ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

REPORT NO. **118054Parkes**

CONTAMINATION ASSESSMENT OF A LAND PORTION DESIGNATED FOR THE PROPOSED FREIGHT TERMINAL, BROLGAN ROAD, PARKES, NSW

ENVIRONMENTAL EARTH SCIENCES NSW
REPORT TO PACIFIC NATIONAL
DATE JUNE 2018
VERSION 1


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ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

5 June 2018

Pacific National
71 May Street
Parkes NSW 2870

Attn: Richard Johnstone

Dear Richard

Contamination Assessment of a land portion designated for the proposed freight terminal, Brolgan Road, Parkes, NSW

Please find enclosed a copy of our report entitled as above. Thank you for the opportunity to undertake this work.

The site was shown to be unaffected from past and current landuse. All heavy metals and organic contaminants were below the Health Investigation Levels (HILs) and Ecological Investigation Levels (EILs) established for the site.

This assessment found that the site is considered suitable for the current agricultural landuse and the intended open spaces/ industrial use in relation to the proposed development as a Freight Terminal.

If you have any queries concerning the investigation or the report please contact the undersigned.

For and on behalf of
Environmental Earth Sciences NSW

Project Manager
Stuart Brisbane
Principal Soil Scientist
118054Parkes

EXECUTIVE SUMMARY

Environmental Earth Sciences NSW was commissioned by Pacific National to undertake a contamination assessment for a portion of land designated for the Parkes Logistic Freight Terminal (the "site").

Objectives

The aim of this investigation is to assess potential soil impact that may have resulted from historical use of the portion of land proposed for the Parkes Logistic Fright Terminal. The work is to assess any unacceptable risk to human health and / or the environment that could preclude the proposed development as open space / industrial land use.

Site inspection

A site walkover was undertaken prior to and during drilling activities on the 22 May 2018. There were no potential asbestos fragments found or soil staining and odour to suggest that contamination may be present. Samples selected for analysis were taken from the upper soil profiles as these layers are the most likely to be affected from past use.

All bores encountered a natural residual soil profile. Subsoil was generally described as a light to medium clay with gravel content <5%. Gravel was angular, and <0.02 m in diameter. Soil pH ranged from 6.5 -7.5. Colour ranged from orange brown to red brown in colour.

Analysis

The final analytical schedule was chosen in consideration of field observations for soils. Samples were analysed for a range of analytes including:

- Total Recoverable Hydrocarbons (TRH) (Fraction C6 – C40);
- Benzene, Toluene, Ethylbenzene and Total Xylenes (BTEX);
- Polycyclic Aromatic Hydrocarbons (PAH);
- Organochlorine pesticides (OCP) and organophosphate pesticides;
- Polychlorinated Biphenyls (PCBs); and
- Heavy metals (As, Cd, CrTOTAL, Cu, Hg, Ni, Pb and Zn).

Results

All heavy metal concentrations in the soil were low and comparable with background ranges. Concentrations were below the Health Investigation Levels (HILs) and established Ecological Investigation and Screening Levels for open space use.

No organic contaminants were detected in the samples and all TRHs, BTEXN, PAHs, PCBs and organochlorines and organophosphates herbicide concentrations were below the established site criteria.

No asbestos fragments were detected in any of the samples or across the investigated area.

Recommendations

As a result of the inspection and soil analysis the site is considered suitable for the current agricultural landuse and as open spaces/ industrial use in relation to the proposed development.

The natural residual soil encountered onsite is suitable to be classified as virgin excavated natural material (VENM) and therefore can be taken to any site that has planning consent to accept it, i.e. it does not need to be taken to the local landfill as general solid waste.

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1 INTRODUCTION

Environmental Earth Sciences NSW was commissioned by Pacific National to undertake a contamination assessment for a portion of land designated for the Parkes Logistic Freight Terminal (the "site"). The portion of land is situated west of the Parkes township along Brolgan Road.

Once fully operational, Pacific National's Parkes Logistics Terminal will have the capacity to process approximately 450,000 cargo containers delivered from both road and rail routes.

This report should be read in conjunction with the limitations and appendices contained within the email dated 18 May 2018 and the limitations detailed in this report.

2 OBJECTIVES

The aim of this investigation is to assess potential soil impact that may have resulted from historical use of the portion proposed for the Parkes Logistic Fright Terminal. The work is to assess any unacceptable risk to human health and/or the environment that could preclude the proposed development or open space/ industrial land use.

Specific objectives for the contamination assessment include:

- identify the likelihood and nature of any contamination at the site; and
- provide preliminary remedial strategies and/or management options for addressing any identified contamination.

3 SCOPE OF WORKS

The following scope of works was undertaken to meet the objectives:

- a site walkover in which the potential for contamination was assessed. Sampling locations were based on a judgmental and random sampling plan;
- ten (10) locations were sampled over the 2-4 Ha block. Five boreholes were drilled to 1-2 m in depth or to residual soil to assess the potential for fill. The remaining five samples were taken from the surface soil;
- 10 samples and 1 duplicate (a total of 11 samples) were analysed for:
    - Total Recoverable Hydrocarbons (TRH) (Fraction C6 – C40);
    - Benzene, Toluene, Ethylbenzene and Total Xylenes (BTEX);
    - Polycyclic Aromatic Hydrocarbons (PAH);
    - Organochlorine and organophosphate pesticides (OCP/OCP);
    - Heavy metals (As, Cd, CrTOTAL, Cu, Hg, Ni, Pb and Zn); and
- preparation of report outlining any areas identified within the proposed development as having an unacceptable risk to human health and the environment and that could preclude the proposed development as open space / industrial land use.

4 SITE IDENTIFICATION AND SETTING

4.1 Location and property description

The site is located west of Parkes, near Brolgan Road approximately 8 km from the Central Business District.

Site identification details are provided in Table 1. A plan of the regional locality of the site, along with site lot configuration is provided in Figure 1.

The investigated area is within a larger grazing paddock, north of the intersection of Brolgan Road with Millers Lookout Road (Figure 2). The site is currently used for grazing purposes. Figure 2 presents the site layout and land-use.

TABLE 1 SITE IDENTIFICATION

Item	Details
Address	Brolgan Road, Parkes
Lot & Plan number	Lot 2 DP 1082995
Area	Approx. 197 ha
Size of investigation area	Approx. 2-3 ha
Zoning	Rural – Primary Production
Propose land use	Open space / industrial
Local Government Authority	Parkes Shire Council
Site Location and Layout	Figure 1 and Figure 2

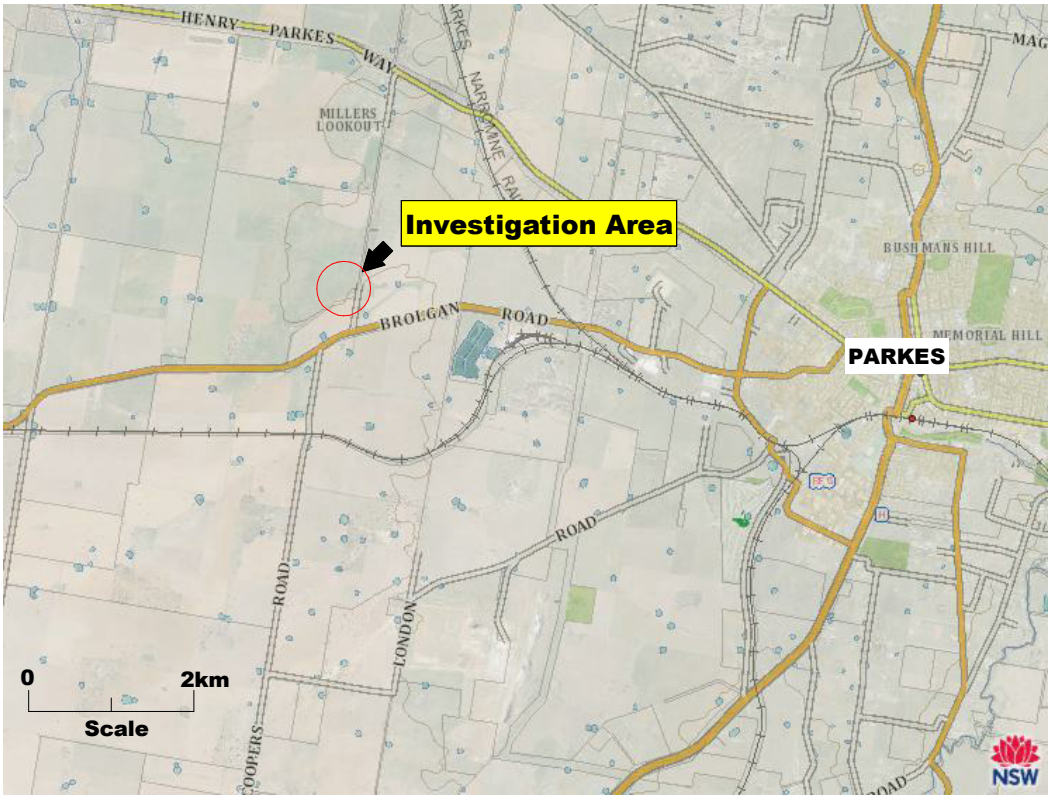
4.2 Site surrounds

The site is situated in a farming district, surrounded by grazing and cropping land. Minor sheds are located to the west of the investigation area and an old farm house and structures to the east. Larger commercial / industrial sites can be found further to the east of the site closer to Parkes.

4.3 Sensitive receptors

The nearest sensitive human receptor is commercial / industrial properties along Brolgan Road >1 km to the east of the site.

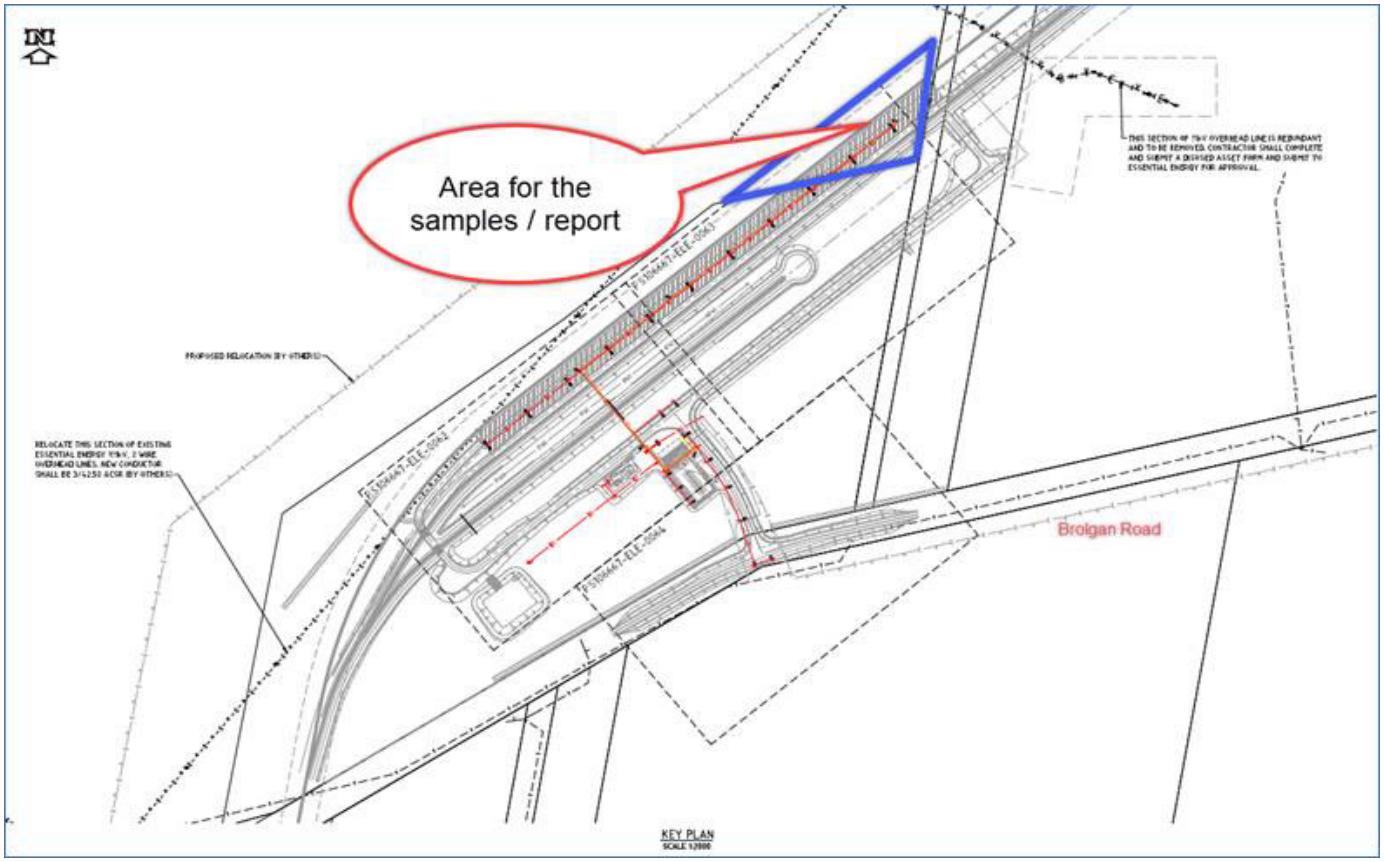
The nearest sensitive environmental receptor is Goobang Creek, a tributary that feeds into the Lachlan River at Condobolin. Goobang Creek is approximately 8 km south of the site.



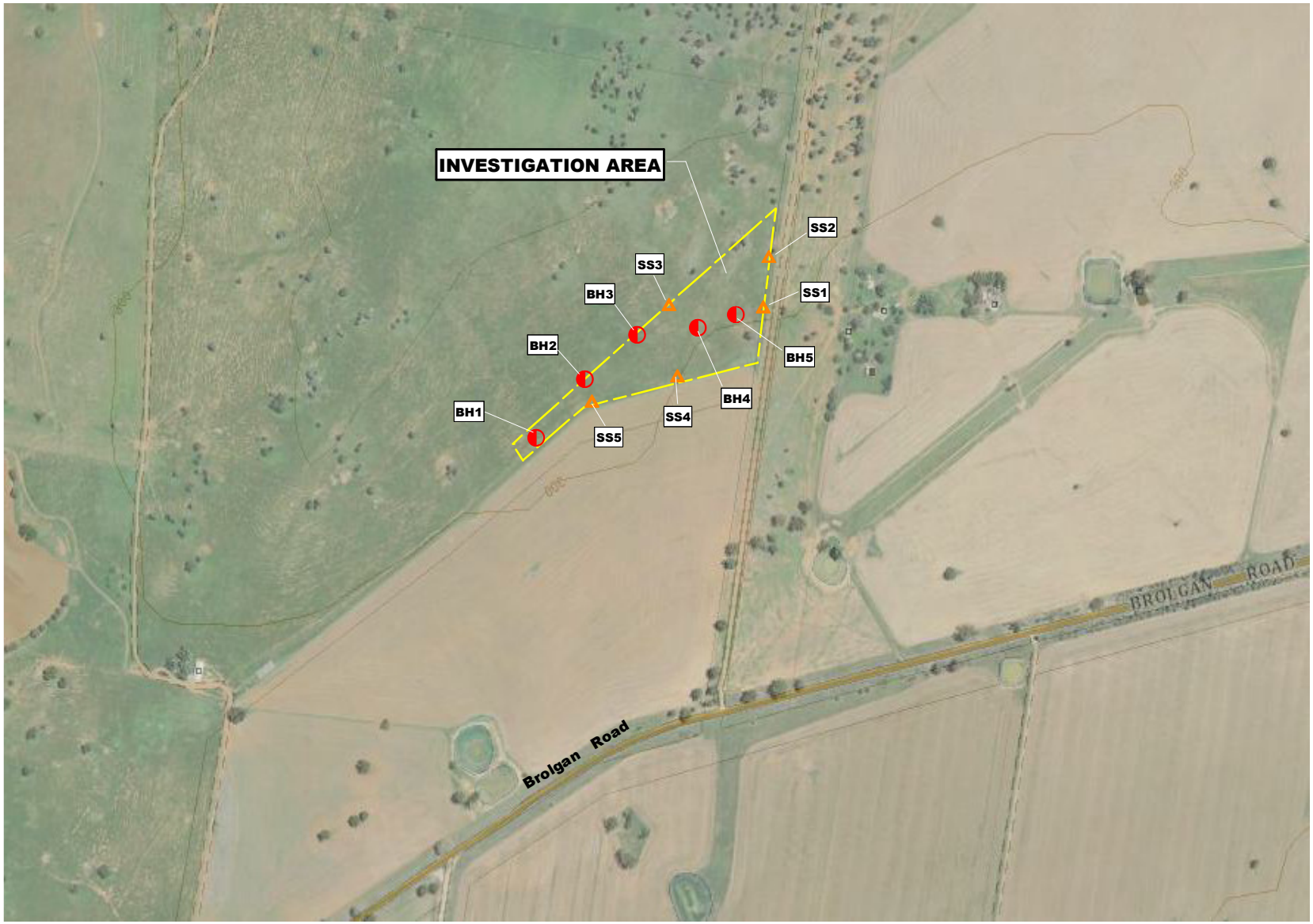
North

Regional Locality Map - Parkes, NSW

Ref. NSW Spatial Information Exchange SIX. website image. 2018.



ENVIRONMENTAL EARTH SCIENCES CONTAMINATION RESOLVED	**Title:** Site Location Map		
	Location: Brolgan Road, Parkes, NSW		
Client: Pacific National Freight Terminal	**Job No.** 118054	**Date:** 06/06/18	**Figure 1**
	Drawn by: TRJ	**Proj. Man.** SB	**Scale:** As shown



North

Investigation Area - Brolgan Rd. Parkes

Borehole locations

Surface sample locations

Scale 0 0.1 0.2km

Ref. NSW Spatial Information Exchange SIX. website image. 2018.

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

Client: Pacific National Freight Terminal

Title: Investigation Area

Location: Brolgan Road, Parkes, NSW

Job No. 118054 | Date: 06/06/18

Drawn by: TRJ | Proj. Man. SB | Scale: As shown

Figure 2

5 SITE HISTORY

5.1 Historical aerial photographs

Historical aerial photographs and recent satellite imagery were viewed to assess the history of the sites. A summary is presented in Table 2.

TABLE 2 SUMMARY OF AERIAL PHOTOGRAPHS

Date	Scale	Comments
1964 Black and white	17,500 ft	Site and surrounding area were used for farming. Some cropping, minor trees stands. No structures on site.
1984 Black and white	1:40 000	Area predominately farm land and cleared. No structures observed on site, paddock to the south used for cropping.
2006 to 2010	Google Earth	No significant changes to sites
2014 to 2017	Google Earth	No significant changes to sites

5.2 NSW EPA Contaminated Sites Register

A search of the NSW EPA contaminated land public record database showed no notices or records for the site.

5.3 Potential Chemicals of Concern

Based on the historical review, the potential for contamination exists from the following historical site activities and features:

- imported fill (heavy metals, asbestos, petroleum hydrocarbons, polycyclic aromatic hydrocarbons);
- farming activities (possible organochlorines, organophosphates and heavy metals);
- operational spills at the site (total recoverable hydrocarbons (TRHs)); and
- asbestos used for building material that may have been dumped onsite.

6 CONCEPTUAL SITE MODEL DEVELOPMENT

A conceptual site model (CSM) consists of the geophysical characteristics at play at the site, the contaminant source, potential receptors and the pathways to the receptors. The CSM, as required by the NEPC (2013), is an iterative process constantly being updated during the investigation process as more information becomes available. Prior to undertaking field work a CSM is derived to design the sampling strategy, or to reduce uncertainties or data gaps in regard to the source of contamination, the pathway and the receptors.

6.1 Climate

The Bureau of Meteorology website (*www.bom.gov.au*, verified February 2018) provided climatic data for the weather stations at Parkes Airport AWS and Macarthur St, Parkes, NSW. Yearly averages for rainfall and evaporation have been provided in conjunction with long term monthly averages (Table 3):

- average annual rainfall: 584.0 mm; and
- average annual evaporation: ~1,548 mm.

January and February are the warmest months and July is the coldest. Mean daily temperatures in summer are in the mid 20 ºC range with maximums >30 ºC, while in winter average temperatures reach 10 ºC.

Rainfall is relatively evenly distributed throughout the year with January receiving the highest monthly total of 59 mm and September the driest 42 mm (Table 3). Rainfall events during the summer months can consist of high intensity storm events which have the potential for erosion especially in sloping and low ground cover environments.

TABLE 3 AVERAGE MONTHLY CLIMATE DATA

Parameters	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec
Maximum Temperature (ºC)	33.5	31.9	28.4	24.0	18.9	15.4	14.0	16.0	20.1	23.6	28.1	30.6
Minimum Temperature (ºC)	17.5	17.4	13.7	9.3	4.7	3.7	2.4	2.5	4.6	7.5	12.3	14.4
Rainfall (mm)	59	47	47	42	48	49	49	50	42	53	47	51
Evaporation (mm)	229	179	161	102	62	42	47	65	96	143	177	245
Evapotranspiration	183	143	128	71	31	21	23	32	67	114	141	195

Note:

1. evapotranspiration rates calculated from evaporation records using a crop factor;
2. measurement commenced in 1889; and
3. measurements are in mm.

Monthly evaporation and evapotranspiration rates exceed monthly rainfall totals for June and July illustrating that soil moisture status is high in winter. It is during these times that most of the groundwater recharge and surface runoff is expected to occur. Soil moisture is generally low in the summer as characterised by the large difference between evaporation and rainfall during this time. Plant growth can be limited by low temperature during the winter and by low moisture during the summer.

6.2 Topography and vegetation

Local topography is described as undulating rises and occasional low hill with slopes up to 15% (King, 1998). Elevation across the landscape ranges from 280-460 m AHD. Rock outcrops occur on crests and upper slopes (King, 1998).

Land is extensively cleared open-woodland used for grazing and cropping. Remnant tree species include kurrajongs, western grey box, cypress pine and yellow box (King, 1998).

Native perennials are common on grazing undisturbed lands and exotic annuals and perennial dominant the cropping country.

6.3 Geology and soils

6.3.1 Regional surface geology

Local geology as identified from the 1:100 000 geological map of Parkes (Raymond *et. al.*, 2000) was the Ordovician aged Goonumbla Volcanics. This unit comprises of Andesitic lavas and breccias, volcanoclastic sandstone and conglomerate commonly altered and sheared in the Parkes Fault Zone (Raymond *et. al.,* 2000).

6.3.2 Soil landscape

The area was identified in the *Soil Landscape of Forbes 1:250 000 sheet* as belonging to the Goonumbla Soil Landscape. Dominant soils in the Goonumbla Soil Landscape are mainly well-drained Rudosols and Tenosols and moderately well-drained Red Chromosols on crests (King, 1998). Red Dermosols and Red Chromosols occur on upper and mid slopes and moderately deep Red and Brown Chromosols occur on lower slopes (King 1998).

Limitations of the Soil Landscape have been identified as (King 1998):

- Rock outcrop (localised);
- water erosion hazard;
- shallow, stony soils with hardsetting surfaces (localised); and
- soil structure decline hazard (local).

6.4 Salinity and acid sulfate soils

According to the Australian Soil Resource Information System (ASRIS), there were low to moderate saline soils located in the local area. Salinity potential is therefore considered to be a moderate risk at the site.

There are no published acid sulfate soils maps available for regional NSW as acid sulfate soils are generally only considered a problem along the coastal areas of NSW where AHD <10 m and around wetlands of inland NSW. Inland acid sulfate soil has also been associated with discharging saline groundwater however their occurrence is limited.

6.5 Hydrogeology

6.5.1 Results of registered bore search

Groundwater information was obtained from the Source: Groundwater Works Summary from NSW Office of Water (http://allwaterdata.water.nsw.gov.au/water.stm 1 June, 2018).

Two aquifers are known to exist about the local region. A shallow semi-confined aquifer contained within the alluvial material of the lower lying areas of Parkes has been intercepted with wells and bores installed to depths of 10 m. Wells installed into this shallow groundwater can be used for domestic and stock use however yield has been reported as slow and dependent on rainfall. Recently installed bores (last 10 years) into the shallow groundwater are generally used for monitoring purposes.

The deeper aquifer is encountered at depths greater than 20 m and is generally associated with fractures within the shale and siltstone. Fractured rock aquifers have very low storage capacity and yield at most 5 L/s. The aquifer is semi confined or under pressure as the standing water level (SWL) equilibrated above the depth of stratigraphy where groundwater was encountered during drilling (Table 3). Groundwater at this depth could be both locally and regionally sourced given the prominence of faulting in the area.

Groundwater underlying the site is known to be relatively deep (>20 m depth), and associated with the underlying fractured rock. Shallow groundwater <10 m in depth is generally not associated with the sedimentary sequences (Silurian aged Mumbigle Formation) or found at elevations equivalent to this site.

7 FIELD PROGRAM

7.1 Rationale for sampling locations

Soil sampling was selected density and locations were chosen with reference to the National Environment Protection Council (NEPC) 2013, *National Environment Protection (Assessment of Site Contamination) Amendment Measure* (NEPAM); the NSW EPA (1995) *Contaminated sites: sampling design guidelines* and Australian Standard AS4482.1:2005, *Guide to the Investigation and Sampling of Sites with Potentially Contaminated Soil*. Part 1: Non-volatile and Semi-volatile Compounds and AS4482.2:1999, *Guide to the Sampling and Investigation of Potentially Contaminated Soil.* Part 2: Volatile Substances.

A summary of soil borehole locations and rationale is provided in Table 4 and Figures 2.

TABLE 4 SUMMARY OF LOCATIONS AND RATIONALE

Location	Sampled Media	Rationale
BH1	Soil	Near southern boundary with cropping paddock
BH2	Soil	Site coverage
BH3	Soil	Site coverage (near bare soil)
BH4	Soil	Site coverage
BH5	Soil	Site coverage
SS1	Soil	Near eastern boundary
SS2	Soil	Near eastern boundary
SS3	Soil	Rocky outcrop
SS4	Soil	Near southern boundary with cropping paddock
SS5	Soil	Near southern boundary with cropping paddock

7.1.1 Site walkover discussion

A site walkover was undertaken prior to and during drilling activities on the 22 May 2018. During the site inspection no indicators of potential contamination were observed.

The investigated area was situated on the side of a south easterly facing low hill. Slope gradients with the upper slope environment ranged from 5-8% and graded down to <3% on the lower slopes. Rock outcrops were common across the site.

The site was part of a larger grazing paddock, and had limited cropping activity in the past, due to the shallow soil and rock outcrops.

Most of the site was cleared except for a few isolated Cypress trees. Eucalypts were observed on the lower slopes in the cropping paddock to the south of the site. Pasture was dominated by native perennials and saffron thistles. At the time of the inspection most of the pasture species were dormant or dead due to the dry weather conditions experienced over the 2017-2018 period. Groundcover was approximately 50-70% with most of this dead litter material.

Trees, appeared to be healthy and showed no evidence of phytotoxicity. There were no apparent indicators of significant soil contamination such as bare ground associated with dead or dying vegetation and soil staining or odour.

There were no structures or evidence of sheds, sheep dips or yards found across the site except for power lines. An old homestead was observed to the east of the site approximately >100 m from the boundary fence.

7.2 Soil Investigation

7.2.1 Drilling method

Environmental Earth Sciences used a truck mounted drill rig with solid flight augers. Each borehole was drilled to a maximum depth of approximately 1- 1.5 metres. Surface samples were collected with a hand auger.

7.2.2 Soil field screening

Assessment of soil at each exploratory location was undertaken by noting the following features:

- soil type (fill or natural material);
- colour and texture;
- foreign constituents; and
- indications of any visual and/or olfactory contamination.

Information was recorded on detailed borelogs that are included in Appendix A.

7.3 Soil sampling

All samples were logged in accordance with Environmental Earth Sciences (2011) *Soil, gas and groundwater sampling manual*.

Soil samples were collected from soil profiles removed from a solid auger flight. To prevent cross contamination, the exterior of each soil sample was cut away (effectively skinning the soil sample) using a clean spatula.

7.3.1 Record keeping

Soil texture, colour, moisture, odour and notable characteristics were recorded for each sample taken from the borehole. Descriptions of soil materials and fill type were recorded on borelogs, noting any visible contamination or malicious odours. Details of soil encountered are included in the logs in Appendix A.

7.3.2 Sampling containers

Once collected, samples for analysis were placed into glass jars and plastic bags, and labelled with the location number, depth of discrete sample collection, site reference, and date. Sampling was in accordance with Environmental Earth Sciences (2011), *Soil, gas and groundwater sampling manual.*

Representative soil samples were collected from each soil material type in the strata. Samples were collected by hand using disposable nitrile gloves, with soil placed directly into a clean glass jar supplied by the nominated NATA accredited laboratory.

7.3.3 Decontamination

When required, sampling tools were decontaminated between locations by washing/ scrubbing with Decon90 or the like. The equipment will be rinsed with distilled or deionised water (a controlled source) at the completion of equipment decontamination.

7.3.4 Handling and transport

Samples were placed in cooled Eskies (not required for asbestos) and submitted to the laboratory within 24 hours of collection. All samples were accompanied by a complete chain of custody form

7.4 Stratigraphy

All bores encountered a natural residual soil profile.

Topsoil was a red brown loam to clay loam which was poorly structured, dry and crumbly. Gravel content was <2% and the gravel was angular, and <0.2 m in diameter. Soil pH ranged from 5.5 -6.5. Depth extended to 0.2-0.3 m in depth.

A distinct boundary separated the topsoil from a lighter red brown light clay. Soil moisture was dry and structure was characterised as moderate. Consistency was brittle to hard and gravel content was <1%. The light clay horizon extended to 0.4-0.6 m in depth. A red brown medium clay was encountered under the light clay. Structure was moderate, and the soil was dry, brittle to hard and stiff. Bedrock was encountered at all bores <1.5 m depth below ground level.

Colour ranged from orange brown to red brown in colour. Subsoil generally showed features of a well-drained profile and no evidence of a seasonal or a perched watertable were noted.

There were no potential asbestos fragments found or staining and odour to suggest that contamination may be present. As a result of these findings samples selected for analysis were selected from the fill and upper soil profiles. These layers are the most likely to be affected from past use.

Sample descriptions have been provided in Table 5.

TABLE 5 SAMPLE DESCRIPTIONS

Sample	Description
BH1 (0-0.1 m)	Residual soil – Loam-clay loam, red brown, dry, pH 6.0, dry, gravel <2%, no odour, staining or asbestos
BH2 (0-0.1 m)	Residual soil – Loam-clay loam, red brown, dry, pH 5.5, dry, gravel <1%, no odour, staining or asbestos
BH3 (0-0.1 m)	Residual soil – Loam-clay loam, red brown, dry, pH 5.5, dry, gravel <5%, no odour, staining or asbestos
BH4 (0-0.1 m)	Residual soil – Loam-clay loam, red brown, dry, pH 6.0-6.5, dry, gravel <5%, no odour, staining or asbestos
BH5 (0-0.1 m)	Residual soil – Loam-clay loam, red brown, dry, pH 6.5, dry, gravel <1%, no odour, staining or asbestos
SS1 (0-0.1 m)	Residual soil – Loam-clay loam, red brown, dry, pH 5.5, dry, gravel <1%, no odour, staining or asbestos
SS2 (0-0.1 m)	Residual soil – Loam-clay loam, red brown, dry, pH 5.5, dry, gravel <1%, no odour, staining or asbestos
SS3 (0-0.1 m)	Residual soil – Loam-clay loam, red brown, dry, pH 6.5, dry, gravel <2%, no odour, staining or asbestos
SS4 (0-0.1 m)	Residual soil – Loam-clay loam, red brown, dry, pH 6.5, dry, gravel <1%, no odour, staining or asbestos
SS5 (0-0.1 m)	Residual soil – Loam-clay loam, red brown, dry, pH 6.5, dry, gravel <1%, no odour, staining or asbestos

8 LABORATORY ANALYSIS

Samples were analysed by Envirolab which is accredited with the National Association of Testing Authorities (NATA) for the methods used. Intra laboratory duplicates (split duplicates) were analysed as part of our standard QA/QC procedures.

8.1 Analytical schedule

The final analytical schedule was chosen in consideration of field observations for soils. Samples were analysed for a range of analytes including:

- Total Recoverable Hydrocarbons (TRH) (Fraction C6 – C40);
- Benzene, Toluene, Ethylbenzene and Total Xylenes (BTEX);
- Polycyclic Aromatic Hydrocarbons (PAH);
- Organochlorine and organophosphate pesticides (OCP/OPP); and

- Heavy metals (As, Cd, CrTOTAL, Cu, Hg, Ni, Pb and Zn).

The analytical schedule is summarised in Table 6. Laboratory transcripts are provided in Appendix B.

TABLE 6 ANALYTICAL SCHEDULE

Soil	No. of samples	No. of intra-lab duplicates	No. of inter-lab duplicates	Trip blank+spike	Total
Heavy metals (suite of 8)	10	1	-	-	11
TRH/BTEXN/PCB	5	1	-	-	6
PAH/OC/OP	10	1	-	-	11

8.1.1 Soil laboratory results

A summary of results is included in Tables 7 and 8. A full laboratory transcript is provided in Appendix B.

TABLE 7 SOIL RESULTS – HEAVY METALS

Sample	As	Cd	Total Cr	Cu	Pb	Ni	Zn	Hg
BH1 (0-0.1 m)	6	<0.4	15	78	9	7	30	<0.1
BH2 (0-0.1 m)	5	<0.4	15	71	10	8	31	<0.1
BH3 (0-0.1 m)	5	<0.4	15	67	9	8	35	<0.1
BH4 (0-0.1 m)	4	<0.4	16	56	10	8	31	<0.1
BH5 (0-0.1 m)	<4	<0.4	14	41	9	6	27	<0.1
SS1 (0-0.1 m)	7	<0.4	14	47	10	7	33	<0.1
SS2 (0-0.1 m)	5	<0.4	9	44	9	5	39	<0.1
SS3 (0-0.1 m)	<4	<0.4	14	56	10	7	36	<0.1
SS4 (0-0.1 m)	5	<0.4	17	61	10	7	42	<0.1
SS5 (0-0.1 m)	5	<0.4	14	56	48	7	50	<0.1
Open Space EILs	110	-	510	150	1100	170	350	-
Open Space HILs	300	100	240	20000	600	800	30000	40

Notes:

1. Site criteria: taken from NEPC 2013, Schedule B(1): Guideline on the Investigation Levels for Soil for Open Space land use
2. HIL – Health Investigation Levels
3. EIL – Ecological Investigation Levels based on soil pH of 5.5 – 6.5 and cation exchange of 5-10 cmol/kg
4. All results expressed in mg/kg on a dry weight basis
5. - Not applicable/ No criteria

Heavy metal results were low and no distinction could be made between the sample locations (Table 7). Metal concentrations were consistent with the background concentration range for the local area.

No organic contaminants were detected in the ten samples selected for analysis (Table 8).

TABLE 8 SOIL RESULTS – ORGANICS

Borehole (depth)	BH1	BH2	BH3	BH4	BH5	SS1	SS2	SS3	SS4	SS5	EIL	HIL
Polycyclic aromatic hydrocarbons (PAHs)												
Phenanthrene	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	
Fluoranthene	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	
Pyrene	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	
Benz(a)anthracene	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	
Chrysene	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	
Benz(b+j) fluoranthrene	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	
Benzo(a)pyrene	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.4	-
Benzo(a)pyrene TEQ	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	4
Total PAHs	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	400
BTEX												
Benzene	nt	<0.2	nt	nt	<0.2	nt	<0.2	<0.2	nt	<0.2	65	120
Toluene	nt	<0.5	nt	nt	<0.5	nt	<0.5	<0.5	nt	<0.5	105	18,000
Ethyl Benzene	nt	<1	nt	nt	<1	nt	<1	<1	nt	<1	125	5,300
Xylene	nt	<2	nt	nt	<2	nt	<2	<2	nt	<2	45	15,000
Naphthalene	nt	<1	nt	nt	<1	nt	<1	<1	nt	<1	170	1,900
TPH												
C_6-C_{10}	nt	<25	nt	nt	<25	nt	<25	<25	nt	<25	-	5,100
C_6-C_{10} less BTEX (F1)	nt	<25	nt	nt	<25	nt	<25	<25	nt	<25	180	
C_{10}-C_{16}	nt	<50	nt	nt	<50	nt	<50	<50	nt	<50	-	3,800
C_{10}-C_{16} less Napth (F2)	nt	<50	nt	nt	<50	nt	<50	<50	nt	<50	120	-
C_{16}-C_{34} (F3)	nt	<100	nt	nt	<100	nt	<100	<100	nt	<100	1,300	5,300
C_{34}-C_{40} (F4)	nt	<100	nt	nt	<100	nt	<100	<100	nt	<100	5,600	7,400
PCBs	nt	<0.1	nt	nt	<0.1	nt	<0.1	<0.1	nt	<0.1	-	2
OCP	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	9-400
OPP	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		

Notes:

1. Site criteria: taken from NEPC 2013, Schedule B(1): Guideline on the Investigation Levels for Soil for Open Space land use
1. HIL – Health Investigation Levels
2. EIL – Ecological Investigation Levels based on soil pH of 6.5-7.0 and cation exchange of 5-10 cmol/kg
3. All results expressed in mg/kg on a dry weight basis
4. NA - Not applicable/ No criteria
5. nt – Not tested

8.2 Procedures for quality control and quality assurance

Quality control is achieved by using NATA registered laboratories using ASTM standard methods supported by internal duplicates, the checking of high, abnormal or otherwise anomalous results against background and other chemical results for the sample concerned.

