Sandy Beach North
Supplementary Noise Assessment

SANDY BEACH NORTH

TRAFFIC NOISE ASSESSMENT

- Final
- 5 November 2008

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1. Introduction

1.1. General Introduction

Sandy Shores Developments are proposing to develop a block of land at Sandy Beach North for residential purposes. Sandy Beach North is located approximately 25 km north of Coffs Harbour on the north coast of NSW. A site plan for the proposed development is included as **Figure 1-1**.

Figure 1-1 Sandy Beach "North" Development Site

1.2. Background

SKM carried out an initial noise assessment for the Sandy Shores Site in 2004. This assessment included the modelling of predicted Pacific Highway road noise for 2006, and recommendations for possible noise wall and bund configurations. This report was based on the Pacific Highway alignment at the time of the report's preparation, and was included in the initial Concept Plan for the Sandy Beach North Development, which was submitted to the Department of Planning (DoP) in November 2005.

The DoPs' comments were received in October 2006, in the form of Director General's Requirements (DGRs). A draft Environmental Assessment (EA) was subsequently prepared and submitted in September 2007. Following discussions with the Department and the provision of the Department's comments on that Draft EA, the DoP issued several further DGRs.

This noise assessment has been updated to address Key Issue 9 as presented in these DGRs, namely:

'Address potential noise impacts, in particular road traffic noise for future residents and appropriate mitigation measures. This should include consideration of the impacts of the RTA's planned upgrade of the Pacific Highway'.

The purpose of this noise assessment is to provide a supplementary assessment of traffic noise impacts on future residents of the Sandy Beach North Development site. It will consider noise impacts as a result of the proposed Pacific Highway upgrade, including the slightly altered alignment and will consider the availability of additional predictions for vehicle numbers. In addition, an assessment will be provided for the impact of traffic generated by the development on noise levels in the vicinity of the local road network in Sandy Beach.

Information contained in this report regarding the Pacific Highway upgrade has generally been contained in the Roads and Traffic Authority's (RTA) Environmental Impact Statement (EIS) for the Pacific Highway Upgrade, Sapphire to Woolgoolga. Local traffic numbers have been provided by Better Transport Futures.

This noise report should be read in conjunction with the Sandy Beach North Noise Assessment Report (SKM, 2004).

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2. Existing Ambient Noise Levels

2.1. Overview

This section of the report provides an overview of the existing traffic noise levels impacting on the site and the results of noise monitoring carried out as part on the initial Sandy Beach North Noise Assessment.

2.2. Road Traffic Noise

As can be seen from **Figure 1-1** the Pacific Highway forms the western boundary of the site. Road traffic noise from the Pacific Highway is the most significant noise source in the vicinity of the site. During site inspections undertaken on 22 June and 27 June 2004, road traffic noise from the Pacific Highway was audible along the entire length of the site's western boundary with traffic noise audible as far back as 250 m from the road.

The Pacific Highway is relatively straight and flat along the entire length of the site's western boundary with two lanes in the northern direction and one heading south. The speed limit on this section of the highway is currently 100 km/h.

There is a narrow corridor of mature vegetation along the western boundary of the site which is moderately dense in most parts, however only sparse in some areas about midway along the boundary. This vegetation provides some filtering of road traffic noise.

As part of the Sapphire to Woolgoolga Pacific Highway Upgrade Project this section of the highway is scheduled for the following changes:

- Upgrade the current three lanes to a divided four lane configuration;
- Increase the speed limit from 100 km/h to 110 km/h;
- The construction of 4m noise walls on both sides of the Pacific Highway, adjacent to the cutting beneath the Diamond Head Drive Bridge between chainage distances 20,420 to 20,680 and 20,750 to 20,970 (refer **Figure 4-1**);
- The road surface through this section of highway is currently dense grade asphalt; as part of the noise management strategy, this will be upgraded to stone mastic asphalt; and
- Numerous dips and crests are to be cut and filled to improve the vertical alignment of the road surface.

Following construction of the residential properties, but prior to the completion of the Pacific Highway Upgrade, access to the residential development is proposed via the construction of two

access roads designed to meet the existing roads of Pine Crescent and Ti Tree Road, located along the southern site boundary. One residential property on each road has been purchased by Sandy Shores Developments, and it is proposed to demolish these premises to provide a road corridor.

2.3. Ambient Noise Monitoring

In order to characterise the existing noise environment at future sensitive residential receiver areas within the proposed development, ambient noise monitoring was undertaken between 22 June and 27 June 2004. The noise monitoring was undertaken at two locations using ARL noise loggers.

The noise monitoring locations are shown on **Figure 1–1**.

