Our Ref: CM:KL: 11886
N:\11886\Worddocs\Authorities\Oct 08 DOP (2).docx

13 October 2008

Director, Major Development Assessment
Department of Planning
GPO Box 39
SYDNEY NSW 2001

Attention: Ann-Maree Carruthers

Dear Madam

RE: MAJOR PROJECT (MP07_0086) REDLAKE ENTERPRISES TOMAGO

We refer to the proposed Redlake development at Tomago and as we have previously foreshadowed enclose an updated site layout plan and a detailed set of plans showing the building elevations, perspectives have also been included.

As can be seen from the drawings the quality of architecture is high and it is considered in particular that the presentation to the street will be attractive and indeed set a new standard for development on Tomago Road.

We refer to the submissions received in response to the public consultation process as previously responded to, letter from the RTA dated 23 June 2008 and facsimile from the Department of Planning dated 29 August 2008 and provide the following consolidated response.

DECC

A separate and comprehensive response has already been provided in relation to all issues raised by DECC and we attach a further copy for your convenience.

Energy Australia

No issues raised by Energy Australia that require a response. Redlake are assisting Energy Australia with the location of a substation on site (not required for the proposed development).

ADW JOHNSON PTY LIMITED
ABN 62 129 445 398

central coast
2 bounty close, tuggerah nsw 2259
po box 3717, tuggerah nsw 2259
phone. 02 4305 4300
fax. 02 4305 4399
video conf. 02 4305 4374
email. coast@adwjohnson.com.au

www.adwjohnson.com.au

hunter region
7/335 hillsborough road, warners bay nsw 2282
phone. 02 4978 5100
fax. 02 4978 5199
video conf. 02 4954 3948
email. hunter@adwjohnson.com.au

Roads & Traffic Authority

Following the receipt of the June letter from the Department of Planning an addendum report has been prepared by Better Transport Futures and is attached to this letter.

The addendum provides an updated analysis based on work in relation to traffic generation rates carried out by Maunsell Australia Pty Ltd.

We request that the RTA complete its assessment of the application as soon as possible based on the attached report.

In relation to the requirement by the Roads and Traffic Authority that the developer contribute some $75,000.00 per developable hectare we advise that Redlake Enterprises whilst prepared to make a reasonable contribution (and has always acknowledged this) is not of the view that this amount is reasonable.

Redlake Enterprises is of the view that the proposed development should be encouraged by the NSW Government. The following reasons are given in support of a lesser contribution:

- The requested contribution is arbitrary and we are not aware of the methodology for its calculation.

- The development costs associated with this site are high. The fact that there is no existing sewer to the site, the need to relocate power lines and the cost to fill the site above flood level and the need to construct an intersection for access off Tomago Road weigh heavily on the project viability.

- The requested contribution does not appear to take account of the benefit being provided by the proposed development to the existing public road network, specifically the proposal to light Tomago Road from the site back to the Pacific Highway.

- The proposed Redlake development offers substantial economic investment in the region and will provide substantial employment opportunity. Accordingly Redlake are of the view that the project should be encouraged rather than discouraged by government.

- The proposed development is a substantial contribution to achieving the objectives of the Lower Hunter Regional Strategy. Indeed it is most likely a catalyst to the development of the adjacent lands currently being sold by the Hunter

Development Corporation (it is considered by Redlake that any intending purchaser of the adjoining lands would be discouraged in the knowledge of a contribution in the order of $75,000 per developable hectare).

Redlake believe that the establishment with the RTA of what is a reasonable contribution can be achieved and accordingly to avoid any further delay in the application being approved requests that this issue be made a condition of consent.

Hunter Water

There are no issues raised by Hunter Water that require a response.

Rural Fire Services

No issues raised to the proposed development that require a response.

Department of Planning

The Department has requested in facsimile dated 29 August 2008 that any changes in the traffic generation rates require that the acoustic report be updated to account for them. Spectrum Acoustics have updated the report to reflect revised traffic generation figures and a copy of the report is attached to this letter. The Spectrum report considers the impact on nearby sensitive receivers.

In relation to the stormwater issues our environmental engineer Scott Day has prepared a response addressing the issues raised and this is attached to this letter.

In relation to the proposed lot sizes we advise that they are based on advice obtained from local real estate agents as to what was the market demand at the time. We note that the proposed lot sizes are similar to the nearby Mirvac subdivision adjacent the Pacific Highway which is currently being sold. The proposed layout can be flexible to market demand. If larger lots are required lots can be simply consolidated. It is unlikely that smaller lots would be required.

Others

A number of non government authority submissions have been received in relation to the proposed development and we provide the following response. Our response is structured to address issues raised rather than each letter individually.

Noise

The EAR establishes that the proposed development (WesTrac and industrial estate including consideration of traffic) will comply with DECC requirements for noise emissions. A construction management plan will also be prepared at the appropriate time and will ensure that construction noise is kept to the minimum.

Concerns were raised in relation to the acoustic assessment in terms atmospheric conditions and criteria adopted for the methodology. The acoustic report submitted with the application has been prepared by an appropriately qualified specialist in the field. The atmospheric conditions and criteria adopted are based on the best information available from the Bureau of Meteorology and using the adopted DECC guidelines.

Concern has been raised in relation to noise generated in future stages of the proposed development. The acoustic report discusses the potential noise from the future industrial subdivision based on typical noise generation. This has established that the future industrial area will comply with DECC guidelines. However it should of course be noted that all future development will be the subject of separate development or project applications and accordingly the specifics of each case will be appropriately assessed on merit at that time.

Pollution

The EAR establishes that the proposed development will not generate any significant adverse pollution of waters, air or to ground.

Concerns have been raised that the exhaust from trucks delivering material to the site would contaminate the locality. The open nature of the area will ensure that there is no unreasonable concentration of emissions.

Concerns have been raised that the proposed development will increase air bourne particulates during construction and operation. A construction management plan will be prepared to address dust associated with construction activities and accordingly this is not expected to impact on neighbouring properties. In the operation phase the proposed development is not expected to generate any excessive airborne particulates. The site will be substantially sealed, unsealed areas can be managed to ensure no unreasonable dust generation.

Concerns have been raised that the proposed development will generate odour. The proposed development will not generate any odours that will impact on the surrounding area.

A question has been asked of the fallout from Tomago Aluminum relative to habitation of the site. The site is not to be used for habitable purposes and has been determined suitable for industrial development. The contamination report has not identified any gross contamination of the site.

Concerns have been raised that the proposed development could result in environmental impacts to the Hunter River, Tomago Sand beds, flora and fauna, livestock neighbouring properties through hazards and spillage. These issues have been adequately addressed in the submitted documentation. The proposed development will not have significant adverse environmental impact. Particular care has been taken in the selection of fill material and the management of onsite potential sources of contamination. Redlake & WesTrac are responsible corporate citizens and are equally concerned to ensure that the project will have no environmental impact. Indeed the proposed stormwater controls for the site will likely mean that the existing quality of water flow to the wetland will be improved compared with the agricultural use of the site. The proposed development incorporates appropriate environmental protection measures such as water quality ponds and storage of fuels and oil etc in bunded areas.

Tomago House

Concerns have been raised in relation to the potential impact of the proposed development on Tomago House and nearby chapel. The proposed development is located significant distance from Tomago House and the associated chapel (there appears to be a misunderstanding that the proposed development is located near or surrounds Tomago House). Accordingly the proposed development can have no significant impact on the heritage value of this building and the preparation of a Heritage Impact Statement is not warranted and no specific landscape or mitigation measures are considered necessary, beyond the landscaping proposed for the site.

The reference to future industrial development on adjoining lands, closer to Tomago House is not a relevant consideration in relation to this application. Such proposal would be assessed on merit as part of any future development or project application.

Flora & Fauna

Concerns raised in relation to the loss of habitat for threatened species and loss of endangered ecological communities have been addressed in detail in the ecological assessment presented with the EAR. It has been determined that the proposed development will not have a significant adverse impact relative to threatened species, habitat or EEC. In particular it is noted that an offset has been provided as part of an MOU between the Minister for the Environment, Minister for Planning and the former owner of the land RLMC.

A reduced development area not only is considered unnecessary but will erode the objectives of the Lower Hunter Regional Strategy that this site be developed as employment lands.

Reduced Property Value

Concern raised that the proposed development will reduce property value (of a home 1.5km from the proposed development) is not founded on any evidence. The site has been earmarked for some time now for employment outcomes and so the actual development of the property consistent with those strategic directions is considered unlikely to have significant impact on property values.

Traffic

Concerns have been raised that the proposed development will increase traffic on Tomago Road and therefore impact on the amenity of homes along Tomago Road.

Development along Tomago Road is generally of an industrial or rural nature and there is not a substantial residential area. A small number of dwellings on rural properties occur along Tomago Road. This makes Tomago Road a good choice for industrial traffic. The proposed development is an employment generating proposal as identified as appropriate within the Hunter Regional Strategy and the Major Project State Environmental Planning Policy.

Accordingly the proposed development will contribute to the increasing traffic numbers on Tomago Road together with the future development of the balance of the Tomago industrial lands including those adjoining as well as the growth of the Newcastle Airport. It is considered that the proposed traffic increases are within expectations and will not unreasonably impact on the existing levels of amenity. The existing road conditions have been identified as adequate for the initial stages of development. With overall increasing numbers of traffic on Tomago Road by a range of users it will be necessary to upgrade the road. The proposed development will contribute its fair share to the RTA for this purpose. Concern has been raised in relation to the deterioration of roads resulting from traffic associated with the proposed development. The proposal will be required to make a contribution to the relevant authority and accordingly address this concern. The proposed development will of course improve the safety of night time traffic on Tomago Road by providing street lighting from the site entrance back to the highway.

Concerns have been raised that the construction process will result in disruption to traffic flows. As with all development interruption to regular traffic flows will result on occasions. However, the disruption is temporary and intermittent and regular traffic flow will return.

The impact on traffic flows will be managed via a management plan to be prepared to minimise disruption.

Flooding

Concern has been raised that raising of the site levels will increase flooding of adjoining properties. The proposed development has been modeled by specialists in the field and it has been determined that the proposed development will not have a significant adverse impact on surrounding properties.

Hydrological Impact – Wetland

Concerns have been raised that the proposed development will have an adverse hydrological impact on the wetlands adjoining the site. The EAR clearly establishes that the proposed development will not have an adverse hydrological impact on the wetland.

Consultation

Concerns have been raised that there has been a lack of consultation as part of the process. The level of consultation has been adequate for the proposed development. Opportunity has been provided to affected people to make comment and indeed the submissions received are a direct result of that. Redlake in addition to the consultation procedures of the Department of Planning placed its own advertisements in the paper encouraging people to make a submission and to contact Redlake Enterprises with any questions. Further, any person that contacted Redlake were afforded the opportunity to comment on the proposal.

Ongoing consultation continues on an as needs basis and a briefing was recently given to Port Stephens Councillors who are very positive about the proposed development. Redlake will continue to assist people with any enquiries in relation to the proposed development.

Alternatives

It has been suggested that there are other alternative sites that should be developed for industry rather than this site. It has been identified by the Lower Hunter Regional Strategy that this site is strategically important to ensure provision of adequate employment opportunities and to provide appropriate land for industrial development. The proposed development is consistent with that objective.

It has also been suggested that the proposed WesTrac component of the development should be located on the western side of the site. It is considered that this offers no better outcome than the approach taken.

Lighting

Concern has been raised in relation to the potential impact of lighting. A lighting management plan will be prepared to minimise potential impacts to surrounding areas.

Stormwater

Concern has been raised that during the construction process stormwater will result in increased saturation of adjoining properties. The construction process will be managed to ensure that this does not occur.

Visual Appearance

A concern has been raised that the proposed development will alter the visual appearance of the site. Given that the subject site and those adjoining to the west have been identified for industrial development it will be inevitable that the development of the site for this purpose will change the appearance of the existing undeveloped site. However, the site is not prominently located and views of the site have a very limited visual catchment. Accordingly the benefits envisaged by the project are considered to outweigh the significance of any visual change to the site. Notwithstanding this the proposed development includes mitigation measures including substantial areas of tree planting that will make a positive contribution to the locality.

A question has been asked as to whether the existing few fig trees located on the site can be retained. Redlake Enterprises that some of these may be able to be retained at significant cost and is currently considering this option.

Identification of Opportunities and Constraints

Concerns have been raised that not all opportunities and constraints have been identified. The EAR and supporting documentation identifies all relevant opportunities and constraints.

Economic Benefits

Concern has been raised that the proposed development does not justify the economic case. The proposed development offers a substantial benefit both in economic and social terms. The proposed capital cost of the project and ongoing business operations

will assist the local and state economies. The proposed employment generated by the WesTrac facility and the future opportunities within the industrial subdivision represents a significant benefit to the community.

Future Generations

oncerns have been raised about what happens in the event that the site becomes vacant "like the BHP Site". In the unlikely scenario that the site is no longer to be used in the manner identified the will be able to be redeveloped for other purposes.

Yours faithfully
ADW Johnson Pty Ltd - (Hunter Office)

CRAIG MARLER
SENIOR PLANNER/PROJECT MANAGER

Better Transport Futures

Mark Waugh Pty Limited
ABN 67 106 169 180
Transport Planning & Engineering

Project Design Note

Project: Tomago Industrial Development

Subject: Site access design note – review of traffic generation rates

Date: September 11, 2008

Ref: P0168

This design note has been prepared to review the traffic movement characteristics for the proposed WesTrac industrial subdivision at Tomago, NSW. The work covers a review of trip generation, trip distribution and trip assignment assumptions. Previous work completed by BTF used standard trip generation rates provided within the RTA Guide to Traffic Generating Development.

However, BTF have reviewed the future stages 2 and 3 of the development and consider that the RTA standard generation rates should not be applied in this instance. Information provided by Hunterland indicates that the traffic generation rates for industrial / business park developments in the Lower Hunter are substantially lower than those within the RTA Guide to Traffic Generating Development. From the "Assessment of Hunter Valley Business Park Trip Rates" prepare by Maunsell Australia Pty Ltd the following trip generation rates are assumed:

- 0.47 trips per 100 m^2 GLFA for the AM peak; and
- 0.56 trips per 100 m^2 GLFA for the PM peak

The data from the Maunsell report also provides details on directional splits between inbound and outbound movements for the various sites. The average of the surveys indicates that the directional split is 60:40, with inbound bias in the AM peak and outbound in the PM peak. This is again different to the normal split of 85:15 adopted by the RTA Guide.

Using the above assumptions for Stage Two and Three of the Westrac development, together with the details provided by the developer for the specific elements within Stage One, the predicted traffic volumes associated with the future development at Tomago is presented in Table 1 below.

PO Box 114 New Lambton, NSW 2305
Phone: (61) 2 4952 5592 Mobile: 0409 250 773
Fax: (61) 2 4952 5573 Email: mwaugh@ markwaugh.com.au

Table 1 – Predicted Future Traffic Volumes

Stage	Facility	Stage Area	Rate	Volume
Stage 1 - WesTrac	Administration	590 m^2	2 per 100 m^2	12
	Machinery Sales			
	Workshops	9780 m^2	-	Assumed 120
	Parts Warehouse and Distribution	6120 m^2	-	Assumed 80
	Machinery Storage	-	-	-
Stage 1 – CAT Institute	Apprentice training	1500 m^2		Assumed 100
	WesTrac			
	Universities/other educational			
Stage 2	Industrial Subdivision	36 hectares	0.47 AM 0.56 PM	**592** **705**
Stage 3	Industrial Subdivision	48.49 hectares	0.47 AM 0.56 PM	798 950
			TOTAL	**1702 am** **1967 pm**

The following assumptions have been made when determining the above traffic flows:

1. Traffic flows for Stage 1 Westrac and Stage 1 CAT Institute are based on the details provided by the client. Due to the unique nature of the development, no comparative data is available from the RTA Guide to Traffic Generating Developments.
2. The traffic flows for the Stage 2 and Stage 3 are based upon Gross Leasable Floor Area (GLFA) as per normal guidelines. Allowing for road construction, landscaping, intersections, car parks etc the GLFA is typically 35% of the total site area.
3. Advice from Asquith & de Witt indicates that the value of 35% of the total site area is appropriate, based upon surveys completed via aerial photography on the Cardiff Business Park area. This is then consistent with the application of the RTA's Cardiff traffic generation rates.

