# Appendix J Acoustic Assessment

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# 7 - 33 Water Street, Strathfield South

# Acoustic Assessment

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# 1 INTRODUCTION

Acoustic Logic Consultancy (ALC) have been engaged to conduct an acoustic assessment of potential noise impacts associated with the proposed residential development to be located at 7 - 33 Water Street, Strathfield South.

This document presents the acoustic review of potential environmental noise impacting the future residence within the development.

An acoustic review of the development has been undertaken and the relevant criteria which are suitable for the development to comply with have been reviewed and include the following:

- Strathfield Municipal Council;
- NSW Industrial Noise Policy (INP);
- State Environmental Planning Policy (Infrastructure) 2007.
- Australian and New Zealand AS/NZS 2107:2000 *'Recommended design sound levels and reverberation times for building interiors'*.

ALC confirms that the development can comply with all of the aforementioned authorities and standards on the proviso that the acoustic treatments nominated in this report are adopted.

## 2 SITE PROPOSAL

The subject site is located to the west of Water Street with surrounding residential and industrial properties as detailed in the figure below.


**Figure 1: Site Survey and Monitoring Location**

- Subject site
- Surrounding residential properties
- Surrounding industrial properties

# 3 EXISTING ACOUSTIC ENVIRONMENT

The existing acoustic environment is categorised by high traffic noise levels from Liverpool Road.

## 3.1 NOISE DESCRIPTORS

Traffic noise constantly varies in level, due to fluctuations in traffic speed, vehicle types, road conditions and traffic densities. Accordingly, it is not possible to accurately determine prevailing traffic noise conditions by measuring a single, instantaneous noise level. To accurately determine the effects of traffic noise a 15-20 minute measurement interval is utilised. Over this period, noise levels are monitored on a continuous basis and statistical and integrating techniques are used to determine noise description parameters. These parameters are used to measure how much annoyance would be caused by a particular noise source.

In the case of environmental noise three principle measurement parameters are used, namely $L_{10}$, $L_{90}$ and $L_{eq}$.

The $L_{10}$ and $L_{90}$ measurement parameters are statistical levels that represent the average maximum and average minimum noise levels respectively, over the measurement intervals.

The $L_{10}$ parameter is commonly used to measure noise produced by a particular intrusive noise source since it represents the average of the loudest noise levels produced by the source.

Conversely, the $L_{90}$ level (which is commonly referred to as the background noise level) represents the noise level heard in the quieter periods during a measurement interval. The $L_{90}$ parameter is used to set the allowable noise level for new, potentially intrusive noise sources since the disturbance caused by the new source will depend on how audible it is above the pre-existing noise environment, particularly during quiet periods, as represented by the $L_{90}$ level.

The $L_{eq}$ parameter represents the average noise energy during a measurement period. This parameter is derived by integrating the noise levels measured over the measurement period. $L_{eq}$ is important in the assessment of traffic noise impact as it closely corresponds with human perception of a changing noise environment; such is the character of traffic noise.

Current practice favours the $L_{eq}$ parameter as a means of measuring traffic noise, whereas the $L_{10}$ parameter has been used in the past and is still incorporated in some codes. For the reasons outlined above, the $L_{90}$ parameter is not used to assess traffic noise intrusion.

# 4 ENVIRONMENTAL NOISE CRITERIA

Environmental noise criteria has been assessed in accordance with the requirements of Strathfield Municipal Council and the NSW State Environmental Planning Policy (SEPP Infrastructure) 2007.

## 4.1 STRATHFIELD MUNICIPAL COUNCIL

Environmental noise requirements for multi-unit housing are detailed in Part C Section 2.5 of the Strathfield Municipal Council Development Control Plan 2005 which states:

6. *Developments adjoining a major road or railway line shall take into consideration impacts of the noise source on the future amenity of residents on the site, ensuring noise sensitive uses are placed in more shielded locations (refer to figure 12).*

   *For development located close to busy roads, reference should be made to AS2107 "Acoustics – Recommended Design Sound Levels & Reverberation Times for Building Interiors" and AS3671 – 1989 "Acoustics – Road Traffic Noise Intrusion – Building Siting & Construction".*

## 4.2 STATE ENVIRONMENTAL PLANNING POLICY (SEPP INFRASTRUCTURE) 2007

Clause 102 of the NSW SEPP for road traffic noise stipulates,

*"This clause applies to development for any of the following purposes that is on land in or adjacent to the road corridor for a freeway, a tollway or a transit way or any other road with an annual average daily traffic volume of more than 40,000 vehicles (based on the traffic volume data published on the website of the RTA) and that the consent authority considers is likely to be adversely affected by road noise or vibration:*

*(a) a building for residential use,*

*If the development is for the purposes of a building for residential use, the consent authority must not grant consent to the development unless it is satisfied that appropriate measures will be taken to ensure that the following $L_{Aeq}$ levels are not exceeded:*

*(a) in any bedroom in the building – 35 dB(A) at any time between 10 pm and 7am,*

*(b) anywhere else in the building (other than a garage, kitchen, bathroom or hallway) – 40 dB(A) at any time."*

### 4.3 PROJECT ACOUSTIC OBJECTIVES

The requirements of the SEPP Infrastructure will be stricter than Strathfield Municipal Council. On this basis, the project traffic noise intrusion requirements are detailed below.

**Table 1 – Traffic Noise Objectives**

| Internal Area | Traffic Noise Level dB(A) $L_{Aeq\ 15\ hour}$ | Traffic Noise Level dB(A) $L_{Aeq\ 9\ hour}$ |
|---|---|---|
| Bedroom | 40 | 35 |
| Living Area | 40 | 40 |

## 5 RECOMMENDED CONSTRUCTIONS

Based on the location of the site and the surrounding roadways and land use activities compliance with the project will be able to comply with the relevant noise level criteria as detailed in this report using standard single glazing such as 6.38mm laminated or 10.38mm laminated glass. Details of the external glass will be provided during detailed DA submission stage and CC stage of the project.