2.3.1. Background Noise Monitoring

Detailed ambient noise monitoring results are contained in the original Sandy Beach North Noise Assessment Report (SKM, 2004), however these have been summarised below for reference.

The weather conditions throughout the monitoring period were generally fine. Meteorological data collected from the BoM Coffs Harbour Station was used to validate the noise data, and any data collected during adverse meteorological conditions (eg winds greater than 5m/s or measureable rainfall) was excluded from the analysis.

The results of ambient noise measurement and analysis are summarised in **Table 2-1**.

Table 2-1 Summary of Noise Surveys at Sandy Beach North - dB(A)

Location Number / Time Period	50th Percentile L_{A10}	L_{Aeq}	Rating Background Level L_{A90}
Location 1			
Day	69.6	66.0	51.5
Evening	70.3	65.9	48.0
Night	69.3	64.5	40.0
Location 2			
Day	53.5	52.1	43.3
Evening	55.8	52.5	47.0
Night	56.3	52.6	42.5

2.3.2. Road Traffic Noise

The existing traffic noise levels were determined from noise measurements made at Location 1 adjacent to the Pacific Highway as shown on **Figure 1–1**, and are presented below:

- $L_{Aeq(15hour)}$ – (0700–2200) - 66.0 dB(A)
- $L_{Aeq(9hour)}$ – (2200–0700) - 64.5 dB(A)

3. Noise Criteria

3.1. Overview

As outlined above, the most relevant noise criteria to the Sandy Beach North Development are the road traffic noise criteria. The following sets out traffic noise criteria for the project.

3.2. Road Traffic Noise Criteria

The EPA's *Environmental Criteria for Road Traffic Noise* (ECRTN) establishes criteria that define acceptable traffic noise levels for different types of developments. In this instance, the following criterion would apply (**Table 3-1**).

Table 3-1 Road Traffic Noise Criteria

Type of Development	Criteria	
	Day (0700-2200)	Night (2200-0700)
New residential land use developments affected by freeway/arterial traffic noise	LA_{eq}(15hr) 55	LA_{eq}(9hr) 50
Land use developments with potential to create additional traffic on local roads	LA_{eq}(1hr) 55	LA_{eq}(1hr) 50

Source: Table 1 ECRTN.

In addition, traffic arising from the development should not lead to an increase in traffic noise on local roads of more than 2dB(A).

Where feasible and reasonable, existing noise levels should be reduced to meet the noise criteria via judicious design and construction of the development.

The location of buildings, internal layouts, building materials and construction methods should be chosen so as to minimise the impact of traffic noise generated by the Pacific Highway on residents of the Sandy Shores Development Area. These techniques have been discussed further in **Section 4.5**.

To reduce the noise impacts of development related traffic on existing local roads, the RTA suggests that consideration should be given to the location of these access roads, the clustering of traffic generating land uses on the development site and the use of barriers or acoustic treatments. Specific methods for this site have been discussed further in **Section 5.5**.

The DECC recognises that it is not always possible to comply with the external noise levels due to reasonable and feasible considerations of the available noise control measures. In these cases, it is recommended that the internal noise levels be designed to a level 10 dB(A) below the relevant external objectives (as detailed in **Table 3-1**), which in this case would equate to 40 dB(A) at night.

The DECC and RTA accept that for standard constructions, there is a 10 dB(A) noise reduction through the facade of a dwelling when the windows are open for ventilation purposes. When the windows are closed, the noise reduction increases to at least 20 dB(A) with standard windows. When acoustically rated windows are to be used, the noise reduction may increase to around 30 dB(A).

In the event that the internal noise levels cannot be achieved with the "windows open" and the windows need to be closed as a means of nose control, the BCA requires that alternative method of ventilation would need to be sought.

4. Pacific Highway Noise Assessment and Controls

4.1. Objectives

This section of the report provides as assessment of road traffic noise impacts on the Sandy Shores Development from Pacific Highway sources, considering appropriate noise controls for the development.

4.2. Background

As discussed previously, in 2007 Wilkinson Murray carried out a noise assessment of this section of the Pacific Highway as part of the EIS for the Sapphire to Woolgoolga Upgrade Project. Many of the inputs for the noise modelling carried out as part of this noise assessment has been sourced from this document.

Traffic noise assessment guidelines contained within ECTRN require that noise levels at sensitive premises are considered for a date ten years after the commissioning of the development. The results of noise modelling contained within the EIS predicted that in 2021, exceedances of the ECTRN criteria could be expected for residents located within approximately 135m to 55m of the upgraded highway alignment.