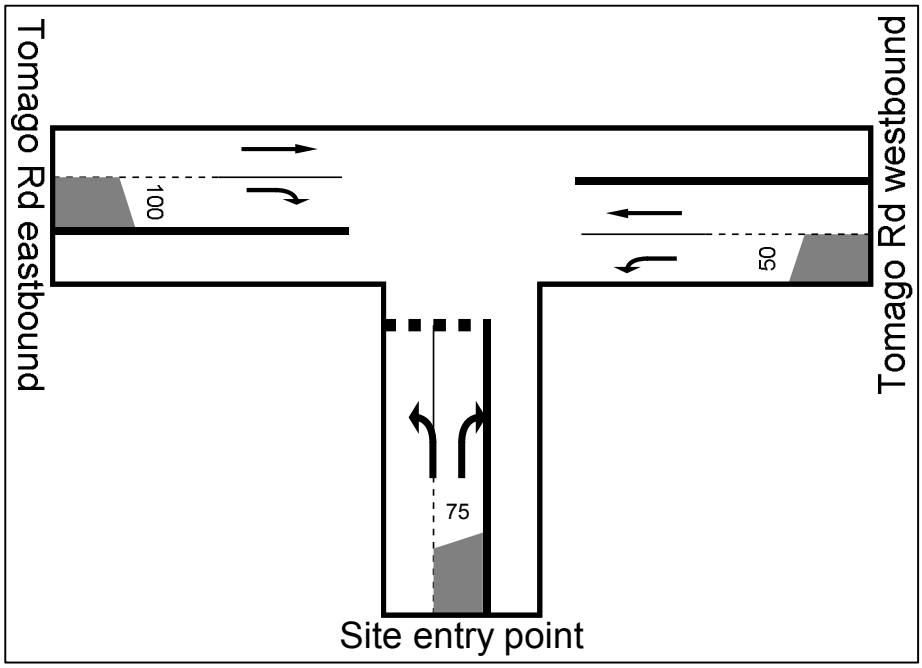
The revised traffic volume data given in Table 1 above has been used to assess the future intersection control for the site access on Tomago Road. The SIDRA analysis covers the 3 stages of the development, to assess the intersection requirements for each of the stages. In this way, the infrastructure requirements can be tailored to the staging needs of the development.

Mark Waugh Pty Limited
ABN 67 106 169 180
Transport Planning & Engineering

Stage One – WesTrac and CAT

During the initial stages as previously advised, the access to the site can be satisfactorily provided via a seagull type intersection. This would provide a sheltered right turn lane for traffic entering the site as well as for traffic exiting the site. In addition, a left turn deceleration lane will be required. As Tomago Road is a classified regional road, the design of this interim intersection will need to be in accordance with the RTA Road Design Guide. A schematic layout for the interim seagull intersection is shown below:

Beyond the Stage One of the development, a seagull control would not have adequate capacity and a signal controlled intersection has been adopted.



PO Box 114 New Lambton, NSW 2305
Phone: (61) 2 4952 5592
Fax: (61) 2 4952 5573
Mobile: 0409 250 773
Email: mwaugh@ markwaugh.com.au

Better Transport Futures

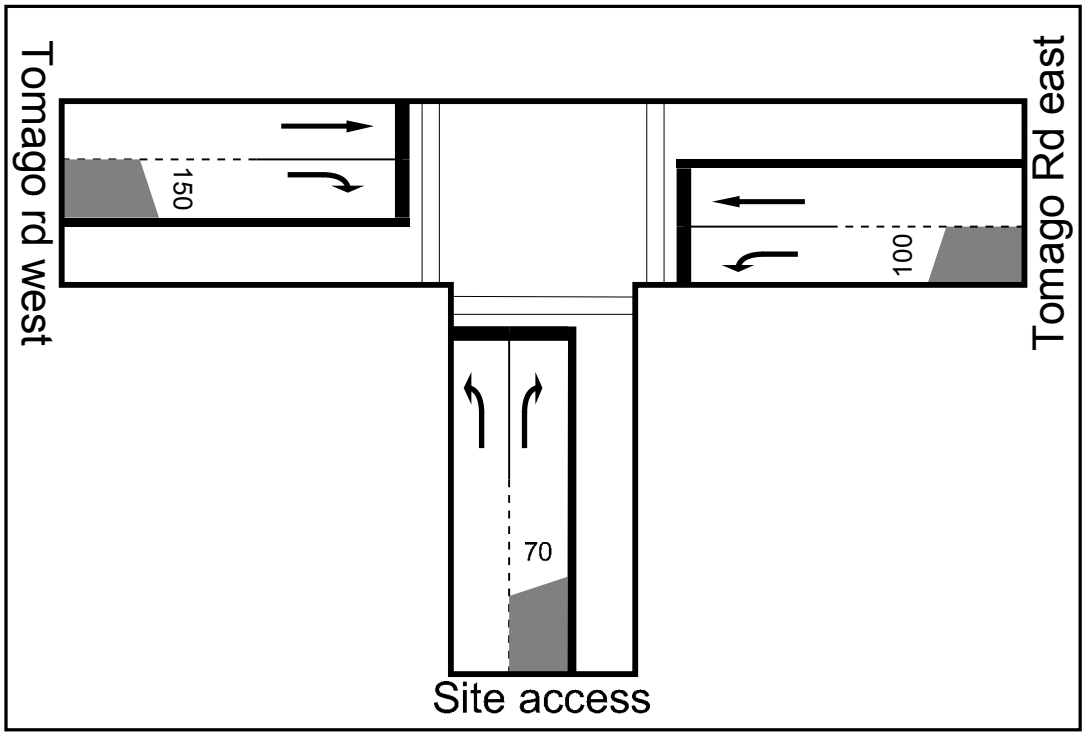
Mark Waugh Pty Limited
ABN 67 106 169 180
Transport Planning & Engineering

Stage Two- WesTrac and CAT and Stage One Industrial Subdivision.

Traffic flows associated with the Stage Two development have been derived from data provided by the client for Stage One and the data provided by the Hunterland report for Stage Two.
Using these assumptions, the Sidra analysis indicates that a signal controlled T intersection will have adequate capacity for Stages 1 and 2. A possible layout is illustrated below:

Signals Phase 1

This layout will need to be designed in accordance with the RTA Road Design Guide. It will need to take into account the specific requirements of the RTA, with regard to cyclists and pedestrians as well as any other design features.



PO Box 114 New Lambton, NSW 2305
Phone: (61) 2 4952 5592 Mobile: 0409 250 773
Fax: (61) 2 4952 5573 Email: mwaugh@ markwaugh.com.au

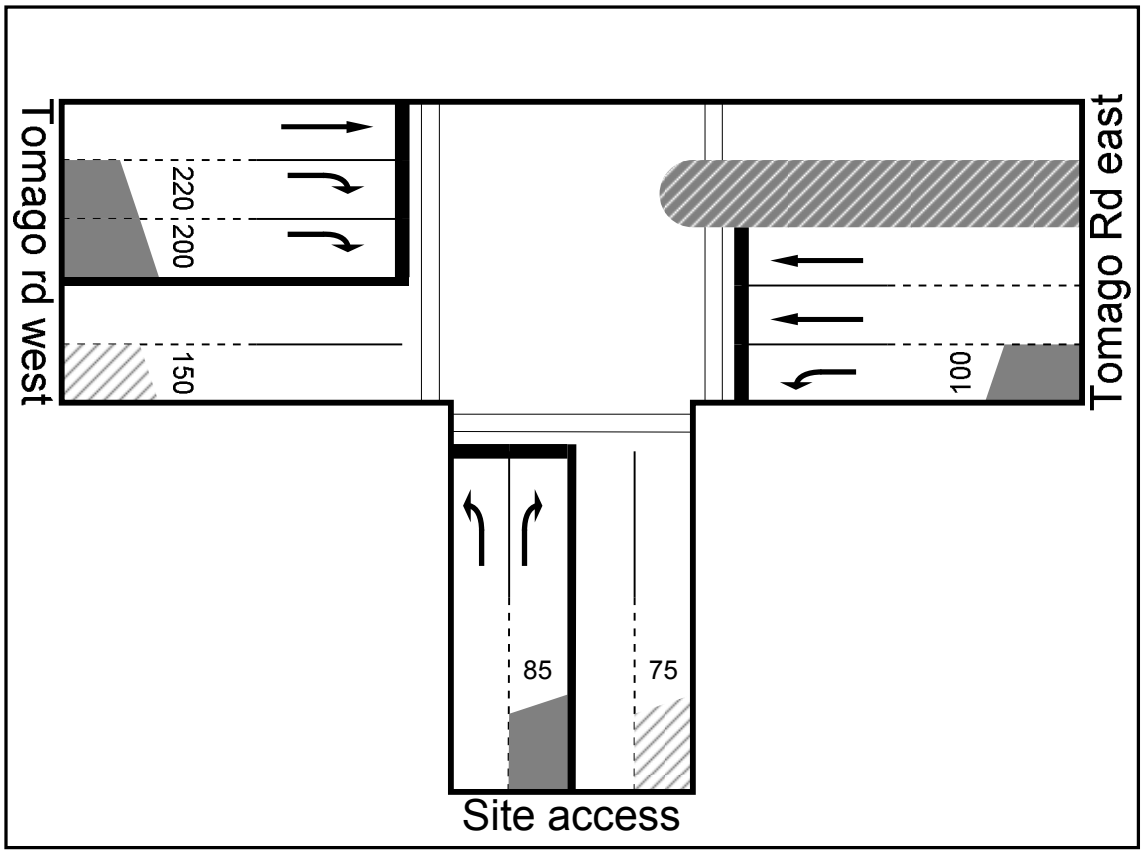
Mark Waugh Pty Limited
ABN 67 106 169 180
Transport Planning & Engineering

Stage Three- WesTrac and CAT and Stage One + Two Industrial Subdivision

Applying the assumptions as above, the Sidra analysis indicates that the single intersection will continue to have adequate capacity to cater for the flows associated with the full development on the site, with additional turn lanes and through lanes provided.

The signal controlled intersection will require upgrading for Stage 3, with dual right lanes into the site as well as two through lanes in each direction along Tomago Road through the intersection.. The indicative layout is provided below:

Signals Phase 2



PO Box 114 New Lambton, NSW 2305
Phone: (61) 2 4952 5592 Mobile: 0409 250 773
Fax: (61) 2 4952 5573 Email: mwaugh@ markwaugh.com.au

Mark Waugh Pty Limited
ABN 67 106 169 180
Transport Planning & Engineering

RTA 10 year background growth assumptions

The above analysis however has not allowed for any background growth along Tomago Road. Whilst it could be argued that the vast majority of background growth along Tomago Road would be created by the subject development, work currently being completed at the airport indicates that there will be a significant increase in development in this location, producing an increase in background flows through this intersection. Our separate review of this matter should be considered here.

Normal RTA practice is to increase background flows by 3% per annum, giving some 30% over 10 years. Using this rate, the intersection layout above has adequate capacity to cater for the 30% background growth along Tomago Road.

Summary and Conclusions

A summary of the Sidra analysis for the proposed single access is provided below.

Scenario	Seagull	Signals (Phase 1)	Signals (Phase 2)
2008 Stage One	YES		
2008 Stage Two	NO	YES	
2008 Stage Three			YES
2018 Stage Three			YES

Conclusions

1. Stage 1 of the development can gain access via a give way controlled intersection with a sheltered right turn lane.
2. The proposed Phase 1 signal-controlled intersection can allow for access Stages 1 and 2 of the development, using the Hunterland derived generation rates for the Stage Two Business Park/Industrial development.
3. Stage 3 will require additional capacity to be provided at the signal controlled intersection, with a second right turn lane for traffic entering the site as well as additional through lane capacity..
4. The analysis has allowed for 30% background growth along Tomago Road to assess the performance in the future design year of 2018. The analysis confirms that the Phase 2 signal controlled intersection will have adequate capacity for this future design year.

PO Box 114 New Lambton, NSW 2305
Phone: (61) 2 4952 5592 Mobile: 0409 250 773
Fax: (61) 2 4952 5573 Email: mwaugh@ markwaugh.com.au

SPECTRUM ACOUSTICS
NOISE AND VIBRATION CONSULTANTS

Project No: 07359

Noise Impact Assessment
WesTrac Facility and Industrial Subdivision
Tomago, NSW

Prepared for:

Asquith & de Witt
Unit 7 / 335 Hillsborough Rd
Warners Bay NSW 2282

On behalf of:

Redlake Enterprises
Level 3, 30 Kings Park Rd
West Perth WA 6005

Author:

Neil Pennington
B.Sc., B. Math.(Hons), MAAS, MASA
Principal / Director

Review:

Ross Hodge
B.Sc.(Hons)
Principal / Director

October 2008
~~November 2007~~

CONTENTS

1.0 INTRODUCTION

This report provides the results and findings of a noise impact assessment of the proposed WesTrac facility and industrial subdivision at Tomago NSW.

The Minister for Planning has confirmed that the proposal is a "major project" to which Part 3A of the *Environmental Planning and Assessment Act 1979* applies. This assessment has been undertaken as part of an Environmental Assessment (EA) of the proposal. The following NSW Department of Environment and Climate Change (DECC) documents provide noise criteria and guidelines for the assessment methodology:

1. *NSW Industrial Noise Policy* (INP, 2000);
2. *Environmental Noise Control Manual* (ENCM, 1994);
3. *Environmental Criteria for Road traffic Noise* (ECRTN, 1999).

2.0 DESCRIPTION OF TERMS

This section of the report aims to convey an understanding of several commonly used acoustical terms. Various terms are explained in plain language and the effects of certain atmospheric phenomena on noise propagation are discussed. Noise level percentiles are explained with the aid of a diagram of a hypothetical noise signal.

The descriptions in this section are not formal definitions of the terms. Formal definitions may be found in AS1633-1985 "Acoustics – Glossary of terms and related symbols".

2.1 General Terms

Sound Power Level

The amount of acoustic energy (per second) emitted by a noise source. Usually written as "L_w" or "SWL", the Sound Power Level is expressed in decibels (dB) and cannot be directly measured. L_w is usually calculated from a measured sound pressure level.

Sound pressure Level

The "noise level", in decibels (dB), heard by our ears and/or measured with a sound level meter. Written as "SPL", the sound pressure level generally decreases with increasing distance from a source. Noise levels are often written as dB(A) rather than dB. The "A-weighting" is a correction applied to the measured noise signal to account for the ear's ability to hear sound differently at different frequencies. The A-weighted sound pressure level therefore represents the measured (or predicted) noise level as it would be heard by the typical human ear.

Temperature Inversion

An atmospheric state in which the air temperature increases with altitude. Sound travels faster in warmer air than in cold air, so that during an inversion the top of a "sound wave" will move faster than the bottom. This bends (refracts) sound back towards the ground. The result is a "trapping" of sound energy near the ground and an increase in noise levels. Similarly, daytime air temperatures typically reduce with altitude (approximately 1-2 ^{0}C/100m called the adiabatic lapse rate) and sound refracts upward slightly. The result is slightly reduced noise levels compared with a uniform or 'neutral' atmosphere.