# 6 NOISE EMISSION OBJECTIVES

Noise level generated from site will be assessed to comply with the requirements of Strathfield Municipal Council and the EPA's Industrial Noise Policy, as detailed in this section of the report.

## 6.1 STRATHFIELD MUNICIPAL COUNCIL

Strathfield Municipal Council DCP Part D ("Industrial Development") states the following with regards to industrial noise emissions:

> *"5. Noise associated with the premises including plant and equipment will be subject to the NSW Environmental Protection Authority's Environmental Noise Control Manual and Industrial Noise Policy 2000 and the Protection of the Environment Operations Act 1997.*
>
> *6. Noise generated from fixed sources or motor vehicles associated with the proposed industrial development must be effectively insulated or otherwise minimised.*
>
> *7. The operating noise level of plant and equipment shall generally not exceed 5dB(A) above the background noise level when measured at the boundaries of the premises between the hours of 7.00am and 10.00pm. If existing background levels are above the Environmental Protection Authority (EPA) criteria, then a merit based assessment will be carried out."*

## 6.2 NSW EPA INDUSTRIAL NOISE POLICY.

The EPA Industrial Noise Policy, has two criteria which need to be satisfied namely Intrusiveness and Amenity.

The EPA Industrial Noise Policy sets out acceptable noise levels for various localities. Table 2.1 on page 16 of the policy indicates 4 categories to distinguish different residential areas. They are rural, suburban, urban and urban/industrial interface. Under the policy the nearest residence would be assessed against the urban/industrial interface criteria.

Noise levels are to be assessed at the property boundary or nearby dwelling, or at the balcony or façade of an apartment.

### 6.2.1 Intrusiveness Criteria

The guideline is intended to limit the audibility of noise emissions at residential receivers and requires that noise emissions measured using the $L_{eq}$ descriptor not exceed the background noise level by more than 5dB(A). Where applicable, the intrusive noise level should be penalised (increased) to account for any annoying characteristics such as tonality.

Background noise levels adopted are presented in Section 4. Noise emissions from the site should be assessed at the most affected residential properties boundaries.

### 6.2.2 Amenity Criterion

The guideline is intended to limit the absolute noise level from all noise sources to a level that is consistent with the general environment.

The EPA's Industrial noise policy sets out acceptable noise levels for various localities. Table 2.1 on page 16 of the policy indicates 4 categories to distinguish different residential areas. They are

rural, suburban, urban and urban/industrial interface. This site is categorised by the residential receivers as urban industrial interface. For the purposes of this condition:

- Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sundays and Public Holidays;
- Evening is defined as the period from 6pm to 10pm;
- Night is defined as the remaining periods.

**Table 2 – EPA Amenity Noise Levels**

| Type of Receiver | Indicative Noise Amenity Area | Time of day | Recommended Noise Level dB(A)$L_{eq(period)}$ | |
|---|---|---|---|---|
| | | | Recommended | Maximum |
| Residences | Suburban | Day | 55 | 60 |
| | | Evening | 45 | 50 |
| | | Night | 40 | 45 |

## 6.3 SLEEP DISTURBANCE

To minimise the potential for sleep arousal the $L_{1\ (1\ minute)}$ noise level of any specific noise source does not exceed the background noise level ($L_{90}$) by more than 15 dB(A) outside a resident's bedroom window, as specified in the *Noise Guide for Local Government* (NGLG) between the hours of 10pm and 7am. The $L_1$ noise level is the level exceeded for 1 per cent of the time and approximates the typical maximum noise level from a particular source. Where the typical repeatable existing $L_1$ levels exceed the above requirement then the existing $L_1$ levels form the basis for, sleep disturbance criteria.

## 6.4 MECHANICAL NOISE EMISSION ASSESSMENT

All mechanical plant for the proposed development shall be selected and treated to comply with the NSW EPA Industrial Noise Policy.

At this stage, no mechanical plant is proposed. If necessary, acoustic treatments for mechanical plant should be determined at CC stage, with the provision of acoustic screens, silencers etc as necessary.

Experience with similar projects indicate that the successful treatment of the mechanical equipment will be possible using regularly used acoustic treatments as detailed above.

# 7 CONCLUSION

This report presents the preliminary acoustic assessment of noise impacts associated with the proposed residential development to be located at 7 - 33 Water Street, Strathfield South.

It can be confirm that acoustic treatments will be possible and practical to the building façade to ensure that internal noise levels comply with the requirements of the State Environmental Planning Policy (SEPP) Infrastructure 2007 and Strathfield Municipal Council.

Mechanical plant servicing the development should be assessed at the construction certificate stage to ensure compliance with the noise emission requirements of Strathfield Municipal Council and can be suitably treated to ensure compliance with the relevant criteria as detailed in this report.

We trust this information is satisfactory. Please contact us should you have any further queries.

Yours faithfully,

Acoustic Logic Consultancy Pty Ltd
Ben White

# Appendix K EMR (Electromagnetic Radiation) Report

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**Report No. 151110b**
(This is to replace report no. 151110a)

# EMF Survey at 7 to 23 Water Street, South Strathfield

**for**

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and

**RJ Green & Lloyd Pty Limited**
23 Water Street, South Strathfield, NSW

**by**

***Geoffrey Garrett***

Signed: 14th March 2016

*Geoffrey Garrett BE (Elect) Hons.*
*NATA Signatory*

*Accredited for compliance with ISO/IEC 17025*

*The tests, calibrations or measurements covered by this document are traceable to national standards of measurements*

*This document is issued in accordance with NATA's accreditation requirements*

*The predictions, comments and conclusions in this report are not covered by the terms of NATA accreditation.*

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# APPLICABLE DOCUMENTS

[1] RHS30 (Radiation Health Series 30), Interim Guidelines on Limits of Exposure to 50/60Hz Electric & Magnetic Fields (1989), National Health and Medical Research Council.

