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ACOUSTICAL CONSULTANTS

Proposed Earthworks for Central Open Spaces
Stages 9 and 11, Cobaki Development
Cobaki, NSW

ENVIRONMENTAL NOISE IMPACT REPORT

Prepared for:

Leda Developments Pty Ltd

17 December 2013
crgref: 13212a report

1.0 INTRODUCTION

This report is in response to a request by Leda Developments Pty Ltd for an environmental noise impact assessment of earthworks activities at the Cobaki Development at Cobaki.

In undertaking the above, noise monitoring was conducted; and through noise modeling, predictions of earthworks activity noise emissions were produced. Based upon the predicted noise impact levels, recommendations regarding acoustic treatment and management controls have been provided.

2.0 SITE & DEVELOPMENT DESCRIPTION

The proposal is to obtain a Section 75W approval for the winning of fill material from Precinct 9 and Precinct 11 sufficient to complete the bulk earthworks in the Central Open Space of the Cobaki Development. Refer to Appendix A of this report for the site location and Appendix B of this report for the earthworks plans.

In-situ material will initially be ripped and heaped with a CAT D11 dozer, assisted by a 75t excavator (CAT 375). Once heaps are created, 65t (CAT 365) and 75t (CAT 375) excavators will be perched on top of the heaps and load six-wheeled drive (6WD) articulated dump trucks (CAT 740) at a rate of approximately one truck per five minutes. Dump trucks (CAT 740) have the capacity to carry 20-22m^3 of fill and can haul loads to the deposition site at a speed of around 20km/hr. On return they can travel at speeds of around 50km/hr, with an empty tray.

The fill material will be dumped and then spread and compacted with a 32t bladed double drum sheep's foot compactor (CAT 825G). Water is applied as necessary for dust suppression and maintenance of moisture content during compaction. The water truck is based on a 6WD articulated dump truck (CAT 730) with a 25,000 litre tank.

It is noted that in-situ material in a portion of Precinct 9 is classified as very hard Greywacke rock, which will require blasting. At this stage, the location of blasting and the amount of blasting is unknown.

Indicative earthworks volumes are as follows:

Precinct 9: Approximately 500,000m^3 of cut required for Central Open Space Stage 1.
Precinct 11: Approximately 100,000m^3 of cut required for Central Open Space Stage 3 and Central Open Space Stage 2.

Onsite earthwork noise / equipment noise has been assessed in accordance with the Department of Environment and Climate Change NSW (DECC) "*Interim Construction Noise Guideline*" to ensure an acceptable noise amenity can be achieved at the nearest offsite noise sensitive receivers (i.e. dwellings). It is noted that the Guideline is not mandatory but *"specifies noise management levels that guide the need to apply work practices to minimise noise impacts"*. The Department of Planning and local councils may find the Guideline useful when dealing with noise from construction works that require planning approval.

Refer to Figure 2 in Appendix A of this report for the assessed noise sensitive receiver locations.

3.0 AMBIENT NOISE SURVEY

The following equipment was used to record ambient noise conditions at the subject site location:

- Rion NC 73 Calibrator; and
- Rion 29E Octave Band Sound Analyser.

All instrumentation hold current calibration certificates from a certified NATA calibration laboratory.

Background L_{A90} noise measurements were conducted between 8am and 9am on Wednesday 5th December 2013. Measurements were conducted at two locations with the microphone in free-field locations and approximately 1.5m above ground. It is noted that two additional locations were chosen for measurement; however, the sites were adversely affected by extraneous noise sources (i.e. distant drop saw cutting noise) and insect (cicada) noise. Refer to Figure 1 in Appendix A of this report for the measurement locations.

All measurements were conducted generally in accordance with Australian Standard AS 1055:1997 – *"Acoustics-Description and measurement of environmental noise*". The operation of the sound level meter was field calibrated before and after the measurement session with no significant drift from the reference signal recorded.

Weather conditions during the noise monitoring period were fine, with a temperature of approximately 25°C and local wind speeds at the measurement positions at or below 5m/s.

Table 1 below presents the measured ambient background L_{A90} noise levels at the measurement locations.

Measurement Location	**SPL dB(A) Hz Octave Band Centre Frequencies**									
	31.5	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**AP**
Location A	14	23	29	30	31	33	37	33	29	**42**
Location B	17	26	27	24	28	31	31	30	31	**38**
Location C	Adversely affected by distant drop saw cutting noise									
Location D	Adversely affected by insect (cicada) noise									

Table 1: Measured noise levels at the attended measurement locations.

4.0 NOISE CRITERIA

4.1 Earthworks Activity Noise Criteria

As a guide to quantifying impacts, the Department of Environment and Climate Change NSW (DECC) "*Interim Construction Noise Guideline*" (referred to in this report as "the guideline") has been used. The guideline states the following in respect to management of noise impacts:

> "*Where noise from construction is above the 'noise affected' levels presented below, the proponent should apply all feasible and reasonable work practices to minimise noise. The proponent should also inform potentially affected parties of the activities to be carried out, the expected noise impacts and duration.*"

Under the guideline, the criteria applied to construction noise impact assessment are as follows:

Time of day	Management level $L_{Aeq\ (15\ min)}$ *	How to apply
Recommended standard hours: Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm No work on Sundays or public holidays	Noise affected RBL + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise. • Where the predicted or measured $L_{Aeq\ (15\ min)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. • The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75 dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. • Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: 1. times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences 2. if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	Noise affected RBL + 5 dB	• A strong justification would typically be required for works outside the recommended standard hours. • The proponent should apply all feasible and reasonable work practices to meet the noise affected level. • Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community. • For guidance on negotiating agreements see section 7.2.2.

* Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5 m above ground level. If the property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30 m of the residence. Noise levels may be higher at upper floors of the noise affected residence.

Based upon the noise criterion presented above and the measured background noise levels the following applies to onsite construction and earthworks noise:

Noise Level L_{Aeq} dB(A)
Noise Affected Level: 48 (L_{A90} 38 + 10 dB(A))
Highly Noise Affected Level: 75

Table 2: Construction and earthworks activity noise limits.

It is also noted that Australian Standard AS 2436 – 1981 "*Guide to noise control on construction, maintenance and demolition sites*" provides extra guidance for management of on-site noise.

4.2 Operational Hours

Condition 49 of the Project Approval refers to the following operational hours:

> ***Noise And Vibration Management***
> ***49. Hours of Work***
> *The hours of construction for the project, including the delivery of materials to and from the site,*
> *shall be restricted as follows:*
> *a. between 7:00 am and 5:00 pm, Mondays to Saturdays inclusive;*
> *b. no work is to be undertaken on Sundays and public holidays.*
> *Works may be undertaken outside these hours where:*
> *c. the delivery of materials is required outside these hours by the Police or other authorities;*
> *d. it is required in an emergency to avoid the loss of life, damage to property and/or to*
> *prevent environmental harm;*
> *e. the work is approved through the CEMP; and*
> *f. residents likely to be affected by the works are notified of the timing and duration of these*
> *works as soon as possible.*
> *The proponent is responsible for instructing and controlling contractors and sub-contractors*
> *regarding hours of work.*

4.3 Blast Overpressure and Vibration Criteria

Given the uncertainty of the extent and location of blasting operations, we provide a set of blasting overpressure and vibration criteria, and recommend that a specialist blast overpressure and vibration consultant be involved in producing the blasting plan when the specific need for blasting has been determined. The Australian and New Zealand Environmental Council's *"Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration"* (ANZEC1990) sets the following limits for blasting overpressure and vibration:

- Maximum level for airblast is 115 dB(L). The level of 115 dB(L) may be exceeded on up to 5% of the total number of blasts over a period of 12 months. The level should not exceed 120 dB(L) at any time;
- Maximum for ground vibration is 5 mm/s, PVS vibration velocity. The PVS level of 5 mm/s may be exceeded on up to 5% of the total number of blasts over a period of 12 months. The level should not exceed 10 mm/s at any time.

5.0 RESULTS & CALCULATIONS

5.1 Assumed Noise Source Levels

Noise source levels used in the assessment have been collected from similar previous assessments. A source height of 2.5m has been assumed for all plant. Existing ground levels were obtained in 3D, dxf file format from a Lidar aerial survey completed in February 2010 over the subject site and surrounding parcels of land, which was obtained from Leda. Source levels were assessed above existing ground as a worst case scenario. Measured *"A"* Weight sound pressure dB(A) levels have been converted into Linear sound power dB(L) levels for use in the 3D noise model.

Noise Source	Sound Power Level SWL dB(A)									
	63	125	250	500	1k	2k	4k	8k	dB(A)	dB(L)
Dozer	99	108	106	112	115	116	114	111	121	131
Excavator	80	88	95	100	100	104	98	85	107	112
6WD articulated dump truck (and water truck)	70	77	81	92	96	94	89	84	100	102
Compactor	80	95	105	106	107	105	99	91	112	118
Grader	92	96	100	112	111	110	101	94	116	122
Loader	88	100	96	103	99	96	90	82	107	119

Table 3: Typical noise source levels associated with the operation of a sand quarry.

For each Precinct (i.e. 9 and 11) the PEN3D model includes a dozer and two excavators at the fill winning area which were digitised into the model as point noise sources. The modelling includes 6WD articulated dump trucks (including a water truck) along the length of the haul roads and connecting the winning area to the dumping areas (digitised as line sources). At each dumping area (Central Open Spaces) the PEN3D model includes a compactor (CAT 825G) digitised as point source.

For Precinct 9, as noted in Section 4.2 of this report, blasting overpressure and vibration will need to be assessed once the specific blasting requirements have been determined.

All source levels are assumed to occur at the same time and for the full 15 minute assessment period, which is considered a worst case scenario. All equipment, including haul trucks will not need to leave the subject site to transport material from the winning area to the dump site.

5.2 Modelled Earthworks Activity Noise Impact Levels

5.2.1 Noise Prediction Model

The PEN3D General Prediction Model (GPM) is based on the method contained in the book "Engineering Noise Control - Theory and Practice" by David Bies & Colin H Hansen of the Department of Mechanical Engineering, University Of Adelaide, Publisher Unwin Hyman 1988. Chapter 5.9 Pages 117 to 127 describes the model.

The basic equation adopted by the GPM is: $Lp = Lw - 20 \log10(r) - 10\log10(4\pi) + AE$

Where: Lp is the sound pressure level at an observer
Lw is the sound power level of the source
20 log10r - 10log10(4PI) is the Distance attenuation
AE is the excess attenuation factors and is determined as the sum of the contributions

Refer to Appendix C for a detailed explanation of the Pen3D model and the attenuation factors.

5.2.2 Meteorology

To define the impacts of local winds and the noise environment, the following is a paraphrased extract from the *"Industrial Noise Policy"*, Section 5.0:

> *"When wind near the ground increases its speed it can increase ambient noise levels by rustling foliage and creating turbulence when passing over or around structures. At higher wind speeds, the noise produced by wind will drown out noise from most industrial and transportation sources. A default wind speed of 3 m/s (at 10m height) is proposed for assessing noise impacts caused by gradient winds. This wind speed can noticeably increase noise received down-wind of a noise source, but may not increase ambient noise levels to the point where they mask noise from the source and make it unnoticeable. A 10m wind of 3m/s is also unlikely to be associated with near-surface winds of a strength able to cause increased ambient noise levels that would mask increased levels of noise from the source.*
>
> *Wind is considered to be a feature where source-to-receiver wind speeds (at 10m height) of 3 m/s or below occur for 30 per cent of the time or more in any assessment period (day, evening, night) in any season."*

Wind rose data for both 9am and 3pm was obtained from the Coolangatta weather station (refer to Appendix C of this report for wind rose data sheets). The data indicates that monthly wind does not occur for greater than 30% at or below 3m/s (approximately 10 km/hr) in any direction.

Further, as earthworks activity will operate during the daytime period, temperature inversions have not been assessed.

5.2.3 Predicted Earthwork Activity Nosie Impact Levels

Based upon the location of the proposed earthworks activities in relation to surrounding noise sensitive receivers, we predict the following earthworks noise impact levels as presented in Table 4 (Precinct 9) and Table 5 (Precinct 11) over the page.

For each Precinct we have assessed three fill winning locations (Locations A, B and C which are indicated in Appendix B of this report.

Precinct 9 Earthworks Activity for Central Open Space Area Stage 1

Receiver Location	Noise Criterion dB(A)	Predicted Noise Impact Levels – (Calm Conditions) dB(A)
Earthworks Location A		
R1 Receivers	**48**	42
R2 Receivers		40
R3 Receivers		41
R4 Receivers		50
R5 Receivers		46
R6 Receivers		50
R7 Receivers		47
R8 Receivers		46
R9 Receivers		45
R10 Receivers		44
R11 Receivers		43
R12 Receivers		44
Cobaki Broadwater Village		40

Receiver Location	Noise Criterion dB(A)	Predicted Noise Impact Levels – (Calm Conditions) dB(A)
Earthworks Location B		
R1 Receivers	**48**	39
R2 Receivers		36
R3 Receivers		35
R4 Receivers		49
R5 Receivers		49
R6 Receivers		50
R7 Receivers		47
R8 Receivers		46
R9 Receivers		45
R10 Receivers		44
R11 Receivers		44
R12 Receivers		45
Cobaki Broadwater Village		39

Receiver Location	Noise Criterion dB(A)	Predicted Noise Impact Levels – (Calm Conditions) dB(A)
Earthworks Location C		
R1 Receivers	**48**	41
R2 Receivers		39
R3 Receivers		35
R4 Receivers		41
R5 Receivers		38
R6 Receivers		40
R7 Receivers		36
R8 Receivers		38
R9 Receivers		37
R10 Receivers		36
R11 Receivers		34
R12 Receivers		36
Cobaki Broadwater Village		40

Table 4: Predicted noise impact levels from Precinct 9 earthworks.

The predicted levels assume that the recommended treatments detailed in Section 6 are incorporated into the earthworks activities.

For PEN3D point source calculation results for the three fill winning locations for each Precinct and for noise contours for Location A of each Precinct refer to Appendix C of this report.