Quality assurance is achieved by confirming that field results, or anticipated results based upon comparison with field observations, are consistent with laboratory results. Also that sampling methods are uniform and decontamination is thorough. In addition, the laboratory undertakes additional duplicate analysis as part of their internal quality assurance program on the basis of one duplicate analysis for every 20 samples analysed.

Field observations are compared with laboratory results when they are not as expected. Confirmation, re-sampling and re-analysis of a sample are undertaken if the results are not consistent with field observations and/or measurements. In addition, field duplicate sample results have to be within the acceptable range of reproducibility. A discussion of the quality of internal laboratory results and field duplicate relative percentage difference (RPD) calculations are presented in Appendix D.

9 ASSESSMENT CRITERIA

In accordance with current legislation, Environmental Earth Sciences refers to the National Environment Protection Council (NEPC) 2013*, National Environment Protection (Assessment of Site Contamination) Amendment Measure* (NEPAM) for site assessment criteria.

Site investigation criteria have been selected to provide an appropriate indication of the environmental status of the site with consideration given to the current land uses as determined by existing site zoning.

Typically for contaminant concentration to be considered acceptable for the respective land use criteria, the data set must conform to the following requirements:

- the 95% upper confidence limit (UCL) of the arithmetic mean of analytical results is below the site criteria;
- the arithmetic (or geometric in cases where the data is log normally distributed) mean is below the site criteria;
- the standard deviation is less than 50% of the site criteria; and
- no single sample analytical result is greater than 250% of the site criteria.

Soil analytical results were tabulated (Tables Appendix) and were compared to the National Environment Protection Council (NEPC) 2013*, National Environment Protection*

(Assessment of Site Contamination) Amendment Measure (NEPC 2013), Schedule B(1): Guideline on the Investigation Levels for Soil and Groundwater:

- Health investigation level (HIL) human exposure setting C (Recreation, Open Space);
- Ecological investigation levels (EILs) for Recreation Open Space, aged soil;
- Ecological Screening Levels (ESLs) for TRH fractions and BTEXN in soil;
- Management Limits for TPH/ TRH in soil;
- Health Screening Levels (HSLs) for Petroleum Hydrocarbons in Soil and Groundwater, Summary, Technical Report 10, September 2011; and
- HSLs for direct contact from soil, human exposure setting C (Recreational Open Space).

9.1 Investigation levels

9.1.1 Health investigation levels (HILs) for soil and vapour

Applicable Tier 1, human-health criteria are summarised in the Table 11.

9.1.2 Ecological investigation levels (EILs) for soil

The ecological investigation levels (EILs) assigned by the NEPC (2013) Schedule B5a - *Guideline on Ecological Risk Assessment* are adopted for this assessment. This guideline presents the methodology for deriving terrestrial EILs using both fresh and aged (i.e. > 2 years old) contamination for soil with the following land use types:

- areas of ecological significance;
- urban residential/ public open space; and
- commercial/ industrial.

The methodology has been developed to protect soil processes, soil biota (flora and fauna) and terrestrial invertebrates and vertebrates. The approved land use on the site is for recreational open space and hence these EILs have been adopted for this assessment.

The values presented for zinc, chromium (III), copper and lead are added contaminant limits (ACLs) based on added concentrations. The EIL is calculated from summing the ACL and the ambient background concentration (ABC) to derive the site-specific soil quality guideline (SQG) taking into account the effect caused by pH, exchangeable cations, iron and total organic carbon in soil that can affect concentration toxicity data.

TABLE 9 SITE SPECIFIC EIL CALCULATION DATA

Sample ID	Material	Cation Exchange Capacity (CEC)	Iron	Total Organic Carbon (TOC)	Field pH
Location (Depth m)	-	meq/100g	%	%	-
BH1-5	clay	5-10		0.5-1	5.5-6.5

Values presented for arsenic, naphthalene and DDT are generic EILs based on total concentrations and fresh contaminants. The EIL for lead has been calculated using the most conservative SQG value based upon field measured pH and estimated exchangeable cation values (King, 1998).

A summary of the EILs for aged contamination in soil (>2 years) for the adopted land use are presented in Table 10.

TABLE 10 SITE SPECIFIC EILS

Analyte	Age of Contaminant	EIL – natural soils Recreational/Open space (mg/kg)
Zinc [1]	Aged	350
Arsenic [2]	Aged	100
Naphthalene [2]	Fresh	170
DDT [2]	Fresh	180
Chromium III [1]	Aged	510
Copper [1]	Aged	150
Lead [2]	Aged	1,100
Nickel [1]	Aged	170

Notes:

1. ambient background concentrations (ABC) were calculated as from NEMP spreadsheet calculator (*www.nepc.gov.au/system/files/.../eil-calculation-spreadsheet-december-2010.xls* .
2. added contaminant limits were determined using Tables 1B (1-5), Schedule B1, NEPC (2013).

9.2 Screening levels

9.2.1 Asbestos screening levels for soil

The NEPC (2013) also provides investigation criteria for acceptable levels of asbestos, or asbestos containing materials (ACM) in soil. These are summarised as:

- asbestos containing material (ACM) in soil on a weight for weight basis (w/w) in commercial/industrial land of 0.05% w/w; and
- asbestos fines (AF) and fibrous asbestos (FA) in soil on a weight for weight basis (w/w) in all land use scenarios of 0.001% w/w.

9.3 Screening levels

9.3.1 Health screening levels (HSLs) for soil, soil vapour and groundwater

For petroleum hydrocarbons, health screening levels (HSLs) have been derived in ASC NEPM (2013) based upon fraction ranges of hydrocarbons together with soil texture classes. The applied soil texture class is determined according to the observed stratigraphy during field assessment.

Soils on site were predominantly clay loams to light clays. A fine to clay soil texture was used for the selection of HSLs to be applied.

The HSL criteria, whilst non-limiting (NL) for vapour intrusion, are provided to prevent the occurrence of phase-separated hydrocarbons (PSH). Fractions F3 (>C_{16}-C_{34}) and F4 (>C_{34}-C_{40}) are semi-volatile and are not of concern for vapour intrusion, however, exposure to human receptors can occur via direct pathways such as dermal contact. The HSL criteria are summarised below in Table 11.

9.3.2 Ecological screening levels (ESLs) for soil

For petroleum hydrocarbons, ESLs have been derived in ASC NEPM (2013) based upon fraction ranges of hydrocarbons, BTEXN and benzo(a)pyrene (BaP) components together with soil texture classes. For this investigation a soil texture class of fine has been adopted based upon field observations. These ESLs are of low reliability except for the volatile and semi-volatile hydrocarbon fractions which are of moderate reliability. Nonetheless the ESLs will be adopted for the investigation to be protective of the proposed land use.

The adopted ESLs are designed to be protective of soil fauna, soil processes, and plants. The ASC NEPM (2013) states that these factors only apply within the rhizome (i.e. zone in the top two metres of soil) and as such ESL criteria need not be applied to chemical results below this depth. Criteria are summarised in Table 11.

9.3.3 Management limits for hydrocarbon fractions F1-F4 in soil

Management limits for F1 and F2 are applied after consideration of relevant ESL and HSL criteria and are generally consider the formation of phase separated hydrocarbons, fire and explosion risks, damage to buried infrastructure and aesthetics (NEPC, 1999). The adopted management limits are based on fine grained soils with criteria summarised in Table 11.

TABLE 11 SITE SPECIFIC EILS

Analyte	HILs (mg/kg) NEPAM (2013)	Site Specific Criteria (mg/kg) EIL/ESL
Arsenic	300	110
Cadmium	100	-
Chromium VI	240	510
Chromium III	17,000	150
Copper	20,000	1,100
Lead	600	-
Mercury	400	170
Nickel	800	350
Zinc	30,000	110
Cyanide (free)	250	
Phenol	3,000	
Cresols	4,700	
Pentachlorophenol	140	
Naphthalene	-	170
Total PAH	400	
Benz(a)anthracene	4 (Sum of carcinogenic PAH as B(a)P Toxicity Equivalent)	
Chrysene		
Benzo(b)fluoranthene		
Benzo(k)fluoranthene		
Benzo(a)pyrene		1.4
Indeno(1.2.3.cd)pyrene		
Dibenz(a.h)anthracene		
Benzo(g.h.i)perylene		
C6 - C10 Fraction	No limit	180[U]
>C10 - C16 Fraction	No limit	120[U]
>C16 - C34 Fraction	No limit	1,300[U]
>C34 - C40 Fraction	No limit	5,600
Benzene	No limit	65[U]
Toluene	No limit	105[U]
Ethyl benzene	No limit	125[U]
Total xylenes	No limit	45[U]
Naphthalene	No limit	170[U]

Analyte	HILs (mg/kg) NEPAM (2013)	Site Specific Criteria (mg/kg) EIL/ESL
DDT+DDD+DDE	400	180
Aldrin + Dieldrin	9	-
PCBs	2	-
Management Limits (Residential, parkland, open space) for 'fine' soils		
C6 - C10	800	
>C10 - C16	1,000	
>C16 - C34	3,500	
>C34 - C40	10,000	
Direct contact HSL-C Recreational Open Space		
C6 - C10	5,100	
>C10 - C16	3,800	
>C16 - C34	5,300	
>C34 - C40	7,400	
Benzene	120	
Toluene	18,000	
Ethyl benzene	5,300	
meta- & para-Xylene	15,000	
ortho-Xylene		
Naphthalene	1,900	
Benzo(a)pyrene	-	

Notes:

1. Health Investigation Level (HIL-C) and Health Screening Level (HSL–C):- Recreational and Open
2. Carcinogenic PAHs: HIL is based on the 8 carcinogenic PAHs and their Toxic Equivalence Factors (TEFs) (potency relative to benzo(a)pyrene [B(a)P]. The B(a)P toxic equivalent (TEQ) is calculated by multiplying the concentration of each carcinogenic PAH in the sample by its B(a)P TEF, given below, and summing these products;
3. the values presented for zinc, chromium (III), copper and nickel are added contaminant limits (ACLs) based on added concentrations. The EIL is calculated from summing the ACL and the ambient background concentration (ABC), calculated from the median value of background bores BH1-19 (Douglas and Partners, 2014);
4. Reference should be made directly to Schedule B1 of the ASC NEPM 1999, as amended May 2013, where ranges based on soil characteristics or depth may apply.

10 DISCUSSION OF RESULTS

The field investigation could find no features to suggest that the site was likely to be contaminated. Drilling only encountered natural residual soil and no fill was observed. Soil was consistent with the local soil types of the Parkes district.

10.1 Soil

10.1.1 Inorganic chemicals compared to guidelines

All heavy metal concentrations in the soil were relatively low and comparable with background ranges. No significant distinction could be found between locations especially with the samples taken near the fence line separating the site from the cropping paddocks. All heavy metals concentrations were below the Health Investigation Levels (HILs) and established ecological investigation and screening levels for open space use.

10.1.2 Organic chemicals compared to guidelines

No organic compounds were detected in the samples and all TRHs, BTEXN, PAHs, PCBs and organochlorine and organophosphate herbicide concentrations were below the established site criteria.

10.1.3 Asbestos

No asbestos fragments were detected in any of the samples collected for analysis.

10.2 Waste classification

Waste classification should be completed with reference to the following guideline:

- NSW Environment Protection Authority (EPA) (2014) *Waste Classification Guidelines Part 1: Classifying Waste*.

Soil requiring offsite disposal to a licenced facility must be classified in accordance with NSW EPA (2014) or an EPA published Resource Recovery Exemption. Waste disposal classification is typically general solid waste, restricted solid waste, hazardous waste or special waste (including clinical and related waste, where asbestos is present and waste tyres).

Soil at all of the inspected locations appeared unaffected from past and current landuse activities, had no asbestos detected and was consistent with residual soil. Accordingly, the residual natural soil and surface soil encountered could be classified as Virgin Excavated Natural Material (VENM) that is suitable for use on any site that has approval to accept soil.

10.3 Aesthetic considerations

The natural soil beneath the site has no aesthetic concerns such as odours or staining, and as such does not require management to address such issues.

11 CONCLUSION

Environmental Earth Sciences NSW was commissioned by the Pacific National to undertake a preliminary contamination assessment for a portion of land designated for the Parkes Logistic Freight Terminal (the "site").

Historical searches showed that the investigation area and surrounds had been used for agricultural purposes. The investigated area has been a grazing paddock and did not contain any structures or equipment used in farming.

A site walkover was undertaken prior to and during drilling activities and found no indications of actual or potential land contamination.

During drilling no potential asbestos fragments, staining or odour were encountered to suggest that contamination may be present.

All heavy metal concentrations in the soil and fill selected for analysis were relatively low and comparable with background ranges. All heavy metals concentrations were below the Health Investigation Levels (HILs) and established ecological investigation and screening levels for open space use.

All TRHs, BTEXN, PAHs, PCBs and organochlorines and organophosphate herbicide concentrations were below detection laboratory detection limits and the established site criteria.

No asbestos fragments were observed in any of the samples or across the site.

The site is therefore suitable for the proposed development or future open space landuse.

12 LIMITATIONS

This report has been prepared by Environmental Earth Sciences NSW ACN 109 404 006 in response to and subject to the following limitations:

1. The specific instructions received from Pacific National;
2. The specific scope of works set out in the email dated 18 May 2018 issued by instructing company for and on behalf of Pacific National, is included in Section 3 (Scope of Work) of this report;
3. May not be relied upon by any third party not named in this report for any purpose except with the prior written consent of Environmental Earth Sciences NSW (which consent may or may not be given at the discretion of Environmental Earth Sciences NSW);
4. This report comprises the formal report, documentation sections, tables, figures and appendices as referred to in the index to this report and must not be released to any third party or copied in part without all the material included in this report for any reason;
5. The report only relates to the site referred to in the scope of works being located near the intersection of Brolgan Road and Millers Lookout Road ("the site");
6. The report relates to the site as at the date of the report as conditions may change thereafter due to natural processes and/or site activities;

7. No warranty or guarantee is made in regard to any other use than as specified in the scope of works and only applies to the depth tested and reported in this report;
8. Fill, soil, groundwater and rock to the depth tested on the site may be fit for the use specified in this report. Unless it is expressly stated in this report, the fill, soil and/or rock may not be suitable for classification as clean fill if deposited off site;
9. This report is not a geotechnical or planning report suitable for planning or zoning purposes; and
10. Our General Limitations set out at the back of the body of this report.

13 REFERENCES

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14 GLOSSARY OF TERMS

The following descriptions are of terms used in the text of this report.

Alluvial. Describes material deposited by, or in transit in, flowing water.

Aquifer. A rock or sediment in a formation, group of formations, or part of a formation which is saturated and sufficiently permeable to transmit economic quantities of water to wells and springs.

Aquifer, confined. An aquifer that is overlain by a confining bed with significantly lower hydraulic conductivity than the aquifer.

Aquifer, perched. A region in the unsaturated zone where the soil is locally saturated because it overlies soil or rock of low permeability.

Background. The natural level of a property.

Baseline. An initial value of a measure.

Bore. A hydraulic structure that facilitates the monitoring of groundwater level, collection of groundwater samples, or the extraction (or injection) of groundwater. Also known as a well, monitoring well or piezometer, although piezometers are typically of small diameter and only used for measuring the groundwater elevation or potentiometric surface.

Borehole. An uncased well drill hole.

Cation Exchange Capacity (CEC). The maximum positive charge required to balance the negative charge on colloids (clays and other charged particles). The units are milli-equivalents per 100 grams of material or centimoles of charge per kilogram of exchanger.

Clay. A soil material composed of particles finer than 0.002 mm. When used as a soil texture group such soils contain at least 35% clay.

Colluvial. Unconsolidated soil and rock material moved down-slope by gravity.

Confined Aquifer. An aquifer that is confined between two low-permeability aquitards. The groundwater in these aquifers is usually under hydraulic pressure, i.e. its hydraulic head is above the top of the aquifer.

Confining layer. A layer with low vertical hydraulic conductivity that is stratigraphically adjacent to one or more aquifers. A confining layer is an aquitard. It may lie above or below the aquifer.

Contaminant. Generally, any chemical species introduced into the soil or water. More particularly relates to those species that render soil or water unfit for beneficial use.

Contamination. Is considered to have occurred when the concentration of a specific element or compound is established as being greater than the normally expected (or actually quantified) background concentration.

Discrete sample. Samples collected from different locations and depths that will not be composited but analysed individually.

Dispersion. A process by which species in solution mix with a second solution, thus reducing in concentration. In particular, relates to the reduction in concentration resulting from the movement of flowing groundwater.

Fracture. A break in the geological formation, e.g. a shear or a fault.

Gradational. The lower boundary between soil layers (horizons) has a gradual transition to the next layer. The solum (soil horizon) becomes gradually more clayey with depth.

Gradient. The rate of inclination of a slope. The degree of deviation from the horizontal; also refers to pressure.

Groundwater. The water held in the pores in the ground below the water table.

Groundwater Elevation. The elevation of the groundwater surface measured relative to a specified datum such as the Australian Height Datum (mAHD) or an arbitrary survey datum onsite, or "reduced level" (mRL).

Head space. The air space at the top of a soil or water sample.

Heavy Metals. All metallic elements whose atomic mass exceeds that of calcium (20) and includes lead (Pb), copper (Cu), Zinc (Zn), cadmium (Cd), and tin (Sn).

Heterogeneous. A condition of having different characteristics in proximate locations. Non-uniform. (Opposite of **homogeneous**).

Horizon. An individual soil layer, based on texture and colour, which differs from those above and below.

Hydrocarbon. A molecule consisting of carbon and hydrogen atoms only, such as found in petroleum.

Mottled. Masses, blobs or blotches of sub-dominant, varying colours in the soil matrix.

Nodulation. Are hard, usually small, accumulation of precipitated iron and/or manganese in the soil profile, usually a result of past alternating periods of oxidation/reduction.

Nodule. A small, concretionary (hard) deposit, usually of iron and/or manganese.

Organics. Chemical compounds comprising atoms of carbon, hydrogen and others (commonly oxygen, nitrogen, phosphorous, sulfur). Opposite is inorganic, referring to chemical species not containing carbon.

Perched Groundwater. Unconfined groundwater separated from an underlying main body of groundwater by an unsaturated zone. Perched groundwater typically occurs in discontinuous, often ephemeral, lenses, with unsaturated conditions both above and below.

pH. A logarithmic index for the concentration of hydrogen ions in an aqueous solution, which is used as a measure of acidity.

Polycyclic aromatic Hydrocarbons (PAHs). Complex organic molecules which originate typically in the combustion of organic compounds.

Precipitation (chemical). There are two types of precipitation, pH dependent precipitation and solubility controlled precipitation. As the pH is raised beyond a threshold level the precipitation of metal cations such as oxy-hydroxides and hydroxides occur. As the pH is raised further precipitation continues until there are very few metal cations remaining in solution. This reaction is entirely reversible. Solubility controlled precipitation occurs between two ions when, at a given temperature and pressure, the concentration of one of the ions exceeds a certain level.

Profile. The solum. This includes the soil A and B horizons and is basically the depth of soil to weathered rock.

QA/QC. Quality Assurance / Quality Control.

Remediation. The restoration of land or groundwater contaminated by pollutants, to a state suitable for other, beneficial uses.

Representative Sample. Assumed not to be significantly different than the population of samples available. In many investigations samples are often collected to represent the worst case situation.

Shale. Fine-grained sedimentary rock formed by the compaction of silt, clay, or sand that accumulates in deltas and on lake and ocean bottoms. It is the most abundant of all sedimentary rocks.

Stratigraphy. A vertical sequence of geological units.

Subsoil. Subsurface material comprising the B and C horizons of soils with distinct profiles. They often have brighter colours and higher clay content than topsoils.

Texture. The size of particles in the soil. Texture is divided into six groups, depending on the amount of coarse sand, fine sand, silt and clay in the soil.

Topsoil. Part of the soil profile, typically the A1 horizon, containing material which is usually darker, more fertile and better structured than the underlying layers.

Total Dissolved Salts (TDS). The total dissolved salts comprise dissociated compounds and undissociated compounds, but not suspended material, colloids or dissolved gases.

Toxicity. The inherent potential or capacity of a material to cause adverse effects in a living organism.

Water table. Interface between the saturated zone and unsaturated zones. The surface in an aquifer at which pore water pressure is equal to atmospheric pressure.

Well. A hydraulic structure that facilitates the monitoring of groundwater level, collection of groundwater samples, or the extraction (or injection) of groundwater. Also known as a Bore.

ENVIRONMENTAL EARTH SCIENCES GENERAL LIMITATIONS

Scope of services

The work presented in this report is Environmental Earth Sciences response to the specific scope of works requested by, planned with and approved by the client. It cannot be relied on by any other third party for any purpose except with our prior written consent. Client may distribute this report to other parties and in doing so warrants that the report is suitable for the purpose it was intended for. However, any party wishing to rely on this report should contact us to determine the suitability of this report for their specific purpose.

Data should not be separated from the report

A report is provided inclusive of all documentation sections, limitations, tables, figures and appendices and should not be provided or copied in part without all supporting documentation for any reason, because misinterpretation may occur.

Subsurface conditions change

Understanding an environmental study will reduce exposure to the risk of the presence of contaminated soil and or groundwater. However, contaminants may be present in areas that were not investigated, or may migrate to other areas. Analysis cannot cover every type of contaminant that could possibly be present. When combined with field observations, field measurements and professional judgement, this approach increases the probability of identifying contaminated soil and or groundwater. Under no circumstances can it be considered that these findings represent the actual condition of the site at all points.

Environmental studies identify actual sub-surface conditions only at those points where samples are taken, when they are taken. Actual conditions between sampling locations differ from those inferred because no professional, no matter how qualified, and no sub-surface exploration program, no matter how comprehensive, can reveal what is hidden below the ground surface. The actual interface between materials may be far more gradual or abrupt than an assessment indicates. Actual conditions in areas not sampled may differ from that predicted. Nothing can be done to prevent the unanticipated. However, steps can be taken to help minimize the impact. For this reason, site owners should retain our services.

Problems with interpretation by others

Advice and interpretation is provided on the basis that subsequent work will be undertaken by Environmental Earth Sciences NSW. This will identify variances, maintain consistency in how data is interpreted, conduct additional tests that may be necessary and recommend solutions to problems encountered on site. Other parties may misinterpret our work and we cannot be responsible for how the information in this report is used. If further data is collected or comes to light we reserve the right to alter their conclusions.

Obtain regulatory approval

The investigation and remediation of contaminated sites is a field in which legislation and interpretation of legislation is changing rapidly. Our interpretation of the investigation findings should not be taken to be that of any other party. When approval from a statutory authority is required for a project, that approval should be directly sought by the client.

Limit of liability

This study has been carried out to a particular scope of works at a specified site and should not be used for any other purpose. This report is provided on the condition that Environmental Earth Sciences NSW disclaims all liability to any person or entity other than the client in respect of anything done or omitted to be done and of the consequence of anything done or omitted to be done by any such person in reliance, whether in whole or in part, on the contents of this report. Furthermore, Environmental Earth Sciences NSW disclaims all liability in respect of anything done or omitted to be done and of the consequence of anything done or omitted to be done by the client, or any such person in reliance, whether in whole or any part of the contents of this report of all matters not stated in the brief outlined in Environmental Earth Sciences NSW's proposal number and according to Environmental Earth Sciences general terms and conditions and special terms and conditions for contaminated sites.

To the maximum extent permitted by law, we exclude all liability of whatever nature, whether in contract, tort or otherwise, for the acts, omissions or default, whether negligent or otherwise for any loss or damage whatsoever that may arise in any way in connection with the supply of services. Under circumstances where liability cannot be excluded, such liability is limited to the value of the purchased service.

APPENDIX A SOIL BORELOGS

Geological Borelog

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

LOCATION					**Logged by** SB
SURFACE ELEVATION		**JOB NUMBER**	118054Parkes		
GROUNDWATER	Nil	**DATUM**		**PROJECT**	**Proj. Manager**
DRILL METHOD	Drill rig	**DATE**	21/05/2108		

#No.	STRATIGRAPHY	GRAPHIC LOG	Depth metres	SAMPLES TYPE	SAMPLES Undisturbed	SAMPLES Disturbed	SAMPLES Lost	SAMPLES Duplicate	Moisture content %	PID/FID Background	PID/FID Reading	CHEMICAL DATA pH - soil	CHEMICAL DATA H2O	CONSTRUCTION DETAILS / COMMENTS
BH1	Loam - clay loam - red brown, crumbly to brittle poor structure, firm, <2% gravel, <20 mm		0.2			■			d			6.0		
	Light clay - lighter red brown, brittle to hard moderate structure, <1% gravel, <20 mm		0.4						d			6.5		No HC odour hydrocarbon stain or asbestos fragments
	Medium clay - red brown, brittle to hard moderate structure, <5% gravel, <20 mm		0.6 0.8						d			7-8		
	EOH @ 1.0 m refusal on bedrock		1.0 1.2											
BH2	Loam - clay loam - red brown, crumbly to brittle poor structure, firm, <1% gravel, <20 mm		0.2			■			d			5.5		
	Light clay - lighter red brown, brittle to hard moderate structure, <1% gravel, <20 mm		0.4						d			6.0		No HC odour hydrocarbon stain or asbestos fragments
	Medium clay - red brown, brittle to hard moderate structure, <5% gravel, <20 mm		0.6 0.8						d			-7.5		
	EOH @ 1.0 m refusal on bedrock		1.0 0.2											
BH3	Loam - clay loam - red brown, crumbly to brittle poor structure, firm, <5% gravel, <20 mm		0.2			■			d			5.5		
	Light clay - lighter red brown, brittle to hard moderate structure, <1% gravel, <20 mm		0.4						d			6.0		No HC odour hydrocarbon stain or asbestos fragments
	Medium clay - red brown, brittle to hard moderate structure, <5% gravel, <20 mm		0.6 0.8						d			7.0		
	EOH @ 1.0 m refusal on bedrock		1.0 1.2 1.4 1.6 1.8									7.5		

Geological Borelog

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

LOCATION					**Logged by**
SURFACE ELEVATION		**JOB NUMBER**	118054Parkes		SB
GROUNDWATER	Nil	**DATUM**		**PROJECT**	**Proj. Manager**
DRILL METHOD	Drill rig	**DATE**	21/05/2108		

#No.	STRATIGRAPHY	GRAPHIC LOG	Depth metres	SAMPLES: TYPE	SAMPLES: Undisturbed	SAMPLES: Disturbed	SAMPLES: Lost	SAMPLES: Duplicate	Moisture content %	PID/FID Background	PID/FID Reading	CHEMICAL DATA: pH - soil	CHEMICAL DATA: H2O	CONSTRUCTION DETAILS / COMMENTS
BH4	Loam - clay loam - red brown, crumbly to brittle poor structure, firm, <5% gravel, <20 mm		0.2			■			d			5.5		
	Light clay - lighter red brown, brittle to hard moderate structure, <1% gravel, <20 mm		0.4			■			d			6.0		No HC odour hydrocarbon stain or asbestos fragments
	EOH @ 0.6 m refusal on bedrock		0.6											
			0.8											
			1.0											
			1.2											
BH5	Loam - clay loam - red brown, crumbly to brittle poor structure, firm, <1% gravel, <20 mm		0.2			■			d			5.5		
	Light clay - lighter red brown, brittle to hard moderate structure, <1% gravel, <20 mm		0.4			■			d			6.0		No HC odour hydrocarbon stain or asbestos fragments
	EOH @ 0.6 m refusal on bedrock		0.6											

Geological Borelog

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

LOCATION				**Logged by** SB
SURFACE ELEVATION		**JOB NUMBER**	118054Parkes	
GROUNDWATER	Nil	**DATUM**		**PROJECT**
DRILL METHOD	Drill rig	**DATE**	21/05/2108	**Proj. Manager**

#No.	STRATIGRAPHY	GRAPHIC LOG	Depth metres	SAMPLES: TYPE	SAMPLES: Undisturbed	SAMPLES: Disturbed	SAMPLES: Lost	SAMPLES: Duplicate	Moisture content %	PID/FID Background	PID/FID Reading	CHEMICAL DATA: pH - soil	CHEMICAL DATA: H2O	CONSTRUCTION DETAILS / COMMENTS
SS1	Loam - clay loam - red brown, crumbly to brittle poor structure, firm, <1% gravel, <20 mm		0.2			■			d			5.5		No HC odour hydrocarbon stain or asbestos fragments
SS2	Loam - clay loam - red brown, crumbly to brittle poor structure, firm, <1% gravel, <20 mm		0.2			■			d			5.5		No HC odour hydrocarbon stain or asbestos fragments
SS3	Loam - clay loam - red brown, crumbly to brittle poor structure, firm, <2% gravel, <20 mm		0.2			■			d			6.5		No HC odour hydrocarbon stain or asbestos fragments
SS4	Loam - clay loam - red brown, crumbly to brittle poor structure, firm, <1% gravel, <20 mm		0.2			■			d			6.5		No HC odour hydrocarbon stain or asbestos fragments
SS5	Loam - clay loam - red brown, crumbly to brittle poor structure, firm, <1% gravel, <20 mm		0.2			■			d			6.5		No HC odour hydrocarbon stain or asbestos fragments

APPENDIX B LABORATORY TRANSCRIPTS AND CHAIN OF CUSTODY FORMS

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 192447

Client Details

Client	Environmental & Earth Sciences
Attention	Stuart Brisbane
Address	PO Box 380, North Sydney, NSW, 2059

Sample Details

Your Reference	**118054 Parkes**
Number of Samples	11 Soil
Date samples received	24/05/2018
Date completed instructions received	24/05/2018

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date results requested by	31/05/2018
Date of Issue	28/05/2018

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Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By
Dragana Tomas, Senior Chemist
Ken Nguyen, Senior Chemist
Steven Luong, Senior Chemist

Authorised By
[redacted]
Jacinta Hurst, Laboratory Manager

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		192447-2	192447-5	192447-7	192447-8	192447-10
Your Reference	UNITS	BH2	BH5	SS2	SS3	SS5
Depth		0-0.1	0-0.1	0-0.1	0-0.1	0-0.1
Date Sampled		21/05/2018	21/05/2018	21/05/2018	21/05/2018	21/05/2018
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	25/05/2018	25/05/2018	25/05/2018	25/05/2018	25/05/2018
Date analysed	-	25/05/2018	25/05/2018	25/05/2018	25/05/2018	25/05/2018
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	115	113	113	119	114

svTRH (C10-C40) in Soil						
Our Reference		192447-2	192447-5	192447-7	192447-8	192447-10
Your Reference	UNITS	BH2	BH5	SS2	SS3	SS5
Depth		0-0.1	0-0.1	0-0.1	0-0.1	0-0.1
Date Sampled		21/05/2018	21/05/2018	21/05/2018	21/05/2018	21/05/2018
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	25/05/2018	25/05/2018	25/05/2018	25/05/2018	25/05/2018
Date analysed	-	26/05/2018	26/05/2018	26/05/2018	26/05/2018	26/05/2018
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100	<100	<100
TRH C_{29} - C_{36}	mg/kg	<100	<100	<100	<100	<100
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH >C_{16} -C_{34}	mg/kg	<100	<100	<100	<100	<100
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	<50	<50	<50
Surrogate o-Terphenyl	%	103	109	106	102	102

PAHs in Soil						
Our Reference		192447-1	192447-2	192447-3	192447-4	192447-5
Your Reference	UNITS	BH1	BH2	BH3	BH4	BH5
Depth		0-0.1	0-0.1	0-0.1	0-0.1	0-0.1
Date Sampled		21/05/2018	21/05/2018	21/05/2018	21/05/2018	21/05/2018
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	25/05/2018	25/05/2018	25/05/2018	25/05/2018	25/05/2018
Date analysed	-	28/05/2018	28/05/2018	28/05/2018	28/05/2018	28/05/2018
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve PAH's	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	104	108	109	108	107

PAHs in Soil						
Our Reference		192447-6	192447-7	192447-8	192447-9	192447-10
Your Reference	UNITS	SS1	SS2	SS3	SS4	SS5
Depth		0-0.1	0-0.1	0-0.1	0-0.1	0-0.1
Date Sampled		21/05/2018	21/05/2018	21/05/2018	21/05/2018	21/05/2018
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	25/05/2018	25/05/2018	25/05/2018	25/05/2018	25/05/2018
Date analysed	-	28/05/2018	28/05/2018	28/05/2018	28/05/2018	28/05/2018
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve PAH's	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	107	106	108	100	98

PAHs in Soil		
Our Reference		192447-11
Your Reference	UNITS	Dup1
Depth		0-0.1
Date Sampled		21/05/2018
Type of sample		Soil
Date extracted	-	25/05/2018
Date analysed	-	28/05/2018
Naphthalene	mg/kg	<0.1
Acenaphthylene	mg/kg	<0.1
Acenaphthene	mg/kg	<0.1
Fluorene	mg/kg	<0.1
Phenanthrene	mg/kg	<0.1
Anthracene	mg/kg	<0.1
Fluoranthene	mg/kg	<0.1
Pyrene	mg/kg	<0.1
Benzo(a)anthracene	mg/kg	<0.1
Chrysene	mg/kg	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2
Benzo(a)pyrene	mg/kg	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1
Total +ve PAH's	mg/kg	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5
Surrogate p-Terphenyl-d14	%	105

Organochlorine Pesticides in soil						
Our Reference		192447-1	192447-2	192447-3	192447-4	192447-5
Your Reference	UNITS	BH1	BH2	BH3	BH4	BH5
Depth		0-0.1	0-0.1	0-0.1	0-0.1	0-0.1
Date Sampled		21/05/2018	21/05/2018	21/05/2018	21/05/2018	21/05/2018
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	25/05/2018	25/05/2018	25/05/2018	25/05/2018	25/05/2018
Date analysed	-	25/05/2018	25/05/2018	25/05/2018	25/05/2018	25/05/2018
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	122	123	117	113	114

Organochlorine Pesticides in soil						
Our Reference		192447-6	192447-7	192447-8	192447-9	192447-10
Your Reference	UNITS	SS1	SS2	SS3	SS4	SS5
Depth		0-0.1	0-0.1	0-0.1	0-0.1	0-0.1
Date Sampled		21/05/2018	21/05/2018	21/05/2018	21/05/2018	21/05/2018
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	25/05/2018	25/05/2018	25/05/2018	25/05/2018	25/05/2018
Date analysed	-	25/05/2018	25/05/2018	25/05/2018	25/05/2018	25/05/2018
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	115	119	118	122	114

Organochlorine Pesticides in soil		
Our Reference		192447-11
Your Reference	UNITS	Dup1
Depth		0-0.1
Date Sampled		21/05/2018
Type of sample		Soil
Date extracted	-	25/05/2018
Date analysed	-	25/05/2018
HCB	mg/kg	<0.1
alpha-BHC	mg/kg	<0.1
gamma-BHC	mg/kg	<0.1
beta-BHC	mg/kg	<0.1
Heptachlor	mg/kg	<0.1
delta-BHC	mg/kg	<0.1
Aldrin	mg/kg	<0.1
Heptachlor Epoxide	mg/kg	<0.1
gamma-Chlordane	mg/kg	<0.1
alpha-chlordane	mg/kg	<0.1
Endosulfan I	mg/kg	<0.1
pp-DDE	mg/kg	<0.1
Dieldrin	mg/kg	<0.1
Endrin	mg/kg	<0.1
pp-DDD	mg/kg	<0.1
Endosulfan II	mg/kg	<0.1
pp-DDT	mg/kg	<0.1
Endrin Aldehyde	mg/kg	<0.1
Endosulfan Sulphate	mg/kg	<0.1
Methoxychlor	mg/kg	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1
Surrogate TCMX	%	118

Organophosphorus Pesticides						
Our Reference		192447-1	192447-2	192447-3	192447-4	192447-5
Your Reference	UNITS	BH1	BH2	BH3	BH4	BH5
Depth		0-0.1	0-0.1	0-0.1	0-0.1	0-0.1
Date Sampled		21/05/2018	21/05/2018	21/05/2018	21/05/2018	21/05/2018
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	25/05/2018	25/05/2018	25/05/2018	25/05/2018	25/05/2018
Date analysed	-	25/05/2018	25/05/2018	25/05/2018	25/05/2018	25/05/2018
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dichlorvos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	122	123	117	113	114

