

Preliminary Site Investigation (PSI)

for potential contamination at

Yanco BESS



DOCUMENT INFORMATION

Prepared For:	ACEnergy
Prepared By:	Cadeema - Environmental & Agricultural Consultants, Shepparton, Victoria
Project Name:	Preliminary Site Investigation (PSI) for contamination on part of 120 Houghton Road Yanco NSW 2703
File Reference:	Yanco BESS PSI (Contamination) ACFenergy
Job Reference:	C375
Project Duration:	Feb 2024 – Sept 2024

DOCUMENT CONTROL

Version	Date	Issue	Author	Reviewed/Approved
1.0	6 March 24	Draft	Briony Dance	Jodie Coutts
2.0	19 April 24	Final	Briony Dance	Cliff Dillon
3.0	5 Sept 24	Rev Final	Briony Dance	Cliff Dillon

CONSULTANT INFORMATION**Cadeema - Soil, Water & Environmental Consulting**

-  A Shepparton based environmental consultancy servicing Victoria, NSW & South Australia
-  An independent, science-driven company, Operating since 1996
-  Ensuring Synergy between People, Productivity and Natural Resources
-  Tertiary qualified staff with over 70 years of combined experience
-  State-wide, big picture experience, but with a local community & site focus
-  Specialising in:

Soil / Water Analysis	EMP	Renewable Energy	Agriculture
Contaminated Soil	LCA	Climate Challenges	Wastes
Wastewater	Groundwater	Water Modelling	Biosolid
Community Engagement	Soil Mapping	Soil Geotech	Horticultural
Environmental Monitoring (soil, surface water & groundwater, vegetation, air etc.)			EIS

ABN:	37 621 073 032	Email:	admin@cadeema.com.au
Phone:	0428 29 1011	Web:	www.cadeema.com.au

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1 INTRODUCTION

In February 2024 Cadeema were engaged by ACEnergy to undertake a Preliminary Site Investigation (PSI) to assess for the presence of and the potential for land contamination on part of 120 Houghton Road Yanco in response to the New South Wales Department of Primary Industries - Agriculture's ('DPI Agriculture's') input to the Yanco Battery Energy Storage System (BESS) draft Scoping Report/SEARS (the '*BESS Project*'). It is proposed that the BESS Project will be constructed on part of two parcels of land owned by Pat Hulme (521/-/DP751745 and 516/-/DP751745 ('*Lot 521*' and '*Lot 516*')) located approximately 1.5 km southwest of the township of Yanco, zoned RU1 Primary Production under the Leeton Local Environmental Plan (LEP) (*Appendix A - Locality Plan*; *Appendix C - Property Report*). The area of the proposed BESS Project comprises approximately 8 ha (the '*site*') of the 240 ha of land that makes up Lot 521 and Lot 516 and is the focus of this PSI (*Appendix B - Site Plans*) (*Image 1*). The total proposed development footprint is approximately 10.3 ha, including the access road and connection route outside of the subject land.



Image 1: Facing the eastern boundary of the site with the Yanco Substation in the background behind rows of roadside planted native trees; canola stubble pictured on the site.

This PSI includes a review of historical site land use, assessment of environmental features on and adjoining the site, assessment of public records relating to planning and contamination, an assessment of historical aerial imagery, a detailed site inspection, representative soil sample collection, soil contaminant laboratory analysis, and the subsequent assessment of the risk of, potential for, or

existence of contamination on the site including whether further investigation is needed. This process satisfies the requirements set out in the Contaminated Land Management Act 1997 (NSW) ('CLM Act'), the NSW Environment Protection Authority ('EPA') published Consultants Reporting on Contaminated Land: Contaminated Land Guidelines ('Guidelines'), and the National Environment Protection (Assessment of Site Contamination) Measure 1999 ('ASC NEPM').

2 POTENTIALLY CONTAMINATED LAND ASSESSMENTS

Where a land contamination status is unknown (that is, it is potentially contaminated land), the first step in the assessment process is typically to undertake a Preliminary Site Investigation (PSI). The aim of the PSI is to assess the risk of, potential for, or existence of contamination and whether further detailed investigation is needed. When assessing land for potential contamination, typically gradual incremental investigation procedures are employed as the risk of contamination is progressively clarified. A typical process might include:

Stage 1 – Preliminary Site Investigation (PSI) - a preliminary investigation which may entail:

- a. no soil/water sample analysis - on straightforward sites with a low risk of soil contamination
- b. limited/selected soil/water sample analysis - where a low risk of contamination is identified and some clarification of soil/water status is deemed necessary

Stage 2 – Detailed Site Investigation - alternatively (or where a PSI identifies some risk (typically a moderate or high risk) of contamination), a Detailed Site Investigation should be undertaken in accordance with the Guidelines, ASC NEPM, and AS 4482.1 – 2005 *Guide to the sampling and investigation of sites with potentially contaminated soil – Non-volatile and semi-non-volatile compounds*.

