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ACOUSTIC ASSESSMENT

1A Leonay Parade, Leonay NSW 2750

PREPARED FOR: PreTech Pty Ltd

OUR REFERENCE: REP-18-7068-A1

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1. INTRODUCTION

EnviroTech has been requested by PreTech Pty Ltd to undertake an acoustic assessment of the proposed torrens title subdivision and construction of 8 single storey senior housing dwellings, at 1A Leonay Parade, LEONAY 2750 (hereafter referred to as the site).

The purpose of this assessment is to accurately predict potential noise levels generated by the proposal and to assess the impact of these noise levels on the nearest receptors, in accordance with the NSW Government's relevant noise criteria. The noise assessment will also include the discussion of the development, potential impacts during the construction stage of the residential buildings and the impacts activities at the neighboring Emu Sports Club may have on future residents.

This assessment has been prepared in accordance with:

- NSW Protection of the Environment Operations Act 1997 (POEO Act)
- Environmental Planning and Assessment Act (1979)
- The Noise Policy for Industry NSW EPA (2017)
- The Noise Guide for Local Government (DECCW, 2009)
- NSW Department of Planning "Development near rail corridors and busy roads" 2008
- Assessing Vibration: a technical guideline (DECC 2006)
- State Environmental Planning Policy (Infrastructure) 2007
- Building Code of Australia

Proposal

The site to be developed is located at 1A Leonay Parade, LEONAY (LOT 1101 DP 1217686) (Figure 1), and covers a total area of approximately 2,202m^2. A site layout is provided in Figure 2 showing the proposed development and the closest residential receivers from the proposal. The proposed development is for a torrens title subdivision consisting of 2 lots and the construction of 8 single storey seniors housing dwellings. The location of the site is on the outskirts of the Leonay Golf Couse and near the golf maintenance shed.

In accordance with the EPAs Industrial Noise Policy (INP), the surrounding noise amenity of the site is classified as Suburban.

The hours of operation of the golf course and maintenance shed is provided in Table 1 below:

Table 1: Hours of operation

	Hours of operation
Emu Sports Club	9:00 am – 1:00 am
Golf Maintenance Shed	5:30 am – 3:00 pm

Figure 1: Aerial photograph of the site. Red star indicates logger placement.

Surrounding Closest Residential/School Classroom/Active Recreational Area Noise Receptors Potentially Impacted by the Proposed Development and the Construction Phase of the Proposed Development.

There are a number of residential properties located within the vicinity of the site on all aspects, and the closest boundaries of these properties on the differing aspects of the site are:

- 3A Leonay Parade, Leonay. Single storey residential house located to the south/south west of subject site. 7m from site boundary.
- 12 / 12A Leonay Parade, Leonay. Single storey residence located to the north east of subject site. 23m from site boundary.
- 10 Leonay Parade, Leonay. Single storey residential house located to the north east of subject site. 30m from site boundary.

Other buildings located within the vicinity of the site that may be potentially impacted by the proposed development include:

- Leonay Public School Playground. School playground located to the south east of subject site. 20m from site boundary.
- Leonay Public School Classrooms. Internal learning areas of the school located to the south east of subject site. 150m from site boundary.

Figure 2: Proposed subdivision/development and potential noise receptors from the proposed.

Figure 3: Logger Location

2. NOISE ASSESSMENT CRITERIA

This section reviews the NSW Government criteria for other noise sources and developments. These may be used as a basis for realistic noise goals from meeting halls to residential receivers.

NSW Government Criteria

The NSW Government, via the Office of Environment & Heritage provides guidelines for many industrial, commercial and domestic types of noise sources. The primary aim of environmental noise control is to minimise the occurrence of offensive noise in the community.

Offensive noise is defined in the NSW Protection of the Environment Operations Act 1997 (POEO Act) as being noise:

a) That, by reason is of its level, nature, character or quality, or the time at which it is made, or other circumstances:

i. is harmful to (or is likely to be harmful to) a person who is outside the premises from which it is emitted, or

ii. interferes unreasonably with (or is likely to Interfere unreasonably with) the comfort or repose of a person who is outside the premises from which it is emitted, or

b) That, is of a level, nature, character or quality prescribed by the regulations or that is made at a time or in other circumstances, prescribed by the regulations.

The NSW Government also state that social surveys have indicated that noise from any particular source will be audible to many people in the community when that noise exceeds the background level by more than 5 decibels (dB). The noise may have characteristics which are pleasant or unpleasant to the listener.

Technically the background is found from the noise level that is present for 90% of the time of the measurement periods (usually 15 minutes each) and this is known as the LA90, 15 minute.

The source noise is found from the 'equivalent continuous A-weighted sound pressure level' (again usually 15 minutes samples), which is known as the LAeq, 15 minute.

The Noise Guide for Local Government

The Noise Guide for Local Government published by the NSW Department of Environment, Climate Change and Water (2004 updated 2009) states:- *'A noise source is generally considered to be intrusive if noise from the source, when measured over a 15 minute period exceeds the background noise by more than 5 dB'*. It is assessed at the most affected point on or within the neighbouring residential property (unless that residence is more than 30 metres from the boundary). Intrusive noise can represent offensive noise. However, it is stated in the Noise Guide for Local Government that this is not always the case and it can depend upon the source of the noise, noise characteristics and cumulative noise levels.

Noise Policy for Industry (INP)

The Noise Policy for Industry (INP; DECC) is used to assess noise from industrial noise sources, scheduled under the Protection of the Environment Operations Act 1997. This is a statutory document referred to by consultants when attempting to control short-term intrusive impacts upon sensitive receptors (i.e. nearby residents), and when attempting to maintain noise level amenities for particular land uses.

In accordance with the INP, there are two criteria which need to be considered when assessing industrial noise. These are:

1) Intrusive Noise Criterion
2) Noise Amenity Criteria.

Both of these criterions need to be satisfied under the INP. In this situation the cumulative impact over the day and evening periods would be significantly less than the peak periods which would cover continuous activity over any one 15 minute period. Therefore, the Noise Amenity Criterion would be the most stringent of the two noise criteria.

Intrusive Noise Criterion

The NSW Government in their Noise Policy for Industry NSW EPA (2017), states that: - *'The intrusiveness of an industrial noise source may generally be considered acceptable if the equivalent continuous (energy-average) A-weighted level of noise from the source (represented by the LAeq descriptor) measured over a 15 minute period, does not exceed the background noise level measured in the absence of the source by more than 5 dB.'* Thus, when considering the environmental consequence of noise from a specific source, any increase above the background sound pressure level, which exceeds 5 dB, may be offensive. Again, it is assessed at the most affected point on or within the neighbouring residential property (unless that residence is more than 30 metres from the boundary).

The NSW Government state that where the existing background noise level at the receptor is less than 30 dBA, as may occur in a quiet suburban or rural area**,** then 30 dBA should be assumed to be the existing background noise level.

The intrusiveness criterion is primarily used to limit short term noise impacts, and is summarized as follows:

$$L_{Aeq,\ 15\ minutes} \leq \textit{rating background noise level} + 5dB$$

The intrusiveness of an industrial noise source is generally considered acceptable if the equivalent continuous (A weighted) noise level $L_{Aeq,\ 15\ minutes}$ does not exceed the rated background noise level by more than 5dB(A).

Noise Amenity Criteria

The Noise Amenity Criteria is used to limit the potential of noise annoyance over longer periods, which may occur as a result of continual increases in background noise.

The Noise Policy for Industry states that *'To limit continuing increases in noise levels, the maximum ambient noise level within an area from industrial noise sources should not normally exceed the acceptable noise levels specified in Table 2.1."*

TABLE 2 – RECOMMENDED NOISE LEVELS FROM INDUSTRIAL NOISE SOURCES.

Type of Receiver	Indicative Noise Amenity Area	Time of Day	Recommended LAeq Noise Level (dBA)	
			Acceptable	Recommended Maximum
Residence	Rural	Day	**50**	**55**
		Evening	**45**	**50**
		Night	**40**	**45**
	Suburban	Day	**55**	**60**
		Evening	**45**	**50**
		Night	**40**	**45**
	Urban	Day	**60**	**65**
		Evening	**50**	**55**
		Night	**45**	**50**
	Urban/Industrial Interface – for existing situations only	Day	**65**	**70**
		Evening	**55**	**60**
		Night	**50**	**55**
School Classroom - Internal	All	Noisiest 1-hour period when in use	**35**	**40**
Active Recreation Area (e.g. playground)	All	When in use	**55**	**60**
Commercial premises	All	When in use	**65**	**70**
Industrial premises	All	When in use	**70**	**75**

Notes:

- Daytime is defined as between 07:00 hours and 18:00 hours
- Evening time is defined as between 18:00 hours and 22:00 hours
- Night time is defined as between 22:00 hours and 07:00 hours

NSW Government Criteria for Domestic Air Conditioners.

The Protection of the Environment Operations (Noise Control) Regulation 2008 Part 4 - Miscellaneous articles, Division 2 - Use of Articles, Subdivision 1 – Time limits on the use of certain articles. Paragraph 52 - Air conditioners (1) states:

'A person must not cause or permit an air conditioner or heat pump water heater to be used on residential premises in such a manner that it emits noise that can be heard within a habitable room in any other residential premises (regardless of whether any door or window to that room is open).

a) Before 8 am or after 10 pm on any Saturday, Sunday or public holiday, or
b) Before 7 am or after 10 pm on any other day.

Interim Construction Noise Guideline (ICNG)

The NSW Environment Protection Authority published the Interim Construction Noise Guideline in July 2009. While some noise from construction sites is inevitable, the aim of the Guideline is to protect the majority of residences and other sensitive land uses from noise pollution most of the time.

Construction noise is one of the major environmental noise issues in NSW – not only from building works but also from demolition, remediation, renewal and maintenance. Construction can generate high noise levels that can adversely affect:

- sleep
- concentration, and thus learning performance
- mental and physical health

This guideline provides noise goals that assist in assessing the impact of construction noise.

The main objectives of the Guideline are to:

- promote a clear understanding of ways to identify and minimise noise from construction works
- focus on applying all 'feasible' and 'reasonable' work practices to minimise construction noise impacts
- encourage construction to be undertaken only during the recommended standard hours (Table 1), unless approval is given for works that cannot be undertaken during these hours
- streamline the assessment and approval stages and reduce time spent dealing with complaints at the project implementation stage
- provide flexibility in selecting site-specific feasible and reasonable work practices in order to minimise noise impacts.

For residences, the basic daytime construction noise goal is that the LAeq, 15min noise management level should not exceed the background noise by more than 10dBA. This is for standard hours: Monday to Friday 7.00am-6.00pm, and Saturday 8.00am-1.00pm. Outside the standard hours,

where construction is justified, the noise management level would be background + 5dBA. Table 3 details the ICNG noise management levels.

TABLE 3 – Construction noise at residences using quantitative assessment.

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.

Construction noise at offices, retail outlets: external LAeq (15 min) 70 dB(A).

3. BACKGROUND & AMBIENT NOISE MEASUREMENTS

1. Determination Method: Long-term continuous sampling

2. Noise Logger Location: See Site Plan, Figure 1

3. Survey Period: 19th November (10:40am) – 27th November (4:10pm)

4. Assessment Time Period: All Hours

5. Monitoring Conditions:

   Heavy winds were recorded for the 22nd of November (up to 69km/h) and on the 23rd of November (up to 72km/h), resulting in the data being withdrawn for those dates.
   No further unusual circumstances or activities

6. Instrumentation: 'ARL' - Type 2 Environmental Noise Logger (Rion NL-42) (Serial number 873126), This instrument conforms to Australian Standard 1259 "Acoustics - Sound Level Meters", (1990) and has an accuracy suitable for both field and laboratory use. The logger was set for the 'A' frequency weighting and 'fast' time weighting.

7. Calibration: The environmental noise logger and calibrator have been checked, adjusted and aligned before and after the measurement period, to conform to the Bruel and Kjrer or RTA factory specifications. Both have been issued with conformance certificates within the last 24 months as required by the regulations. The internal test equipment used is traceable to the National Measurement Laboratory at C.S.I.R.O., Lindfield, NSW, Australia. No significant system drift occurred over the measurement periods. Current calibration certificate in appendix

8. Results:

The recorded LA90 levels determine the Rating Background Level (RBL). The RBL is defined as the median value of the tenth percentile value for the recorded LA90 levels for the complete monitoring period. The tenth percentile is also referred to as the Assessment Background Level (ABL).