Organophosphorus Pesticides						
Our Reference		192447-6	192447-7	192447-8	192447-9	192447-10
Your Reference	UNITS	SS1	SS2	SS3	SS4	SS5
Depth		0-0.1	0-0.1	0-0.1	0-0.1	0-0.1
Date Sampled		21/05/2018	21/05/2018	21/05/2018	21/05/2018	21/05/2018
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	25/05/2018	25/05/2018	25/05/2018	25/05/2018	25/05/2018
Date analysed	-	25/05/2018	25/05/2018	25/05/2018	25/05/2018	25/05/2018
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dichlorvos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	115	119	118	122	114

Organophosphorus Pesticides		
Our Reference		192447-11
Your Reference	UNITS	Dup1
Depth		0-0.1
Date Sampled		21/05/2018
Type of sample		Soil
Date extracted	-	25/05/2018
Date analysed	-	25/05/2018
Azinphos-methyl (Guthion)	mg/kg	<0.1
Bromophos-ethyl	mg/kg	<0.1
Chlorpyriphos	mg/kg	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1
Diazinon	mg/kg	<0.1
Dichlorvos	mg/kg	<0.1
Dimethoate	mg/kg	<0.1
Ethion	mg/kg	<0.1
Fenitrothion	mg/kg	<0.1
Malathion	mg/kg	<0.1
Parathion	mg/kg	<0.1
Ronnel	mg/kg	<0.1
Surrogate TCMX	%	118

PCBs in Soil						
Our Reference		192447-2	192447-5	192447-7	192447-8	192447-10
Your Reference	UNITS	BH2	BH5	SS2	SS3	SS5
Depth		0-0.1	0-0.1	0-0.1	0-0.1	0-0.1
Date Sampled		21/05/2018	21/05/2018	21/05/2018	21/05/2018	21/05/2018
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	25/05/2018	25/05/2018	25/05/2018	25/05/2018	25/05/2018
Date analysed	-	25/05/2018	25/05/2018	25/05/2018	25/05/2018	25/05/2018
Aroclor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCLMX	%	123	114	119	118	114

Acid Extractable metals in soil						
Our Reference		192447-1	192447-2	192447-3	192447-4	192447-5
Your Reference	UNITS	BH1	BH2	BH3	BH4	BH5
Depth		0-0.1	0-0.1	0-0.1	0-0.1	0-0.1
Date Sampled		21/05/2018	21/05/2018	21/05/2018	21/05/2018	21/05/2018
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	25/05/2018	25/05/2018	25/05/2018	25/05/2018	25/05/2018
Date analysed	-	25/05/2018	25/05/2018	25/05/2018	25/05/2018	25/05/2018
Arsenic	mg/kg	6	5	5	4	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	15	15	15	16	14
Copper	mg/kg	78	71	67	56	41
Lead	mg/kg	9	10	9	10	9
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	7	8	8	8	6
Zinc	mg/kg	30	31	35	31	27

Acid Extractable metals in soil						
Our Reference		192447-6	192447-7	192447-8	192447-9	192447-10
Your Reference	UNITS	SS1	SS2	SS3	SS4	SS5
Depth		0-0.1	0-0.1	0-0.1	0-0.1	0-0.1
Date Sampled		21/05/2018	21/05/2018	21/05/2018	21/05/2018	21/05/2018
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	25/05/2018	25/05/2018	25/05/2018	25/05/2018	25/05/2018
Date analysed	-	25/05/2018	25/05/2018	25/05/2018	25/05/2018	25/05/2018
Arsenic	mg/kg	7	5	<4	5	5
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	14	9	14	17	14
Copper	mg/kg	47	44	56	61	56
Lead	mg/kg	10	9	10	10	48
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	7	5	7	7	7
Zinc	mg/kg	33	39	36	42	50

Acid Extractable metals in soil		
Our Reference		192447-11
Your Reference	UNITS	Dup1
Depth		0-0.1
Date Sampled		21/05/2018
Type of sample		Soil
Date prepared	-	25/05/2018
Date analysed	-	25/05/2018
Arsenic	mg/kg	6
Cadmium	mg/kg	<0.4
Chromium	mg/kg	14
Copper	mg/kg	78
Lead	mg/kg	9
Mercury	mg/kg	<0.1
Nickel	mg/kg	7
Zinc	mg/kg	33

Moisture						
Our Reference		192447-1	192447-2	192447-3	192447-4	192447-5
Your Reference	UNITS	BH1	BH2	BH3	BH4	BH5
Depth		0-0.1	0-0.1	0-0.1	0-0.1	0-0.1
Date Sampled		21/05/2018	21/05/2018	21/05/2018	21/05/2018	21/05/2018
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	25/05/2018	25/05/2018	25/05/2018	25/05/2018	25/05/2018
Date analysed	-	26/05/2018	26/05/2018	26/05/2018	26/05/2018	26/05/2018
Moisture	%	9.2	7.0	9.2	6.8	7.2

Moisture						
Our Reference		192447-6	192447-7	192447-8	192447-9	192447-10
Your Reference	UNITS	SS1	SS2	SS3	SS4	SS5
Depth		0-0.1	0-0.1	0-0.1	0-0.1	0-0.1
Date Sampled		21/05/2018	21/05/2018	21/05/2018	21/05/2018	21/05/2018
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	25/05/2018	25/05/2018	25/05/2018	25/05/2018	25/05/2018
Date analysed	-	26/05/2018	26/05/2018	26/05/2018	26/05/2018	26/05/2018
Moisture	%	8.4	5.7	7.0	8.6	8.1

Moisture		
Our Reference		192447-11
Your Reference	UNITS	Dup1
Depth		0-0.1
Date Sampled		21/05/2018
Type of sample		Soil
Date prepared	-	25/05/2018
Date analysed	-	26/05/2018
Moisture	%	8.8

Method ID	Methodology Summary
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis. Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).
Org-005	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.
Org-005	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's. Note, the Total +ve reported DDD+DDE+DDT PQL is reflective of the lowest individual PQL and is therefore simply a sum of the positive individually report DDD+DDE+DDT.
Org-006	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.
Org-006	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD. Note, the Total +ve PCBs PQL is reflective of the lowest individual PQL and is therefore" Total +ve PCBs" is simply a sum of the positive individual PCBs.
Org-008	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.

Method ID	Methodology Summary
Org-012	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. For soil results:- 1. 'EQ PQL'values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'EQ zero'values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'EQ half PQL'values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore "Total +ve PAHs" is simply a sum of the positive individual PAHs.
Org-014	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-10	192447-5
Date extracted	-			25/05/2018	2	25/05/2018	25/05/2018		25/05/2018	25/05/2018
Date analysed	-			25/05/2018	2	25/05/2018	25/05/2018		25/05/2018	25/05/2018
TRH C_6 - C_9	mg/kg	25	Org-016	<25	2	<25	<25	0	93	89
TRH C_6 - C_{10}	mg/kg	25	Org-016	<25	2	<25	<25	0	93	89
Benzene	mg/kg	0.2	Org-016	<0.2	2	<0.2	<0.2	0	89	85
Toluene	mg/kg	0.5	Org-016	<0.5	2	<0.5	<0.5	0	89	86
Ethylbenzene	mg/kg	1	Org-016	<1	2	<1	<1	0	95	92
m+p-xylene	mg/kg	2	Org-016	<2	2	<2	<2	0	95	91
o-Xylene	mg/kg	1	Org-016	<1	2	<1	<1	0	96	93
naphthalene	mg/kg	1	Org-014	<1	2	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-016	120	2	115	120	4	124	118

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-10	192447-5
Date extracted	-			25/05/2018	2	25/05/2018	25/05/2018		25/05/2018	25/05/2018
Date analysed	-			26/05/2018	2	26/05/2018	26/05/2018		26/05/2018	26/05/2018
TRH C_{10} - C_{14}	mg/kg	50	Org-003	<50	2	<50	<50	0	102	105
TRH C_{15} - C_{28}	mg/kg	100	Org-003	<100	2	<100	<100	0	95	102
TRH C_{29} - C_{36}	mg/kg	100	Org-003	<100	2	<100	<100	0	92	83
TRH >C_{10} -C_{16}	mg/kg	50	Org-003	<50	2	<50	<50	0	102	105
TRH >C_{16} -C_{34}	mg/kg	100	Org-003	<100	2	<100	<100	0	95	102
TRH >C_{34} -C_{40}	mg/kg	100	Org-003	<100	2	<100	<100	0	92	83
Surrogate o-Terphenyl	%		Org-003	130	2	103	102	1	105	109

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-10	192447-5
Date extracted	-			25/05/2018	2	25/05/2018	25/05/2018		25/05/2018	25/05/2018
Date analysed	-			25/05/2018	2	28/05/2018	28/05/2018		25/05/2018	25/05/2018
Naphthalene	mg/kg	0.1	Org-012	<0.1	2	<0.1	<0.1	0	98	94
Acenaphthylene	mg/kg	0.1	Org-012	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-012	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-012	<0.1	2	<0.1	<0.1	0	112	110
Phenanthrene	mg/kg	0.1	Org-012	<0.1	2	<0.1	<0.1	0	108	104
Anthracene	mg/kg	0.1	Org-012	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-012	<0.1	2	<0.1	<0.1	0	115	109
Pyrene	mg/kg	0.1	Org-012	<0.1	2	<0.1	<0.1	0	113	108
Benzo(a)anthracene	mg/kg	0.1	Org-012	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-012	<0.1	2	<0.1	<0.1	0	103	100
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-012	<0.2	2	<0.2	<0.2	0	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-012	<0.05	2	<0.05	<0.05	0	123	120
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-012	101	2	108	110	2	113	105

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	11	25/05/2018	25/05/2018		[NT]	[NT]
Date analysed	-			[NT]	11	28/05/2018	25/05/2018		[NT]	[NT]
Naphthalene	mg/kg	0.1	Org-012	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Acenaphthylene	mg/kg	0.1	Org-012	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-012	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-012	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Phenanthrene	mg/kg	0.1	Org-012	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Anthracene	mg/kg	0.1	Org-012	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-012	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Pyrene	mg/kg	0.1	Org-012	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Benzo(a)anthracene	mg/kg	0.1	Org-012	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-012	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-012	[NT]	11	<0.2	<0.2	0	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-012	[NT]	11	<0.05	<0.05	0	[NT]	[NT]
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-012	[NT]	11	105	138	27	[NT]	[NT]

QUALITY CONTROL: Organochlorine Pesticides in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-10	192447-5
Date extracted	-			25/05/2018	2	25/05/2018	25/05/2018		25/05/2018	25/05/2018
Date analysed	-			25/05/2018	2	25/05/2018	25/05/2018		25/05/2018	25/05/2018
HCB	mg/kg	0.1	Org-005	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
alpha-BHC	mg/kg	0.1	Org-005	<0.1	2	<0.1	<0.1	0	104	109
gamma-BHC	mg/kg	0.1	Org-005	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-005	<0.1	2	<0.1	<0.1	0	95	97
Heptachlor	mg/kg	0.1	Org-005	<0.1	2	<0.1	<0.1	0	99	101
delta-BHC	mg/kg	0.1	Org-005	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-005	<0.1	2	<0.1	<0.1	0	103	104
Heptachlor Epoxide	mg/kg	0.1	Org-005	<0.1	2	<0.1	<0.1	0	95	96
gamma-Chlordane	mg/kg	0.1	Org-005	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-005	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-005	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-005	<0.1	2	<0.1	<0.1	0	105	106
Dieldrin	mg/kg	0.1	Org-005	<0.1	2	<0.1	<0.1	0	108	109
Endrin	mg/kg	0.1	Org-005	<0.1	2	<0.1	<0.1	0	95	96
pp-DDD	mg/kg	0.1	Org-005	<0.1	2	<0.1	<0.1	0	109	111
Endosulfan II	mg/kg	0.1	Org-005	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-005	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Endrin Aldehyde	mg/kg	0.1	Org-005	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-005	<0.1	2	<0.1	<0.1	0	76	92
Methoxychlor	mg/kg	0.1	Org-005	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-005	114	2	123	123	0	127	125

QUALITY CONTROL: Organochlorine Pesticides in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	11	25/05/2018	25/05/2018		[NT]	[NT]
Date analysed	-			[NT]	11	25/05/2018	25/05/2018		[NT]	[NT]
HCB	mg/kg	0.1	Org-005	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
alpha-BHC	mg/kg	0.1	Org-005	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
gamma-BHC	mg/kg	0.1	Org-005	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-005	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-005	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
delta-BHC	mg/kg	0.1	Org-005	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-005	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Heptachlor Epoxide	mg/kg	0.1	Org-005	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
gamma-Chlordane	mg/kg	0.1	Org-005	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-005	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-005	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-005	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Dieldrin	mg/kg	0.1	Org-005	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Endrin	mg/kg	0.1	Org-005	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-005	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Endosulfan II	mg/kg	0.1	Org-005	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-005	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Endrin Aldehyde	mg/kg	0.1	Org-005	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-005	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Methoxychlor	mg/kg	0.1	Org-005	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-005	[NT]	11	118	116	2	[NT]	[NT]

QUALITY CONTROL: Organophosphorus Pesticides						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-10	192447-5
Date extracted	-			25/05/2018	2	25/05/2018	25/05/2018		25/05/2018	25/05/2018
Date analysed	-			25/05/2018	2	25/05/2018	25/05/2018		25/05/2018	25/05/2018
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-008	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Bromophos-ethyl	mg/kg	0.1	Org-008	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Chlorpyriphos	mg/kg	0.1	Org-008	<0.1	2	<0.1	<0.1	0	105	106
Chlorpyriphos-methyl	mg/kg	0.1	Org-008	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-008	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Dichlorvos	mg/kg	0.1	Org-008	<0.1	2	<0.1	<0.1	0	86	86
Dimethoate	mg/kg	0.1	Org-008	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Ethion	mg/kg	0.1	Org-008	<0.1	2	<0.1	<0.1	0	104	98
Fenitrothion	mg/kg	0.1	Org-008	<0.1	2	<0.1	<0.1	0	109	107
Malathion	mg/kg	0.1	Org-008	<0.1	2	<0.1	<0.1	0	73	70
Parathion	mg/kg	0.1	Org-008	<0.1	2	<0.1	<0.1	0	92	108
Ronnel	mg/kg	0.1	Org-008	<0.1	2	<0.1	<0.1	0	108	108
Surrogate TCMX	%		Org-008	114	2	123	123	0	115	120

QUALITY CONTROL: Organophosphorus Pesticides						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	11	25/05/2018	25/05/2018		[NT]	[NT]
Date analysed	-			[NT]	11	25/05/2018	25/05/2018		[NT]	[NT]
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-008	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Bromophos-ethyl	mg/kg	0.1	Org-008	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Chlorpyriphos	mg/kg	0.1	Org-008	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Chlorpyriphos-methyl	mg/kg	0.1	Org-008	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-008	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Dichlorvos	mg/kg	0.1	Org-008	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Dimethoate	mg/kg	0.1	Org-008	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Ethion	mg/kg	0.1	Org-008	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Fenitrothion	mg/kg	0.1	Org-008	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Malathion	mg/kg	0.1	Org-008	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Parathion	mg/kg	0.1	Org-008	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Ronnel	mg/kg	0.1	Org-008	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-008	[NT]	11	118	116	2	[NT]	[NT]

QUALITY CONTROL: PCBs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-10	192447-5
Date extracted	-			25/05/2018	2	25/05/2018	25/05/2018		25/05/2018	25/05/2018
Date analysed	-			25/05/2018	2	25/05/2018	25/05/2018		25/05/2018	25/05/2018
Aroclor 1016	mg/kg	0.1	Org-006	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-006	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-006	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-006	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-006	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-006	<0.1	2	<0.1	<0.1	0	100	105
Aroclor 1260	mg/kg	0.1	Org-006	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCLMX	%		Org-006	114	2	123	123	0	115	120

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-10	192447-5
Date prepared	-			25/05/2018	2	25/05/2018	25/05/2018		25/05/2018	25/05/2018
Date analysed	-			25/05/2018	2	25/05/2018	25/05/2018		25/05/2018	25/05/2018
Arsenic	mg/kg	4	Metals-020	<4	2	5	5	0	111	77
Cadmium	mg/kg	0.4	Metals-020	<0.4	2	<0.4	<0.4	0	110	91
Chromium	mg/kg	1	Metals-020	<1	2	15	17	12	115	104
Copper	mg/kg	1	Metals-020	<1	2	71	72	1	116	106
Lead	mg/kg	1	Metals-020	<1	2	10	10	0	112	90
Mercury	mg/kg	0.1	Metals-021	<0.1	2	<0.1	<0.1	0	119	95
Nickel	mg/kg	1	Metals-020	<1	2	8	8	0	106	88
Zinc	mg/kg	1	Metals-020	<1	2	31	32	3	109	93

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	11	25/05/2018	25/05/2018		[NT]	[NT]
Date analysed	-			[NT]	11	25/05/2018	25/05/2018		[NT]	[NT]
Arsenic	mg/kg	4	Metals-020	[NT]	11	6	6	0	[NT]	[NT]
Cadmium	mg/kg	0.4	Metals-020	[NT]	11	<0.4	<0.4	0	[NT]	[NT]
Chromium	mg/kg	1	Metals-020	[NT]	11	14	13	7	[NT]	[NT]
Copper	mg/kg	1	Metals-020	[NT]	11	78	75	4	[NT]	[NT]
Lead	mg/kg	1	Metals-020	[NT]	11	9	9	0	[NT]	[NT]
Mercury	mg/kg	0.1	Metals-021	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Nickel	mg/kg	1	Metals-020	[NT]	11	7	7	0	[NT]	[NT]
Zinc	mg/kg	1	Metals-020	[NT]	11	33	29	13	[NT]	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

CHAIN OF CUSTODY - ANALYSIS REQUEST FORM

Job No: 118054 Parkes Laboratory: EnviroLab

Project Manager: Stuart Brisbane Sampler: SB Site Location: Parkes Sheet: 1 of ___

No. of samples	Sample ID/ Depth	Anticipated Result (PID)/EC reading	Date sampled	Time sampled	Sample Matrix: Soil	Water	Sediment	Analysis Required: Combs 6 (TRH/BTEX)	PAH, oc/op PCB/ Metals			PAH/oc/op Metals							Sample-specific Instructions/ notes
1	BH1 (0-0.1)	low	21/5	am	✓			✓				✓							
2	BH2 (0-0.1)				✓			✓					✓						
3	BH3 (0-0.1)				✓							✓							
4	BH4 (0-0.1)				✓							✓							
5	BH5 (0-0.1)				✓			✓											
6	SS1 (0-0.1)				✓							✓							
7	SS2 (0-0.1)				✓			✓											
8	SS3 (0-0.1)				✓			✓											
9	SS4 (0-0.1)				✓							✓							
10	SS5 (0-0.1)				✓			✓											
11	Dup1											✓							
	TOTAL																		

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200

Job No: 192447
Date Received: 24/5/18
Time Received: 10:30
Received By: MT.
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

15:10

Turn Around *(circle)*: NORMAL / 3 DAYS / 48 HRS / 24 HRS *(confirm with lab in advance if quick turn-around is required)*

Comments/ Instructions:

Lab Quotation No. *(if applicable)*:

Send report to *(email address)*:

Cc: report to *(email address)*:

Cc: Invoice to *(email address)*: accounts@eeslgroup.com

	Name		Date	Time
Sent off Site/Office by:	Stuart Brisbane	[redacted]	23/5/	a.m.
Receiving Lab:	EES		24/5	10:30
Receiving Lab:				

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED
Phone: (02) 9922 1777
Fax: (02) 9922 1010
PO Box 380, North Sydney NSW 2059
Email: eesNSW@eeslgroup.com

APPENDIX C QUALITY ASSURANCE AND QUALITY CONTROL PROCEDURES

TABLE OF CONTENTS

1 DATA QUALITY OBJECTIVES

Development of data quality objectives (DQOs) for each project is a requirement of the National Environment Protection (Assessment of Site Contamination) Amendment Measure (NEPC 2013). Specific discussion in the development of the DQO's has been included in the main report.

Based on the DQOs the following measurement data quality indicators (MDQIs) are provided in Table 1.

TABLE 1 MEASUREMENT DATA QUALITY INDICATORS (MDQIS)

Parameter	Procedure	Minimum Frequency	Criteria	
			(5 to 10x LOR[4])	>10x LOR
Precision	Field Duplicates	1 in 20 - metals	<80 RPD	<50 RPD
		1 in 20 - semi-volatiles	<100 RPD	<80 RPD
		1 in 20 - volatiles	<150 RPD	<130 RPD
	Lab Replicate*	1 in 20	<50 RPD	<30 RPD
Accuracy*	Reference Material	1 in 10	60% to 140%R	80% to 120%R
	Matrix spikes			
	Surrogate spikes			
Representativeness*	Reagent Blanks	1 per batch	No detection	
	Holding Times*	Every sample	-	
Blanks**	Trip Blank	1 per batch	No detection	
	Rinsate Blanks			
Sensitivity	Limit of Reporting	Every sample	LOR < ½ site criteria	

Notes:

1. RPD – relative percentage difference;
2. %R – percent recovery;
3. LOR – limit of reporting;
4. [4] no limit at <5x LOR;
5. * the MDQI is usually specified in the standard method. If not, use the default values set out in this table; and
6. ** only necessary when measuring dissolved metals and volatile organic compounds in water samples.

It should be noted that Standards Australia (i.e. AS4482.1) specify that typical MDQIs for precision should be ≤50% RPD, however it should be noted that low concentrations and organic compounds can be acceptable if reported outside of this range. As the standard suggests, an RPD of >50% has been used as a 'trigger' and values above this level of repeatability have also been noted and explained.

Our adopted MDQIs for precision acknowledge the intrinsic heterogeneity of metal and semi volatile chemical concentrations in disturbed soil that may potentially cause large variations in results between laboratory subsamples (although all efforts are made to homogenise non volatile duplicate samples). Similarly, large variations in volatile chemical concentrations between duplicates may be unavoidable even when using best practice sampling

methodology, especially as we seek to minimise the disturbance to the sample while splitting it which means a high degree of inherent heterogeneity is expected.

As such, our adopted RPD criteria are considered to be a suitable measure for the reproducibility of results within a naturally heterogeneous media such as soil. A ≤50% RPD trigger value will be used, with any exceedance discussed and assessed for acceptability.

2 FIELD QA/QC PROGRAM

2.1 Sample collection, preservation, transportation and storage

Soil samples were collected and placed in appropriate sample containers as supplied by the nominated National Association of Testing Authorities (NATA) laboratory. Samples were labelled with the corresponding field/sample identification number, site reference and date in accordance with Environmental Earth Science sample procedures. Samples were placed in a chilled container prior to transport to the nominated laboratory.

Soil samples were supplied to NATA accredited laboratories (EnviroLab) under a completed chain of custody (CoC). Copies of the CoC documentation and laboratory transcripts are provided in Appendix B of the main report.

2.2 Intra (blind) duplicate sampling

2.2.1 Soil

One intra (blind) samples was collected during collection of soil samples. The relative percentage differences (RPD) calculations of the collected inter duplicate sample is presented in Table 2 below.

Calculated RPDs between the primary sample and their corresponding duplicate samples were all within the acceptable limits (MQDIS), as such, we consider the data set to be reliable.

2.3 Occurrence of anomalous results

Upon review of the QAQC data, no anomalous results were identified.

TABLE 2 SOIL FIELD INTRA AND INTER DUPLICATE RESULTS

Sample	LOR	Primary Sample BH1	Intra duplicate sample Dup 1	RPD%	Acceptance Criteria
Depth (m)		0-0.1 m			
Arsenic	4	6	6	0	<50
Cadmium	0.4	<0.4	<0.4	0	<50
Chromium	1	15	14	2	<50
Copper	1	78	78	0	<50
Lead	1	9	9	6	<50
Nickel	1	7	7	0	<50
Zinc	1	30	33	9.5	<50
Mercury	<0.1	<0.1	<0.1	0	<50

Notes:
1. LOR level of reporting
2. RPD relative percentage difference
3. - not analysed, or RPD not calculable

3 LABORATORY QUALITY CONTROL

3.1 Holding time

Analysed samples were extracted and analysed within acceptable holding times as defined in AS4482.1-2005.

3.2 Laboratories and analytical procedures

Laboratory analysis of primary and intra (blind) duplicate samples for this project was completed by EnviroLab. This laboratory is accredited by NATA for the methods used, details of this accreditation can be viewed at http://www.nata.asn.au/, while details of the samples sent to each laboratory and the analysis requested are contained in the chain of custody documentation held in Appendix B. The analytical methods are noted on the laboratory transcripts.

3.3 Required limits of reporting

Acceptable limits of reporting (LOR) were mostly provided by the analytical laboratory to allow the results to be compared against the soil and groundwater investigation levels with the exception of few analytes (list analytes) that were considered not be a chemicals of concern.

3.4 Laboratory method blanks

Reported results for laboratory method blank samples were lower than laboratory LORs.

3.5 Laboratory duplicates

Laboratory duplicate results can be found in the analytical laboratory reports. The RPD between analytical results for primary samples and their corresponding laboratory soil duplicates were within acceptable limits.

3.6 Matrix spike recoveries

The matrix spike recovery results can be found in the analytical laboratory reports. Matrix spike recoveries were generally within the DQO range of 70% - 130% or 75%-125% for heavy metals. All matrix spike recoveries were within acceptable limits.

3.7 Laboratory control spike recoveries

The surrogate spike recovery results can be found in the analytical laboratory reports and generally ranged within the DQO range of 40% - 150%. All laboratory control spike recoveries were within acceptable limits.

4 ASSESSMENT OF DATA QUALITY

Based on information presented above, it can be confidently stated that the MDQO's for this project have been met and the data set is considered to be reliable for interpretative use.

5 QA/QC APPENDIX REFERENCES

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Australian/New Zealand Standard (AS/NZS) (2008). *Quality management systems - Requirements* (AS/NZS ISO 9001:2008). Standards Australia/Standards New Zealand, Sydney/Wellington.

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National Environment Protection Council (NEPC) (2013). *National Environment Protection (Assessment of Site Contamination) Amendment Measure*, Adelaide, SA.

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NSW Environment Protection Authority (EPA) (1995). *Contaminated Sites: Sampling design guidelines.*

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Standards Australia (2005). *Guide to the investigation and sampling of sites with potentially contaminated soil, Part 1: Non-volatile and semi-volatile compounds* (AS 4482.1).

Standards Australia (1999). *Guide to the investigation and sampling of sites with potentially contaminated soil, Part 2: Volatile substances* (AS4482.2).

SITE PHOTOGRAPHS

Photograph 1. Facing east and upslope

Photograph 2. Facing east

Photograph 3. Facing south east to down gradient cropping paddock

Photograph 4. Facing north upslope

Parkes Logistics Terminal – Lighting Impact Assessment

Development Application No:	DA2018/0033
Description of Development:	Freight Transport Facility
Applicant:	Pacific National (NSW) Pty Ltd
Landowner(s):	Terminals Australia Pty Ltd

May 2018

Pacific National Pty Ltd
ACN 098 060 550

Contents

Pacific National Pty Ltd
ACN 098 060 550

Overview

This document provides an impact statement on surrounding land and depicts:

1. The lighting coverage and lux levels within proximity of the train loading and container handling areas;
2. Pacific National – NR Class Locomotive Fleet lighting impact; and
3. Supporting photos and elevation profiles of the residential properties located around the site.

The report has been prepared in accordance with the AS 4282 Control of the Obtrusive Effects of Outdoor Lighting and other relevant standards, as requested by Council.

Findings

It can be concluded from the assessment that the impact on surrounding properties in insignificant given:

- the topography and distances from the proposed terminal infrastructure to the surrounding dwellings; and
- that lighting will be strategically designed and sited so as not to cause unnecessary illumination.

Recommendations

In detailed design of the facility, Pacific National will limit light overspill wherever possible, including establishing lights over night-time work areas only, limiting the general use of flood lights, use of overhead lights that are specifically designed to shine directly downwards.

There is potential for train headlights to shine briefly towards nearby residences, particularly trains at night exiting the rail siding. Pacific National proposes to mitigate the limited light impacts by either constructing a solid wall barrier directly adjoining the eastern side of the proposed spur line turnout from the rail siding, or undertaking mitigation at the site of sensitive receivers R13, R14 and R15.

At this stage, it is the preference of Pacific National that mitigation works are conducted at sensitive receivers, as these works would assist in the reduction of all rail lighting impacts experienced at these residences from trains passing along the mainline track network. However, until these negotiations are finalised with affected landowners, Pacific National is committing to either mitigation strategy to ensure light impacts are minimised to acceptable levels. Any solid wall barrier would be setback more than 500 metres from residences not associated with the development.

It is requested that the condition to satisfy this requirement be tied to securing a construction certificate for such purposes.

Appendices

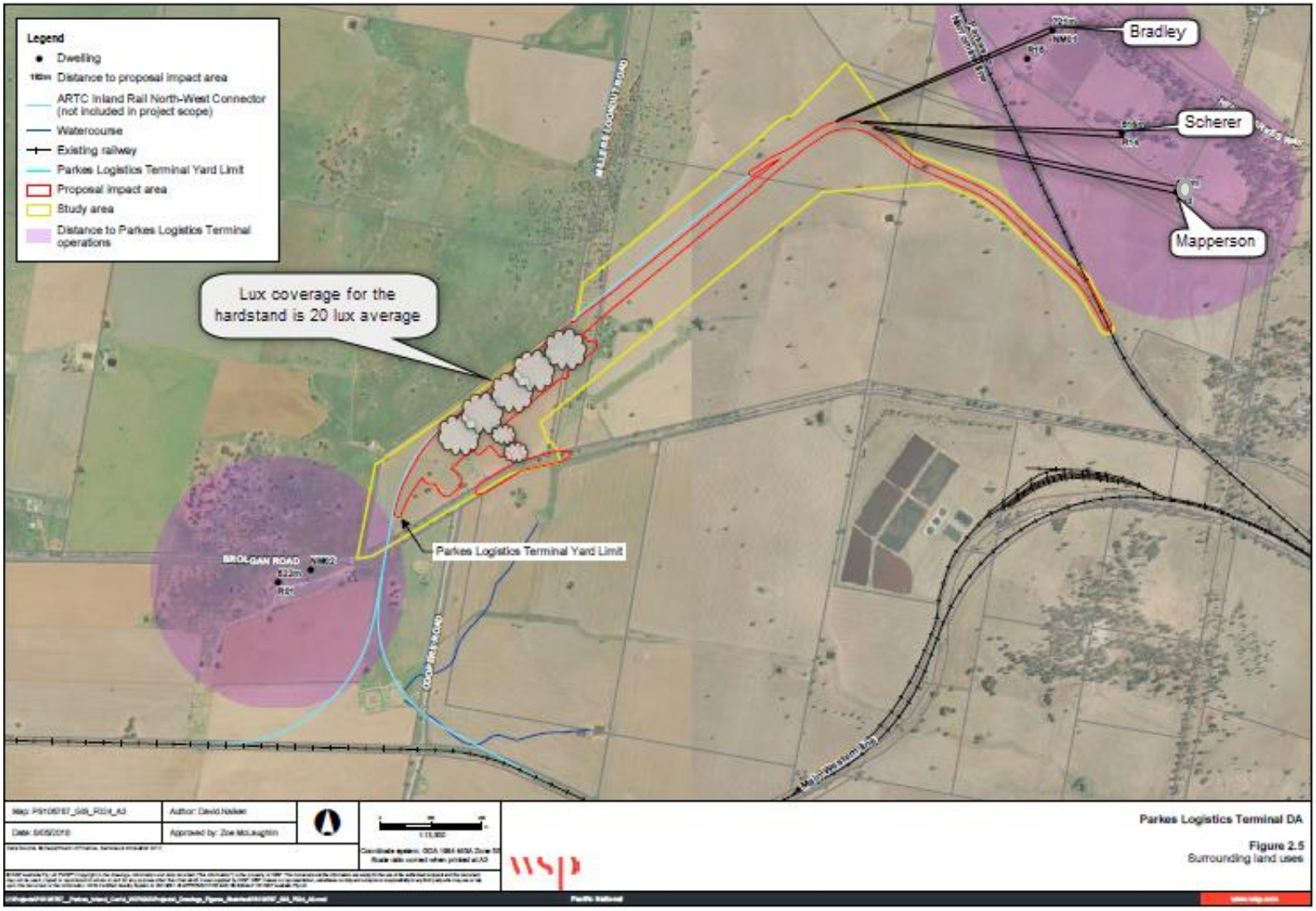
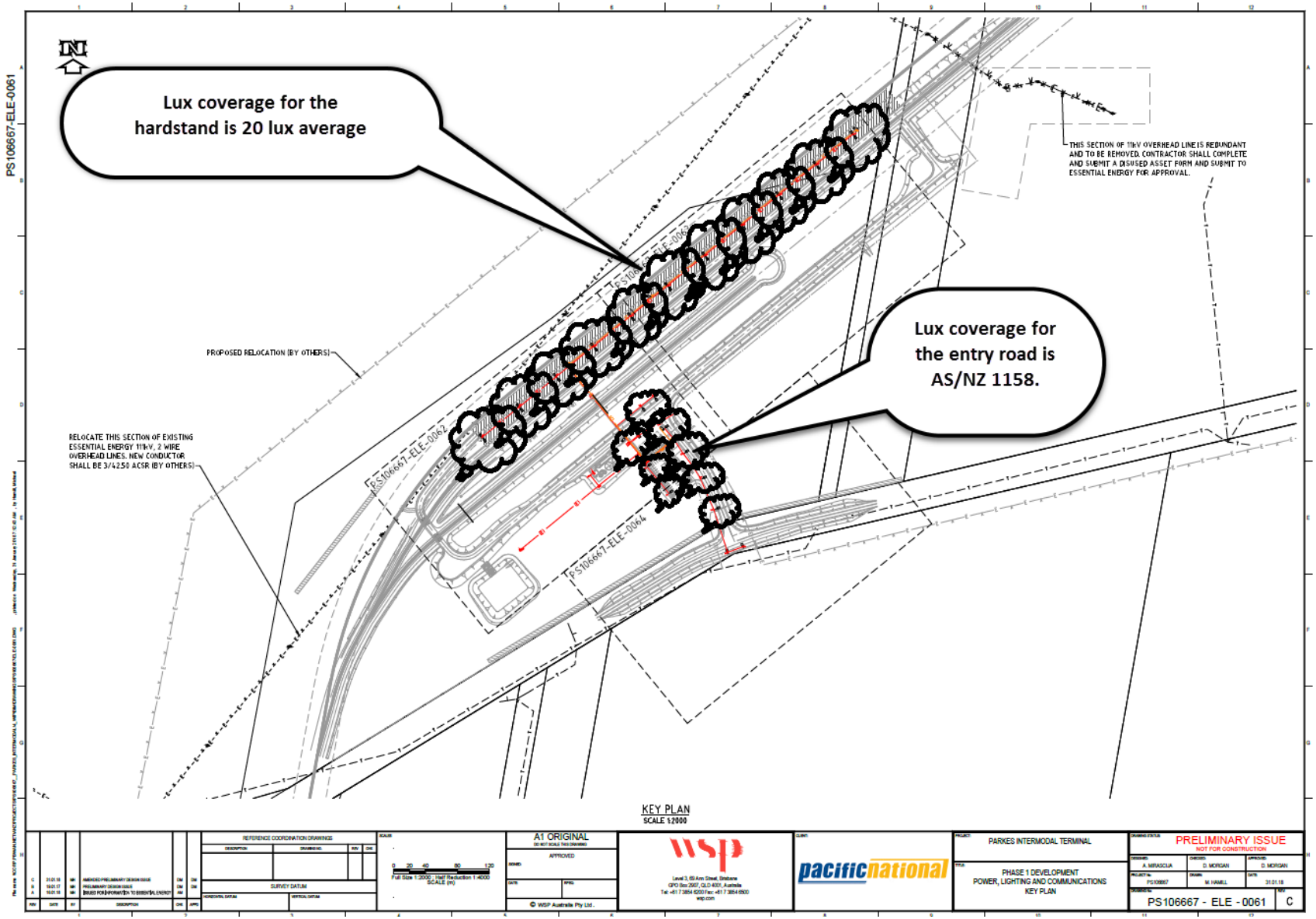


Figure 1


PS106667-ELE-0061
Lux coverage for the hardstand is 20 lux average
Lux coverage for the entry road is AS/NZ 1158.
PROPOSED RELOCATION (BY OTHERS)
RELOCATE THIS SECTION OF EXISTING ESSENTIAL ENERGY 11kV, 2 WIRE OVERHEAD LINES. NEW CONDUCTOR SHALL BE 3/4250 ACSR (BY OTHERS)
THIS SECTION OF 11kV OVERHEAD LINE IS REDUNDANT AND TO BE REMOVED. CONTRACTOR SHALL COMPLETE AND SUBMIT A DISUSED ASSET FORM AND SUBMIT TO ESSENTIAL ENERGY FOR APPROVAL.
PS106667-ELE-0062
PS106667-ELE-0064
KEY PLAN
SCALE 1:2000
A1 ORIGINAL
APPROVED
© WSP Australia Pty Ltd.
PARKES INTERMODAL TERMINAL
PHASE 1 DEVELOPMENT
POWER, LIGHTING AND COMMUNICATIONS
KEY PLAN
PRELIMINARY ISSUE
NOT FOR CONSTRUCTION
A. MIRASCIJA
D. MORGAN
D. MORGAN
M. HAMILL
31.01.18
PS106667 - ELE - 0061
C

Dick & Dot Bradley - Condobolin Road

Meeting held on Monday 14th May, a discussion was held on the general project, noise & light. Dick advised that their house had double glazing, a walk around the property to review the potential effects (as per photos below).