[2] AS/NZS 61000.6.1:2006 Electromagnetic compatibility (EMC) Part 6.1: Generic Standards – Immunity for residential, commercial and light-industrial environments.

[3] Report of the NRPB Advisory Group on Non-Ionising Radiation. "Power Frequency Electromagnetic Fields and the Risk of Cancer" 6 March 2001.

*Note: * The finding by the UK NRPB is of a possible doubling of the risk of leukemia in children when exposed to a power frequency magnetic field of greater than 0.4 microtesla. The NRPB (Doll) report concluded that from a review of studies conducted in a residential environment "the possibility remains that high and prolonged time-weighted average exposure to power frequency magnetic fields can increase the risk of leukaemia in children". The report considered studies based on residential exposure. This finding has yet to be scientifically replicated and cause and effect established.*

[4] IEEE 644-1994, IEEE Standard Procedures for Measurement of Power Frequency Electric and Magnetic Fields from AC Power Lines.

[5] Electromagnetic Compatability & Interference for Medtronic IPGs (Implantable PulseGeneratots), ICDs (Implantable Cardioverter Defibrillator) & ILRs (Implantable Loop Recorder), by Medtronic.

[6] IEC60601-1-2 , Medical Electrical Equipment Part 1-2 General Requirements for Safety - Electromagnetic Compatibility, International Electrotechnical Commission.

[7] ARPANSA Fact Sheet – Electricity and Health, June 2015, by the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA).

# 1 INTRODUCTION

A property at 7 to 23 Water Street, South Strathfield, NSW, Australia, where several commercial buildings are currently situated, is being considered for possible rezoning and development of multi-storey residential buildings. The outline of the property, consisting of several lots, is shown in green in Figure 2 of the Appendix.

As the property is located adjacent to a High Voltage (HV) 132kV transmission power line, there is concern of the extent of the power-frequency Electromagnetic Fields (EMF), and the impact to the health and safety of occupants of a future residential building development.

A survey was conducted, at the site of the property, to measure the EMF from the power line, for assessing the potential impact to the health and safety of future residential occupants, and the interference impact to general electronic and general medical equipment.

# 2 REQUIREMENT

The requirements of this EMF survey assessment are described in the points below:

1) Conduct a survey of the EMF emitted by the HV power transmission line, at selected locations where the buildings are proposed and on the grounds of the property in the vicinity of the power line.
2) Measure onsite (using IEEE Std 644-1987 methodology), power-frequency electric and magnetic field strengths.
3) Measurements will generally be performed at ground level and at height, at the locations of concern, where fields may be significant.
4) Calculate the maximum expected EMF strength values (by extrapolation of the measured values).
5) Investigate the impact of the measured and maximum expected EMF, with regard to human exposure and interference to general electronic equipment.
6) Determine health and safety compliance in terms of the National Health and Medical Research Council (ARPANSA RHS30:1989) limits of human exposure and APRANSA radiation protection standard exposure limits for 0 – 3 kHz magnetic & electric fields, consultation draft 2006, and associated precautionary requirements.
7) Determine interference compliance in terms of the interference standards applicable to general electronic equipment AS/NZS 61000.6.1 (formerly AS/NZS 4252.1).
8) Establish the boundary and decline of electric and magnetic field strength with distance from the power transmission line, and determine the boundaries where the limits may be exceeded.
9) A recommendation and/or an outline of a plan to mitigate any electromagnetic EMF non-compliance issues.

# 3 APPLICABLE STANDARDS

## *3.1 EMF Limits of Exposure*

The limits of safety for magnetic and electric fields are established by the National Health and Medical Research Council (NH&MRC) and published in the ARPANSA Radiation Protection Series No. 30 “Interim Guidelines on limits of exposure to 50/60 Hz electric and magnetic fields (1989)”.

The low frequency electric and magnetic field exposure limits applicable to human health are summarized in the table below:

**Table 1. - Human Limits of Exposure to 50/60 Hz Electric & Magnetic Fields**

| **Exposure Activity** | **Applicable Standard** | **Electric Field** (kV/m) | **Magnetic Field** (μT) |
|---|---|---|---|
| Occupational (whole working day) | ARPANSA RHS30 | 10 | 500 |
| General Public (up to 24hrs per day) | ARPANSA RHS30 | 5 | 100 |

## *3.2 Limits of Exposure for Implantable Medical Devices*

The limits of exposure that are applicable to the medical devices of interest, are shown in the table below:

**Table 2. - Electric & Magnetic Field Limits of Exposure applicable to Medical Devices**

| **Medical Device** | **Applicable Guideline/ Specification** | **Electric Field** rms | **Magnetic Field** rms |
|---|---|---|---|
| Implantable Pulse Generator (IPG)<br>Implantable Cardioverter Defibrillator (ICD)<br>Implantable Loop Recorder (ILR) | Medtronic | 6 kV/m (50/60Hz) | 80 A/m (100 μT) (<= 10kHz) and 1 A/m (> 10kHz) |
| Pacemakers | ARPANSA RHS30 | 2.5 kV/m (50/60Hz) | 100 μT |

Note: Medtronic is a leading manufacturer of medical devices.