In order to predict the traffic noise impacts on residents within the development area, and considering the altered terrain as a result of the realignment of the highway corridor, SKM validated the SoundPlan model against the results contained in the EIS. The results of this validation modelling have been discussed below and presented graphically in **Appendix A**.

After the model had been validated against the results outlined in the EIS, the noise emission ratios from separate traffic sources were changed slightly, in order to more precisely represent actual vehicle emissions. These changes were for both heavy vehicle wheels and light vehicles (wheels and engines).

Topography information and engineering files of the proposed noise walls for this section of the planned Pacific Highway Upgrade was obtained from Connell Wagner, via the RTA

4.3. Prediction and Assessment of Road Traffic Noise

4.3.1. Input to SoundPlan Model

Table 4-1 lists the key input parameters used in the model to predict the night-time emissions for a number of scenarios. Calculations were undertaken using the UK's Department of Environment, *Calculation of Road Traffic Noise* (CORTN) algorithms as implemented within the SoundPLAN suite of noise prediction programs. The EPA and RTA support this procedure.

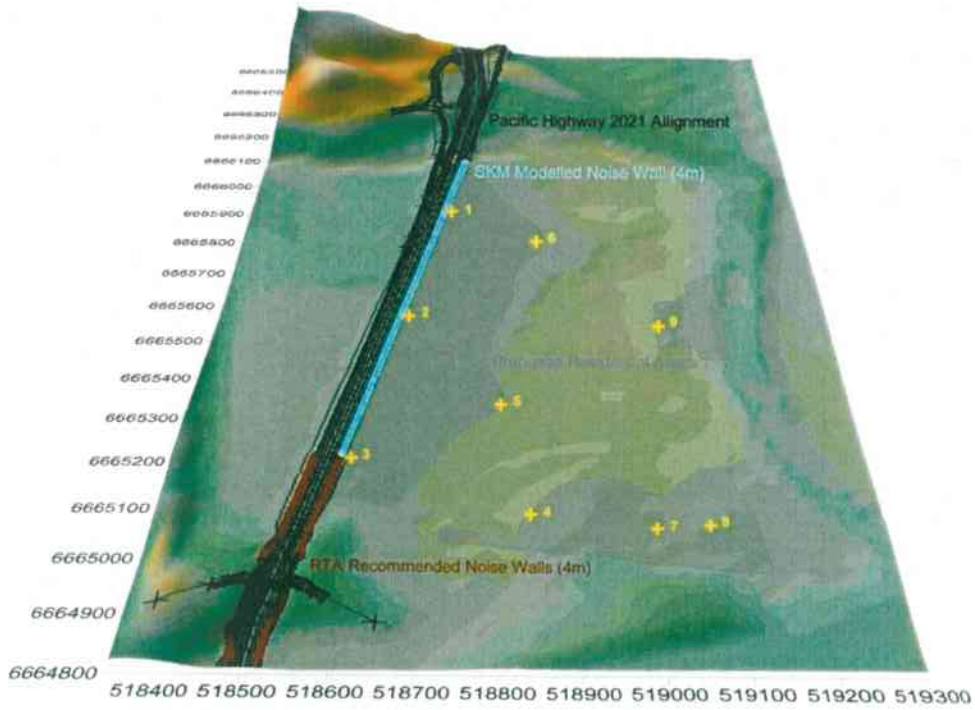
Table 4-1 Summary of Modelling Inputs

Input Variable	Data Sources from
Traffic volumes and mix	Pacific Highway Upgrade - Sapphire to Woolgoolga EIS
Ground topography	Obtained from surveys supplied by Asquith and DeWitt and RTA (Connell Wagner)
Gradient of roadway	Obtained from survey supplied by RTA
Air and ground absorption	Ground absorption of 0.5 adopted
Height of Sources	0.5m (Light Vehicle engines and wheel noise), 0.5m (Heavy Vehicle Wheel Noise), 1.5m (Heavy Vehicle Engines) and 3.6m (Heavy Vehicle Exhausts)
Height of receivers	1.5 m above ground terrain
The acoustic properties of the existing road pavement surfaces	Stone Mastic Asphalt (-2dB(A))
Traffic Speed	110 km/h along Pacific Highway
Attenuation due to building structures	Not included
Facade Reflection	Not included
Reference height of receivers	1.5m above natural ground
Existing roadside barriers	As shown in **Figure 4-1**, at a height of 4m.
Year of assessment	2021

Receiver locations were chosen to be representative of the major residential areas of the development site, and have been nominated as shown in **Figure 4-1**.