Fig 2 Looking South West at the Terminal

Fig 3 Bradley's Property

Fig 4 Looking North East at the Bradley's

The house hold is protected by farm sheds and trees and also there is (as below) a elevation difference of 10m and a distance of 894m from the point that which a NR loco's light would be directed at the Bradley's property. When the train comes around the bend in the line as per (Figure 1) the train light will be in line for about 5-10 seconds at a speed of 15km/h.

Matt Scherer - Condobolin Road

No submission was recorded from Mr Scherer, PN will reach out and set up a meeting for a general project update.

Looking South West

Matt Scherer

Looking East at the Scherer property

The house hold has little protection at this stage, trees could be planted if necessary also there is (as below) a elevation difference of 10m and a distance of 1,173m from the point that which a NR loco's light would be directed at the Scherer property. When the train comes around the bend in the line as per (Figure 1) the train light will be in line for about 5-10 seconds at a speed of 15 km/h.

Brett Mapperson - Condobolin Road

Meeting held on Monday 14th May, a discussion was held on the general project, noise & light at the Mapperson Parkes business, Brett & Cheryl where in attendance.

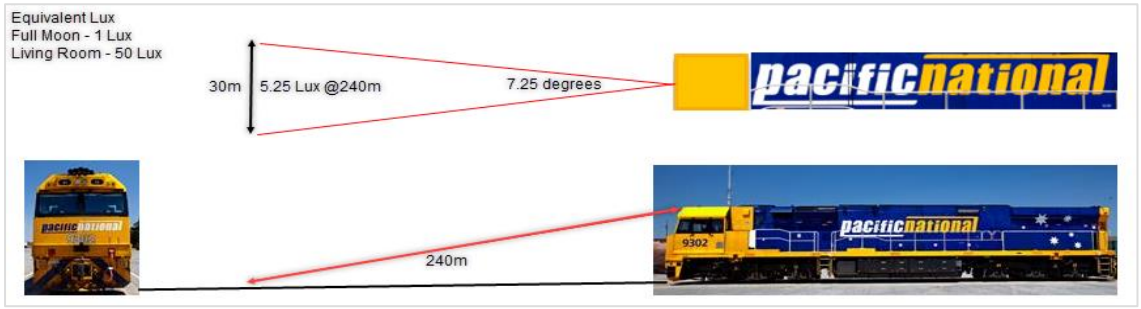
Looking West

Brett Mapperson property

Looking East at the Mapperson's Property

The house hold has little protection at this stage, trees could be planted if necessary also there is (as below) a elevation difference of 13m and a distance of 1429m from the point that which a NR loco's light would be directed at the Mapperson's property. When the train comes around the bend in the line as per (Figure 1) the train light will be in line for about 5-10 seconds at a speed of 15 km/h.

Specification of the lights and lux levels of the Loco Lights



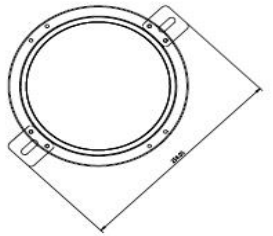
Visi-Bright L56

Features

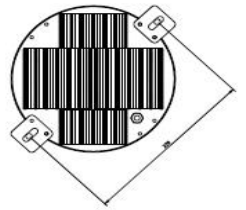
- Dimensionally equivalent front face sealing area for LED replacement of PAR56 incandescent lamps
- Vibration and shock tested to IEC 61373
- LED 50,000 hours life to 70% lumen maintenance (typical)
- Fits many existing cast aluminium headlight mounting plates
- Luminous intensity 300,000 Candela (pair)
- Illuminance 5.25 lux @ 240m (pair)
- Powered by constant current driver assembly for 60 to 130VDC applications
- Other voltages available on request
- High impact clear lens
- Patented Design

Technical Data

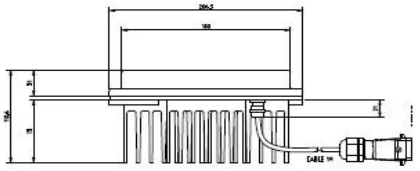
Luminous Intensity	300,000 Candela per pair
Illuminance	5.25 Lux @ 240m per pair (on the centreline)
Beam Angle	7.25 Degrees
Life	50,000 hours to 70% lumen maintenance (typical)
Power Consumption	66 Watts
Constant Current Driver	External Unit Required - max 3150mA @ 18 to 22V
Shock/Vibration	IEC 61373
EMC	CISPR 11, C Tick Compliant
Operating Temperature	-20°C to 55°C
Ingress Protection	IP 66 front surface IP44 rear surface
Mass (grams)	3200g
Overall Dimensions (millimetres)	203.5 dia x 113 deep
Connections	Weidmüller HQ5 male plug with 1.5m long 1.5mm sq cable
Order Number	7940009698



TOP VIEW



BOTTOM VIEW



FRONT VIEW

Notes

Enquire about custom driver assemblies available for all applications

PACIFIC NATIONAL

PARKES LOGISTICS TERMINAL

NOISE AND VIBRATION IMPACT ASSESSMENT

MAY 2018

wsp

Question today
Imagine tomorrow
Create for the future

Parkes Logistics Terminal
Noise and Vibration Impact Assessment

Pacific National

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Brisbane QLD 4000
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REV	DATE	DETAILS
0	23/01/2018	Draft for internal review
1	30/01/2018	First issue
2	07/03/2018	Updated occupancy
3	22/03/2018	Updated to include redesign of access track
4	23/05/2018	Updated assessment (Noise Policy for Industry)

	NAME	DATE	SIGNATURE
Prepared by:	A. Vuillemin / C. Marsh	23/05/2018	[redacted]
Reviewed by:	Z. Lai	23/05/2018	
Approved by:	A. White	23/05/2018	

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Pacific National proposes to construct and operate an intermodal terminal facility, the Parkes Logistics Terminal, at Brolgan Road, Parkes, NSW. The aim of the terminal is to facilitate the movement of double stacked containers between Parkes and Perth.

The proposed Parkes Logistics Terminal is located in a rural area 6km to the west of Parkes. The facility is bounded to the north and to the west by agricultural properties, to the south by Brolgan Road and to the east by the Parkes Narromine railway. There are numerous residential receivers surrounding the site, as well as three industrial receivers to the south-east. The nearest receiver is approximately 800m from to the southeast around 400m from the northern access track.

Unattended noise measurements have been conducted to derive the operational project specific noise levels in line with the NSW Noise Policy for Industry (NPfI) (EPA, 2017) and construction noise management levels in line with the Interim Construction Noise Guideline (DECC, 2009).

The main operational activity is the movement of trains on the access tracks and transfer of containers from train to train to maximise double stacking opportunities. The transfer is proposed to be done through use of reach stackers to move containers between trains and to a designated central container storage area on the hardstand pavement. Scissor lifts, forklifts, mobile cranes and small golf-cart style vehicles are also expected to be used to help move goods around the site. The Parkes Logistics Terminal is expected to handle trains up to a maximum length of 1,800m and approximately 80 container movements per day. Operational noise levels have been predicted for 2 typical 15-minute period scenarios and for maximum noise levels.

Exceedance of the NPfI project specific noise levels was predicted for four receivers (R01, R13, R14 and R15) by between 2 and 5 dB. The main causes of the exceedance were train passby on the access tracks, locomotives idling and reach stackers operating on site. Feasible and reasonable mitigation options for the four impacted receivers (R01, R13, R14 and R15) have been considered and further investigation should be carried out during the detailed design stage.

The vehicles expected to access the site during the operational phase of the project would be a combination of semi-trailers and B-doubles delivering or picking up containers as well as staff passenger vehicles and water and sewage service trucks. The assessment of road traffic noise impacts indicated that vehicles generated by the Proposal are unlikely to cause an increase of more than 2 dB during the daytime. During the night period, the increased vehicles on the road have been predicted to increase the noise on Brolgan Road by up to 7 dB. Despite the increase, the road traffic noise levels are expected to meet the RNP night criterion. A detailed road traffic noise assessment should be undertaken when detailed traffic volumes and haulage routes for operations are available.

Significant operational vibration is not expected to be generated from the proposed activities.

Construction works are expected to take place over a six to nine-month period between 7am and 5pm Monday to Friday and between 8am and 1pm on Saturdays. Six construction scenarios have been investigated and exceedance of the daytime noise management levels have been predicted for up to four scenarios. The maximum predicted exceedance is 22 dB. Distances to compliance with the noise management levels are provided for each construction scenario.

During construction, it is anticipated that approximately 100 vehicle movements will occur per day between 7am and 6pm with approximately 60% being light vehicles and 40% being heavy vehicles (typically 10 tonnes and semi-trailer trucks during site establishment, earthworks and supply of goods). This predicted traffic volume is unlikely to increase the existing road traffic noise level by more than 2 dB.

Rock breakers, vibratory rollers and compactors are expected to be the most significant vibration generating equipment during construction. The nearest receiver is located over 400m from the closest construction activities and comfortably complies with the safe working distances for human comfort and building damage.

A construction noise and vibration management plan utilising detailed construction methodologies of the contractor should be developed for the project prior to commencement of the works.

1 PROJECT BACKGROUND

1.1 PROJECT DESCRIPTION

Pacific National proposes to construct and operate an intermodal terminal facility, called the Parkes Logistics Terminal (the Proposal), at Brolgan Road, Parkes, NSW. Parkes is the easternmost location from Sydney on the east west route where double stacked containers can be used due to bridge heights and other restrictions. Parkes is also strategically located at the intersection of the Newell Highway and major railways linking Melbourne, Brisbane, Sydney and Perth.

The aim of the Proposal is to facilitate the movement of double stacked containers between Parkes and Perth. This allows for more freight containers to be moved on fewer trains than if they were single stacked (termed 'cargo consolidation') and improves rail capacity and efficiency. Once Inland Rail is operational, it would also allow for the transfer of freight between the east-west rail route (between Sydney and Perth) and the Inland Rail route (between Melbourne and Brisbane).

The key components of the Proposal are:

- Rail sidings for the loading and unloading of trains which would be accessed via the proposed Australian Rail Track Corporation (ARTC) north-west rail connector track and the existing Parkes to Narromine track.
- Hardstand pavement areas for container storage, loading and unloading
- Access roads from Brolgan Road and internally for trucks and light vehicles
- An office building, staff amenities and car parking
- Utility services including for drainage, lighting, water, power, data, security and sewerage
- Signage and landscaping.

It is anticipated that construction of the Proposal would begin in June 2018 and be completed by February 2019. The Proposal, once completed, would operate 24 hours per day, seven days per week.

1.2 SENSITIVE RECEIVERS

The Proposal is located in a rural area 6km to the west of Parkes. The facility is bounded to the north and to the west by agricultural properties, to the south by Brolgan Road and to the east by the Parkes-Narromine railway.

There are numerous residential receivers surrounding the site, as well as three industrial receivers to the south-east. These are summarised in Table 1-1. The locations of the sensitive receivers are shown on Figure 1.1. No heritage listed structure have been identified at this stage of the project.

Residential receivers have been grouped into two noise catchment areas NCA1 and NCA2. NCA1 includes the receivers to the south and west of the site (R01 to R10), not impacted by Henry Parkes Way and NCA2 includes the receivers impacted by Henry Parkes Way (R11 to R42).

Table 1-1 Sensitive receivers

RECEIVER	ADDRESS	TYPE	NOISE CATCHMENT AREA
R01	Brolgan Road	Residential	NCA1
R02	664 Brolgan Road	Residential	NCA1
R03	761 Brolgan Road	Residential	NCA1
R04	812 Brolgan Road	Residential	NCA1

RECEIVER	ADDRESS	TYPE	NOISE CATCHMENT AREA
R05	844 Brolgan Road	Residential	NCA1
R06	890 Brolgan Road	Residential	NCA1
R07	Keiths Lane	Residential	NCA1
R08	184 Coopers Road	Residential	NCA1
R09	London Road	Residential	NCA1
R10	396 London Road	Residential	NCA1
R11	132 Brolgan Road	Residential	NCA2
R12	144 Brolgan Road	Residential	NCA2
R13	437 Henry Parkes Way	Residential	NCA2
R14	459 Henry Parkes Way	Residential	NCA2
R15	501 Henry Parkes Way	Residential	NCA2
R16	629 Henry Parkes Way	Residential	NCA2
R17	641 Henry Parkes Way	Residential	NCA2
R18	43 Millers Lookout Road	Residential	NCA2
R19	65 Millers Lookout Road	Residential	NCA2
R20	60 Millers Lookout Road	Residential	NCA2
R21	8 Millers Lookout Road	Residential	NCA2
R22	893 Henry Parkes Way	Residential	NCA2
R23	822 Henry Parkes Way	Residential	NCA2
R24	796 Back Trundle Road	Residential	NCA2
R25	696 Back Trundle Road	Residential	NCA2
R26	679 Back Trundle Road	Residential	NCA2
R27	613 Back Trundle Road	Residential	NCA2
R28	29 Nanardine Lane	Residential	NCA2
R29	41 Nanardine Lane	Residential	NCA2
R30	513 Back Trundle Road	Residential	NCA2
R31	465 Back Trundle Road	Residential	NCA2
R32	425 Back Trundle Road	Residential	NCA2
R33	397 Back Trundle Road	Residential	NCA2
R34	Back Trundle Road	Residential	NCA2
R35	319 Back Trundle Road	Residential	NCA2
R36	317 Back Trundle Road	Residential	NCA2

RECEIVER	ADDRESS	TYPE	NOISE CATCHMENT AREA
R37	362 Henry Parkes Way	Residential	NCA2
R38	364 Henry Parkes Way	Residential	NCA2
R39	436 Henry Parkes Way	Residential	NCA2
R40	408 Henry Parkes Way	Residential	NCA2
R41	357 Henry Parkes Way	Residential	NCA2
R42	349 Henry Parkes Way	Residential	NCA2
I01	249 Brolgan Road	Industrial	-
I02	Woolstore Place	Industrial	-
I03	104 Brolgan Road	Industrial	-

Figure 1.1 Sensitive receivers and project layout

1.3 PURPOSE OF THIS ASSESSMENT

The purpose of this assessment is to support the Development Application for the Proposal. The potential impacts to be assessed are:

- On-site operational noise (including maximum noise levels)
- On-site operational vibration
- Off-site operational road traffic noise
- Construction noise (including maximum noise levels)
- Construction vibration
- Construction generated road traffic noise.

Operational rail noise and vibration outside the facility is not included in the scope of this assessment.

1.4 INFORMATION SOURCES

The assessment has been prepared with reference to the following documents:

- Australian Standard AS 1055:2000 - Acoustics - Description and measurement of environmental noise.
- Australian Standard AS 2436:2010 - Acoustics – Guide to noise and vibration control on construction, demolition and maintenance sites.
- Australian Standard AS 2670:2001 – Evaluation of human exposure to whole-body vibration.
- British Standard BS 6841:1987 - Guide to measurement and evaluation of human exposure to whole-body mechanical vibration and repeated shock.
- British Standard BS 7385-2:1993 - Evaluation and measurement for vibration in buildings. Guide to damage levels from groundborne vibration.
- ISO 9613-1:1993 - Acoustics - Attenuation of sound during propagation outdoors - Part 1: Calculation of the absorption of sound by the atmosphere.
- CONCAWE – The Propagation of Noise from Petroleum and Petrochemical Complexes to Neighbouring Communities – Report no. 4/81 (1981).
- NSW Department of Environment and Conservation (DEC) – Assessing Vibration: A Technical Guideline (2006).
- NSW Department of Environment and Climate Change (DECC) - Interim Construction Noise Guideline (ICNG) (2009).
- NSW Department of Environment and Climate Change (DECC) – Road Noise Policy (RNP) (2011).
- NSW Environment Protection Authority (EPA) – Industrial Noise Policy (INP) (2000).
- NSW Environment Protection Authority (EPA) – Noise Policy for Industry (NPfI) (2017).
- NSW Environment Protection Authority (EPA) – Implementation and transitional arrangements for the Noise Policy for Industry (2017).
- NSW Environment Protection Authority (EPA) - Rail Infrastructure Noise Guideline (RING) (2013).

2 EXISTING NOISE ENVIRONMENT

The existing noise environment surrounding the Proposal has been characterised by WSP and is detailed in the following sections.

2.1 MONITORING LOCATIONS

Noise monitoring locations were selected to be representative of the nearest sensitive receivers potentially impacted by the proposed development. The monitors were located with microphones between 1.2m and 1.5m from the ground and in a free-field location, being at least 3.5m from other reflecting surfaces, other than the ground.

Location NM01 was at approximately 150m to the south of Henry Parkes Way, to the north-east of the site and the existing railway. It is considered representative of receivers to the north and north-east of the proposed development. It is considered representative of receivers in NCA2.

Location NM02 was along Brolgan Road, approximately 10m from the road centreline, to the south-west of the site. It is considered representative of receivers to the south and south-east of the proposed development. It is considered representative of receivers in NCA1.

These noise monitoring locations are shown in Figure 1.1.

2.2 MONITORING PERIOD

The noise survey was undertaken between Wednesday 29 November 2017 and Monday 18 December 2017.

The instrumentation used for unattended noise measurements was installed and retrieved by a WSP engineer. Attended noise measurements were conducted at the monitoring locations during setup and decommissioning of the unattended noise monitoring equipment.

2.3 EQUIPMENT

A summary of the noise monitoring equipment used is presented in Table 2-1 and pictures are provided in Figure 2.1 and Figure 2.2. Calibration of the noise equipment was checked on site before and after the measurements to monitor any drift. No significant drift (greater than +/- 0.5 dB) was noted across the measurement period.

Table 2-1 Noise monitoring equipment

EQUIPMENT	MANUFACTURER	MAKE	SERIAL NUMBER	CALIBRATION STATUS	LOCATION
Sound level meter	Acoustic Research Labs	Ngara	878007	Current	Location NM01
Sound level meter	Acoustic Research Labs	Ngara	8780D3	Current	Location NM02
Sound level meter	Norsonic	Nor140	8168427	Current	All
Calibrator	Rion	NC-73	11248294	Current	All

Figure 2.1 Unattended noise monitoring equipment – Location NM01

Figure 2.2 Unattended noise monitoring equipment – Location NM02

2.4 METEOROLOGICAL CONDITIONS

Weather conditions during attended measurements were observed to be suitable for sound level measurements, with light wind and no rain.

Inclement weather conditions (rainfall above 0.2mm or wind velocities above 5m/s) were recorded during the unattended measurements period between Wednesday 29 November 2017 and Monday 18 December 2017 at the nearest Bureau of Meteorology station located at Parkes Airport (station ID 60801), 11km to 14km to the east of the monitoring locations.

Affected periods of the unattended noise monitoring were excluded from further analysis in line with the method detailed in the NPfI.

2.5 NOISE MEASUREMENT RESULTS

Table 2-2 summarises the unattended long-term noise monitoring results. The recorded noise data is reported as the average equivalent continuous average sound levels $L_{eq\ 15min}$ and rating background levels (RBL) as defined in the NPfI.

Appendix A presents the daily graphs of the noise monitoring.

Table 2-2 Unattended noise measurement results

LOCATION ID	**MEASURED NOISE LEVEL dBA**					
	Day 7am-6pm		**Evening 6pm-10pm**		**Night 10pm-7am**	
	$L_{eq,15min}$	**RBL**	**$L_{eq,15min}$**	**RBL**	**$L_{eq,15min}$**	**RBL**
NM01	56	33	52	33	56	32
NM02	53	28	52	26	45	24

Table 2-3 reports the monitoring of ambient road traffic noise at the monitoring location near Brolgan Road (NM02).

Table 2-3 Long term unattended measured traffic noise levels

LOCATION ID	**MEASURED TRAFFIC NOISE LEVEL dBA [1]**			
	Day 7am-10pm		**Night 10pm-7am**	
	$L_{eq,15h}$	**$L_{eq,1h}$ [1]**	**$L_{eq,9h}$**	**$L_{eq,1h}$ [2]**
NM02	53	56	45	48

Note 1: Measured traffic noise levels are free-field

Note 2: $L_{eq,1h}$ calculated using the 10th percentile method as described in Appendix B of the RNP.

Table 2-4 summarises the results of the attended measurements conducted at both monitoring locations.

Table 2-4 Attended noise measurements results

LOCATION ID	DATE AND TIME	$L_{eq,15min}$, dBA	$L_{90,15min}$, dBA	COMMENTS
NM01	29/11/17 12:45pm	43	37	Birds 41 dBA Light vehicles 44 to 46 dBA Heavy vehicle 56 dBA
	18/12/17 10:00am	45	37	Birds 41 to 49 dBA Light vehicles 50 to 53 dBA Heavy vehicle 52 dBA
NM02	29/11/17 10:50am	62	30	Birds 39 dBA Insects 35 dBA Tractor 77 dBA Light vehicles 77 to 84 dBA Heavy vehicle 85 dBA
	18/12/17 12:30pm	60	38	Light vehicles 77 to 81 dBA Birds Insects

Noise levels at both locations are typical of rural areas, with the background noise affected by sources including birds, insects and occasional vehicles passing-by. No industrial noise was noticeable at both monitoring locations during the setup and decommissioning of the noise monitoring equipment. For this reason, attended measurements have only been conducted during daytime.

3 ASSESSMENT CRITERIA

The following sections provide an overview of the assessment criteria applicable to the Proposal.

3.1 PARKES SHIRE COUNCIL

The Proposal is located within the jurisdiction of the Parkes Shire Council and the noise and vibration impact assessment is conducted in accordance with the Parkes Shire Development Control Plan (DCP) 2013.

According to the Land Zoning Map – Sheet LZN_005A, the Proposal is located in the Parkes National Logistics Hub zoned SP1 Special Activities (Freight Transport Facility, Heavy Industrial Storage Establishment, High Technology Industry, Rural Industry, Transport Depot, Truck Depot).

Relevant to noise and vibration in the Parkes National Logistics Hub, the Parkes Shire Development Control Plan 2013 states that "*any activity that will produce noise emissions from a premise is to be in accordance with the provisions of the NSW Government Industrial Noise Policy"*.

The Industrial Noise Policy (INP) has been replaced in 2017 by the NPfI. The EPA's transitional arrangements for the NPfI state there where the INP is referenced in a statutory document, such as a Development Control Plan, then the INP is to be implemented. However, Parkes Shire Council considers the Development Control Plan is generally accepted not to be a statutory plan for the purpose of this exercise and as such, considers that WSP cannot rely on the INP in this case. As such, Parkes Shire Council requested that the NPfI be adhered to for planning assessment purposes.

There are no requirements for vibration but it is current practice to consider vibration for such a proposal.

As a result, the assessment has been prepared with reference to the following guidelines, policies and standards:

- Noise
  - NSW Environment Protection Authority (EPA) - Noise Policy for Industry (NPfI) (2017)
  - NSW Department of Environment and Climate Change (DECC) - Interim Construction Noise Guideline (ICNG) (2009)
  - NSW Department of Environment and Climate Change (DECC) – Road Noise Policy (RNP) (2011)
- Vibration
  - NSW Department of Environment and Conservation (DEC) – Assessing Vibration: A Technical Guideline (2006)
  - British Standard BS 7385-2:1993 - Evaluation and measurement for vibration in buildings. Guide to damage levels from groundborne vibration (1993).

3.2 OPERATIONAL NOISE

Operational noise is assessed according to the NPfI. The NPfI is the appropriate assessment method for the Proposal as the RING assessment method specifically excludes noise from railway system activities such as loading or unloading of freight onto rolling stock and the non-network line servicing the site does not extend beyond the boundary of the premises.

The rail tracks from the network lines have been assessed under the NPfI as they are non-network tracks specifically for the use of the facility and are a designated siding for the facility within the special use zone (SP1 Special Activities Parkes National Logistics Hub). An Environmental Protection Licence has not yet designated a boundary for the terminal's activities, therefore a conservative approach is taken to include the sidings and access track into the facilities operation.

The NPfI defines the project noise trigger levels as the lower value of the project intrusiveness noise level and the project amenity noise level. It also includes a maximum noise level assessment to consider sleep disturbance (refer to Section 3.4).

The project intrusiveness noise level is intended to protect receivers against intrusive noise in the short term. It is defined as $L_{eq,15min}$ less than or equal to the RBL plus 5 dB.

The amenity noise levels and project amenity noise levels are intended to maintain noise amenity and limit cumulative noise increases for sensitive land uses. In Table 2.2 of the NPfI, recommended amenity noise levels are defined for daytime, evening and night period for sensitive receiver type and for residential areas, the type of area. The appropriate residential amenity area for this project is rural. The recommended amenity noise levels apply to noise from all industrial noise sources including noise emitted from the Proposal.

Table 3-1 presents the project intrusiveness noise levels, project amenity noise levels and project noise trigger levels for the nearest sensitive receivers. These are based on the noise measurements results and RBL detailed in Section 2.5.

Table 3-1 Operational noise criteria

REC.	TIME PERIOD	RATING BACKGROUND LEVEL, dBA	PROJECT INTRUSIVE-NESS NOISE LEVEL $L_{eq,15min}$ dBA	AMBIENT NOISE LEVEL $L_{eq,Period}$ dBA [1]	PROJECT AMENITY NOISE LEVEL $L_{eq,15min}$ dBA [2]	PROJECT NOISE TRIGGER LEVEL $L_{eq,15min}$ dBA
NCA1	Day	35[3]	40	56	48 (50-5+3)	**40**
	Evening	30[3]	35	52	43 (45-5+3)	**35**
	Night	30[3]	35	56	46 (56-10)[4]	**35**
NCA2	Day	35[3]	40	53	48 (50-5+3)	**40**
	Evening	33	38	52	43 (45-5+3)	**38**
	Night	32	37	45	38 (40-5+3)	**37**
I01, I02, I03	Any Time	-	-	45	68 (70-5+3)	**65**

Note 1: Period denotes either Day, Evening or Night.

Note 2: Project amenity noise level converted from $L_{eq,period}$ to $L_{eq,15min}$ according to the method in Chapter 2.2 of the NPfI.

Note 3: Where the measured rating background level is less than 30 dBA for the evening and night periods, it is set to 30 dBA. When it is found to be less than 35 dBA for the day period, it is set to 35 dBA.

Note 4: Where the resultant project amenity noise level is 10 dB or more lower than the existing industrial noise level. In this case the project amenity noise levels can be set at 10 dB below existing industrial noise levels (as per note 3 of Section 2.4 of the NPfI)

3.3 CONSTRUCTION NOISE

The ICNG details construction noise and vibration criteria for general construction activities. The ICNG uses noise management levels (NML) to determine the noise level at which reasonable and feasible noise management and mitigation should be implemented for the project.

Table 3-2 defines how the noise management levels are applied for residential receivers. They are based on existing RBL in the vicinity of the Proposal plus an additional allowance of 10 dB during the recommended standard hours for construction work and 5 dB outside of these hours. Residents are deemed likely to be affected by noise where the NML are exceeded. If the predicted noise levels exceed 75 dBA, then residents are deemed to be 'highly affected' and require additional considerations to mitigate potential impacts.

Table 3-2 ICNG construction noise management levels for residential receivers and working hours

TIME OF DAY	NOISE MANAGEMENT LEVELS $L_{eq,15min}$ [1,2] dBA	HOW TO APPLY
Recommended standard hours: Monday to Friday: 7am to 6pm Saturday: 8am to 1pm No work on Sundays or public holidays	Noise affected Rating background level + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise. — Where the predicted or measured $L_{eq,15min}$ dBA 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 dBA	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: — 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). — 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 Rating background level + 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 above the noise affected level, the proponent should negotiate with the community.

Note 1: Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5 metres above ground level. If the property boundary is more than 30 metres from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30 metres of the residence. Noise levels may be higher at upper floors of the noise affected residence.

Note 2: The rating background level is the overall single-figure background noise level measured in each relevant assessment period (during or outside the recommended standard hours). It is described in detail in the NPfI.

Table 3-3 provides a summary of the applicable NML based on the background noise monitoring conducted. In addition, Table 3-4 lists the NML that have been adopted for non-residential sensitive receivers as required by the ICNG.

Table 3-3 Construction noise management levels for residential receivers

RECEIVER	NOISE MANAGEMENT LEVELS, $L_{eq,15min}$ dBA			
	Day (SH) [1]	Day (OOHW) [1]	Evening (OOHW)	NIGHT (OOHW)
NCA1	40	35	35	35
NCA2	43	38	38	37

Note 1: SH = Recommended standard working hours. OOHW = outside of recommended standard hours work as defined in Table 3-2.

Table 3-4 Construction noise management levels for non-residential sensitive land uses

LAND USE	NOISE MANAGEMENT LEVELS, $L_{eq,15min}$ dBA Applies when properties are being used
Industrial	75 (external)

3.4 SLEEP DISTURBANCE

Work activities taking place at night have the potential to disturb people's sleep patterns. Sleep disturbance is considered for operational and construction activities based on the guidelines as follows.

3.4.1 OPERATIONAL ACTIVITIES

The potential for sleep disturbance from maximum noise level events and operational noise during the night-time period is detailed in the NPfI. The operational sleep disturbance criteria for the proposed development at the nearest residential locations are the following:

- $L_{eq,15min}$ 40 dBA or the rating background level plus 5 dB, whichever is the greater, and/or
- L_{Fmax} 52 dBA or the rating background level plus 15 dB, whichever is the greater.

Where the development night-time noise levels at a residential location exceed the following, a detailed maximum noise level event assessment should be undertaken.

Based on the measurements detailed in Section 2.5, the external sleep disturbance criteria are as follows for all residential receivers.

- $L_{eq,15min}$ 40 dBA
- L_{Fmax} 52 dBA.

3.4.2 CONSTRUCTION ACTIVITIES

Chapter 4.3 of the ICNG discusses the method for assessing and managing sleep disturbance. This guidance references further information in the RNP relating to sleep disturbance criteria. The RNP suggests a screening level of $L_{1,1min}$ or L_{max} dBA, equivalent to the rating background level + 15 dB. Where this level is exceeded, further analysis is recommended. Chapter 5.4 of the RNP then goes on to state that:

- maximum internal noise levels below 50-55 dBA would be unlikely to result in people's sleep being disturbed and unlikely to cause people to wake up
- if the noise exceeds 65-70 dBA once or twice each night, the disturbance would be unlikely to have any notable health or wellbeing effects.

Therefore for internal noise levels above 55 dBA, sleep disturbance would be considered likely. Assuming that receivers may have windows partially open for ventilation, a 10 dB outside to inside correction has been adopted as indicted in the

ICNG. Therefore, a sleep disturbance external screening criterion of 65 dBA L_{Fmax} has been adopted for construction. Feasible and reasonable safeguards should be considered where there are night-time predicted exceedances above this limit.

3.5 ROAD TRAFFIC NOISE

The Proposal will generate construction and operational vehicle movements on the surrounding roads which have the potential to impact sensitive receivers along the access routes.

The application notes from the RNP detail the requirements for construction and operational generated traffic noise as follows:

- *for existing residences and other sensitive land uses affected by additional traffic on existing roads generated by land use developments, any increase in the total traffic noise level as a result of the development should be limited to 2 dB above that of the noise level without the development. This limit applies wherever the noise level without the development is within 2 dB of, or exceeds, the relevant day or night noise assessment criterion.*

The consideration of mitigation is required where additional construction related traffic or operational off-site traffic on existing roads creates an increase of more than 2 dB at existing sensitive receivers.

Arterial and sub-arterial roads are assessed over day (7am to 10pm) and night (10pm to 7am) periods and local roads are assessed over a one hour period (typically the peak hour) within the respective day and night periods. Table 3-5 presents a summary of the noise level criteria for the arterial, sub-arterial and local roads affected by additional traffic from land use developments and construction activities.

Table 3-5 Road traffic noise criteria for receivers on existing roads affected by additional traffic from land use developments

ROAD	**ROAD TRAFFIC NOISE CRITERIA** [1]	
	DAY 7AM-10PM	**NIGHT 10PM-7AM**
Brolgan Road	$L_{eq\ 15hr}$ 60 dBA	$L_{eq\ 9hr}$ 55 dBA
Millers Lookout Road	$L_{eq\ 1hr}$ 55 dBA	$L_{eq\ 1hr}$ 50 dBA
Henry Parkes Way	$L_{eq\ 15hr}$ 60 dBA	$L_{eq\ 9hr}$ 55 dBA

Note 1: Façade corrected noise levels.

3.6 VIBRATION

Operational and construction vibration can lead to:

- Cosmetic building damage (and structural damage in extreme cases).
- Loss of amenity due to perceptible vibration, termed human comfort.
- Impacts on the condition and structural integrity of key infrastructure.

Importantly, cosmetic damage is regarded as minor in nature; it is readily repairable and does not affect a building's structural integrity. It is described as hairline cracks on drywall surfaces, hairline cracks in mortar joints and cement render, enlargement of existing cracks, and separation of partitions or intermediate walls from load bearing walls. If there is no significant risk of cosmetic building damage, then structural damage is not considered a significant risk and is not assessed.

3.6.1.1 COSMETIC DAMAGE

There is no Australian Standard that provides guidance for cosmetic damage due to vibration. Therefore, the evaluation of vibration in relation to cosmetic damage to buildings from vibrational energy is proposed to be conducted in accordance

with British Standard BS 7385-2:1993 - Evaluation and measurement for vibration in buildings. Guide to damage levels from groundborne vibration. Table 3-6 presents the guideline limits for cosmetic damage for short term vibration.

Table 3-6 Transient vibration guide values for cosmetic damage (BS 7385)

TYPE OF BUILDING	PEAK COMPONENT PARTICLE VELOCITY IN FREQUENCY RANGE OF PREDOMINANT PULSE	
	4 - 15 Hz	15 Hz and above
Reinforced or framed structures Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	
Unreinforced or light framed structures Residential or light commercial type buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

Note: Values referred to are at the base of the building.

The guide values in Table 3-6 relate predominantly to transient vibration which does not give rise to resonant responses in structures, and to low-rise buildings. Where the dynamic loading caused by continuous vibration is such as to give rise to dynamic magnification due to resonance, especially at the lower frequencies where lower guide values apply, then the guide values in Table 3-6 may need to be reduced by up to 50%.

3.6.1.2 HUMAN COMFORT

Table 3-7 presents the limits (vibration dose values) above which it is considered there is a risk that the amenity and comfort of people occupying buildings would be affected by vibration from construction works. These limits are taken from the NSW Assessing vibration: a technical guideline.

Table 3-7 Vibration limits (human exposure) for intermittent vibration

LOCATION	DAY 7AM-10PM		NIGHT 10PM-7AM	
	PREFERRED	MAXIMUM	PREFERRED	MAXIMUM
Critical areas	0.10	0.20	0.10	0.20
Residences	0.20	0.40	0.13	0.26
Schools, educational institutions	0.40	0.80	0.40	0.80
Places of worship	0.40	0.80	0.40	0.80

The vibration guideline also specifies limits for continuous and impulsive vibration. These vibration limits are expressed in acceleration (m/s^2) and peak particle velocity (mm/s) as presented in Appendix C of the vibration guideline, reproduced in Table 3-8.

Table 3-8 Preferred and maximum values for continuous and impulsive vibration

LOCATION	ASSESSMENT PERIOD	RMS ACCELERATION m/s^2				PEAK PARTICLE VELOCITY mm/s	
		PREFERRED VALUES		MAXIMUM VALUES		PREF. VALUES	MAX. VALUES
		Z-AXIS	X AND Y AXES	Z-AXIS	X AND Y AXES		
CONTINUOUS VIBRATION							
Critical areas	All	0.0050	0.0036	0.010	0.0072	0.14	0.28
Residences	Day 7am-10pm	0.010	0.0071	0.020	0.017	0.28	0.56
	Night 10pm-7am	0.007	0.005	0.014	0.010	0.20	0.40
Schools, educational institutions	All	0.020	0.014	0.040	0.028	0.56	1.1
Places of worship	All	0.020	0.014	0.040	0.028	0.56	1.1
IMPULSE VIBRATION							
Critical areas	All	0.0050	0.0036	0.010	0.0072	0.14	0.28
Residences	Day 7am-10pm	0.3	0.21	0.60	0.42	8.6	17.0
	Night 10pm-7am	0.10	0.071	0.20	0.14	2.8	5.6
Schools, educational institutions	All	0.64	0.46	1.28	0.92	18.0	36.0
Places of worship	All	0.64	0.46	1.28	0.92	18.0	36.0

4 OPERATIONAL NOISE AND VIBRATION

This section describes the potential noise and vibration impacts associated with the operation of the Proposal.

