercial and

industrial facility, does not fit into the category of SFPP and therefore the performance criteria for residential/rural residential subdivision are considered to be conservative criteria and adequate for this assessment.

The predominant vegetation formation, slope and direction towards the hazard relative to the development footprint were used to determine minimum APZs. This is summarised below in *Table 5.38*.

Table 5.38 Minimum APZ in each Direction from the Site Footprint.

Vegetation Formation	Direction from Site	Effective Slope	APZ for residential	APZ for SFPP
Industrial park, Nursing home	North	Upslope and flat land (0°)°	Defendable space required	Defendable space required
Freshwater Wetland, Pacific Hwy	North-east	Upslope and flat land (0°)	10 m	35 m
Sandgate Bypass, Sandgate Cemetery	South-east	Upslope and flat land (0°)	Defendable space required	Defendable space required
Sandgate Bypass, Sandgate Cemetery, Residential area	South	Upslope and flat land (0°)	Defendable space required	Defendable space required
Driving Range, Cleared Land	South-west	Upslope and flat land (0°)	Defendable space required	Defendable space required
Forested Wetlands	North-west	Upslope and flat land (0°)	15 m	50 m

APZ requirements for residential and SFPP based upon Table A2.4 and Table A2.6 of Planning for Bush Fire Protection (2006). These have been provided as a guide for likely separation distance requirements for the site.

Shed C has a separation distance of over 80 m to the north-west to the predominant forested wetland hazard, making it the closest building to this area. This is made up of perimeter roads around the boundary of the site and the Main Northern Railway. The separation distance meets the minimum requirement of APZs for both Residential/Rural Residential Subdivisions and SFPP.

Shed A, Shed B, Shed C, Shed D and the administration office are separated by approximately 25 m to 90 m from the freshwater wetland to the north-east of the site. This separation distance meets the minimum requirement for APZs for Residential/Rural Residential Subdivision but does not meet the minimum requirement for SFPP for all sheds (Shed A & administration office). However the site, being a commercial and industrial facility, does not categorically fit into the SFPP development class and thus the performance criteria for residential/rural residential subdivision is considered adequate for the APZs within the site.

Construction Standards

The development is a Class 5-8 building, and as such, the BCA does not provide for any bush fire specific performance requirements and thus *AS 3959 Construction of Buildings in Bushfire-prone Areas* does not apply as a set of 'deemed to satisfy' provisions. The general fire safety construction provisions are taken as acceptable solutions. The buildings to be used for storing AN on the site are constructed of non-combustible material including corrugated metal sheeting walls, concrete flooring and a variety of industrial roofing.

Access

The property is accessed off Old Maitland Road by a private access road. The property access road is a two-wheel drive, two-way, sealed, all-weather road allowing for traffic to pass in opposite directions (approximately seven metres in width). A minimum vertical clearance of four metres to any overhanging obstructions, including overhanging tree branches is provided and the road surface has the capacity to carry fully-loaded fire fighting vehicles (15 t). Given these characteristics, the proposed development meets the criteria for property access roads for Residential and Rural Residential Subdivisions as specified in Planning for Bush Fire Protection (NSW RFS 2006). Although there is only one access point to the site, the intent of separation of access and egress is to avoid congestion at times of fire. The movement of staff from the site would be managed through site specific emergency planning to avoid any potential conflict with fire fighting appliances and personnel.

Water and Utilities

Utility services must be adequate in order to meet the requirements of *Planning for Bush Fire Protection* (NSW RFS 2006), including adequate water supply. The site's gas, electricity and fuel storage should not contribute to the risk of fire.

A reticulated water supply is available on site, with a series of fire hydrants with booster stations throughout the site. Shed C is also fitted with four internal hydrants, while Shed D is fitted with two external hydrants. A series of three hydrants are located between Shed A and Shed B which are currently being reviewed. These hydrants will be relocated to allow for water application in the vicinity of shed A, shed B and the outdoor compound (HSE 2012).

Vegetation is well clear of the one overhead transmission line that accesses the site and is not seen as presenting a fire risk. The site is not supplied with gas and does not store significant amounts of fuel.

Emergency planning

The site is required to have an Emergency Plan that is consistent with Fire and Rescue NSW Guidelines *Emergency Plans at Sites Having Dangerous Goods, Explosives and Major Hazards Facilities* and Safe Work Australia Guidelines *Guide for Major Hazards Facilities Emergency Plans.* This is outside the scope of Planning for Bush Fire Protection (NSW RFS 2006) and the BFHA however the Site Emergency Plan that currently exists for the site (Crawfords Freightlines Pty Ltd, dated 21 October 2011) embodies a risk assessment and the majority of the procedures prescribed in the RFS Guidelines *Preparation of Emergency/Evacuation Plan.*

Landscaping, vegetation mapping and property maintenance

The site has negligible vegetation or landscaping. Given the industrial nature of the site, features are unlikely to be implemented, retaining the current defendable spaces. Property maintenance requirements as stated in the *Planning for Bushfire Protection* (NSW RFS 2006) to be applied to the site are listed in the 'mitigation measures' *Section 5.11.3.*

The BFHA found that the development can be managed to provide acceptable bush fire protection measures such that it meets the aims and objectives of Planning for Bush Fire Protection (NSW RFS 2006) and minimises the risk of spread of fire to the nearby wetlands. This is due to the adequate site infrastructure, the size of the sites APZs, the lack of site vegetation and access to the site.

5.11.3 Mitigation Measures

The implementation of the following bush fire protection measures would afford protection of the existing buildings on site, and provide adequate separation distance and management of the site to minimise the spread of fire from the site to adjoining areas of natural vegetation, in particular the forested wetlands to the north-west of the site. The measures meet the aims and objectives of Planning for Bush Fire Protection (NSW RFS 2006):

- check hydrants are available and in working order;
- ensure hoses and hose reels are not perished and fittings are tight and in good order;
- ensure the access road is in good condition with trees not forming an obstacle during smoky conditions;
- ensure perimeter roads are free of obstacles to provide access for firefighting appliances and personnel;
- check roof lines for dislodged roofing materials;

- ensure screens on windows and doors are in good condition without breaks or holes in fly screen material and frames are well fitted into sills and window frames;

- ensure that where fitted drenching or spray systems are regularly tested before the commencement of the fire season;

- ensure doors are fitted with draught seals and well maintained (if applicable);

- ensure mats are of non-combustible material or in areas of low potential exposure;

- ensure combustible materials are located down slope and well away from the buildings;

- combustible materials are to be located well away from buildings that store AN. The Hazard Analysis for the site (HSE 2012) prescribes that stores will be kept clear of vegetation and any other combustible materials for a distance of a least 5 m around the external perimeter of the store; and

- the Hazard Analysis for the site (HSE 2012) prescribes that vehicles powered by internal combustion engines operated within the stores should be diesel-powered, fitted with a battery isolation switch and insulated cover over the battery, and be fitted with a spark arrestor and dry-powder extinguisher. Vehicles should be kept outside the store when not in use, be started outside the store and be garaged at least 10 m from the store.

5.12 HERITAGE

5.12.1 Aboriginal Cultural Heritage

Existing Environment

The Awabakal peoples are recognised and acknowledged as traditional custodians of the land and waters of the area surrounding the site.

It is believed that occupation in the local area occurred predominantly within the last 4,000 years, after climatic change and rising sea-levels transformed the environment of the region. Occupation of the area may have extended as far back as 30,000-40,000 years, however, few landscape contexts exist in which archaeological evidence of older occupation would be conserved (Kuskie and Kamminga, 2000). The area and its surrounds would have provided resource rich wetlands, swamps, lakes, estuaries and coastline (Kuskie and Kamminga, 2000).

Methodology

Database search

A search of the Aboriginal Heritage Information Management System (AHIMS) was undertaken on 12 June 2012 for the site and a surrounding 50 m buffer. The search results are detailed in *Annex L*.