## *3.3 Human Pain Thresholds to Low Frequency Contact Currents (50Hz)*

The human pain threshold of steady state contact currents with vehicles due to low frequency electric and magnetic near fields is summarised in the table below:

**Table 3. - Exposure Limits resulting from steady state contact currents with vehicles from 50/60 Hz Electric Fields**

| Exposure Incident | Applicable Guideline | E Field (kV/m rms) |
|---|---|---|
| Painful shock for children, finger contact, truck | RHS30 | 8 |
| Median touch perception for men, finger contact, car | RHS30 | 4-5 |
| Median touch perception for children, finger contact, car | RHS30 | 2 |

### *3.4 Susceptibility of General Electronic Equipment*

If power frequency electromagnetic fields (EMF) or static magnetic fields are significant enough, they can interfere with electronic equipment, which may result in degradation of performance or operation, and may cause malfunction.

Electronic equipment is often manufactured to withstand power frequency (50 Hz) magnetic fields that may be encountered in everyday situations, and the applicable interference immunity limits are given in the table below:

**Table 4. – Operation of Equipment in 50 Hz Magnetic Fields**

| Electronic Equipment Type | Applicable Standard | Magnetic Field | |
|---|---|---|---|
| | | (amps/metre ) | (μT) |
| General | AS/NZS 61000.6.1 | 3.0 (50Hz) | 3.77 |
| General Medical | IEC / EN 60601-1-2 | 3.0 (50Hz) | 3.77 |

Note: 1. There are no limits applying to static and slowly varying magnetic fields.
2. These interference immunity requirements are not mandatory.

These immunity requirements are not mandatory. Although equipment marketed in Australia is expected to comply with the above requirements, it is acknowledged that a more practical limit is 10 mG or 1.0 μT which is widely accepted as the level above which interference may be visible as shimmer or wobble on visual display equipment having a conventional electromagnetic deflection system.

## 4 MEASUREMENT METHODOLOGY & ACCURACY

### *4.1 Magnetic & Electric Fields*

Magnetic and electric field measurements performed using IEEE Std 644-1987 methodology.

All magnetic and electric fields measured are true rms values of the resultant (from the X, Y & Z planes) and recorded in a 5Hz to 32kHz bandwidth.

The measurement duration was determined by the time required to obtain a stable repeatable reading indicative of the maximum true rms value at that time.

The uncertainty of the measurements performed was typically ± 4.3% for magnetic fields and ± 5.2% for electric fields.

The calibration of the measurement equipment (EMC Services Plant No. 24) was current.

# 5 RESULTS

## *5.1 Magnetic Fields*

Measurements of the power frequency magnetic fields were taken with distance away from the power line, in increments of 1 m (metre) or 2 m starting from five separate locations (refer locations A0 to E0 of Figure 1), and the results recorded in Tables 5 to 8 of the Appendix. All the measurements were taken at a height of 1m above ground level.

## *5.2 Electric Fields*

Electric field strengths were measured where more significant at selected locations on the property nearby the power line (refer locations A4, E0 & F of Figure 1) and the results recorded in Table 9. All the measurements were taken at a height of 1m above ground level.

# 6 ANALYSIS

## *6.1 General Public Exposure*

The maximum magnetic field recorded at ground level was 3.915μT at Location D0 (refer Table 8) and the maximum during peak loading is expected to be 6.34μT; both the measured and predicted peak values are well below the ARPANSA 100μT limit applicable to the General Public (refer Table 1).

As the magnetic field decreases proportionally with the inverse of the square of the distance away from the power line, the predicted maximum field levels (by extrapolation of the measured values) can be estimated at closer distance to the power line conductors; accordingly a maximum field level of 100μT is predicted to be exceeded within 11 metres away from the nearest conductors when the power line feeders are each operating at the maximum licensed load of 27500 kVA.

The maximum electric field recorded with free surrounding space at ground level was 0.0614 kV/m at 1m AGL, in the vicinity of Location E0 (refer Table 9). This field level is well below the ARPANSA RHS30 limit of 5 kV/m applicable to the general public (refer Table 1), and well below the 2.5kV/m value (refer Table 2), which ARPANSA advises may cause some types of pacemakers to be affected, as “body currents produced by contact with a vehicle in a weaker field may cause interference .....” [1].

## *6.2 Impact on Health*

Although the present ARPANSA guideline limits are relatively higher, long-term exposure to a magnetic field strength of 0.4μT or more, is regarded by some experts to be associated with an increase in the number of recorded cases of childhood leukemia; the UK National Radiological Protection Board (NRPB) Advisory Group on Non-Ionising Radiation (AGNIR) reported their research findings in relation to this in 2001 [3]. However, as these research findings, of the UK NRPB are yet to be proven or adopted in standards, they currently only suggest that quasi-continuous exposure to low level power-frequency magnetic fields, may increase the risk of leukemia in children.

At distances closer than at locations A10 from the power line conductors (i.e. 27.5m radially away from the nearest mid-height power line conductor), the maximum average field level is expected to be higher than that within normal office and residential areas, which is less than 0.7 μT, according to the current ARPANSA Factsheet – Electricity and Health [7]. The ARPANSA Factsheet states that, current scientific evidence does not establish that exposure to normal magnetic fields found around the home and office causes health effects to occupants, but it does not advise on exposure due to higher level fields, as the science is not well understood.

As the long term exposure to magnetic fields within a future building developed on the property can be significantly higher than usual for residential dwellings located near HV power lines, an unusually high level of exposure should be avoided where possible so as to prevent a probable health risk.

### *6.3 Interference*

Where the maximum expected magnetic fields exceed the 3.77μT interference limit (refer Table 4) there is risk of interference to general electronic and general medical equipment, which may be within 20m radially away from the nearest mid-height power line conductor (refer location E4 in Table 8).

# 7 CONCLUSION

## *7.1 Impact on Health & Safety*

Except within 11 m away from the nearest power line conductors, the measured and predicted power-frequency magnetic fields are below the ARPANSA RHS30 exposure limit applicable to the General Public.