The resultant RBL (LA90) and ambient (LAeq) levels for each period are summarised below in Table 4. Section 9 of the report contains a geographical presentation of the background noise levels generated from the monitoring period.

TABLE 4 – Summary of existing noise levels

Time of Day	***Rating Background Noise Level (L90) dBA***	***Log Average Existing Ambient Noise Levels (LAeq) dBA***
Day (7am – 6pm)	42.63	51.70
Evening (6pm – 10pm)	41.69	53.97
Night (10pm – 7am)	37.75	47.48

4. NOISE GOALS

As discussed above the assessment procedure given in the Noise Policy for Industry NSW EPA (2017) has two components: Controlling intrusive noise impacts and maintaining noise level amenity. Based on existing ambient noise levels, site specific noise goals from the proposal should not exceed a LAeq level of 47.63 dBA (42.63 + 5 – intrusive noise criterion) for the daytime. Site specific noise goals from this proposal should not exceed a LAeq levels of 45 dBA for the evening and 40 dBA for the night. These are shown in the table below:

TABLE 5 – Noise goal for the proposed senior housing dwellings on neighboring receivers

Time Of Day	***Intrusiveness Criterion***	***Amenity Criteria***
Day Time	**47.63dBA** (LAeq,15min)	55 dBA LAeq,
Evening	46.69dBA (LAeq,15min)	**45 dBA** LAeq,
Night	42.75dBA (LAeq,15min)	**40 dBA** LAeq,

Notes:

- The criteria in **BOLD** apply being the lower of either the Intrusiveness Criterion or the Amenity Criterion.

TABLE 6 – School Classroom (Internal) Noise Goals

Time Of Day	***Noise Goal***
Day Time	**35dBA** (LAeq,15min)

TABLE 7– Active Recreational Area (Playground) Noise Goals

Time Of Day	*Noise Goal*
Day Time	**55dBA** (LAeq,15min)

Construction Noise

For residences, the basic daytime construction noise goal is that the LAeq, 15min noise management level should not exceed the background noise by more than 10dBA. This is for standard hours: Monday to Friday 7.00am-6.00pm, and Saturday 8.00am-1.00pm.

Time Of Day	*Allowable Criterion*
Day Time (7am – 6pm)	**Residence 52.63 dBA** (LAeq,15min)

Vibration Construction

Human Comfort

Criteria for assessment of the effects of vibration on human comfort are set out in British Standard 6472-1992. Methods and criteria in that Standard are used to set "preferred" and "maximum" vibration levels in the document "Assessing Vibration: A Technical Guideline" (2006) produced by the NSW EPA.

Acceptable values of human exposure to continuous vibration, such as that associated with drilling, are dependent on the time of day and the activity taking place in the occupied space (e.g. workshop, office, residence or a vibration-critical area). Guidance on preferred values for continuous vibration is set out below in Table 8.

Table 8: Acceptable vibration dose values for intermittent vibration (m/s $^{1.75}$)

Table 2.4 Acceptable vibration dose values for intermittent vibration (m/s$^{1.75}$)

Location	Daytime[1]		Night-time[1]	
	Preferred value	Maximum value	Preferred value	Maximum value
Critical areas[2]	0.10	0.20	0.10	0.20
Residences	0.20	0.40	0.13	0.26
Offices, schools, educational institutions and places of worship	0.40	0.80	0.40	0.80
Workshops	0.80	1.60	0.80	1.60

1 Daytime is 7.00 am to 10.00 pm and night-time is 10.00 pm to 7.00 am.

Criteria for building structures

When assessing potential vibration impacts on building structures, the velocity and direction of the movement is measured. The measurement is referred to as the Peak Particle Velocity (PPV), presented in mm/s.

Vibration from construction activities, with regard to building damage, is assessed using the German standard DIN 4150: Part 3 – 1999 *Effects of Vibration on Structures* (DIN Guideline). The DIN Guideline values for PPV measured at the foundation of various structures are summarised in Table 9 below.

Table 9: Guideline Values of vibration velocity for evaluating the effects of short term vibration.

Type of structure	Guideline values for velocity, vi (mm/s)			
	Vibration at the foundation at a frequency of:			Vibration at horizontal plane of highest floor at all frequencies
	1 Hz to 10 Hz	10 Hz to 50 Hz	50 Hz to 100 Hz*	
Buildings used for commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40
Dwellings and buildings of similar design and/or use	5	5 to 15	15 to 20	15
Structures that, because of their sensitivity to vibration, do not correspond to those listed in lines 1 and 2 and are of great intrinsic value (eg heritage structures / buildings that are under a preservation order)	3	8 to 10	8 to 10	8
* For frequencies above 100Hz, at least the values specified in this column shall be applied				

From the guidelines outlined above, the following vibration criteria have been determined for the Project.

Type of structure	Guideline values for velocity, vi (mm/s)			
	Vibration at the foundation at a frequency of:			Vibration at horizontal plane of highest floor at all frequencies
	1 Hz to 10 Hz	10 Hz to 50 Hz	50 Hz to 100 Hz*	
Buildings used for commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40

Recommend design Levels and reverberation times for building interiors.

Sound Insulation rating of floors: A floor in a Class 2 or 3 building must have a Rw + Ctr (airborne) not less than 50 and an Ln,w (impact) not more than 62.

Sound Insulation rating of walls: A wall in a Class 2 or 3 building must—
(i) have a Rw + Ctr (airborne) not less than 50, if it separates sole-occupancy units; and
(ii) have a Rw (airborne) not less than 50, if it separates a sole-occupancy unit from a plant room, lift shaft, stairway, public corridor, public lobby or the like, or parts of a different classification; a

Sound Insulation rating of soil and waste pipes:
If a duct, soil, waste or water supply pipe, including a duct or pipe that is located in a wall or floor cavity, serves or passes through more than one sole-occupancy unit, the duct or pipe must be separated from the rooms of any sole-occupancy unit by construction with an Rw + Ctr (airborne) not less than— (i) 40 if the adjacent room is a habitable room (other than a kitchen); or (ii) 25 if the adjacent room is a kitchen or non-habitable room.

5. NOISE SOURCE MODELS

This section provides details of the calculations used for predicting noise levels and the resulting noise levels at the potentially affected residential receptors. The internal noise levels predictions have been determined using the sound level of 65 dBA for standardised speech and 70 dBA for raised voice speech.

Predicted Ongoing Noise Levels

Golf Cart

The below calculation was determined on the scenario of 2 electric golf carts and 4 people talking at a standardised level near the proposed senior housing development.

Total 15 minute average	**75.8 dBA**

Two electric golf carts and 4 people were modelled as it will be extremely unlikely and infrequent situation that more than 2 golf carts and 4 people will be in the one area at the same time.

Mechanical Plant (Air-Conditioners)

Electrical, mechanical, hydraulic and air conditioning equipment is to be housed so that it does not create an 'offensive noise' as defined in the Protection of the Environment Operations Act 1997, either within or at the boundaries of any property at any time of the day.

The below calculation was determined by the noise produced by a typical air-conditioner condenser.

Total 15 minute average	**54 dBA**

Maintenance Shed

The below calculation is of a worst case scenario if all noise generating sources from the maintenance shed of the golf course are emitting noise at the one time. Whilst this maybe highly unlikely it is best practice to calculate and model this scenario to show noise compliance at neighboring receivers whilst the proposed is at full noise capacity.

The major internal noise sources for the proposed are listed below.

Toro Reelmaster 3100.D Reel Trim Mower – 83 dBA
Sand Pro 3040 Grooming Maintenance Machine – 87 dBA
Agrimetal Leaf Blower – 87 dBA
John Deere 1200a Bunker Rake – 78 dBA
John Deere 7200A Precision Cut Mower – 83 dBA
Greensmaster 3150-Q Riding Greensmower – 84 dBA
Kubota L3300 Tractor – 80 dBA

The below calculation was determined on a worst case scenario of all the mowers/tractors being turned on at any one time at the maintenance shed.

Total 15 minute average - Daytime	**92.5 dBA**

The calculated maximum internal noise level of the proposed is 92.5 dBA.

Function Rooms (10 – 150 people)

The below calculation was determined on a scenario of 150 persons attending a function and half of the attendees talking at the same time used raised speech.

Total 15 minute average	**88.8 dBA**

Outdoor Carpark

The below calculation was determined on the worst case scenario of the outdoor carpark lot being full. The below calculation takes into account twenty percent of the cars in the parking lot starting at the same time. A noise level of 80 dBA was taken for each car starting and leaving the premise.

Total 15 minute average	**95.6 dBA**

Although there are 180 car spaces in the emu sports club carpark, the likely hood of more than 36 cars starting and leaving at the same time is extremely unlikely unless an emergency occurred.

Predicted External Noise Levels

The source noise has been modelled using the International Standard ISO 9613-2 (1996(E)) 'Acoustic - Attenuation of sound during propagation outdoors Part 2 General method of calculation '. This Standard specifies methods for the description of noise outdoors in community environments. The method described in the Standard is general in the sense that it may be applied to a wide variety of noise sources, and covers the major mechanism of attenuation. The method allows for downwind propagation conditions namely:

- Wind direction within an angle of ± 45° of the direction connecting the centre of the dominant sound source and the centre of the specified receiver region with the wind blowing from source to receiver,
- Wind speed between approximately 1 m/s and 5 m/s measured at a height of 3 m to 11 m above the ground.
-

Basic Noise Modelling Equations

The equivalent continuous downwind sound pressure level (LAeq) at each receiver point has been calculated using the equation below:-

$$L_{Aeq} = (L_{Aeq,\,int} + 10\log_{10} S - R) - 14 + D_c - A$$

Where:

$L_{Aeq,\,int}$ is the reverberant noise level within the building;
S is the area of the building envelope radiating noise;
R is the sound reduction index of the building envelope component;
D_c is directivity correction; and
A is the attenuation that occurs during the propagation from source to receiver.

The attenuation term A in the equation above is given by:-

$$A = A_{div} + A_{atm} + A_{gr} + A_{bar} + A_{misc}$$

Where:

A_{div} is the attenuation due to geometric divergence;
A_{atm} is the attenuation due to atmospheric absorption;
A_{gr} is the attenuation due to the ground effects;
A_{bar} is the attenuation due to a barrier; and
A_{misc} is the attenuation due to miscellaneous other effects.

Predicted Construction Noise Levels

The calculation of noise emission to the environment considers the surface area of the development radiating noise, the sound reduction index of the structural component and distance to the receiver location.

Construction Noise

Sound Power Levels (SWLs) for typical construction plant are identified below in Table 10.

Plant	Sound Power Level
Concrete Truck	109
Angle Grinder	109
Concrete Pump – 120 mm diameter / 50 bar	112
Concrete Saw	116
Mobile Crane	98
Dump Truck	108
Compressor	100
Bobcat	103
Hand Tools	90
Excavator	108
Crawler Cranes	98
Tower Crane	104
Front End Loader	112
Excavator	107
Hammer Hydraulic	122
Bored Pile Rig	112

Table 10: Typical construction plant noise.

Assessment of possible construction noise at surrounding receivers has been undertaken for the proposed construction works. Modelling has been conducted for a number of construction scenarios with plant located across the construction site.

Scenario A – Excavation Stage
Scenario B – Building Construction

The construction noise modelling assumes a “typical worst-case” scenario whereby all plant, is running continuously. As such, the modelling represents likely noise levels that would occur during intensive periods of construction. Therefore, the presented noise levels can be considered in the upper range of noise levels that can be expected at surrounding receivers when the various construction scenarios occur.

Once noise sources have been applied to the model, the resultant noise levels at identified surrounding receivers are predicted. These results are then compared with established site-specific noise criteria.

The results of construction noise modelling for each scenario are presented in Table below.

Table 11: Predicted construction noise data on residential receivers

Residential Receiver	Predicted Noise Level (Dba)	NML (Dba)	Exceedance (Dba)
Scenario A – Bulk Excavation			
A – 3A Leonay Parade	63.10	52.63	10.47
B – 12/12A Leonay Parade	52.77	52.63	0.14
C – 10 Leonay Parade	50.46	52.63	NIL
Scenario B – Building Construction			
A – 3A Leonay Parade	55.10	52.63	2.47
B – 12/12A Leonay Parade	44.77	52.63	NIL
C – 10 Leonay Parade	42.46	52.63	NIL

Exceedances of noise management levels of up to 10.47 dBA at neighboring residence boundaries to the south and east of the site may be expected during the excavation period when major equipment is located on site. This magnitude of exceedance is consistent with similar sites where residences overlook development sites.