The CoRTN method predicts the LA_{10} (18hr) and the LA_{10} (1hr) noise levels at a receiver location based on the parameters listed in **Table 4-1**. To allow adaptation to NSW criteria, the 15 hour and 9 hour traffic numbers are modified so that the LA_{10} (18hr) and LA_{10} (1hr) model output is representative of the LAeq (15hr) and LAeq (1hr) noise levels. The results are then modified by the relationship, LA_{10} (period) = LA_{eq} (period) + 3 dB(A), to predict the LA_{eq} (15hr) and LA_{eq} (9hr) noise levels. Both the DECC and RTA support the use of the CoRTN algorithms and the correction to LA_{eq} values.

- Figure 4-1 SoundPlan Terrain Model Input



4.3.2. Traffic Data

Predicted traffic levels for the year 2021, in the form of Annual Average Daily Traffic (AADT), on the Pacific Highway north of Graham Drive (South) are detailed in **Table 4-2**. This traffic data has been sourced from the RTA's Pacific Highway Upgrade, Sapphire to Woolgoolga EIS - Noise and Vibration Assessment.

- Table 4-2 AADT Traffic Data 2021

Period		Light Vehicles	Heavy Vehicles
Day (7am-10pm)	North Bound	10 570	1 224
	South Bound	10 046	1 259
Night (10pm-7am)	North Bound	709	568
	South Bound	953	363

4.3.3. Noise Model Validation

In order to ensure the validity of the noise prediction model, the initial run was to duplicate the results contained in the EIS for the highway upgrade. A comparison of the resulting noise contours for 2021 night time period (LAeq 9hr) is contained in **Appendix A**.

The EIS modelling predicted greater noise attenuation at areas close to the highway, whereas our model predicted greater attenuation further from the road corridor, particularly to the north and south of the site. In between these two areas good correlation was observed across the two models. Overall less than 5 dB(A) difference is shown across the site, which is considered acceptable for the purposes of this assessment, although the results should be viewed as slightly conservative.

4.4. Predicted Noise Levels Across Development

Road traffic noise levels have been predicted across the entire site for 2021, and are presented in **Table 4-3**. A graphical representation of these results, in the form of noise contour plots is contained in **Appendix B**.

Examination of the results shows that without any barriers in place, day and night-time road traffic noise impacts extend well into the site. During daytime hours, compliance with the ECTRN criteria of 55 dB(A) would be expected at three of the nine calculated locations. Similar results are expected during the night, with the exception of Location 9, where compliance with the 50 dB(A) night time criteria is predicted.

- **Table 4-3 Modelled Traffic Noise – No Mitigation**

Location	Daytime Noise Levels – dB(A)		Night Time Noise Levels – dB(A)	
	ECTRN Criteria	Predicted Noise Levels	ECTRN Criteria	Predicted Noise Levels
1	55	**68.5**	50	**63.5**
2	55	**69.0**	50	**64.0**
3	55	**66.0**	50	**61.5**
4	55	54.5	50	50.0
5	55	**59.0**	50	**54.5**
6	55	**58.5**	50	**53.5**
7	55	52.0	50	47.5
8	55	50.5	50	46.0
9	55	**54.5**	50	49.5

As part of the Noise and Vibration Assessment for the Pacific Highway Upgrade EIS, Wilkinson Murray has recommended 4m noise walls be constructed either side of the Diamond Head Drive Overpass (refer **Figure 4-1**) in order to mitigate noise impacts for residents located adjacent to the highway in Sandy Beach. For the purposes of this noise model, this noise wall has been continued from the Diamond head Bridge to the Double Crossing Creek Bridge, a total distance of approximately 1.1km.

The results of this noise model have given in **Table 4-4** and **Appendix B**.

- **Table 4-4 Modelled Traffic Noise – 4m Noise Walls**

Location	Daytime Noise Levels – dB(A)		Night Time Noise Levels – dB(A)	
	ECTRN Criteria	Predicted Noise Levels	ECTRN Criteria	Predicted Noise Levels
1	55	**59.5**	50	**54.5**
2	55	**58.5**	50	**53.5**
3	55	**58.0**	50	**53.5**
4	55	51.5	50	47.0
5	55	54.0	50	49.5
6	55	54.0	50	49.5
7	55	49.0	50	44.5
8	55	47.5	50	43.0
9	55	50.5	50	46.0

These results show that a 4m noise barrier along the full length of the site is effective in reducing both day and night time road traffic noise impacts in areas close to the highway. This effect is reduced at further distances due to the shadow effect the wall creates when mitigating traffic noise. If this noise wall is constructed as outlined, compliance with ECTRN criteria is predicted at Locations in the central and eastern areas of the Sandy Beach Development site (Locations 4, 5, 6, 7, 8 and 9), with exceedances of less than 5dB(A) being predicted during both day and night time periods at the Locations 1, 2 and 3. Consideration of traffic noise during planning of the site layout, and simple built to form noise controls would be expected to reduce noise levels to within ECTRN criteria.