Precinct 11 Earthworks Activity for Central Open Space Area Stages 2 and 3

Receiver Location	Noise Criterion dB(A)	Predicted Noise Impact Levels – (Calm Conditions) dB(A)
Earthworks Location A		
R1 Receivers	**48**	41
R2 Receivers		43
R3 Receivers		37
R4 Receivers		49
R5 Receivers		46
R6 Receivers		50
R7 Receivers		47
R8 Receivers		48
R9 Receivers		46
R10 Receivers		46
R11 Receivers		43
R12 Receivers		46
Cobaki Broadwater Village		39

Receiver Location	Noise Criterion dB(A)	Predicted Noise Impact Levels – (Calm Conditions) dB(A)
Earthworks Location B		
R1 Receivers	**48**	40
R2 Receivers		39
R3 Receivers		35
R4 Receivers		44
R5 Receivers		42
R6 Receivers		46
R7 Receivers		40
R8 Receivers		40
R9 Receivers		39
R10 Receivers		39
R11 Receivers		36
R12 Receivers		37
Cobaki Broadwater Village		39

Receiver Location	Noise Criterion dB(A)	Predicted Noise Impact Levels – (Calm Conditions) dB(A)
Earthworks Location C		
R1 Receivers	**48**	41
R2 Receivers		43
R3 Receivers		35
R4 Receivers		50
R5 Receivers		45
R6 Receivers		46
R7 Receivers		41
R8 Receivers		42
R9 Receivers		39
R10 Receivers		39
R11 Receivers		35
R12 Receivers		36
Cobaki Broadwater Village		37

Table 5: Predicted noise impact levels from Precinct 11 earthworks.

The predicted levels assume that the recommended treatments detailed in Section 6 are incorporated into the earthworks activities.

For PEN3D point source calculation results for the three fill winning locations for each Precinct and for noise contours for Location A of each Precinct refer to Appendix C of this report.

6.0 RECOMMENDED ACOUSTIC TREATMENTS

6.1 Recommended Acoustic Management Controls and Treatments for Earthworks Noise

It is recommended that the following acoustic management controls and treatments be applied to the earthworks phases of Precinct 9 (Central Open Space Stage 1) and Precinct 11 (Central Open Space Stages 2 and 3) to minimise noise emissions:

- Where possible earthworks should be undertaken so that a south or southwest working face provides physical screening to the offsite dwellings to the south.
- All earthworks activities should be limited to the time restrictions presented in Section 4.2.
- Vehicles have a modified beeper installed (commonly termed a "croaker", as they sound similar to a frog croak).
- No alarm bells/paging systems should be used. Cordless telephones are a suitable substitute.
- Drivers and workers be instructed to operate plant and equipment in a manner that does not generate unnecessary noise, through avoiding excessive revving, and avoidance of impact with solid objects.
- All plant be maintained in good condition; with all reasonable and feasible acoustic treatments (i.e. residential mufflers and plant enclosures) installed and maintained (refer to AS 2436 – 1981 "*Guide to noise control on construction, maintenance and demolition sites*").
- Siting of equipment - locating noisy equipment as far away from noise sensitive dwellings to the south as is practical, distance separation will reduce potential noise impacts.
- Truck unloading be conducted away from the nearest offsite southern dwellings where possible.
- Plant/equipment which tends to discharge noise in a certain direction should be orientated away from the nearest offsite dwellings to the south.
- Plant/equipment should be turned off when not in use or throttled down to a minimum.
- Assign the task of managing noise emissions to a person (the *'responsible person'*) that is contactable at all times and is likely to be present onsite most of the time that activity is occurring. This person would be responsible for handling noise complaints sensitively, and ensuring that work does not commence before the times specified. The *'responsible person'* should maintain a Noise Complaint Record (example provided in Appendix C of this report).
- The *'responsible person'* should also conduct regular observations of noise from the earthworks activities. Should any noise sources be identified as being able to be practically relocated further away from the southern offsite dwelling, the *'responsible person'* should undertake to have the source relocated.
- Providing local residents (the noise sensitive receivers indicate within Figure 2 of this report) with an indicative schedule of the works program, in particular, a clear notification of the times when new or noisy activities are to be conducted. This notification should also include contact details of the *'responsible person'* should residents wish to discuss the onsite activity.
- If complaints arise regarding noise, the complaint will be directed to the *'responsible person'*, who will determine the source of the noise, and take immediate steps to mitigate the noise. This may involve moving the noise source further away from affected premises, replacing the equipment, apply earth mounds / berms where possible or in some cases, engaging a qualified acoustic consultant to provide specialist control advice.

6.2 Recommended Blasting Management Controls

Upon determination of the location, extent, type and frequency of blasting requirements, a specialist blast overpressure and vibration consultant should be engaged to produce a blasting plan. The aim of this plan should be to comply with The Australian and New Zealand Environmental Council's *"Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration"* (ANZEC1990).

7.0 DISCUSSION

The proposal is to obtain a Section 75W approval for the winning of fill material from Precinct 9 and Precinct 11 sufficient to complete the bulk earthworks in the Central Open Space of the Cobaki Development, Cobaki.

In-situ material will initially be ripped and heaped with a dozer and assisted by an excavator. Once heaps are created, excavators will be perched on top of the heaps and load 6WD dump trucks. The fill material will be dumped at the Central Open Space areas and then spread and compacted with a 32t bladed double drum sheep's foot compactor.

For each Precinct (i.e. 9 and 11) the PEN3D model has included a dozer and two excavators at the fill winning area (as point noise sources); 6WD articulated dump trucks (including a water truck) along the length of the haul roads (as line sources); and at each dumping area (Central Open Space areas) a compactor as a point source.

Based upon the three assessed earthworks winning locations (Locations A, B and C) for both Precinct 9 and Precinct 11, predicted noise impacts at the nearest assessed offsite noise sensitive receiver locations are within 2 dB of the adopted external noise criterion of 48 dB(A). It is noted that as the average person cannot typically detect a 3 dB variation in sound pressure level, a 2 dB rise is unlikely to be detectable and is typically considered an acceptable outcome.

Further, the noise criterion has been sourced from the Department of Environment and Climate Change NSW (DECC) "*Interim Construction Noise Guideline*". It is noted that the Guideline is not mandatory but *"specifies noise management levels that guide the need to apply work practices to minimise noise impacts"*.

To minimise the potential for annoyance we have recommended the limitation of hours of operation (7am to 6pm Monday to Saturday and 7am to 5pm, no work on Sundays or public holidays), application of south or southwest working faces and earth mounds / berms (where possible) and implementation of best practice work methods such as:

- Maintaining equipment;
- Use of residential mufflers and modified beepers;
- Locating equipment as far as possible from offsite receivers;
- Turning off equipment when not in use;
- Training personal to be considerate of offsite residents; and
- Assigning a *'responsible person'* to oversee noise emissions and handle noise complaints should they arise.

For construction and earthworks activities, the key to managing noise impacts is to ensure that all practical steps are taken to minimise noise from the site – if the nearby residents are aware that the developer is mindful of noise impacting upon their premises, they will tend to be less annoyed than if they feel no regard is made as to their amenity. Good communication is an important factor in managing noise from the site, as a good relationship between the developer and the residents will further ensure that should an issue arise, it can be dealt with in a reasonable manner.

It is also noted that noise impact levels at individual properties will vary from day to day depending on the location of earthworks activities and the type of works being undertaken.

Overall, the noise impacts if managed properly should not cause complaints. The key in avoiding complaints is good communication with neighbours, and managing onsite activities where possible to minimise impacts upon people.

Further, as recommended, it would be advantageous to keep surrounding residents abreast of the works progress; and give prior notice of any activities which may cause unexpected noise intrusion. In the unlikely event of a noise complaint, the complaint must be dealt with sensitively and respectfully, with the noise abated as soon as possible.

As a final note, in-situ material in a portion of Precinct 9 is classified as very hard Greywacke rock, which will require blasting. At this stage, the location of blasting and the amount of blasting is unknown. Therefore, given the uncertainty of blasting requirements, we have provided a set of blasting overpressure and vibration criteria, and recommend that a specialist consultant be involved in producing the blasting plan when the specific need for blasting has been determined.

8.0 CONCLUSIONS

This report is in response to a request by Leda Developments Pty Ltd for an environmental noise impact assessment to obtain a Section 75W approval for the winning of fill material from Precinct 9 and Precinct 11 sufficient to complete the bulk earthworks in the Central Open Space of the Cobaki Development, Cobaki.

Based upon the adopted noise limit criterion, overall, the proposed earthworks activities will generally be within acceptable levels of Council's requirements, subject to the acoustic management controls and treatments recommended in Section 6 being integrated into the earthworks operations.

Report Reviewed By:

JAY CARTER BSc
Director

Report Compiled by:

Matthew Lopez BEng
Consultant

APPENDIX A

Subject Site, Noise Sensitive Receivers and Noise Monitoring Locations

Figure 1: Subject Site and Nosie Monitoring Locations (http://maps.six.nsw.gov.au/).

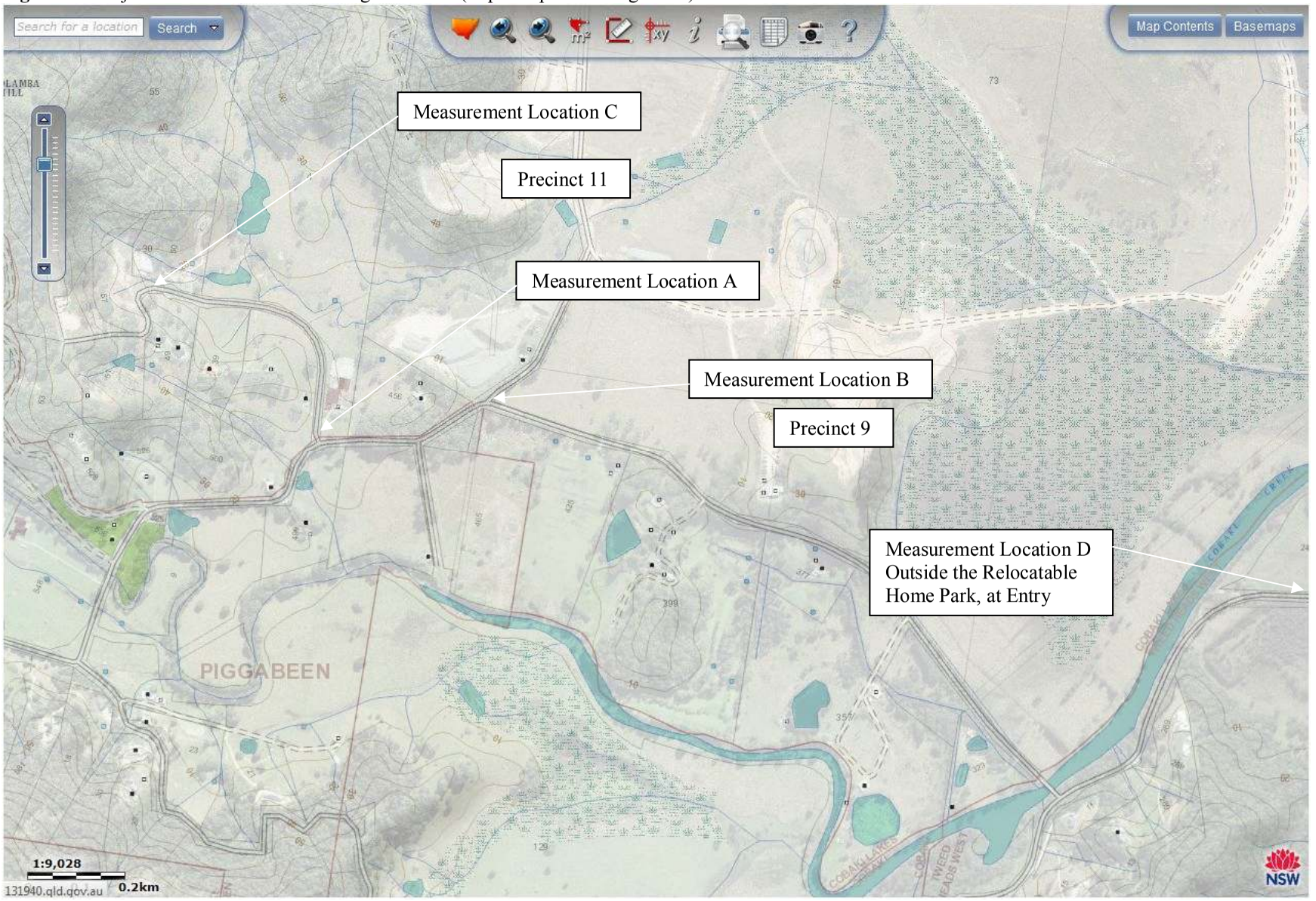
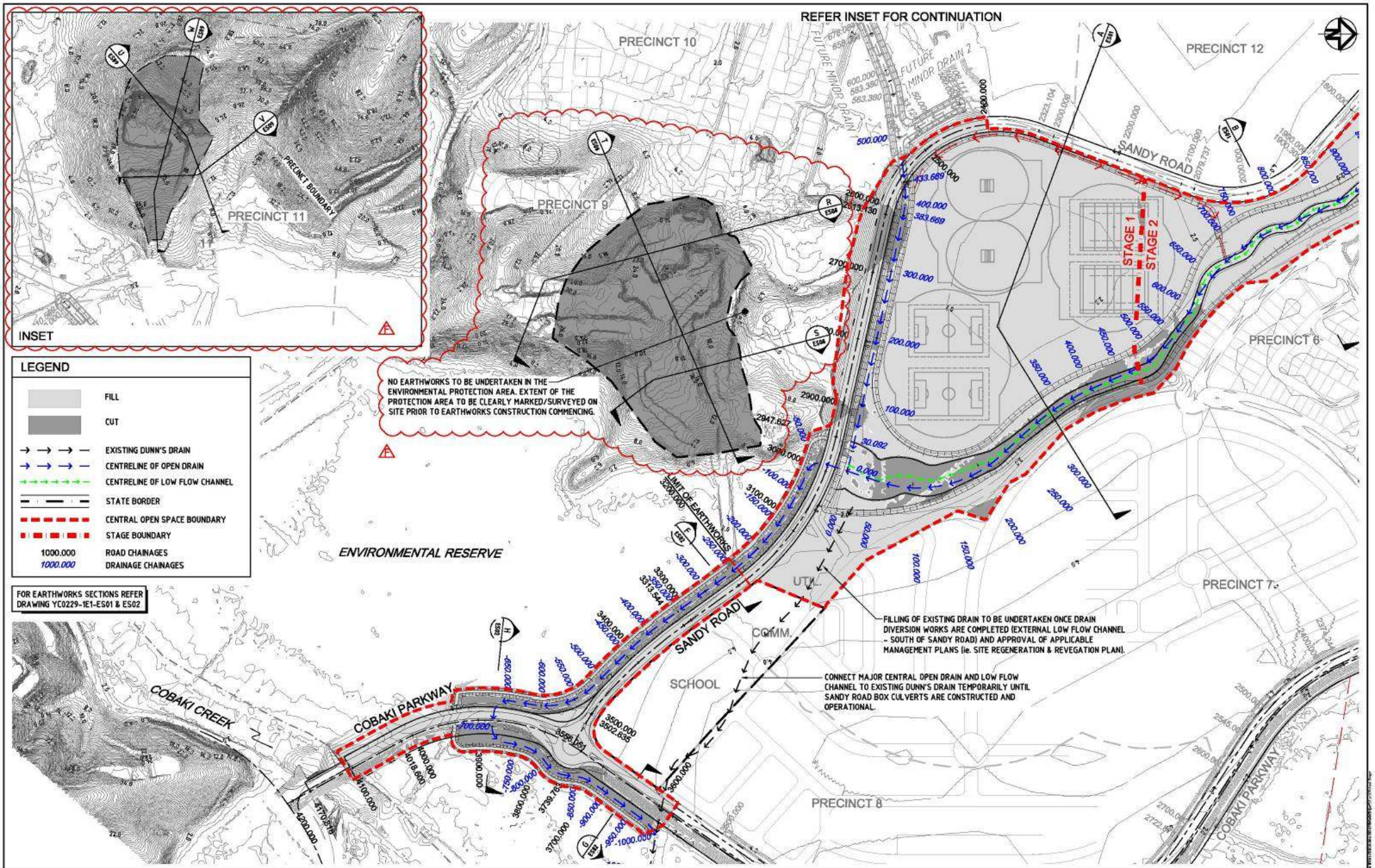