Table 12: Predicted construction noise data on school

School	Predicted Noise Level (Dba)	NML (Dba)	Exceedance (Dba)
Scenario A – Bulk Excavation			
A – Classroom	36.48	35	1.48
B – Playground	53.98	55	NIL
Scenario B – Building Construction			
A – Classroom	28.48	35	NIL
B – Playground	45.98	55	NIL

Exceedances of noise management levels of up to 1.48 dBA at the nearest school classroom to the east of the site may be expected during the excavation period when major equipment is located on site. This attenuation will be provided by the walls, roof, windows and door of the classroom.

During the construction stages the magnitude of exceedance will reduce due to the nature of construction activities. Based on these findings the adoption of reasonable and feasible noise management and mitigation will be required. These measures should be determined in detail when a contractor, with defined construction techniques, has been engaged on the project. However, “in-principle” mitigation measures are detailed in the following sections.

Construction Vibration

Operation of rock breakers and the like generate ground vibration that has the potential to transmit to nearby buildings. Table below sets out the typical ground vibration levels at various distances for safe working distances.

Table 13: Recommended Safe Working Distances for Vibration-Intensive Plant

Item	Description	Safe Working Distance	
		Cosmetic Damage	Human Response
Small Hydraulic Hammer	(300 kg – 5 to 12t excavator)	2m	7m
Medium Hydraulic Hammer	(900 kg – 12 to 18t excavator)	7m	23m
Large Hydraulic Hammer	(1600 kg – 18 to 34t excavator)	22m	73m
Vibratory Pile Driver	Sheet piles	2m to 20m	20m
Pile Boring	≤ 800 mm	2m (nominal)	N/A
Jackhammer	Hand held	1m (nominal)	Avoid contact with structure

The highest vibration levels will occur when construction equipment is located on the northern, eastern and southern side of the site near neighboring residences. A review of the site plant and surrounding receivers indicates that the minimum distance between the vibration generating activities and surrounding buildings will be in the order of 1-2m. Therefore, the use of medium to large rock breakers if used onsite should be carefully managed.

Structural damage vibration criteria in residential buildings are much higher than human comfort criteria, and predicted vibration levels are within these criteria under most circumstances.

6. NOISE ASSESSMENT

The calculation of noise emission to the environment considers the surface area of the development radiating noise, the sound reduction index of the structural component and distance to the receiver location. Surface areas and the construction of the walls, roof, windows and doors are determined from the initial site inspection. The distance is measured from the proposed noise sources to the nearest residential receivers.

With the recommendations correctly implemented, as specified in Section 7 below and discussion of existing building materials below, the activities from within the proposal **are** predicted to generate sound pressure levels which are compliant at neighboring receivers.

The noise emission dBA to the nearest residential receptors were calculated as follows:

Golf Cart

The nearest sensitive receptor property boundary can be located roughly 10m from the potential golf cart route.

75.8 – 20 LOG (10 / 1) = **55.8 dBA**

Therefore, the minimum required 'Weighted Sound Reduction Index (Rw) from the golf cart route to the nearest proposed residential receptor property boundaries are **8.17 dBA** for the daytime, **10.8 dBA** for the evening and **15.8 dBA** for the night .

This attenuation that is required can be achieved via the construction materials of the senior housing dwellings. The minimum building code requirements for the roof, walls, windows and door will be sufficient to meet the noise goals of 15.8 dBA that is required.

Mechanical Plant (Air-conditioners) .

The nearest sensitive receptor property boundary can be located roughly 1m from the potential mechanical plant at any proposed residency.

54 – 20 LOG (2 / 1) = **47.98 dBA**

Therefore, the minimum required 'Weighted Sound Reduction Index (Rw) from the air conditioner condensers for the proposal to the nearest residential receptor property boundaries are **0.35 dBA** for the daytime, **2.98 dBA** for the evening and **7.98 dBA** for the night .

This attenuation that is required can be achieved via the construction materials of the senior housing dwellings. The minimum building code requirements for the roof, walls, windows and door will be sufficient to meet the noise goals of 7.98 dBA that is required.

Maintenance Shed

The proposed construction of the senior housing development is located 100m to the north east of the golf maintenance shed.

92.5 – 20 LOG (100 / 1) = **52.5 dBA**

Therefore, the minimum required 'Weighted Sound Reduction Index (Rw) from the proposed senior housing development to the golf maintenance shed is **4.87 dBA** for the daytime, **7.5 dBA** for the evening and **12.5 dBA** for the night**.**

Considering the loudest machinery that may be used on the golf course (Sand Pro 3040 Grooming Maintenance Machine) is in operation 6m from the proposed senior housing development:

87 – 20 LOG (6 / 1) = **71.44 dBA**

Therefore, the minimum required 'Weighted Sound Reduction Index (Rw) from the proposed senior housing development to the golf maintenance shed is **23.81 dBA** for the daytime, **26.44 dBA** for the evening and **31.44 dBA** for the night**.**

The following constructions details are indicative of the type of construction required to achieve the noise goals as previously recommended.

Roof Construction

The roof construction proposed that is selected is colorbond roof sheeting with sarking (Roof pitch at 22°). R 3.0 insulation or better is recommend over a 10mm plasterboard ceiling. When correctly constructed roof componentry will achieve a weighted reduction value of 40 – 45 dBA, far greater than the required 31.44 dBA.

Wall Construction

Design plans of the proposed senior housing development indicate the external walls of the structures are to be comprised of selected weather board planking, painted fresh. Sarking, minimum density insulation and 10mm plasterboard will achieve a weighted reduction value of 45-55 dBA. This is far above the required noise reduction required of 31.44 dBA.

Window Construction

The below recommendations are for the western and southern aspects of the proposed senior housing development only.

The windows that are proposed for this senior housing development are selected pre-painted windows in aluminimum frames. All externally exposed windows are to be as a minimum consisting of laminated 6.38mm glass, with full perimeter acoustic type seals. If doulble glazing is proposed the following configurating as a minimum is needed, 5mm/100mm gap/5mm. Both above

configurations will provide attenuations of 32-43 dBA. Further attenuation of the transmitted noise may achieved via:

- Use of laminated glass of greater thickness
- Double glazing of greater varied configuration (cavity and glass depth)

Door Construction

If timber doors are to be used externally, a 45mm single leaf solid core door within a steel frame with proprietary acoustic seals is required. This would give the overall door a rating of 33 Rw.

If glass doors are used two options are recommended. A double-glazed wide gap configuration is required; 4mm glass within non-sealed frames will provide a 35 dBA reduction or an 8.5mm thick laminated glass door which will provide a 32 dBA reduction. Further improvement upon the noise reduction is achievable via the implementation of various acoustically designed proprietary products.

Provided these proposed construction recommendations are adhered to the proposed senior housing development will be acoustically sufficient for construction in the proposed area.

Function Rooms – Emu Sports Club

The nearest sensitive receptor property boundary is located roughly 250m from the centre of the function rooms at Emu Sports Club.

88.8 – 20 LOG (250 / 1) = **40.84 dBA**

Therefore, the minimum required 'Weighted Sound Reduction Index (Rw) from the function hall to the nearest residential receptor property boundaries of the proposal are **0.84 dBA** for the daytime.

This attenuation that is required can be achieved via the construction materials of the senior housing dwellings. The minimum building code requirements for the roof, walls, windows and door will be sufficient to meet the noise goals of 0.84 dBA that is required.

Carpark – Emu Sports Club

The nearest sensitive receptor property boundary is located roughly 280m from the centre of the function rooms at Emu Sports Club.

95.6 – 20 LOG (280 / 1) = **46.66 dBA**

Therefore, the minimum required 'Weighted Sound Reduction Index (Rw) from the function hall to the nearest residential receptor property boundaries of the proposal are **1.66 dBA** during the evening and **6.66 dBA** for the daytime.

This attenuation that is required can be achieved via the construction materials of the senior housing dwellings. The minimum building code requirements for the roof, walls, windows and door will be sufficient to meet the noise goals of 6.66 dBA that is required.

7. RECOMMENDATIONS

Mechanical Plant (Air Conditioners)

Maximum noise emission levels for mechanical plant noise is to not exceed 56 dBA. Plant equipment with a higher dBA can be used in a sound booth which has the capacity to lower Rw by desired dBA.

Electrical, mechanical, hydraulic and air conditioning equipment is to be housed so that it does not create an 'offensive noise' as defined in the Protection of the Environment Operations Act 1997, either within or at the boundaries of any neighboring property at any time of the day.

Differing models of air conditioners will provide differing noise emitting values. Acoustic Enclosures typically achieve performance between 15dB (A) to 25dB (A) with higher performance systems readily available.

It is recommended for the proposed building that external air conditioning units emit a noise level of 70 dBA or less. Providing an acoustic enclosure on a unit with a noise level of 70 dBA with a 25 dBA reduction, relevant noise goals at the relevant property boundaries will be achieved.

Construction Noise & Vibration Mitigation Measures

Noise levels from construction activities have been predicted to exceed the noise management levels nominated in the guidelines at some surrounding receivers. Therefore, noise control measures are recommended to ensure that noise is reduced where feasible.

The following project-specific mitigation measures are recommended:

- Selection of quietest feasible construction equipment;
- Localised treatment, such as barriers, shrouds and the like around fixed plant, such as pumps, generators and concrete pumps;
- Provision of respite periods, particularly on Saturdays;
- Limit noisy work to daylight or less sensitive hours where possible;
- Select low noise options for plant and equipment. Ensure equipment mufflers operate in a proper and efficient manner;
- Where possible, use quieter construction methods;
- Only have necessary equipment on-site and turn off when not in use;
- Ensure all plant and equipment is well maintained and where possible, fitted with silencing devices;
- Plan traffic flow, parking and loading/unloading areas to minimise reversing movements;

- Plant Noise Audit – Noise emission levels of all critical items of mobile plant and equipment should be checked for compliance with noise limits appropriate to those items prior to the equipment going into regular service;

- Operator Instruction – Operators should be trained in order to raise their awareness of potential noise problems and to increase their use of techniques to minimise noise emission;

- Equipment Selection – All fixed plant at the work sites should be appropriately selected, and where necessary, fitted with silencers, acoustical enclosures and other noise attenuation measures in order to ensure that the total noise emission from each work site complies with EPA guidelines;

- Site Noise Planning – Where practical, the layout and positioning of noise-producing plant and activities on each work site should be optimised to minimise noise emission levels;

- An effective community relations program should be put in place to keep the community that has been identified as being potentially affected appraised of progress of the works, and to forewarn potentially affected groups (e.g. by letterbox drop, meetings with surrounding owners / tenants, etc.) of any anticipated changes in noise and vibration emissions prior to critical stages of the works, and to explain complaint procedures and response mechanisms;

- Close liaison should be maintained between the communities overlooking work sites and the parties associated with the construction works to provide effective feedback in regard to perceived noise emissions. In this manner, equipment selections and work activities can be coordinated where necessary to minimise disturbance to neighboring communities, and to ensure prompt response to complaints, should they occur;

- Identification of a site contact person to follow up any complaints, should they occur;

The adoption of the above measures is aimed at working towards achieving the construction noise management levels established at surrounding receivers.