4.5. Other Means of Noise Mitigation

4.5.1. Maximise Distance of Internal Living Areas away from Pacific Highway

It is recommended that traffic noise be considered when designing interior areas of all residential buildings. Noise sensitive areas should be located as far east as possible within the buildings. This may mean situating activities such as kitchens, laundries, garages or rumpus rooms towards the western areas of buildings and placing bedrooms, offices and lounge rooms towards the east of the structures.

4.5.2. Noise Wall

For the purposes of this assessment, a noise wall was hypothetically constructed along the top of the road bund and parallel to the Pacific Highway in the same alignment as the wall assumed in the RTA assessment of the Sapphire to Woolgoolga Upgrade. Further consultation with the RTA would be required to confirm their acceptance of extending the proposed noise wall as assumed in this assessment.

In the design of the noise barrier, the RTA publication '*Noise Wall Design Guidelines*' should be considered, and approval sought from the RTA.

It should be noted that should the noise wall not be constructed along the top of the road batter (for example along the develop site boundary, approximately 2m below the road alignment), the effectiveness of the noise wall will be significantly less than these results show.

4.5.3. Built From Controls

As discussed in **Section 3.2**, where traffic noise does not meet the external noise criteria, it is recommended that internal noise levels are reduced to 10 dB(A) below the applicable criteria, in this case noise levels of 45 dB(A) and 40 dB(A) for day and night time periods respectively should be aimed for.

The typical level of noise attenuation across a building threshold, assuming doors and windows are open and of standard construction, would be in the order of 10 dB(A).

Some suggestions for the consideration of noise mitigation in building design and the likely level of noise reduction that may be achieved are shown below in **Table 4-5**.

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- Table 4-5 Built to Form Noise Mitigation Options

Noise Mitigation Method	Range of Noise Reduction dB(A)
Minimisation of window size and the number of windows facing highway	5 – 10
Sealing of doorways and windows facing highway	4 - 10
Thicker glass and / or double glazing used in windows and solid core doors	4 – 10
Insulation used in ceiling	4 – 8
Double layer or thick plasterboard used in walls and ceiling or insulation	4 – 7
Double brick walls used in construction (with 10mm gap between layers), possibly only in walls facing the highway	15 - 20
Walled courtyard between house and highway (ground level areas)	10-12

Other design options that may be considered include flats roofs as a pose to pitched roofs, and floors of concrete slab construction rather than wooden floors.

Assuming the 4m noise wall is constructed; residences towards the centre (Locations 4, 5 and 6) and east of the Sandy Beach North Development site (Locations 7, 8 and 9) are expected to comply with ECTRN criteria.

For residences located adjacent to the Pacific Highway (Locations 1, 2 and 3), some further methods of noise reduction may be necessary. Assuming primary attenuation has already been achieved with the construction of the noise wall, options such as weather seals on doors and windows, roof insulation and a thicker or a double layer of plasterboard used in ceilings should reduce noise levels to within ECTRN criteria.

5. Local Traffic Noise Assessment and Controls

5.1. Overview

This section of the report provides an assessment of the noise related impacts of traffic travelling to and from the proposed Sandy Beach Development site on the existing community of Sandy Beach, and considers possible noise mitigation methods where required.

5.2. Background

As a part of the environmental assessment for the Sandy Beach North development, Better Transport Futures carried out a traffic study on the impact of the development on the traffic loads of local roads. The inputs for the noise calculations carried out as part of this assessment have generally been sourced from this document.

Current peak hour traffic flows on local roads is very low; typically in the order of 50 vehicles per hour on Ti Tree Road and Pine Crescent, and 100 vehicles per hour on Diamond Head Drive. Upon completion of the Sandy Shores Development, up to 238 vehicles per peak hour could be generated from the site, although this number would decrease by 70% when the Pacific Highway Upgrade is completed, and the direct access road to the development site from the Pacific Highway is constructed.

Traffic noise assessment guidelines contained within ECTRN require that noise levels at sensitive premises are considered for a date ten years after the commissioning of the development. In order to provide long term access to this area, it has been proposed that a direct access road to the Pacific Highway is constructed; however work on this road is not proposed to begin until the Sapphire to Woolgoolga Pacific Highway Upgrade project has been completed.

Construction of the Sandy Beach North development is currently expected to be complete by the end of 2015, whilst a completion date for Sapphire to Woolgoolga Pacific Highway Upgrade has yet to be finalised. For this reason, an assessment of the interim traffic noise impacts on the local road network has been considered in addition to a final traffic noise estimation.