Figure 2: Subject Site and Surrounding Noise Sensitive Receivers (http://maps.six.nsw.gov.au/).

APPENDIX B

Earthworks Plans



STATUS	CONSTRUCTION CERTIFICATE	FOR APPROVAL	
F	PRECINCT 9 AND PRECINCT 11 BORROW AREAS ADDED	M.B.	11.12.13
E	MINOR OPEN DRAIN 5 ADDED TO DRAWING SET	T.W.	02.10.13
D	BULK EARTHWORKS CONSTRUCTION CERTIFICATE	M.G.	15.02.13
C	RESPONSE TO 3rd PARTY SWMP REVIEW	H.W.	18.10.12
B	RESPONSE TO TSC REQUEST FOR INFORMATION (RFI)	H.W.	04.05.12
A	ORIGINAL ISSUE	G.S.	18.03.11
REV	DESCRIPTION	DRAWN	DATE

DRAWING IS NOT TO BE SCALED

SCALE (AT ORIGINAL SHEET SIZE) 50 0 50 100 1:2500

ORIGINAL SHEET SIZE A1

CLIENT
LEDA MANORSTEAD Pty Ltd

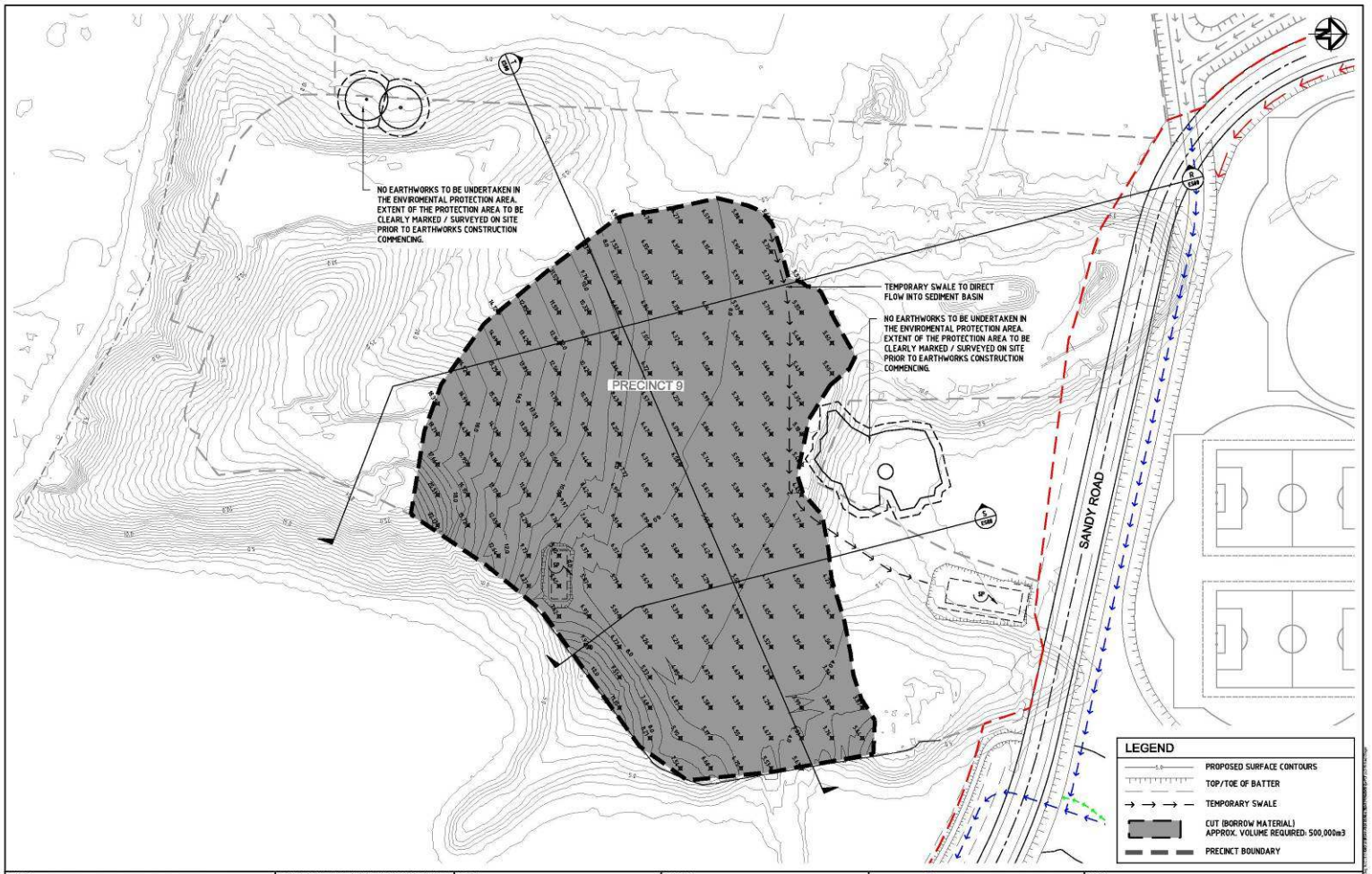
LEDA

PROJECT
COBAKI, TWEED HEADS WEST
CENTRAL OPEN SPACE
BULK EARTHWORKS
CONSTRUCTION CERTIFICATE
CIVIL ENGINEERING DRAWINGS

SEDGMAN YEATS
LEVEL 1, 193 FERRY ROAD SOUTHPORT QLD 4215 AUSTRALIA
T 07 5554 4299 F 07 5563 1672 info@yeats.com.au www.yeats.com.au

TITLE
BULK EARTHWORKS CUT & FILL PLAN
SHEET 1 OF 2

TASK	BY	INITIAL	DATE	APPROVED	RPEQ No	7817
REVIEW	CS		18.03.11	DRAWING NUMBER		REVISION
DESIGN	CJE		18.03.11	YC0229-1E1-EC01		F
DRAWN	GS		18.03.11			



STATUS	CONSTRUCTION CERTIFICATE	FOR APPROVAL
A	ORIGINAL ISSUE	G.S. 11.12.13
REV	DESCRIPTION	DRAWN DATE

DRAWING IS NOT TO BE SCALED

SCALE (AT ORIGINAL SHEET SIZE) — SCALE 10 0 10 20 30 40 50 1:1000

ORIGINAL SHEET SIZE: A1

CLIENT: LEDA MANORSTEAD Pty Ltd

PROJECT: COBAKI, TWEED HEADS WEST
CENTRAL OPEN SPACE
BULK EARTHWORKS
CONSTRUCTION CERTIFICATE
CIVIL ENGINEERING DRAWINGS

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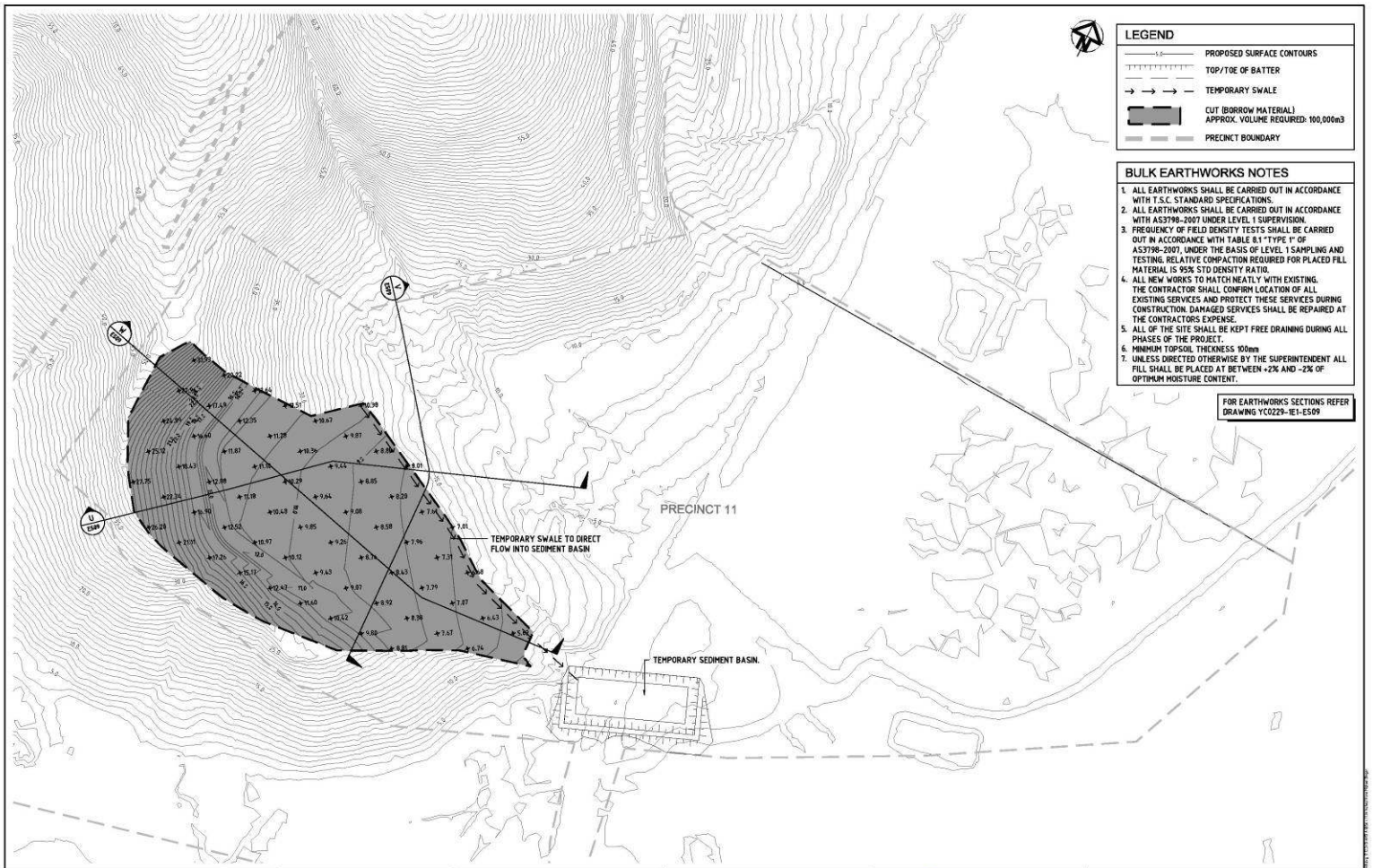
TITLE: PRECINCT 9
BORROW AREA EARTHWORKS PLAN

TASK	BY	INITIAL	DATE	APPROVED	RPEQ No 7817
REVIEW	CS		11.12.13	DRAWING NUMBER	REVISION
DESIGN	CJE		11.12.13	YC0229-1E1-EW13	A
DRAWN	GS		11.12.13		



BULK EARTHWORKS NOTES

1. ALL EARTHWORKS SHALL BE CARRIED OUT IN ACCORDANCE WITH T.S.C. STANDARD SPECIFICATIONS.
2. ALL EARTHWORKS SHALL BE CARRIED OUT IN ACCORDANCE WITH AS3798-2007 UNDER LEVEL 1 SUPERVISION.
3. FREQUENCY OF FIELD DENSITY TESTS SHALL BE CARRIED OUT IN ACCORDANCE WITH TABLE 8.1 "TYPE 1" OF AS3798-2007, UNDER THE BASIS OF LEVEL 1 SAMPLING AND TESTING. RELATIVE COMPACTION REQUIRED FOR PLACED FILL MATERIAL IS 95% STD DENSITY RATIO.
4. ALL NEW WORKS TO MATCH NEATLY WITH EXISTING. THE CONTRACTOR SHALL CONFIRM LOCATION OF ALL EXISTING SERVICES AND PROTECT THESE SERVICES DURING CONSTRUCTION. DAMAGED SERVICES SHALL BE REPAIRED AT THE CONTRACTORS EXPENSE.
5. ALL OF THE SITE SHALL BE KEPT FREE DRAINING DURING ALL PHASES OF THE PROJECT.
6. MINIMUM TOPSOIL THICKNESS 100mm
7. UNLESS DIRECTED OTHERWISE BY THE SUPERINTENDENT ALL FILL SHALL BE PLACED AT BETWEEN +2% AND -2% OF OPTIMUM MOISTURE CONTENT.

