PROJECT REFERENCE: N2107068
CLIENT: Skyton Developments No.2 Pty Ltd
DATE OF TESTING: 15th September 2021
VERSION: 1.0
SITE: 74-76 Marlborough Rd, Homebush West NSW 2140

REPORT - HIGH VOLTAGE POWER LINE RADIATION SURVEY

Compiled By:

Tim Nightingale
BSc.(Hons), MSc, MRACI, AIDGC
Senior Consultant

Luke Meadows
BSc (Environ), Licensed Asbestos Assessor (#001348)
WELL PTA, NABERS Assessor, ATTMA L1
Senior Consultant

Andrew Bellamy
BSc
WELL AP, LAA, ISIAQ, ATTMA L1
Principal Consultant

Dr Vyt Garnys
PhD, B.Sc. (Hons)
M.AusIMM, M.ACA, M.FMA,M.ISIAQ, M.AIRAH, NABERS
Accredited Assessor, Lead Auditor (OHS&E, Quality)
Principal Consultant & Managing Director

STRATHFIELD COUNCIL RECEIVED
DA2021.272
DATE 20 October 2021
TABLE OF CONTENTS

1 INTRODUCTION .................................................................................................................. 3
  1.1 Objective and Scope ........................................................................................................... 3
  1.2 Subject Site ....................................................................................................................... 4

2 RADIATION SOURCES ....................................................................................................... 5
  2.1 High Voltage Electrical Power (Electrical Infrastructure) .................................................. 5

3 RADIOFREQUENCY AND ELECTROMAGNETIC RADIATION TESTING METHODOLOGY ......... 6
  3.1 High Voltage Electrical Power (Electrical Infrastructure) .................................................. 6
    3.1.1 Sampling ..................................................................................................................... 6
    3.1.2 Applicable Guidelines/Standards ................................................................................. 6
  3.2 Survey Limitations ............................................................................................................. 6

4 RESULTS .............................................................................................................................. 7
  4.1 Site Observations .............................................................................................................. 7

5 OVERALL CONCLUSION ..................................................................................................... 10
  5.1 High Voltage Electrical Power (Electrical Infrastructure) .................................................. 10

APPENDIX A – SAMPLING LOCATIONS ................................................................................. 11

APPENDIX B – SITE LOCATION ............................................................................................. 12

APPENDIX C – AUSTRALIAN RADIOFREQUENCY SPECTRUM ............................................. 14

APPENDIX D – REFERENCES ................................................................................................. 15
1 Introduction

CETEC were engaged by Skyton Developments No.2 Pty Ltd to conduct a survey of electromagnetic radiation (EMR) from high voltage infrastructure in the vicinity of 74-76 Marlborough Rd, Homebush West NSW 2140.

The site inspection and measurements were conducted on 15th September 2021 between the hours of 07:30am to 10:30am.

1.1 Objective and Scope

The objective of the radiofrequency (RF) and electromagnetic radiation (EMR) assessment is:

➢ To determine if the magnetic and electric field strength from high voltage infrastructure in close proximity to the building is below the ARPANSA recommended exposure levels.
➢ To determine if the site is fit for its future proposed residential development.

The scope of this assessment includes:

➢ Measurement of very low frequency electric and magnetic fields strengths across the range of 5 Hz to 60 Hz resulting from the close proximity of the above ground power lines and possibly from other sources the nearby the site.

➢ Provision of a report detailing the findings of the testing with reference to relevant exposure levels contained in the Radiation Protection Standard: Maximum exposure levels to radiofrequency Fields – 3kHz to 300GHz (ARPANSA 2002) and with reference to the World Health Organisation (WHO) document: Environmental Health Criteria 238 - Extremely Low Frequency Fields. World Health Organisation, 2007 (Published under the joint sponsorship of the International Labour Organization, the International Commission on Non-Ionizing Radiation Protection, and the World Health Organization).
### 1.2 Subject Site