Under the interim scenario, it is proposed that two access roads are constructed to the residential development area. One road would be constructed as a continuation of Pine Tree Crescent, whilst the other would extend Ti Tree Road further north, and into the area of the Sandy Beach North Development. From these roads, vehicles would pass along Diamond Head Drive and then turn either north or south onto Graham Drive and onwards to the Pacific Highway (refer **Figure 5-1** and Figure 5-2).

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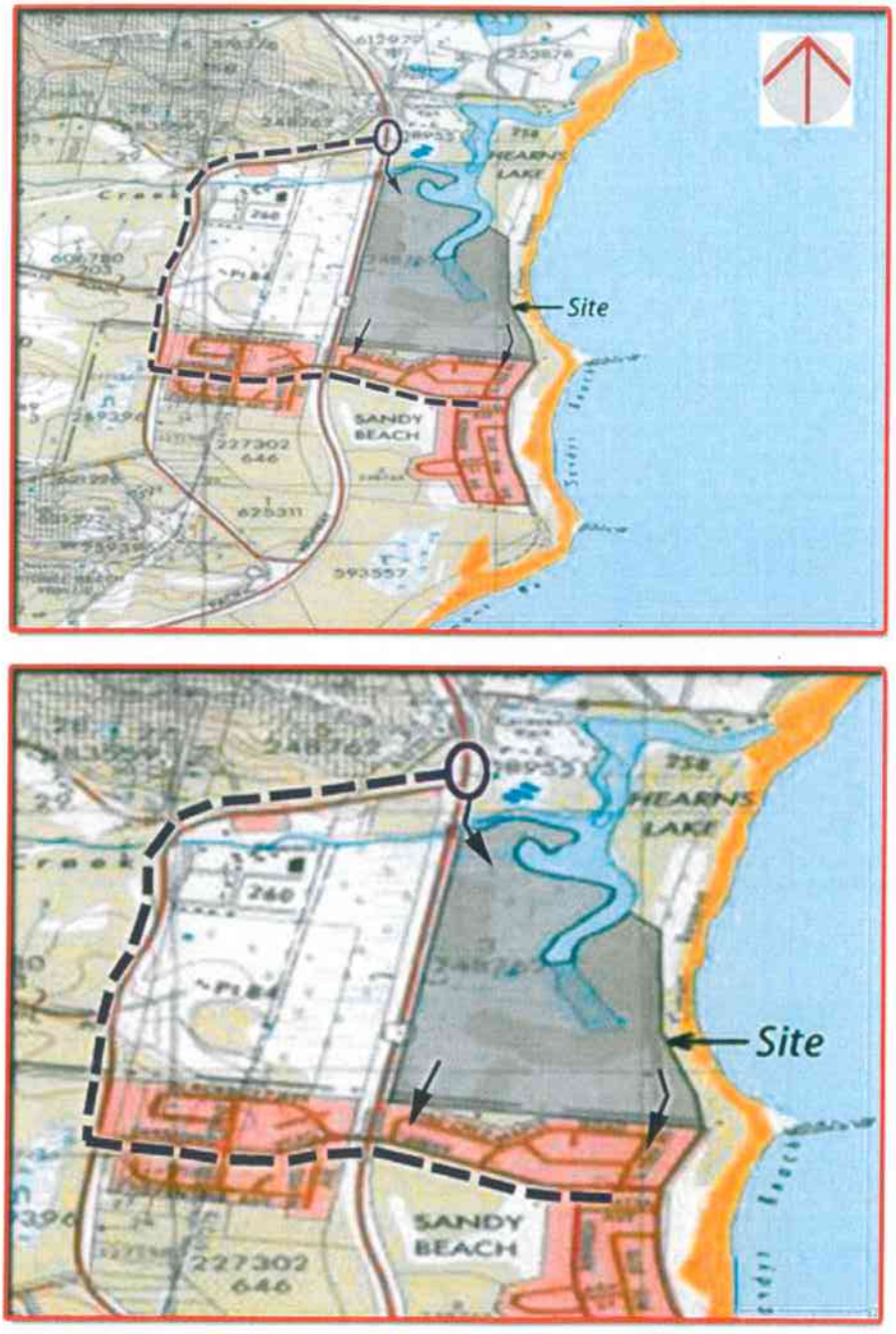
- **Figure 5-1 Proposed Site Entrance Locations**

- Figure 5-2 Proposed Site Access Routes



Under the final, long term scenario 30% of traffic has been maintained on the route outlined above, whilst 70% has been assumed to use the direct access road to enter the Pacific Highway.