Literature review

Literature relevant to the Aboriginal cultural heritage of the site was reviewed. Background literature specific to the project includes:

- Dominic Steele (2005), *Upgrade to State Highway SH23, Shortland to Sandgate;*
- Department of Land and Water Conservation (DLWC) (2002) NSW State Groundwater Dependent Ecosystems Policy;
- Dallas (1994) *Sandgate Sewerage Scheme Survey*;
- Mills & Wilkinson (1994), J McD CHM (1997) and Central West AHS (1998) *Shortland Wastewater Treatment Works Surveys*; and
- Umwelt (2002) *Bluegum Vista Test Excavations*.

Potential Impacts

Database Search

The database search did not identify any Aboriginal sites or places that have been recorded or declared in the searched area.

Literature Review

- Upgrade to State Highway SH23, Shortland to Sandgate.

A Preliminary Aboriginal Archaeological Survey and Assessment was undertaken for upgrade of State Highway SH23 from Shortland to Sandgate (Dominic Steele 2005). The study area included land immediately to the south and east of the proposed storage facility and surrounding areas. A comprehensive Aboriginal archaeological field survey did not result in the location of any Aboriginal archaeological sites, areas of archaeological potential or areas of Aboriginal cultural significance. Background research found that no Aboriginal sites have previously been recorded within the subject site.

- Sandgate Sewerage Scheme Survey (Dallas 1994).

The survey area was adjacent to the Pacific Highway between Sandgate and the St Joseph's Nursing Home. The results of the surveys found that no

Aboriginal archaeological sites were considered able to reside in this landscape and no evidence of prior Aboriginal use was recorded.

- Shortland Wastewater Treatment Works Surveys (*Mills & Wilkinson 1994, J McD CHM 1997, Central West AHS 1998*).

Several archaeological surveys were undertaken related to the upgrade of the Shortland Wastewater Treatment Works and the installation of additional mains connected to those works. Mills & Wilkinson (1994) found several stone artefacts within this area (recorded as two open campsites) but did not regard any areas as retaining archaeological sensitivity. One isolated stone artefact was recorded in a highly disturbed context between Maitland Road and the Main Northern Railway south of Shortland Road.

- Bluegum Vista Test Excavations (Umwelt 2002).

The study area, approximately 5km west of the site was about 120 ha in size and located on a low sloping ridge overlooking Hexham Swamp. These excavations represent the largest investigation of the southern margins of Hexham Swamp. The initial survey did not identify any surface evidence or areas of potential Aboriginal significance. The excavation of approximately 300 m^2 of soil at 20 locations identified 3001 stone artefacts. It was concluded that the significance of the recovered remains derived largely from the lack of swamp margin sites which had been preserved in the region rather than the intactness of the deposit.

The results of the surveys found that no Aboriginal archaeological sites were considered able to reside in this landscape and no evidence of prior Aboriginal use was recorded. The majority of the site is located on highly disturbed or modified ground which possesses no potential for the survival of in situ remains of past Aboriginal use. The site has been highly altered from which the Aboriginal people would have experienced before European colonisation. All vegetation on the site has been cleared. The development of transport infrastructure, residential development, pastureland and artificial wetlands in the surrounding areas have significantly altered the local topography and landscape. Given the highly disturbed nature of the site and the lack of ground disturbance required, impacts to Aboriginal Cultural Heritage would be negligible. No further archaeological works prior to commencement of the operation should be required.

Mitigation Measures

The following measures will be undertaken to reduce potential impacts to indigenous heritage:

- all construction personnel working on site would receive training in their responsibilities under the National Parks and Wildlife Act 1974. Records of training undertaken, including names of staff / contractors and date of training will be kept by Crawfords for the duration of the project. Where

practicable, training will be developed and implemented in consultation with representatives of the local Aboriginal community;

- in the event that surface disturbance identifies a new Aboriginal object, all works must halt in the immediate area to prevent any further impacts to the object(s). A suitably qualified archaeological specialist and representative of the local Aboriginal community must be contacted to determine the nature, extent and significance of the object(s). The site is to be registered in AHIMS (managed by OEH) and the management outcome for the site included in the information provided to AHMS. Crawford's will consult with representatives of the local Aboriginal community and the archaeological specialist to develop and implement management strategies for all objects / sites. If impacts are unavoidable, mitigation measures are to be undertaken in accordance with the heritage component of the Construction Management Plan. All sites impacted must have an Aboriginal Site Impact Recording form completed and submitted to the AHIMS registrar within three (3) months of completion of these works;

- in the unlikely event that following surface disturbance human remains are located within the project area, all works in the immediate area are to halt to prevent any further impacts to the remains. The NSW Police are to be contacted immediately. No action is to be taken until the NSW Police provide written notification. If the skeletal remains are identified as Aboriginal, Crawford's will contact OEH's Environment Line on 131 555 and representatives of the local Aboriginal community. No works will continue until OEH provides written notification; and

- the Aboriginal cultural heritage management measures identified above are to be detailed in the Construction Environmental Management Plan and Operational Environmental Management Plan, as relevant.

5.12.2 European Heritage

Existing Environment

The site and the surrounding area has been heavily modified since European settlement through a variety of development and land use activities. Newcastle itself has a rich European history, with its establishment in 1797 making it Australia's second oldest city.

Methodology

A search of various heritage databases and registers was undertaken to identify listed heritage items within the area. The search included:

- Australian Heritage Database;

- State Heritage Register;

- various Section 170 Registers and Inventory; and
- Newcastle LEP 2012.

Potential Impacts

Six items were identified as a result of the database searches, and included:

- Hunter Estuary Wetland (Australian Heritage Database);
- 2HD Studio (Newcastle LEP);
- Sandgate Cemetery (Newcastle LEP);
- Sandgate Cemetery Office (Newcastle LEP);
- Sandgate Cemetery Railway Spur (Newcastle LEP); and
- Sandgate Ironbark Creek Underbridges (Railcorp Section 170 Register).

The proposal would be located within the existing footprint of Crawfords Sandgate operation. The area, established in the early 1970s, has been highly disturbed and modified to its current form. The site has no known European Heritage value. Given this level of modification, it is unlikely that items of heritage importance would be discovered. The activities involved in the storage of AN would occur within existing structures. The transportation of AN to and from site would not occur within immediate proximity of the listed items. Practises on site have the potential to impact the Hunter Estuary Wetland through uncontrolled pollutant discharges from the site into Shortland Wetlands in the form of sediment and/or hydrocarbons and/or chemicals. Mitigation measures and safeguards are proposed to avoid such an event.

It is highly unlikely that impacts to the listed items would occur given the previous level of disturbance at the site, coupled with the nature of the operation and the transport routes within existing corridors.

Mitigation Measures

In the event European heritage items currently unidentified are uncovered as a result of the operations, all works will cease immediately until the item has been inspected by a qualified archaeologist and recommendations relating to the management of the item are made.

5.13 VISUAL AND LANDSCAPE

An assessment of the visual impact of the proposal has been undertaken to evaluate the visual character of the site and surrounding landscape and assess the potential visual impact resulting from the proposed development. Visual impact can largely be determined by assessing the:

- visibility of the site from the surrounds – including viewer sensitivity, period of view, distance of view and context of the view; and
- degree of contrast between the site and the surrounding landscape – the visual difference between the development and the surrounding landscape.

5.13.1 *Existing Environment*

The proposed storage facility is located within the southern apex of an established industrial estate. It is located at the southern base of a small mound approximately 15 m ASL. The landscape of the surrounding area is relatively flat, comprising of vast floodplains and wetland to northwest of the site. A smaller disturbed wetland is located immediately to the east of the site. The Hunter Wetland Centre, a Ramsar listed wetland, as well the Kooragang Island and Hexham Swamp Nature Reserve located to the west and northwest of the site offer high visual amenity in the area. Other areas that could be seen as offering significant value in landscape/ scenic terms include housing areas and the Sandgate Cemetery.