FOR EARTHWORKS SECTIONS REFER DRAWING YC0229-1E1-ES09

STATUS	CONSTRUCTION CERTIFICATE	FOR APPROVAL
A	ORIGINAL ISSUE	G.S. 11.12.13
REV	DESCRIPTION	DRAWN DATE

DRAWING IS NOT TO BE SCALED

SCALE (AT ORIGINAL SHEET SIZE) — SCALE 10 0 10 20 30 40 50 1:1000

ORIGINAL SHEET SIZE: A1

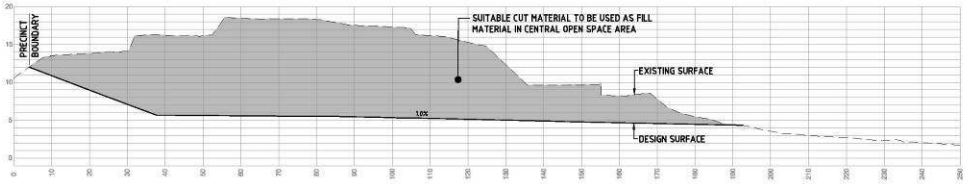
CLIENT: LEDA MANORSTEAD Pty Ltd

PROJECT: COBAKI, TWEED HEADS WEST
CENTRAL OPEN SPACE
BULK EARTHWORKS
CONSTRUCTION CERTIFICATE
CIVIL ENGINEERING DRAWINGS

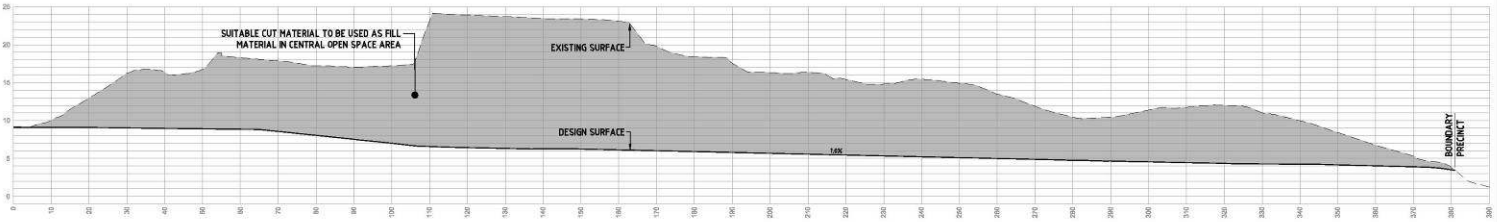
SEDGMAN YEATS
LEVEL 1, 193 FERRY ROAD SOUTHPORT QLD 4215 AUSTRALIA
T 07 5556 4288 F 07 5563 1672 info@yeats.com.au www.yeats.com.au

TITLE: PRECINCT 11
BORROW AREA EARTHWORKS PLAN

TASK	BY	INITIAL	DATE	APPROVED	RPEQ No 7817
REVIEW	CS		11.12.13	DRAWING NUMBER	REVISION
DESIGN	CJE		11.12.13	YC0229-1E1-EW14	A
DRAWN	GS		11.12.13		



SECTION S
SCALE 1:500 h
SCALE 1:250 v



SECTION T
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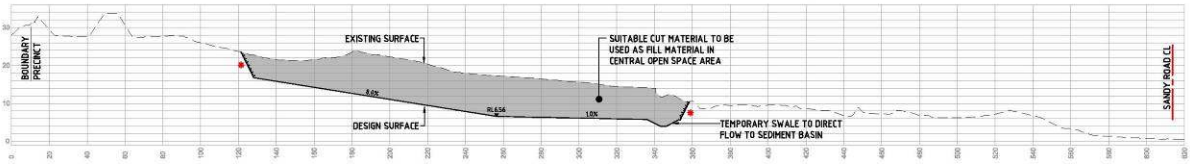


SECTION R
SCALE 1:1000 h
SCALE 1:500 v

NOTE

✱ CONTRACTOR TO APPLY A TEMPORARY 1 in 2 BATTER AT THIS LOCATION DURING BULK EARTHWORKS PHASE. LANDFORMING OF FUTURE EARTHWORKS IS TO BE UNDERTAKEN AS PART OF FUTURE WORKS OF PRECINCT 11 AND SHALL NOT BE INCLUDED IN THE BORROW AREAS FOR THE CENTRAL OPEN SPACE.

LEGEND

- FINAL DESIGN SURFACE
- EXISTING DESIGN SURFACE
- ✱ TEMPORARY 1 in 2 BATTER
- CUT (BORROW MATERIAL)

STATUS	CONSTRUCTION CERTIFICATE	FOR APPROVAL
A	ORIGINAL ISSUE	G.S. 11.12.13
REV	DESCRIPTION	DRAWN DATE

SCALE (AT ORIGINAL SHEET SIZE): AS SHOWN
ORIGINAL SHEET SIZE: A1

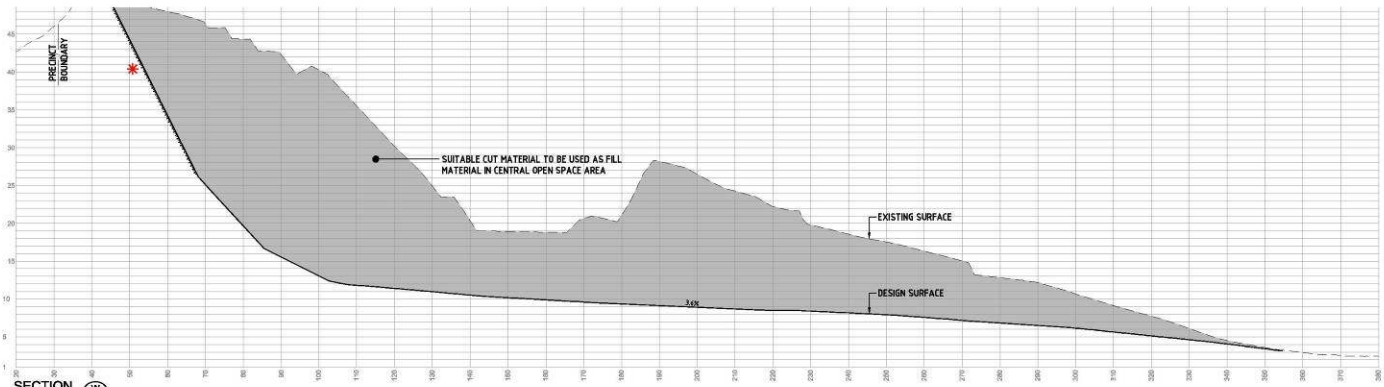
CLIENT: LEDA MANORSTEAD Pty Ltd

PROJECT: COBAKI, TWEED HEADS WEST
CENTRAL OPEN SPACE
BULK EARTHWORKS
CONSTRUCTION CERTIFICATE
CIVIL ENGINEERING DRAWINGS

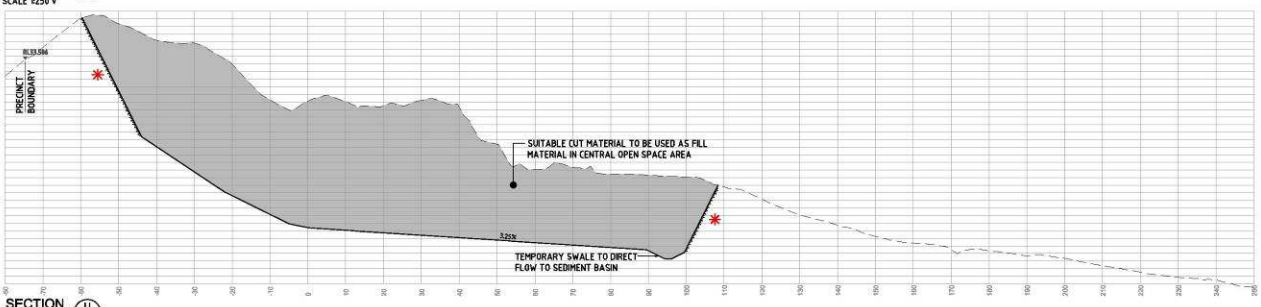
SEDGMAN YEATS
LEVEL 1, 169 FERRY ROAD SOUTHPORT QLD 4215 AUSTRALIA
T 07 5594 4288 F 07 5563 9172 info@yeatscom.au www.yeatscom.au

TITLE: PRECINCT 9
BORROW AREA EARTHWORKS SECTIONS

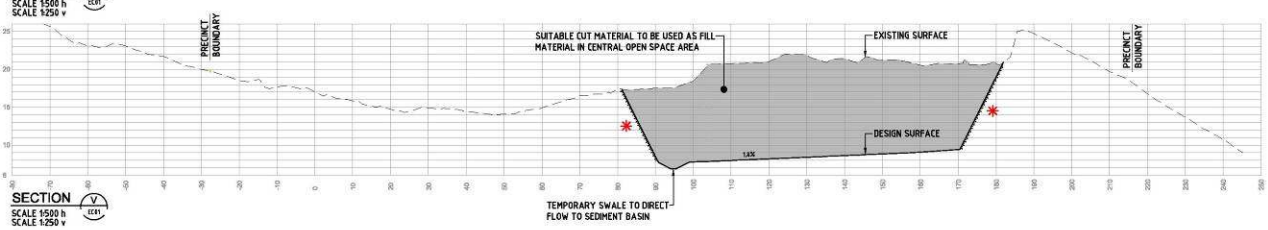
TASK	BY	INITIAL	DATE	APPROVED	RPEQ No 7817
REVIEW	CS		11.12.13		
DESIGN	MB		11.12.13	DRAWING NUMBER	REVISION
DRAWN	GS		11.12.13	YC0229-1E1-ES08	A



SECTION W
SCALE 1:500 h
SCALE 1:250 v



SECTION U
SCALE 1:500 h
SCALE 1:250 v



SECTION V
SCALE 1:500 h
SCALE 1:250 v

NOTE

✱ CONTRACTOR TO APPLY A TEMPORARY 1 in 2 BATTER AT THIS LOCATION DURING BULK EARTHWORKS PHASE. LANDFORMING OF FUTURE EARTHWORKS IS TO BE UNDERTAKEN AS PART OF FUTURE WORKS OF PRECINCT 11 AND SHALL NOT BE INCLUDED IN THE BORROW AREAS FOR THE CENTRAL OPEN SPACE.

LEGEND

- FINAL DESIGN SURFACE
- EXISTING DESIGN SURFACE
- ✱ TEMPORARY 1 in 2 BATTER
- CUT (BORROW MATERIAL)

STATUS	CONSTRUCTION CERTIFICATE	FOR APPROVAL
A	ORIGINAL ISSUE	G.S. 11.12.13
REV	DESCRIPTION	DRAWN DATE

SCALE (AT ORIGINAL SHEET SIZE): AS SHOWN
ORIGINAL SHEET SIZE: A1

CLIENT: LEDA MANORSTEAD Pty Ltd

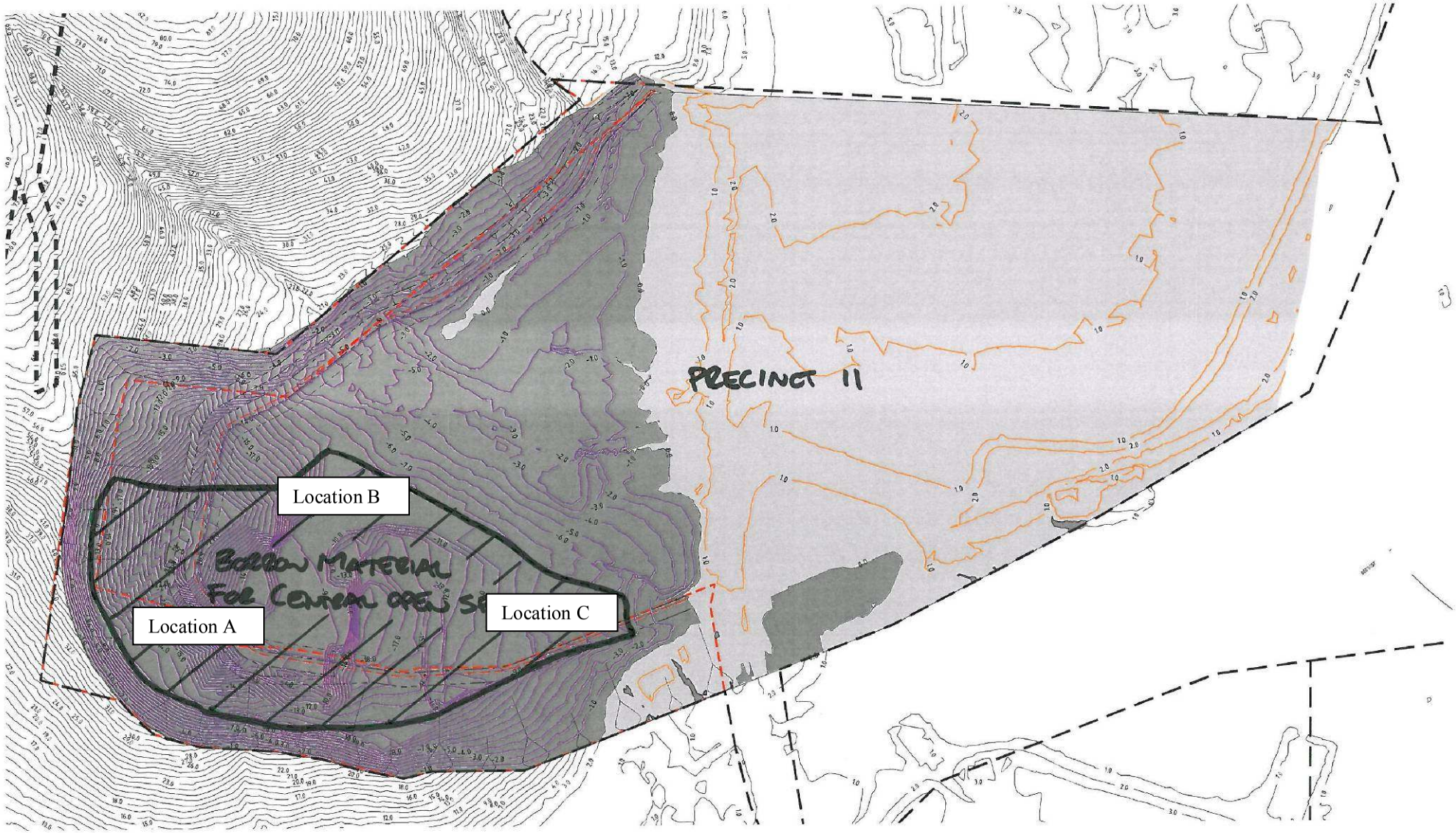
PROJECT: COBAKI, TWEED HEADS WEST
CENTRAL OPEN SPACE
BULK EARTHWORKS
CONSTRUCTION CERTIFICATE
CIVIL ENGINEERING DRAWINGS