5.3. Assessment of Development Generated Traffic Noise

Calculations were based on the UK's Department of Environment, *Calculation of Road Traffic Noise* (CORTN) algorithms. Calculations are made at a nominal 10m setback from the various local roads which is assumed to be the minimum setback of existing houses from local roads. As the current route access from the Pacific Highway to Sandy Beach carries residential traffic, cars and light commercial vehicles are assumed to make up 98% of total traffic and trucks make up 2 %

The results of these calculations have been detailed below in **Table 5-1** to **Table 5-3**.

- **Table 5-1 Existing Traffic Noise Impacts**

	Graham Drive (South)	Graham Drive (North)	Diamond Head Drive	Pine Crescent	Ti Tree Road
$L_A$eq (1hr) – Cars	52	53	48	45	45
$L_A$eq (1hr) – Trucks	49	50	45	42	42
Criteria	55	55	55	55	55
$L_A$eq (1hr) – Total	54	54	50	47	47

- **Table 5-2 Interim Traffic Noise Impacts**

	Graham Drive (South)	Graham Drive (North)	Diamond Head Drive	Pine Crescent	Ti Tree Road
$L_A$eq (1hr) – Cars	54	54	53	49	51
$L_A$eq (1hr) – Trucks	51	51	50	47	48
Criteria	55	55	55	55	55
$L_A$eq (1hr) – Total	55	**56**	**55**	**51**	**53**

- **Table 5-3 Final Traffic Noise Impacts**

	Graham Drive (South)	Graham Drive (North)	Diamond Head Drive	Pine Crescent	Ti Tree Road
$L_A$eq (1hr) – Cars	53	53	50	48	47
LAeq (1hr) – Trucks	50	50	47	45	44
Criteria	55	55	55	55	55
LAeq (1hr) – Total	54	55	52	49	49

The results of the calculations contained in **Table 5-2** show that during the interim period, prior to the construction of the Pacific Highway Access Road, a marginal exceedance of the ECTRN criteria is expected to occur at Graham Drive North. In addition, during this interim period, noise levels at Diamond Head Drive, Pine Crescent and Ti Tree Road are predicted to increase by between 4 and 6dB(A), thereby exceeding the maximum 2dB(A) increase permitted under the ECTRN criteria. However, it should be noted that these increases are temporary in nature, and are only predicted to occur at this magnitude during peak hour periods.

After the construction of the Pacific Highway access road, traffic numbers on these roads are expected to decrease by approximately 70%. As can be seen from the information contained in **Table 5-3** above, the final estimated noise levels on local roads in Sandy Beach are not expected exceed 55dB(A) during peak hour at any location. In addition calculations have shown that a final traffic noise level increase of between zero and 2dB(A) is expected at at each location. Noise levels are therefore expected to comply with ECTRN criteria at all residences along this route.

These traffic noise calculations are based on worst case peak hour traffic load, and increases during most other time periods would be expected to result in noise levels well below those predicted in this noise assessment. In addition these noise levels are predicted at a nominal distance of 10m from the road corridor, and whilst this separation is accurate for the suburban residents in Sandy Beach, many residential locations on Graham Drive are rural in nature and premises are located at significantly larger distances from the road corridor. As such noise levels along most of Graham Drive are expected to be considerably lower than those predicted above.

5.4. Summary

A summary of the traffic noise impacts on local Sandy Beach Roads has been given below in **Table 5-4**:

Table 5-4 Summary of Traffic Noise Impacts

Calculated Traffic Noise Level – dB(A)	Graham Drive (South)	Graham Drive (North)	Diamond Head Drive	Pine Crescent	Ti Tree Road
Criteria	55	55	55	55	55
Existing	54	54	50	47	47
Interim	55	**56**	**55**	**51**	**53**
Final	54	55	52	49	49

The final traffic noise levels on local roads following construction of the Pacific Highway access to the Sandy Beach North Development are expected to comply with ECTRN criteria at all locations. However in the period prior to the construction of the Pacific Highway access road, noise levels at

Graham Drive North, Diamond Head, Pine Crescent and Ti Tree Road may marginally exceed the ECTRN criteria.

5.5. Recommendations

The results of the noise assessment outlined above show that final noise levels on the local road network in Sandy Beach impacts are not expected to result in major impacts on surrounding residents. However during the interim period, prior to the construction of the direct access road to the Pacific Highway, noise levels at Graham Drive North, Diamond Head, Pine Crescent and Ti Tree Road may marginally exceed the ECTRN criteria.