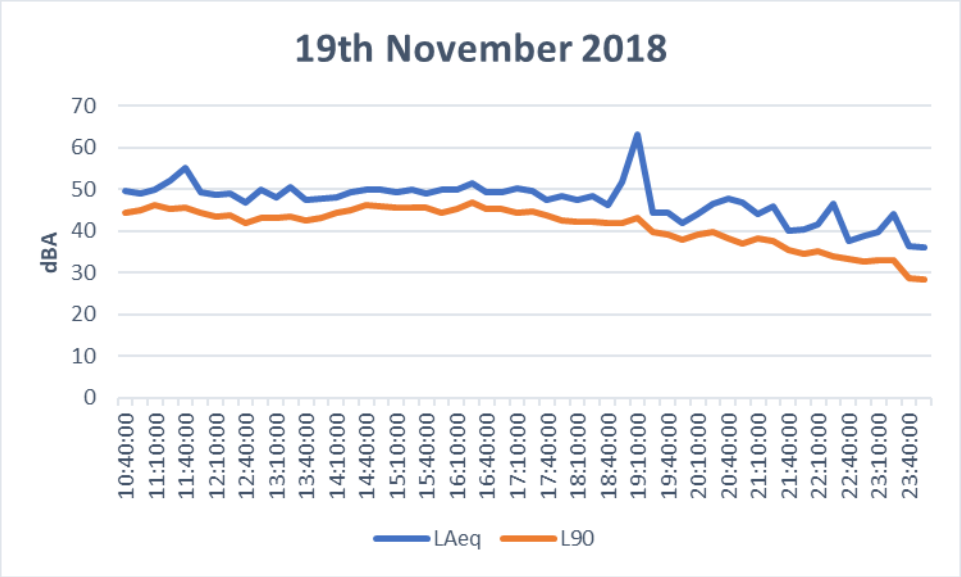
8. CONCLUSION

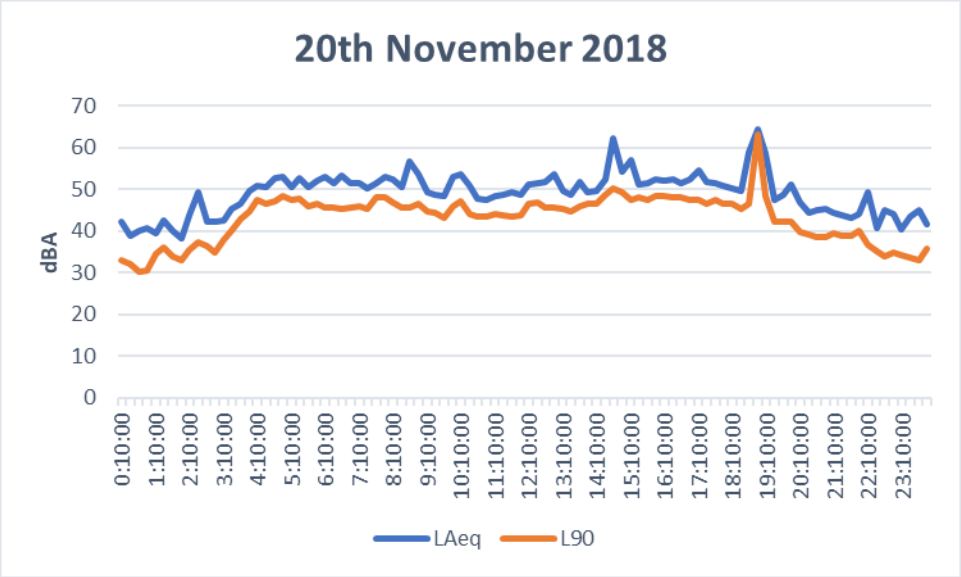
The acoustic assessment the proposed torrens title subdivision and senior housing development, at 1A Leonay Parade, LEONAY 2750 has determined that the noise generated from the proposal will be negligible once attenuation recommendations are put into place to the closest residential receivers.

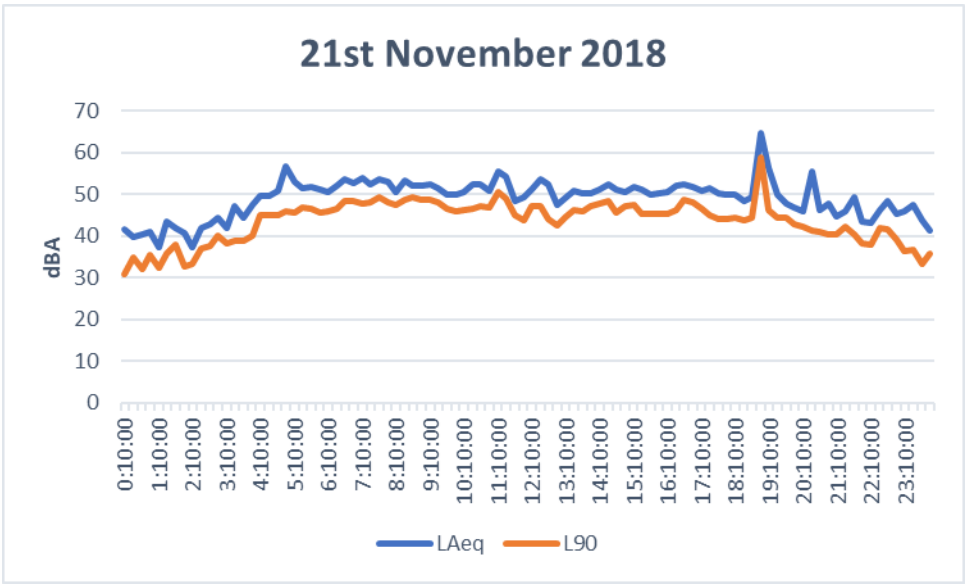
It is concluded that the proposed development is predicted to comply with the relevant noise goals providing the recommendations provided in Section 6 and 7 above are adhered to.

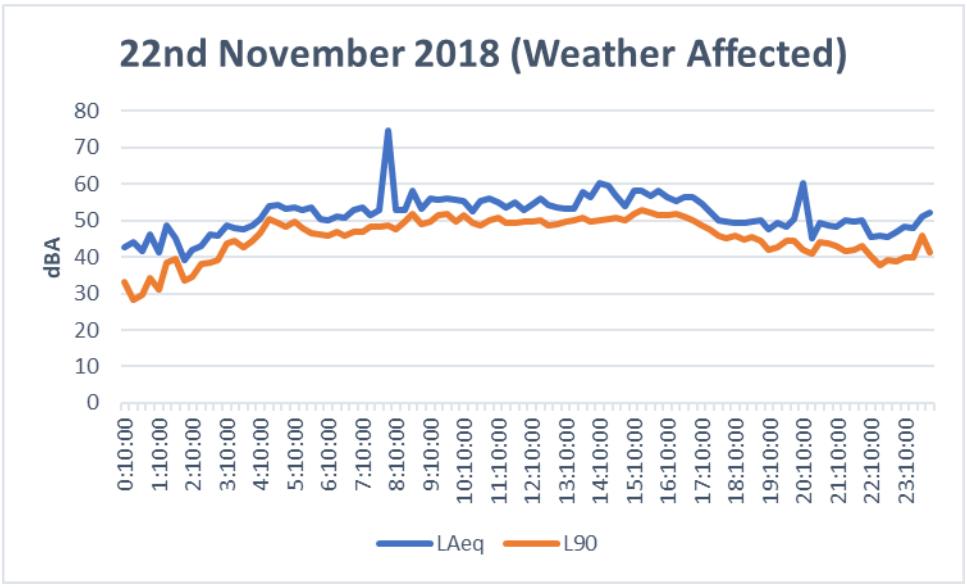
9. GRAPHED DATA

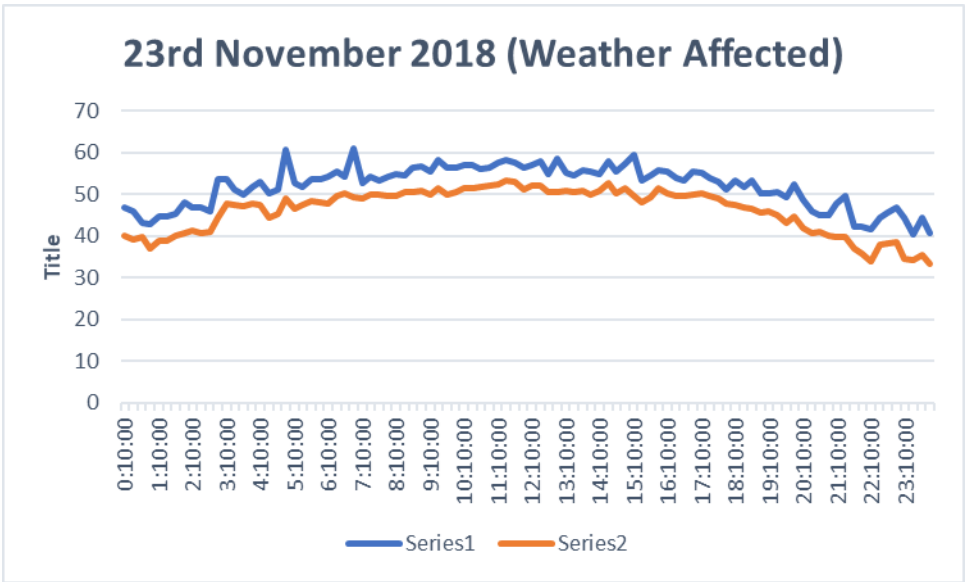
Measured noise levels.