The power-frequency magnetic and electric fields measured and predicted within the property at 1 metre above ground level are well below the ARPANSA RHS30 exposure limit applicable to the general public.

## *7.2 Interference*

Within 20 metres radially away from the nearest power line conductors, the maximum predicted magnetic fields exceed the AS/NZS 61000.6.1 interference limit of 3.77μT applicable to general electronic and general medical equipment.

# 8 RECOMMENDATION

## *8.1 Impact on Health & Safety*

The maximum average magnetic field level within 23m radially away from the nearest power line conductors, would be more than at the majority of residential dwellings located adjacent to power line easements exposed to lower level fields (eg. of 1μT or less); for residential dwellings within 23m radially away from the conductors precautionary mitigation measures would therefore be recommended, so as to minimize an otherwise probable risk to health.

## *8.2 Interference*

Further to Section 8.1, at a distance of at least 23m radially away from the nearest power line conductors, the risk of interference to general electronic and general medical equipment should be minimal as the maximum expected field level is safely below 3.77μT.

Cathode Ray Tube (CRT) Video Display Units (VDUs) that could possibly be used (eg. for security surveillance or computing purposes) at the locations where 1μT is exceeded, will be susceptible to interference. Interference to this type of equipment becomes visually apparent as wobble or flicker on the display, though it can often be mitigated by adjustment of the screen refresh rate, or replacement with an LCD type.

## *8.3 Mitigation*

As the present vegetation alongside the fence line at the southern side of the property and adjacent to the power line, assists in reducing the electric field level so well below the ARPANSA RHS30 limit of 5 kV/m, it is recommended that the vegetation be maintained or replaced with similar vegetation of similar height.

The affects of the magnetic fields adjacent to the HV power line may generally be reduced by:

*a)* Increasing the distance between the source and the affected area - The effect of a magnetic field will diminish rapidly as the separation distance is increased. Normally the decrease will be proportional to the inverse square of the separation distance. For example, if the separation distance is doubled the magnetic field will reduce by a factor of four.

*b)* Reducing the seperation distance between power line current carrying conductors, such as possibly by bundled overhead cabling, or else by re-locating as underground cabling.

*c)* Introducing a screen (or shielding) between the source and the affected area - Shielding is costly and is most effective when applied to the general (rather than specific) area. Increasing the coverage area, and the thickness of the shielding, improves magnetic field attenuation. This mitigation option should be avoided as it would be difficult and costly to implement.

# 9 APPENDIX

## Table 5. – Measured & Predicted Magnetic Fields – 7 to 23 Water Street

| Location | | Measurement at 1m AGL | Predicted 50Hz Magnetic Fields at 1 m AGL when under various Loads (1) | | |
|---|---|---|---|---|---|
| Location Number (refer Figure 1) | Comments | Magnetic Field (5-32kHz) Measured 8th Dec 2015 4pm-5pm (2) (μT rms) | Average Loading during 2015 (3) (μT rms) | Maximum Average Loading Expected (4) (μT rms) | Peak Loading Expected (5) (μT rms) |
| A0 | A0 is at the fence line | 1.461 | 0.72 | 1.25 | 2.5 |
| A2 | 2m northwards from A0 | 1.308 | 0.64 | 1.12 | 2.24 |
| A4 | 4m northwards from A0. 23m radially away from closest mid-height power conductor. | 1.136 | 0.56 | 0.97 | 1.94 |
| A6 | 6m northwards from A0. | 0.987 | 0.49 | 0.85 | 1.7 |
| A8 | 8m northwards from A0 | 0.895 | 0.44 | 0.77 | 1.54 |
| A10 | 10m northwards from A0 . 27.5m radially away from closest mid-height power conductor. | 0.783 | 0.38 | 0.68 | 1.36 |
| A12 | 12m northwards from A0. | 0.706 | 0.35 | 0.62 | 1.24 |
| A14 | 14m northwards from A0 | 0.657 | 0.32 | 0.58 | 1.16 |
| A16 | 16m northwards from A0 | 0.58 | 0.29 | 0.51 | 1.02 |
| A18 | 18m northwards from A0 | 0.517 | 0.25 | 0.46 | 0.92 |
| A20 | 20m northwards from A0 | 0.47 | 0.23 | 0.42 | 0.84 |
| A22 | 22m northwards from A0 | 0.432 | 0.21 | 0.38 | 0.76 |
| A24 | 24m northwards from A0 | 0.39 | 0.19 | 0.35 | 0.7 |
| A26 | 26m northwards from A0 | 0.363 | 0.18 | 0.33 | 0.66 |
| A28 | 28m northwards from A0 | 0.32 | 0.16 | 0.29 | 0.58 |
| A30 | 30m northwards from A0 | 0.251 | 0.12 | 0.23 | 0.46 |
| A32 | A32 is at the boundary of the building. | 0.255 | 0.13 | 0.23 | 0.46 |

Note:
1. The predicted values are calculated by extrapolation of the measured values, under various loading conditions.
2. During the survey the average loading of feeders 910 & 911 was 13226 kVA & 135550 kVA, respectively, as provided by Ausgrid.
3. During 2015, the average loading of feeders 910 & 911 was 5474 kVA & 60380 kVA, respectively, as provided by Ausgrid.
4. The maximum average loading is calculated as 50% of the licensed capacity of 27500 kVA per feeder.
5. The maximum loading is calculated as 100% of the licensed capacity of 27500 kVA per feeder.