Wind Shear

A moving air mass will experience a "friction drag" at the ground in much the same way as a lava flow will flow quickly on top and "roll over" the lava beneath which must drag along the ground. This increasing wind speed with altitude is called "wind shear".

For a sound wave travelling down wind, the top of the wave moves faster than the bottom and the wave bends towards the ground. However, for a wave travelling into the wind the top of the wave is slowed down more than the bottom is and the wave bends upwards. **Figure 1** shows several examples of how atmospheric effects can bend sound waves.

FIGURE 1
Sound refraction under temperature inversions and wind gradients.

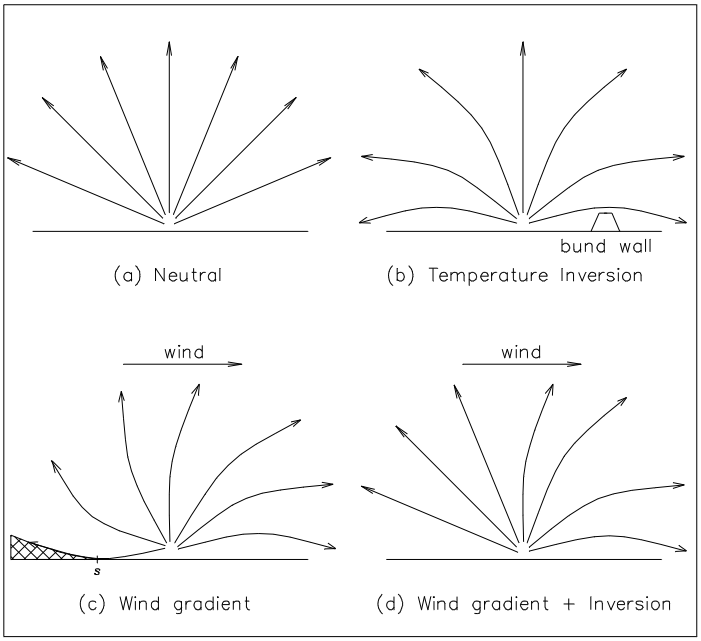


Figure 1 shows that sound rays can be refracted over a barrier (usually a bund wall or small hill) during a temperature inversion, increasing noise levels in the 'shadow zone'.

Neutral Atmospheric Conditions

An atmosphere that is at a temperature of approximately 23^0C from ground level to an altitude of 200m or more. There are no fluctuations in density or humidity and no wind. Such conditions rarely occur, as temperature will usually vary with altitude and there is always movement in various directions in different layers of the atmosphere.

Prevailing Atmospheric Conditions

Atmospheric conditions (with regards to potential effects on noise propagation) which are characteristic of the study area. These will typically include seasonal wind directions and velocities. Temperature inversions will be included as prevailing if they occur, on average, for more than 2 nights per week in winter.

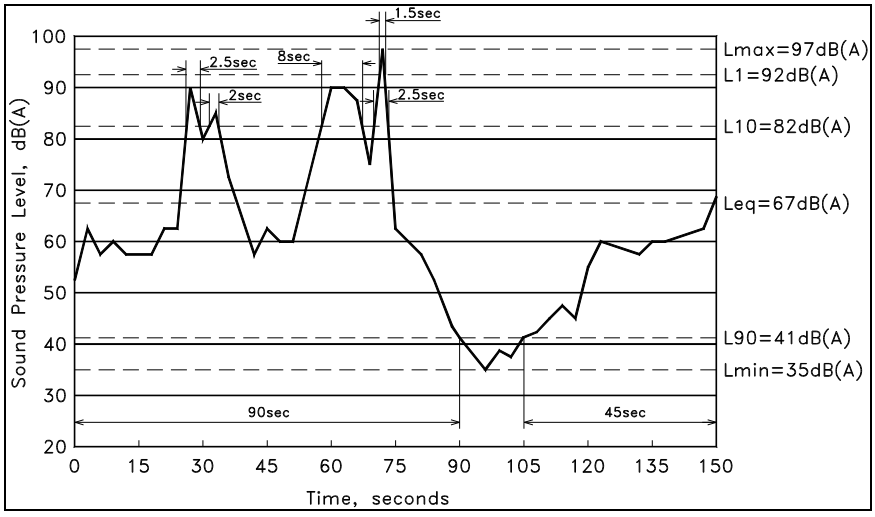
Adverse Atmospheric Conditions

Adverse conditions will include simultaneous winds and temperature inversions, even if the inversions occur for less than 2 nights per week in winter. This represents the worst case scenario for potential noise enhancement due to atmospheric effects.

2.2 Noise Level Percentiles

A noise level percentile (L_n) is the noise level (SPL) in decibels which is exceeded for "n" % of a given monitoring period. Several important L_n percentiles will be explained by considering the hypothetical time signal in **Figure 2**.

FIGURE 2
Hypothetical time-trace of 150-second sound signal.



The signal in Figure 3 has a duration of 2.5 minutes (ie 150 seconds) with noises occurring as follows:

- The person holding the instrument is standing beside a road and hears crickets in nearby grass at a level of around 60 dB (A);

- At about the 30 second mark a motorcycle passes on the road, followed by a car;
- At 60 seconds a truck passes;
- After the truck passes it sounds its air horn at the 73 second mark;
- The crickets are startled into silence as the truck fades into the distance;
- All is quiet until 105 seconds when the crickets slowly start to make noise, reaching full pitch by 120 seconds;
- The measurement stops at 150 seconds, just when an approaching car starts to become audible.

L_{A1} Noise Level

Near the top of Figure 3, there is a dashed line at 92 dB(A). A small spike of 1.5 sec duration extends above this line at around 73 seconds. Since 1.5 sec is 1% of the signal duration (150 seconds), the L_1 (or L_{A1} to signify A-weighting) noise level of this sample is 92 dB(A). The L_1 percentile is often called the *average peak noise level* and is used by the NSW Department of Environment and Conservation (DEC) as a measure of potential disturbance to sleep.

L_{A10} Noise Level

The dashed line at 82 dB(A) is exceeded for four periods of duration 2.5 sec, 2 sec, 8 sec and 2.5 sec, respectively. The total of these is 15 sec, which is 10% of the total sample period. Therefore, the L_{A10} noise level of this sample is 82 dB(A). The L_{A10} percentile is called the *average maximum noise level* and has been widely used as an indicator of annoyance caused by noise.

L_{A90} Noise Level

In similar fashion to L_{A1} and L_{A10}, Figure 3 shows that the noise level of 41 dB(A) is exceeded for 135 seconds (90 + 45 =135). As this is 90% of the total sample period, the L_{A90} noise level of this sample is 41 dB(A). The L_{A90} percentile is called the *background noise level*.

L_{Aeq} Noise Level

Equivalent continuous noise level. As the name suggests, the L_{Aeq} of a fluctuating signal is the continuous noise level which, if occurring for the duration of the signal, would deliver equivalent acoustic energy to the actual signal. L_{Aeq} can be thought of as a kind of 'average' noise level. Recent research suggests that L_{Aeq} is the best indicator of annoyance caused by industrial noise and the DEC *NSW Industrial Noise Policy* (INP) takes this into consideration.

L_{Amax} and L_{Amin} Noise Levels

These are the maximum and minimum SPL values occurring during the sample. Reference to Figure 3 shows these values to be 97 dB(A) and 35 dB(A), respectively.

3.0 THE PROPOSAL

WesTrac is the dealer for Caterpillar earthmoving machinery in Western Australia, New South Wales, the Australian Capital Territory and Northern China. The Company assembles, sells and services new and used machinery. Stage 1 of the proposed development is for the establishment of an integrated WesTrac facility on the northern half of Lot 161 DP774440, Tomago Road, which will be their NSW/ACT Headquarters.

Stage 2 of the proposal involves subdividing the adjoining land to the west (Lot 1 DP1003492) for sale to related and unrelated industrial users. This assessment considers the potential noise impacts from Stage 1 on nearby residential receivers and provides a general assessment of the proposed Stage 2 subdivision.

3.1 Hours of Operation

It is anticipated that the WesTrac facility will operate 24 hours per day, using three shifts, 7 days per week. Industries in the Stage 2 are also assumed to operate 24 hours per day.

3.2 Employment

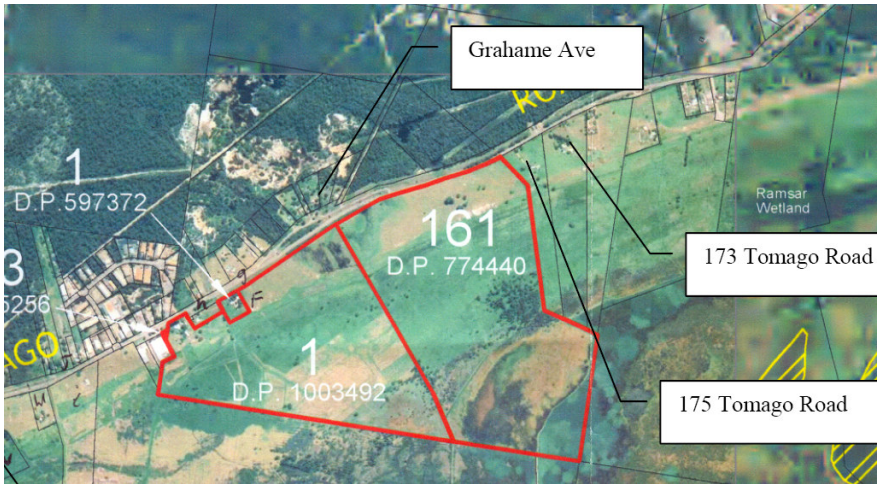
The WesTrac facility is expected to employ 400-600 people during the construction stage. Operation of the facility is expected to generate 300-400 jobs. Substantial additional employment opportunities will result from the future industries in the Stage 2 development.

3.3 Residential Receivers

The nearest residential receivers to the site are located to the east at 173 and 175 Tomago Road and in Graham Avenue. Both of these locations are considered representative of other nearby receivers. A dilapidated residence at Lot 1 DP597372 Tomago Road may also be impacted by noise, if occupied, but is further trom the WesTrac site that the other receiver locations.

The locations of the project site and the nearest residences are shown in **Figure 3**.

FIGURE 3
Project site and residential receivers.



4.0 THE EXISTING ENVIRONMENT

The existing meteorological and acoustic environments have been studied as part of this EA. The acoustical climate has been quantified at two representative residential locations around the project site.

4.1 Meteorology

The atmospheric conditions most relevant to noise assessments are temperature inversions, gentle winds (indicative of possible wind shear) and relative humidity. Meteorological data from the Bureau of Meteorology's Nobbys Head station were analysed to determine dominant wind directions in the 0-3 m/s category. The following data are the most significant with respect to noise propagation:

- Extremes of relative humidity (RH) are rarely experienced. For modelling purposes, a value of 70% RH was adopted;

- Mild temperature inversions are likely to occur on at least 20-25% of mornings and evenings in winter. An inversion strength of $+3^0$C/100m was adopted in the noise models (as per procedures in the INP, Appendix C).

- Gradient winds are predominantly south-easterly in summer and north-westerly in winter. A wind speed of 3m/s (at 10m above ground level) from each of these directions was modelled to determine the noise impact under each of these 'prevailing' wind conditions.

Typical calm daytime conditions of no wind, 70% RH and -1°C/100m vertical temperature gradient (ie, dry adiabatic lapse rate, DALR) was also modelled to represent daytime noise levels under calm conditions.

4.2 Ambient Noise Levels

Ambient noise monitoring was conducted at 175 Tomago Rd (immediately east of the site) and 308 Tomago Rd (west of the site) during the period 17-23 October 2007. Noise levels were recorded for 15 minute statistical intervals over the entire measurement period using Svan 949 Environmental Noise Loggers in accordance with the relevant DECC guidelines and AS 1055-1997 "Acoustic Description and Measurements of environmental noise". Calibration certificates for these loggers are attached in **Appendix A**. Periods of adverse weather conditions were excluded from the data as per the procedures outlined in Appendix B of the INP.

Background noise levels were calculated from the measured data using the tenth percentile method as specified in the INP. These are referred to as "Rating Background Levels" (RBL). Existing L_{Aeq} and L_{A90} (Rating Background levels, RBL) levels are summarised in **Table 1**. Noise data charts are shown in **Appendix B**.

TABLE 1
Measured ambient noise levels (October 2007).

Location	L_{Aeq}, period			L_{A90}, period		
	Day	Evening	Night	Day	Evening	Night
175 Tomago Rd	57	55	53	38	33	30
308 Tomago Rd	57	53	52	40	32	30

The contribution of existing industrial and transport noise sources to the measured ambient L_{Aeq} levels is estimated as follows:

175 Tomago Road
No industrial noise sources observed nearby and no industrial noise audible during deployment or retrieval of noise logger. Noise levels at this site are dominated by traffic on Tomago road.

308 Tomago Road
Slight industrial noise audible to the west, but not dominant. Noise levels at this site are also dominated by traffic on Tomago road.

5.0 NOISE CRITERIA

This section derives construction, operational and traffic noise criteria from the relevant DECC guidelines. The construction and operational criteria are based on measured background levels as shown in Table 1 above. In the interests of conservatism, the lower of the measured background levels in Table 1 will be adopted for all receivers. These levels are:

Day	38 dB(A),L_{90}
Evening	32 dB(A),L_{90}
Night	30 dB(A),L_{90}

5.1 Construction Noise

Recommended construction noise criteria vary depending on construction duration, as outlined in Section 157 of the DECC *Environmental Noise Control Manual* (ENCM) and reproduced below:

- Construction period less than 4 weeks:
  L_{A10} level restricted to background (L_{A90}) + 20dB
- Construction period more than 4 weeks but less than 26 weeks:
  L_{A10} level restricted to background (LA_{90}) + 10dB

DECC recommends construction during daytime hours only. For construction periods longer than 26 weeks, a construction noise criterion of background (LA_{90}) + 5dB is usually adopted.

Construction activities (including land-fill and building construction) are expected to take longer than 6 months and the criterion of 'daytime background level + 5dB' or **43 dB(A),L_{10}** would apply.

5.2 Operational Noise

In setting operational noise goals for a particular project, the INP considers both Amenity and Intrusiveness criteria. The former is set to limit continuing increase in noise from industry, whilst the latter is set to minimise the intrusive impact of a particular noise source. Given the receivers are not subject to significant existing industrial noise levels, the intrusiveness criteria are those applicable to setting the project specific noise goals. That is, the Rating Background Level (RBL) for the time period, plus 5 dB(A).

The Project-Specific Noise Levels (PSNL) for the development are therefore;

43dB(A) $L_{eq\ (15\ min)}$	**Day (7am – 6pm)**
37dB(A) $L_{eq\ (15\ min)}$	**Evening (6pm – 10pm)**
35dB(A) $L_{eq\ (15\ min)}$	**Night (10pm – 7am)**

5.3 Sleep Disturbance

As the project would operate 24 hours per day, it is necessary to assess the potential for impact noises to cause disturbance to residents' sleep during night time hours. DECC considers that a $L_{A1(1\ minute)}$ level, effectively the maximum noise level, should generally not exceed the nigh time background noise level by more than 15 dB (Ref. ENCM). Based on the measured background level of 30dB(A),L90 the sleep disturbance criterion is 45dB(A),L_{max}.

The ENCM is an old document, however, and more recent findings referenced in the DECC's *Environmental Criteria for Road Traffic Noise* (ECRTN, Appendix B3) lead to the following conclusions (p29):

- *Maximum internal noise levels below 50-55 dB(A) are unlikely to cause awakening reactions.*

- *One or two noise events per night, with maximum internal noise levels of 65-70 dB(A), are not likely to affect health and wellbeing significantly.*

Since the main objective of this assessment is to determine potential noise impacts on amenity, rather than on health and wellbeing, it is conservatively assumed from the above conclusions that disturbance to sleep may be minimised by ensuring that internal maximum noise levels do not exceed 50 dB(A). It is also accepted by DECC, and generally, that the noise loss through an open window to the centre of a room is 10 dB. The maximum acceptable external noise level is therefore **60 dB(A),L_{max}**.