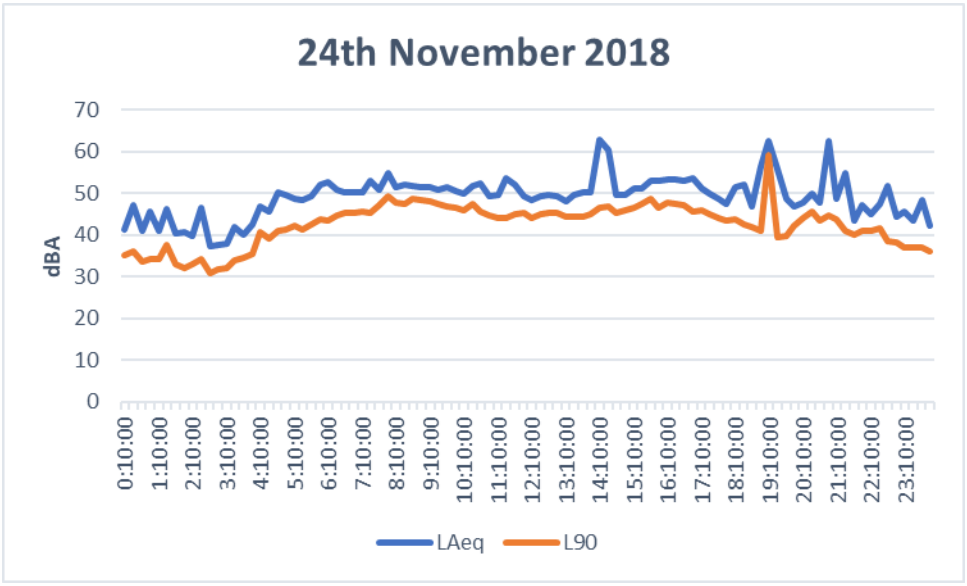


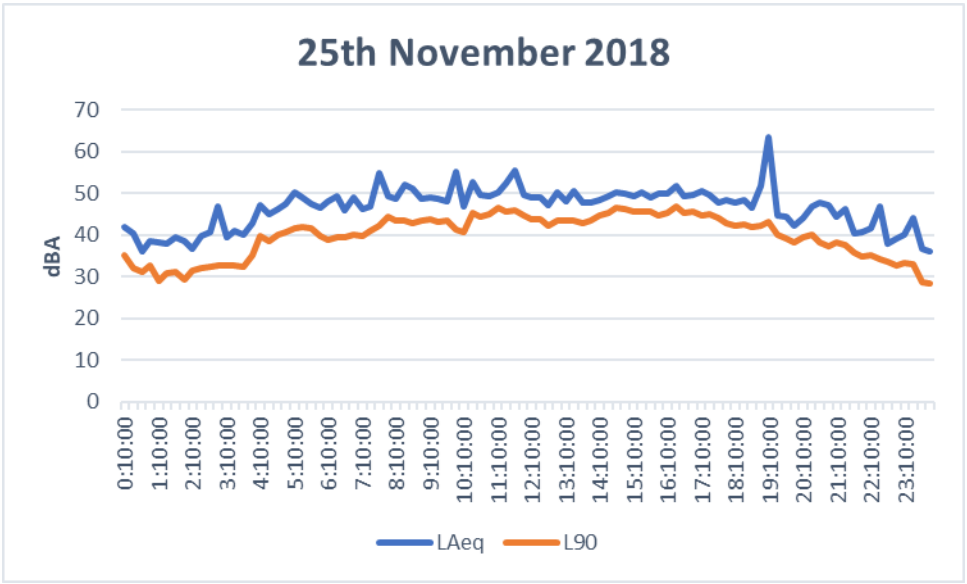


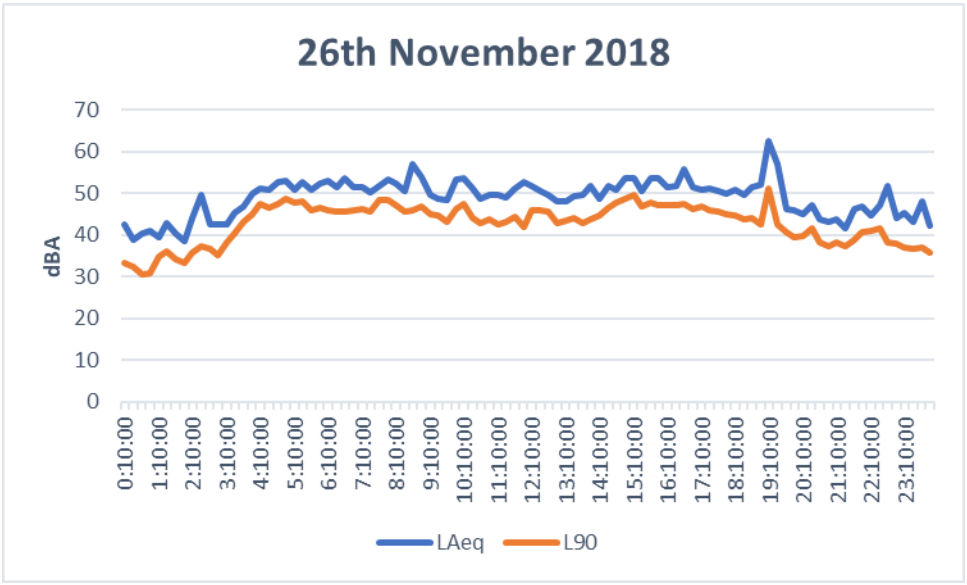


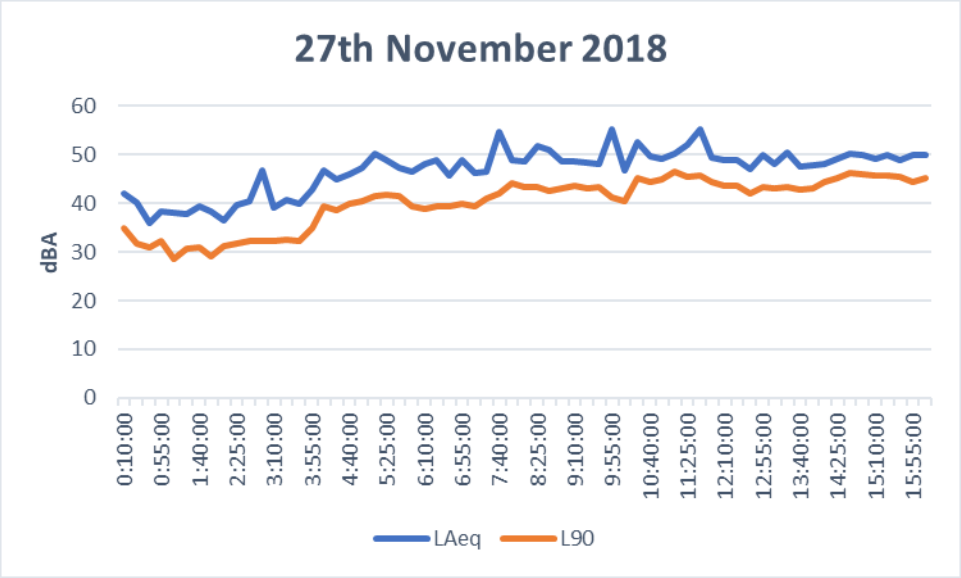












Appendix I – Site Photos

Figure A1: Toro Reelmaster 3100.D Reel Trim Mower

Figure A2: Sand Pro 3040 Grooming Maintenance Machine

Figure A3: Agrimetal Leaf Blower

Figure A4: John Deere 1200a Bunker Rake

Figure A5: John Deere 7200A Precision Cut Mower

Figure A6: Greensmaster 3150-Q Riding Greensmower

Figure A7: Kubota L3300 Tractor

Appendix II – Site Plans

Client:

Leonay Links Pty Limited as trustee Fairways Unit Trust

ARCHITECTURAL CONSULTANTS

DEVELOPMENT CONSULTANTS

Proposed SEPP Housing for Seniors or People with a Disability 2004

Part of Lot 110 in DP1135581, (Leonay Golf Course) 1a Leonay Parade, LEONAY

Development Application - June 2018

PreTech Pty Ltd - Architects
John Hepworth Nominated Architect Reg. No 5036

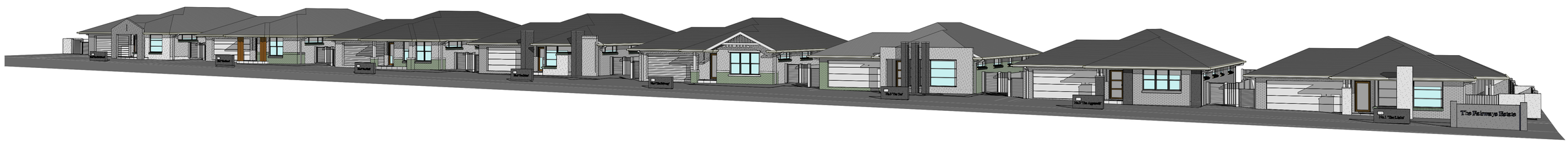
Level 1, Suite 2/86 Henry Street
Penrith NSW 2750 Australia
PO Box 301 Penrith NSW 2751

T - (02) 4732 5100

E - admin@pretech.com.au

ARCHITECTURAL DRAWING SCHEDULE

SITE PLAN, GROUND FLOOR PLANS & DEVELOPMENT CALCULATIONS	1 : 250	A 01
SITE PLAN & ROOF PLANS	1 : 250	A 02
ELEVATIONS	1 : 200	A 03
ELEVATIONS, SECTION & THERMAL PERFORMANCE SPECIFICATION	1 : 200	A 04
SITE ANALYSIS PLAN	1 : 350	A 05
SHADOW ANALYSIS (June 22, 9.0am, 12.0 & 3.0pm)	1 : 400	A 06



Leonay Parade Facade

SURVEY LEGEND & NOTES

wt ~ DENOTES WINDOW TOP
wb ~ DENOTES WINDOW BOTTOM

DENOTES OVERHEAD ELECTRICITY

DENOTES SEWERMAIN (approx.position only)

t/k DENOTES TOP OF KERB

NOTE: SPREAD OF TREES IS APPROXIMATE ONLY

NatHERS - THERMAL COMFORT SUMMARY

Address: *Lot 1100 Leonay Pde, Leonary NSW 2750*

Building Elements	Material	Detail
External walls	Brick Veneer	R2.0 bulk insulation *(excluding garage)*
Internal walls	Plasterboard on studs	R2.0 bulk insulation to walls adjacent to garage
Ceiling	Plasterboard	R3.5 bulk insulation to ceilings with roof above *(excluding garage)*
Floors	Concrete	Waffle Pod
Roof	Roof Tiles / Metal Roof – Dark Colour Solar Absorptance > 0.70	Foil (sisalation) to underside of roof
Doors/Windows	*Awning windows & French door:* Aluminium frame, single glazed clear	U value 6.70 or less and SHGC 0.57 +/- 10%
	Sliding doors, Double Hung windows & fixed windows: Aluminium frame, single glazed clear	U value 6.70 or less and SHGC 0.70 +/- 10%
Lighting: Each dwelling has been rated with non-ventilated LED downlights as per NatHERS Certificate.		
Note: Insulation specified must be installed in accordance with Part 3.12.1.1 of the BCA.		
Note: In some climate zones, insulation should be installed with due consideration of condensation and associated interaction with adjoining building materials.		
Note: Self-closing damper to all exhaust fans.		

BASIX COMMITMENTS NOTES

WATER				
Fixtures	All Shower Heads	All toilet flushing systems	All kitchen taps	All bathroom taps
	3 star (> 6 but <= 7.5 L/min)	4 star	4 star	4 star
Alternative water source	Individual rainwater tank to collect run off from at least 90m² of roof area - Tank size min 2000 litres			
	The applicant must connect the rainwater tank to:			
	Landscape connection	Toilet connection	Laundry connection	Pool top up
	Yes	Yes	YES	N/A
ENERGY	*Hot water system*: Gas instantaneous with a performance of 5 stars			
	Bathroom ventilation system: Individual fan, ducted to façade or roof; manual switch on/off			
	Kitchen ventilation system: Individual fan, ducted to façade or roof; manual switch on/off			
	Laundry ventilation system: Individual fan, ducted to façade or roof; manual switch on/off			
	Cooling system: 1 Phase air-conditioning EER 2.5 - 3.0 in at least 1 living/bed area (zoned)			
	Heating system: 1 Phase air-conditioning EER 2.5 - 3.0 in at least 1 living/bed area (zoned)			
	Natural lighting: As per BASIX Artificial lighting: As per BASIX			
	Alternative energy: Must install a photovoltaic system with the capacity to generate at least 1.0 peak kilowatts of electricity.			
	Must install a gas cooktop and electric oven.			
	Must install a fixed outdoor clothes drying line as part of the development.			

NOTE:
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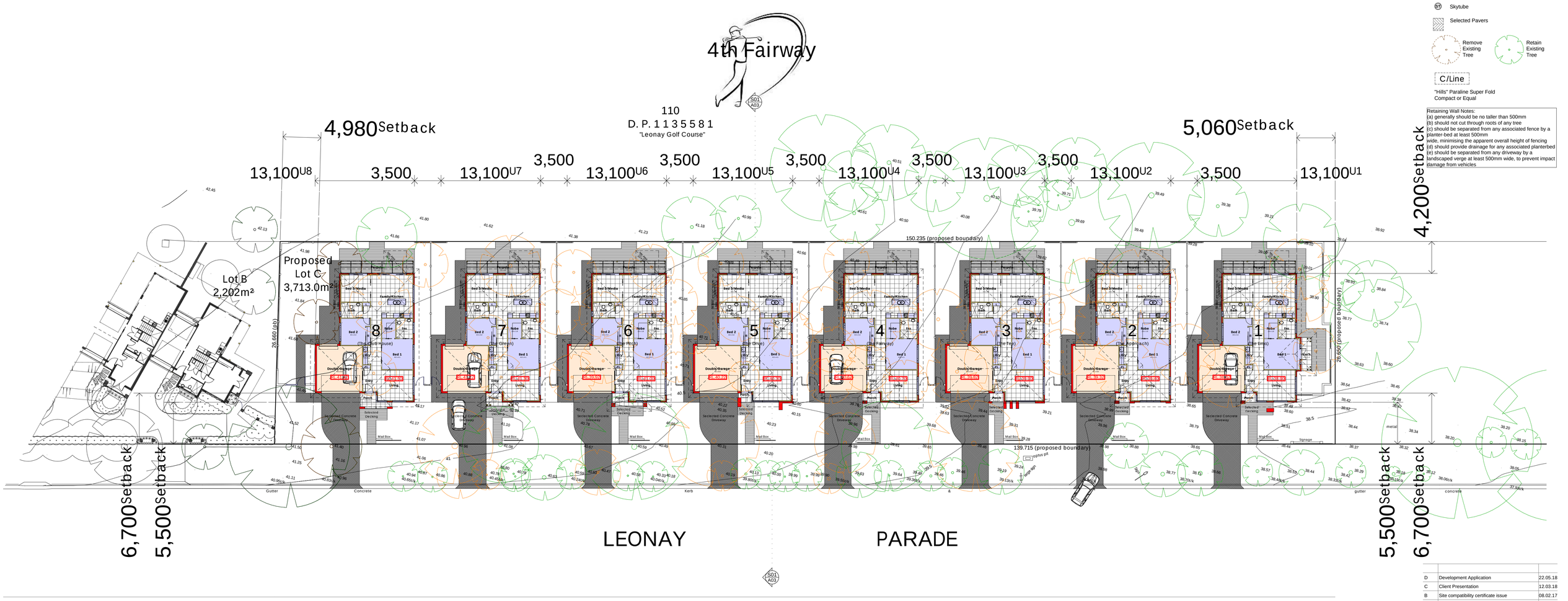
LEGEND

- 1000 — Existing Surveyors Spot Level
- RL 10.00 — Proposed Related Level
- 2,000L AWT — Selected above ground pre-fabricated water tank 2,000L, 625W x 2250L x 1930Hgt
- (S) — Smoke Detector
- R A — Roof Access
- HWS — Electric Hot Water System
- HW — Gas Hot water
- Exhaust Fan/Light
- ST — Skytube
- Selected Pavers
- Remove Existing Tree
- Retain Existing Tree
- C/Line — "Hills" Paraline Super Fold Compact or Equal

Retaining Wall Notes:
(a) generally should be no taller than 500mm
(b) should not cut through roots of any tree
(c) should be separated from any associated fence by a planter-bed at least 500mm wide, minimising the apparent overall height of fencing
(d) should provide drainage for any associated planterbed
(e) should be separated from any driveway by a landscaped verge at least 500mm wide, to prevent impact damage from vehicles