<table>
<thead>
<tr>
<th><strong>Location:</strong></th>
<th>74-76 Marlborough Rd, Homebush West NSW 2140</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lot:</strong></td>
<td>3</td>
</tr>
<tr>
<td><strong>Plan:</strong></td>
<td>DP1261802</td>
</tr>
<tr>
<td><strong>Local Government Area:</strong></td>
<td>Strathfield</td>
</tr>
<tr>
<td><strong>Approx. Size:</strong></td>
<td>5556 m²</td>
</tr>
</tbody>
</table>
2 RADIATION SOURCES

2.1 High Voltage Electrical Power (Electrical Infrastructure)

The range referred to as extremely low frequency (ELF) is defined as the range of 0 to 3 kHz. Electric and magnetic fields (EMF) in this range are typically produced by the operation of power systems or the operation of mains appliances within a home (e.g. televisions, hairdryers, computers and electric blankets). The power systems may include overhead high voltage power lines as well as electrical substations.

Electricity in Australia is distributed at the alternating frequency of 50 Hz.

Some typical values for a variety of ELF magnetic fields according to ARPANSA are shown in Table 1.

Table 1: Typical values of magnetic fields measured near power lines and substations.

<table>
<thead>
<tr>
<th>Source</th>
<th>Location of measurement</th>
<th>Range of measurements (mG)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distribution Line</td>
<td>directly underneath</td>
<td>2 - 30</td>
</tr>
<tr>
<td>Distribution Line</td>
<td>10m away</td>
<td>0.5 - 10</td>
</tr>
<tr>
<td>Substation</td>
<td>at substation fence</td>
<td>1 - 8</td>
</tr>
<tr>
<td>Transmission line</td>
<td>directly underneath</td>
<td>10 - 200</td>
</tr>
<tr>
<td>Transmission line</td>
<td>at edge of easement</td>
<td>2 - 50</td>
</tr>
</tbody>
</table>

* Note: Levels of magnetic fields may vary from the range of measurements shown
3 RADIOFREQUENCY AND ELECTROMAGNETIC RADIATION TESTING METHODOLOGY

3.1 High Voltage Electrical Power (Electrical Infrastructure)

3.1.1 Sampling

Magnetic and electric field strength was measured using a Magnetic Field Survey Meter, NARDA EFA-300 Magnetic & Electric Field Analyser, capable of measuring ELF fields across the range 5Hz to 32 kHz.

Measurements were collected at 11 locations throughout the entire site at a height of 1.8 meters above floor level in each location. Refer to Appendix A for site sample locations

3.1.2 Applicable Guidelines/Standards

At present, ARPANSA is reviewing exposure limits for ELF fields in the range of 0 Hz – 3 kHz, however, the interim guideline on limit for exposure of 50/60 Hz electric and magnetic fields was published by the National Health and Medical Research Council (NHMRC) (1989) recommends the following:

➢ Members of the general public should not be exposed on a continuous basis to unperturbed magnetic flux densities exceeding 0.1 mT (1000 mG).

For EMF electric field strength, The World Health Organisation recommends limits proposed by both the International Commission on Non-Ionizing Radiation Protection (ICNIRP) and the Institute of Electrical and Electronics Engineers (IEEE). They recommend the following:

➢ Members of the general public should not be exposed on a continuous basis to electric fields exceeding 5 kV/m at 50 Hz (ICNIRP and IEEE).
➢ Workers should not be exposed to more than 10 kV/m (ICNIRP) or to 20 kV/m (IEEE). CETEC assumes an exposure limit of 10 kV/m for workers in this case.

3.2 Survey Limitations

Results of this survey are indicative of conditions at the site at the time of the assessment only. In addition, it is assumed that electrical infrastructure was operating normally at the time of the assessment.
4 RESULTS

4.1 Site Observations

During the site inspection, potential sources and receivers of RF and EMR were observed, including high voltage cables located directly above the site. These cables are connected by 132kV double circuit steel towers, and the lowest cable height from the base of tower is approximately 15 meters from ground height. In contrast, the nearest railway line cables are located perpendicular (East – West) of a distance of approximately 30 m from the point under the nearest overhead cables. Although the railway cables operate at a lower electrical voltage, it is still likely these cables had an influence on the overall results of the assessment. The locations of the high voltage cables can be seen in appendix B. See photos below of overhead transmission lines and transmission towers within the vicinity of the site.