5.4 Traffic Noise

Noise from vehicle movements on public roads is subject to criteria in the NSW *Environmental Criteria for Road Traffic Noise* (ECRTN). The ECRTN recommends various criteria based on the functional categories of roads applied by the Roads and Traffic Authority (RTA).

The RTA differentiates roads based on a number of factors including traffic volume, heavy vehicle use, through or local traffic, vehicle speeds and applicable traffic management options. Vehicles accessing the site would do so via Tomago Road, which is accessed from the Pacific Highway to the west and Masonite Road and Nelson Bay Roads to the east.

Since the Pacific Highway and Nelson Bay Road are arterials, this assessment will only consider potential traffic noise impacts at residences along Tomago Road, which is a 'collector' road with lower noise criteria. **Table 2** below shows the noise criteria relevant to traffic on collector roads extracted from Table 1 of the ECRTN. For the assessment of traffic noise, the day time period is from 7am to 10pm, whilst night is from 10pm to 7am.

TABLE 2
Road traffic noise criteria.

Situation	Recommended Criteria, $L_{eq(1\ hour)}$	
	Day (7am to 10pm)	Night (10pm to 7am)
13. Landuse developments with potential to create additional traffic on **collector** roads	60 dB(A)	55 dB(A)

The ECRTN also advises that, where criteria are already exceeded:

"In all cases, traffic arising from the development should not lead to an increase in existing noise levels of more than 2 dB."

Existing traffic noise levels in Table 1 do not exceed the levels in Table 2, so the Table 2 levels will apply as the project traffic noise criteria.

6.0 ASSESSMENT METHODOLOGY

6.1 Stage 1 WesTrac

6.1.1 Construction Noise

Construction would first involve depositing and levelling fill material over an area of 23 Ha. This would involve the use of road-going tip-trucks delivering fill and then levelling with a small tracked dozer (CAT D8 or similar). The dozer would also be used to spread a sand ridge on the northern site frontage over the site. A typical sound power level of 108 dB(A) was used for the tip-trucks and 113 dB(A) for the dozer.

It is generally assumed that, since the site requires some 1.9m of fill, filling the WesTrac site would commence on the eastern site boundary and extend to the west. This would provide a noise buffer between trucks importing fill and residences east of the site.

A 3km x 1.5km area was digitised into the Environmental Noise Model (ENM v3.06) software to model noise emissions from the site. The above noise sources were entered as points and the point calculation mode was used to determine noise levels at the assessed receivers. Similarly, building construction works were modelled to each receiver location. Construction of the administration building and general workshop were considered as worst cases for receivers to the west and east, respectively.

Significant noise sources included metal fabrication (105 dB(A)), a crane (102 dB(A)), diesel generator (98 dB(A)) and light vehicle movements (100 dB(A)).

6.1.2 Operational Noise

A comprehensive occupational noise study was conducted at the existing Mt Thorley site by Global Acoustics in September 2007. Noise emissions from most activities on site were measured, as well as L_{Aeq} noise levels inside and outside the various buildings. The Global Acoustics report provides noise levels suitable for determining the internal noise levels of all buildings to be constructed at the Tomago site.

This assessment assumes the buildings would be constructed from sheet metal and calculates external noise levels from the measured internal levels. External wall surfaces of all buildings were represented by point sources in the ENM model equivalent to the total sound power level of the plane surfaces.

The machinery workshops and other potential noise sources are generally on the eastern side of the site. The proposed layout of the eastern half of the site is shown in **Figure 4**. Full details of the site layout and surrounding areas are shown elsewhere in the EA documents.

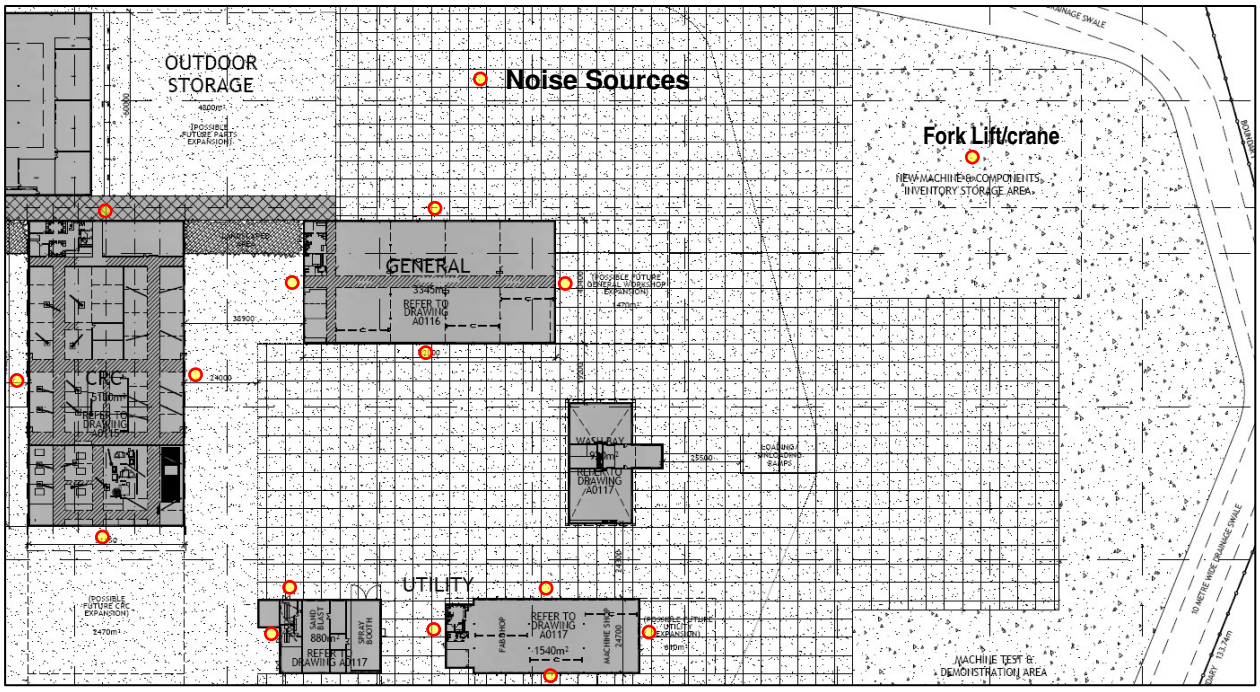


Figure 4. Source locations on eastern half of project site.

Point sources were generated for external walls of the Component Rebuild Centre (CRC), general workshop, fabrication/machine shop and the dynamometer. A small crane was also assumed to be operating in the New Machine and Components Inventory Storage Area at the eastern end of the site.

An example calculation for the east wall of the CRC is shown in **Table 3**.

TABLE 3
L_{Aeq} sound power level calculation for east wall of CRC.

Propagation element	Sum	Octave band centre frequency, Hz							
		31.5	63	250	500	1k	2k	4k	8k
Internal dB(A)	74	30	42	46	57	62	69	68	69
internal dB(lin)	77	69	68	62	66	65	69	67	68
STL[1] steel wall		7	13	15	17	22	27	32	37
SPL outside	63	62	55	47	49	43	42	35	31
Area gain (1000m^2)		30	30	30	30	30	30	30	30
Lw, wall	93	92	85	77	79	73	72	65	61

[1] Sound Transmission Loss of 0.8mm steel sheeting.

The dynamometer was identified as being a potentially noisy source, although the existing unit at Mt Thorley only operates occasionally and was not available for testing within the timeframe of this assessment. It was observed on the Mt Thorley site, however, that the dynamometer was housed in a 200mm thick concrete enclosure. Staff at the site confirmed that normal conversation was possible immediately outside the enclosure with the unit running, suggesting levels well below 85 dB(A).

An estimate of the dynamometer's noise emissions was achieved by using file data of a 1000 kw V16 turbo-diesel engine operating at full revs inside an enclose (the major noise source in a dynamometer), subtracting

the sound transmission loss of 150mm (nominal) pre-cast concrete and adding a surface area gain over the enclosure surfaces. The enclosure in which the engine was measured was lined with perforated sheet steel over 50mm thick acoustic insulation. This treatment reduces internal reverberation (and therefore external noise) by typically 6dB although it will be assumed that the proposed dynamometer enclosure at the Tomago site will not be similarly lined. The calculated sound power level of the western wall of the dynamometer enclosure is shown in **Table 4**.

TABLE 4
L_{Aeq} sound power level calculation for west wall of dynamometer enclosure.

Propagation element	Sum	Octave band centre frequency, Hz							
		31.5	63	125	250	500	1k	2k	4k
Internal dB(A)	99	53	67	75	84	80	95	95	91
internal dB(lin)	101	92	93	91	93	83	95	94	90
Enclosure[1]		6	6	6	6	6	6	6	6
STL[2] 150mm concrete		24	30	34	38	41	50	57	62
SPL outside	76	74	69	63	61	48	51	43	34
Area gain (75m^2)		19	19	19	19	19	19	19	19
Lw, wall	94	93	88	82	80	67	70	62	53

[1] Reverberant build-up of 6dB inside enclosure.
[2] Sound Transmission Loss of 150mm concrete.

Assessment of operational noise was conducted using RTA Technologies Environmental Noise Model (ENM) v3.06. Each of the noise sources discussed above was included in the model. Noise modelling was undertaken for the atmospheric conditions described below:

Calm – 20^{0}C, 70% R.H., no wind (neutral atmospheric),

Inversion - +3^{0}C/100m temperature inversion,

South East wind - 20^{0}C, 70% R.H., 3m/s wind from the south east, and

North West wind - 20^{0}C, 70% R.H., 3m/s wind from the north west,

6.1.3 Sleep Disturbance

Maximum impact noises would occur within workshops (hammering, welding, grinding, rattle gun, air arc gouging, oxy cutting, etc) and in external areas where steel parts are being handled by the fork lift or crane. Maximum noise levels presented in the Global Acoustics report were up to 20dB higher than L_{Aeq} levels. This correction was applied to predicted L_{Aeq} (operational) levels to estimate worst case impact noise levels.

6.1.4 Traffic Noise

The potentially most affected residences with regard to traffic noise are near the site or on Tomago Road. Existing traffic numbers on Tomago Road and proposed traffic numbers to be generated by the Project during the landfill stage were sourced from the Traffic Management Plan prepared by Mark Waugh Pty Limited, dated June 2007 and a Project

Design Note also by Mark Waugh Pty Limited (MWPL), dated September 2008.

No significant number of vehicle movements would be generated from the site, except at shift changes. Traffic numbers from employees at the site were presented in the Project Design Note by MWPL as:

- 0.47 trips per 100m^2 GLFA for the am peak; and
- 0.56 trips per 100m^2 GLFA for the pm peak.

The Project Design Note also quoted a directional split of 60:40 with inbound bias in the am peak and outbound in the pm peak.

6.2 Stage 2 Industrial Development

There is no information available relating to the Stage 2 industrial development. Noise criteria for future industries will depend on the recommended amenity levels for cumulative industrial noise levels and the predicted levels from the WesTrac facility. Discussion of noise limits for future development will be possible after completion of the assessment of the WesTrac facility.

7.0 WESTRAC FACILITY ASSESSMENT

7.1 Construction Noise

7.1.1 Earthworks

The ENM noise model was utilised in point calculation mode to determine construction noise levels (landfill stage) at the two receivers closest to the site. Construction activities (dominated by the dozer on site spreading fill material) were modelled at the nearest points to each receiver. The results of the point calculations for the four modelled scenarios are shown in **Table 5**. Inversion conditions have been modelled for completeness but are normally not considered for daytime activities.

TABLE 5
Predicted construction noise levels dB(A),$L_{10(15minute)}$.

Location	Meteorological Condition				
	Neutral	Inversion	SE wind	NW wind	Criterion[1]
175 Tomago Road	41	43	40	43	43
Graham Avenue	40	42	43	38	43

[1] Construction activities are generally only approved for daytime hours of 7am-6pm, so only the daytime criterion applies.

The results in Table 4 suggest that worst case noise emissions would be less than or equal to the daytime construction noise criteria during the landfill phase of the project. If possible, land filling should commence at the nearest point to the residences and progress into the site (generally to the south west) to further reduce the likelihood of noise disturbance.

7.1.2 Building Construction

Major noise sources for building construction works potentially include include:

Source	Lw, dB(A)
Oxy Cutting	89
Hammering steel	108
5-inch grinder	105
Drop-saw	107

These particularly loud sources may all operate at one time, producing a total sound power level of 111 dB(A). If there are two such sets of activities, the total sound power would increase to 114 dB(A). This is equal to the total sound power level adopted for the landfill stage. Table 5 shows landfill noise not exceeding the noise criterion. Since the building construction noise sources would be further from residences than the worst case location of landfill activities, and are of a more high-frequency nature which dissipates more rapidly with distance, then the noise from building construction would be lower than the levels in Table 5 and compliant with the criterion.

7.2 Operational Noise

The ENM noise model was utilised in contour calculation mode to determine noise levels at the two receivers closest to the site. Predicted noise levels for the four modelled scenarios are shown in **Table 6**. Noise contours are included as **Figure B1** in **Appendix B**.

TABLE 6
Predicted operational noise levels dB(A), $L_{eq(15minute)}$.

Location	Meteorological Condition				
	Neutral	Inversion	SE wind	NW wind	Criteria[1]
175 Tomago Road	40	42	40	42	43 / 37 / 35
Graham Avenue	25	27	27	22	43 / 37 / 35

[1] Day / Evening / Night criteria as defined in Section 5.2.

The results in Table 6 suggest that noise emissions could be up to 5 dB above the evening criterion and 7dB above the nigh time criterion at 175 Tomago Road. Since the exceedance is 5dB or more, these are considered 'major' exceedances and noise control should be applied. The ranked noise sources in the point calculations reveal the following noise contributions to the predicted noise level at 175 Tomago Road under inversion conditions:

Crane in inventory area:	42
Fabrication building:	20
Dynamometer:	20
CRC:	<20
TOTAL	42

The dominant source at this residence is the crane operating outdoors in the inventory area. At times when there is no outdoor activity, general noise levels from within the workshop areas are expected to be well below the night time criteria.

If the Proponent wishes to be able to move parts around in the inventory area during the evening or at night, it is recommended that a 3.5m high acoustic barrier be erected along a portion of the eastern site boundary to provide 7dB attenuation to 175 Tomago Road. The recommended location and minimum extent of the acoustic barrier is shown in **Figure 5**.