SEDGMAN YEATS
LEVEL 1, 169 FERRY ROAD SOUTHPORT QLD 4215 AUSTRALIA
T 07 5594 4288 F 07 5563 9172 info@yeatscom.au www.yeatscom.au

TITLE: PRECINCT 11 BORROW AREA
EARTHWORKS SECTIONS

TASK	BY	INITIAL	DATE	APPROVED	RPEQ No 7817
REVIEW	CS		11.12.13		
DESIGN	CJE		11.12.13	DRAWING NUMBER	REVISION
DRAWN	GS		11.12.13	YC0229-1E1-ES09	A


Location A
Location B
Location C
PRECINCT 9
PRECINCT 9
BORROW MATERIAL
FOR CENTRAL OPEN SPACE


PRECINCT 11
Location B
Location A
Location C

APPENDIX C

Wind Rose Data, Noise Model Calculations / Predictions and Noise Complaint Register

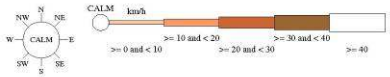
Rose of Wind direction versus Wind speed in km/h (01 Dec 1991 to 30 Sep 2010)

Custom times selected, refer to attached note for details

COOLANGATTA

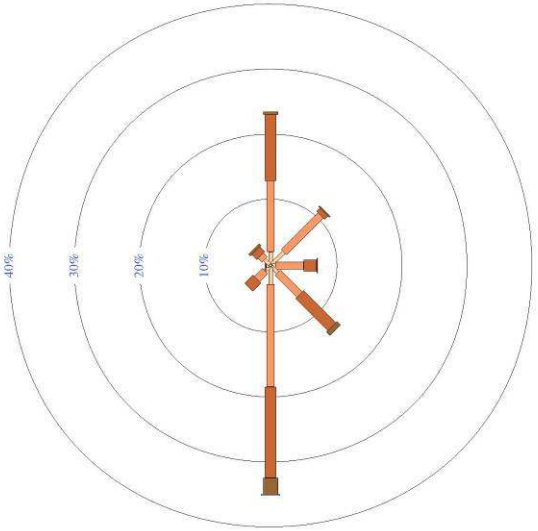
Site No: 040717 • Opened Jan 1982 • Still Open • Latitude: -28.1681° • Longitude: 153.5053° • Elevation 4m

An asterisk (*) indicates that calm is less than 0.5%.
Other important info about this analysis is available in the accompanying notes.



9 am Jan
559 Total Observations

Calm 1%



Rose of Wind direction versus Wind speed in km/h (01 Dec 1991 to 30 Sep 2010)

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COOLANGATTA

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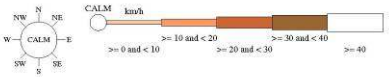
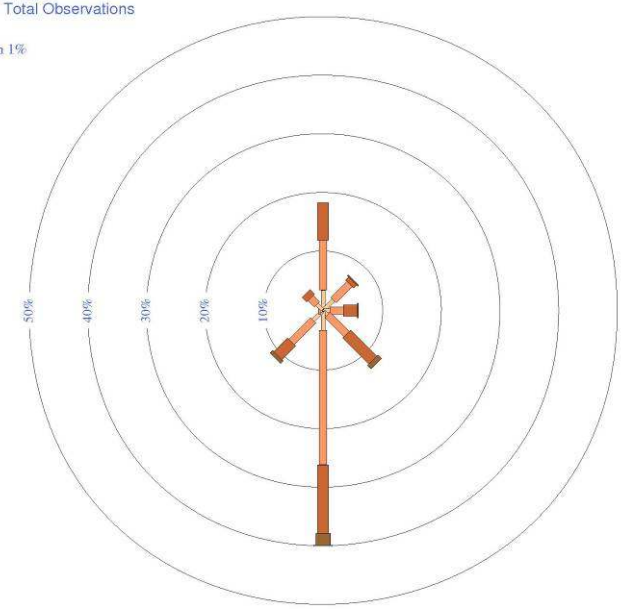


9 am Feb
501 Total Observations

Calm 1%



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Rose of Wind direction versus Wind speed in km/h (01 Dec 1991 to 30 Sep 2010)

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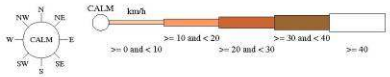
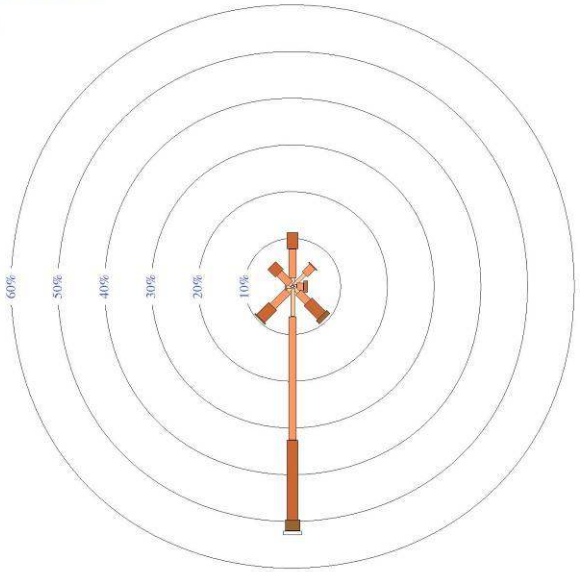


9 am Mar
572 Total Observations

Calm 1%



Rose of Wind direction versus Wind speed in km/h (01 Dec 1991 to 30 Sep 2010)

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COOLANGATTA

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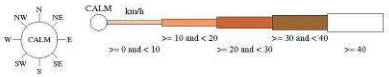
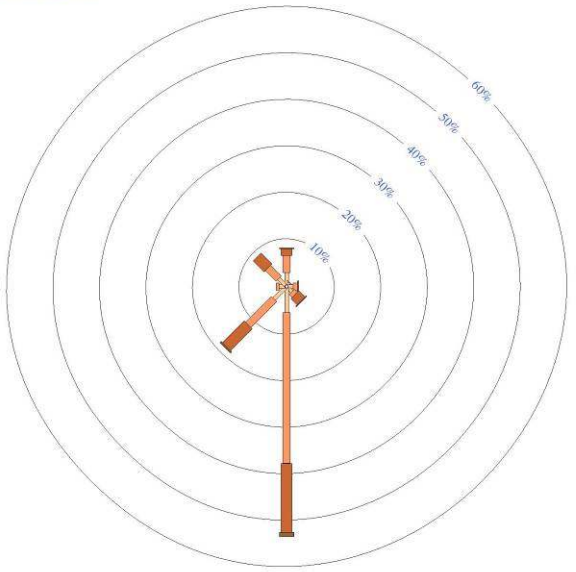


9 am Apr
564 Total Observations

Calm 2%



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Rose of Wind direction versus Wind speed in km/h (01 Dec 1991 to 30 Sep 2010)

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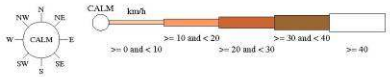
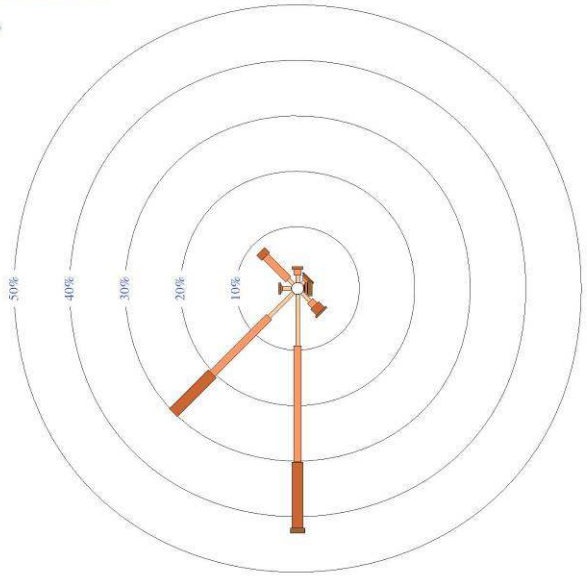


9 am May
581 Total Observations

Calm 5%



Rose of Wind direction versus Wind speed in km/h (01 Dec 1991 to 30 Sep 2010)

Custom times selected, refer to attached note for details

COOLANGATTA

Site No: 040717 • Opened Jan 1982 • Still Open • Latitude: -28.1681° • Longitude: 153.5053° • Elevation 4m

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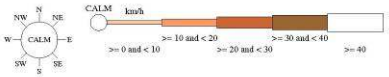
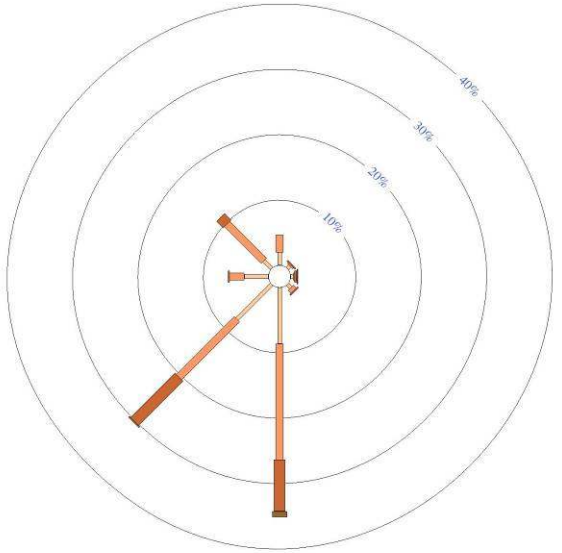


9 am Jun
563 Total Observations

Calm 9%



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Rose of Wind direction versus Wind speed in km/h (01 Dec 1991 to 30 Sep 2010)

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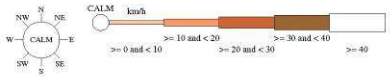
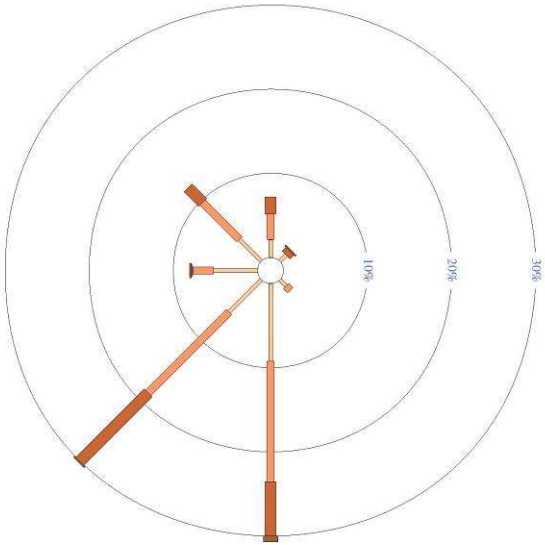


9 am Jul
574 Total Observations

Calm 8%



Rose of Wind direction versus Wind speed in km/h (01 Dec 1991 to 30 Sep 2010)

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COOLANGATTA

Site No: 040717 • Opened Jan 1982 • Still Open • Latitude: -28.1681° • Longitude: 153.5053° • Elevation 4m

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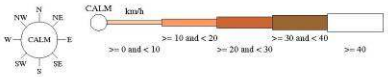
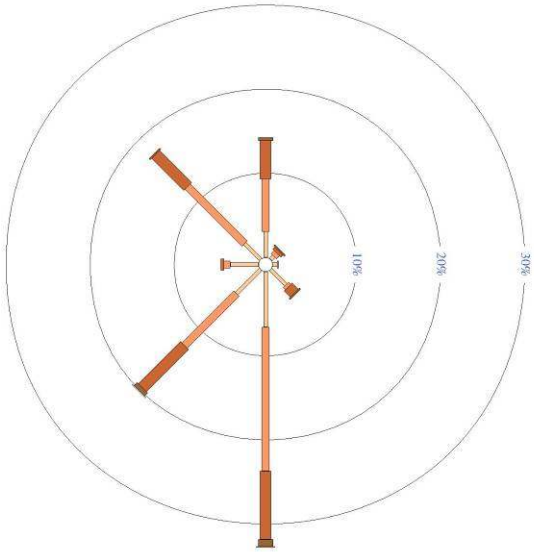


9 am Aug
585 Total Observations

Calm 4%



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Rose of Wind direction versus Wind speed in km/h (01 Dec 1991 to 30 Sep 2010)

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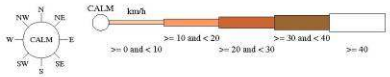
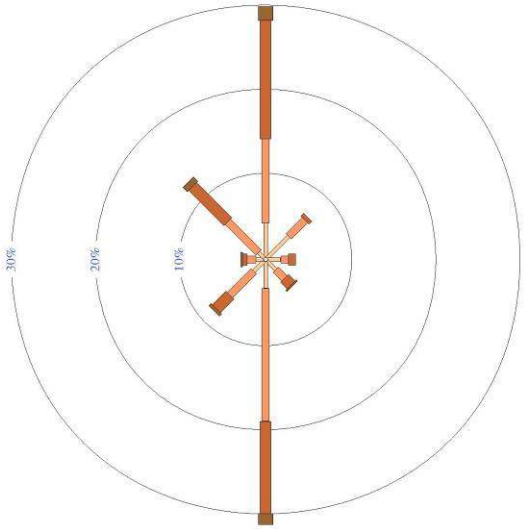


9 am Sep
551 Total Observations

Calm 1%



Rose of Wind direction versus Wind speed in km/h (01 Dec 1991 to 30 Sep 2010)