![Photo 1: Transmission tower](image1.png)
![Photo 2: Overhead transmission lines & transmission tower](image2.png)
![Photo 3: Overhead transmission lines & transmission tower](image3.png)
![Photo 4: Sample location directly underneath transmission lines](image4.png)
| Photo 5: Sample location directly underneath transmission lines & transmission tower | Photo 6: Sample location directly underneath transmission lines |
Table 2: Spatial distribution of Magnetic Field Strength at the site from high voltage electrical power supply infrastructure

<table>
<thead>
<tr>
<th>Sample Number</th>
<th>Height above floor (m)</th>
<th>Location</th>
<th>Low freq Magnetic field strength (mG)</th>
<th>Low freq electric field strength (V/m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.8</td>
<td>See Appendix A</td>
<td>0.0015</td>
<td>4.88</td>
</tr>
<tr>
<td>2</td>
<td>1.8</td>
<td>See Appendix A</td>
<td>0.0021</td>
<td>43.9</td>
</tr>
<tr>
<td>3</td>
<td>1.8</td>
<td>See Appendix A</td>
<td>0.0016</td>
<td>108.2</td>
</tr>
<tr>
<td>4</td>
<td>1.8</td>
<td>See Appendix A</td>
<td>0.0015</td>
<td>71.4</td>
</tr>
<tr>
<td>5</td>
<td>1.8</td>
<td>See Appendix A</td>
<td>0.0018</td>
<td>31.7</td>
</tr>
<tr>
<td>6</td>
<td>1.8</td>
<td>See Appendix A</td>
<td>0.0018</td>
<td>426</td>
</tr>
<tr>
<td>7</td>
<td>1.8</td>
<td>See Appendix A</td>
<td>0.002</td>
<td>558</td>
</tr>
<tr>
<td>8</td>
<td>1.8</td>
<td>See Appendix A</td>
<td>0.0019</td>
<td>633</td>
</tr>
<tr>
<td>9</td>
<td>1.8</td>
<td>See Appendix A</td>
<td>0.0016</td>
<td>1112</td>
</tr>
<tr>
<td>10</td>
<td>1.8</td>
<td>See Appendix A</td>
<td>0.0025</td>
<td>1241</td>
</tr>
<tr>
<td>11</td>
<td>1.8</td>
<td>See Appendix A</td>
<td>0.002</td>
<td>877</td>
</tr>
<tr>
<td>12</td>
<td>1.8</td>
<td>See Appendix A</td>
<td>0.0018</td>
<td>757</td>
</tr>
<tr>
<td>13</td>
<td>1.8</td>
<td>See Appendix A</td>
<td>0.0017</td>
<td>345</td>
</tr>
<tr>
<td>14</td>
<td>1.8</td>
<td>See Appendix A</td>
<td>0.0019</td>
<td>771</td>
</tr>
<tr>
<td>15</td>
<td>1.8</td>
<td>See Appendix A</td>
<td>0.0016</td>
<td>175</td>
</tr>
<tr>
<td>16</td>
<td>1.8</td>
<td>See Appendix A</td>
<td>0.0017</td>
<td>538</td>
</tr>
<tr>
<td>17</td>
<td>1.8</td>
<td>See Appendix A</td>
<td>0.0023</td>
<td>587</td>
</tr>
<tr>
<td>18</td>
<td>1.8</td>
<td>See Appendix A</td>
<td>0.002</td>
<td>312</td>
</tr>
<tr>
<td><strong>Site Average</strong></td>
<td></td>
<td></td>
<td><strong>0.0019</strong></td>
<td><strong>477</strong></td>
</tr>
<tr>
<td><strong>Exposure Limits</strong></td>
<td></td>
<td></td>
<td><strong>1000 mG</strong></td>
<td><strong>5000 V/m</strong></td>
</tr>
</tbody>
</table>
5 OVERALL CONCLUSION

5.1 High Voltage Electrical Power (Electrical Infrastructure)

The measured Magnetic Field Strength and Electric Field Strength being emitted from high voltage infrastructure in the range of 1Hz to 100kHz, including at extremely low frequencies in the range of 0 to 3000 Hz were well below standard exposure limits for the general public at all testing locations.