5.13.2 *Potential Impacts*

The site is partially visible from Maitland Road/Pacific Highway, Old Maitland Road and the access road to Newcastle Practice Range. The site is within the peripheral view of motorists travelling along the Pacific Highway and is viewed against other industrial land uses and railway infrastructure. Houses located within the suburb of Maryland, approximately 3.7 km to the west of the site have distant glimpses of the site and is also viewed together with railway infrastructure and existing industrial buildings. The Newcastle Practise Range, a golf driving range is located immediately to the west of the site. The proposed site can be seen from the practice range, although northern sections of the proposed site are buffered by the raised rail corridor between the two locations.

Site activities are largely viewed from passing passenger trains and future motorists using the Newcastle Inner City Bypass (Shortland to Sandgate). Views from trains and vehicles would be at speed passing the site. The use of the site is consistent with the zoning of the land and surrounding land uses. No new buildings are proposed and the management and placement of shipping containers, together with the storage and organisation of other equipment is not considered excessive or unsightly.

The running logistics of the site ensure that the placement of containers, equipment and material is neatly stacked in dedicated areas to aid in efficient and safe handling techniques. It is therefore considered that the view from passing passenger trains and future passing motorists would not result in a negative impact on views from these aspects. Further, the view is in keeping with rail corridor land uses along parts of the Main Northern Railway.

Given the lay of the land, views of the site from the SEPP 14 wetland are largely restricted.

Limited night lighting is visible from within and surrounding the site from existing industrial sources. Night lighting from the site is limited to security lighting and lighting associated with occasional night time deliveries of product material. It is not considered that the occasional night lighting would have an impact on neighbouring visual amenities and night time activities are consistent with the proposed zoning and land use activities.

The site is highly disturbed with negligible natural environment. The site offers no visual amenity to the surrounding area. The proposal will not require the construction of any additional storage structures. A large proportion of the AN would be stored within existing sheds. The storage of AN outside of the sheds would be located within storage containers that are already in use at the site.

Overall the proposed works would not detract from the areas visual amenity, given the highly disturbed nature of the site, coupled with the fact that no further structures would be built and the lack of surrounding receivers.

5.14 SOCIO-ECONOMIC

5.14.1 Crawfords Operation

The AN that would be stored at the storage facility would be used for various mining operations, largely within the Hunter Valley. Other storage and distribution activities at the site may vary over time depending on contracts and the requirements of clients. However, it is expected that they are likely to be similar to the activities currently undertaken at the site (HSE 2012). Any change in current storage use would require the appropriate statutory approval.

Although leased separately, Scafflink Australia, a scaffolding hire company is located within the site. Given vehicles movements are not expected to significantly increase, impacts to Scafflink are expected to be minor.

5.14.2 *Access to surrounding businesses*

Access to the site is gained off the Pacific Highway/Maitland Road, onto Old Maitland Road for approximately 200 metres and then of a private access road for 500 m. This is the only vehicular access to the site. Sibelco, a mineral storage and production operation, is located 200 m north of the site. Sibelco share the access road off Old Maitland Road, and hence vehicles travelling to the site must drive past the Sibelco site. The TIA (BTF, 2012) found even during peak periods, queues along the access road would not form.

The sole access point to the proposed site is located of Old Maitland Road. Other businesses located off Old Maitland Road include:

- St Joseph's House (Nursing Home) 500 m NNE (access of Old Maitland Road);
- HL Mullane & Sons (Plumbing and Gas fitting) 500 m NNE (access of Old Maitland Road); and
- Rocla (cement/concrete production, paving, brick, retaining wall construction) 300 m NNE (access of Old Maitland Road).

Results from the TIA found that the vehicle movements associated with the site would not affect the local road network capacity. Therefore impacts to these surrounding businesses are expected to be negligible.

5.14.3 *Other Businesses*

There are a number of businesses and public facilities in the surrounding area. They are described in *Table 5.39*.

Table 5.39 Surrounding businesses in the locality of the site

Business / Facility	Business Type	Distance from site	Access point
Newcastle Practise Range	Driving range/golf shop	100 metres west	off Astra Street
Sandgate Cemetery	Mixed faith cemetery	100 metres southeast	off Maitland Road / Pacific Highway
U Haul and Sandgate Caltex	Service station	300 metres east	off Maitland Road / Pacific Highway
Koala Glass	Glass Repair workshop	400 metres east	off Maitland Road / Pacific Highway
Sandgate Autos	Car sales yard	500 metres northeast	off Maitland Road / Pacific Highway

Given the high volume of traffic along the Maitland Road/Pacific Highway and the relatively small volume of traffic associated with Crawfords operations, impacts to nearby businesses along this road passage would be negligible. Access to the Newcastle Practice Range is gained off Astra Street which is located off Sandgate Road.

Access to Astra Street is approximately 2.1 km from the entrance to Old Maitland Road, the main access to the site. Given the location of the customers of the AN, truck movements would not go within the proximity of the access to the Practice Range.

5.14.4 Conclusion

In summary, the proposed AN facility will have a positive economic impact through providing continued employment to both the storage facility and allowing the operation of various mining endeavours in the Hunter Valley and further afield. Impacts to surrounding businesses would be negligible given the routes of the transport to and from the storage facility, the reduction of truck movements and the existing high movements of heavy vehicles in the locality.

5.15 CUMULATIVE EFFECTS

Cumulative impacts are those impacts likely to arise from the interaction of project activities and associated operations with other significant projects and activities in the area. This assessment is in accordance with the requirement to consider "any cumulative environmental effect with other existing or likely future activities" in Section 82(2)(o) of the EP&A Regulation.

The site is located at the southern end of a small industrial estate. There are three other industrial based facilities within the estate and one nursing home which are all listed in the socio-economic impact assessment located in *Section 5.14*. The site shares a private access road with Sibelco. This is the sole access road to both facilities. The road would have on average 100 truck movements associated with the site per day. The TIA found that this was sustainable. It is therefore unlikely that the development would impact upon Sibelco operations and other operations within the industrial estate.

Scafflink Australia operates within the site and occupy an area of 3,197 m^2 on the eastern edge of the site. It operates independently to the Crawford operations. Access to the area is gained through the same access road as Crawfords. The additional storage and distribution of AN would not impact upon Scafflink Australia's operation given the small number of traffic movements to the area and the small increase in truck movements to the site.

The RMS is currently constructing a 1.8 km four-lane divided carriageway to the south of the site from Shortland to Sandgate as part of the Newcastle Inner City Bypass. The link will intersect with the Pacific Highway approximately 330 m to the south of the intersection with Old Maitland Road. The RMS has indicated that the opening of this link is unlikely to have an impact upon the volumes of traffic utilising the Pacific Highway in this location. Discussions with Council and RMS have indicated that there are no planned traffic management works in the general locality of the site (BTF, 2012).

No strain on local resources would occur as a result of the proposal. Council has indicated that there are no other developments of significance in the general locality of the site (BTF, 2012). The site itself has already been developed for the purpose of a storage and distribution facility. No additional construction works would be required for the storage of AN. All works would occur within the existing site footprint. The existing facility is consistent with the general character of the immediate surrounding area

Sensitive receivers identified in the area include St Joseph's Home and residential properties along Maitland Road and Astra Street in Sandgate, and Blanch Street in Shortland. There are no activities operating in the locality that would cause cumulative environmental impacts in conjunction with the proposed extension. The potential environmental impacts have been assessed with respect to factors such as noise, air quality, Aboriginal and European heritage, surface water and groundwater conditions, traffic, waste generation and visual amenity. There are no other activities that would be likely to significantly alter the social or economic impacts of the development by virtue of cumulative impacts.

Based on the assessment of individual environmental, social and economic issues throughout this EIS, the surrounding industrial character of the site and the lack of other activities in the area that could cause cumulative impacts in conjunction with the proposal, it is considered that the potential impacts of the proposal have been thoroughly assessed and are acceptable.