Due to the short term nature of these traffic noise impacts, it is recommended that mitigation measures utilised to manage these impacts should generally be temporary in nature. In noting this, the following noise management options are suggested:

- The direct access road to the Pacific Highway should be constructed as soon as possible. The ideal option would be its construction as part of the Sapphire to Woolgoolga Pacific Highway Upgrade; and
- The establishment of open and constructive communication paths with the community of Sandy Beach. This should include the providing of information about benefits to the community as a result of the development and information about noise mitigation works that are being undertaken.

Due to the preliminary nature of the information used in this assessment and variations in the nominal 10m separation distance used between residential facades and the road corridor, actual noise levels may vary from the calculations contained above. For this reason, a program of road traffic noise monitoring should be established during and after the completion of the project and maintained on a regular basis until the Pacific Highway access road has been constructed.

Where consultation with concerned residents fails to achieve satisfactory outcomes in regards to development related road noise, consideration may be given to the construction of traffic calming devices, such as chicanes, mid blocks, speed humps and roundabouts; although works of this nature will need to be undertaken in close consultation with the RTA. A reduction in the speed limit on these roads may also reduce noise levels generated by passing traffic.

6. Conclusions and Recommendations

6.1. General Conclusions

Sinclair Knight Merz was commissioned to undertake a supplementary assessment of road traffic noise impacts associated with the proposed residential development of Sandy Beach North.

This assessment has shown that the proposed development site is moderately affected by road traffic noise from the adjacent Pacific Highway both for existing conditions and following the planned upgrade of the Highway, and noise controls are required to mitigate these impacts.

When the Pacific Highway Upgrade is constructed, a direct access road onto the development site from the highway will be constructed. After this road is constructed, the assessment has shown that the development is unlikely to have a major long term impact on the levels of road traffic noise in Sandy Beach, however prior to the construction of this access road, some temporary traffic noise impacts may be noticed at residential locations on Pine Crescent, Ti Tree Road, Diamond Head Drive and Graham Drive North.

6.2. Noise Control Recommendations

6.2.1. Pacific Highway Noise Recommendations

The results of traffic noise modelling show that a noise barrier of 4m in height, located along the road corridor at the top of the road batter, and constructed as a continuation to the proposed RTA noise barriers, are moderately effective in reducing both day-time LA_{eq}(15-hour) and night-time LA_{eq}(9-hour) noise impacts at proposed development sites throughout the development area.

Depending upon the building location, and in addition to the modelled noise walls described above, a range of design and built to form noise mitigation methods will also be required at residences adjacent to the Pacific Highway. Assuming these suggested options are employed, compliance with the ECTRN criteria is expected to be achievable.

6.2.2. Local Traffic Noise Recommendations

The results of the noise assessment show that the final noise levels on the local road network in Sandy Beach are not expected to result in major impacts on surrounding residents. However during the interim period, prior to the construction of the direct access road to the Pacific Highway, some impacts may be experienced on local roads, in particular on Diamond Head Drive, Pine Crescent, Ti Tree Road and Graham Drive North. Due to the short term nature of these traffic noise impacts, it is recommended that mitigation measures utilised to manage these impacts should generally be temporary in nature.

Maintaining a constructive and open communication dialogue with residents should be the primary method of managing any noise issues associated with these impacts. In addition the Pacific Highway access road should be constructed as soon as possible, either in conjunction with or immediately following the completion of the Pacific Highway Upgrade.

During and after completion of the project, a program of road traffic noise monitoring should be established at affected residential properties and maintained on a regular basis until this access road has been constructed.

Where agreement is unable to be reached with the community, and traffic noise remains a concern, the installation of traffic calming devices may assist in reducing car pass by speeds and associated noise levels.

7. References

SKM. (2004). *Sandy Beach 'North', Noise Assessment Report*, prepared for Sandy Shores Development Pty Ltd.

Connell Wagner Pty Ltd (2007). *Coffs Harbour Highway Planning, Sapphire to Woolgoolga Section, Environmental Assessment*, prepared for Roads and Traffic Authority.

State Pollution Control Commission (1991). *Reducing Traffic Noise – A Guide for Homeowners, Designers and Builders.*

Environmental Protection Authority (1999). *Environmental Criteria for Road Traffic Noise.*

Council of Standards Australia (1989). *Australian Standards 3671 – 1989, Acoustics – Road Traffic Noise Intrusion – Building Siting and Construction.*

Appendix A

Validation of Noise Model Against Results from Pacific Highway Upgrade – Sapphire to Woolgoolga EIS – Night time (LA_{eq} 9hr)

Appendix B

2021 Daytime Noise Modelling Results – No Walls

2021 Night Time Noise Modelling Results – No Walls

2021 Daytime Noise Modelling Results – 4m Walls

2021 Night Time Noise Modelling Results – 4m Walls