A Stage 1 PSI assessment (be this 1a or 1b) may conclude that there is a low likelihood of contamination and the site is therefore safe for the current or intended use. Alternatively, the Stage 1 PSI assessment may identify some minor contamination and subsequently recommend and/or formulate an appropriate Remedial Action Plan (RAP). Where more significant contamination (or a heightened risk of contamination) is identified, a Stage 2 Detailed Site Investigation is typically required.

A PSI would usually involve outlining the purpose of the investigation followed by a complete site history account documenting past and present potentially contaminating activities (on and off site sources). A site investigation is required and a detailed account of environmental features on and surrounding the site should be compiled. A PSI will also include a Conceptual Site Model, identification of data gaps, or recommendations for further investigation. A detailed account should be provided of the presence of,

risk of, and/or likelihood of contamination on the site. Where a heightened risk of contamination is identified, the PSI should identify potential human and ecological receptors on and off-site, identify potentially affected media, detail all contaminants of potential concern, and/or perform or recommend preliminary sampling and analysis to assess the need for a further investigation.

A Stage 2 Detailed Site Investigation is a more detailed level of assessment and potentially includes soil, surface water and groundwater laboratory analysis of statistically selected representative environmental samples to verify or refute the presence of contamination. The Detailed Site Investigation may conclude that either; there is a low likelihood of contamination and the site is therefore safe for development; or, where contamination is identified, quantify the contamination (type and extent) and recommend a Remedial Action Plan (RAP). A RAP typically outlines a detailed remediation strategy which then needs to be implemented prior to development.

This PSI correlates with Stage 1b above and includes site history, site environmental features, site inspection results, soil sample laboratory analysis, and the subsequent assessment of the risk of, potential for, or existence of contamination and whether further investigation is needed.

3 METHODOLOGY

3.1 Desktop Assessment

A desktop review of publicly available land use and environmental information was undertaken including assessment of site history, environmental features/history (vegetation, soil, surface water, groundwater etc), Council zoning/planning and a public records search along with searches of relevant regulatory authority registers in relation to environmental assessments, environmental impacts and contamination (*Appendix D - Desktop Assessment Data Sources*). Aerial photography was also sourced and assessed for the site as this can provide insights into historical land use (*Appendix E - Historical Aerial Imagery*).

3.2 Fieldwork

On 20 March 2024, two appropriately qualified and experienced agricultural and environmental consultants from Cadeema inspected the site noting evidence of prior land-use, the current condition of the land and relevant environmental features. This site inspection included soil physical characteristic assessments to assess the soils and to determine the presence of refuse, dumped foreign material and/or fill. Soil physical characteristics were assessed utilising a decontaminated 100 mm diameter hand auger exposing the soil profile to depths of approximately 40 to 80 cm (*Appendix F - Site Environmental Features*) (*Image 2*). One surface soil sample was collected for soil contaminant chemistry laboratory analysis from an area deemed to have the most potential for land contamination.



Image 2: A sample of surface soil was collected from the site with a decontaminated 100mm diameter hand auger.

3.3 Soil Laboratory Analysis

To help assess the potential for contamination and to screen for the presence of contaminants, one soil sample was collected from the site from the upper 10 cm of the soil profile. The soil sampling location and parameters analysed were based on the potential for contamination ascertained from the desktop review and site inspection, and on the consultants' experience with on-site and adjoining land use, being long-term agriculture and substations. As detailed hereunder, one sample was collected from a potential 'hotspot' (the area in the vicinity of the water release point from the farm distribution channel flood gate adjoining the water authority irrigation channel parallel to the Yanco Substation) which was deemed to have the highest risk of contamination and this soil sample was subject to a targeted soil contaminant screen (Sample 3 (S3)). The location of the soil sample collection point S3 is depicted in the appendices (Appendix B - Site Plans) and sampling location GPS coordinates are provided in Table 1.

Table 1: Soil sample collection location with GPS coordinates.

Sample ID	Utility	GPS Coordinates	
		Latitude	Longitude
S3	Flood gate closest to release onto site adjoining water authority irrigation channel parallel to Yanco Substation	34°36'5.68"S	146°23'40.96"E

The soil sample was appropriately handled and stored and was dispatched to the laboratory within 24 hours of sample collection. The soils were analysed by ALS laboratories (Springvale Melbourne) who are a NATA (National Association of Testing Authorities) accredited laboratory specialising in soil contaminant chemistry analysis. The soil analysis results are provided in the appendices (*Appendix G - Soil Laboratory Chemical Analysis Results*).