4.1 PROPOSED ACTIVITIES

The Proposal is to be used for the loading and unloading of containers from trains and trucks to facilitate the movement of double stacked containers between Parkes and Perth.

The main operational activity is the transfer of containers from train to train to maximise double stacking opportunities. The transfer is proposed to be done through use of reach stackers to move containers between trains and to a designated central container storage area within the hardstand pavement. Scissor lifts, forklifts, mobile cranes and small golf-cart style vehicles are also expected to be used to help move goods around the site. The Proposal is expected to handle up to 2 trains per day with a maximum length of 1,800m and approximately 80 container movements per day. This is expected to reduce the number of east-west train services required from 12 west-bound and 10 east-bound trains per week to 8 west-bound and 6 east-bound trains per week and therefore, possibly improving existing rail traffic noise on existing rail lines.

It is also understood that ARTC will allow Pacific National to use the North-West Connector track prior to the full operation of Inland Rail. This needs to be constructed for the Proposal to become operational. The North-West Connector track is however not part of the Proposal and similar to off-site rail noise, is not part of this assessment. The northern access track is a private rail spur and in accordance with the RING is assessed according to the NPfI.

The facility is proposed to operate 24 hours per day, seven days a week in three shifts as follows: 10pm to 6am, 6am to 2pm and 2pm to 10pm.

Typically, the only vehicles that are expected to access the site once operational would be a combination of semi-trailers and B-doubles delivering or picking up containers as well as staff passenger vehicles and water and sewage service trucks. In total, the Proposal is expected to generate approximately 200 vehicle movements each day, including a maximum of four heavy vehicle movements. On average, it is assumed that there would be a total number of 98 people on-site per day, with a maximum of 31 people per shift.

4.2 NOISE MODELLING PARAMETERS

A noise model was created using SoundPLAN 7.4 modelling software to predict the noise generated during typical operation conditions for both standard and noise-enhancing meteorological conditions. Modelling inputs included all relevant structures within the assessment area, ground topography, locations of sensitive receivers, noise-generating equipment, as well as any other inputs which may have an effect on the noise environment, such as fences and barriers on-site. The adopted prediction method for the model was the CONCAWE method.

The modelling parameters are shown in Table 4-1.

Table 4-1 Operational noise modelling inputs

PARAMETER	MODELLING INPUT
Ground absorption	Ground absorption factors are set to 0 for all roads, hardstand and 0.75 for grass / vegetation.
Terrain data	Terrain data have been provided NSW Land and Property Information.
Meteorological conditions	Standard conditions: Stability category D, 0.5m/s wind from noise source to receiver. Noise-enhancing conditions: — Day and Evening: Stability category D, 3m/s wind from noise source to receiver — Night: Stability category F, 2m/s wind from noise source to receiver.
Buildings	Sensitive receivers are modelled as points only. Given the distance between the source and the closest receiver, buildings have not been included.
Receiver height	The receiver heights are set to 1.5m. Receivers on higher floors have not been modelled as no site survey identified if the properties are single or double storeys.
Noise sources	As described in Section 4.3.

4.3 OPERATIONAL NOISE SOURCES

The facility is proposed to operate 24 hours per day, seven days a week in three shifts. It is assumed that all activities occur at the same rate through each shift, and activities are independent of the shift. Limited operational information is available at this stage of the project, and therefore, the two scenarios over a 15-minute period were developed as follows:

- Scenario 1
  - a train arrives at the terminal from the southern access tracks
  - the locomotive is detached from the train
  - the locomotive is moved to the rail siding using the locomotive shifter
  - the locomotive travels to the appropriate location in preparation for departure and remains idle
  - the diesel reach stacker is unloading 2 containers onto the hardstand pavement / trucks / adjacent train
  - two trucks are entering the site, idling and departing
  - five personal light vehicles are travelling on-site
  - scissor lift, forklift and mobile crane are being used to move goods.
- Scenario 2
  - As scenario 1, except the train arrives from the 2.5km northern access track travelling at 20km/h

The proposed modelled typical operational noise scenario and sources are summarised in Table 4-2. Source noise levels used for the assessment were sourced from other logistics terminal facilities, the TfNSW Rail Noise Database, Australian Standard AS 2436 and WSP database.

Table 4-2 Operational noise scenario and sources

EQUIPMENT	NUMBER OF ITEMS	SOUND POWER LEVEL, dBA	DURATION OF USE OVER 15 MINUTE PERIOD
Locomotive shifter	1 shifter moving 1 locomotive	95	2 min
Locomotive 10 km/h	2 locomotives at 10 km/h up to position and then idling	106 (per locomotive)	Moving source at 10 km/h on southern access track
Locomotive idling		100	Remaining time (~12 min)
Locomotive 20 km/h on access track	2 locomotives travel at 20km/h on the northern access track	106 (per locomotive)	Locomotives take 7.5 minutes to travel the 2.5km access track
Wagons 20 km/h on access track	1,800m of wagons at 20 km/h on the northern access track	116	Wagons take 13 minutes to travel the 2.5km access track
Diesel reach stacker	1	106	5 min
Scissor lift	1	105	3 min
Forklift	1	106	3 min
Mobile crane	1	104	3 min
Truck 10 km/h	2 trucks at 10 km/h up to position and then idling	103	Moving sources at 10 km/h
Truck idling		95	Remaining time (~13 min)
Light vehicle 10 km/h	5	88	Moving sources at 10 km/h

4.4 PREDICTED NOISE LEVELS

The predicted noise levels at the nearest sensitive receivers for the typical 15-minute scenario are presented in Table 4-3. Noise contours maps are provided in Appendix B. Values in bold show exceedance of the project noise trigger level for the most stringent period.

Table 4-3 Predicted operational noise levels, $L_{eq,15min}$ dBA

RECEIVER	ADDRESS	MOST STRINGENT PROJECT SPECIFIC NOISE LEVEL	SCENARIO 1		SCENARIO 2	
			STANDARD	NOISE ENHANCING	STANDARD	NOISE ENHANCING
R01	Brolgan Road	35	**37**	**40**	35	**38**
R02	664 Brolgan Road	35	27	30	26	29
R03	761 Brolgan Road	35	<25	<25	<25	<25
R04	812 Brolgan Road	35	<25	<25	<25	<25
R05	844 Brolgan Road	35	<25	<25	<25	<25
R06	890 Brolgan Road	35	<25	<25	<25	<25
R07	Keiths Lane	35	<25	<25	<25	<25

RECEIVER	ADDRESS	MOST STRINGENT PROJECT SPECIFIC NOISE LEVEL	SCENARIO 1		SCENARIO 2	
			STANDARD	NOISE ENHANCING	STANDARD	NOISE ENHANCING
R08	184 Coopers Road	35	<25	26	<25	26
R09	London Road	35	<25	<25	<25	<25
R10	396 London Road	35	<25	<25	<25	<25
R11	132 Brolgan Road	37	<25	<25	25	28
R12	144 Brolgan Road	37	<25	<25	27	30
R13	437 Henry Parkes Way	37	<25	<25	36	**39**
R14	459 Henry Parkes Way	37	<25	<25	**39**	**42**
R15	501 Henry Parkes Way	37	<25	<25	**39**	**42**
R16	629 Henry Parkes Way	37	<25	<25	31	34
R17	641 Henry Parkes Way	37	<25	<25	30	34
R18	43 Millers Lookout Road	37	<25	<25	29	32
R19	65 Millers Lookout Road	37	<25	26	32	35
R20	60 Millers Lookout Road	37	<25	25	30	33
R21	8 Millers Lookout Road	37	<25	<25	27	30
R22	893 Henry Parkes Way	37	<25	<25	<25	<25
R23	822 Henry Parkes Way	37	<25	<25	<25	<25
R24	796 Back Trundle Road	37	<25	<25	<25	<25
R25	696 Back Trundle Road	37	<25	<25	<25	<25
R26	679 Back Trundle Road	37	<25	<25	<25	<25
R27	613 Back Trundle Road	37	<25	<25	<25	<25
R28	29 Nanardine Lane	37	<25	<25	<25	<25
R29	41 Nanardine Lane	37	<25	<25	<25	<25
R30	513 Back Trundle Road	37	<25	<25	<25	25
R31	465 Back Trundle Road	37	<25	<25	<25	27
R32	425 Back Trundle Road	37	<25	<25	<25	26
R33	397 Back Trundle Road	37	<25	<25	<25	25
R34	Back Trundle Road	37	<25	<25	<25	25
R35	319 Back Trundle Road	37	<25	<25	<25	26
R36	317 Back Trundle Road	37	<25	<25	<25	26

RECEIVER	ADDRESS	MOST STRINGENT PROJECT SPECIFIC NOISE LEVEL	SCENARIO 1		SCENARIO 2	
			STANDARD	NOISE ENHANCING	STANDARD	NOISE ENHANCING
R37	362 Henry Parkes Way	37	<25	<25	25	28
R38	364 Henry Parkes Way	37	<25	<25	26	29
R39	436 Henry Parkes Way	37	<25	<25	29	33
R40	408 Henry Parkes Way	37	<25	<25	26	29
R41	357 Henry Parkes Way	37	<25	<25	26	29
R42	349 Henry Parkes Way	37	<25	<25	25	28
I01	249 Brolgan Road	65	<25	27	32	35
I02	Woolstore Place	65	<25	<25	<25	27
I03	104 Brolgan Road	65	<25	<25	<25	27

4.4.1 MODIFYING FACTORS

In accordance with the NPfI, where a noise source contains certain characteristics, such as tonality, intermittency, irregularity or dominant low frequency content, it can cause greater annoyance than other noise at the same noise level. The NPfI Fact Sheet C should be used for assessment of modifying factors.

A review of any potential annoying characteristics, including low frequency for the Proposal has been undertaken using NPfI Fact Sheet C. The predicted noise levels did not indicate that any adjustments were warranted.

4.5 MAXIMUM NOISE LEVELS

The assessment of the potential for sleep disturbance during the night-time period is detailed in the NPfI. Sleep disturbance is generally triggered by single transient noise events, which for the Proposal may include train horns, train passby on the private access tracks, trucks and forklifts reverse beepers (if tonal), trucks air brake release and impact noise generated when moving and banging containers within the terminal. Maximum sound power levels for the transient events under investigation as well as minimum distance for compliance with the sleep disturbance criteria are listed in Table 4-4.

The location of the receivers relative to the site can be found in the project layout figure in Figure 1.1.

Table 4-4 Transient events and minimum distance for compliance

EVENT	MAXIMUM SOUND POWER LEVEL, dBA	SLEEP DISTURBANCE SCREENING CRITERIA L_{Fmax}, dBA	COMPLIANCE DISTANCE
Train horn	145	52	> 10 km
Reverse beepers	105		~ 230 m
Trucks air brake release	118		~ 950 m
Containers banging noise	118		~ 950 m
Train passby	118		~ 950 m

At this stage of the project, it is unclear if public address systems and truck horns will be used, and therefore, these have not been assessed.

4.6 ASSESSMENT OF PREDICTED NOISE LEVELS

4.6.1 EQUIVALENT NOISE LEVELS

The predicted operational noise levels are assessed against the most stringent project noise trigger levels. For residential receivers this is the night-time period. For industrial receivers, this is whenever they are in use.

Generally, receivers were predicted to experience noise levels below the trigger levels. Four residential receivers were predicted to experience noise levels that exceed the most stringent trigger levels as follows:

- R01 during scenario 1 by 2 dB and 5 dB under standard and noise enhancing conditions respectively. Also by 3 dB in scenario 2 under noise enhancing conditions.
- R13 during scenario 2 by 2 dB under noise enhancing conditions
- R14 and R15 during scenario 2 by 2 dB during standard conditions and 5 dB under noise enhancing conditions

The primary cause of the exceedances for receivers R13, R14 and R15 was the train passby on the northern access track. For receiver R01, the exceedances are caused by the train entering the terminal on the southern road, the locomotive idling and the diesel reach stacker.

In line with the NPfI, where project specific noise levels are exceeded reasonable and feasible noise mitigation should be investigated and following mitigation, an assessment of the significance of residual impacts is performed.

4.6.2 MAXIMUM NOISE LEVELS

The maximum noise level trigger is exceeded for all surrounding receivers when the train horn is in use. At this stage of the project, train horns are not expected to be used on-site or on the access tracks. Truck's air release and noise generated by containers banging against each other, on the floor or on a truck platform were also predicted to marginally exceed the sleep disturbance criterion for receiver R01 by up to 1 dB under standard meteorological conditions and up to 4 under noise enhancing.

For train passbys, the maximum noise levels were predicted to exceed the criterion at R14. The highest predicted noise level was L_{max} 56 dBA at R14 for a train passby. The number of passbys is likely to be up to 2 per 24 hour period, therefore these events are not likely to occur frequently throughout the night. Additional guidance in the RNP on sleep disturbance, may be used in line with the NPfI.

The RNP uses World Health Organisation and other research to provide context for how maximum noise levels may affect sleep. The RNP concludes that internal noise levels of below 50-55 dBA are unlikely to awaken people from sleep. Using

a 10 dB correction to convert external noise levels to internal noise levels, as per the NPfI, the highest predicted maximum noise level is 46 dBA at R14. According to the RNP, the risk of sleep disturbance is unlikely at R1 and R14.

Furthermore, receiver R14 is located adjacent to an existing freight rail line and would likely already experience maximum noise levels of similar or greater magnitudes from existing rail movements, and potential future movements from increases in rail traffic due to the Inland Rail project. Therefore the potential increase in maximum noise levels impacts is considered limited compared with the existing noise conditions at these receivers.

In consideration of the above, further investigation of mitigation measures is not considered necessary for maximum noise levels.

4.7 VIBRATION

Significant operational vibration is not expected to be generated from the proposed activities and no further assessment is required.

4.8 MITIGATION MEASURES

As there are predicted exceedances of the project noise trigger levels, feasible and reasonable mitigation should be investigated during the design stage to reduce noise emission towards the project noise trigger levels for receiver R1. Noise management and mitigation measures should include consideration of the following:

- On-site shielding, such as buildings, mounds and container stacks.
- Limit the use of scissor lifts, forklift, mobile crane during the evening and night-time.
- Switch off truck and locomotive engine when not in use.
- Use an electric reach stacker instead of a diesel reach stacker.
- Use of broadband reversing alarms for all equipment on site to minimise the emission of tonal noise from the site.
- Use hydraulic-braked trucks at night and minimise use of engine compression breaking.
- Provide training to operators to minimise noise generated during loading / unloading activities, specifically to avoid banging containers.
- Avoid any irregular surfaces such as wheel cleaning rumble bars on the ground to avoid noise when vehicles run over them.
- Movements and operations on the access tracks should be such that bunching and stretching noise should be minimised.
- Locomotive operators should select locomotives with reduced noise levels.

For receivers R13, R14 and R15, the main cause of the trigger level exceedances is the train passby on the northern access track. The control of noise at source is governed by the train and the tracks. Reducing locomotive and wagon noise levels is however not considered feasible as the noise levels are controlled by ARTC network requirements.

Furthermore, these exceeding receivers are spaced at least 300 m apart, this means that in order to substantially reduce noise levels at the receivers, mitigation measures for the trackform, or barriers would be required to cover a large distance that it would not be considered a reasonable option.

In assessing further reasonable and feasible mitigation measures, the level of exceedance has been investigated. The largest exceedance at receivers R1, R13, R14 and R15 is 5 dB under noise enhancing conditions. This suggests that controls at the receivers should be investigated during assessment of subsequent stages of the design.

As far as train horn is concerned, these are used as a warning device for emergencies only and given the noise level generated on-site, are likely to exceed the maximum noise levels in the Work Health and Safety Regulations 2011 for staff on-site. Therefore, it is expected train horn will not be used and alternative warning devices such as on-site public address system or safety procedure will be implemented to minimise the noise impact on-site and on the surrounding receivers.

5 CONSTRUCTION NOISE AND VIBRATION

This section describes the potential noise and vibration impacts associated with the construction of the facility.

5.1 ASSESSMENT SCENARIOS

Detailed construction activities and schedules are not available at this stage of the project. Construction works are expected to take place over a six to nine-month period with hours of operation to be between 7am and 5pm Monday to Friday and between 8am and 1pm on Saturdays.

WSP identified typical noise generating activities for the project and defined the following worst-case scenarios and equipment.

Table 5-1 Construction assessment scenarios

SCENARIO	EQUIPMENT
1 - Site establishment and delivery of materials	Trucks, tip trucks, mobile crane, front end loader
2 - Bulk earthworks	Scraper, grader, excavator, rock breaker
3 - Trenches / Utilities	Backhoe, crane truck
4 - Pavement/hardstand	Vibrating roller, steel drum roller
5 - Buildings	Large crane, power tools, hand tools, light tower
6 - Rail tracks	Mobile crane, hand tools, compactor, vibratory roller, compressor, rail tamper, ballast tamper,

5.2 ASSESSMENT METHOD

Noise levels from construction activities have been predicted at the nearest receiver types in each noise catchment area. As a worst-case scenario, each item of plant in the scenario has been assumed to be operating simultaneously and at the closest point to the receiver.

In addition, certain activities are specified by the ICNG to require the addition of 5 dB to the predicted level to account for the “annoying” characteristics of the noise produced. These activities include the use of rock breaker, vibratory roller, rail and ballast tampers.

5.3 NOISE SOURCE LEVELS

The noise sources levels for each item of plant used in each scenario are presented in Table 5-2. Noise levels were sourced from Australian Standard AS 2436, TfNSW Construction Noise Strategy and WSP database.

Table 5-2 Construction equipment sound power levels

PLANT	SWL, dBA	USAGE FACTOR	1	2	3	4	5	6
Truck	107	10%	X					
Tip truck	117	10%	X					
Mobile crane	104	75%	X					X
Front end loader	113	75%	X					
Scraper	116	50%		X				
Grader	110	75%		X				
Excavator	107	75%		X				
Rock breaker [1]	118	25%		X				
Backhoe	104	75%			X			
Crane truck	104	25%			X			
Vibratory roller [1]	108	75%				X		X
Steel drum roller	108	75%				X		
Crane	105	75%					X	
Power tools	105	25%					X	
Hand tools	100	50%					X	X
Light tower	80	100%					X	
Compactor	113	75%						X
Compressor	101	75%						X
Rail tamper [1]	114	50%						X
Ballast tamper [1]	115	50%						X
Total SWL, dBA			113	117	104	110	106	117

Note 1: Equipment used for activities proven to be particularly annoying to nearby residents according to the ICNG.

5.4 PREDICTED NOISE LEVELS

Table 5-3 presents the predicted worst-case construction noise levels for receivers located in NCA1, NCA2 and industrial receivers. Values in bold and italic show exceedance of the noise management level.

Table 5-3 Predicted construction noise levels

REC	NOISE MANAGEMENT LEVEL, dBA	SHORTEST DISTANCE BETWEEN ACTIVITIES AND RECEIVERS, m PREDICTED NOISE LEVELS, $L_{eq,15min}$, dBA					
	STANDARD HOURS	1 SITE EST.	2 [1] EARTHWORKS	3 UTILITIES	4 [1] PAVEMENT	5 BUILDING	6 [1] TRACKS
NCA1	40	***1000m*** ***46***	***400m*** ***62***	**400m** **44**	***800m*** ***49***	900m 39	***400m*** ***62***
NCA2	43	2000m 39	***400m*** ***62***	**400m** **44**	***1000m*** ***47***	2200m 31	***400m*** ***62***
I01	75	1800m 40	1300m 51	1300m 34	1300m 45	2000m 32	1300m 52
I02	75	3200m 35	2600m 45	2600m 28	2600m 38	3500m 27	2600m 46
I03	75	3600m 34	2600m 45	2600m 28	2600m 38	3700m 26	2600m 46

Note 1: Includes a +5 dB penalty to account for equipment proven to be particularly annoying to nearby residents according to the ICNG.

5.5 MAXIMUM NOISE LEVELS

Construction works are proposed to be undertaken during standard construction hours, therefore, an assessment of maximum noise levels is not required.

5.6 ASSESSMENT OF PREDICTED NOISE LEVELS

The worst case predicted noise levels presented in Table 5-3 indicate the following impacts:

- exceedance of the standard hours management noise levels in NCA1 for scenarios 1, 2, 3, 4 and 6
- exceedance of the standard hours management noise levels in NCA2 for scenarios 2, 3, 4 and 6.

The maximum predicted exceedance is 22 dB. WSP predicted the following distance to compliance for each scenario. All receivers further than the compliance distance are predicted to comply with the noise management levels.

Table 5-4 Distance for compliance with noise management levels

	1 SITE EST.	2 EARTHWORKS	3 UTILITIES	4 PAVEMENT	5 BUILDING	6 TRACKS
Distance to comply with SH NML	1400m	1900m	450m	900m	550m	2000m

5.7 VIBRATION

The significant vibration generating equipment is expected to be as follows:

- rock breaker (equivalent to excavator mounted hammer)
- vibratory roller / compactor

The TfNSW Construction Noise Strategy includes safe working distances for human comfort and building damage as for the above equipment.

Table 5-5 presents the indicative safe working distances for cosmetic damage for standard structures in addition to human comfort. The nearest receiver is located within 400m of the closest construction activities and 800m from the hardstand and building, and therefore, construction vibration is not expected to have a negative impact.

However, site specific safe working distances should be developed on site as the propagation of vibration is highly dependent on local ground conditions and specific equipment being used. Where work is proposed within the safe working distances, mitigation and management measures should be implemented to ensure that vibration can be controlled to appropriate levels. In the event heritage listed structures are identified within 50m of the construction works, these should be assessed on a case by case basis and the condition of the items considered when setting vibration limits.

Table 5-5 Recommended safe working distances from vibration intensive plant

PLANT ITEM	RATING	SAFE WORKING DISTANCE, m	
		COSMETIC DAMAGE	HUMAN COMFORT
Vibratory roller	<50kN (1-2 tonnes)	5	15-20
	<100kN (2-4 tonnes)	6	20
Rock breaker (excavator mounted)	(300kg 5-12t excavator)	2	7

5.8 MITIGATION AND MANAGEMENT MEASURES

A construction noise and vibration management plan should be developed for the project prior to commencement of works. The management plan would utilise detailed construction methodologies of the contractor and would at a minimum include:

- Identified nearby residences and other sensitive land uses.
- Approved hours of work and what work will be undertaken.
- Significant noise and vibration generating activities.
- Details of noise mitigation and management measures to be applied.
- Information for worker training to minimise noise impacts.
- Community consultation protocol(s).
- Complaints handling protocol(s).
- Construction works should be planned and carried out during standard construction hours wherever possible.

The following sections present standard mitigation measures contained within the TfNSW Construction Noise Strategy, which deals with similar types of project to the Proposal which should be considered as mitigation measures as part of the noise management plan.

5.8.1 MANAGEMENT CONTROLS

The mitigation management measures outlined in Table 5-6 should be implemented where reasonable and feasible to reduce the disturbance to the nearby receivers during the project.

Table 5-6 Management controls

ACTION	DETAILS
Working hours	Construction activities should be undertaken during recommended standard hours unless otherwise approved. To be included in Project Induction and Pre Start Briefings, Toolbox Talks etc. Work generating high noise levels should be scheduled during less sensitive time periods.
Implementation of any project specific mitigation measures required.	In addition to the measures set out in this table, any project specific mitigation measures identified in this report.
Implement community consultation measures	Periodic notification (monthly letterbox drop or equivalent), website, Project Infoline, Construction Response Line, email distribution list.
Site inductions	All employees, contractors and subcontractors are to receive an environmental induction. The induction must at least include: — All relevant project specific and standard noise and vibration mitigation measures — Relevant licence and approval conditions — Permissible hours of work — Any limitations on high noise generating activities — Location of nearest sensitive receivers — Construction employee parking areas — Designated loading/unloading areas and procedures — Site opening/closing times (including deliveries) — Environmental incident procedures.
Behavioural practices	No swearing or unnecessary shouting or loud stereos/radios on site. No dropping of materials from height, throwing of metal items and slamming of doors.
Noise monitoring	A noise monitoring program should be carried out for the duration of works in accordance with the Construction Noise and Vibration Management Plan.
Vibration monitoring	Attended vibration measurements shall be undertaken at all buildings within 20m of vibration generating activities when these activities commence to confirm that vibration levels are within the acceptable range to prevent cosmetic building damage.
Respite periods	Restricting time when noisy work is carried out. High noise and vibration generating activities may only be carried out in continuous blocks, not exceeding 3 hours each, with a minimum respite period of 1 hour between each block.

5.8.2 SOURCE CONTROLS

The source noise mitigation measures outlined in Table 5-7 should be implemented where reasonable and feasible to reduce the disturbance to the nearby receivers during the project.

Table 5-7 Source controls

ACTION	DETAILS
Equipment selection	All fixed plant at the work sites should be selected to be as quiet as practicable and where required, fitted with silencers, acoustical enclosures and other noise attenuation measures.
Equipment selection	Use quieter and less vibration emitting construction methods where feasible and reasonable.
Maximum noise levels	The noise levels of plant and equipment must have operating sound power or sound pressure levels that would meet the predicted noise levels.
Rental plant and equipment	Noise emissions should be considered as part of the selection process.
Use and siting of plant	Avoid simultaneous operation of noisy plant within discernible range of a sensitive receiver. The offset distance between noisy plant and adjacent sensitive receivers is to be maximised. Plant used intermittently to be throttled down or shut down. Plant and vehicles to be turned off when not in use. Noise-emitting plant to be directed away from sensitive receivers.
Plan worksites and activities to minimise noise	Plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site. Prevent vehicles and plant queuing to access site.
Non-tonal reversing alarms	Non-tonal reversing beepers (or an equivalent mechanism) will be fitted and used on all construction vehicles and mobile plant used on site.
Minimise disturbance arising from delivery of goods to construction sites	Loading and unloading of materials/deliveries is to occur as far as possible from sensitive receivers. Site access points and roads as far as possible away from sensitive receivers will be used. Dedicated loading/unloading areas to be shielded if close to sensitive receivers. Delivery vehicles to be fitted with straps rather than chains for unloading, wherever possible. Delivery to occur during standard hours where possible.
Construction related traffic	Schedule and route vehicle movements away from sensitive receivers and during less sensitive times Limit the speed of vehicles and avoid the use of engine compression brakes Maximise on-site storage capacity to reduce the need for truck movements during sensitive times
Silencers on mobile plant	Where possible reduce noise from mobile plant through additional fittings including: — Residential grade mufflers — Damped hammers such as “City” Model Rammer Hammers — Air Parking brake engagement is silenced

ACTION	DETAILS
Hand tools	As much as practical the use of hand tools will be used in specifically designated areas as far as possible from sensitive receivers and preferably separated by a barrier. Metal on metal contact will be avoided where possible.

5.8.3 PATH CONTROLS

The noise mitigation path controls outlined in Table 5-8 outlined should be implemented in order to reduce the disturbance to the nearby receivers during the project.

Table 5-8 Path controls

ACTION	DETAILS
Shield stationary noise sources	Stationary noise sources should be enclosed or shielded whilst ensuring that the occupational health and safety of workers is maintained.
Shield sensitive receivers from noisy activities	Use structures to shield residential receivers from noise such as site shed placement; earth bunds; fencing; erection of operational stage noise barriers (where practicable) and consideration of site topography when situating plant.
Acoustic barriers	Erecting barriers on site at source where practical will be considered to reduce the impact of noise at receivers. AS 2436 identifies the options for barriers to reduce noise emissions from construction sites.

6 OFF SITE ROAD TRAFFIC NOISE

The potential for the Proposal to generate additional traffic on the surrounding roads is considered in this section. There is limited information available at this stage of the project with regard to haulage routes, therefore, only the traffic on Brolgan Road is considered and a screening assessment is conducted.

6.1 EXISTING TRAFFIC

A detailed traffic survey has been conducted by Trans Traffic Survey on behalf of WSP between Thursday 30 November and Wednesday 20 December.

The weekly daytime and night-time average number of vehicles over the 3-week period are as follows:

- Daytime: 209 vehicles in both directions, including 12.1% of heavy vehicles
- Night-time: 13 vehicles in both directions, including less than 1% of heavy vehicles

6.2 OPERATION

Vehicles that are typically expected to access the site once operational would be a combination of semi-trailers and B-doubles delivering or picking up containers as well as staff passenger vehicles and water and sewage service trucks. In total, the Parkes Logistics Terminal is expected to generate approximately 200 vehicle movements each day, including a maximum of four heavy vehicle movements. On average, it is assumed that there would be a total number of 98 people on-site per day, with a maximum of 31 people per shift.

As discussed in Section 4.3, it is assumed that all activities occur at the same rate through each shift, and activities are independent of the shift. At this stage of the project, traffic distribution patterns are not known and it is assumed that the off-site traffic is split 25% to the west and 75% to the east of the site on Brolgan Road. Therefore, it is anticipated that vehicles movements are distributed as follows.

Table 6-1 Vehicles movements on Brolgan Road - Operation

DIRECTION	DAY 7AM-10PM		NIGHT 10PM-7AM	
	LIGHT VEHICLES	HEAVY VEHICLES	LIGHT VEHICLES	HEAVY VEHICLES
Westbound	31	1	18	Up to 1
Eastbound	92	2	55	Up to 1

6.3 CONSTRUCTION

During construction, it is anticipated that approximately 100 vehicle movements will occur per day between 7am and 6pm with approximately 60% being light vehicles and 40% being heavy vehicles (typically 10 tonnes and semi-trailer trucks during site establishment, earthworks and supply of goods).

Similar to operations, it is assumed that the off-site traffic is split 25% to the west and 75% to the east of the site on Brolgan Road. Therefore, it is anticipated that vehicles movements are distributed as follows.

Table 6-2 Vehicles movements on Brolgan Road - Construction

DIRECTION	DAY 7AM-10PM (TRAFFIC BETWEEN 7AM AND 6PM)	
	LIGHT VEHICLES	HEAVY VEHICLES
Westbound	15	10
Eastbound	45	30

6.4 ASSESSMENT

In order to generate an increase of more than 2 dB, the traffic volume needs to increase by more than 60%. Given the predicted vehicles movements for operations and construction works presented in Sections 6.2 and 6.3, an increase of more than 2 dB for receivers on Brolgan Road is not considered likely for daytime operations and construction works.

As far as traffic at night is concerned, an increase of 150% westbound and 450% eastbound is expected on Brolgan Road. Receivers along Brolgan Road currently experience less than 13 vehicles per night, including no trucks (2 occasional two axle trucks movements were recorded at 6am over a 3 weeks traffic counting period) and road traffic noise $L_{eq,9h}$ is 45 dBA. Given the proposed maximum traffic at night (31 westbound and 78 eastbound) and the distance from the receivers to the road (exceeding 80m), the expected maximum traffic noise increase is approximately 6 to 7 dB and therefore, compliance with RNP criteria listed in Table 3-5 is expected.

WSP recommends a detailed road traffic noise assessment is undertaken when detailed traffic volumes and proposed haulage routes for operations and construction works are available.

7 SUMMARY OF ENVIRONMENTAL NOISE AND VIBRATION IMPACTS

The predicted impacts with the mitigation recommended in Section 4.8 and Section 5.8 as a result of the Proposal have each been assigned a rating. The rating considers the likelihood of the impact occurring and the magnitude of the impact on the receiving environment. The ratings are defined where one or more of the following conditions are satisfied:

- *negligible*: Where noise levels meet or are 2 dB or less above the noise management levels or project specific noise levels.
- *marginal*: Where noise levels are between 3 and 5 dB above the operational project specific noise levels but below the project amenity noise level.
- *moderate*: where noise levels are between 3 and 5 dB above the operational project specific noise levels and the amenity level, exceedance of the noise management levels for construction, the potential for sleep disturbance to occur or the potential for ground-borne vibration to cause cosmetic damage or to result in 'annoyance' at some point during construction or operation.
- *major*: Operational noise levels are more than 5 dB above the operational project specific noise level, an exceedance of the 'highly noise affected' construction noise management levels, the risk of long-term sleep disturbance or an accepted certainty that ground-borne vibration would have an impact on people or buildings.

Table 7-1 Summary of noise and vibration impacts using recommended mitigation

SOURCE	ASSESSED IMPACT	RECOMMENDED MITIGATION
Operational noise: daytime	Negligible to Moderate	See Section 4.8
Operational noise: evening	Negligible to Moderate	See Section 4.8
Operational noise: night	Negligible to Moderate	See Section 4.8
Operational noise: sleep disturbance	Negligible	See Section 4.8
Operational vibration	Negligible	Not applicable
Operational road traffic: daytime	Negligible	See Section 6.4
Operational road traffic: night	Negligible	See Section 6.4
Construction noise: standard hours	Moderate to Major	See Section 5.8
Construction noise: outside of standard hours	Not applicable	Not applicable
Construction vibration: building damage	Negligible	Not applicable
Construction vibration: human perception	Negligible	Not applicable
Construction road traffic	Negligible	See Section 6.4

8 CONCLUSION

WSP conducted a Noise and Vibration Impact Assessment for the proposed Parkes Logistics Terminal. The purpose of this assessment is to support the Development Application for the Proposal. The following potential impacts have been assessed:

- On-site operational noise (including maximum noise levels)
- On-site operational vibration
- Off-site operational road traffic noise
- Construction noise (including maximum noise levels)
- Construction vibration
- Construction generated road traffic noise.

Operational rail noise and vibration outside the facility is not included in the scope of this assessment.

Based on the information available at this stage, all impacts are predicted to be negligible with the exception of on-site operational noise and construction noise.

Two typical scenarios were assessed for on-site operational noise. Based on these scenarios, exceedance of the on-site operational noise trigger levels is predicted for the nearest receiver R01 and feasible and reasonable mitigation should be investigated for this receiver. Additional exceedances were identified at three receivers R13, R14 and R15 closest to the northern access track. When the design of the terminal is developed further, it shall be designed to meet the requirements listed in the NPfI for all proposed operations.

An analysis of operational maximum noise levels indicated that sleep disturbance effects are unlikely to occur.

Six construction scenarios have been investigated and exceedance of the daytime noise management levels have been predicted for up to four scenarios. The maximum predicted exceedance is 22 dB. A construction noise and vibration management plan utilising detailed construction methodologies of the contractor should be developed for the project prior to commencement of the work.

The screening assessment of off-site road traffic noise was limited to Brolgan Road as haulage routes are not available. The assessment concluded that with the information available to date, an increase of more than 2 dB is unlikely during daytime for operations and construction works, and despite a significant 7 dB increase at night, the road traffic noise levels are expected to meet the RNP night criterion. A detailed road traffic noise assessment should be undertaken when detailed traffic volumes and haulage routes for operations are available.