**Table 6. – Measured & Predicted Magnetic Fields – 7 to 23 Water Street**

| **Location** | | **Measurement at 1m AGL** | **Predicted 50Hz Magnetic Fields** at **1 m AGL when under various Loads** (1) | | |
|---|---|---|---|---|---|
| **Location Number** (refer Figure 1) | **Comments** | Magnetic Field (5-32kHz) Measured 8th Dec 2015 4pm-5pm (2) (μT rms) | Average Loading during 2015 (3) (μT rms) | Maximum Average Loading Expected (4) (μT rms) | Peak Loading Expected (5) (μT rms) |
| **B0** | B0 is at the rear of the building | 0.576 | 0.28 | 0.51 | 1.02 |
| **B2** | 2m northwards from B0 | 0.562 | 0.28 | 0.5 | 1 |
| **B4** | 4m northwards from B0 . | 0.512 | 0.25 | 0.45 | 0.9 |
| **B6** | 6m northwards from B0 | 0.47 | 0.23 | 0.42 | 0.84 |
| **B8** | 8m northwards from B0 | 0.439 | 0.22 | 0.39 | 0.78 |
| **B10** | 10m northwards from B0 | 0.34 | 0.17 | 0.3 | 0.6 |
| **B12** | 12m northwards from B0 | 0.372 | 0.18 | 0.33 | 0.66 |
| **B14** | 14m northwards from B0 | 0.344 | 0.17 | 0.31 | 0.62 |
| **B16** | 16m northwards from B0 | 0.323 | 0.16 | 0.29 | 0.58 |
| **B18** | 18m northwards from B0 | 0.304 | 0.15 | 0.28 | 0.56 |
| **B20** | 20m northwards from B0 | 0.268 | 0.13 | 0.24 | 0.48 |

Note:
1. The predicted values are calculated by extrapolation of the measured values, under various loading conditions.
2. During the survey the average loading of feeders 910 & 911 was 0 kVA & 133998 kVA, respectively, as provided by Ausgrid.
3. During 2015, the average loading of feeders 910 & 911 was 5474 kVA & 60380 kVA, respectively, as provided by Ausgrid.
4. The maximum average loading is calculated as 50% of the licensed capacity of 27500 kVA per feeder.
5. The maximum loading is calculated as 100% of the licensed capacity of 27500 kVA per feeder.

**Table 7. – Measured & Predicted Magnetic Fields – 7 to 23 Water Street**

| Location | | Measurement at 1m AGL | Predicted 50Hz Magnetic Fields at 1 m AGL when under various Loads (1) | | |
|---|---|---|---|---|---|
| Location Number (refer Figure 1) | Comments | Magnetic Field (5-32kHz) Measured 7th Dec 2015 4:30pm-6pm (2) (μT rms) | Average Loading during 2015 (3) (μT rms) | Maximum Average Loading Expected (4) (μT rms) | Peak Loading Expected (5) (μT rms) |
| C0 | C0 is at the fence line | 3.673 | 1.63 | 3.01 | 6.02 |
| C1 | 1m northwards from C0 | 3.464 | 1.53 | 2.81 | 5.62 |
| C2 | 2m northwards from C0 | 3.178 | 1.41 | 2.55 | 5.1 |
| C3 | 3m northwards from C0 | 2.962 | 1.31 | 2.35 | 4.7 |
| C4 | 4m northwards from C0 | 2.803 | 1.24 | 2.21 | 4.42 |
| C5 | 5m northwards from C0 | 2.618 | 1.16 | 2.05 | 4.1 |
| C6 | 6m northwards from C0. 18.5m radially away from closest mid-height power conductor. | 2.402 | 1.06 | 1.88 | 3.76 |
| C7 | 7m northwards from C0. | 2.271 | 1.01 | 1.77 | 3.54 |
| C8 | 8m northwards from C0 | 2.096 | 0.93 | 1.63 | 3.26 |
| C9 | 9m northwards from C0 | 1.895 | 0.84 | 1.47 | 2.94 |
| C10 | 10m northwards from C0 | 1.708 | 0.76 | 1.32 | 2.64 |
| C11 | 11m northwards from C0 | 1.592 | 0.7 | 1.23 | 2.46 |
| C12 | 12m northwards from C0 | 1.503 | 0.67 | 1.16 | 2.32 |
| C13 | 13m northwards from C0 | 1.41 | 0.62 | 1.09 | 2.18 |
| C14 | 14m northwards from C0. 23.5m radially away from closest mid-height power conductor. | 1.334 | 0.59 | 1.03 | 2.06 |
| C15 | 15m northwards from C0 | 1.262 | 0.56 | 0.98 | 1.96 |
| C16 | 16m northwards from C0 | 1.19 | 0.53 | *0.93* | 1.86 |
| C17 | 17m northwards from C0 | 1.094 | 0.48 | *0.85* | 1.7 |
| C18 | 18m northwards from C0. | 1.008 | 0.45 | *0.79* | 1.58 |

Note:
1. The predicted values are calculated by extrapolation of the measured values, under various loading conditions.
2. During the survey the average loading of feeders 910 & 911 was 13226 kVA & 135550 kVA, respectively, as provided by Ausgrid.
3. During 2015, the average loading of feeders 910 & 911 was 5474 kVA & 60380 kVA, respectively, as provided by Ausgrid.
4. The maximum average loading is calculated as 50% of the licensed capacity of 27500 kVA per feeder.
5. The maximum loading is calculated as 100% of the licensed capacity of 27500 kVA per feeder.