3.4 Assessment & Reporting

After the review of relevant publicly available and historical site information, an assessment and interpretation of the data collected in the field and received from the laboratory was undertaken. A detailed account was compiled of the environmental features on and adjoining the site and this is provided in the appendices (*Appendix F - Site Environmental Features*). Evidence of relevant site anthropogenic interventions was compiled along with details of land uses on and adjoining the site, and in the district. The collation and assessment of this information facilitated assessment of the potential for contaminated land to exist on the site. The results are compiled in this report including conclusions on the potential for site contamination along with recommendations for remedial action if required. Where required, the assessment makes recommendations for further work.

4 THE SITE

4.1 Location & Extent

The site is located approximately 1.5 km southwest from the township of Yanco and forms part of a larger rural holding (*Appendix A - Locality Plan; Appendix B - Site Plans*). The site covers approximately 8 ha and is around 500 m long (east to west) and 133 m wide (north to south) (*Appendix B - Site Plans*). Site access is currently gained from Houghton Road via the unsealed Hulme Road. The northern boundary runs parallel to Houghton Road, with approximately 500 m of frontage to the road. The closed Junee Hay railway line, Ronfeldt Road and Gogeldrie Branch Canal run parallel to Houghton Road. Land adjoining Ronfeldt Road, further north of the site, is primarily agricultural land. The eastern boundary of the site adjoins Hulme Road adjacent to the Yanco Substation, which shares its eastern boundary with the Yanco Sewerage Plant. Land to the south and west of the site, on Lot 516 and 521, consists of open irrigable agricultural cropping/grazing land associated with the same rural holding as the site. There is no existing infrastructure on the site however, there is a Major Electricity Transmission Line and associated easement across Lot 516 and Lot 521, as well as a residence and agricultural shedding on Lot 516. The southern boundary of Lot 516 adjoins River Road, to the southwest of which is the Murrumbidgee Valley National Park (a NSW National Parks and Wildlife Service Reserve). Further details on environmental features on and adjoining the site are provided in the appendices (*Appendix F - Site Environmental Features*).

4.2 Zoning

The site is covered by the Leeton Local Environmental Plan 2014 and as detailed in the Property Report (*Appendix C - Property Report*) is zoned RU1 - Primary Production. Land to the immediate north, south, east, and west of the site is primarily zoned RU1 – Primary Production (except for a small parcel to the north of the site adjoining Ronfeldt Road that is zoned SP2 Waste or Resource Management Facilities and two parcels to the east of the site zoned SP2 Infrastructure Electricity and Distribution and SP2 Sewerage Systems). As mentioned above, land adjacent to the western half of the southern boundary of Lot 516 adjoining River Road is zoned C1 - National Parks and Nature Reserves. Parts of the Murrumbidgee Valley National Park are categorised Bush Fire Prone Land (Vegetation Category 2 and Vegetation Buffer). Land approximately 600 m northeast of the site is zoned R2 - Low Density Residential and constitutes the outskirts of the rural town of Yanco.

4.3 Existing Land Use

The site consists of open, irrigable, land formed, agricultural cropping and grazing land (*Image 3*). The landowner indicated he took ownership of the land in the mid-1970s and understood that the land was irrigated periodically for approximately 50 years prior to that time. The landowner advised that the property was historically used for sheep grazing and cropping land and may have been used for rice production in a minor way. The landowner indicated that he had used the site for irrigated summer crops and winter crops over a 30 year period; lucerne was grown for half of that time and other summer and winter crops for the other half. However, the landowner has since moved away from irrigated summer cropping on the site given difficulties with establishing summer crops due to hard setting soil, which requires more effort and subsequently lower yields. The landowner advised that he currently conducts rotational winter cropping and grazing on the site, growing predominately winter crops (wheat, barley, and canola) which are occasionally ‘shoulder’ irrigated in autumn and spring. The landowner indicated that he would continue rotational winter cropping on and in the vicinity of the site (most likely barley in winter 2024) and subsequently in the vicinity of the site during the proposed BESS construction and operation. He did not indicate any plans for other future uses of the site or land in the vicinity of the site. Based on historical aerial imagery, the Yanco Substation, adjacent to the eastern boundary of the site, appears to have been established between 1945 and to 1968. Further information on the site is provided in the appendices (*Appendix A - Locality Plan; Appendix B - Site Plans; Appendix E - Historical Aerial Imagery; Appendix F - Site Environmental Features*).



Image 3: Facing west on the site; canola stubble.