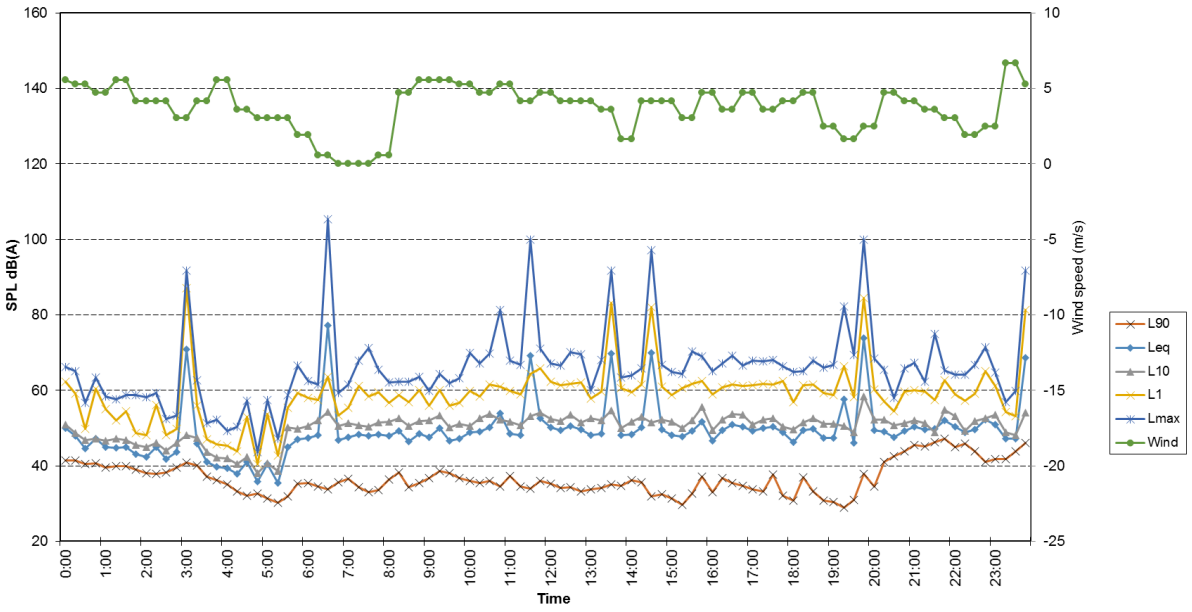
APPENDIX A

NOISE MONITORING DATA

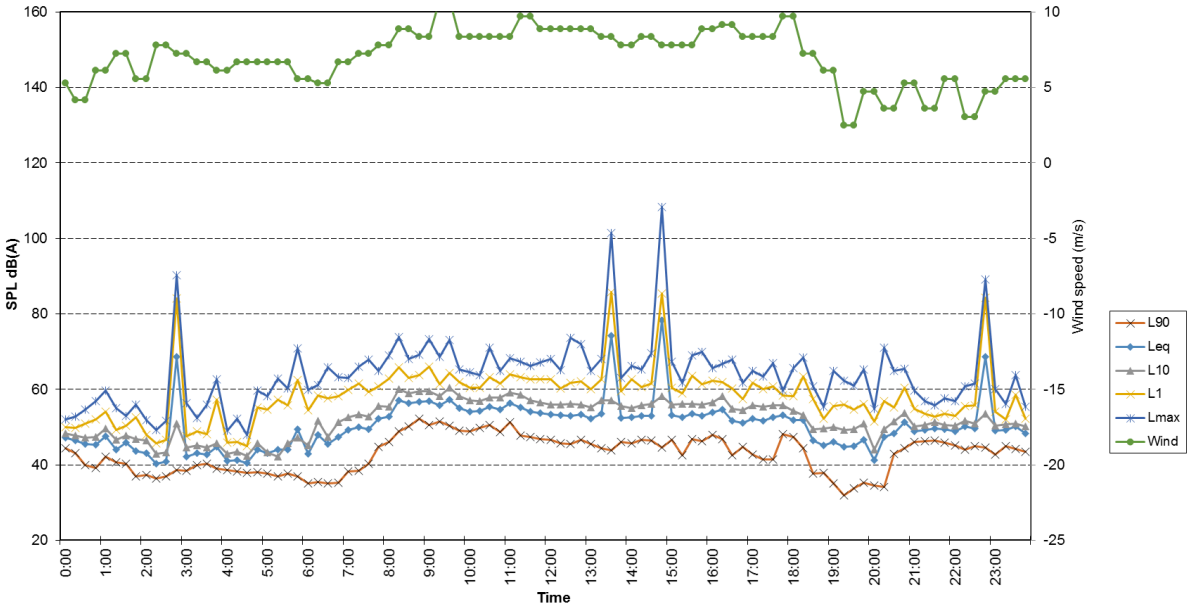
A1 LOCATION NM01 (HENRY PARKES WAY)

Location NM01
Measured Noise Levels - Wednesday 29/11/2017

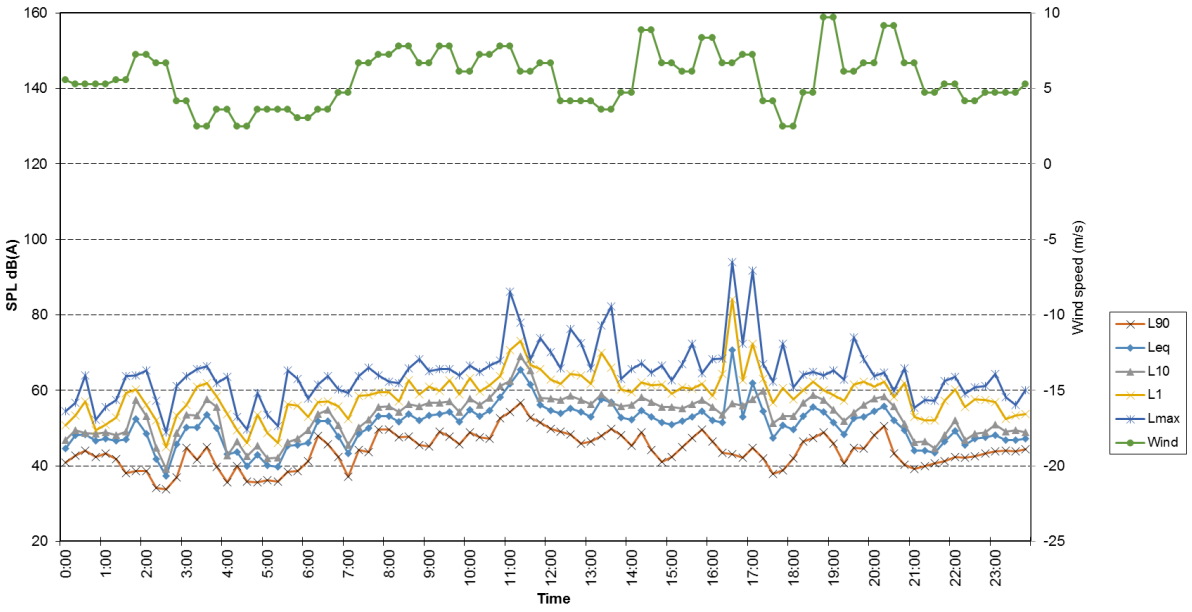
Location NM01
Measured Noise Levels - Thursday 30/11/2017



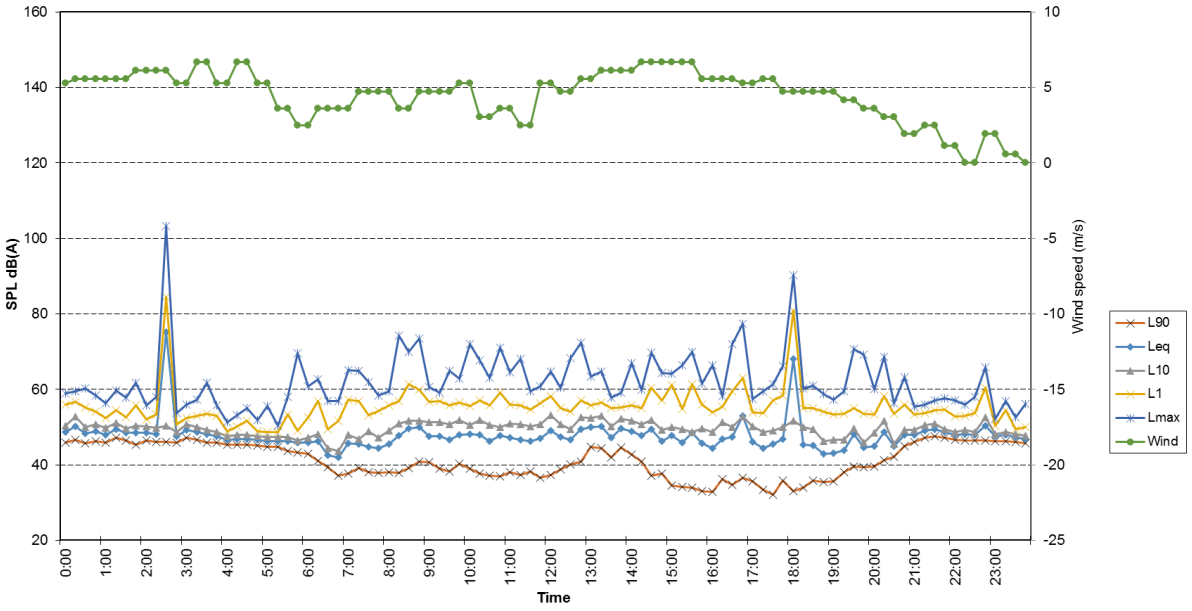
Location NM01
Measured Noise Levels - Friday 01/12/2017



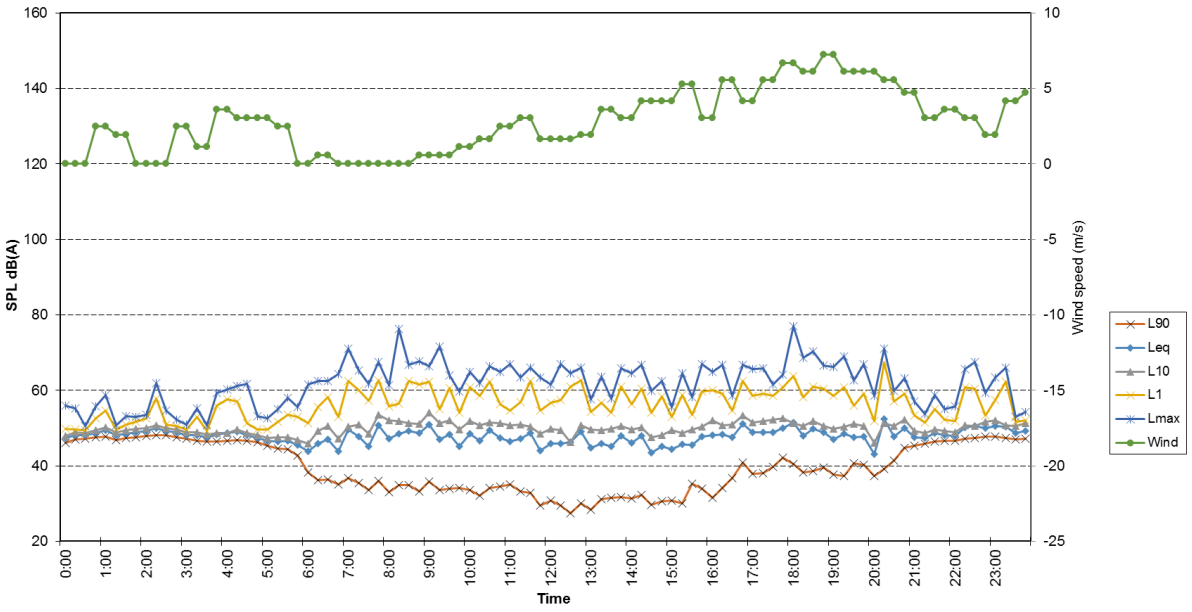
Location NM01
Measured Noise Levels - Saturday 02/12/2017



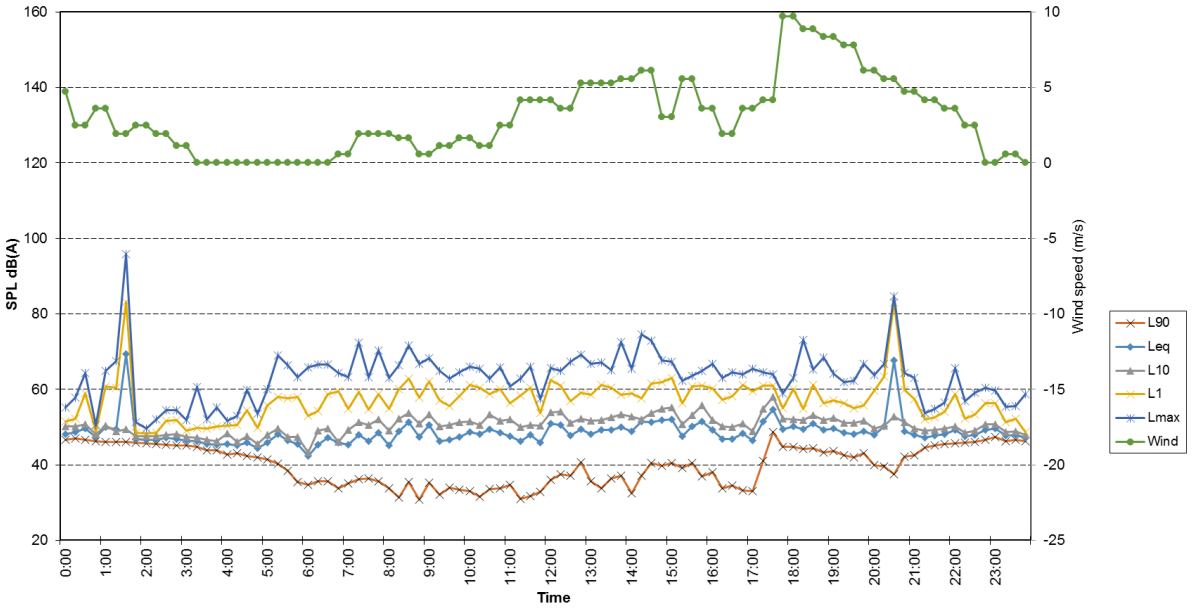
Location NM01
Measured Noise Levels - Sunday 03/12/2017



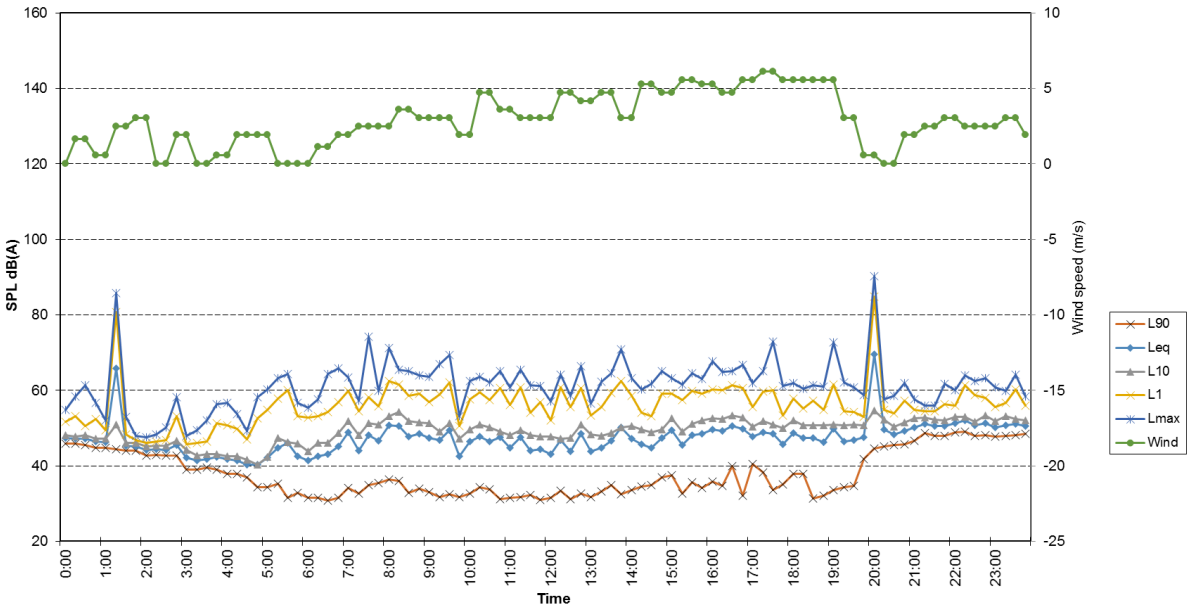
Location NM01
Measured Noise Levels - Monday 04/12/2017



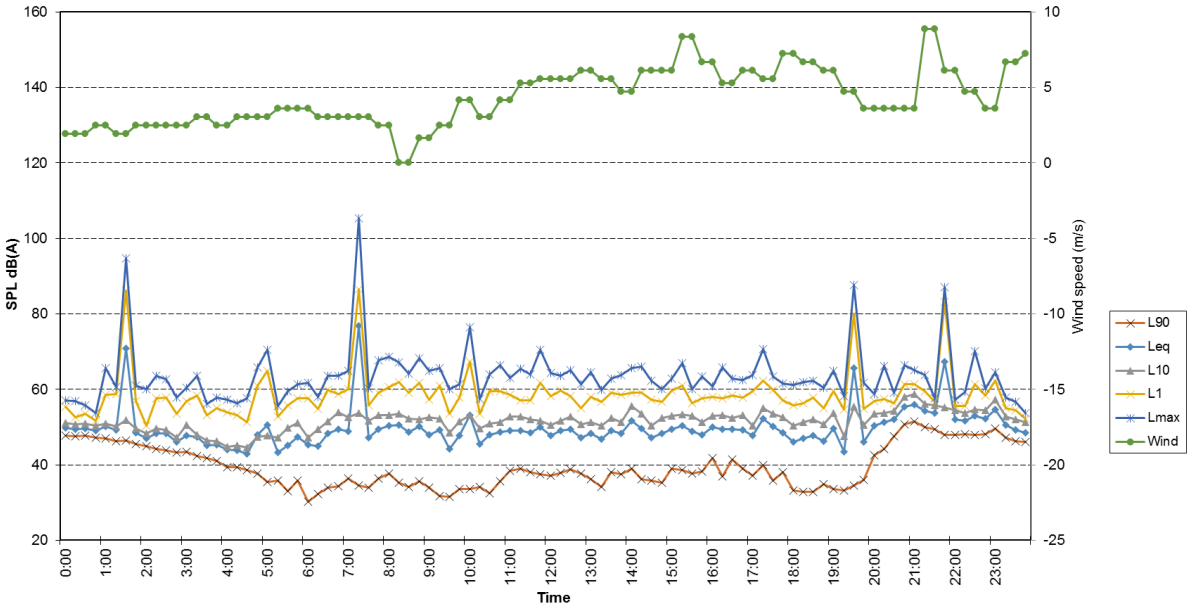
Location NM01
Measured Noise Levels - Tuesday 05/12/2017



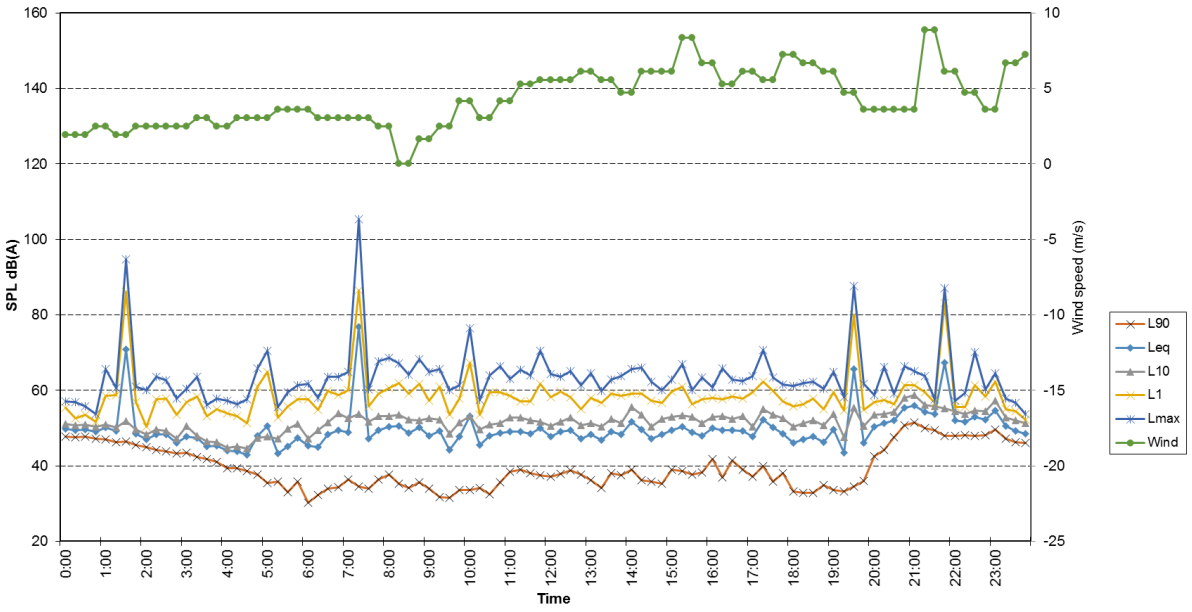
Location NM01
Measured Noise Levels - Wednesday 06/12/2017



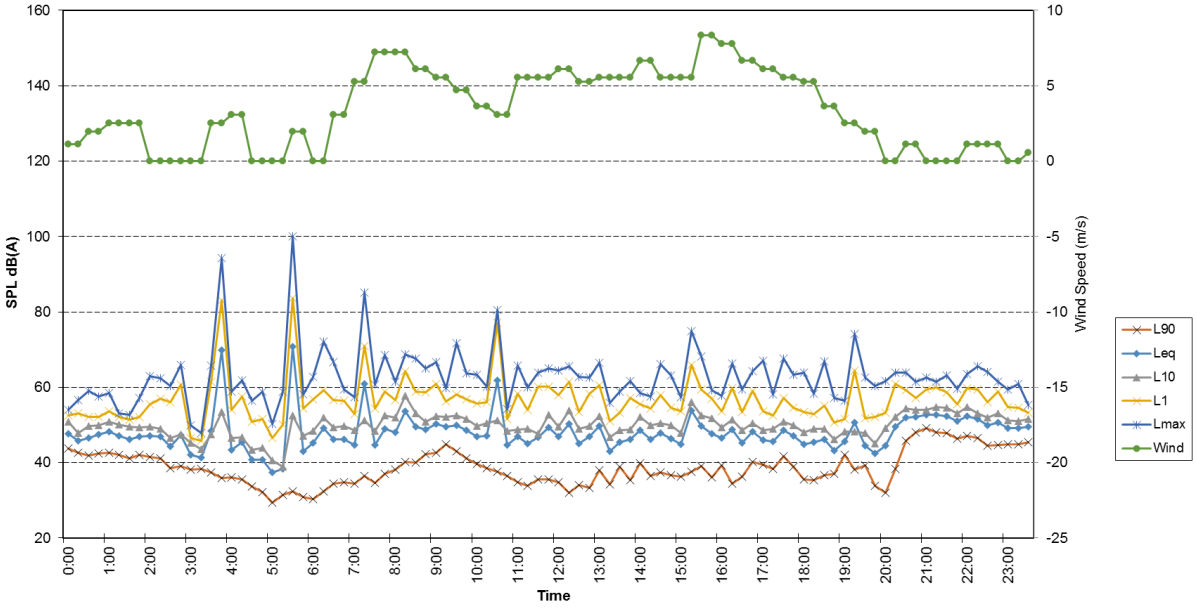
Location NM01
Measured Noise Levels - Thursday 07/12/2017



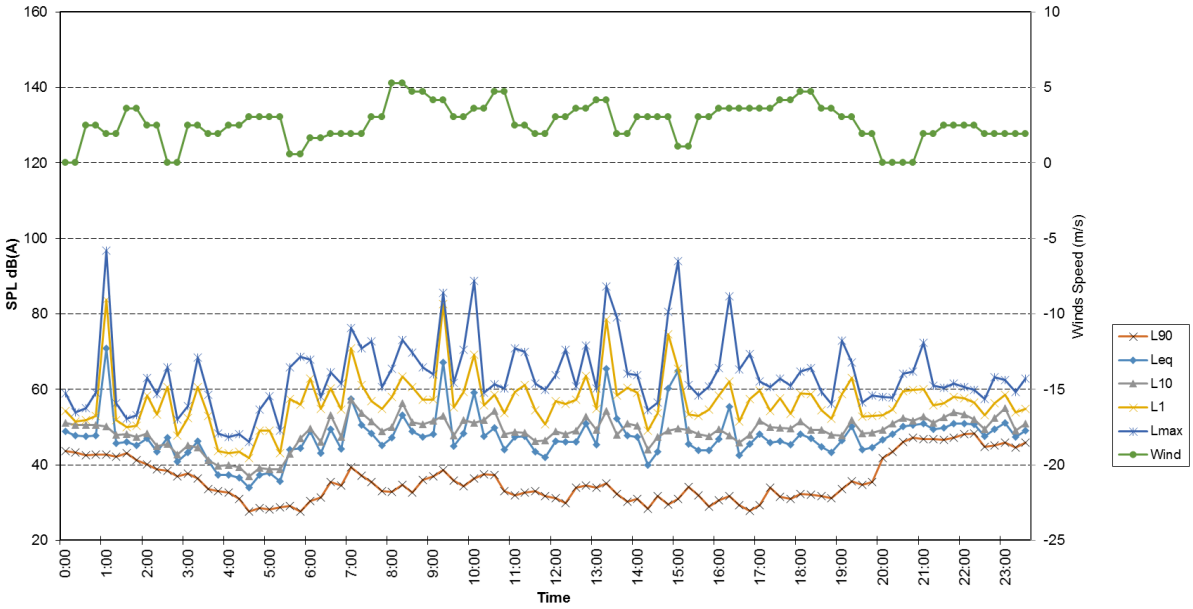
Location NM01
Measured Noise Levels - Thursday 07/12/2017



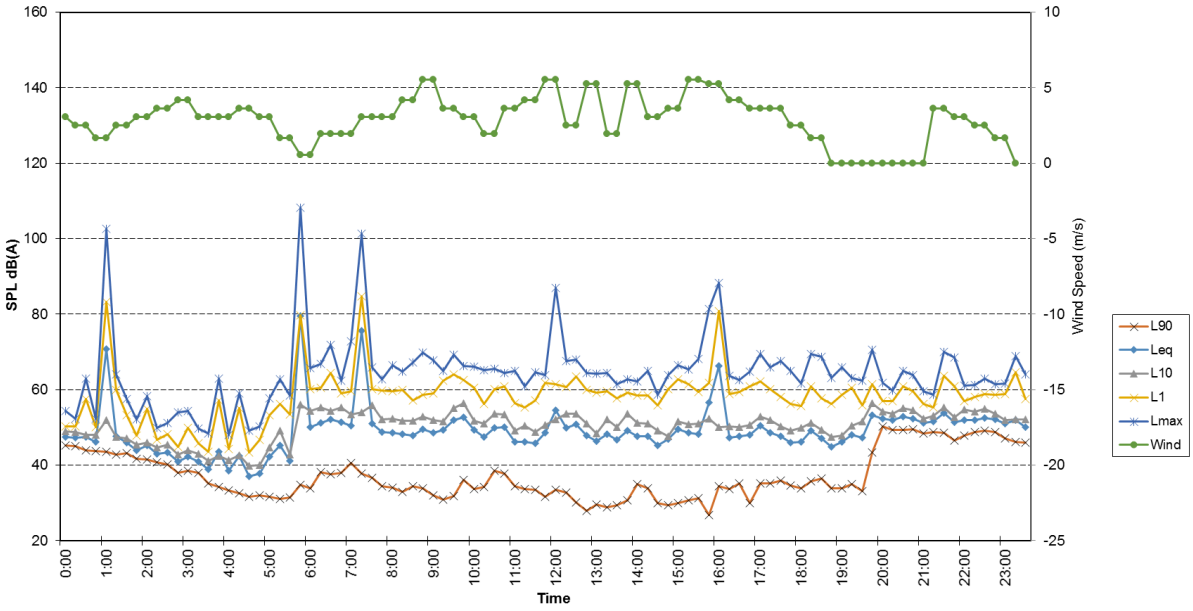
Location NM01
Measured Noise Levels - Saturday 09/12/2017



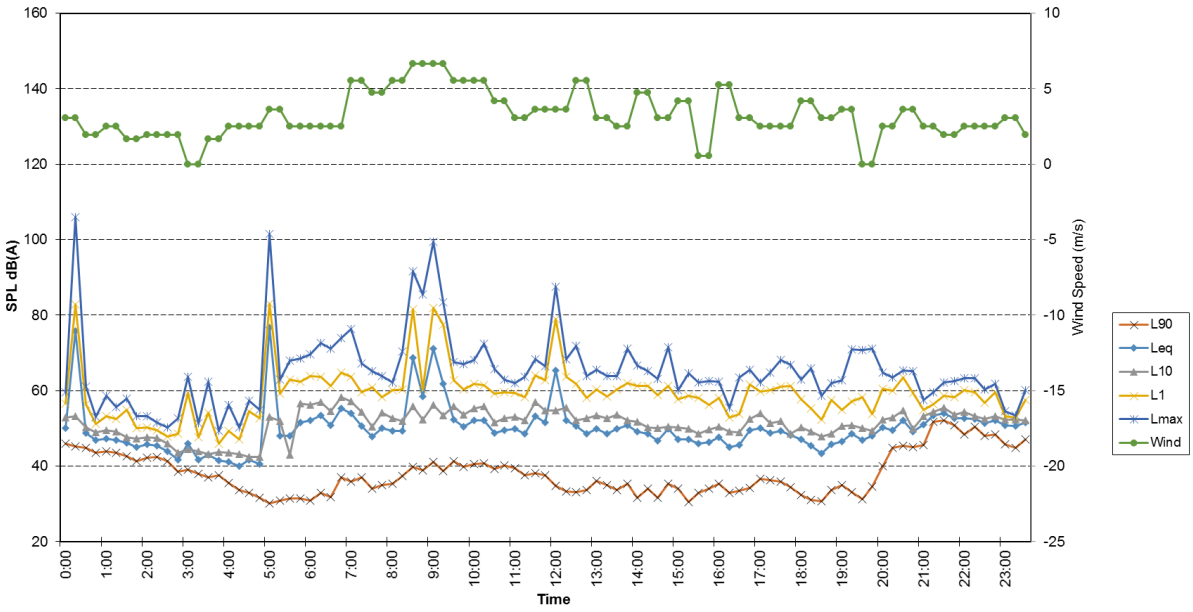
Location NM01
Measured Noise Levels - Sunday 10/12/2017



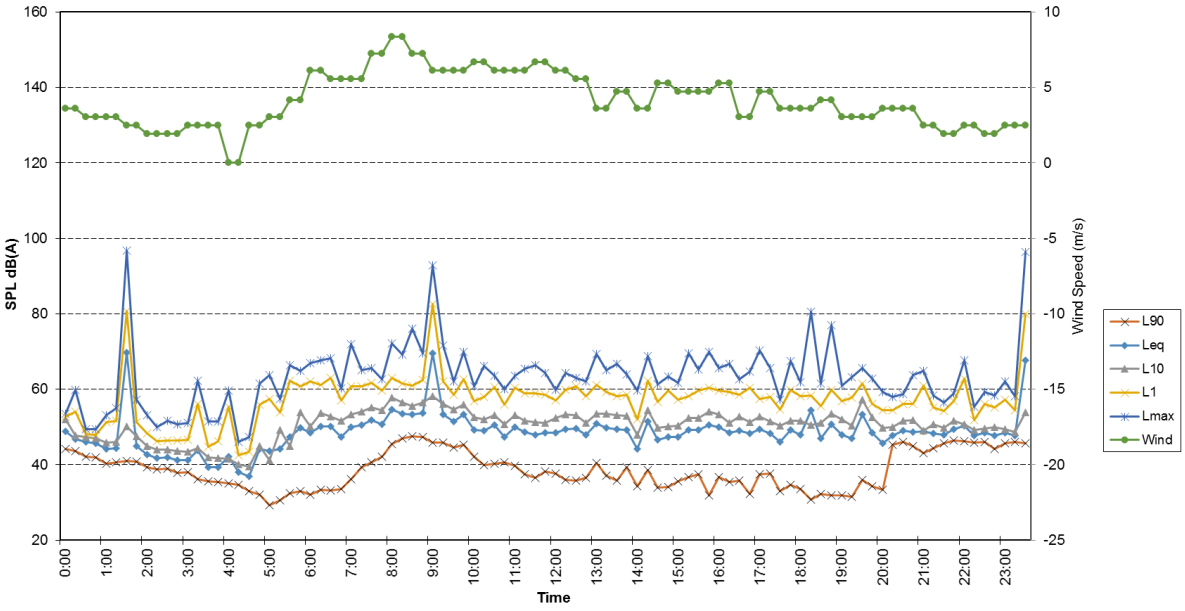
Location NM01
Measured Noise Levels - Monday 11/12/2017



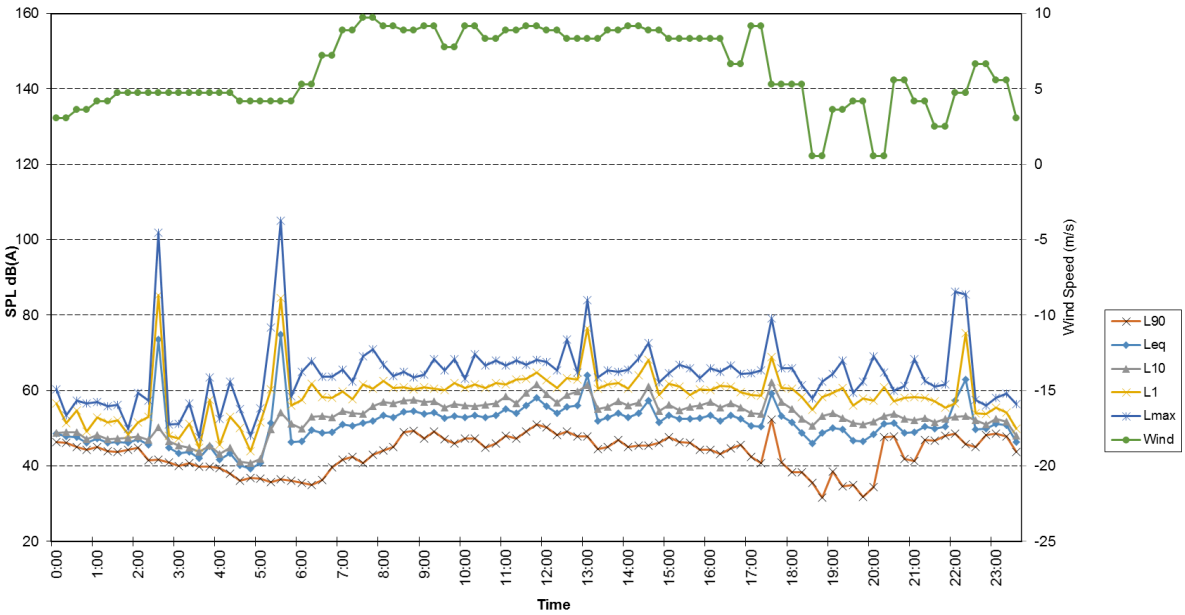
Location NM01
Measured Noise Levels - Tuesday 12/12/2017



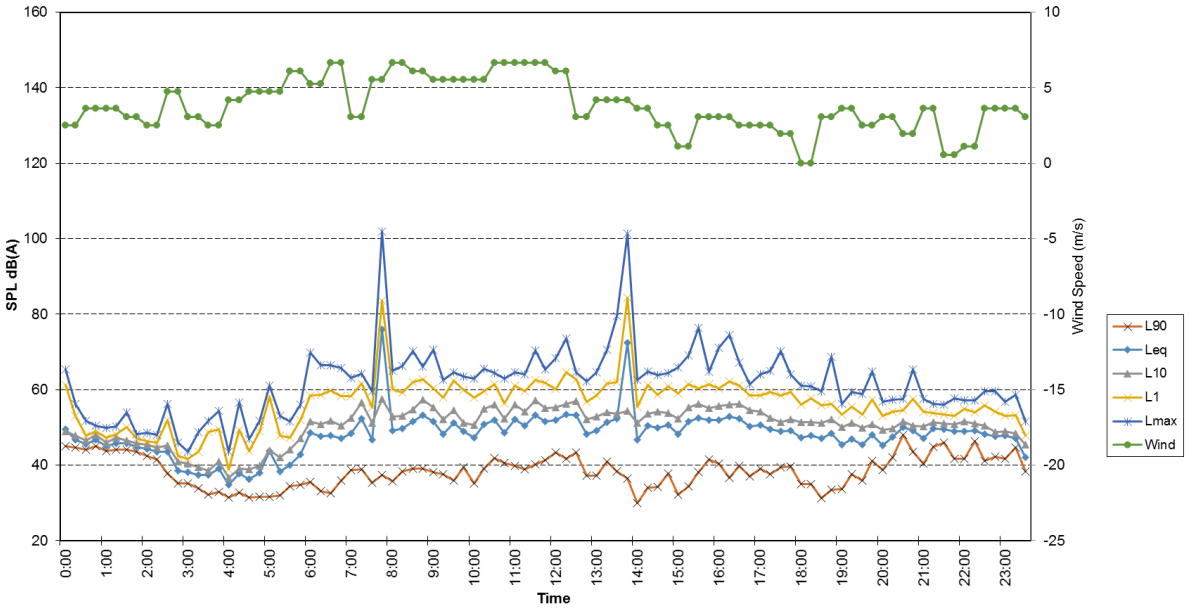
Location NM01
Measured Noise Levels - Wednesday 13/12/2017