6 MANAGEMENT AND MITIGATION MEASURES

This Chapter summarises measures to manage risk, and avoid, mitigate or eliminate impacts. It outlines how these measures would be implemented and monitored through Construction and Operational Environmental Management Plans (CEMP and OEMP).

6.1.1 Introduction

A consolidated summary of all the proposed environmental management and monitoring measures, have been included in accordance with the DGRs for the proposal.

Crawfords currently operate under a site specific Environmental Management Plan (EMP). This EMP was developed and reviewed as part of the Major Hazardous Facility (MHF) compliance process by WorkCover NSW. The existing EMP will be incorporated into Construction and Operational Environmental Management Plans as necessary and implemented on site. The CEMP and OEMP will reflect the commitments made within this project application, any relevant conditions of consent and license conditions. The CEMP and OEMP would be developed to ensure appropriate mitigation measures as identified in the preceding chapters as summarised in this chapter.

6.1.2 Proposed Management and Mitigation Measures

The identification of appropriate management and mitigation measures is imperative for the successful operation of this type of use in this location. They emphasises Crawfords commitment to safe handling, storage and transportation of a dangerous goods to ensure that potential health, safety, social and environmental impacts are either eliminated or appropriately minimised.

Table 6.1 summarises safeguards, management and mitigation measures and identifies timeframes for their implementation.

Table 6.1 Summary of Management and/or Mitigation Measures

Item	Management and/or mitigation Measure	Implementation C - Construction O - Operation
	General	
A1	Crawfords would implement all practical measures to avoid, or minimise any impacts to the environment that may arise from the operation of the proposal.	C,O
A2	Should the proposal be granted development consent, Crawfords would make a separate application to the NSW EPA for an EPL prior to the operation of the proposal.	C

Item	Management and/or mitigation Measure	Implementation C - Construction O - Operation
A3	Crawfords employees and contractors would undergo an updated training/induction program in accordance with the CEMP, OEMP, Safety Management System (SMS) and other training commitments as required by any consent conditions. All personnel involved in site and transportation operations will be made aware of their environmental obligations and the need to comply with conditions of consent.	C,O
A4	Crawfords would continue the appointment of an Environment and Community Management Representative to ensure the implementation of all environmental management measures. The representative would ensure that all measures are being effectively carried out in accordance with the CEMP, OEMP, SMS and all environmental approval and legislative requirements.	C, O
	Hazard and Risk	
B1	The OEMP should incorporate the development of the SMS in accordance with HIPAP No.9 (DoP, 2011b) incorporating the following framework: • management of the SMS; • hazard identification and risk assessment; • standard operating procedures; • process safety information; • contractor management; • pre-commissioning reviews; • equipment integrity; • safe work practices; • management of change; • incident reporting and investigation; • employee selection, training and education; • procurement; • emergency planning (*site emergency plan);* • security; • auditing; • drug and alcohol testing; and • rail work fatigue management.	C,O
B2	An inspection, testing and preventative maintenance program would be developed, implemented and maintained as part of the OEMP/SMS to ensure the reliability and availability of key safety equipment.	I,O
B3	An inspection, testing and preventative maintenance program would be developed, implemented and maintained to ensure that all company owned and contracted mechanical equipment, including fleet vehicles, are maintained in accordance with Australian Standards and the SMS.	C,O
B3	Measures for the storage, handling and transportation of AN would be implemented in accordance with ISO 31000 and AS4326 (2008) to reduce the likelihood of an explosion due to fire, contamination or high energy impact. These measures are to be incorporated into the site SMS.	C,O

Item	Management and/or mitigation Measure	Implementation C - Construction O - Operation
B4	All 'route plan and risk assessments' shall be included in the OEMP/SMS. A review of all 'route plan and risk assessments' shall be undertaken every six months.	C,O
B5	The current Site Emergency Plan (SEP) shall be reviewed and developed in accordance with HIPAP No.1 (DoP, 2011a) and incorporated into the CEMP and OEMP.	C,O
B6	The SEP should make provision for the following emergency events; • heat radiation; • fire; • fume emission; • explosion; • flood; • release of contaminants; • major transport incident; • malicious act; • communicated threat; and • any combination of the above factors.	C,O
B7	The following site specific flood mitigation measures shall be incorporated into the SEP. In advance of any flood warning received from the BoM for a 2% or 1% AEP flood event, Crawfords would employ the following measures to minimise the risk of flood waters entering product stores: • advise stakeholders and customers in the 48 hours leading up to a 2% AEP flood event that no additional product will be received or stored on site; • each AN store shall have as a component of the emergency response equipment a supply of 250 micron four metre wide polythene construction membrane sufficient to encase the entire internal perimeter of the stores leaving no gaps and allowing two metre overlap at joins; • in response to a 1% AEP flood event the AN stacks shall be reconfigured by placing the outer rows of flexible IBCs against store walls. Stacks shall also be reconfigured to remove segregation gaps between stacks and ensure no voids between individual flexible IBCs or bag stacks and walls; • during the repositioning of the flexible IBCs, the 250 micron polythene membrane shall be placed against the store walls allowing one metre of membrane under the outer row of bags and three metres of membrane in vertical contact with the internal surface of store walls; • in response to a 1% AEP flood event, pedestrian access and vehicular access doors shall be sandbagged and polythene sheeted externally to eliminate flood water ingress; • flooding emergency events shall be reported in accordance with the Site Emergency Plan; and • termination of a flooding emergency will be undertaken in accordance with the Site Emergency Plan.	C,O
B8	The following site specific fire mitigation measures shall be incorporated into the SEP: • check hydrants are available and in working order; • ensure hoses and hose reels are not perished and fittings are tight	C,O

Item	Management and/or mitigation Measure	Implementation C - Construction O - Operation
	and in good order; • ensure the access road is in good condition with trees not forming an obstacle during smoky conditions; • ensure perimeter roads are free of obstacles to provide access for fire fighting appliances and personnel; • check roof lines for dislodged roofing materials; • ensure screens on windows and doors are in good condition without breaks or holes in fly screen material and frames are well fitted into sills and window frames; • ensure that where fitted drenching or spray systems are regularly tested before the commencement of the fire season; • ensure combustible materials are located down slope and well away from the buildings; • combustible materials are to be located well away from buildings that store AN. The Hazard Analysis for the site (HSE 2012) prescribes that stores will be kept clear of vegetation and any other combustible materials for a distance of a least 5 m around the external perimeter of the store; and the Hazard Analysis for the site (HSE 2012) prescribes that vehicles powered by internal combustion engines operated within the stores should be diesel-powered, fitted with a battery isolation switch and insulated cover over the battery, and be fitted with a spark arrestor and dry-powder extinguisher. Vehicles should be kept outside the store when not in use, be started outside the store and be garaged at least 10 m from the store.	
B9	The current Site Security Plan shall be reviewed and incorporated into the CEMP and OEMP.	C,O
B10	Engineering certification of the structural integrity of the sheds under a flood event (2% and 1% AEP) will be undertaken by Crawfords prior to building modification works to ensure proposed flood mitigation measures are adequate. Any relevant recommendations as a result of the engineering assessment will be implemented, as required, to ensure shed structural stability.	C
	Soil and Groundwater	

C1	The CEMP shall include the following controls with regard to the control of sedimentation and contaminants:
	• works will not take place during heavy rainfall;
	• undertake stripping of soil, immediately before starting bulk earthworks;
	• suitable areas for any temporary stockpiling of excavated soil and debris (on flat ground) will be clearly identified and delineated before the commencement of works;
	• ensure stockpiles are:
	  • stabilised if they are to be in place for more than 10 days;
	  • protected from run-on water by installing water diversion structures; and
	  • installed with sediment filters immediately downslope to protect other lands and waterways from; and
	  • all erosion, sediment control and runoff diversion measures will be established before any excavation begins. These will be left in place throughout works execution and beyond works completion until all surfaces have been fully restored and stabilised.
		C