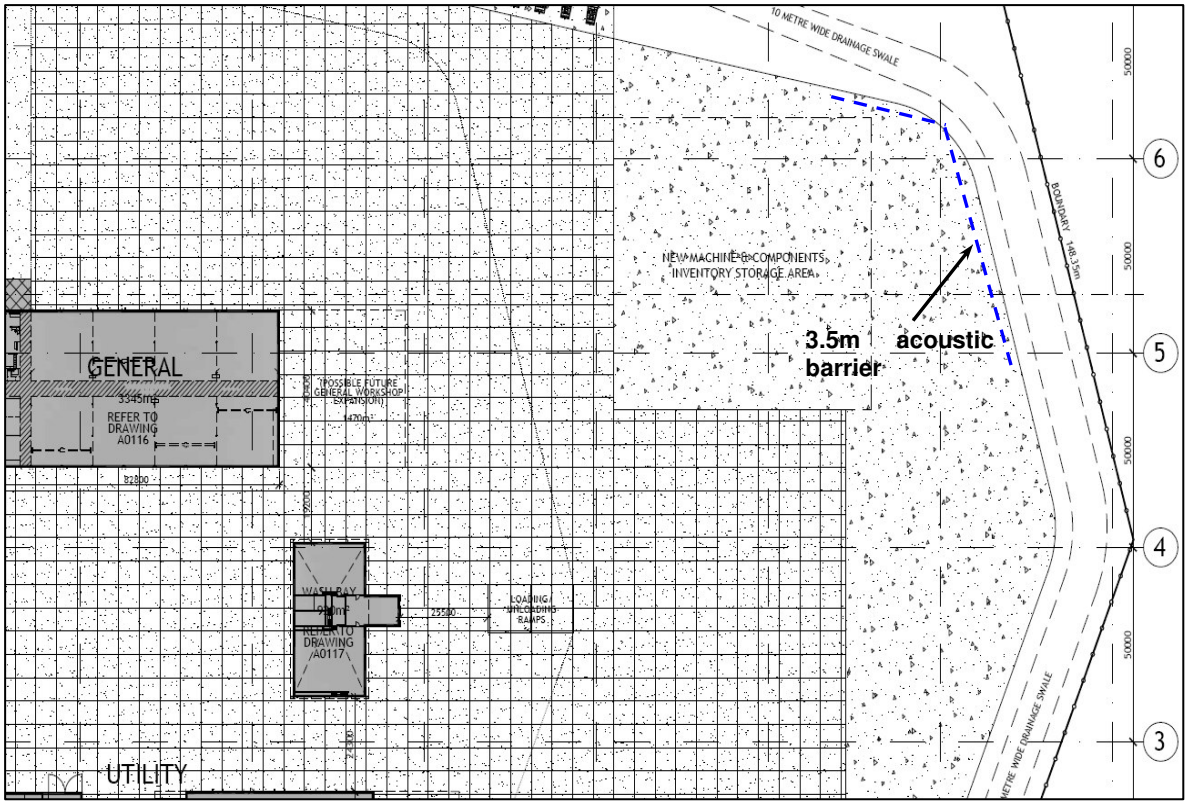


Figure 5. Location of recommended acoustic barrier.

Noise levels were re-calculated using ENM with the 3.5m barrier in place as shown in Figure 5. Predicted noise levels are summarised in **Table 7**. Noise contours showing the effect of the acoustic barrier under inversion conditions are shown in **Figure B2** in Appendix B.

TABLE 7
Predicted operational noise levels with 3.5m acoustic barrier.

Location	Meteorological Condition				
	Neutral	Inversion	SE wind	NW wind	Criteria[1]
175 Tomago Road	31	34	30	34	43 / 37 / 35
Graham Avenue	25	27	27	22	43 / 37 / 35

[1] Day / Evening / Night criteria as defined in Section 5.2.

The calculation results in Table 7 suggest that the proposed 3.5m acoustic barrier will provide sufficient attenuation of noise from the outside inventory area to satisfy the night-time operational noise criterion.

7.3 Sleep Disturbance

Maximum impact noise levels from activities *inside buildings* (ie the CRC and other workshops) may be conservatively estimated by adding 20dB to predicted noise levels without the external activities included. Resulting maximum noise levels are summarised in **Table 8**.

TABLE 8
Predicted maximum noise levels from workshop activities.

Location	Meteorological Condition				
	Neutral	Inversion	SE wind	NW wind	Criteria[1]
175 Tomago Road	41	43	40	43	45 / 60
Graham Avenue	40	40	41	39	45 / 60

[1] ENCM and ECRTN criteria as defined in Section 5.3.

Results in Table 8 are all below the ENMC's 'screening test' criterion of 45dB(A),L_{max} for potential disturbance to sleep. This suggests very little potential for 24-hour workshop activities to present a sleep disturbance problem.

Maximum noise emissions from all sources (including activities in the outdoor inventory area) and with the 3.5m acoustic barrier in place are summarised in **Table 9**.

TABLE 9
Predicted maximum noise levels from all site activities.

Location	Meteorological Condition				
	Neutral	Inversion	SE wind	NW wind	Criteria[1]
175 Tomago Road	51	54	50	54	45 / 60
Graham Avenue	45	47	47	42	45 / 60

[1] ENCM and ECRTN criteria as defined in Section 5.3.

The maximum noise levels in Table 9 are above the 'screening criterion' of 45 dB(A) by up to 2dB at Graham Avenue residences. This is considered a minor exceedance not requiring further attention. Predicted exceedances up to 9dB at 175 Tomago Road suggest that the potential for sleep disturbance should be considered further.

Considering the predicted level in the context of the existing noise environment, **Figure 6** shows the worst case noise level of 54dB(A),L_{max} from WesTrac and the measured night time average L_{Amax} levels from existing traffic on Tomago road. Figure 6 also shows the existing night-time average traffic noise (L_{Aeq}) and background (L_{A90}) levels.

Figure 6
Predicted maximum noise levels and existing noise parameters.

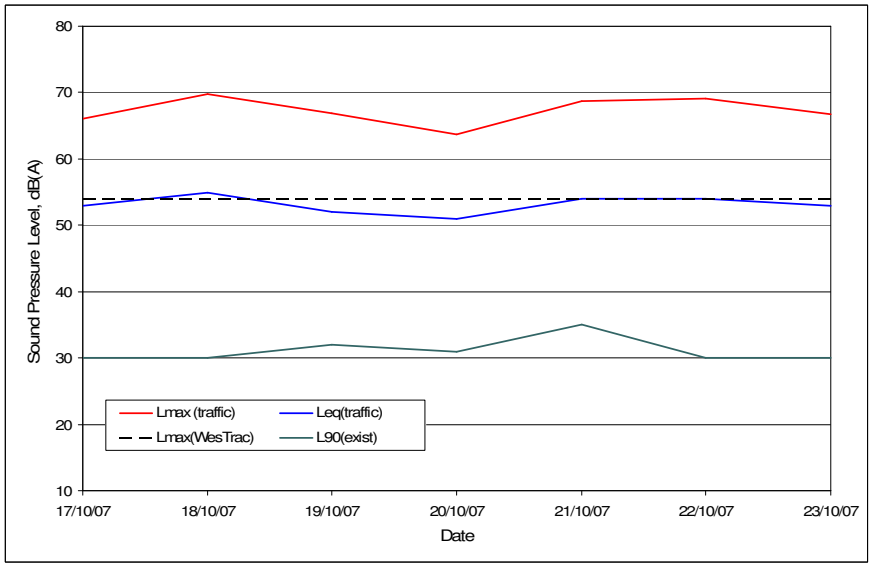


Figure 6 shows that the expected maximum noise level of 54 dB(A) from WesTrac is approximately equal to the night-time L_{Aeq} level from traffic on Tomago Road. This is at least 10 dB below the existing maximum levels of 65-70 dB(A) from individual passing vehicles. The worst case noise levels from WesTrac would therefore not be a major noise source in the context of 175 Tomago Road, would be 10 dB below existing noise from individual vehicles and would be 6dB below the level of 60 dB at which disturbance to sleep is considered unlikely by DECC.

7.4 Traffic Noise

Peak hour traffic numbers passing the site on Tomago Road (east of McIntyre Road) were calculated from the estimated traffic numbers presented in the MWPL Project Design Note, and based on the 60:40 peak hour bias, and are summarised below in **Table 10**.

TABLE 10
Peak hour traffic volumes passing residences west of project site (from MWPL).

Project Stage	AM peak hour volume	PM peak hour volume
Stage 1 – WesTrac + CAT Institute	187	187
Stage 2 – Industrial Subdivision	355	423
Stage 3 – Industrial Subdivision	479	570

Analysis of the noise logger data for the morning (7:30 – 8:30 am) and afternoon (3:30 – 4.30 pm) peaks shows a $L_{Aeq(1\text{-}hour)}$ noise level up to 59 dB(A). This is 2 dB above the 57 dB(A) average daytime traffic noise measured at both locations, as would be expected due to the increased traffic numbers.

The peak hour traffic volume of 390 vehicles/hour recorded by SWPL coincides with a measured noise level of 59 dB(A). It will be assumed that all of this noise is attributed to traffic.

Correcting for the number of vehicles that would be generated by the project gives:

Stage 1 – 187 vehicles: $59 + 10\times\log_{10}(187/390) = 58.7$ dB(A).
Existing (390 vehicles): = 59 dB(A)
TOTAL (Stage 1): = 61.8 dB(A)

This result suggests that addition of stage 1 traffic may result in an exceedance of the 60 dB(A) traffic noise criterion. The exceedance is not greater than 2 dB, however, and is considered acceptable under the ECRTN guidelines.

Stage 2 – 423 vehicles: $59 + 10\times\log_{10}(423/390) = 59.4$ dB(A).
Existing (Stage 1): = 61.8 dB(A)
TOTAL (Stage 2): = 63.7 dB(A)

The estimated traffic noise increase from Stage 1 to stage 2 is 1.9 dB which does not exceed the 2 dB increase allowed under the ECRTN.

Stage 3 – 570 vehicles: $59 + 10\times\log_{10}(570/390) = 60.6$ dB(A).
Existing (Stage 2): = 63.7 dB(A)
TOTAL (Stage 3): = 65.4 dB(A)

Again, the introduction of Stage 3 traffic will not result in a traffic noise increase in excess of the 2 dB allowed under the ECRTN.

8.0 STAGE 2 AND 3 INDUSTRIAL DEVELOPMENT

There is currently no information relating to the industrial subdivision upon which a quantitative assessment may be based. The following sections provide general planning criteria for the staged development. Potential traffic noise associated with these stages of the project was considered in section 7.4 above.

8.1 Amenity Noise Criteria

Overall cumulative noise criteria for emissions from a number of industries are contained in the DECC amenity criteria in the INP. Considering the receiver area as 'suburban', the appropriate amenity criteria are summarised in **Table 11**.

TABLE 11
Amenity criteria for Stage 2 Industrial Development.

Receiver Type	Noise Amenity Area	Time of day	Acceptable L_{Aeq} noise levels
Residence	Suburban	Day	55
		Evening	45
		Night	40

8.2 Individual Noise Criteria

Conservatively assuming that the background noise levels would not increase after commencement of the WesTrac operations, the intrusive criteria for an individual industry planning to enter Stage 2 would be:

43dB(A) $L_{eq\ (15\ min)}$	Day (7am – 6pm)
37dB(A) $L_{eq\ (15\ min)}$	Evening (6pm – 10pm)
35dB(A) $L_{eq\ (15\ min)}$	Night (10pm – 7am)

It is typically the case that only a small number of industries may front Tomago Road (closest to residences) and the rest would occupy spaces deeper into the subdivision (south of Tomago Road) and would be substantially shielded from residence by industries along the road frontage. It is there frontage industries that would present the greatest potential for cumulative noise impacts.

The large WesTrac facility would provide a substantial buffer distance, and screening, for industries in stage 2 with regards to potential impacts at 173 Tomago Road and residences further to the east.

The amenity criteria may be 'partitioned' amongst 3-4 future industries by limiting the noise contribution from each one to a level 5 dB below the total recommended industrial noise level. Equitable operational noise criteria for future industries in Stage 2 are summarised below.

43dB(A) $L_{eq\ (15\ min)}$	50dB(A) $L_{eq\ (11\ hour)}$	Day (7am – 6pm)
37dB(A) $L_{eq\ (15\ min)}$	40dB(A) $L_{eq\ (4\ hour)}$	Evening (6pm – 10pm)
35dB(A) $L_{eq\ (15\ min)}$	35dB(A) $L_{eq\ (9\ hour)}$	Night (10pm – 7am)

Individual future industries would be required to submit noise impact assessments as part of the Development Application process. These assessments would need to consider the above criteria (unless future conditions require re-assessment), construction noise and traffic noise in accordance with the applicable standards and guidelines.

The above indicative criteria are realistically achievable and do not indicate that the site is inappropriate for industrial development, on acoustic grounds.

9.0 CONCLUSION

An assessment of the proposed WesTrac facility and industrial subdivision at Tomago has been conducted.

The assessment of the WesTrac facility has highlighted the potential for night time noise criterion exceedances at one residence east of the site. The exceedance can be mitigated by constructing a 3.5m high acoustic barrier along a portion of the site boundary as indicated in this report.

An acoustic barrier comprises an earth mound or a fence or a fence on a mound. An acoustic fence requires a minimum mass of 15 kg/m2 and must make contact with the ground. There are to be no significant gaps in the fence. Timber fences are commonly used in similar situations. These typically comprise two layers of overlapping treated pine palings with a cap (or coping) running along the top to prevent separation of the palings.

No exceedances of traffic noise criteria have been predicted. The periods of maximum traffic generation by the WesTrac facility would occur at shift changes and would comprise light vehicles.

Individual assessment of future industries in the Stage 2 development would be required, and an assessment of likely operational noise criteria has found that the site is able to accommodate the managed noise output from multiple industries.

We conclude that the project could proceed without impacting on the acoustical amenity of nearby residents, provided the recommendations in this report are adopted.

10.0 REFERENCES

Environment Protection Authority (EPA). *Environmental Criteria for Road Traffic Noise* (ECRTN, 1999), Sydney.

Environment Protection Authority (EPA). *NSW Industrial Noise Policy* (INP, 2000), Sydney.

State Pollution Control Commission (SPCC). *Environmental Noise Control Manual* (ENCM, 1994).

APPENDIX A

NOISE LOGGER CALIBRATION CERTIFICATES

CONFORMANCE CERTIFICATE

We certify that the equipment listed below has been checked, adjusted and aligned to conform to manufacturers specifications.

Certificate No: 7759

INSTRUMENT: Sound & Vibration Anayser
Svantek

Type No: Svan-949 **Serial No:** 9757

Owner: Spectrum Acoustics Pty Ltd
1 Roath St
Cardiff NSW 2285

CONDITION OF TEST:

Ambient Pressure: 1007 **mbar**

Temperature: 23 **°C** **Relative Humidity:** 37 **%**

Date of Calibration: 6/10/06

CHECKED BY: JK **AUTHORISED SIGNATORY:** .....
Jack Kielt

The tests, calibrations or measurements covered by this document are traceable to Australian national standards of measurement. This document shall not be reproduced, except in full. The equipment listed above has been calibrated in this laboratory. The equipment performed satisfactorily in all the tests conducted.

NATA
WORLD RECOGNISED ACCREDITATION
Accredited Lab. No. 9262
Acoustic and Vibration Measurements

ACU-VIB
ELECTRONICS

HEAD OFFICE
Unit 14, 22 Hudson Ave. Castle Hill NSW 2154
Tel: (02) 9680-8133 Fax: (02) 9680-8233
Mobile: 0413 809 806
web site: www.acu-vib.com.au

Page 1 of 1
AVCERT4 Rev.1 03.09.04

CONFORMANCE CERTIFICATE

We certify that the equipment listed below has been checked, adjusted and aligned to conform to manufacturers specifications.

Certificate No: 7758

INSTRUMENT: Sound & Vibration Anayser
Svantek

Type No: Svan-949 **Serial No:** 9758

Owner: Spectrum Acoustics Pty Ltd
1 Roath St
Cardiff NSW 2285

CONDITION OF TEST:

Ambient Pressure: 1007 **mbar**

Temperature: 23 °C **Relative Humidity:** 37 %

Date of Calibration: 6/10/06

CHECKED BY: JK **AUTHORISED SIGNATORY:** .....
Jack Kielt

The tests, calibrations or measurements covered by this document are traceable to Australian national standards of measurement. This document shall not be reproduced, except in full. The equipment listed above has been calibrated in this laboratory. The equipment performed satisfactorily in all the tests conducted.