Issue	Amendment	Date
D	Development Application	22.05.18
C	Client Presentation	12.03.18
B	Site compatibility certificate issue	08.02.17
A	Pre-Lodgement council meeting	08.10.16

PreTech Pty Ltd - Architects
John Hepworth Nominated Architect Reg. No 5036
Level 1, Suite 2-86 Henry Street
Penrith, NSW 2750
Telephone: (02) 4732 5100 Email: admin@pretech.com.au

Project
Proposed SEPP 2004 Housing
Leonay Golf Course, 1a Leonay Parade, LEONAY
Client : Leonay Links Pty Ltd trustee Fairways Unit Trust

Job No.	Scale	
00372	1:250	
Author	Drawn	Date
S.Vlangos	S.Vlangos	Oct 2016

Drawing
Site, Ground Floor Plan & Development Calculations

No. in Set	Dwg. No.	Issue
06	A01	D

DEVELOPMENT CALCULATIONS

1. SITE AREA = 3,713.0m²

2. PARKING REQUIREMENTS

2.0 space per every 3 bed unit (x8 units), plus 8 visitor.
= 24.0 Spaces
Total provided = 24.0 Spaces

3. LANDSCAPED OPEN AREA

Min. required 30.0% = 1,136.40m²
Actual Area 39.42% = 1,493.22m²

4. UNIT FLOOR AREAS

UNIT 1		UNIT 4	
Living Area	= 146.23m²	Living Area	= 143.12m²
Garage	= 39.55m²	Garage	= 39.55m²
Pergola	= 16.49m²	Pergola	= 16.49m²
Verandah	= 6.27m²	Porch	= 2.53m²
Porch	= 2.72m²	Total Area	= 201.69m²
Total Area	= 211.26m²		
UNIT 2&3		UNIT 5	
Living Area	= 143.59m²	Living Area	= 143.54m²
Garage	= 39.55m²	Garage	= 39.55m²
Pergola	= 16.49m²	Pergola	= 16.49m²
Porch	= 2.72m²	Porch	= 1.85m²
Total Area	= 202.30m²	Total Area	= 201.43m²

UNIT 6		UNIT 8	
Living Area	= 143.12m²	Living Area	= 143.12m²
Garage	= 39.55m²	Garage	= 39.55m²
Pergola	= 16.49m²	Pergola	= 16.49m²
Porch	= 4.45m²	Porch	= 5.59m²
Total Area	= 203.61m²	Total Area	= 205.12m²
UNIT 7			
Living Area	= 143.12m²		
Garage	= 39.55m²		
Pergola	= 16.49m²		
Porch	= 4.30m²		
Total Area	= 203.46m²		

5. COURTYARD AREAS

Unit 1	= 188.14m²
Unit 2	= 150.41m²
Unit 3	= 150.41m²
Unit 4	= 150.41m²
Unit 5	= 150.41m²
Unit 6	= 150.41m²
Unit 7	= 150.41m²
Unit 8	= 217.34m²

6. DEEP SOIL ZONE AREA

Min. required 15.0% = 568.20m²
Actual Area 30.05% = 1,138.30m²

7. FSR (Floor Space Ratio)

Required 0.5:1 = 1,866.50m²
Actual 0.31:1 = 1,149.33m²

SURVEY LEGEND & NOTES

wt ~ DENOTES WINDOW TOP
wb ~ DENOTES WINDOW BOTTOM

DENOTES OVERHEAD ELECTRICITY

DENOTES SEWERMAIN (approx.position only)

t/k DENOTES TOP OF KERB

NOTE: SPREAD OF TREES IS APPROXIMATE ONLY

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Roof	Roof Tiles / Metal Roof – Dark Colour Solar Absorptance > 0.70	Foil (sisalation) to underside of roof
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Note: Self-closing damper to all exhaust fans.		

BASIX COMMITMENTS NOTES

WATER				
Fixtures	**All Shower Heads**	**All toilet flushing systems**	**All kitchen taps**	**All bathroom taps**
	3 star (> 6 but <= 7.5 L/min)	**4 star**	**4 star**	**4 star**
Alternative water source	**Individual rainwater tank to collect run off from at least 90m² of roof area - Tank size min 2000 litres**			
	The applicant must connect the rainwater tank to:			
	Landscape connection	**Toilet connection**	**Laundry connection**	**Pool top up**
	Yes	**Yes**	**YES**	**N/A**
ENERGY	***Hot water system*: Gas instantaneous with a performance of 5 stars**			
	***Bathroom ventilation system*: Individual fan, ducted to façade or roof; manual switch on/off**			
	***Kitchen ventilation system*: Individual fan, ducted to façade or roof; manual switch on/off**			
	***Laundry ventilation system*: Individual fan, ducted to façade or roof; manual switch on/off**			
	***Cooling system*: 1 Phase air-conditioning EER 2.5 - 3.0 in at least 1 living/bed area (zoned)**			
	***Heating system*: 1 Phase air-conditioning EER 2.5 - 3.0 in at least 1 living/bed area (zoned)**			
	Natural lighting: As per BASIX **Artificial lighting: As per BASIX**			
	Alternative energy: Must install a photovoltaic system with the capacity to generate at least 1.0 peak kilowatts of electricity.			
	Must install a gas cooktop and electric oven. **Must install a fixed outdoor clothes drying line as part of the development.**			

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- R A — Roof Access
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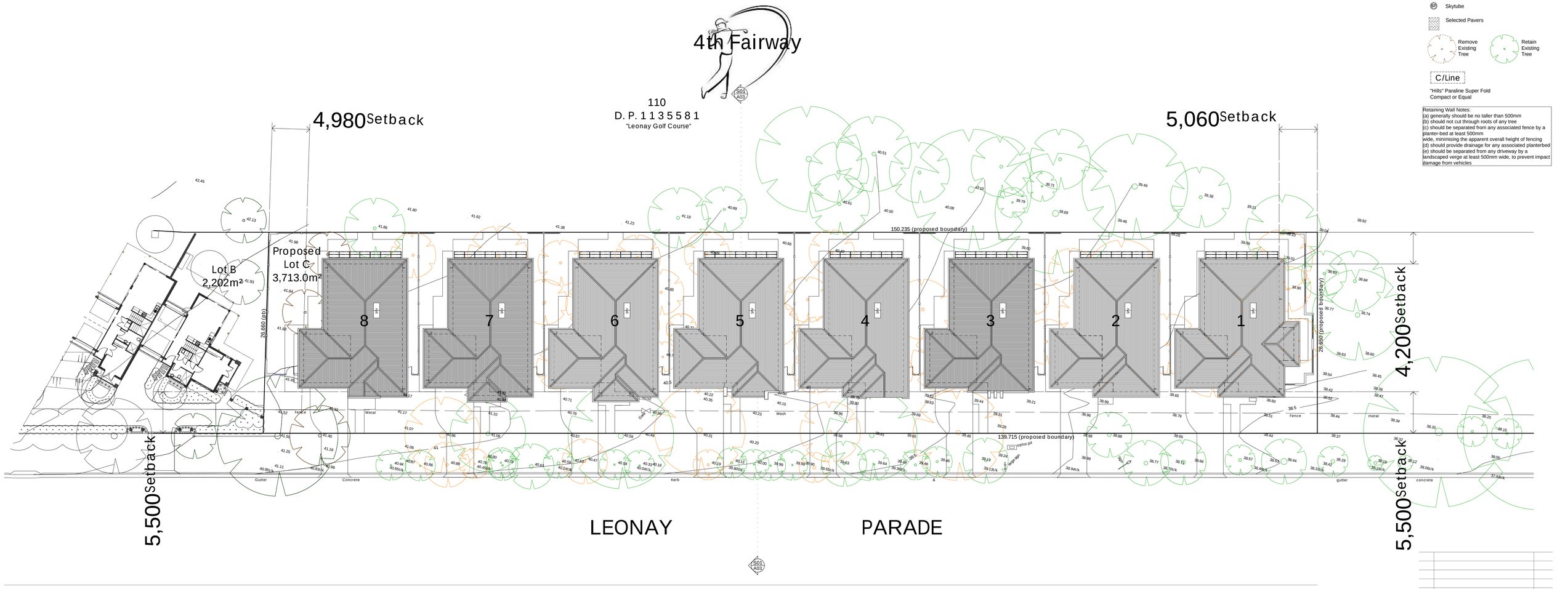

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plus 8 visitor.
= 24.0 Spaces
Total provided = 24.0 Spaces

3. LANDSCAPED OPEN AREA

Min. required 30.0% = 1,136.40m²
Actual Area 39.42% = 1,493.22m²

4. UNIT FLOOR AREAS

UNIT 1
Living Area = 146.23m²
Garage = 39.55m²
Pergola = 16.49m²
Verandah = 6.27m²
Porch = 2.72m²
Total Area = 211.26m²

UNIT 2&3
Living Area = 143.59m²
Garage = 39.55m²
Pergola = 16.49m²
Porch = 2.72m²
Total Area = 202.30m²

UNIT 4
Living Area = 143.12m²
Garage = 39.55m²
Pergola = 16.49m²
Porch = 2.53m²
Total Area = 201.69m²

UNIT 5
Living Area = 143.54m²
Garage = 39.55m²
Pergola = 16.49m²
Porch = 1.85m²
Total Area = 201.43m²

UNIT 6
Living Area = 143.12m²
Garage = 39.55m²
Pergola = 16.49m²
Porch = 4.45m²
Total Area = 203.61m²

UNIT 7
Living Area = 143.12m²
Garage = 39.55m²
Pergola = 16.49m²
Porch = 4.30m²
Total Area = 203.46m²

UNIT 8
Living Area = 143.12m²
Garage = 39.55m²
Pergola = 16.49m²
Porch = 5.59m²
Total Area = 205.12m²

5. COURTYARD AREAS

Unit 1 = 188.14m²
Unit 2 = 150.41m²
Unit 3 = 150.41m²
Unit 4 = 150.41m²
Unit 5 = 150.41m²
Unit 6 = 150.41m²
Unit 7 = 150.41m²
Unit 8 = 217.34m²

6. DEEP SOIL ZONE AREA

Min. required 15.0% = 568.20m²
Actual Area 30.05% = 1,138.30m²

7. FSR (Floor Space Ratio)

Required 0.5:1 = 1,866.50m²
Actual 0.31:1 = 1,149.33m²

Issue	Amendment	Date
A	Development Application	20.05.18

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Penrith, NSW 2750
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Project
Proposed SEPP 2004 Housing
Leonay Golf Course, 1a Leonay Parade, LEONAY
Client : Leonay Links Pty Ltd Trustee Fairways Unit Trust

Job No.	Scale	
00372	1:250	
Author	Drawn	Date
S.Vlangos	S.Vlangos	Oct 2016

Drawing
Site Plan & Roof Plan

No. in Set	Dwg. No.	Issue
06	A02	A

NOTE:
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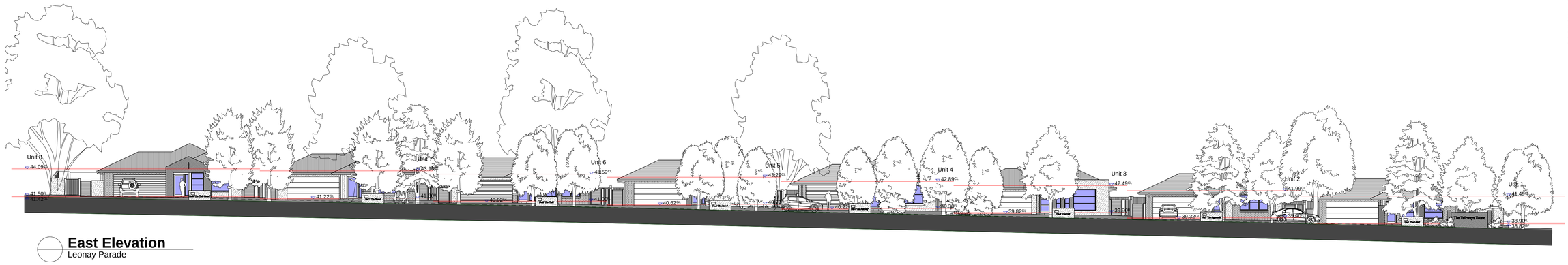
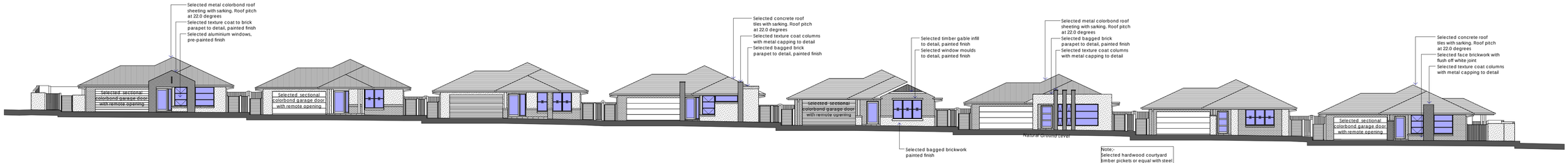
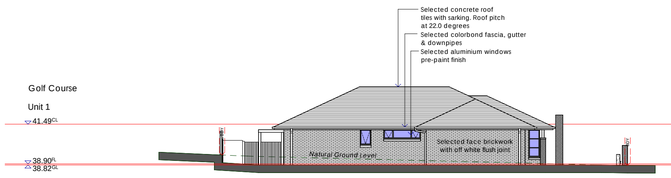
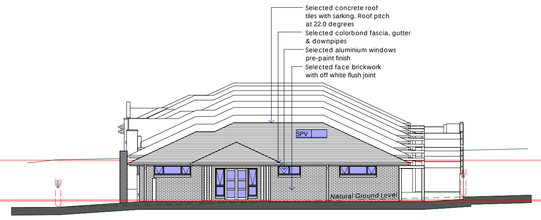