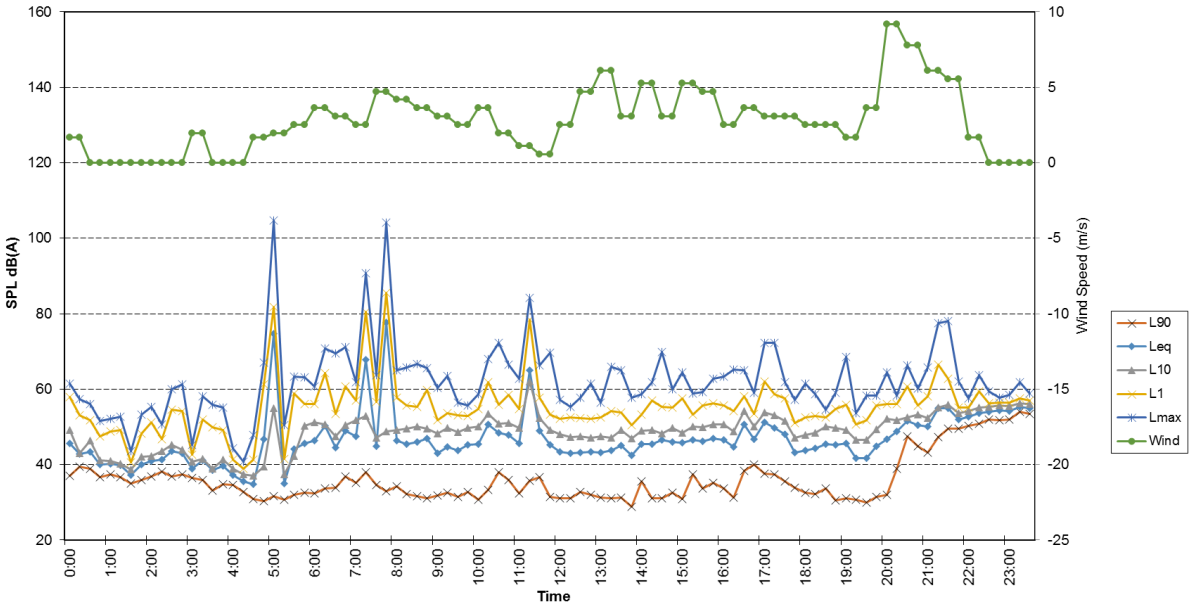
Location NM01
Measured Noise Levels - Thursday 14/12/2017



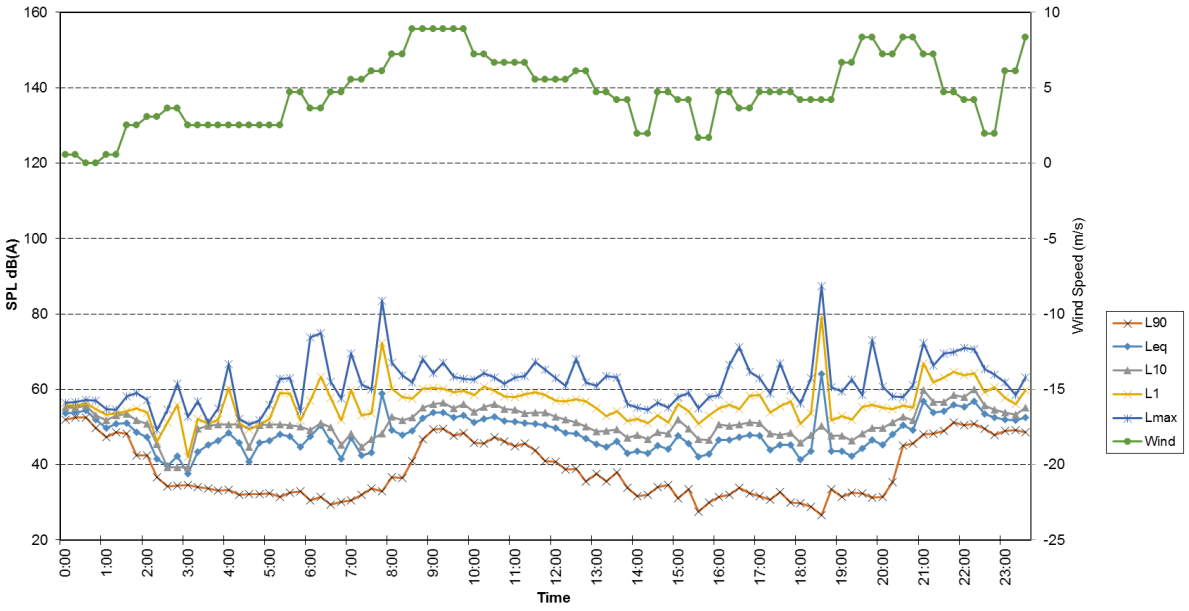
Location NM01
Measured Noise Levels - Friday 15/12/2017



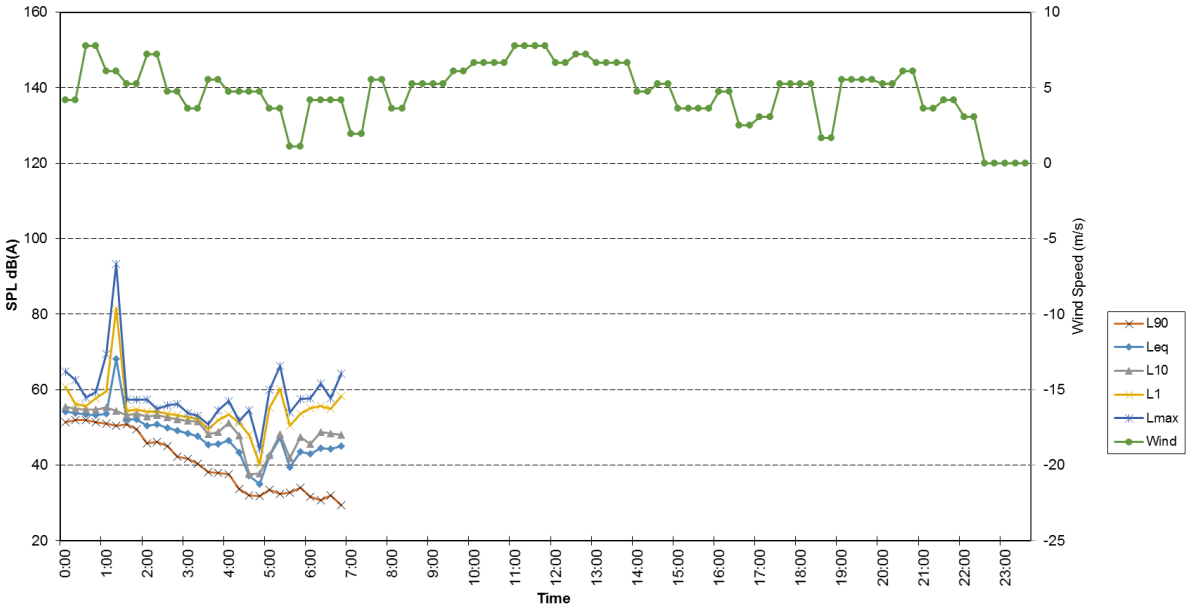
Location NM01
Measured Noise Levels - Saturday 16/12/2017



Location NM01
Measured Noise Levels - Sunday 17/12/2017



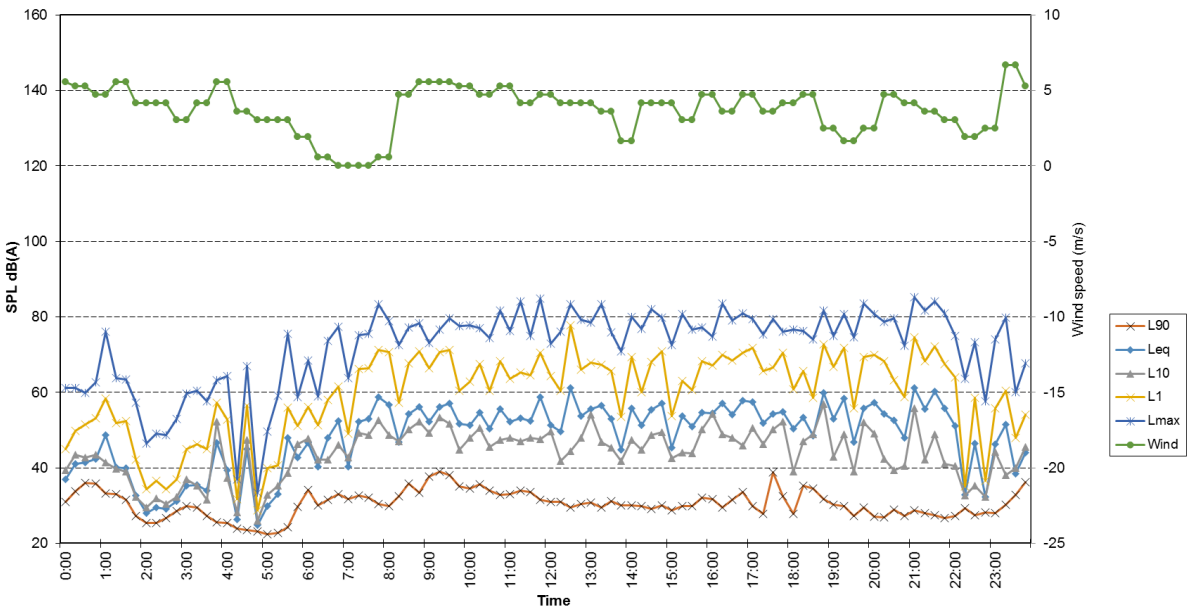
Location NM01
Measured Noise Levels - Monday 18/12/2017



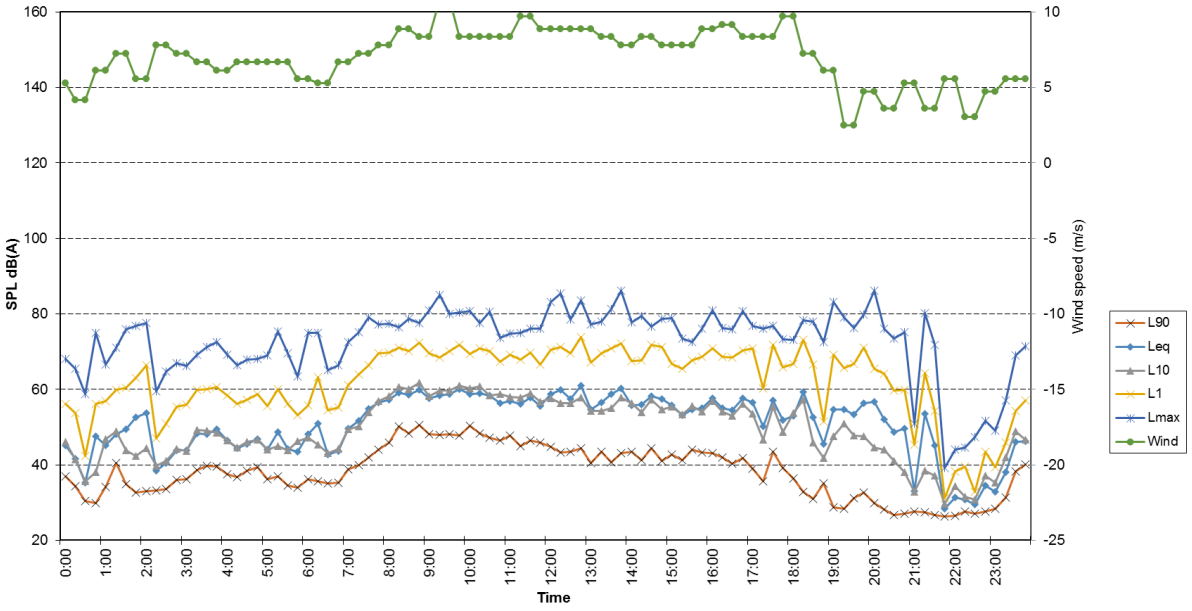
A2 LOCATION NM02 (BROLGAN ROAD)

Location NM02
Measured Noise Levels - Wednesday 29/11/2017

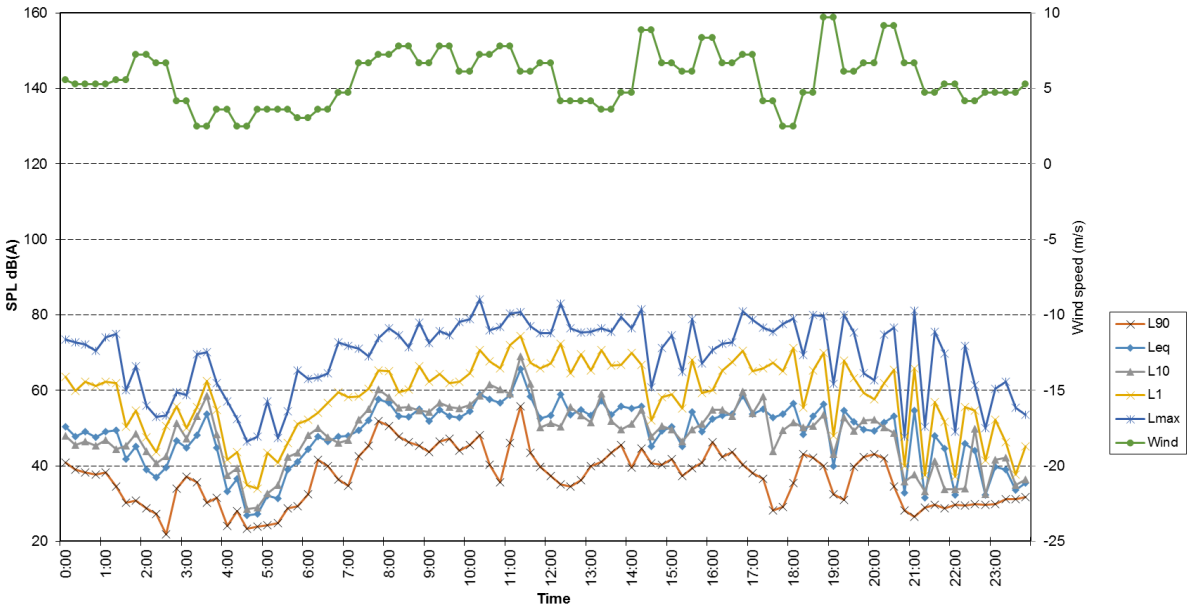
Location NM02
Measured Noise Levels - Thursday 30/11/2017



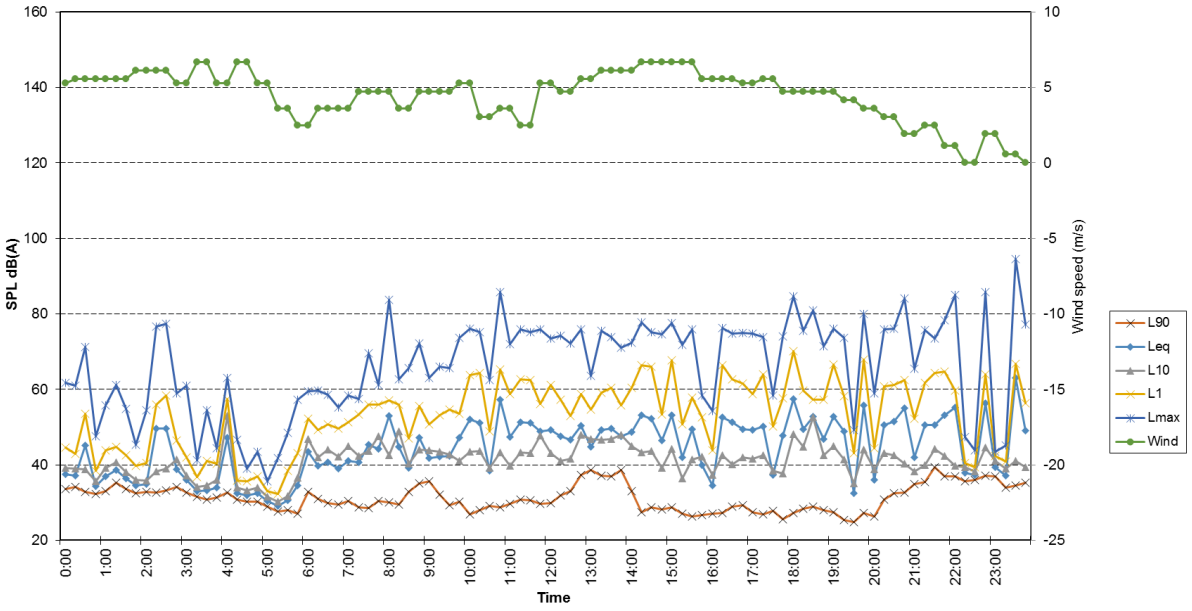
Location NM02
Measured Noise Levels - Friday 01/12/2017



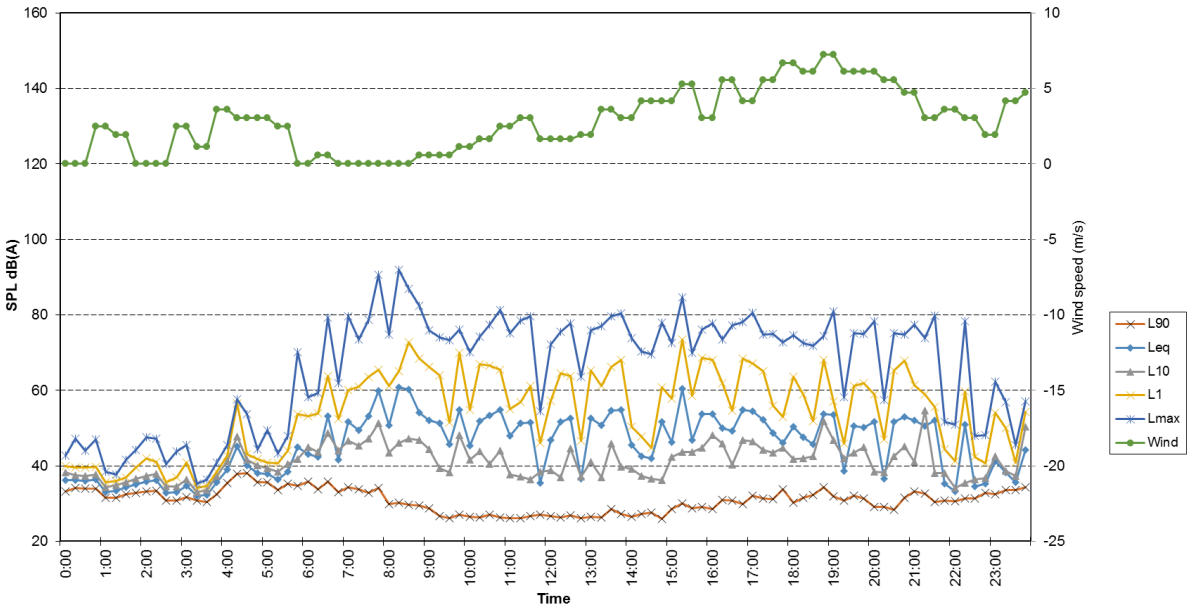
Location NM02
Measured Noise Levels - Saturday 02/12/2017



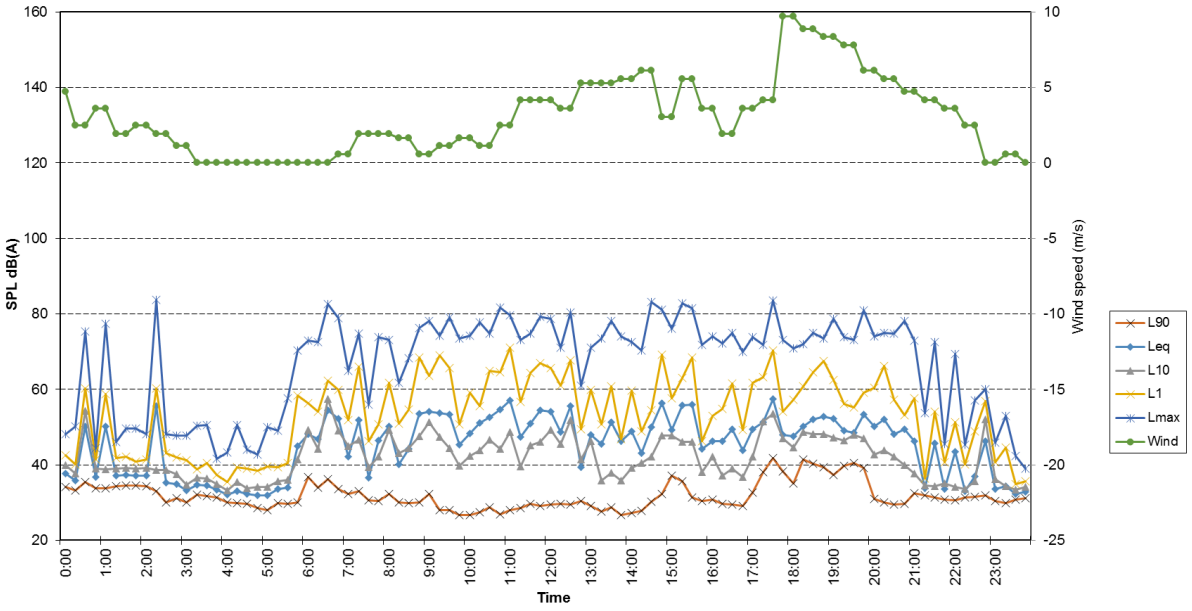
Location NM02
Measured Noise Levels - Sunday 03/12/2017



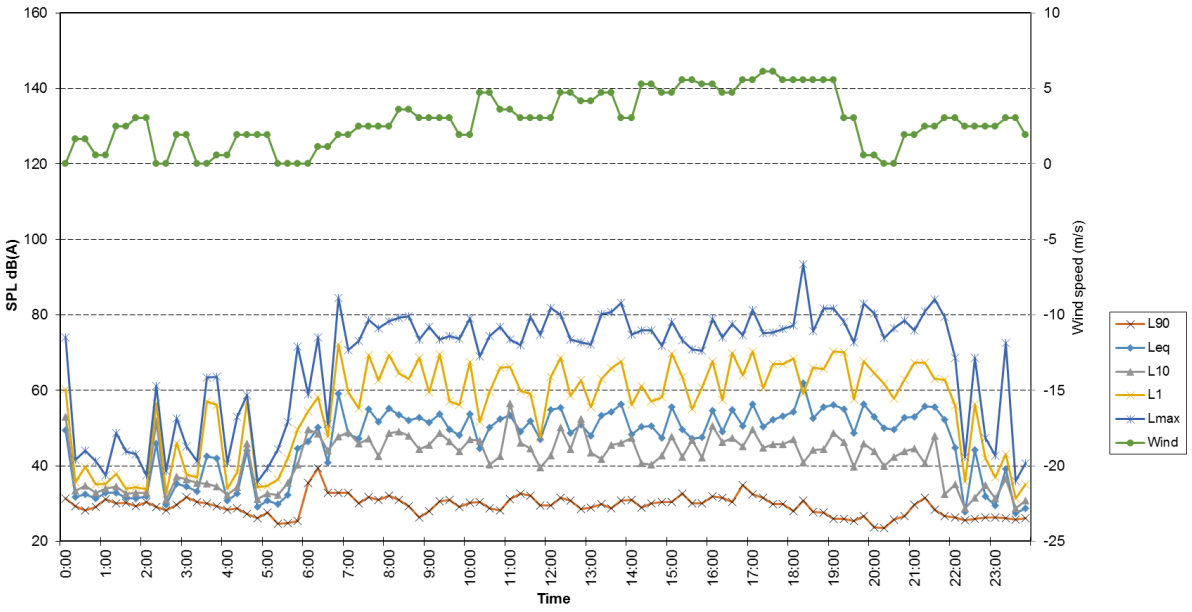
Location NM02
Measured Noise Levels - Monday 04/12/2017



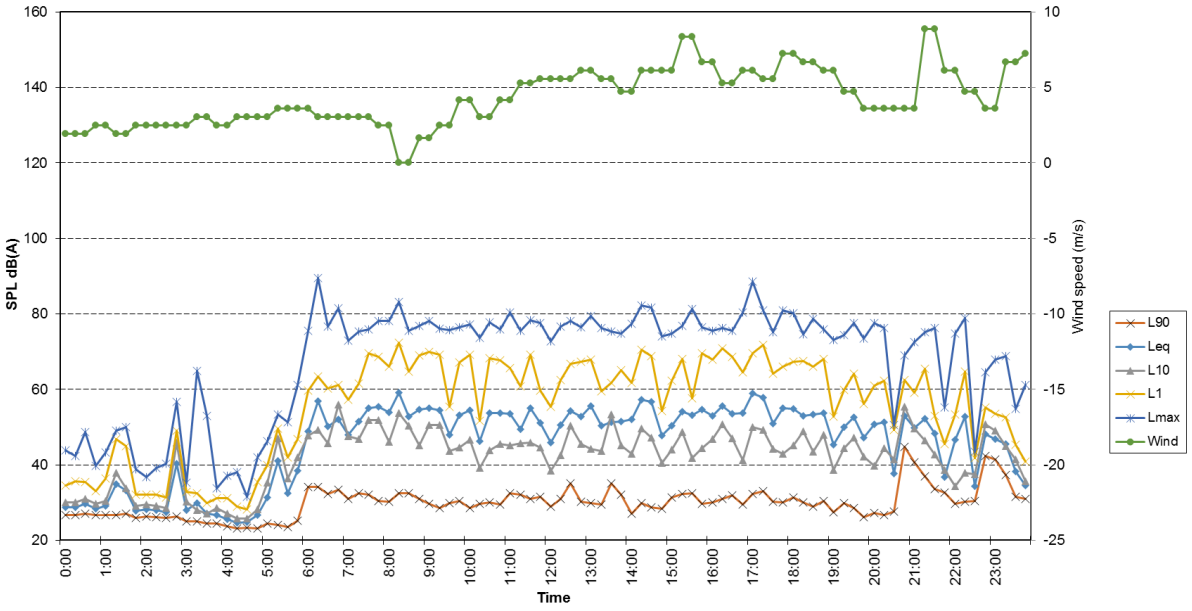
Location NM02
Measured Noise Levels - Tuesday 05/12/2017



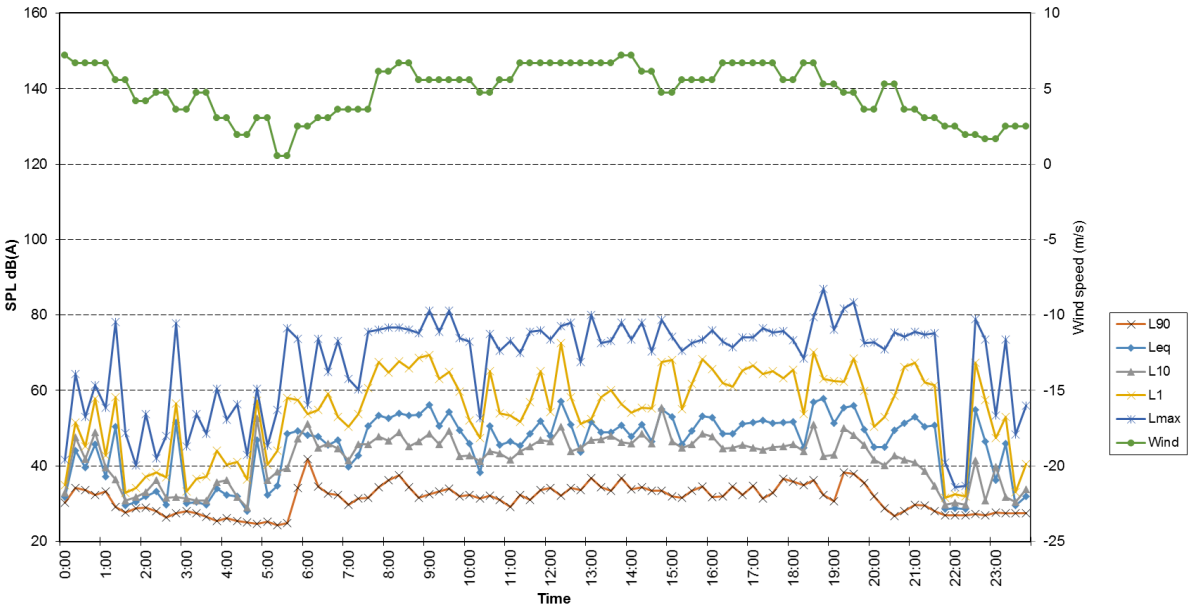
Location NM02
Measured Noise Levels - Wednesday 06/12/2017



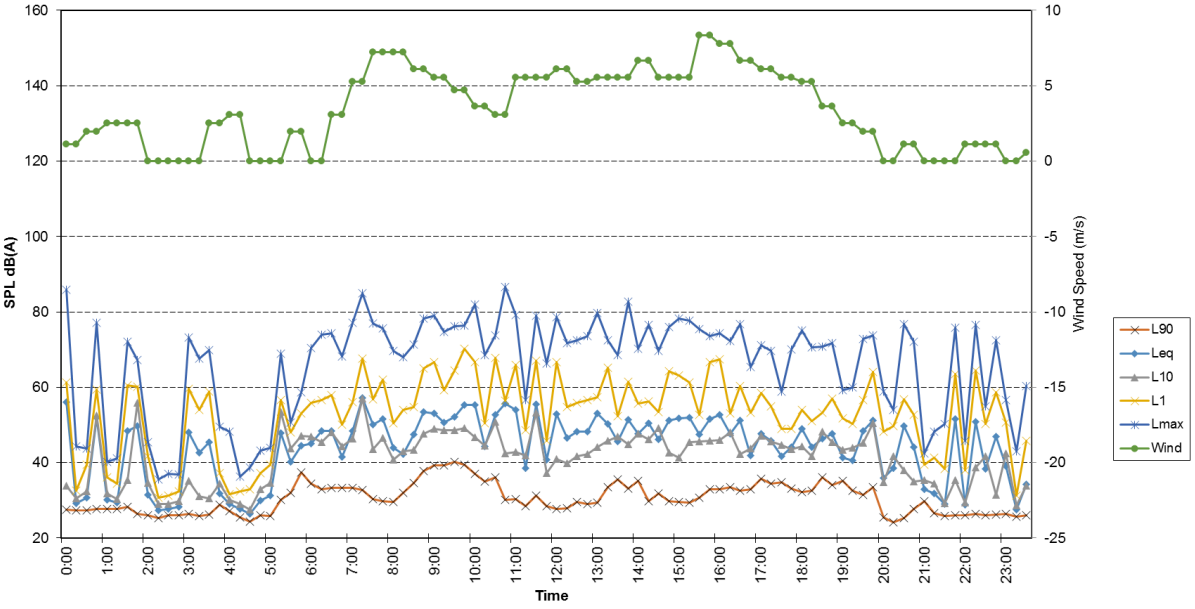
Location NM02
Measured Noise Levels - Thursday 07/12/2017



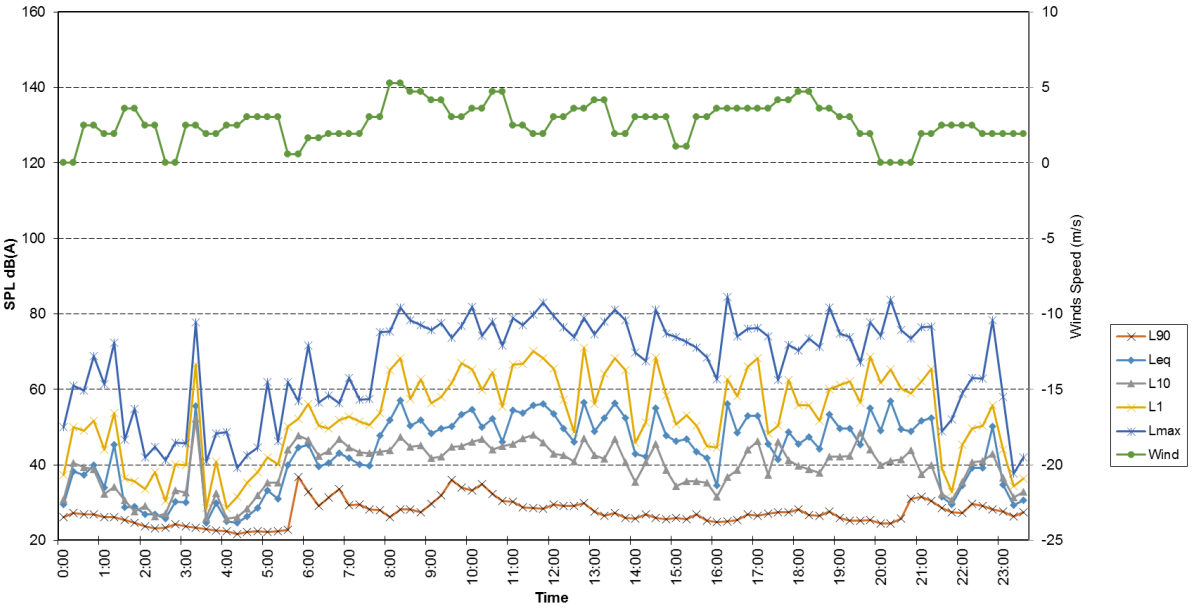
Location NM02
Measured Noise Levels - Friday 08/12/2017



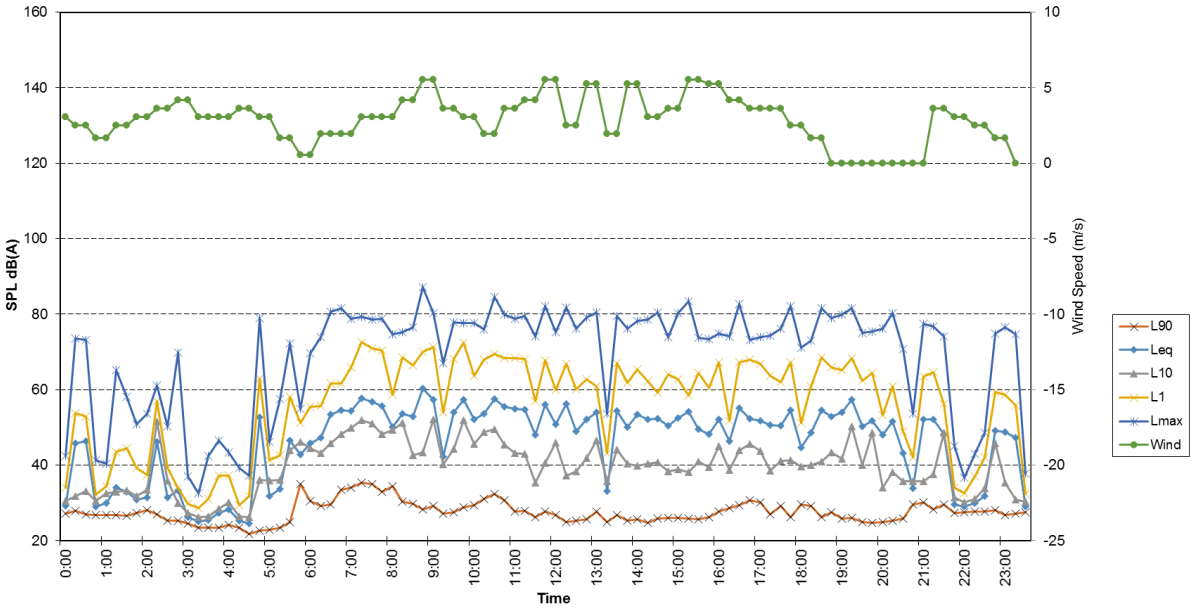
Location NM02
Measured Noise Levels - Saturday 09/12/2017



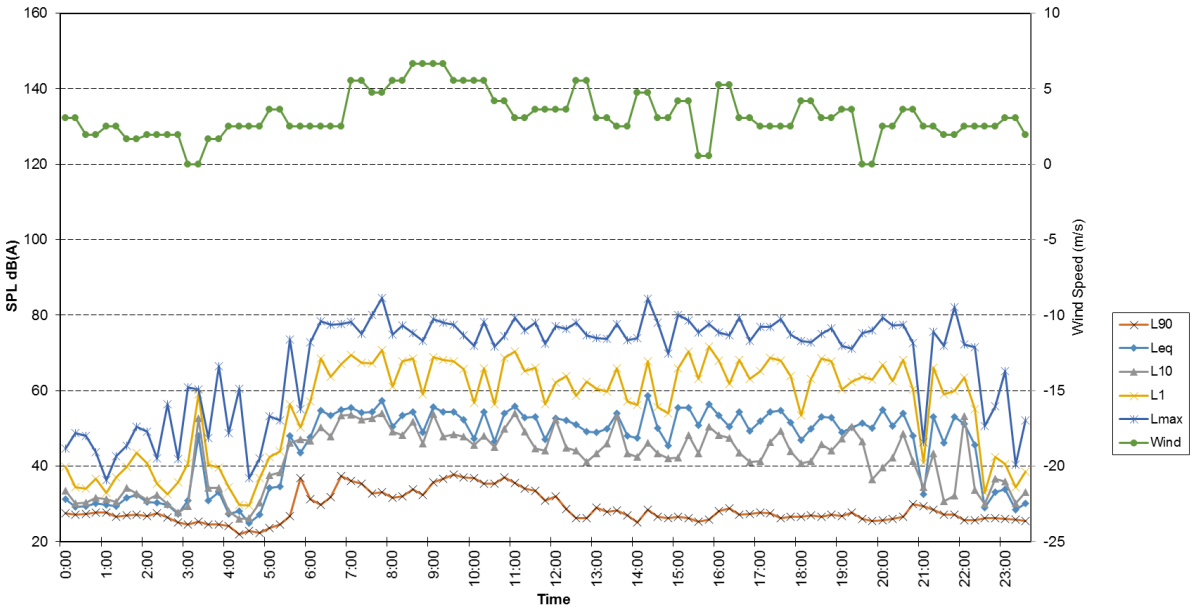
Location NM02
Measured Noise Levels - Sunday 10/12/2017