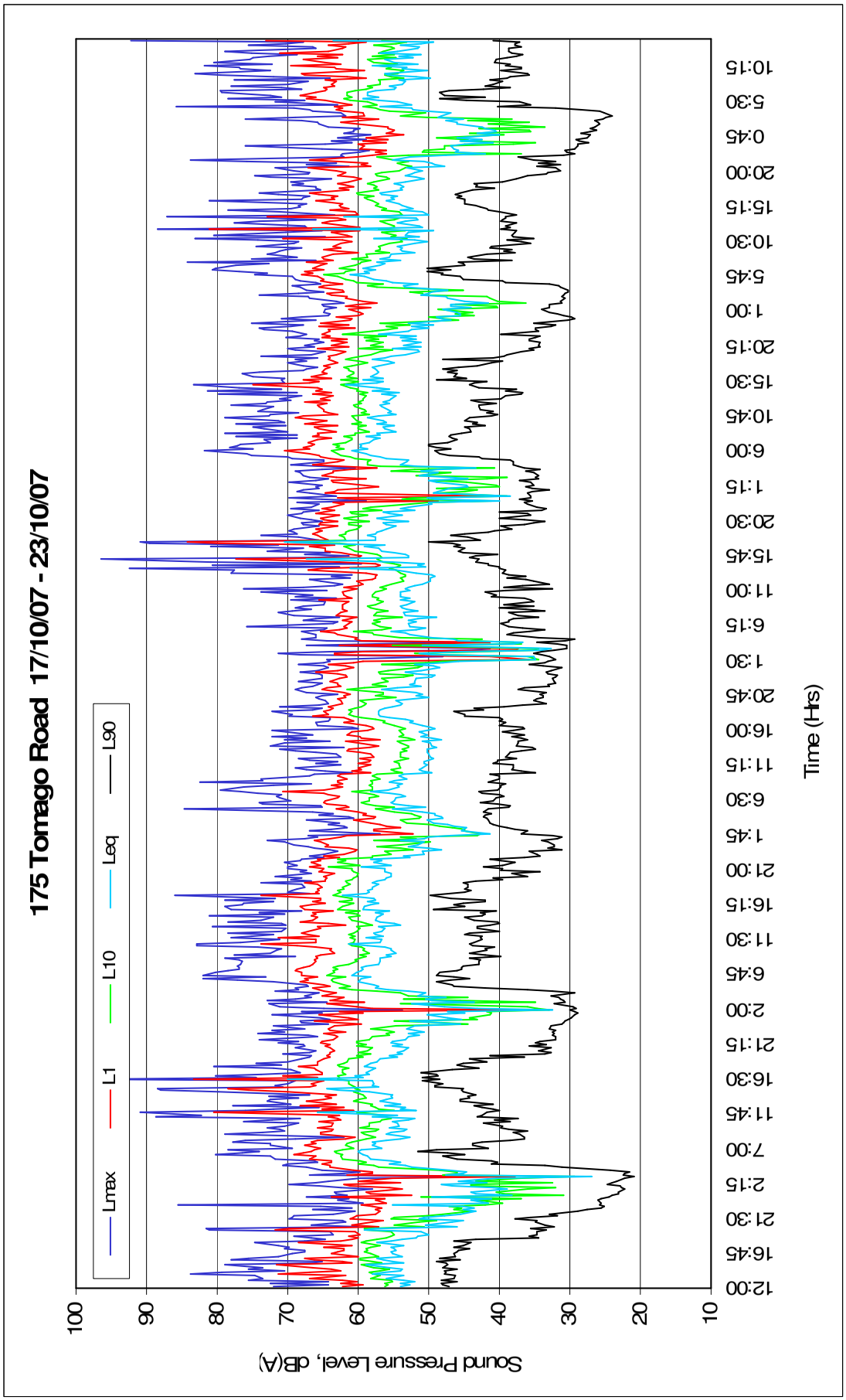
NATA
WORLD RECOGNISED ACCREDITATION
Accredited Lab. No. 9262
Acoustic and Vibration Measurements

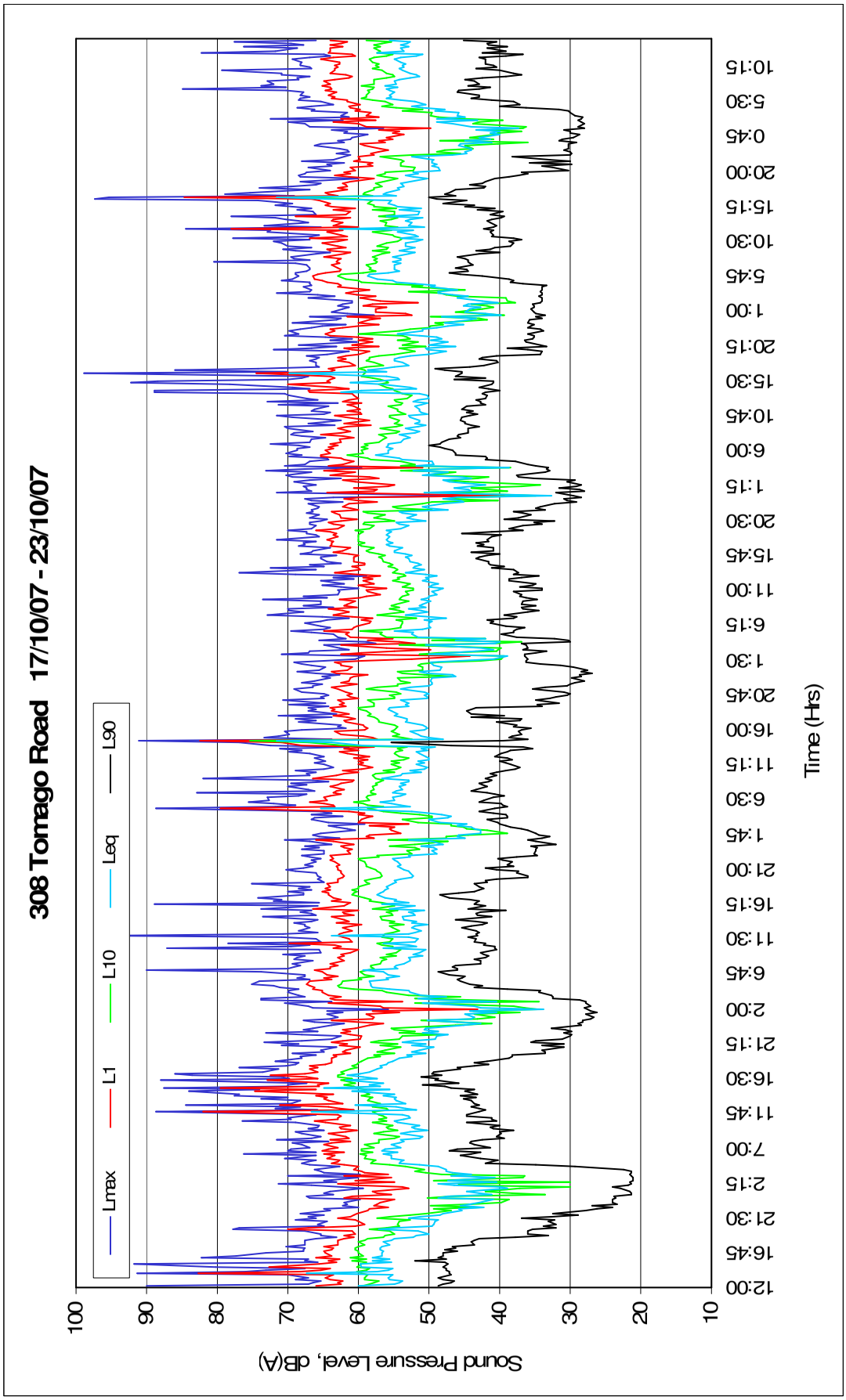
ACU-VIB
ELECTRONICS
HEAD OFFICE
Unit 14, 22 Hudson Ave. Castle Hill NSW 2154
Tel: (02) 9680-8133 Fax: (02) 9680-8233
Mobile: 0413 809 806
web site: www.acu-vib.com.au

Page 1 of 1
AVCERT4 Rev.1 03.09.04

APPENDIX B

NOISE MONITORING DATA


175 Tomago Road 17/10/07 - 23/10/07
Sound Pressure Level, dB(A)
100
90
80
70
60
50
40
30
20
10
Lmax
L1
L10
Leq
L90
Time (Hrs)
12:00
16:45
21:30
2:15
7:00
11:45
16:30
21:15
2:00
6:45
11:30
16:15
21:00
1:45
6:30
11:15
16:00
20:45
1:30
6:15
11:00
15:45
20:30
1:15
6:00
10:45
15:30
20:15
1:00
5:45
10:30
15:15
20:00
0:45
5:30
10:15


308 Tomago Road 17/10/07 - 23/10/07
Lmax
L1
L10
Leq
L90
Sound Pressure Level, dB(A)
100
90
80
70
60
50
40
30
20
10
Time (Hrs)
12:00
16:45
21:30
2:15
7:00
11:45
16:30
21:15
2:00
6:45
11:30
16:15
21:00
1:45
6:30
11:15
16:00
20:45
1:30
6:15
11:00
15:45
20:30
1:15
6:00
10:45
15:30
20:15
1:00
5:45
10:30
15:15
20:00
0:45
5:30
10:15

APPENDIX C

NOISE CONTOURS

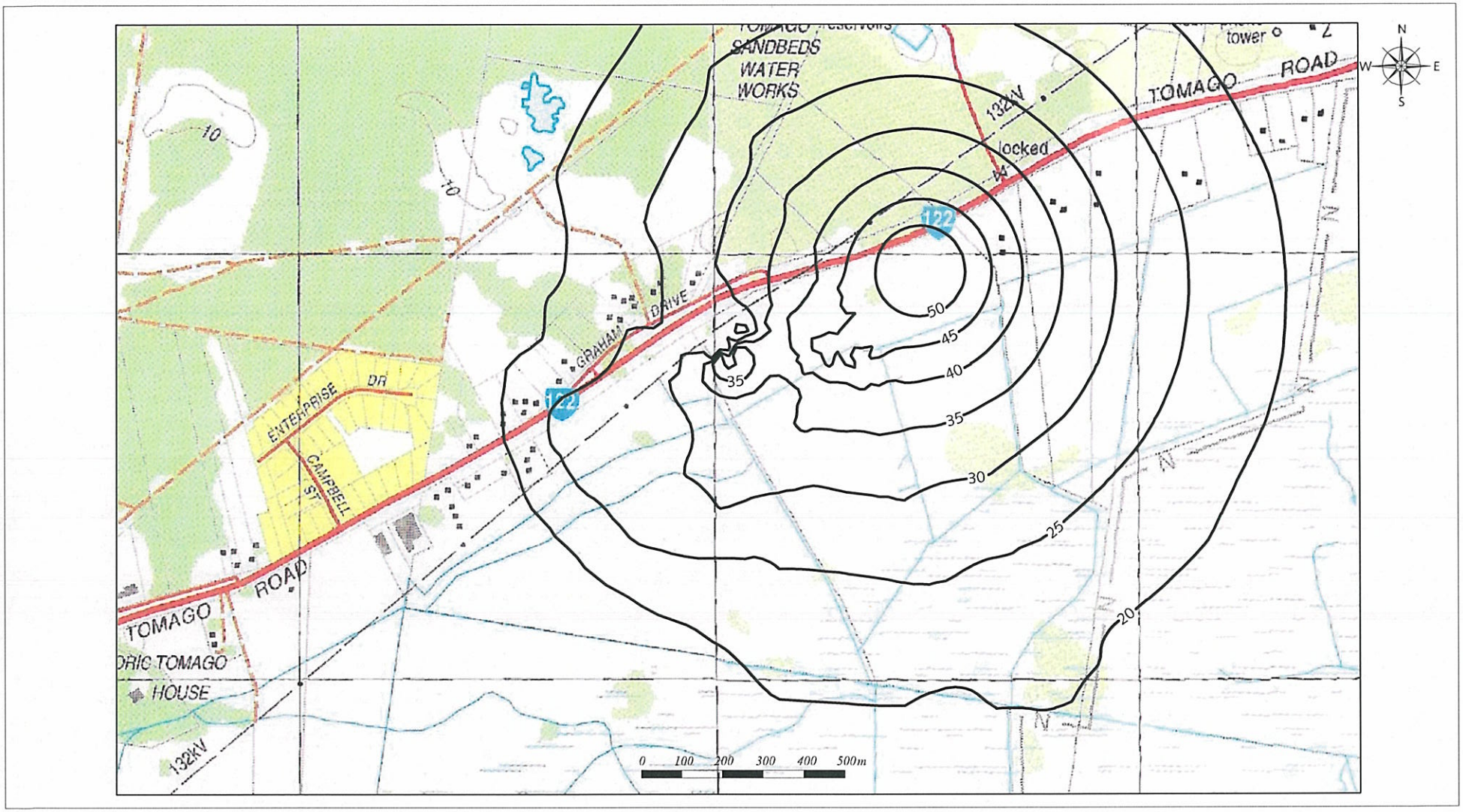


FIGURE B1

Noise Contours dB(A), L_{eq} (15 min)
Temperature Inversion - No Acoustic Barrier

Base Source: Williamtown 1 : 25 000 Orthophoto 9232-2N & Beresfield 1 : 25 000 Orthophoto 9232-3N

SPECTRUM ACOUSTICS

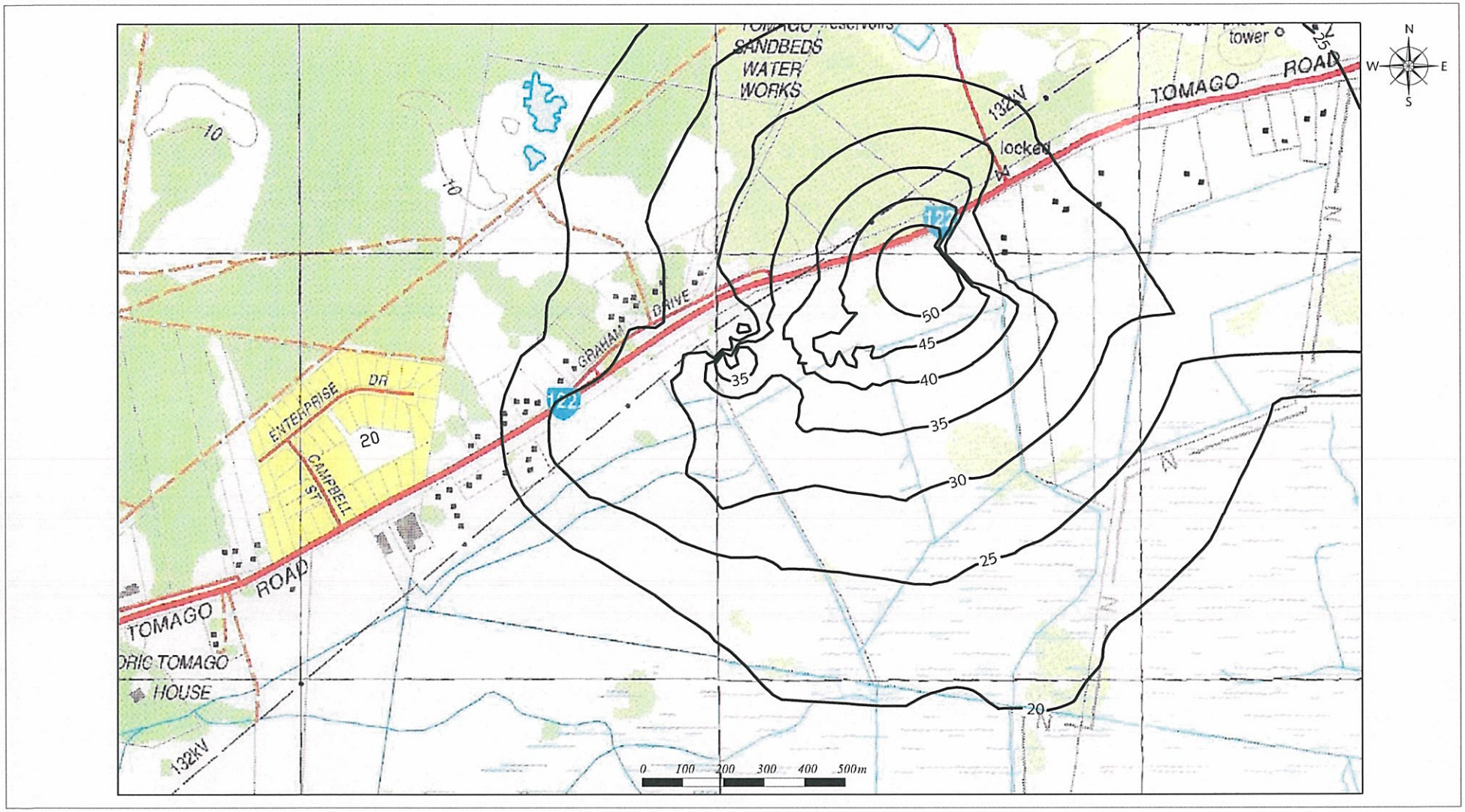


FIGURE B2

Noise Contours dB(A), L_{eq} (15 min)
Temperature Inversion - 3.5m Acoustic Barrier