The results of the electromagnetic survey do not show any evidence of radiation within ranges noted which exceed safe guidance values for general population on this site.

As such CETEC can determine the site is fit for its future intended use a residential development based on the electromagnetic survey results. The site is safe for general occupants in relation to the measured levels of magnetic and electric field strength from high voltage infrastructure in the vicinity of the site.

It is assumed the design of the proposed residential development has allowed for correct minimum easements distance from the high voltage infrastructure in the vicinity of the site.

This recommendation is based on current electrical service infrastructure present at the time of testing.
Appendix A – Sampling Locations
APPENDIX B – SITE LOCATION

Photo 1: Aerial photograph of the site, including location of above ground power lines shown in red, and the site outlined in green.
APPENDIX C – AUSTRALIAN RADIOFREQUENCY SPECTRUM

Australian radiofrequency spectrum
allocations chart

VLF
3 kHz
30 kHz

LF
30 kHz
300 kHz

MF
300 kHz
3000 kHz

HF
3000 kHz
30 MHz

VHF
30 MHz
300 MHz

UHF
300 MHz
2 GHz

SHF
3 GHz
30 GHz

EHF
30 GHz
300 GHz

© Australian Communications and Media Authority 2017
APPENDIX D – REFERENCES

1. Radiation Protection Standard: Maximum exposure levels to radiofrequency Fields – 3kHz to 300GHz (ARPANSA 2002)

2. Australian Radiation Protection and Nuclear Safety Agency: Website - Radiation Protection / Radiofrequency Radiation

3. World Health Organisation: Website – Electromagnetic fields (EMF) / What are electromagnetic fields?
   http://www.who.int/peh-emf/about/WhatsEMF/en/

4. World Health Organisation’s World Health Criteria on Extremely Low Frequency Fields
   http://www.who.int/peh-emf/publications/Complet_DEC_2007.pdf?ua=1

5. ICNIRP Guidelines For Limiting Exposure To Time-Varying Electric And Magnetic Fields (1HZ – 100 kHZ)

6. Australian Communications and Media Authority

7. Radio Frequency National Site Archive (RFNSA) Mobile Base Stations
DISCLAIMER

CETEC has taken all reasonable care to ensure that the information contained in this report is accurate. The report is based on data and information collected by CETEC personnel during location visits and information accepted in good faith from various personnel associated with this work. However, no warranty or representation can be given that the information and materials contained in it are complete or free from errors or inaccuracies.

CETEC accepts no responsibility for any deficiency, misstatements or inaccuracies contained in this report as a result of omissions, misinterpretation or fraudulent acts of the persons interviewed or contacted.

To the extent permitted by applicable laws, CETEC accepts no liability for any decision, action, loss, damages or expenses of any kind including without limitation, compensatory, direct, indirect or consequential damages, loss of data, income or profit, loss of or damage to property, or claims by third parties howsoever arising in connection with the use or reliance on the information in this report. This exclusion of liability shall also apply to damages arising from death or personal injury potentially caused by the negligence of CETEC or any of its employees or agents.

By viewing this report, you are acknowledging that you have read and agree to the above disclaimer.

COPYRIGHT

The material in this report is protected by copyright, which is owned by CETEC. Users may view, print and download the contents for personal use only and the contents must not be used for any commercial purposes, without the express permission of Skyton Developments No.2 Pty Ltd and CETEC. Furthermore, the material in this report, or any part of it, is not to be incorporated or distributed in any work or in any publications in any form without the permission of Skyton Developments No.2 Pty Ltd and CETEC.