Item	Management and/or mitigation Measure	Implementation C - Construction O - Operation
C2	Maintenance and checking of proposed erosion and sedimentation controls would be undertaken on a monthly basis and records kept and provided upon request.	C,O
C3	Sediment would be cleared from behind barriers on a regular basis and all controls would be managed in order to work effectively at all times, that is, sedimentation controls would be less than 50% full at all times.	C,O
C4	Any material transported onto pavement surfaces would be swept and removed at the end of each working day.	C,O
C5	Hardstand material as proposed would be implemented on all trafficable areas to minimise erosion and the tracking of soil and particulates onto pavement surfaces.	C,O
C6	Given PASS were identified on site, further analysis and management of soils at the site may be required if excavation of natural estuarine sediments is to occur. If ASS are encountered during construction, an ASS management plan would be prepared in accordance with the ASS Manual *(ASS Management Advisory Committee 1998).*	C,O
C7	Implementation of groundwater management plan within the construction and operations environmental management plans to manage potential risks associated with potential acid sulphate soils (PASS) and elevated concentrations of ammonia, nitrogen, PAHs and metals as reported in *Targeted Phase II Environmental Site Assessment, Lot 12 Old Maitland Road Sandgate* (ERM, 2012);	C,O
C8	Prior to the commencement of activities on site, the site should be notified under Section 60 of the CLM Act 1999.	C
	Groundwater	
D1	A Groundwater Management Plan (GWMP) will be developed and included within the OEMP. This plan will outline the measures that would be used to manage site practices and the testing of ammonia and nitrogen concentrations in groundwater.	O
D2	Monitoring activities as part of the GWMP are required to maintain, prevent or minimise impact on the quality of groundwater.	O
	Surface water and waste water	
E1	A surface water management plan (SWMP) would be developed as part of the CEMP and OEMP to manage stormwater runoff. This plan would be developed in accordance with 'The Blue Book' *Managing Urban Stormwater – Soils and Construction Volume 1 and 2* (Landcom, 2004). The plan would outline: • measures to manage soils in line with the Soil and Erosion Management Plan; • provision of permanent on-site water storage to the volume of 320 m^3, and • measures to prevent the movement of contaminated run off.	C,O
E2	Fire water management would ensure that, in the event of a fire on site, there is no loss of containment off the site of potentially contaminated water.	O

Item	Management and/or mitigation Measure	Implementation C - Construction O - Operation
E3	The OEMP will detail hydrocarbon spill procedures and ensure that servicing of plant, equipment and vehicles is appropriately managed.	O
	Flora and Fauna (Ecology)	
F1	A Flora and Fauna Management Plan (FFMP) would be developed and incorporated as part of the CEMP and OEMP. The FFMP should include: • avoidance of the use of biocides and implementing erosion and sediment controls; • rehabilitation/landscaping works to incorporate native flora species that have the potential to provide foraging resources for native fauna species; • educate site personnel as to the appearance and location of native threatened and pest species. All sightings (location, time, date and description) of native threatened species shall be recorded; and • lighting shall be redirected to reduce unnecessary light spill that may have potential to impact nocturnal fauna.	C,O
	Air Quality	
G1	Regular use of a road sweeper over the sealed surface to remove the build-up of any particulate matter.	C,O
G2	Continued use of the screw auger when transferring AN from flexible IBCs into bulk trucks which limits the amount of emissions generated.	O
G3	Continued use of sealed off areas on site to limit the generation of emissions.	O
G4	The efficiency of all upgraded mobile and fixed equipment be considered during procurement for fuel-powered equipment.	O
G5	Investigate opportunities for low emission transportation of AN (ie utilise transport trucks that use biodiesel as opposed to regular diesel).	O
G6	Investigate opportunities for using increased quantities of biodiesel in on site plant.	O
G7	Select vehicle size for purchase based on task ie larger vehicles generally have a lower emissions intensity than smaller vehicles.	O
G8	Site management to ensure that equipment is maintained to retain energy efficiency.	C,O
G9	Site management to check current vehicle fleet and consider the installation of aerodynamic features to reduce fuel consumption.	O
G10	Minimise running of empty trucks where possible ie look at back loading vehicles.	O
G11	Optimise freight loads so that all trucks are full.	O
G12	Reduce packaging and packaging weight to maximise use of productive space and minimise waste ie bulk product in place of flexible IBCs.	O

Item	Management and/or mitigation Measure	Implementation C - Construction O - Operation
G13	Incorporation of a driver behaviour education program on fuel and energy efficiency which identifies: • slow acceleration to the average driving speed; • selection of route to optimise driving at speeds that optimise fuel efficiency; • driving at speeds that avoid the need for heavy braking; • leaving adequate distance between vehicles to avoid the need for heavy braking; • using roads at times of least congestion to prevent idling time and stop/start driving; and • minimise idling loses by turning vehicles off when not driving. Cab comfort can be maintained through the use of generators allowing engines to be switched off. •	O
	Greenhouse Gas	
H1	Energy audits will be held when practicable to ensure that the site is using current practice techniques to minimise energy use and is operating at optimum energy levels; and	O
H2	Investigate opportunities for purchasing part or all of electricity consumption from renewable sources.	O
	Noise and Vibration	
I1	In principle noise management measures during construction works include: • application of all feasible and reasonable work practices to meet the noise affected level; and • inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.	C
I2	Good practice construction noise management measures which, subject to actual construction work requirements, may be investigated include: • works should adhere to the standard construction hours of work, with no out of hours works to be undertaken; • ensure site managers periodically check the site and nearby residences and other sensitive land uses for noise problems so that solutions can be quickly applied; • regularly instruct workers and contractors (such as toolbox talks) to use equipment in ways to minimise noise. Site workers are to be made aware of the potential noise impacts and are to be encouraged to take practical and reasonable measures to minimise disturbance; • keep truck drivers informed of designated vehicle routes, parking locations, acceptable delivery hours or other relevant practices (for example, minimising the use of engine brakes, and no extended periods of engine idling); • equipment should be selected to minimise noise emissions, where feasible and reasonable; • equipment and plant should be properly maintained to ensure normal operating performance and minimise noise emissions; • equipment and plant found to produce excessive noise compared to normal industry expectations should be removed from the site or stood down until repairs or modifications can be made; • noise emissions from reversing alarms should be minimised,	C

Item	Management and/or mitigation Measure	Implementation C - Construction O - Operation
	although use of such alarms should still be satisfactory to achieve occupational health and safety requirements; and • consideration for the placement of possible noise sources should be taken into consideration and clustering of noisy plant items avoided. Static plant, for example generators, concrete mixers etc, will be placed as far as it is practicable from potential noise sensitive areas.	
I3	The following noise management measures will be incorporated into the OEMP during the evening and morning shoulder period: • heavy vehicle drivers to be instructed to quietly enter and exit the site and should be instructed to limit extended periods of vehicle idling time. Where vehicle idling is unavoidable ERM recommends that Crawford's utilise on site structures (eg buildings or shipping containers etc) to obstruct noise sources from the nearest sensitive receptor location, where practical; • the use of mobile plant motion alarms should be limited. Plant and equipment usage on site should be optimised during these periods to maximise forward motion, which will reduce motion alarms that typically sound in reverse. Where this is not achievable, visible alarms (ie flashing lights instead of audible alarms) or installation of "squashed duck" type alarms which are known to be less intrusive than standard alarms; and • the use of large forklifts (ie 36T) should be limited. Where large forklift usage is required, the operators should be instructed to operate the equipment following normal good operational practices.	O
	Waste Management	
J1	A Waste Management Plan (WMP) will be prepared for the site as part of the CEMP and OEMP. This would be developed prior to the commencement of construction activities and would include: • identification of requirements for waste avoidance, reduction, reuse and recycling; • procedures for meeting legislative requirements; • where possible, waste suitable for reuse or recycling would be treated in accordance with the NSW Government's Waste Reduction and Purchasing Policy; • procedures for obtaining the required approvals for the management of waste; • stockpile location and management; • clear labelling of stockpiles; • procedures to minimise waste movements around site; • measures to minimise leaching of stockpiles; • procedures for waste AN to be recovered as soon as possible following a spill using clean brooms and shovels. To avoid possible contamination use of clean up equipment would be restricted to AN stores only; • procedures for the removal of spilt AN. Flushing with water would not be permitted; • AN waste contaminated with organic substances shall be treated as Class 1 Explosive, removed from the AN store and managed accordingly; • waste should be seen as hazardous if the content of waste is unknown;	C,O