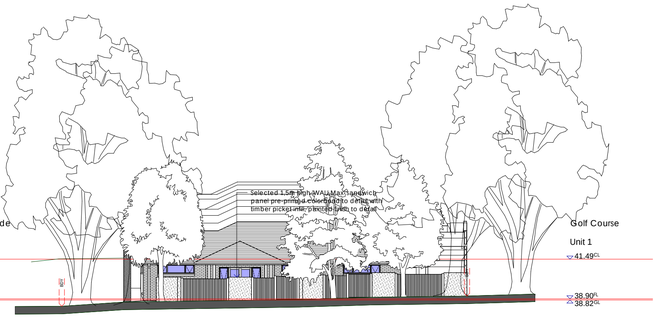
East Elevation
Leonay Parade



East Elevation

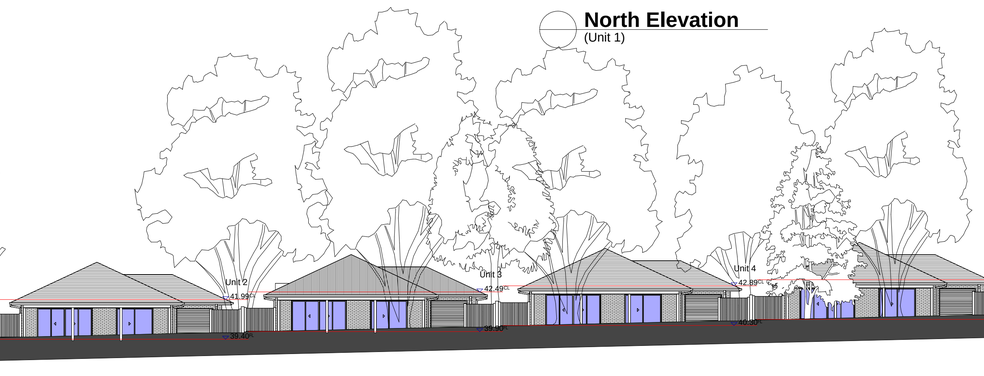




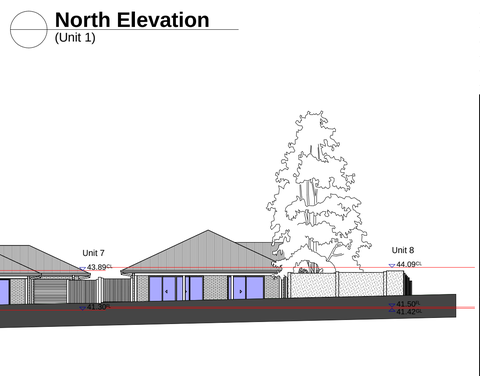


South Elevation
(Unit 1)

North Elevation
(Unit 1)



North Elevation
(Unit 1)



West Elevation
Golf Course

A	Development Application	22.05.18
Issue	Amendment	Date

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Telephone: (02) 4732 5100 Email: admin@pretech.com.au

Project
Proposed SEPP 2004 Housing
Leonay Golf Course, 1a Leonay Parade, LEONAY
Client : Leonay Links Pty Ltd Trustee Fairways Unit Trust

Job No. 00372	Scale 1:250	
Author S.Vlangos	Drawn S.Vlangos	Date May 2018

Drawing
Elevations

No. in Set	Dwg. No.	Issue
06	A03	A

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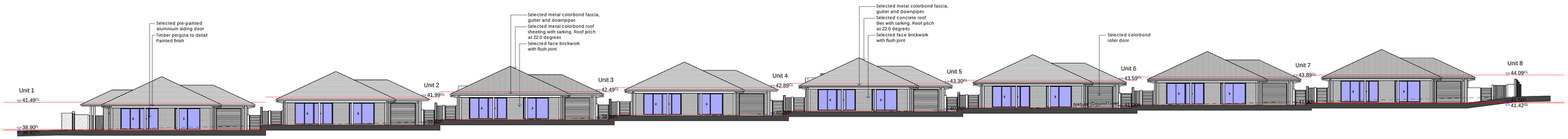
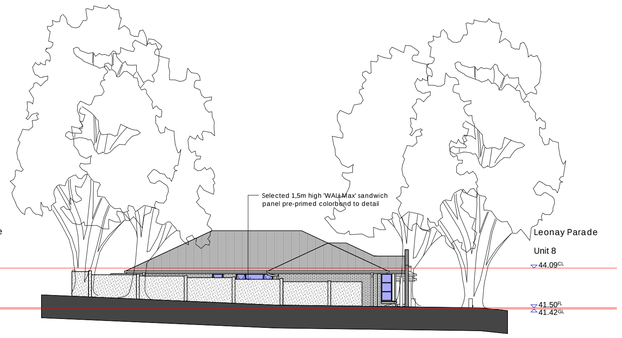


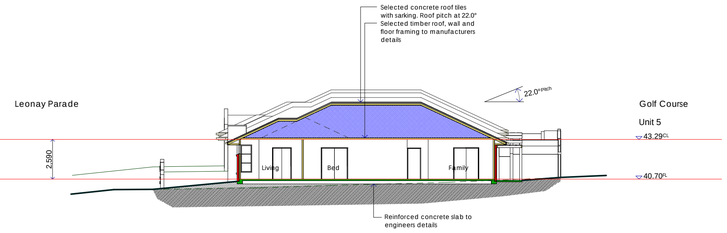
North Elevation
(Unit 8)

South Elevation
(Unit 8)



South Elevation
(Unit 8)

West Elevation



Section
S01
A01
(Unit 5)

NatHERS - THERMAL COMFORT SUMMARY

Address: *Lot 1100 Leonay Pde, Leonary NSW 2750*

Building Elements	Material	Detail
External walls	Brick Veneer	R2.0 bulk insulation *(excluding garage)*
Internal walls	Plasterboard on studs	R2.0 bulk insulation to walls adjacent to garage
Ceiling	Plasterboard	R3.5 bulk insulation to ceilings with roof above *(excluding garage)*
Floors	Concrete	Waffle Pod
Roof	Roof Tiles / Metal Roof – Dark Colour Solar Absorptance > 0.70	Foil (sisalation) to underside of roof
Doors/Windows	***Awning windows & French door:*** Aluminium frame, single glazed clear	U value 6.70 or less and SHGC 0.57 +/- 10%
	Sliding doors, Double Hung windows & fixed windows: Aluminium frame, single glazed clear	U value 6.70 or less and SHGC 0.70 +/- 10%

Lighting: *Each dwelling has been rated with non-ventilated LED downlights as per NatHERS Certificate.*
Note: *Insulation specified must be installed in accordance with Part 3.12.1.1 of the BCA.*
Note: *In some climate zones, insulation should be installed with due consideration of condensation and associated interaction with adjoining building materials.*
Note: *Self-closing damper to all exhaust fans.*

BASIX COMMITMENTS NOTES

WATER				
Fixtures	All Shower Heads	All toilet flushing systems	All kitchen taps	All bathroom taps
	3 star (> 6 but <= 7.5 L/min)	4 star	4 star	4 star
Alternative water source	Individual rainwater tank to collect run off from at least 90m² of roof area - Tank size min 2000 litres			
	The applicant must connect the rainwater tank to:			
	Landscape connection	Toilet connection	Laundry connection	Pool top up
	Yes	Yes	YES	N/A
ENERGY	*Hot water system*: Gas instantaneous with a performance of 5 stars			
	Bathroom ventilation system: Individual fan, ducted to façade or roof; manual switch on/off			
	Kitchen ventilation system: Individual fan, ducted to façade or roof; manual switch on/off			
	Laundry ventilation system: Individual fan, ducted to façade or roof; manual switch on/off			
	Cooling system: 1 Phase air-conditioning EER 2.5 - 3.0 in at least 1 living/bed area (zoned)			
	Heating system: 1 Phase air-conditioning EER 2.5 - 3.0 in at least 1 living/bed area (zoned)			
	Natural lighting: As per BASIX Artificial lighting: As per BASIX			
	Alternative energy: Must install a photovoltaic system with the capacity to generate at least 1.0 peak kilowatts of electricity.			
	Must install a gas cooktop and electric oven.			
	Must install a fixed outdoor clothes drying line as part of the development.			

External Colour Schedule

Unit 1 'The Links'
- Concrete Roof Tiles — Monier 'Atura' Camelot
- Metal fascia — Colour_Colorbond 'Surfmist'
- Metal gutter & downpipes — Colour_Colorbond 'Surfmist'
- Feature Entry Door — Dark stain natural timber
- Face Brickwork — Austral 'Freedom' Everyday Life
- Feature Column_Brickwork — Colour_Colorbond 'Jasper'
- Aluminium windows and doors — Colour_White
- Garage Metal Door — Colour_Colorbond 'Surfmist'
- External timber work — Colour_Off White (Dulux)

Unit 2 'The Approach'
- Concrete Roof Tiles — Monier 'Atura' Barramundi
- Metal fascia — Colour_Colorbond 'Windspray'
- Metal gutter & downpipes — Colour_Colorbond 'Windspray'
- Feature Entry Door — Dark stain natural timber
- Face Brickwork — Austral 'Pepper' Urban One
- Feature Column_Brickwork — Colour_Colorbond 'Ironstone'
- Aluminium windows and doors — Colour_White
- Garage Metal Door — Colour_Colorbond 'Windspray'
- External timber work — Colour_Off White (Dulux)

Unit 3 'The Tee'
- Metal Roof Sheeting — Colour_Colorbond 'Woodland Grey'
- Metal fascia — Colour_Colorbond 'Dune'
- Metal gutter & downpipes — Colour_Colorbond 'Dune'
- Feature Entry Door — Dark stain natural timber
- Face Brickwork — Austral 'Pepper' Urban One
- Bagged & Painted Brickwork — Colour_Colorbond 'Gully'
- Feature Column_Brickwork — Colour_Colorbond 'Jasper'
- Aluminium windows and doors — Colour_White
- Garage Metal Door — Colour_Colorbond 'Windspray'
- External timber work — Colour_Off White (Dulux)

Unit 4 'The Fairway'
- Concrete Roof Tiles — Monier 'Atura' Caraway
- Metal fascia — Colour_Colorbond 'Dune'
- Metal gutter & downpipes — Colour_Colorbond 'Dune'
- Feature Entry Door — Dark stain natural timber
- Face Brickwork — Austral 'Leisure' Everyday Life
- Bagged & Painted Brickwork — Colour_Colorbond 'Dune'
- Aluminium windows and doors — Colour_White
- Garage Metal Door — Colour_Colorbond 'Windspray'
- External timber work — Colour_Off White (Dulux)

Unit 5 'The Drive'
- Concrete Roof Tiles — Monier 'Atura' Barramundi
- Metal fascia — Colour_Colorbond 'Monument'
- Metal gutter & downpipes — Colour_Colorbond 'Monument'
- Feature Entry Door — Dark stain natural timber
- Face Brickwork — Austral 'Rosewood' Wilderness Design
- Bagged & Painted Brickwork — Colour_Colorbond 'Dune'
- Aluminium windows and doors — Colour_White
- Garage Metal Door — Colour_Colorbond 'Dune'
- External timber work — Colour_Off White (Dulux)