Base Source: Williamtown 1 : 25 000 Orthophoto 9232-2N & Beresfield 1 : 25 000 Orthophoto 9232-3N

SPECTRUM ACOUSTICS

KG4104_FIGB2.DWG

NOVEMBER 2007

Spectrum Acoustics Pty Limited
ABN 40 106 435 554
PO Box 374 Wallsend NSW 2287
Tel. +61 2 4954 2276
Fax. +61 2 4954 2257

FAX

To Company:	Asquith & deWitt	Fax:	4978 5199
Attention:	Craig Marler	Date:	29/2/08
From:	Neil Pennington	Ref:	07359/2495
Copies to:		Pages:	3

☐ Urgent ☐ Please Reply ☐ For your files ☐ No action required

Subject: Tomago Industrial Subdivision

Dear Craig,

Thanks you for forwarding comments on the noise component of the Tomago EA, provided by DECC and DoP. The two issues raised by DoP relate to construction noise levels and road traffic noise. We respond to these issues as follows:

1) Construction noise scenarios considered earthworks (landfill) over the entire project site with noise sources (dozer and trucks) located at the nearest points to residential receivers. The total sound power level of earthworks sources was 114 dB(A). This is equal to the sound power level expected from two building construction sites (see section 7.1.2 of acoustic assessment). Building construction works would always be at a greater distance from residences than earthworks, and earthworks in later stages would be no closer to residences than earthworks at the Westrac site. Therefore it was concluded that since earthworks at the Westrac site were predicted to comply with construction noise criteria, then all other construction activities would also comply.

2) Existing daytime traffic noise levels were determined from noise logger data as 59 dB(A),$L_{eq(1hour)}$ during peak hours and 57 dB(A),$L_{eq(1hour)}$ averaged throughout the day. Table 2.1 of the Traffic Impact Study by Better Transport Futures (BTF) shows a PM peak traffic volume of 390 vehicles/hour which was taken as corresponding to the measured peak noise levels. Table 4.2 of the BTF report forecasts a PM peak traffic volume of 265 vehicles from the Westrac Facility. Noise levels from this volume of traffic would be 57 dB(A). This is 3 dB lower than the daytime criterion of 60 dB(A) in the ECRTN. Adding this to the existing daytime level (peak) gives 61 dB(A) which equals the maximum recommended noise level increase of 2 dB over existing levels. For the further development of Stages 2 and 3, traffic noise levels should not increase by more than a further 2 dB. This level of noise increase would require an additional 412 vehicle movements in peak hour. Tables 4.3 and 4.4 of the BTF report suggest that only a little over half this number of vehicle would be generated by Stages 2 and 3 and unacceptable traffic noise levels will not result.

DECC raised the issue of potential noise impacts on migratory birds in the SEPP 14 and RAMSAR wetland areas south of the project site. There is no definitive industrial noise level at which there may be disruption to the normal habits of migratory birds. The following comments and observations are offered for DECC's consideration of the likelihood that noise from the site would have a detrimental impact on these birds..

Noise contours prepared for the Westrac Facility (Appendix B of acoustic assessment) show noise levels of approximately 20 dB(A),L_{eq} at the nearest point of the wetland area (with no acoustic barrier and under inversion conditions). Maximum impact levels of up to 32 dB(A) are also likely at this distance. A level of 20 dB(A) is at least 10 dB below the existing background noise level and the predicted maximum level of 32 dB(A) is comparable with the background level. Such low levels of noise are not likely to disturb or even be noticed by wetland birds (see information below).

The noise contours also show noise levels of approximately 47 dB(A),L_{eq} at the southern boundary of the Westrac site (with no acoustic barrier and under inversion conditions). Maximum impact levels of up to 59 dB(A) are also likely at this distance. These levels will be adopted as indicative levels that may be experienced by migratory birds close to the southern-most industrial development in the south-east corner of the project site. Reference to the project site layout in relation to the wetland area shows that the site boundary slopes towards the northwest from the southeast corner and the distance to the nearest point of the wetland increases to a distance of over 1 km, thereby greatly reducing potential noise impacts.

An article in the University of Sydney Science Alliance newsletter (September 2007) detailed the progress made by researchers aiming to reduce bird strikes at Sydney Airport by using 'ecological principles'. Professor Dickman of USyd claims a better result with these methods than "..sending airport workers out to check what birds are around and then shooting them...". Professor Dickman notes that habitat around Sydney Airport is attractive to birds with the coast, nearby bushland and freshwater wetlands in abundance. Ecological control methods include controlling food sources (dispersing schooling fish), locking garbage bins, remaining vigilant to birds' migratory habits, mowing surrounding grasses to 20cm and netting the banks of local wetlands to stop "...a lot of species from coming in...".

It may be inferred from the above study that birdlife of all kinds thrives close to Sydney Airport (a major noise source), to the point where methods are needed to scare or encourage birds to move to safer, more distant locations. The noise level within 500m of Sydney Airport (at ground level) would regularly exceed the maximum level of 59 dB(A) likely to emanate from the Tomago development.

Another relevant study presented at the 2001 Third Joint Annual Meeting of the Bird-Strike Committee-USA/Canada (2001) by Aimee Hutchinson of Birds Australia looked at the effectiveness of gas scare guns in dispersing birds near Sydney Airport. The study consisted of installing gas guns at 100m spacing along the seawall of runway 16L/34R. The guns were detonated in sequence every 10 minutes from 6:45 to 7:45 am for a week and bird dispersion rates/directions and number counts were compared with the weeks prior to and after the study. A pertinent finding was that birds in flight showed a greater aversion response than birds on the ground and most of the response was displayed by birds within 150m of the gas guns. This suggests that birds nesting greater than 150m from a series of gas guns fired regularly may not be particularly disturbed by the noise. The study recommended the permanent placement of gas guns at Sydney Airport, so even this source of very high noise levels would need to occur constantly in the hope of dislodging the nearby bird colonies.

The above findings and the general proximity of Hunter wetland bird colonies to existing industry and infrastructure suggest that these existing colonies may be subjected to, and tolerant of, much higher man-made noise levels than those predicted to be emitted from the Tomago development. Regarding natural noise sources: maximum noise levels from within a bird colony itself; nearby birds such as galahs; frogs and insects such as crickets and cicadas would regularly exceed 65-70 dB(A) at the site of a nesting bird within the wetland habitat. Thunder claps are also known to be extremely loud but are not known to overly disrupt bird colonies (although other non-noise disturbance may result from an approaching storm).

These considerations suggest that 59 dB(A) is a relatively low level of noise impact compared with what might currently be experienced by birds within the wetland areas south of the project site, and is certainly much less than the level of noise that would be experienced by established bird colonies near coastal airports.

Should you require any further information please contact the undersigned on 4954 2276 or 0406 670677.

Yours faithfully,

Spectrum Acoustics Pty Limited

Neil Pennington
Principal/Director

Stormwater

The key points of issues raised by DoP in relation to stormwater have been highlighted in bold and italics and responses below. Reference is made to the Stormwater Management Reports by Asquith & deWitt, Version 1, November 2007 Volume 3 (WesTrac facility) and Volume 4 (Industrial Subdivision).

Water Balance

A high emphasis has been placed on water reuse for the WesTrac facility. Since the original stormwater report – Volume 3, further design of the wastewater treatment system has been progressed and amended the allocation of water reuse on site has been amended. Wastewater discharge will now be accommodated on site, used for irrigation of the landscaping areas of the development. The area requirement for wastewater irrigation is approximately 1.5 hectares. The dedicated development area for landscaping is 1.14 hectares and the remainder of area required for irrigation will be created from selected areas of the swale embankment. The total swale area is 2.24 hectares, of which at least 1 hectare is available for shaping and use for irrigation. Application rates are such that there is no runoff of wastewater and that any nutrients, pathogens and any other potentially polluting species generated from the proposed development are retained, assimilated or utilised on site. Monitoring of wastewater quality will still be managed in accordance with our original reporting. Design for irrigation, allocation area will be determined at detailed design stage.

A portion of the roofwater, which was allocated to irrigation of the landscaped area, will now discharge from the rainwater tank to the RAMSAR wetland.

Surface flows maintained to the RAMSAR Wetland

As outlined in our original stormwater reports - Volumes 3 and 4, the existing site soils are predominantly waterlogged clays, other than a low dunal formation. The clays cover approximately 90% of the site. The waterlogged condition of the clays on site means that there is reduced infiltration for rainfall as initial loss prior to stormwater runoff during a rain event. Whilst void storages and effects of vegetation still remain and influence initial loss, there are no basin/storage areas of the site with major ponding depths of greater than 0.5m. Therefore runoff and consequently discharge volumes are larger than undeveloped peak flows from conventional sites.

Following development of the WesTrac site and Stages 2 and 3, there is the inclusion of constructed wetlands with surface area of approximately 13 hectares. These have been sized for stormwater treatment, as our adopted 'no impact' approach. The wetlands provide a large surface area for evaporation, where on average, evaporation exceeds rainfall. Conventional development usually requires constructed wetlands with surface area of 2-3% of the site area to meet water quality objectives. At this site, constructed wetlands of surface area equivalent to approximately 15% of the site area are proposed. This is over 5 times the area normally allocated within a development site for constructed wetlands, providing a much larger surface area for evaporation and seepage.

There are also rainwater tank provisions and swale drainage areas adopted within the development. These are providing reuse and seepage respectively, reducing the volume of runoff to be discharged from the site post development.

As described in our original stormwater report - Volume 3, a daily timestep model was used to represent water volumes discharging from WesTrac during dry, average and wet years. In order to most accurately account for runoff volume from the existing site in our model, the curve matching for initial and continuing loss from the existing site was matched to the Hydrologic Group 'D' (Heavy clays) from the Blue Book. This reference provided the basis for runoff volume discharge matching from the WesTrac facility. As described in the stormwater report – Volume 4, for Stages 2 and 3, the MUSIC model was relied upon due to the conceptual nature and assumptions of the future development anticipated across the industrial subdivision.

Waterlogged clays of the existing site increase the runoff volumes from the existing site. Significantly increased constructed wetland areas, rainwater tanks and swales associated with the proposed development decrease the runoff volumes from the site post development. Both of these factors are conducive to reducing the difference in runoff volumes discharged from the site between pre and post development simulations. Most certainly this is the case when comparing the proposed development site to conventional development. This will be described in further detail below in the water balance response.

Stormwater treatment strategy Upstream of the Tomago Sand Beds

Roof water from the catchment draining to the infiltration area is drained to the rainwater tanks. Gross pollutants from the hardstand areas are proposed to be collected at stormwater outlets discharging to the infiltration area. This is an amendment to Section 3.1.4 and Figure 7 of the stormwater report - Volume 3. No MUSIC modelling has been undertaken for this catchment, since the infiltration area has a catchment of approximately 1.3 hectares and the hardstand area draining runoff directly to this area is approximately 7.25 hectares. This is a high proportion, approximately 18%, of treatment area by comparison to the directly connected impervious surface, which minimises the loading per unit area. Modelling outcomes from MUSIC typically result in a much lesser ratio of treatment node area to development area required for treatment of runoff and consequently it is considered unnecessary to model. The infiltration area is essentially a large bioretention treatment unit providing significant surface area for water quality treatment, prior to the transmission of stormwater to groundwater. Hunter Water Corporation, the trustee of the water reserve has already accepted this component of the project, with no concerns in relation to this matter. Refer to **Appendix A**.

Groundwater Mounding

There is the possibility of groundwater mounding and temporary interception of the groundwater reserve during construction which may require a licence/permit application to be made with Department of Water & Energy under the Water Management Act 2000.

Hydraulic Conductivity and Landscape

The Tomago Sandbeds are well regarded for the high infiltration rates of the sands present. Appendix L of the Application is the Landscape Design Report, Revision A, December 2007 by Terras Landscape Architects. In Section 2.0 of their report it is acknowledged that the soils are sandy and of high infiltration capacity and low fertility. In Section 3.0 the adjacent vegetation types over the high infiltrating sands are acknowledged and that these would have been present on site previous to the farming activities. Sheets 7254.5-L01 & L02 specify these appropriate vegetation types to be used.

Water Balance

A broad water balance for development of the overall site, based on the MUSIC results is as follows:

For an average rainfall year of 1099mm and Evapotranspiration of 1731mm

Volume discharge from developed site is 42ML/year

Inflows
Site catchment areas of developed portions, ponds and swales is 973ML/year

Outflows
Pond Area – evapotranspiration – 225ML/year
Pond Area – seepage loss (0.36mm/hr) – 410ML/year
Swale Area – seepage loss (0.36mm/hr) – 48ML/year
Rainwater Tank Usage – 248ML/year

Inflow – outflow for discharge from site = 42ML/year (average rainfall year)

Clarification of Constructed Wetlands Area
In the final paragraph of Section 3.2 of the stormwater report – Volume 4, it is described that constructed wetlands with surface area of 13 hectares are required for the 'no impact' solution, which is the preferred solution. This area allocation is also presented in Figure 6 of Volume 4.
Water quality reduction objectives of TSS-85%, TP-65% and TN-45% for Stages 2 and 3 is a lower target level than the level of 'no impact' provided by approximately 13 hectares of constructed wetlands within the development site as proposed. Reductions of TSS – 99.8%, TP – 98.7% and TN – 98.3% have been achieved for 'no impact' solution.

Nutrient Loads
As described above it has been amended in the strategy to reuse all wastewater on site to the landscaped areas.

HCCREMS
The HCCREMS document was considered in relation to the original stormwater reporting. However since the discharge of stormwater is directly to large, existing farm drains, excavated through the wetlands downstream, it was deemed unnecessary to undertake analysis of flooding and drying cycles. The large majority of the time for pre and post development, discharge is contained within the existing drains. The downstream drainage through the RAMSAR wetlands is significantly altered by the large drains, embankments closer to the Hunter River, several pipe culverts with flood gates, extensive areas of pasture grasses and dumps of spoil from farm drain excavation.

The drains have been cleaned out in the past 12-18 months presumably by NPWS or DECC. There appears to be ongoing work to the farm drain edges, which continues to change the drain capacity and therefore flooding regime of the wetlands adjacent. Furthermore, we understand that there are changes mooted for the wetlands area to become wader habitat.