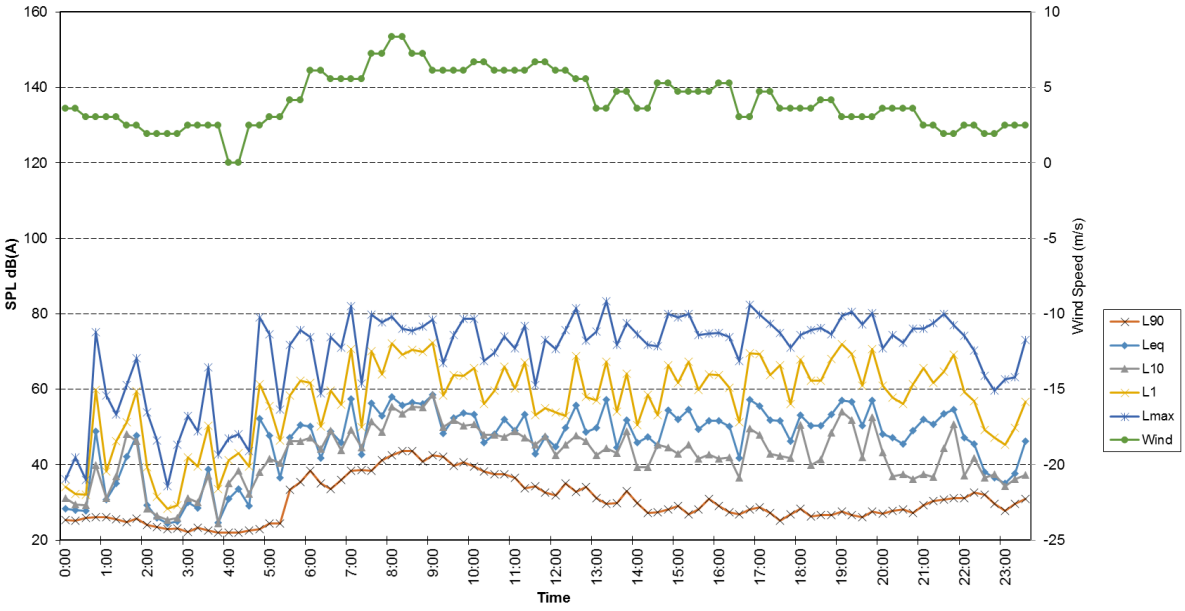
Location NM02
Measured Noise Levels - Monday 11/12/2017



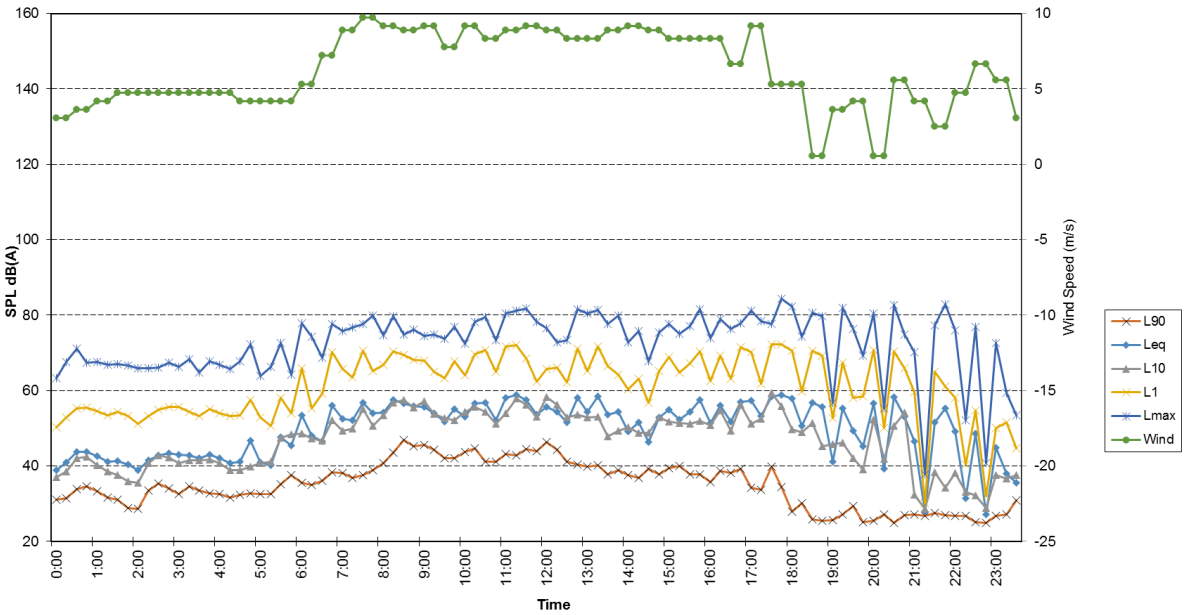
Location NM02
Measured Noise Levels - Tuesday 12/12/2017



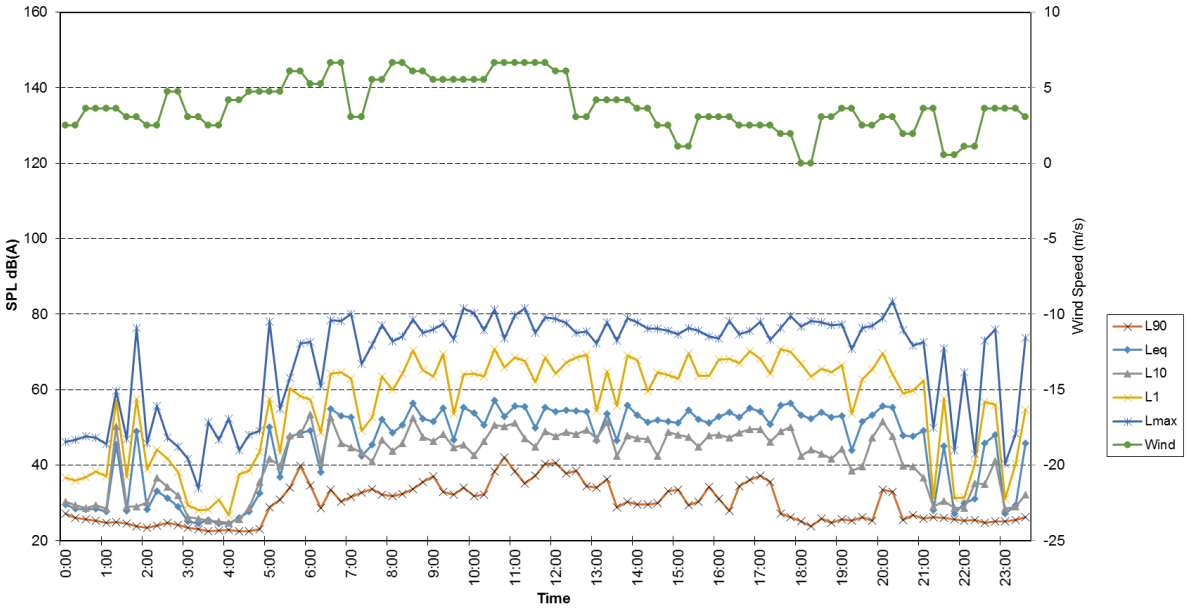
Location NM02
Measured Noise Levels - Wednesday 13/12/2017



Location NM02
Measured Noise Levels - Thursday 14/12/2017

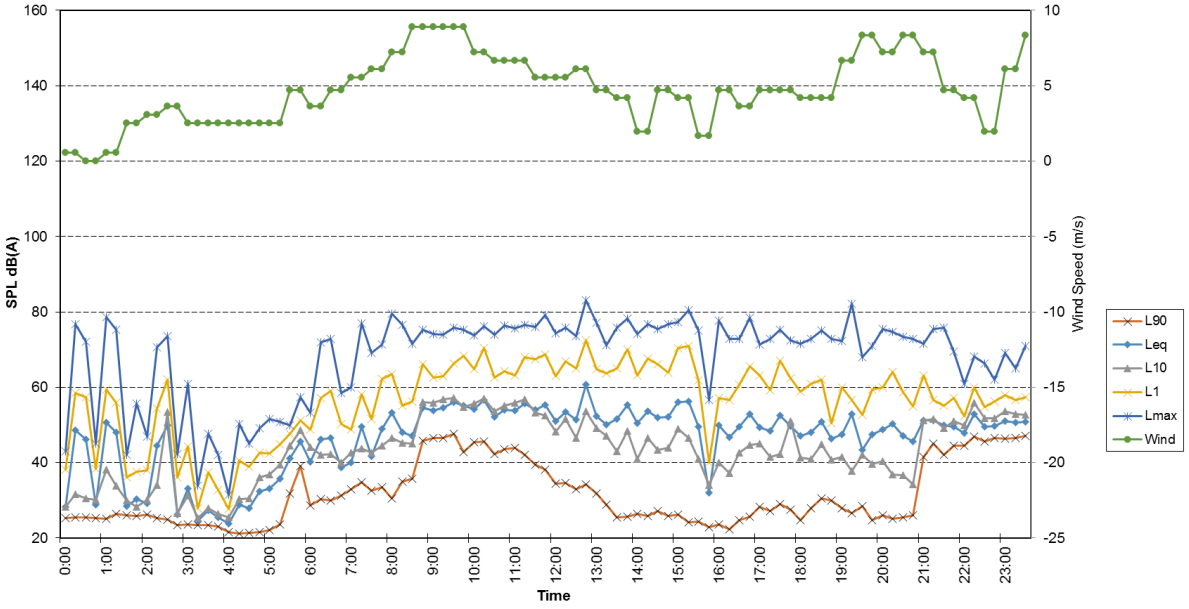


Location NM02
Measured Noise Levels - Friday 15/12/2017

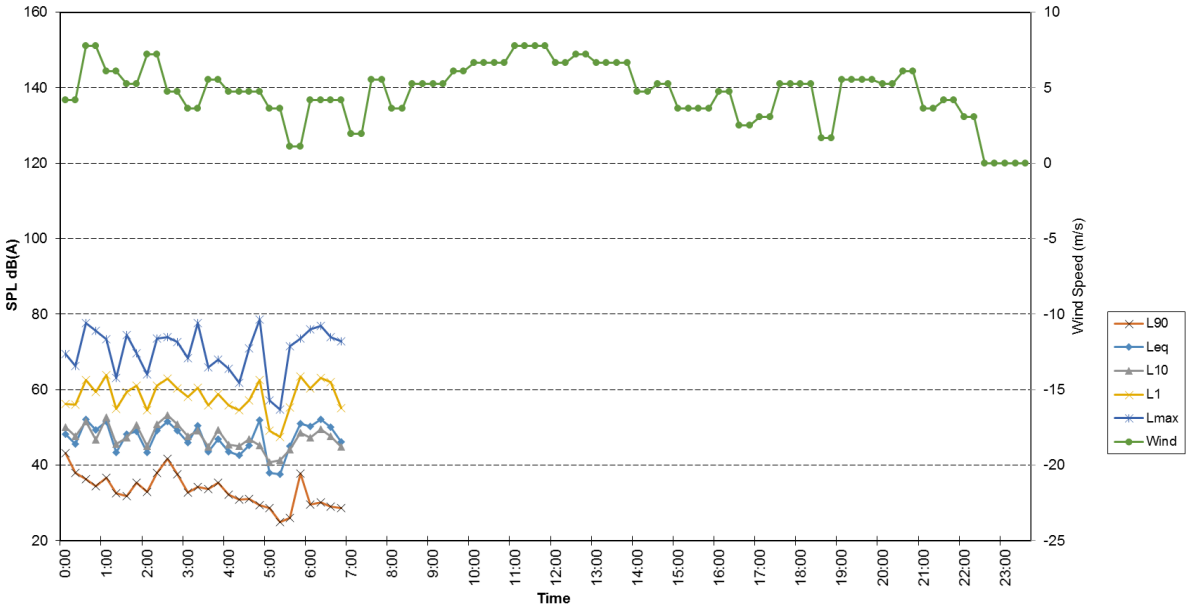


Location NM02
Measured Noise Levels - Saturday 16/12/2017

Location NM02
Measured Noise Levels - Sunday 17/12/2017



Location NM02
Measured Noise Levels - Monday 18/12/2017



APPENDIX B

PREDICTED NOISE CONTOURS

Legend

- Sensitive receiver

CONTOURS
dBA, LAeq (15 min)

- 25
- 30
- 35
- 40
- 45
- 50
- 55
- 60
- 65
- 70
- 75
- 80
- 85
- 90
- 95

R02

R01

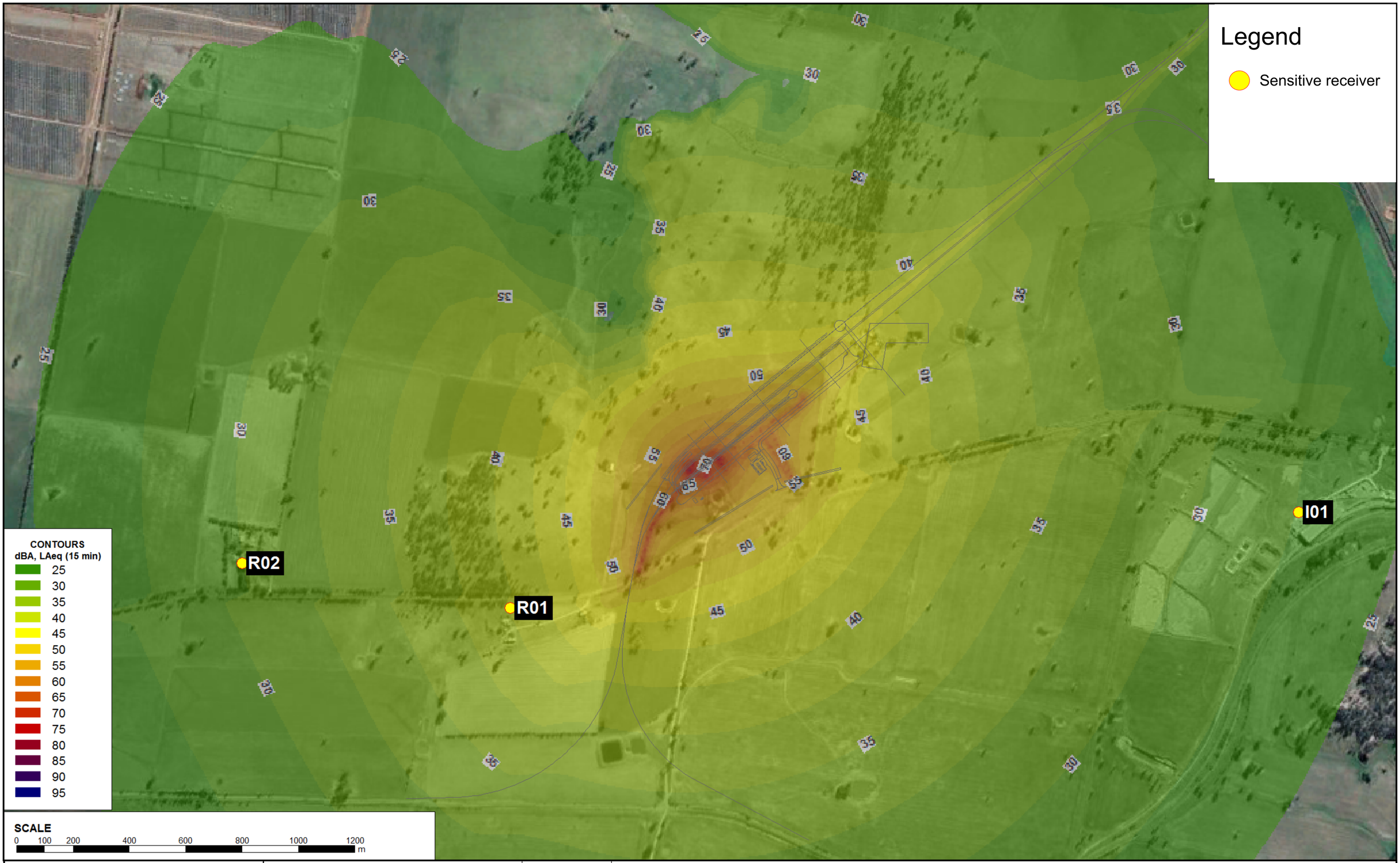
I01

SCALE
0 100 200 400 600 800 1000 1200 m

Date: 21/03/2018	Prediction Algorithm: CONCAWE
Appendix: B	Prediction Height: 1.5m
Map Number: 1	Coordinate System: UTM Zone 55 WGS84
Client: Pacific National	Author: AH

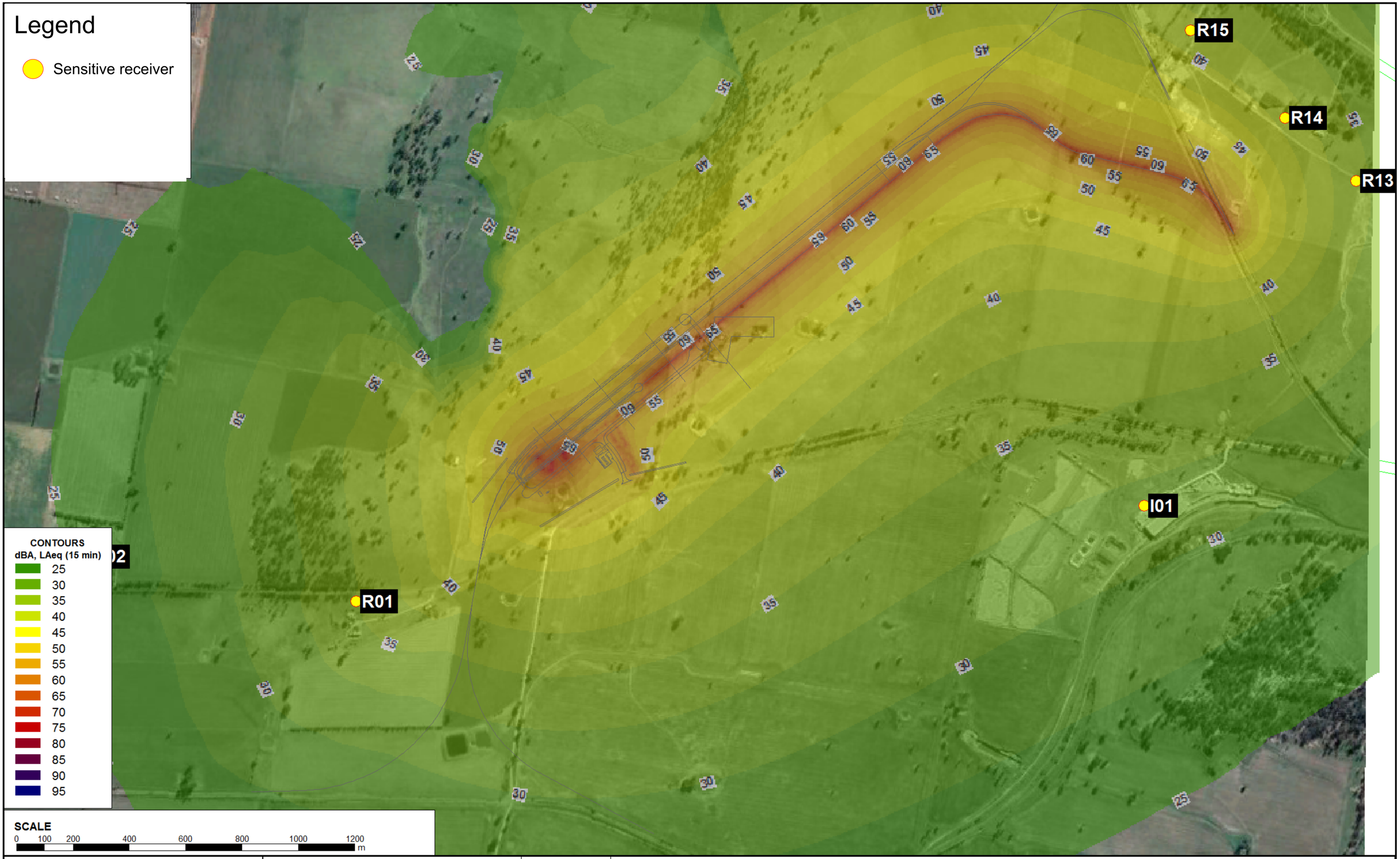
N

PARKES LOGISTICS TERMINAL
Scenario 1
Standard Meteorological Conditions



Date: 21/03/2018	Prediction Algorithm: CONCAWE
Appendix: B	Prediction Height: 1.5m
Map Number: 2	Coordinate System: UTM Zone 55 WGS84
Client: Pacific National	Author: AH

PARKES LOGISTICS TERMINAL
Scenario 1
Noise Enhancing Meteorological Conditions

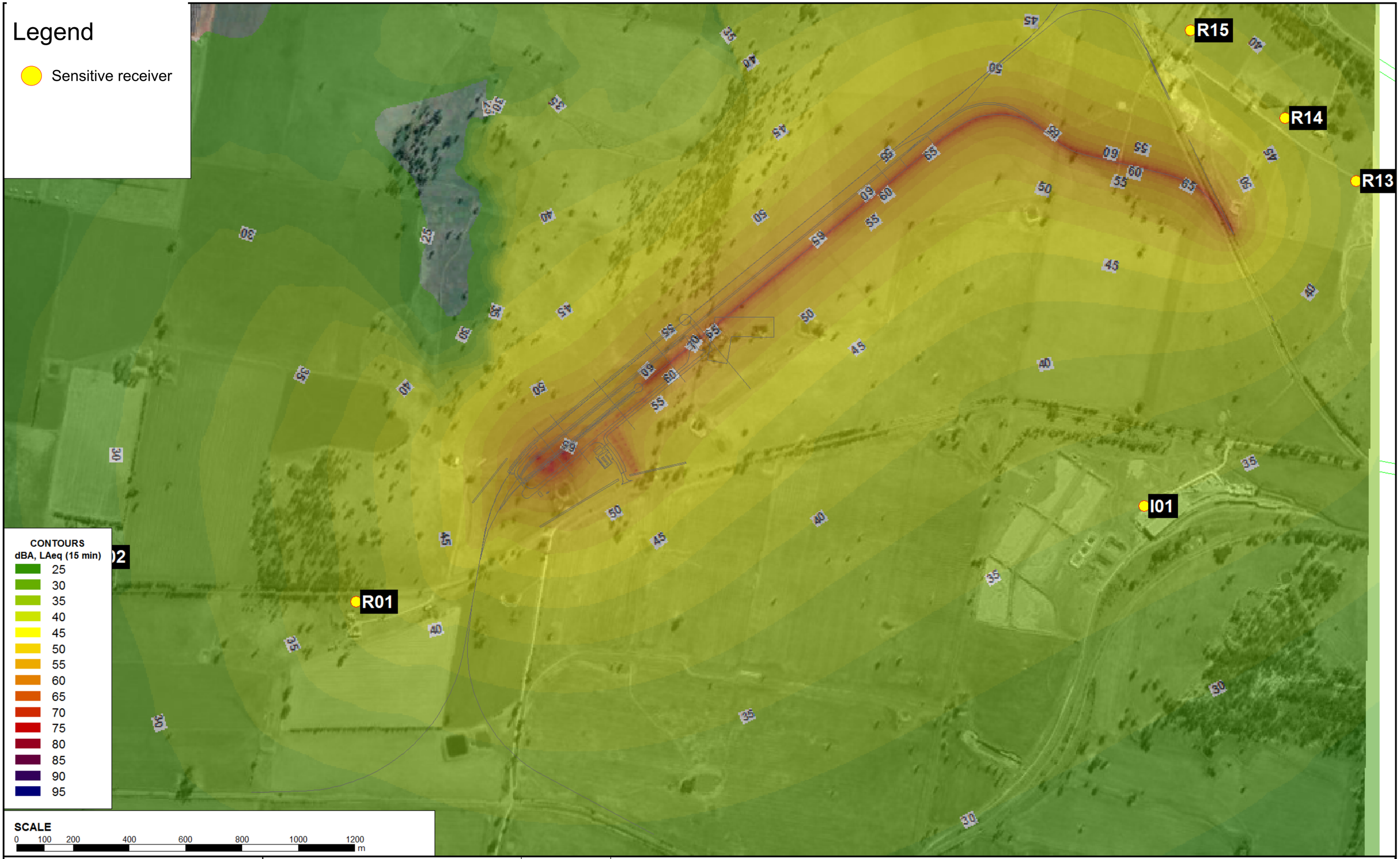


Date: 21/03/2018	Prediction Algorithm: CONCAWE
Appendix: B	Prediction Height: 1.5m
Map Number: 3	Coordinate System: UTM Zone 55 WGS84
Client: Pacific National	Author: AH

PARKES LOGISTICS TERMINAL

Scenario 2

Standard Meteorological Conditions



Date: 21/03/2018	Prediction Algorithm: CONCAWE
Appendix: B	Prediction Height: 1.5m
Map Number: 4	Coordinate System: UTM Zone 55 WGS84
Client: Pacific National	Author: AH

PARKES LOGISTICS TERMINAL
Scenario 2
Noise Enhancing Meteorological Conditions

Michael Carter
Parkes Shire Council
PO Box 337
Parkes NSW 2870

Via email: michael_carter@parkes.nsw.gov.au

31 May 2018

RE: DA18033 Parkes Logistics Terminal - Response to PSC Request for Additional Information

Dear Michael,

Reference is made to Council's letter of 10 May 2018 requesting additional information relating to residential buffers, updated acoustic impact assessment, lighting impacts, DCP variations and contaminated land planning.

Please find below and attached, Pacific National's response to Council's request for additional information:

1. Residential Dwelling Buffer Plan

Given it was always Pacific National's intention to secure no less than 500 meter distance to nearest dwellings it can now be confirmed through further design development that the proposal has achieved this distance or greater to the nearest residential dwellings. Please refer to Figure One at Appendix One which identifies:

— The location of each of the dwellings within close proximity to the proposed development;
— Adherence of 500m distance or greater to the nearest dwellings; and
— The boundary of the proposed development.

2. Updated Acoustic Impact Assessment

An updated Noise and Vibration Impact Assessment has been prepared by WSP dated May 2018. The report has been prepared in accordance with the NSW Noise Policy for Industry 2017 and other relevant standards, as requested by Council. The WSP report indicates noise exceedances at sensitive receivers of between 2 – 5 dB from on-site operations (largely caused by passing train movements along the spur line) and 2 – 7dB for operational vehicular traffic movements along Brolgan Road. At construction phase, predicted exceedances of up to 22 dB are noted in the WSP report. To address potential noise impacts, Pacific National propose the following:

- For all phases of the development, Pacific National will adopt the noise mitigation measures in the WSP Statement of Environmental Effects, March 2018 and as detailed in Section 4.8, 5.8.1 - 5.8.3 of the WSP Noise and Vibration Impact Assessment report, May 2018.
- For all phases of the on-site development, from start of construction and until six months after commissioning of the development, a noise monitoring program will be carried out and exceedances addressed to comply with relevant noise criteria.
- For all road traffic operations, Pacific National proposes no physical mitigation given that compliance with RNP is expected along the relatively robust industrial road network that is established between the development site and the Newell Highway and Condobolin Road.
- For construction phase, Pacific National will adopt a Construction Environmental Management Plan and a Construction Noise and Vibration Management Plan to control all aspects of work operations that have potential to generate excessive noise, including hours of operation, use of noisy equipment, training etc.

For operational phase, Pacific National proposes to mitigate noise to acceptable limits under the NSW Noise Policy for Industry 2017, by either constructing a solid wall barrier directly adjoining the eastern side of the proposed spur line turnout from the rail siding to act as an effective noise barrier to train pass by noise, or undertaking noise mitigation at the site of sensitive receivers R01, R13, R14 and R15.

At this stage, it is the preference of Pacific National that mitigation works are conducted at sensitive receivers, as these works would assist in the reduction of all rail noise experienced at these residences from trains passing along the mainline track network. However, until these negotiations are finalised with affected landowners, Pacific National is committing to either mitigation strategy to ensure compliance with relevant noise criteria. Any solid wall barrier would be setback more than 500 metres from residences not associated with the development. It is requested that the condition to satisfy this requirement be tied to securing a construction certificate for such purposes.

Please find attached the Noise and Vibration Impact Assessment prepared by WSP dated May 2018.

3. Lighting Impact Assessment

A Light Impact Assessment has been prepared by Pacific National dated May 2018. The report has been prepared in accordance with the AS 4282 Control of the Obtrusive Effects of Outdoor Lighting and other relevant standards, as requested by Council. The report demonstrates that lighting of the rail terminal will not impact on adjoining landowners / road or rail operations, provided lighting is strategically designed and sited so as not to cause unnecessary illumination.

In detailed design of the facility, Pacific National will limit light overspill wherever possible, including establishing lights over night-time work areas only, limiting the general use of flood lights, use of overhead lights that are specifically designed to shine directly downwards, etc. There is potential for train headlights to shine briefly towards nearby residences, particularly trains at night exiting the rail siding. Pacific National proposes to mitigate the limited light impacts by either constructing a solid wall barrier directly adjoining the eastern side of the proposed spur line turnout from the rail siding, or undertaking mitigation at the site of sensitive receivers R13, R14 and R15.

At this stage, it is the preference of Pacific National that mitigation works are conducted at sensitive receivers, as these works would assist in the reduction of all rail lighting impacts experienced at these residences from trains passing along the mainline track network. However, until these negotiations are finalised with affected landowners, Pacific National is committing to either mitigation strategy to ensure light impacts are minimised to acceptable levels. Any solid wall barrier would be setback more than 500 metres from residences not associated with the development. It is requested that the condition to satisfy this requirement be tied to securing a construction certificate for such purposes.

Please find attached the Light Impact Assessment prepared by Pacific National dated May 2018.

4. DCP Variations

Section 4.5 of the Statement of Environmental Effects, which accompanied the Development Application, outlined the proposed compliance to the Parkes Shire Development Control Plan (DCP) 2013.

It is requested that Parkes Shire Council consider a variation to their Development Control Plan 2013 on the basis of the standards to be achieved and discussed in the following table:

DCP CLAUSE	NON-COMPLIANCE	STANDARD ACHIEVED
Internal Roads (Cl 4.3.5.6)	Internal access roads will have a minimum 10 metre carriageway	It is proposed to have 9 metre carriageways. The internal access roads have been designed to be suitable for vehicles up to B-Doubles and have a wider sealed width than Brolgan Road. This is considered to meet this standard.
Landscape Plan (Cl 4.3.10)	No landscape plan provided	Five-metre-wide vegetation buffers would be planted along the edge of Brolgan Road and in the north- west corner of the Proposal site. A two-metre vegetation zone would also be provided around three sides of the carpark for shading. Suitable drought tolerate and native species would be selected for planting from Appendix 1 of the DCP. Landscaping would be further developed as part of detailed design and a landscape plan would be submitted to Parkes Shire Council for approval prior to any construction works on site. A condition of approval requiring a landscape plan be submitted for approval prior to any construction works on site would meet this clause.
Waste Management Plan (Cl 4.3.11.1)	No waste management plan has been developed as the design has not progressed to a sufficient design phase and the construction contractor has not been engaged.	A waste management plan would be developed by the construction contractor and submitted to Parkes Shire Council for approval prior to any construction works on site. A condition of approval to this effect would meet this clause.
Reticulated water supply (Cl 4.3.1.1)	Reticulated water supply is not proposed as part of this proposal due to the small scale of works and the cost associated with the connection to town water supply.	Water would be delivered regularly to the site and stored within on-site potable and fire water storage tanks. The water supply would be reticulated within the site. More permanent solutions would be investigated for subsequent phases of the Parkes Logistics Terminal.
Vehicle access (Cl 4.3.5.12)	The Proposal includes direct vehicle access from Brolgan Road which is not permitted in the DCP.	Given the site layout in relation to the railway line, direct vehicle access to Brolgan Road was considered necessary for operation of the Proposal and could not easily be avoided. This is not expected to have a negative impact on the traffic flow or safety along Brolgan Road. The parking areas would be on-site and not interfere with Brolgan Road. A traffic and rail access impact assessment has been included as part of the Statement of Environmental Effects to ensure safety and amenity of road users.

5. Contaminated Land Planning

Parkes City Council have requested Pacific National consider a report specifying the findings of a preliminary investigation of the land concerned carried out in accordance with the contaminated land planning guidelines.

The report and its findings is depicted at Attachment 3.

Regards

[redacted]

Richard Johnstone
Project Director, PLT

Attachments

1. WSP Report - Parkes Logistics Terminal, Noise and Vibration Impact Assessment (May 2018)
2. PN Report - Parkes Logistics Terminal, Lighting Impact Assessment (May 2018)
3. K&H Geotechnical Services Report – Preliminary Contamination Investigation (May 2018)

Appendix One

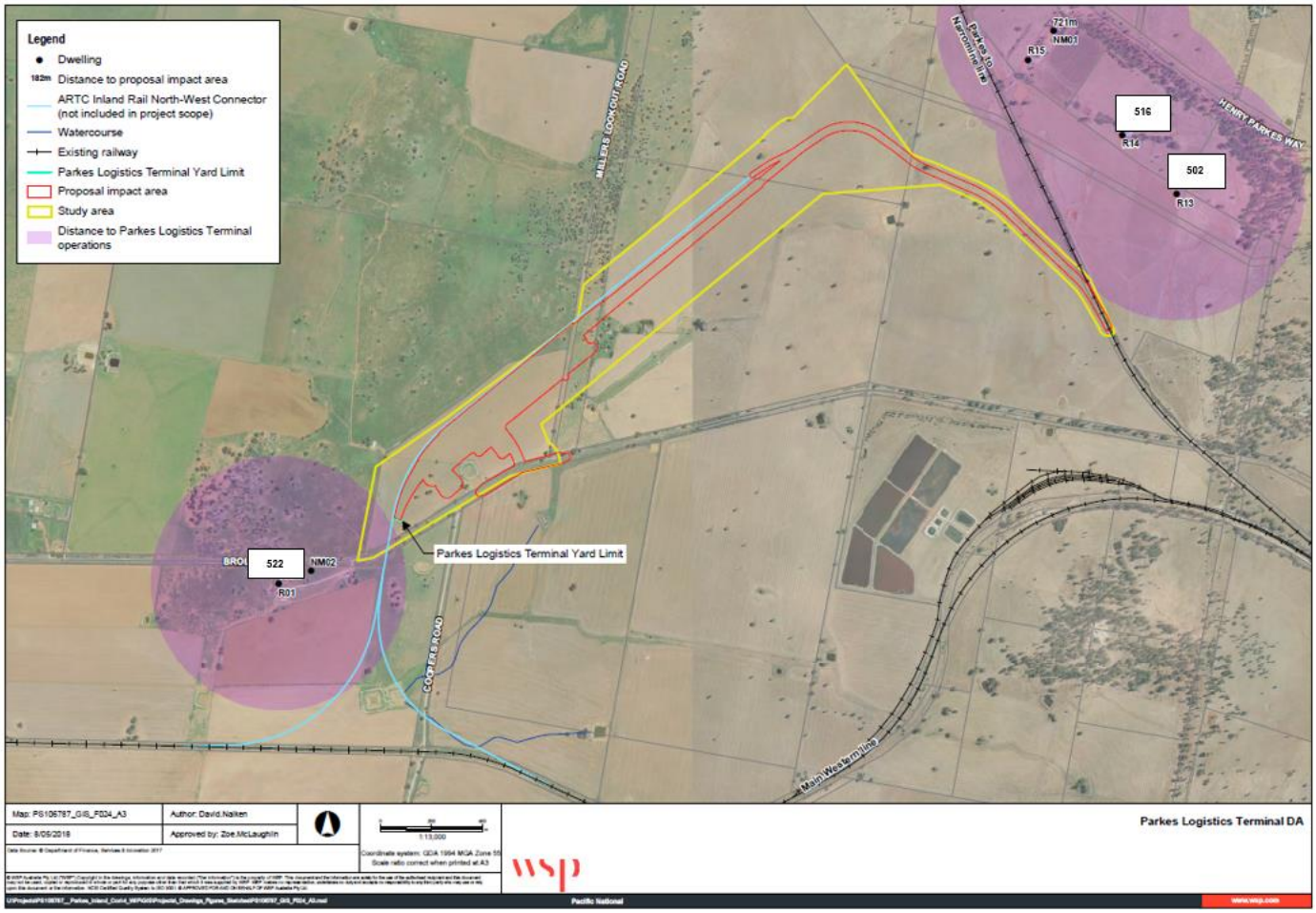


Figure One