Item	Management and/or mitigation Measure	Implementation C - Construction O - Operation
	• all sampling and classification results for the life of the project to demonstrate compliance with the EPA Waste classification guidelines will be retained; • the site will be maintained and kept free of rubbish and cleaned up at the end of each working day; and • any noxious plant species removed from the site would be bagged and disposed of at a licensed landfill.	
J2	The Asbestos Management Plan (ERM, 2012b) (refer to *Annex C*) which has been prepared for the site and identifies procedures and practices to be implemented for the safe management of asbestos on the site shall be appended to the WMP	O
J3	A licenced waste management contractor would be used to remove waste from the site for reuse, recycling or disposal.	C,O
	Traffic and Transport	
K1	The current Traffic Management Plan (TMP) will be reviewed and updated as part of the OEMP. The TMP would outline: • Hours of permitted vehicle activity; • Designated routes for traffic and defined access points to the site; • when practical, maximise loads to reduce truck movements; • if practical, minimise transport movements during the identified peak periods; • designated areas within the site for truck turning movement, parking, loading and unloading to allow heavy vehicles to enter and leave the site in a forward direction; • procedures and/or principles for vehicle speed limits and the safe operation of vehicles; and • guidelines that will ensure drivers obey all road rules.	O
	Heritage	
L1	The following measures will be undertaken to reduce potential impacts to indigenous heritage: • all construction personnel working on site would receive training in their responsibilities under the National Parks and Wildlife Act 1974. Records of training undertaken, including names of staff / contractors and date of training will be kept by Crawfords for the duration of the project. Where practicable, training will be developed and implemented in consultation with representatives of the local Aboriginal community; • in the event that surface disturbance identifies a new Aboriginal object, all works must halt in the immediate area to prevent any further impacts to the object(s). A suitably qualified archaeological specialist and representative of the local Aboriginal community must be contacted to determine the nature, extent and significance of the object(s). The site is to be registered in AHIMS (managed by OEH) and the management outcome for the site included in the information provided to AHMS. Crawfords will consult with representatives of the local Aboriginal community and the archaeological specialist to develop and implement management strategies for all objects / sites. If impacts are unavoidable, mitigation measures are to be undertaken in accordance with the heritage component of the Construction Management Plan. All sites impacted must have an Aboriginal Site Impact Recording form completed and submitted to the	C,O

Item	Management and/or mitigation Measure	Implementation C - Construction O - Operation
	AHIMS registrar within three (3) months of completion of these works;. • in the unlikely event that following surface disturbance human remains are located within the project area, all works in the immediate area are to halt to prevent any further impacts to the remains. The NSW Police are to be contacted immediately. No action is to be taken until the NSW Police provide written notification. If the skeletal remains are identified as Aboriginal, Crawford's will contact OEH's Environment Line on 131 555 and representatives of the local Aboriginal community. No works will continue until OEH provides written notification; and • the Aboriginal cultural heritage management measures identified above are to be detailed in the Construction Environmental Management Plan and Operational Environmental Management Plan, as relevant.	
L2	In the event European heritage items currently unidentified are uncovered as a result of the operations, all works will cease immediately until the item has been inspected by a qualified archaeologist and recommendations relating to the management of the item are made.	C,O
	Visual and Landscape	
M1	Night time operations are directly limited to deliveries of AN to the site only.	C,O
M2	Lighting should avoid the direct line of sight toward residences beyond the site.	C,O
M3	The use of floodlighting is to be minimised.	C,O
M4	Lighting would be focused only onto work areas during operation.	C,O

6.1.3 Environmental, Community, Health and Safety Management

The proposal requires the construction of stormwater management measures to ensure that stormwater runoff is treated appropriately. To manage potential impacts associated with construction activities a CEMP is proposed which will cover all environmental aspects and include controls and mitigation measures.

The CEMP would ensure that:

- all work complies with relevant regulations, legislation and standards;
- environmental aspects are considered for each activity; and
- commitment is made to regular audits to confirm compliance with plan, policies, approvals, conditions and licences.

Crawfords currently employs a Compliance Manager for the facilitation of their environmental, health and safety management systems. Crawfords are committed to the continual appointment of an appropriately qualified professional in this role to ensure that all mitigation and management measures are effectively applied and that on site activities are in accordance with approved plans, policy, guidelines and licences.

6.2 CEMP OUTLINE

The purpose of the CEMP is to provide a reference document to ensure that all safeguards, management and mitigation measures recommended as part of the proposal are being appropriately implemented and monitored.

The CEMP details the proposal, outlines construction management and site controls and provides a checklist, monitoring and reporting framework.

The CEMP shall include the following framework:

- Background – including a description of the proposed works, program and timing; CEMP context and objectives and relevant environmental policies;
- Environmental management – environmental management structure and responsibility; statutory requirements, licences and approvals; environmental reporting, training; and emergency contacts and response;
- Implementation – risk assessment; environmental management activities and controls; and specific environmental control and/or management plans; and
- Monitoring and Review – environmental monitoring and auditing; corrective actions and review schedule.

The following detailed environmental control and/or management plans will be included in the CEMP:

- Safety management system (SMS) incorporating a Site Emergency Plan (SEP);
- Soils and erosion control plan;
- Groundwater management plan;
- Surface water management plan;
- Noise and vibration control plan;
- Air quality control plan;
- Flora and fauna management plan;

- Waste management plan incorporating asbestos management; and
- Traffic management plan.

6.3 OEMP OUTLINE

An OEMP would be developed and implemented for all operational activities associated with the storage and distribution of AN at the Sandgate facility. The plan would follow a similar structure to that set out in *Section 6.2* and would address long term management actions to ensure that all safeguards, management and mitigation measures recommended as part of the proposal are being appropriately implemented and monitored.

7 PROPOSAL EVALUATION AND JUSTIFICATION

This Chapter provides an evaluation of the proposal including outcomes and conclusions regarding the overall suitability of the proposal, taking into consideration the likely environmental impacts of the proposal, the suitability of the site and the overall benefits of the proposal.

Schedule 2 of the Environmental Planning and Assessment Regulation, 2000 requires that an EIS include:

The reasons justifying the carrying out of the development or activity in the manner proposed, having regard to biophysical economic and social considerations and the principles of ecologically sustainable development.

The development can be justified if:

- the socio-economic and environmental benefits outweigh the disadvantages; and
- the overall impacts are acceptable to the community in terms of the principles of ESD.

This Chapter focusses on the proposed development in these terms.

7.1 SOCIO-ECONOMIC CONSIDERATIONS

Demand for AN is largely driven by mining operations, many of them based in the Hunter Valley. Although it is recognised that clients change over time, the demand for AN is expected to continue to grow into the future as regional mining operations continue to expand. The continuation of the proposal will provide employment security to the 65 people employed by Crawfords on site. It will also provide indirect benefit to the employment of an additional 130 positions through suppliers and contracts to Crawfords.

The facility has most of the infrastructure needed to operate at the increased volumes. The site is located in an existing industrial estate. This estate is situated in a location which has minimal impacts to the surrounding land uses. Given the adjoining rail network to the site, coupled with its close proximity to the Port of Newcastle and the Pacific Highway being the main distributor road to the region's mining operations, the site's location is well suited for its proposed use.