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COOLANGATTA

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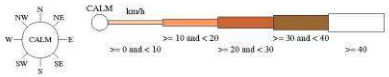
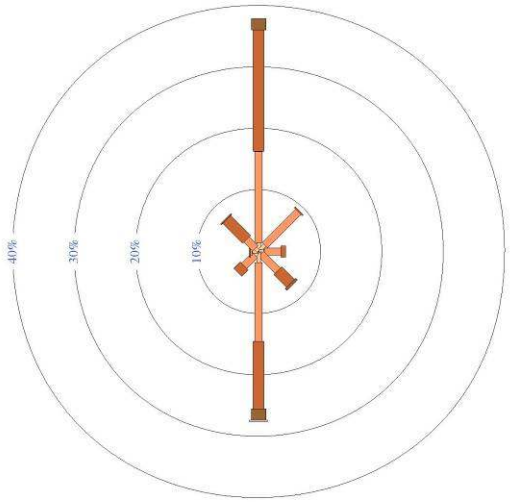


9 am Oct
547 Total Observations

Calm *



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Rose of Wind direction versus Wind speed in km/h (01 Dec 1991 to 30 Sep 2010)

Custom times selected, refer to attached note for details

COOLANGATTA

Site No: 040717 • Opened Jan 1982 • Still Open • Latitude: -28.1681° • Longitude: 153.5053° • Elevation 4m

An asterisk (*) indicates that calm is less than 0.5%.
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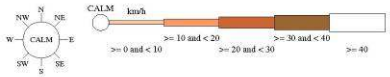
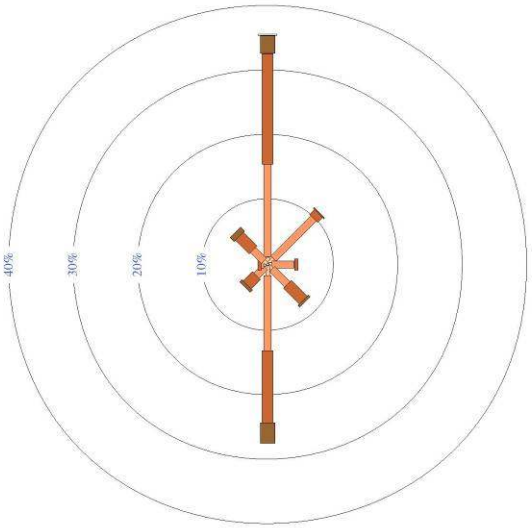


9 am Nov
522 Total Observations

Calm 1%



Rose of Wind direction versus Wind speed in km/h (01 Dec 1991 to 30 Sep 2010)

Custom times selected, refer to attached note for details

COOLANGATTA

Site No: 040717 • Opened Jan 1982 • Still Open • Latitude: -28.1681° • Longitude: 153.5053° • Elevation 4m

An asterisk (*) indicates that calm is less than 0.5%.
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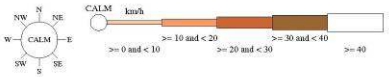
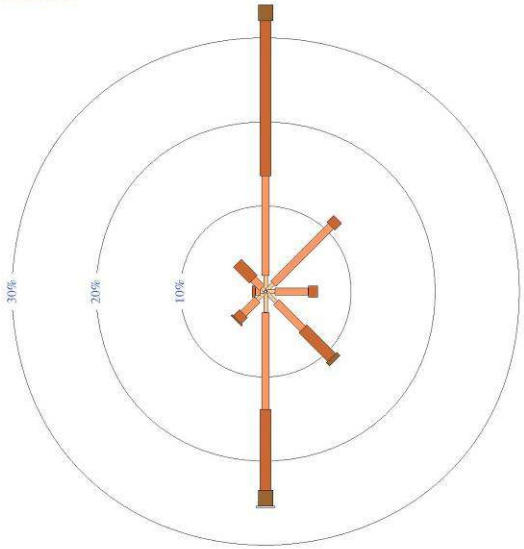


9 am Dec
583 Total Observations

Calm 1%



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TCZMONTH Page 1

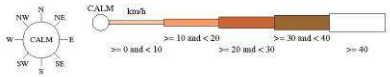
Rose of Wind direction versus Wind speed in km/h (01 Dec 1991 to 30 Sep 2010)

Custom times selected, refer to attached note for details

COOLANGATTA

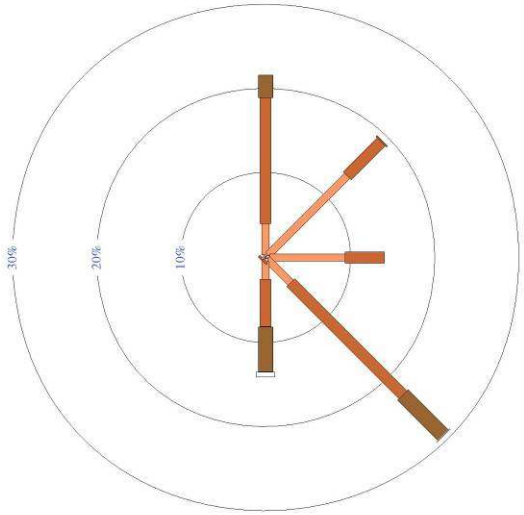
Site No: 040717 • Opened Jan 1982 • Still Open • Latitude: -28.1681° • Longitude: 153.5053° • Elevation 4m

An asterisk (*) indicates that calm is less than 0.5%.
Other important info about this analysis is available in the accompanying notes.



3 pm Jan
562 Total Observations

Calm *



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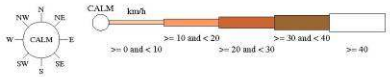
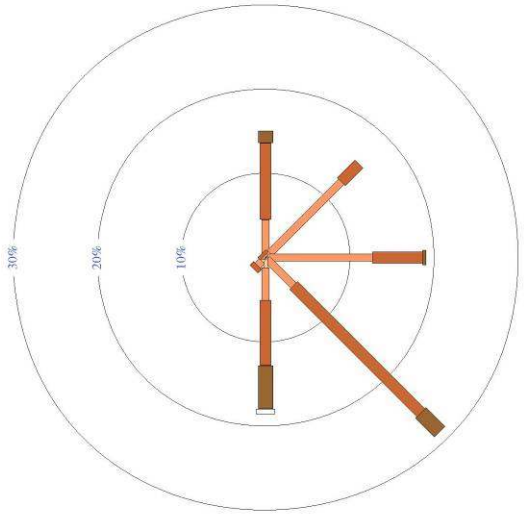


3 pm Feb
505 Total Observations

Calm *



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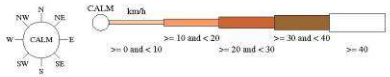
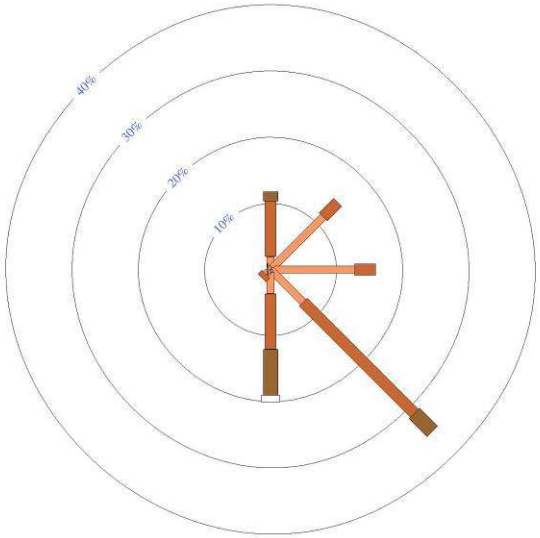


3 pm Mar
576 Total Observations

Calm *



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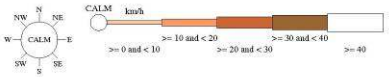
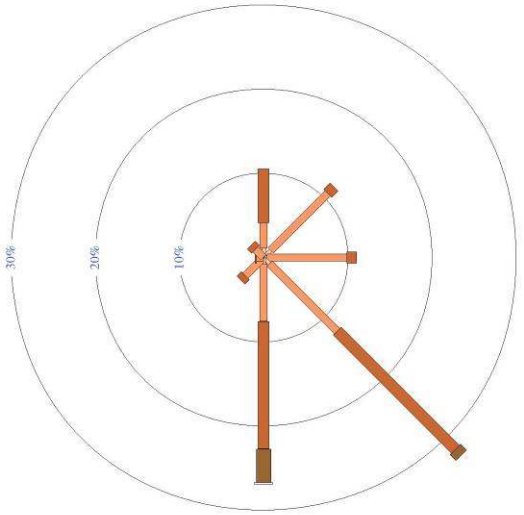


3 pm Apr
564 Total Observations

Calm *



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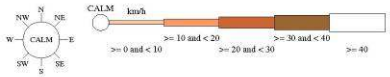
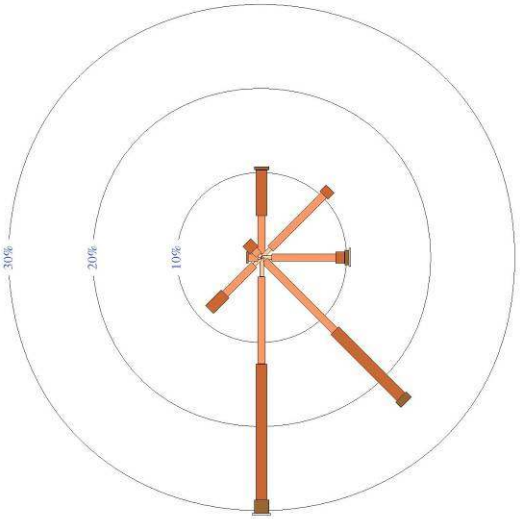


3 pm May
575 Total Observations

Calm *



Rose of Wind direction versus Wind speed in km/h (01 Dec 1991 to 30 Sep 2010)

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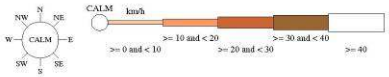
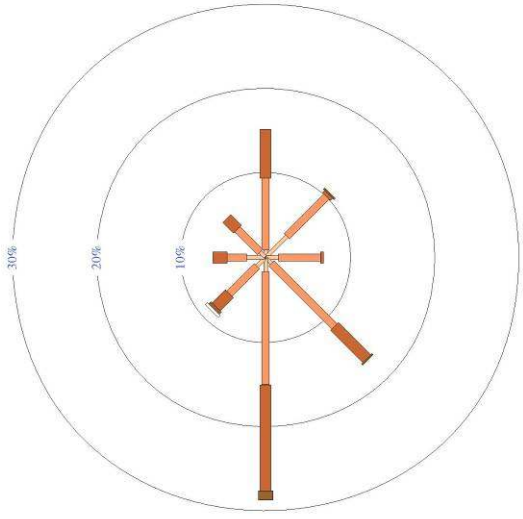


3 pm Jun
563 Total Observations

Calm *



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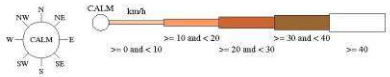
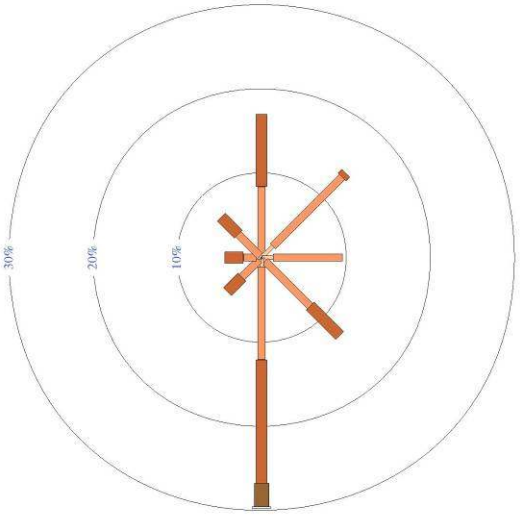


3 pm Jul
576 Total Observations

Calm *



Rose of Wind direction versus Wind speed in km/h (01 Dec 1991 to 30 Sep 2010)

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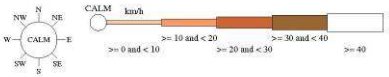
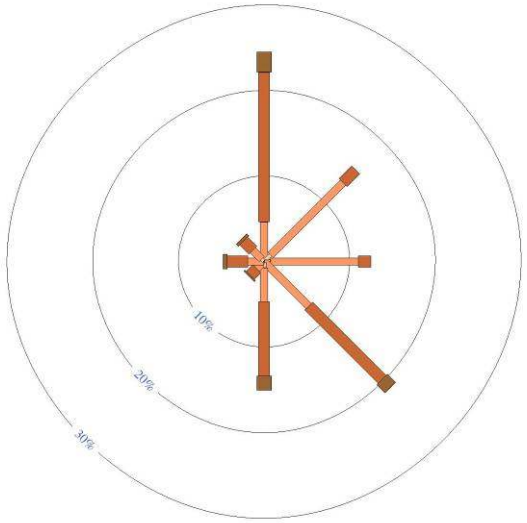


3 pm Aug
585 Total Observations

Calm *



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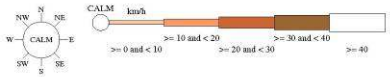
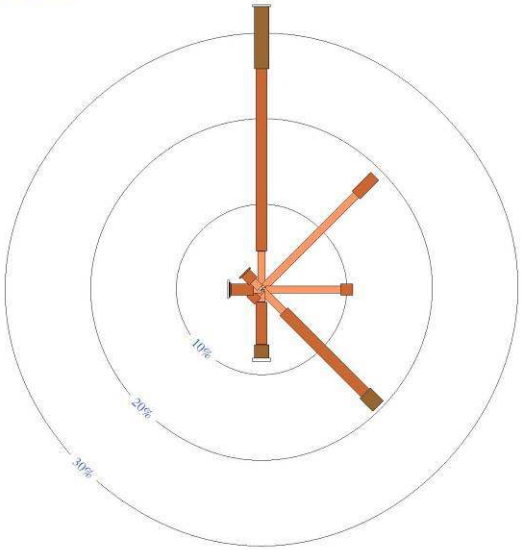