All of these variables as a result of alterations and continuing alterations provide a host of conflicting objectives when considering flooding and drying cycles. As a result, the emphasis of the stormwater treatment design was to maintain water quality, annualised volume of discharge quantities and match post development peak flow levels to pre development peak flow levels. Furthermore, this was completed to a 'no impact' objective level.

Description of Existing Downstream Conditions

Drainage

In the south eastern corner of the development site, there is a confluence of existing farm drains. The confluence is the junction of a drain from along the rear, southern boundary with a drain from the north (refer to **Plate 1**). Below the confluence, water heads in a southerly direction toward the Hunter River.

The drain heading south from the south east corner is a straight, 6m wide farm drain (refer to **Plate 2**). The depth of the drain heading south is estimated to be 1.5m deep since there is a twin 1500mm diameter RCP (with flood gates) culvert crossing of the drain approximately 90 metres south of the confluence (refer to **Plate 3**).

The farm drain construction was typical of the times, with excavated material being deposited as a levee on the banks of the excavated drain (refer to **Plate 4**). This means that the banks are generally at a higher elevation than much of the surrounds, although pipe culverts have been installed to facilitate flows from the wetlands surrounds to the drain. Floodgates fitted prevent exchange. As a result of the increased elevation and disturbance, the banks are lined with pasture grasses.

The overbank area beyond the pasture grasses for the first 850 metres from the southern site boundary is salt marsh with phragmites variant. The next 640 metres is swamp oak forestseparated from the drain by pasture grasses both sides (refer to **Plate 5**). These vegetation types have been mapped by Ecobiological and presented as **Figure 1**. At the base of the farm drain before entering the Mangrove area, there are five, 1500mm diameter RCP culverts each with flood gates fitted (refer to **Plate 6**). All floodgates appear to be in condition and working order.

There has been a further modification noted to have occurred to the farm drain within the past two years. Aerial photography from 18 December 2006 indicates a gravel track adjacent to the eastern bank of the north south farm drain, refer to **Figure 2**. Most recent site inspection within the past month indicates that this embankment appears to have been removed, evident by the invasion of phragmites over the reduced elevation of this area (refer to **Plates 1, 2** and **4**). Reduction of this embankment height would lead to more regular inundation of the adjacent, overbank areas by stormwater from the upstream catchment as the farm drain capacity is exceeded more regularly for flooding hydrology. This could also be interpreted that the farm drain had been assessed prior to embankment/gravel track removal as having sufficient capacity for low flow events, not altering the flooding or drying cycles of the adjacent wetlands/salt marsh. The eastern side of the drain is the RAMSAR wetlands.

Vegetation

The downstream wetlands downstream of the site are identified by Ecobiological as salt marsh with phragmites variant and swamp oak forest. These are closest to 'salt marsh' and 'forest swamp – ephemeral' classifications respectively from the HCCREMS document. However, the significance of the large farm drain, the flood gates, pipe culverts and overbank elevations and alterations to the natural drainage are all factors of consideration that make it non typical. For example, 'salt marsh' is described as marine in the HCCREMS document, whereas our ecologist has described that the water is only mildly brackish, most likely as a result of the flood gates.

Compliance Objectives
Modelling of the flooding and drying cycles has not been undertaken and deemed unnecessary however, commentary can be provided on the trends of what is likely to occur post development.

From the hydrological management objectives for salt marsh (Table 6 of HCCREMS), flooding and drying hydrology are both identified as objectives to be assessed. Post development discharge will continue to the large existing farm drain downstream of the site, as is currently the existing, pre development case. Hence the majority of the time, stormwater discharge from the development will be contained within the farm drain, due to it's large capacity. Modelling has been shown that post development peak flows match pre development peak flow levels, hence changes in flood height in the drain post development are negligible. Therefore there are only a small number of incidences of inundation occurring each year (pre and post). Modelling undertaken indicates that the difference in flow and flood level in the drain will be negligible between pre and post development discharges from the site. Increased impervious area as a result of the development is managed by water reuse strategies within the development and the large buffering capacity of the constructed wetlands, the comparison of annual volume of discharge from the site post development was made with the base, existing case of the site being waterlogged. It is concluded from the modelling and existing altered wetland conditions that there is no discernible difference in flooding and drying cycles to the wetland post development.

From the hydrological management objectives for Swamp Oak – Ephemeral (Table 6 of HCCREMS), drying hydrology is identified. Modelling and discharges have been described however it is important to recognize that the Swamp Oak forest is a considerable distance downstream, some 850 metres from the downstream boundary. At this point, the embankments of the large farm drain are intact on both sides of the drain and lined with pasture grasses (refer to **Plate 5** and **Figure 1**). This is protecting the swamp oak forest from inundation by overflows from the channel. It is concluded that there is no discernible difference in drying cycles to the swamp oak forest post development.

Downstream channel capacity
As described above, it is assumed that the farm drains are approximately 1.5m deep, consistent with the 1500mm diameter pipe culvert crossings. The channel width has been measured at 6 metres wide at the crossing, which is a consistent width for its full length. The channel is straight and clear of vegetation, conducive to increased conveyance as described above (refer to **Plates 2-4**).

The existing capacity of the channel is dependent on the tidal level in the Hunter River at the time of runoff conveyance. At low tide, the channel can be expected to convey high flows, however during high tides, coupled with the flood gates there would be possible stagnation of stormwater discharge. Therefore the breakout of stormwater flows from the channel is dependent on the timing of the rainfall event, consequential runoff quantity and timing of the tidal cycle. It is expected however that due to the large size of the farm drain that the majority of the time, stormwater will be contained within the channel and break out, overflow incidences would be relatively infrequent.

Modelling has been undertaken to demonstrate that post development peak flows are equivalent to pre development peak flow levels. The quantity of stormwater discharging from the site has also been quantified on an annual basis for comparison between pre and post development. This has shown to be closely equivalent. This indicates that there will be no discernible difference between stormwater discharge from the site contained within the farm drain pre and post development.

Plate 1 – Confluence

Plate 2 – Drain south

Plate 3 – Twin 1500mm pipe crossing

Plate 4 – Spoil embankment track

Plate 5 – Farm Drain through Swamp Oak Forest

Plate 6 – Five 1500mm Pipe Crossing

FIGURE 1 - VEGETATION MAPPING

Plotted By: roberto Plot Date: 12/09/08 - 15:04 Cad File: N:\11886\Dwg\Eng Design\Drain Letter \Sep 08\Figure 2008-09-11.dwg

Appendix A – HWC Approval Letter

HUNTER WATER CORPORATION . PO BOX 5171 HRMC NSW 2310 . TEL 1300 657 657
36 HONEYSUCKLE DRIVE NEWCASTLE . ABN 46 228 513 446 . HUNTERWATER.COM.AU

6 July 2008 Ref: 2008-544

Department of Planning
GPO Box 39
SYDNEY NSW 2001

Attention: Ann-Maree Carruthers

RE Redlake Enterprises Mixed Use Development, Tomago Road, Tomago

Thank you for your letter of 29 April 2008 seeking Hunter Water's comments on the proposed Redlake development.

I apologise for the time taken in responding to your request, this project is of particular interest to Hunter Water both as a prospective customer and as a key participant in the servicing of the wider Tomago and Williamtown areas. Hunter Water is currently finalising a strategy for a wastewater servicing scheme which will form a crucial component in the environmentally sustainable development of the Tomago and Williamtown areas.

Hunter Water is a member of the Westrac Project Steering Group and has had an ongoing association with the proponent and its consultants, this is acknowledged in the Environmental Assessment prepared by Asquith and DeWitt (ADW Johnson)

It is noted that the applicant is seeking approval for the whole development, with Stage 1 being the development of the Westrac Facility and further stages being the industrial subdivision of the balance of the land.

Hunter Water's comments should be considered as part of the consultation to be assessed and determined by the Minister for Planning under Part 3A of the Environmental Planning and Assessment Act 1979 (EP&A Act).

Water Supply

The nominal points of connection point for water are the 200mm diameter watermain in Tomago Road and a cross connection with 500mm diameter watermain in Tomago Road. (Please refer to the attached plan).

Hunter Water's preliminary assessment indicates that capacity is available for the development of Stages 1,2 and 3. However, the applicant will be required to develop a water servicing strategy in consultation with Hunter Water to determine the full servicing requirements including any upgrades to infrastructrue that may be required.

Wastewater Transportation

Hunter Water is currently liaising with various parties, including the proponent, for a Regional Wastewater Transportation Scheme that would service the proposed Williamtown DAREZ and the Tomago Area, including the proposed Redlake Development and the adjoining proposed Tomago Employment Zone.

Hunter Water is currently finalising the servicing strategy including funding arrangements and will be reporting back to the parties in September 2008.

Hunter Water notes that Section 4.3 of Appendix F of the Environmental Assessment acknowledges the development of this wastewater transportation system for Stages 2 and 3 of the proposal, and that an interim on-site system is proposed for Stage 1 until the wider wastewater strategy is finalised and the system constructed.

The timeline for the development of the Regional Wastewater Transportation Scheme is likley to be outside the scope of Stage 1 of the proposal.

Hunter Water does not have any specific objections to the use of an interim on-site system for the Westrac Facility, however this is subject to further negotiaton with the proponent to ensure that once the overall scheme is operational that this proposal be connected to Hunter Water's transportation system.

Negotiation for servicing would include funding and construction of the scheme, including payment of contributions in accordance with IPART regulated Developer Servicing Plans.

Hunter Water does have concerns that should a privately operated de-centralised wastewater system be approved as the ultimate servicing solution for this development that this would then be seen as the standard for the servicing of the Tomago area.

The Regional Williamtown-Tomago scheme is strategic to Hunter Water's interests in being able to provide an efficient, enviromentally sustainable wastewater transportation and treatment system at least cost to the community and its customers.

Environmental Assessment of Proposal

Hunter Water has assessed the proposal in relation to the Hunter Water (Special Areas) Regulation 2003.

The top northern portion of the proposed development lies within the boundary of the Special Regulation Area water supply catchments.

Hunter Water is satisfied that the report has adequately addressed previous comments to the proponent via its consultant Asquith and Dewitt (ADW Johnson) with regard to the development, specifically with regard to the location and selection of sewerage facilities, aquifer interference, safe storage and handling of fuels/chemicals and surface runoff.

The proponent has structured the development in a way such that activities and systems noted above with the potential for impact have been located outside of the Special Regulations Area. It is also noted that the groundwater flow regime at the location of this development is likely to be away from the water storage aquifer further lowering the potential risk.

Wastewater Treatment

Raymond Terrace WWTW is planned to be upgraded by Hunter Water in 2009. The design process has commenced. Continued liaison with the developer and respective design consultants will be welcomed as inputs into our design and construction process.

General

It is a requirement of Hunter Water that application for a Section 50 "Notice of Requirements"

be made for specific development proposals. Hunter Water would then formally assess the development, determine system capacity and nominate actual connection points to water and sewer. The Notice of Requirements would also nominate a number of actions to be completed by the developer. Completion of all actions in the Notice of Requirements triggers release of the Section 50 Compliance Certificate for the development.

The completion of Hunter Water's requirements (usually works and payment of fees) is best achieved prior to issue of Construction Certificate by Council or private certifier for other associated construction works.

To this end Hunter Water requests that the Department of Planning include appropriate wording in its development consent conditions to reflect our needs.

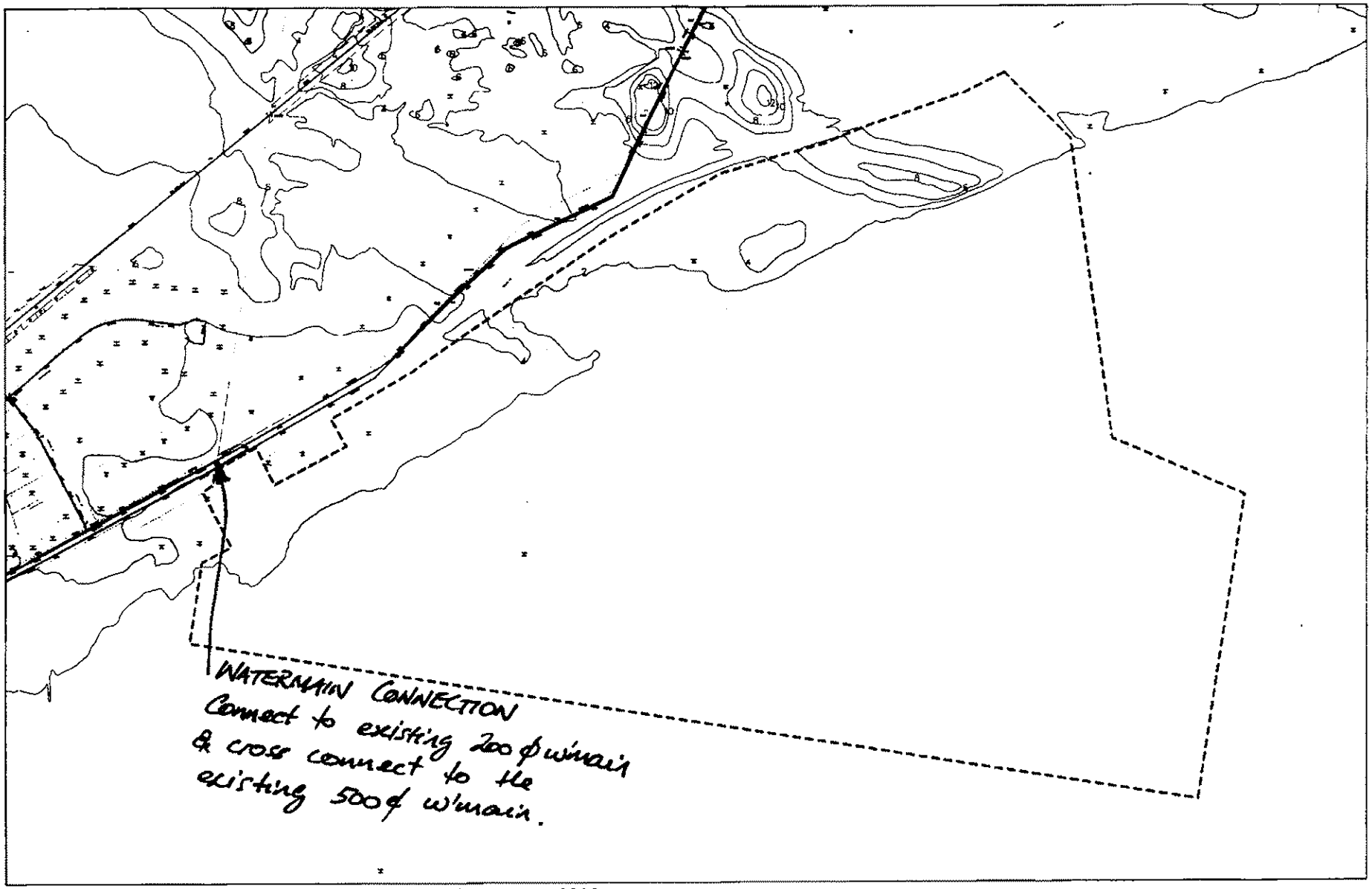
Our Sales and Business Development team is available at short notice to discuss with the Department of Planning or the development community their water and sewer servicing needs and I would encourage open communication between all stakeholders.

Should you require further clarification or assistance please contact the enquiries officer listed below.

Yours faithfully

Brett Lewis
Manager Sales and Business Development

Enquiries: Rennie Ferguson – Developer Services Engineer
Tel: 02 4979 9724
Fax: 02 4979 9711



Date: 25/06/2007 **Scale:** 1 : 8000

Notes: LOTS 1, 1, 161 & 513 TOMAGO ROAD, TOMAGO

HWC DOES NOT GUARANTEE THE ACCURACY OF THIS PLAN