Increasing the quantity of AN stored on site would reduce current truck movements on public roads due to the handling and logistics required to ensure that product does not exceed 2,000 t under the interim arrangements. Present arrangements require excess AN being stored off site until capacity on site becomes available. The removal of additional truck movements (approximately 20 inbound/outbound movements per day), would ease the local road network and create a safer driving environment.

The site is highly disturbed, with no evidence of its natural form. The proposed increase in storage of AN at the site would not increase the current development footprint and would not further disturb natural areas on the existing site. Investigations into previous land uses indicate that site practices and management techniques have not been to industry best practice or in accordance with policies or licence conditions. Crawfords propose to improve existing site conditions through industry best practice stormwater management practices (including installing stormwater quality devices). In addition, the sensitive and chemical nature of AN requires special product handling and storage arrangements in accordance with AS 4326 and ISO 31000. Crawfords understand the level of risk in storing and transporting a Class 5 dangerous good and continue to demonstrate occupational health and safety compliance through existing WorkCover NSW licencing the MHF site accreditation process. This is especially important given the proximity of certain sensitive environmental receivers and wetland environments within the locality.

This EIS has found that the proposal would have negligible impacts to the immediate and surrounding environment. The approval of the proposal would improve the environment at and around the site through the implementation of a range of measures documented in various environmental management plans, including the installation of stormwater quality devices. A range of mitigation measures have been put forward to be implemented on the site to manage any potential adverse environmental impacts.

8 ECOLOGICALLY SUSTAINABLE DEVELOPMENT

This Chapter provides a discussion of the socio-economic considerations and the principles of ecologically sustainable development.

Australia's *National Strategy for Ecologically Sustainable Development (1992)* defines ecologically sustainable development (ESD) as: 'using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased'. The four principles of ESD are listed in Schedule 2 of the Environmental Planning and Assessment Regulation 2000 as follows:

- the precautionary principle;
- social equity, including inter-generational equity;
- conservation of biological diversity and ecological integrity; and
- improved valuation, pricing and incentive mechanisms.

The proposal generally complies with the principles of ESD as demonstrated in the following pages.

8.1.1 The Precautionary Principle

According to the POEO Act, the precautionary principle means that 'if there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation'. In the application of the principle, decisions should be guided by careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment and an assessment of the consequences of various options. This principle was developed in response to the difficulty of interpreting scientific data. The scientific method produces results based on confidence limits determined by the scope of data acquisition, interpretation methods and general understanding within a particular scientific discipline.

This proposal has been planned and assessed through a conservative and precautionary approach. It has been assessed as having a minor environmental impact. The proposal is economically sound, as it requires no site preparation, it utilises existing infrastructure and will continue to provide ammonium nitrate to the region's mining operations.

In addition, potential threats to the quality of the environment have been determined with a reasonable degree of certainty through the use of scientific investigation and analysis of the individual and cumulative environmental impacts of the proposal. It should be noted that no major threats of 'irreversible or long-term environmental damage' were identified during the EIS process and where other more minor threats have been identified, controls have been proposed and will be put in place should the proposal be approved.

8.1.2 Social and Intergenerational Equity

Social equity involves value concepts of justice and fairness so that the basic needs of all sectors of society are met and there is a fair distribution of costs and benefits to improve the wellbeing and welfare of the community, population or society. Social equity does not imply equality, rather that there should be equal access to opportunities for improved welfare with a bias towards advantaging the least well-off sectors of society.

Social equity includes intergenerational equity, which requires that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations. The development provides continued employment opportunities for the 65 employees of Crawfords at the site. The social well-being of residents of the Sandgate area would not be compromised by continuing a development that has been operating in a similar form for several years without adverse health or safety impacts.

Potential impacts on indigenous and non-indigenous heritage were assessed as negligible. Whilst the proposal will assist in resource extraction, the rights of future generations would not be compromised in the process.

8.1.3 Conservation of biological diversity and ecological integrity

Biological diversity refers to the diversity of genes, species, populations, communities and ecosystems and the linkages between them. Biological resources are responsible for vital ecological services such as maintaining soil fertility and the supply of fresh water. Maintaining biological diversity safeguards life support functions and can be considered a minimal requirement for ecological integrity.

A comprehensive assessment of the likely impacts of the development on flora and fauna is detailed in *Chapter 5* and *Annex F*. The ecological assessment found that although the habit has been disturbed it continues to provide habitat for a number of significant species and that the development is unlikely to significantly impact the surrounding habitat areas.

8.1.4 Improved Valuation and Pricing of Environmental Resources

This principle establishes the need to determine economic values for services provided by the natural environment, such as the atmosphere's ability to receive gaseous emissions, cultural values and visual amenity. Applying standard methods of valuation and pricing to environmental resources is a difficult process, largely due to the intangible nature of much of the natural environment. The environment has conventionally been considered a free resource and environmental factors have been excluded from determining the real cost of an activity. The indicative costs to the environment are shown by the cost of the mitigation measures and safeguards and are included in the real costs of the proposal. The proposal makes use of an existing facility, thus not demanding the use of construction materials.

9 CONCLUSION

This Chapter provides justification for the proposal including a comprehensive assessment of biophysical, economic and social issues and the principles of ecologically sustainable development.

The environmental impacts of the development have been carefully considered during the preparation of this EIS and it is considered that the operation of the facility, including existing and proposed environmental protection measures, provides a net benefit to the site and surrounding environment in terms of on site infrastructure and environmental safeguards.

Potential adverse impacts arising from the project have been identified. A range of strategies have been assessed to avoid, minimise and mitigate identified impacts. Where appropriate these have been incorporated into the Statement of Commitments.

AN requires specifically designed site infrastructure and strictly controlled transportation, storage and site management measures. A number of potential alternative sites for the storage and distribution of AN were assessed based on locational and safety criteria. Alternative site options were discounted for a variety of reasons including proximity to sensitive receivers and potential explosion risks, transporting product through congested and sensitive areas, noise impacts and incompatible land uses with regard to the consideration of AS 4326 and the policies of WorkCover NSW.

To the extent feasible, the proposal has been designed to address areas of concern to Council, relevant government agencies and the wider community by:

- upgrading existing site facilities to international storage and handling requirements; and

- improving environmental efficiency through stormwater management system upgrades and better management of noise and air quality at the site by integrating monitoring, operating procedures and upgraded infrastructure.

The storage and distribution of AN from Crawfords Sandgate facility has been occurring for many years with minimal negative impacts to the local community. Increasing the volume of AN stored on site whilst maintaining current operations with improved environmental management measures, would provide a continued reliable supply of ammonium nitrate to mining operations in the region.

The project provides a range of key benefits, including:

- improved storage and handling processes;

- improved environmental management, including stormwater management and emergency response procedures;

- provision of diverse employment and training options for the local workforce;

- economic benefits to various communities throughout the Hunter via value added spending (both direct and indirect); and

- facilitation of an indirect benefit to employment of approximately 130 positions through supply and demand and contracts.

The project can be implemented with minimal adverse socio-economic and environmental impacts as demonstrated throughout this EIS. While some potentially adverse environmental impacts may occur during operation, these are generally minor and specific mitigation measures have been formulated to minimise any adverse impacts and ensure the operations can proceed in an environmentally sustainable manner.

The project is justified on the basis of the efficient utilisation of existing resources and overall economic benefits to local and regional economies. It satisfies the objectives of ecologically sustainable development.

REFERENCES

Australian Greenhouse Office Department of the Environment and Water Resources (2007) **National Greenhouse Gas Inventory: Analysis of recent trends and greenhouse indicators 1990 to 2005**, p 71.

Australian Heritage Database (2012) *Search: Sandgate NSW*. **Department of Sustainability, Environment, Water, Population and Communities**. Australian Government. Assessed on 6 June 2012 *http://www.environment.gov.au/cgi-bin/ahdb/search.pl*

Aboriginal Heritage Information Management System (2012) *Search area: Lot 12 DP 625053 Buffer 50 m*. **Office of Environment and Heritage. NSW Government.** Assessed 12 June 2012 at *http://www.environment.nsw.gov.au/licences/AboriginalHeritageInformationManagementSystem.htm*

Better Transport Futures (2012) **Proposed Storage Facility Sandgate, NSW**. **Traffic Impact Assessment**. Prepared for ERM June 2012.