3 pm Sep
556 Total Observations

Calm *



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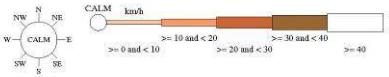
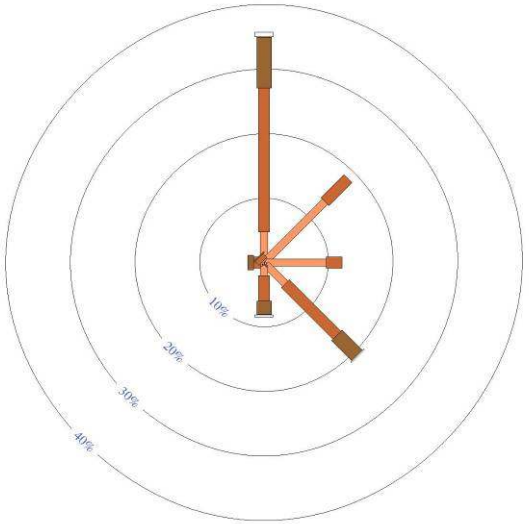


3 pm Oct
549 Total Observations

Calm *



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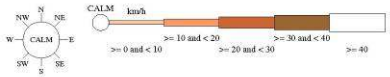
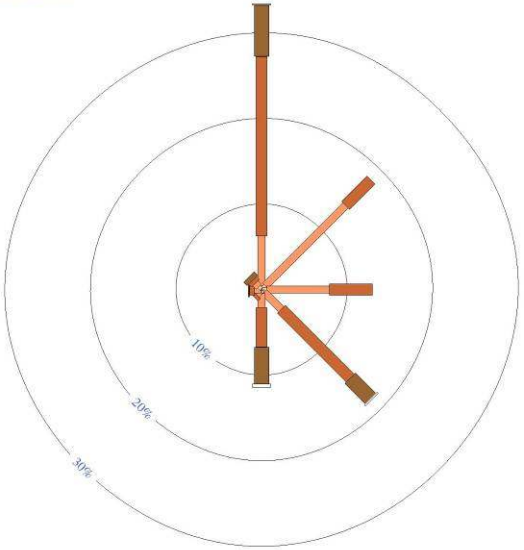


3 pm Nov
527 Total Observations

Calm *



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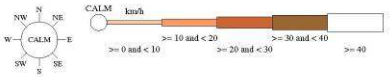
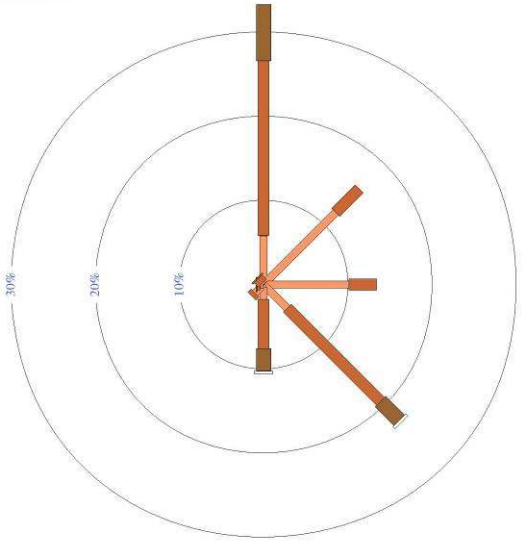


3 pm Dec
584 Total Observations

Calm *



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TCZMONTH Page 1

Pen3D Model Explanation:

The PEN3D General Prediction Model (GPM) is based on the method contained in the book "Engineering Noise Control - Theory and Practice" by David Bies & Colin H Hansen of the Department of Mechanical Engineering, University Of Adelaide, Publisher Unwin Hyman 1988. Chapter 5.9 Pages 117 to 127 describes the model.

The PEN3D software was originally developed in 1993 and has been in constant development and review.

The basic equation adopted by the GPM is:

$$Lp = Lw - 20 \log10(r) - 10\log10(4\pi) + AE$$

Where

Lp is the sound pressure level at an observer
Lw is the sound power level of the source
20 log10r - 10log10(4PI) is the Distance attenuation
AE is the excess attenuation factors and is determined as the sum of the contributions

The excess attenuation factors AE comprise

$$AE = Aa + Ag + Am + Ab + Af$$

Where

Aa = Excess attenuation due to air absorption
Ag = Excess attenuation due to ground reflection
Am = Excess attenuation due to meteorological effects
Ab = Excess attenuation due to barriers; and
Af = Excess attenuation due to forests

The following sections describe the excess attenuation factors and the implementation within PEN3D.

Air Absorption Excess Attenuation

Aa, the attenuation due to air absorption is dependent upon temperature and relative humidity. The values used in the PEN noise model are based on Sutherlan, LC JF Piercy, H.E. Bass & L.B. Evans 1974. Method for calculating the absorption of sound by the atmosphere. Journal of the Acoustical Society of America 56, Supplement 1 (abstract).

$$Aa = m\ r$$

where

m is the absorption per m; and
r is the actual distance from source to receiver

Ground Reflection Excess Attenuation

Ag, The excess attenuation due to ground reflection is obtained by combining the direct wave and the reflected wave incoherently, that is the energy from the ground wave is added to the direct wave.

$$R = \frac{Z \sin(\beta) - \rho c}{Z \sin(\beta) + \rho c}$$

where

- β is the angle the reflected wave makes with the ground
- Z is the complex ground impedance (a function of the flow resistivity);
- ρ is the density of air; and
- c the speed of sound.

The reflection loss A_R is given by -20*log10(R)

$$Ag = -10\log10(1 + 10^{-AR/10})$$

Meteorological Excess Attenuation

Am, the excess attenuation due to meteorology is obtained by firstly calculating the vertical sonic gradient due to wind and temperature effects. It is calculated by reference to the method outlined in "A Method to To Incorporate Meteorological Effects into A Road Traffic Model" by MA Simpson, Proceedings of Acoustics 2004.

Barrier Excess Attenuation

Ab, the excess attenuation due to barriers is obtained by firstly calculating the curved noise path due to wind and temperature effects. It is calculated by reference to the method outlined in "A Method to To Incorporate Meteorological Effects into A Road Traffic Model" by MA Simpson, Proceedings of Acoustics 2004.

If a barrier exists the effective location of the source and receiver is modified according to the method outlined in Tonin, R, "Estimating Noise Levels from Petrochemical Plants, Mines and Industrial Complexes", Acoustics Australia, 13(2):59-67, 1985.

Forest Excess Attenuation

Af, the excess attenuation due to forest is obtained by the following:

$$Af = 0.01\ r\ f^{(1/3)}$$

where

r = distance through the forest in (m), and
f = frequency in (Hz)

LOCATION A
Pen3D2000 V 1.9.11
Project Code:13212a
Project Description:Noise assessment of Cobaki
File:C:\Users\User\Desktop\2013 pen files\13212a cobaki\13212a_earthworks LINE SOURCE P9 COP.PEN
File Description:Data file covering P9 COP

Tuesday 10 Dec, 2013 at 16:09:14
Environmental Calculations
All point and line sources included. Line source segmentation angle: 10 degrees. Calculations for specified meteorology.
Noise level results are the logarithmic addition of all the noise sources
Noise level results incorporate the incoherent ground reflection algorithm
Meteorology :
Wind speed 0.0 (m/s) Wind direction 0 Mast height 10.0 (m)
Temperature 20.0 (C) Temperature Gradient 0.0 (C/100m) Humidity 50.0 (%)
Surface Roughness of terrain 0.023000000 (m) Zero plane offset 0.080000000 (m)

Receptor	X Posn (m)	Y Posn (m)	Height (m)	Ground (m)	Noise Level (dB(A))
R1 A	547541.8	6881628.4	1.5	25.5	41.7
R1 B	547553.6	6881560.8	1.5	30.6	41.0
R1 C	547408.5	6881399.0	1.5	40.5	40.5
R1 D	547325.4	6881415.7	1.5	18.2	40.2
R2 A	546919.3	6881675.6	1.5	1.6	39.7
R2 B	547114.6	6881588.1	4.2	2.5	39.7
R2 C	547076.1	6881441.2	1.5	1.3	38.1
R2 D	546896.3	6881487.1	1.5	3.0	37.5
R2 E	546736.4	6881613.0	1.5	1.9	38.0
R3	546804.0	6881925.5	1.5	2.5	41.2
R4	546474.8	6881930.5	4.2	16.5	50.2
R5	546009.7	6881952.3	1.5	4.4	45.5
R6	545988.7	6882279.0	1.5	15.5	49.7
R7	545755.6	6882278.4	1.5	15.3	46.7
R8	545680.6	6882329.9	1.5	33.0	45.7
R9	545572.1	6882328.7	4.2	34.5	44.5
R10	545501.4	6882370.2	1.5	41.8	43.8
R11	545427.6	6882542.6	1.5	22.9	43.1
R12	545549.8	6882623.8	1.5	20.0	44.0
relocatable homes	548117.4	6881954.3	1.5	3.0	39.7

File:C:\Users\User\Desktop\2013 pen files\13212a cobaki\13212a_earthworks LINE SOURCE P11 COP final.PEN
File Description:Data file covering 11 cop

Tuesday 10 Dec, 2013 at 08:28:34
Environmental Calculations
All point and line sources included. Line source segmentation angle: 10 degrees. Calculations for specified meteorology.
Noise level results are the logarithmic addition of all the noise sources
Noise level results incorporate the incoherent ground reflection algorithm
Meteorology :
Wind speed 0.0 (m/s) Wind direction 0 Mast height 10.0 (m)
Temperature 20.0 (C) Temperature Gradient 0.0 (C/100m) Humidity 50.0 (%)
Surface Roughness of terrain 0.023000000 (m) Zero plane offset 0.080000000 (m)

Receptor	X Posn (m)	Y Posn (m)	Height (m)	Ground (m)	Noise Level (dB(A))
R1 A	547541.8	6881628.4	1.5	25.5	38.9
R1 B	547553.6	6881560.8	1.5	30.6	40.6
R1 C	547408.5	6881399	1.5	40.5	40.4
R1 D	547325.4	6881415.7	1.5	18.2	39.9
R2 A	546919.3	6881675.6	1.5	1.5	42.9
R2 B	547114.6	6881588.1	4.2	2.5	41.4
R2 C	547076.1	6881441.2	1.5	1.5	40.6
R2 D	546896.3	6881487.1	1.5	3	41.8
R2 E	546736.4	6881613	1.5	2	40.7
R3	546804	6881925.5	1.5	2.5	36.5
R4	546474.8	6881930.5	4.2	16.5	49.2
R5	546009.7	6881952.3	1.5	4.2	45.5
R6	545988.7	6882279	1.5	15.8	49.6
R7	545755.6	6882278.4	1.5	15.3	46.5
R8	545680.6	6882329.9	1.5	33	47.5
R9	545572.1	6882328.7	4.2	34.5	46.1
R10	545501.4	6882370.2	1.5	41.5	46.1
R11	545427.6	6882542.6	1.5	22.9	43.4
R12	545549.8	6882623.8	1.5	20	46.2
relocatable homes	548117.4	6881954.3	1.5	3	38.8

LOCATION B
Pen3D2000 V 1.9.11
Project Code:13212a
Project Description:Noise assessment of Cobaki
File:C:\Users\User\Desktop\2013 pen files\13212a cobaki\13212a_earthworks LINE SOURCE P9 COP.PEN
File Description:Data file covering P9 COP

Tuesday 10 Dec, 2013 at 15:59:22
Environmental Calculations
All point and line sources included. Line source segmentation angle: 10 degrees. Calculations for specified meteorology.
Noise level results are the logarithmic addition of all the noise sources
Noise level results incorporate the incoherent ground reflection algorithm
Meteorology :
Wind speed 0.0 (m/s) Wind direction 0 Mast height 10.0 (m)
Temperature 20.0 (C) Temperature Gradient 0.0 (C/100m) Humidity 50.0 (%)
Surface Roughness of terrain 0.023000000 (m) Zero plane offset 0.080000000 (m)

Receptor	X Posn (m)	Y Posn (m)	Height (m)	Ground (m)	Noise Level (dB(A))
R1 A	547541.8	6881628.4	1.5	25.5	39.3
R1 B	547553.6	6881560.8	1.5	30.6	38.6
R1 C	547408.5	6881399	1.5	40.5	38
R1 D	547325.4	6881415.7	1.5	18.2	38.2
R2 A	546919.3	6881675.6	1.5	1.6	34.6
R2 B	547114.6	6881588.1	4.2	2.5	36.1
R2 C	547076.1	6881441.2	1.5	1.3	34.7
R2 D	546896.3	6881487.1	1.5	3	33.5
R2 E	546736.4	6881613	1.5	1.9	34.5
R3	546804	6881925.5	1.5	2.5	34.6
R4	546474.8	6881930.5	4.2	16.5	48.9
R5	546009.7	6881952.3	1.5	4.4	49.1
R6	545988.7	6882279	1.5	15.5	50.2
R7	545755.6	6882278.4	1.5	15.3	47.1
R8	545680.6	6882329.9	1.5	33	46.1
R9	545572.1	6882328.7	4.2	34.5	44.8
R10	545501.4	6882370.2	1.5	41.8	44.1
R11	545427.6	6882542.6	1.5	22.9	43.6
R12	545549.8	6882623.8	1.5	20	44.6
relocatable homes	548117.4	6881954.3	1.5	3	38.5

File:C:\Users\User\Desktop\2013 pen files\13212a cobaki\13212a_earthworks LINE SOURCE P11 COP final.PEN
File Description:Data file covering 11 cop

Tuesday 10 Dec, 2013 at 08:56:08
Environmental Calculations
All point and line sources included. Line source segmentation angle: 10 degrees. Calculations for specified meteorology.
Noise level results are the logarithmic addition of all the noise sources
Noise level results incorporate the incoherent ground reflection algorithm
Meteorology :
Wind speed 0.0 (m/s) Wind direction 0 Mast height 10.0 (m)
Temperature 20.0 (C) Temperature Gradient 0.0 (C/100m) Humidity 50.0 (%)
Surface Roughness of terrain 0.023000000 (m) Zero plane offset 0.080000000 (m)