Unit 6 'The Pitch'
- Concrete Roof Tiles — Monier 'Atura' Camelot
- Metal fascia — Colour_Colorbond 'Dune'
- Metal gutter & downpipes — Colour_Colorbond 'Dune'
- Feature Entry Door — Dark stain natural timber
- Bagged & Painted Brickwork — Colour_Colorbond 'Dune'
- Aluminium windows and doors — Colour_White
- Garage Metal Door — Colour_Colorbond 'Dune'
- External timber work — Colour_Off White (Dulux)

Unit 7 'The Green'
- Metal Roof Sheeting — Colour_Colorbond 'Monument'
- Metal fascia — Colour_Colorbond 'Monument'
- Metal gutter & downpipes — Colour_Colorbond 'Monument'
- Feature Entry Door — Dark stain natural timber
- Face Brickwork — Austral 'Pepper' Urban One
- Bagged & Painted Brickwork — Colour_Colorbond 'Dune'
- Aluminium windows and doors — Colour_White
- Garage Metal Door — Colour_Colorbond 'Windspray'
- External timber work — Colour_Off White (Dulux)

Unit 7 'The Club House'
- Metal Roof Sheeting — Colour_Colorbond 'Woodland Grey'
- Metal fascia — Colour_Colorbond 'Monument'
- Metal gutter & downpipes — Colour_Colorbond 'Monument'
- Feature Entry Door — Dark stain natural timber
- Face Brickwork — Austral 'Freedom' Everyday Life
- Bagged & Painted Brickwork — Colour_Colorbond 'Dune'
- Aluminium windows and doors — Colour_White
- Garage Metal Door — Colour_Colorbond 'Dune'
- External timber work — Colour_Off White (Dulux)

Issue		
A	Development Application	22.05.18
Issue	Amendment	Date

PreTech — Working Together

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Proposed SEPP 2004 Housing
Leonay Golf Course, 1a Leonay Parade, LEONAY
Client : Leonay Links Pty Ltd Trustee Fairways Unit Trust

Job No.	Scale	
00372	1:250	
Author	Drawn	Date
S.Vlangos	S.Vlangos	May 2018

Drawing
Elevations, Section & Thermal Commitments

No. in Set	Dwg. No.	Issue
06	A04	A

Document Set ID: 8625961
Version: 1, Version Date: 21/03/2019

SURVEY LEGEND & NOTES

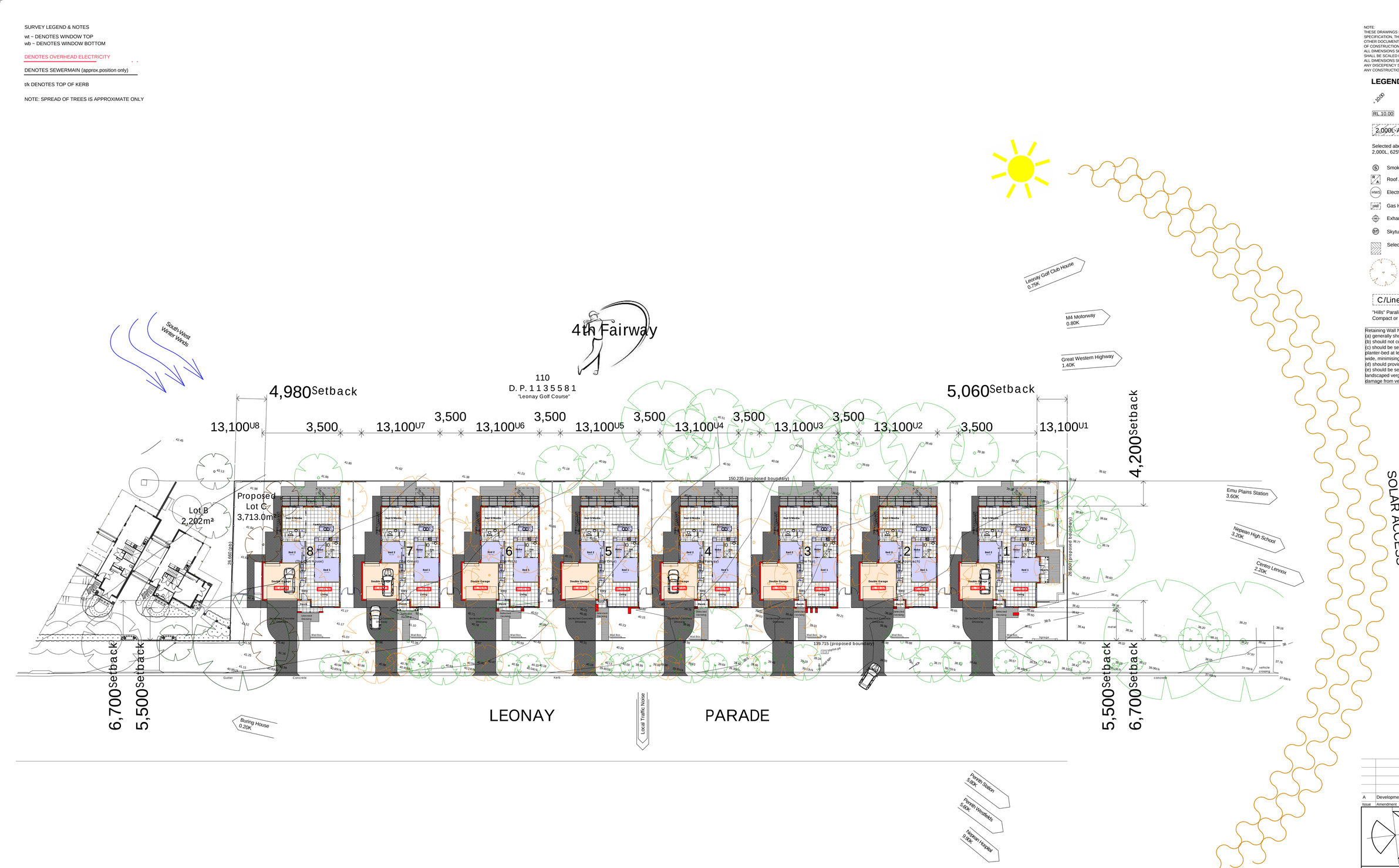
wt ~ DENOTES WINDOW TOP
wb ~ DENOTES WINDOW BOTTOM

DENOTES OVERHEAD ELECTRICITY

DENOTES SEWERMAIN (approx.position only)

t/k DENOTES TOP OF KERB

NOTE: SPREAD OF TREES IS APPROXIMATE ONLY



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LEGEND

- 1000 — Existing Surveyors Spot Level
- RL 10.00 — Proposed Related Level
- 2,000L AWT — Selected above ground pre-fabricated water tank 2,000L, 625W x 2250L x 1930Hgt
- (S) — Smoke Detector
- R A — Roof Access
- HWS — Electric Hot Water System
- HW — Gas Hot water
- Exhaust Fan/Light
- ST — Skytube
- Selected Pavers
- Remove Existing Tree
- Retain Existing Tree
- C/Line — "Hills" Paraline Super Fold Compact or Equal

Retaining Wall Notes:
(a) generally should be no taller than 500mm
(b) should not cut through roots of any tree
(c) should be separated from any associated fence by a planter-bed at least 500mm wide, minimising the apparent overall height of fencing
(d) should provide drainage for any associated planterbed
(e) should be separated from any driveway by a landscaped verge at least 500mm wide, to prevent impact damage from vehicles

Issue	Amendment	Date
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Job No.	Scale	
00372	1:250	
Author	Drawn	Date
S.Vlangos	S.Vlangos	May 2018

Drawing
Site Analysis Plan

No. in Set	Dwg. No.	Issue
06	A05	A

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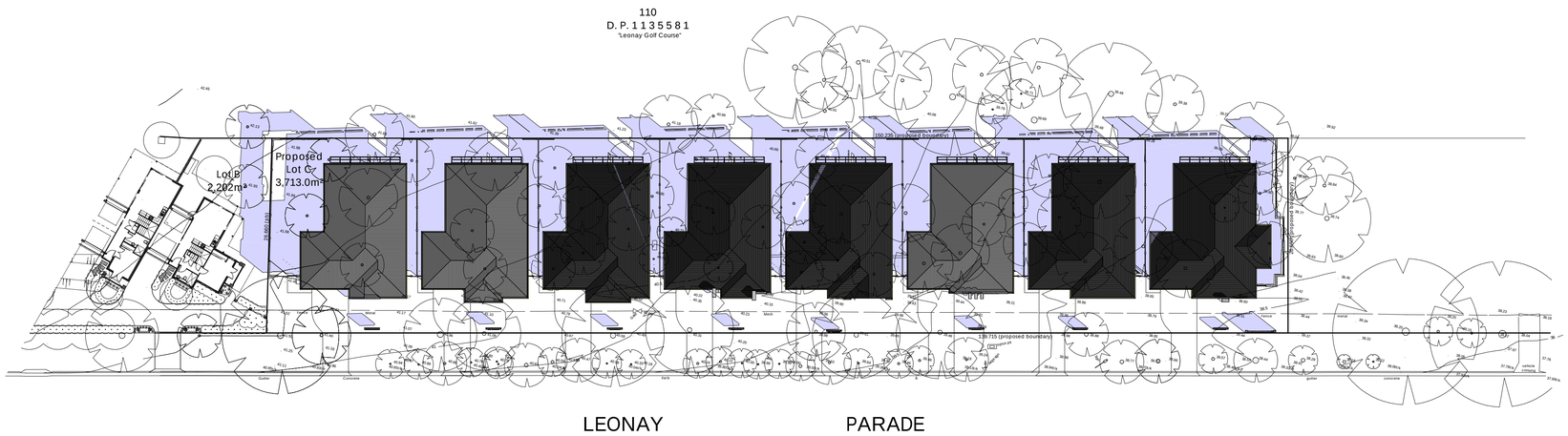
Shadow Legend

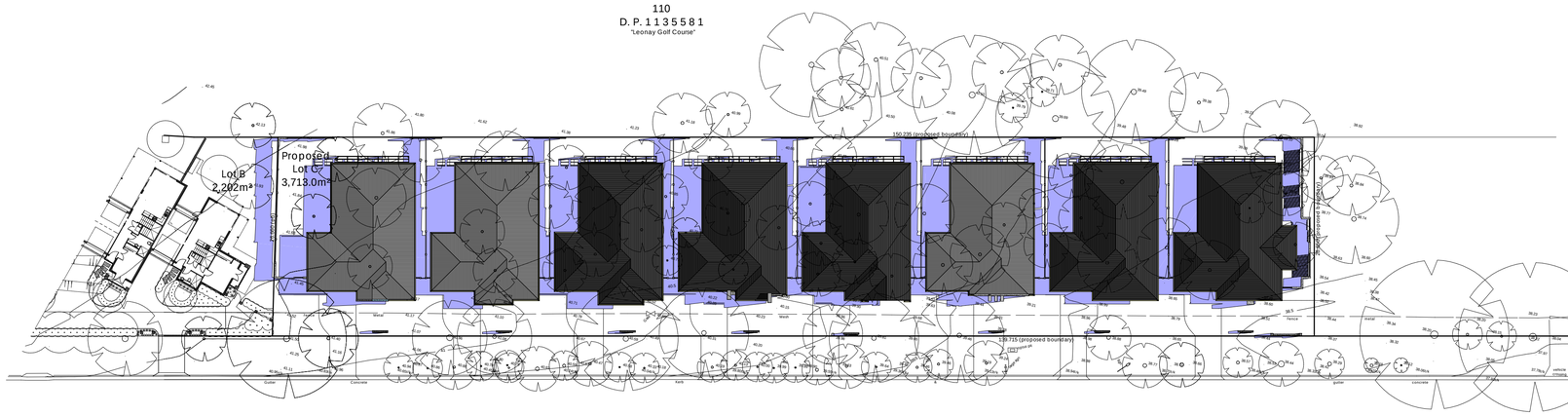
- 9.0am
- 12.0
- 3.0pm

4th Fairway



Shadow Diagram
9.0am

4th Fairway



Shadow Diagram
12.0

4th Fairway

Shadow Diagram
3.0pm

Issue	Amendment	Date
A	Development Application	22.05.18

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Job No.	Scale	
00372	1:300	
Author	Drawn	Date
S.Vlangos	S.Vlangos	May 2018

Drawing
Shadow Analysis
June 21, 9.0am, 12.0 & 3.0pm

No. in Set	Dwg. No.	Issue
06	A06	A