**Table 8. – Measured & Predicted Magnetic Fields – 7 to 23 Water Street**

| Location | | Measurement at 1m AGL | Predicted 50Hz Magnetic Fields at 1 m AGL when under various Loads (1) | | |
|---|---|---|---|---|---|
| Location Number (refer Figure 1) | Comments | Magnetic Field (5-32kHz) Measured 7th Dec 2015 4:30pm-6pm (2) (μT rms) | Average Loading during 2015 (3) (μT rms) | Maximum Average Loading Expected (4) (μT rms) | Peak Loading Expected (5) (μT rms) |
| D0 | D0 is at the fence line | 3.915 | 1.73 | 3.17 | 6.34 |
| D1 | 1m northwards from D0 | 3.721 | 1.65 | 2.98 | 5.96 |
| D2 | 2m northwards from D0 | 3.604 | 1.6 | 2.86 | 5.72 |
| D3 | 3m northwards from D0 | 3.442 | 1.52 | 2.71 | 5.42 |
| D4 | 4m northwards from D0 | 3.265 | 1.45 | 2.56 | 5.12 |
| D5 | 5m northwards from D0 | 3.106 | 1.37 | 2.42 | 4.84 |
| D6 | 6m northwards from D0 | 2.998 | 1.33 | 2.33 | 4.66 |
| D7 | 7m northwards from D0 | 2.745 | 1.22 | 2.13 | 4.26 |
| D8 | 8m northwards from D0 | 2.51 | 1.11 | 1.94 | 3.88 |
| | | | | | |
| E0 | E0 is at the fence line | 2.94 | 1.3 | 2.31 | 4.62 |
| E1 | 1m northwards from E0 | 2.786 | 1.23 | 2.17 | 4.34 |
| E2 | 2m northwards from E0 | 2.648 | 1.17 | 2.06 | 4.12 |
| E3 | 3m northwards from E0 19.5m radially away from closest mid-height power conductor. | 2.456 | 1.09 | 1.91 | 3.82 |
| E4 | 4m northwards from E0. 20m radially away from closest mid-height power conductor. | 2.31 | 1.02 | 1.79 | 3.58 |
| E5 | 5m northwards from E0 | 2.161 | 0.96 | 1.67 | 3.34 |
| E6 | 6m northwards from E0 | 2.037 | 0.9 | 1.58 | 3.16 |
| E7 | 7m northwards from E0 | 1.936 | 0.86 | 1.5 | 3 |
| E8 | 8m northwards from E0 | 1.811 | 0.8 | 1.4 | 2.8 |
| E9 | 9m northwards from E0 | 1.734 | 0.77 | 1.34 | 2.68 |
| E10 | 10m northwards from E0 | 1.641 | 0.73 | 1.27 | 2.54 |
| E11 | 11m northwards from E0 | 1.509 | 0.67 | 1.17 | 2.34 |

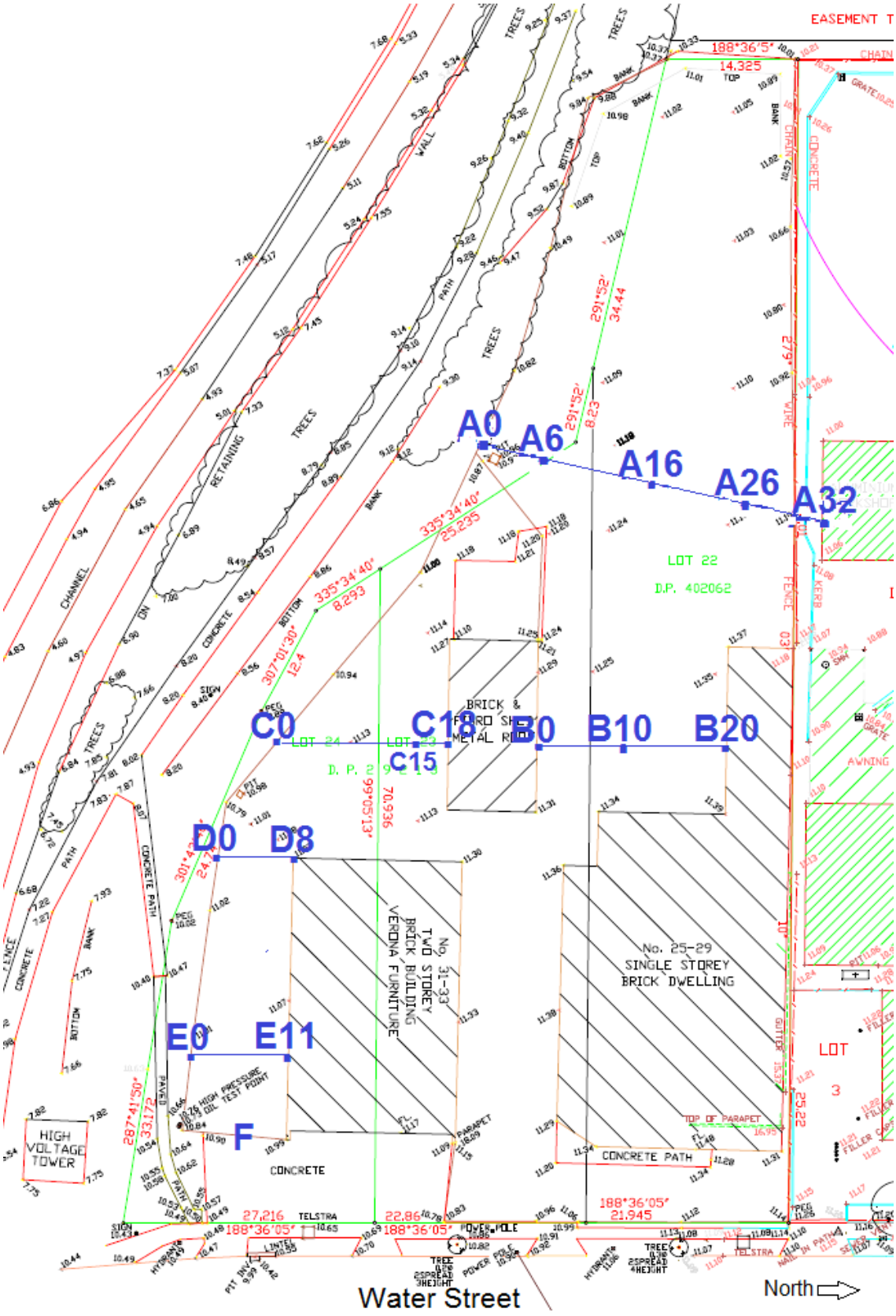
Note:
1. The predicted values are calculated by extrapolation of the measured values, under various loading conditions.
2. During the survey the average loading of feeders 910 & 911 was 13226 kVA & 135550 kVA, respectively, as provided by Ausgrid.
3. During 2015, the average loading of feeders 910 & 911 was 5474 kVA & 60380 kVA, respectively, as provided by Ausgrid.
4. The maximum average loading is calculated as 50% of the licensed capacity of 27500 kVA per feeder.
5. The maximum loading is calculated as 100% of the licensed capacity of 27500 kVA per feeder.