Receptor	X Posn (m)	Y Posn (m)	Height (m)	Ground (m)	Noise Level (dB(A))
R1 A	547541.8	6881628.4	1.5	25.5	38.1
R1 B	547553.6	6881560.8	1.5	30.6	38.2
R1 C	547408.5	6881399	1.5	40.5	40.4
R1 D	547325.4	6881415.7	1.5	18.2	40.4
R2 A	546919.3	6881675.6	1.5	1.5	38.4
R2 B	547114.6	6881588.1	4.2	2.5	36.6
R2 C	547076.1	6881441.2	1.5	1.5	36.8
R2 D	546896.3	6881487.1	1.5	3	36.7
R2 E	546736.4	6881613	1.5	2	38.5
R3	546804	6881925.5	1.5	2.5	34.5
R4	546474.8	6881930.5	4.2	16.5	44.4
R5	546009.7	6881952.3	1.5	4.2	42
R6	545988.7	6882279	1.5	15.8	45.8
R7	545755.6	6882278.4	1.5	15.3	39.9
R8	545680.6	6882329.9	1.5	33	40.4
R9	545572.1	6882328.7	4.2	34.5	38.8
R10	545501.4	6882370.2	1.5	41.5	38.6
R11	545427.6	6882542.6	1.5	22.9	36.1
R12	545549.8	6882623.8	1.5	20	36.7
relocatable homes	548117.4	6881954.3	1.5	3	39.2

LOCATION C
Pen3D2000 V 1.9.11
Project Code:13212a
Project Description:Noise assessment of Cobaki
File:C:\Users\User\Desktop\2013 pen files\13212a cobaki\13212a_earthworks LINE SOURCE P9 COP.PEN
File Description:Data file covering P9 COP

Tuesday 10 Dec, 2013 at 15:41:07
Environmental Calculations
All point and line sources included. Line source segmentation angle: 10 degrees. Calculations for specified meteorology.
Noise level results are the logarithmic addition of all the noise sources
Noise level results incorporate the incoherent ground reflection algorithm
Meteorology :
Wind speed 0.0 (m/s) Wind direction 0 Mast height 10.0 (m)
Temperature 20.0 (C) Temperature Gradient 0.0 (C/100m) Humidity 50.0 (%)
Surface Roughness of terrain 0.023000000 (m) Zero plane offset 0.080000000 (m)

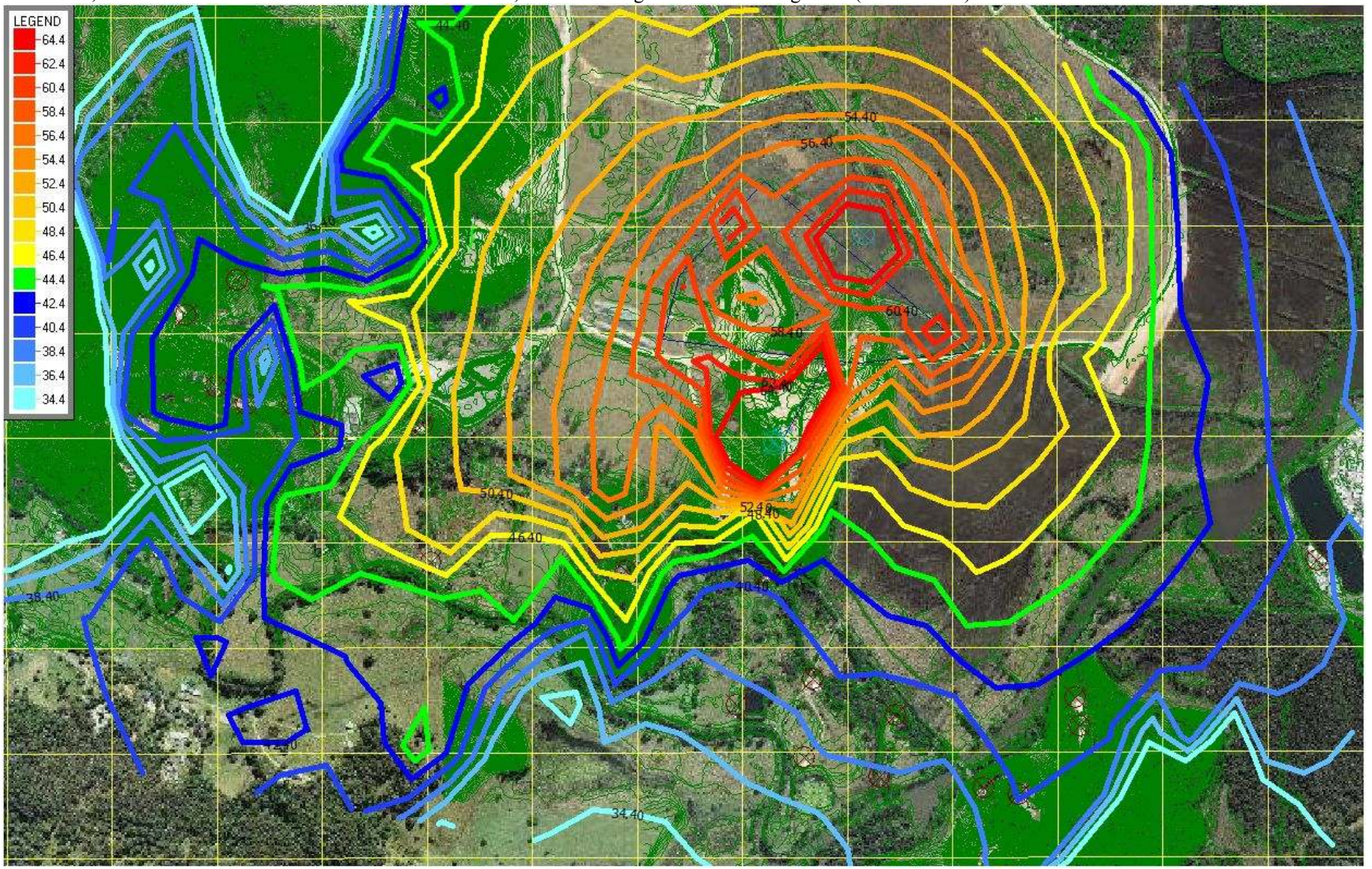
Receptor	X Posn (m)	Y Posn (m)	Height (m)	Ground (m)	Noise Level (dB(A))
R1 A	547541.8	6881628.4	1.5	25.5	40.8
R1 B	547553.6	6881560.8	1.5	30.6	40.1
R1 C	547408.5	6881399	1.5	40.5	39.1
R1 D	547325.4	6881415.7	1.5	18.2	39.2
R2 A	546919.3	6881675.6	1.5	1.6	38.2
R2 B	547114.6	6881588.1	4.2	2.5	38.6
R2 C	547076.1	6881441.2	1.5	1.3	36.8
R2 D	546896.3	6881487.1	1.5	3	36.4
R2 E	546736.4	6881613	1.5	1.9	33.7
R3	546804	6881925.5	1.5	2.5	35.3
R4	546474.8	6881930.5	4.2	16.5	40.7
R5	546009.7	6881952.3	1.5	4.4	37.7
R6	545988.7	6882279	1.5	15.5	39.6
R7	545755.6	6882278.4	1.5	15.3	36.3
R8	545680.6	6882329.9	1.5	33	37.6
R9	545572.1	6882328.7	4.2	34.5	36.6
R10	545501.4	6882370.2	1.5	41.8	36.4
R11	545427.6	6882542.6	1.5	22.9	34.2
R12	545549.8	6882623.8	1.5	20	35.8
relocatable homes	548117.4	6881954.3	1.5	3	40

File:C:\Users\User\Desktop\2013 pen files\13212a cobaki\13212a_earthworks LINE SOURCE P11 COP final.PEN
File Description:Data file covering 11 cop

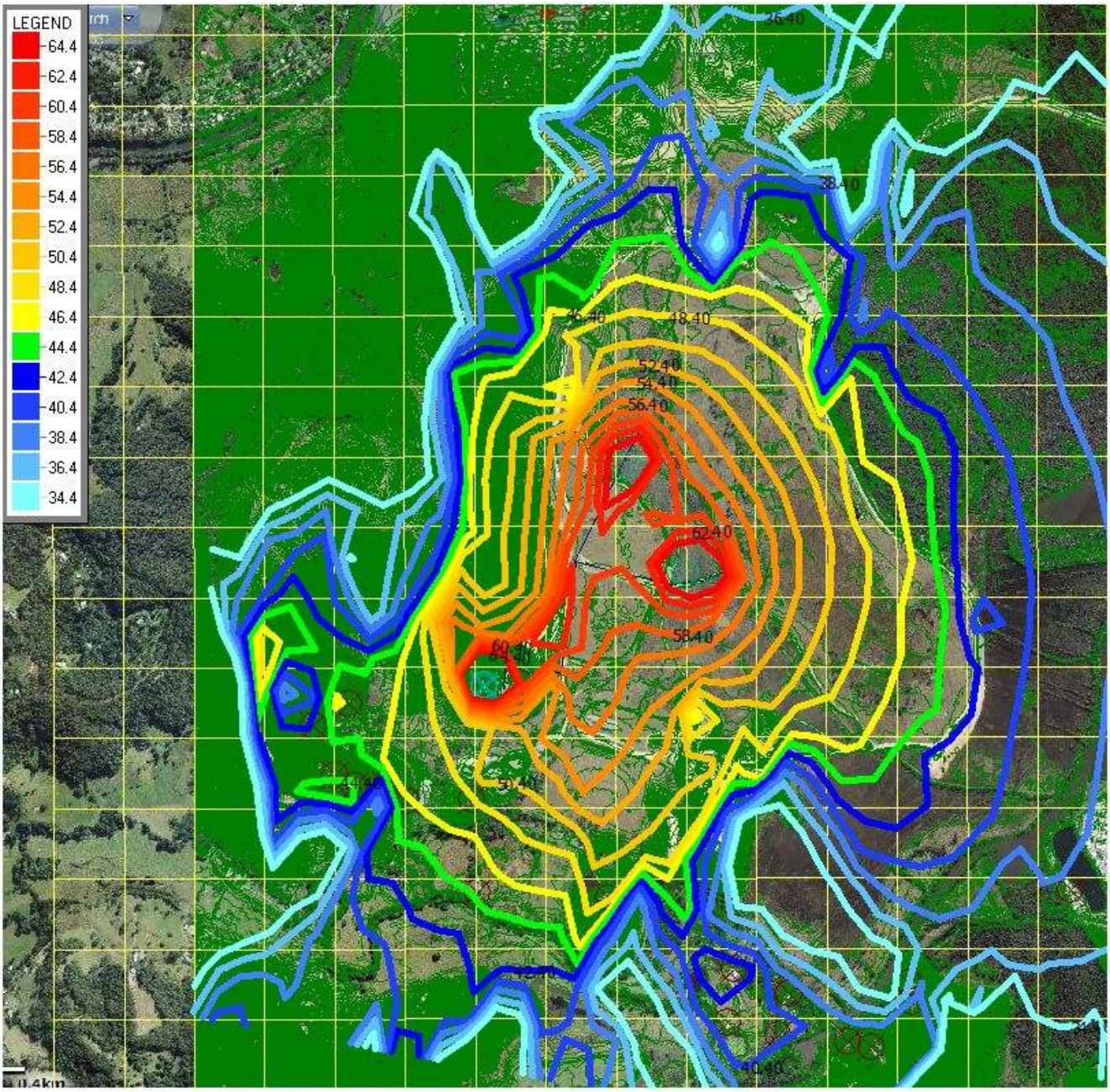
Tuesday 10 Dec, 2013 at 09:17:41
Environmental Calculations
All point and line sources included. Line source segmentation angle: 10 degrees. Calculations for specified meteorology.
Noise level results are the logarithmic addition of all the noise sources
Noise level results incorporate the incoherent ground reflection algorithm
Meteorology :
Wind speed 0.0 (m/s) Wind direction 0 Mast height 10.0 (m)
Temperature 20.0 (C) Temperature Gradient 0.0 (C/100m) Humidity 50.0 (%)
Surface Roughness of terrain 0.023000000 (m) Zero plane offset 0.080000000 (m)

Receptor	X Posn (m)	Y Posn (m)	Height (m)	Ground (m)	Noise Level (dB(A))
R1 A	547541.8	6881628.4	1.5	25.5	37.7
R1 B	547553.6	6881560.8	1.5	30.6	37.7
R1 C	547408.5	6881399	1.5	40.5	40.7
R1 D	547325.4	6881415.7	1.5	18.2	40.8
R2 A	546919.3	6881675.6	1.5	1.5	38.5
R2 B	547114.6	6881588.1	4.2	2.5	35.9
R2 C	547076.1	6881441.2	1.5	1.5	38
R2 D	546896.3	6881487.1	1.5	3	43.1
R2 E	546736.4	6881613	1.5	2	38.6
R3	546804	6881925.5	1.5	2.5	34.7
R4	546474.8	6881930.5	4.2	16.5	50.3
R5	546009.7	6881952.3	1.5	4.2	44.6
R6	545988.7	6882279	1.5	15.8	46.4
R7	545755.6	6882278.4	1.5	15.3	40.6
R8	545680.6	6882329.9	1.5	33	41.5
R9	545572.1	6882328.7	4.2	34.5	39.4
R10	545501.4	6882370.2	1.5	41.5	38.9
R11	545427.6	6882542.6	1.5	22.9	34.7
R12	545549.8	6882623.8	1.5	20	35.9
relocatable homes	548117.4	6881954.3	1.5	3	37.4

Precinct 9, Location A Scenario: Predicted Nosie Contours, Receiver Height of 1.5m above ground (Not to Scale).



Precinct 11, Location A Scenario: Predicted Nosie Contours, Receiver Height of 1.5m above ground (Not to Scale).



NOISE COMPLAINT RECORD

Initial Complaint Recording

Date & Time of record:_____

Name of Complainant (if given): _____

Complainant Telephone Number: _____

Address of complainant (if given):_____
_____
_____

Identification and description of noise source (e.g. excavator noise):
_____
_____

Time of day noise is occurring: _____

Number of days the noise has occurred: _____

Complaint Investigation & Remediation

Liaison with noise source equipment operator:_____

Recommended control (e.g. earth berm): _____

Verification that noise controls have been implemented: _____

Follow-up Complainant

Contact date: _____

Complainant comment (e.g. is noise still annoying ? – if yes, refer to Note below): _____
_____
_____

NOTE
If complainant is still affected after all reasonable steps have been taken to ameliorate the noise, specialist advice should be sought from a qualified acoustical consultant