BMT WBM (2012) **Ammonium Nitrate and Distribution Facility, Sandgate, NSW – Stormwater, Flooding and Receiving Water Quality Assessments** (R.N2303.001.00). October 2012

Central West Archaeological and Heritage Services Pty Ltd (1998). **An Archaeological Survey Of the Proposed Minmi Sewerage Rising Main Between Shortlands Sewerage Treatment Works and Minmi in the Hunter Valley**. Report to PPK Environment & Infrastructure Pty Ltd.

Chessman B, 2003, **SIGNAL 2 – A Scoring System for Macro-invertebrate ('Water Bugs') in Australian Rivers**, **Monitoring River Heath Initiative Technical Report no 31.** Commonwealth of Australia, Canberra.

City of Newcastle (2011) **Newcastle Local Environment Plan 2011,** Map 3.

Crawfords Freightlines Pty Ltd (2011) **Site Emergency Plan, Crawfords Freightlines Sandgate Site, Russells Transport Depot, Lot 12 Old Maitland Rd, Sandgate, NSW.** Third Draft dated 21 October 2011.

Crawfords Freightlines Pty Ltd (2012) **Security Plan Sandgate (SSAN Security Plan Sandgate)**,Version: 1 amended 3 December 2012.

Dallas, M. (1994). **Sandgate Sewerage Scheme Archaeological Survey for Aboriginal Sites.** Report to Rust PPK Consultants on behalf of the NSW PWD Hunter Sewerage Project.

DECC (2005) **Approved Methods for the Modelling and Assessment of Air Pollutants in NSW.** August 2005.

Department of Climate Change and Energy Efficiency (DCCEE) (2009), **National Greenhouse Gas Inventory - Kyoto Protocol Accounting**

Framework: NSW 2009,
http://ageis.climatechange.gov.au/ Accessed 1 June 2012.

Department of Climate Change and Energy Efficiency (DCCEE) (2010), **National Greenhouse and Energy Reporting System Measurement: Technical Guidelines for the estimation of greenhouse emissions by facilities in Australia,** DCCEE. June 2010

Department of Climate Change and Energy Efficiency (DCCEE) (2011), **National Greenhouse Accounts Factors**. DCCEE, July 2011

Dominic Steele Consulting Archaeology (2005) **Preliminary Aboriginal Archeological Survey and Assessment. Proposed Upgrade of State Highway SH23 Shortland to Sandgate.** Prepared for the RTA

Ecologically Sustainable Development Steering Committee (1992) **National Strategy for Ecologically Sustainable Development**. Accessed from Department of Sustainability, Environment, Water, Population and Communities
http://www.environment.gov.au/about/esd/publications/strategy/intro.html 28/06/2012

Engel, B.A (1966) **1:250,000 Geological Series – Explanatory Notes.** Newcastle SI/56-2. Department of Mines, Geological Survey of NSW.

Environmental Protection Authority (1998) **Action for Air – The NSW Government's 25-Year Air Quality Management Plan**

Enviromet (1993) **Soil Sampling and Analysis of the Toll Bulk Services Site at Sandgate.** Prepared for Peko Wallsend Operations Ltd.

Enviromet (1992**) Soil Sampling and Analysis of the Toll Bulk Services Site at Sandgate.** Prepared for Peko Wallsend Operations Ltd.

ERA Environmental Services Pty Ltd (1994) **Plan of Management for the Toll Bulk Services Site Sandgate.** Prepared for North Mining Ltd

ERM (2012a) **Ammonium Nitrate Storage and Distribution Facility Air Quality Assessment.** Prepared for Crawfords Freightlines Pty Ltd

ERM (2012b) **Ammonium Nitrate Storage and Distribution Facility Bush Fire Hazard Assessment.** Prepared for Crawfords Freightlines Pty Ltd

ERM (2012c) **Ammonium Nitrate Storage and Distribution Facility Ecology Assessment.** Prepared for Crawfords Freightlines Pty Ltd

ERM (2012d) **Ammonium Nitrate Storage and Distribution Facility Greenhouse Gas Assessment.** Prepared for Crawfords Freightlines Pty Ltd

ERM (2012e) **Ammonium Nitrate Storage and Distribution Facility Noise and Vibration Impact Assessment.** Prepared for Crawfords Freightlines Pty Ltd

ERM (2012f) **Lot 12 Old Maitland Road Sandgate NSW Asbestos Management Plan.** Prepared for Crawfords Freightlines Pty Ltd.

ERM (2012g) **Lot 12 Old Maitland Road Sandgate NSW Hazardous Materials Assessment.** Prepared for Crawfords Freightlines Pty Ltd.

ERM (2012h) **Lot 12 Old Maitland Road Sandgate NSW 2304 Phase I Environmental Site Assessment**. Prepared for Crawfords Freightlines Pty Ltd.

ERM (2012i) Lot 12 Old Maitland Road Sandgate NSW 2304 **Targeted Phase II Environmental Site Assessment.** Prepared for Crawfords Freightlines.

Janelle Adrain, Health and Safety Essentials Pty Ltd (2012) **Crawfords Freightlines Pty Ltd Lot 12 Old Maitland Road, Sandgate (NSW) Ammonium Nitrate Storage Facility. Hazard Analysis – Revision 1** (Storage in Shed A, Shed B, Shed D & Outdoor Compound).

Jo McDonald CHM Ltd (1997). **Archaeological Survey of the Maryland to Shortland Rising Main, Hexham Swamp**. Report to CH2M Australia on behalf of Hunter Water Corporation.

Kuskie, P. J. & Kamminga (2000) **Salvage of Aboriginal Archaeological Sites in Relation to the F3 Freeway near Lenaghans Drive, Black Hill, New South Wales. Volumes 1-3.** Unpublished report to the NSW Roads and Traffic Authority (Major Projects, Newcastle).

Mills & Wilkinson (1994). **Archaeological Survey of Proposed Upgrade of the Shortland Wastewater Treatment Works.** Report to Hunter Water Corporation.

NSW Heritage Database (2012) **Search: Sandgate, Newcastle LGA. Office of Environment and Heritage.** NSW Government. Assessed on 6 June 2012 at *http://www.environment.nsw.gov.au/heritageapp/heritagesearch.aspx*

NSW Rural Fire Service (2006) **Planning for Bush Fire Protection. A Guide for Councils, Planners, Fire Authorities and Developers.** Prepared by NSW Rural Fire Service in cooperation with the Department of Planning.

Umwelt Environmental Consultants (2002). **Management of Aboriginal Cultural Heritage Values in the Bluegum Vista Estate.** Report to Landcom.

Waste Classification Guidelines (2009) **Classifying Waste.** Department of Environment, Climate Change and Water. NSW Government.

World Business Council for Sustainable Development (WBCSD) (2004**) The Greenhouse Gas Protocol, A Corporate Accounting and Reporting Standard - Revised Edition,** WBCSD World Resources Institute, March 2004.

ERM has over 100 offices across the following countries worldwide

Australia
Argentina
Belgium
Brazil
China
France
Germany
Hong Kong
Hungary
India
Indonesia
Ireland
Italy
Japan
Korea
Malaysia
Mexico
Netherlands
New Zealand
Peru
Poland
Portugal
Puerto Rico
Singapore
Spain
Sri Lanka
Sweden
Taiwan
Thailand
UK
USA
Venezuela
Vietnam

Environmental Resources Management

PO Box 3071
Thornton NSW 2322
53 Bonville Avenue
Thornton NSW 2322

T: +61 2 4964 2150
F: +61 2 4964 2152
www.erm.com

ERM