**Table 9. – Measured Electric Fields at 7-23 Water Street**

| Measurement Location at 1m AGL (1) | | Electric Field (50Hz) Measured 7th Dec 2015 6pm-7pm (kV/m rms) |
|---|---|---|
| **Location** (refer Figure 1) | **Comments** | |
| **A4** | 4m northwards away from A0. | 0.0039 |
| **E0** | Near the fence line. | 0.0614 |
| **F** | Midway between fence line and building. | 0.0041 |

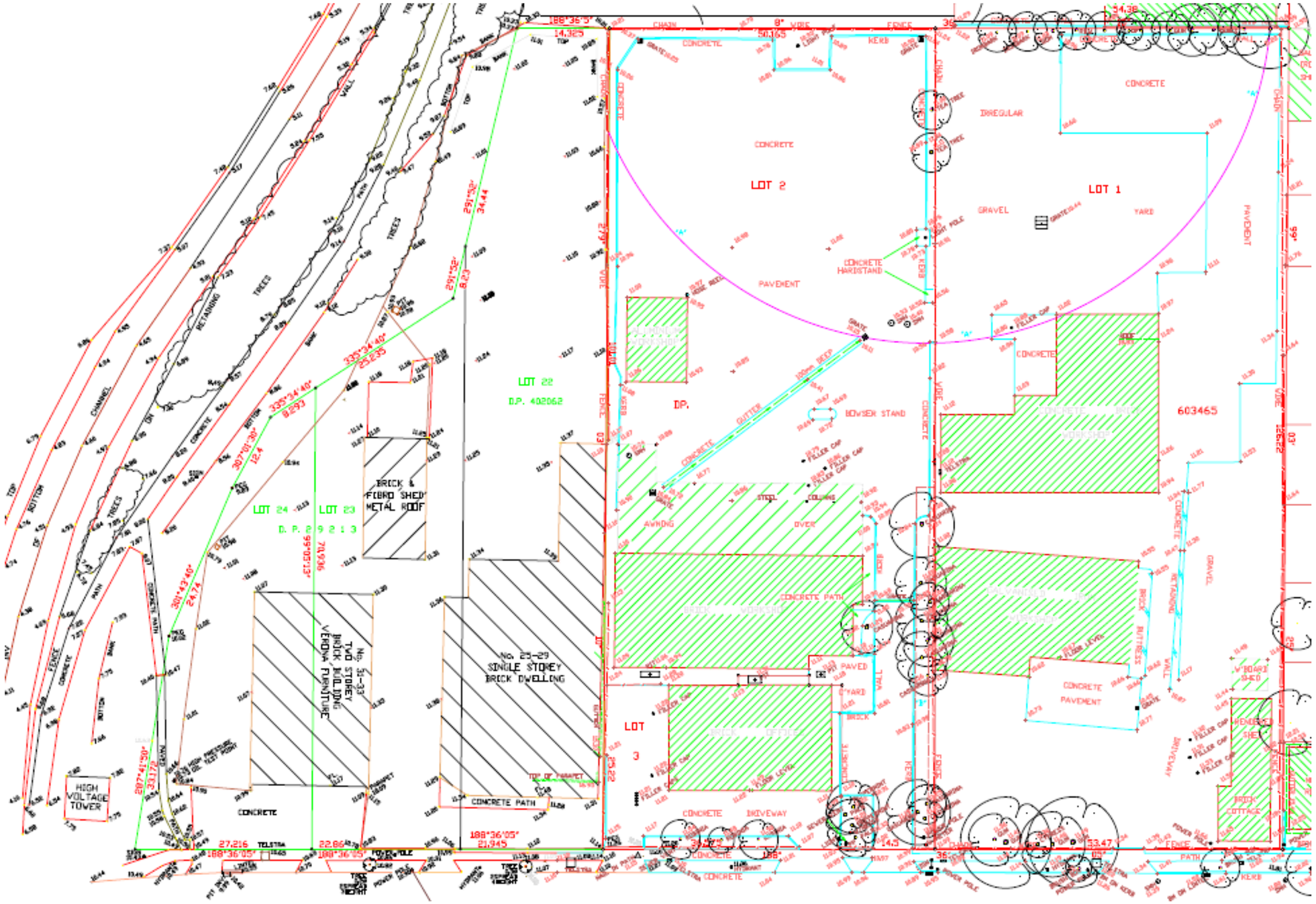
Note: 1. Measurement location at 1 metre above ground level (AGL).

***Figure 1 – Measurement Locations at 7-23 Water Street***




Note: 1. This figure is based on an original drawing provided by Crown Group, that has been copied and marked-up for illustration purposes only, and is not to scale.
2. The brown line at the southern side of the property, shows the approximate location of the fence line.

***Figure 2 – Property at 7-23 Water Street***




Note: 1. This figure is based of an original drawing provided by Crown Group, that has been copied and marked-up for illustration purposes only, and is not to scale.

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