5 POTENTIAL FOR CONTAMINATION

5.1 History

The potential for a site to be contaminated is initially assessed based on the risk of contamination associated with historical land use on and in the vicinity of the site. Details on site history were obtained from historical regulatory and planning reports, ownership records, land use records, site environmental information (*Appendix D - Desktop Assessment Data Sources*) and from aerial photography (*Appendix E - Historical Aerial Imagery*) along with interviews with the long-term landowner Pat Hulme. The aerials indicate land on and adjoining the site was cleared for agriculture prior to 1945. Since 1945 anecdotal evidence indicates the site has been utilised for irrigated agriculture and sheep husbandry. The landowner indicated that the property contained infrastructure associated with sheep husbandry including a sheep dip approximately 800 m from the site that was decommissioned in around the 1980s and has since been removed. Agricultural infrastructure including a residence and shedding appears to have been established on the property prior to 1945. As mentioned above, the Yanco Substation seems to have been constructed between 1945 and 1968. There is a water authority irrigation channel that runs parallel to Yanco Substation, which connects to the farm irrigation distribution channel on the

eastern boundary of the site by way of an irrigation slide gate and pipe under Hulme Road (*Image 4*, *Image 5* and *Image 6*). Based on historical land use, the highest risk of land contamination is associated with the potential for land contamination presented by the Yanco Substation where a variety of maintenance activities would likely be undertaken, including the use of dielectric fluid. This presents a risk for land contamination by way of excess water run-off from the Yanco Substation onto the site through the irrigation system. The land closest to the first irrigation gate in the farm distribution channel on the eastern boundary of the site was deemed to present the highest risk for localised land contamination and was therefore the focus of soil sample collection (*Image 6*).



Image 4: Water authority irrigation channel running parallel to Yanco Substation (left); slide gate to channel that enters a pipe under Hulme Road into the farm distribution channel on the eastern boundary of the site (right).



Image 5: Slide gate to channel and pipe under Hulme Road (left); facing west onto the site, water sitting in the channel at exit of pipe under Hulme Road to farm distribution channel on the eastern boundary of the site (right).



Image 6: Facing east from the farm distribution channel on the eastern boundary of the site, pipe under Hulme Road and Yanco Substation and water authority irrigation channel in the background (left); area where sample was taken outside of first gate on the farm distribution channel on the eastern boundary of the site where water is released onto the site (right).

5.2 Records

In addition to historical records, the potential for a site to be contaminated should also consider publicly available historical regulatory records to determine if these indicate an elevated risk of land contamination (*Appendix D - Desktop Assessment Data Sources*). Based on such a search, there is no evidence to suggest that the site, or land within 1 km of the site, has been, or is listed/highlighted/mentioned or is covered by any of the following:

- the NSW EPA Contaminated Land List
- a Former Gasworks
- the National Waste Management Site Database or National Liquid Fuel Facilities
- the NSW EPA PFAS Investigation Program, Department of Defence PFAS Investigation Program, Department of Defence PFAS Management Program, or Airservices Australia National PFAS Management Program
- a Department of Defence Site or Unexploded Ordnance
- the NSW EPA Other Sites with Contamination Issues (including, James Hardie asbestos manufacturing and waste disposal sites, Radiological investigation sites in Hunter's Hill, Pasmenco Lead Abatement Strategy Area)
- Delicensed Activities still regulated by the EPA
- Potentially contaminative business activities in historical Business Directory Records, including Dry Cleaners, Motor Garages & Service Stations
- Temporary Water Restriction (Botany Sands Groundwater Source) Order 2018
- Naturally Occurring Asbestos Potential
- Current Mining & Exploration Titles/Applications
- a State Environmental Planning Policy Significant Precinct
- Commonwealth Heritage List, National Heritage List, State Heritage Register – Curtilages, Environmental Planning Instrument – Heritage

The EPA issued a Clean-Up Notice on 27 May 2011 in respect of suspected waste storage on land approximately 380 m northwest of the western boundary of the site. It appears from current aerial imagery that the land has been cleaned-up and the waste disposed of and therefore did not present any cause for concern.

There is no evidence to suggest past land activities occurred on the site that may cause contamination such as acid/alkali plant and formulation, airports, asbestos production and disposal, chemicals manufacture and formulation, defence works, drum re-conditioning works, dry cleaning establishments, electrical manufacturing (transformers), electroplating and heat treatment premises, engine works, explosives industry, gas works, iron and steel works, landfill sites, metal treatment, mining and extractive industries, oil production and storage, paint formulation and manufacture, pesticide manufacture and formulation, power stations, railway yards, scrap yards, service stations, sheep and cattle dips, smelting and refining, tanning and associated trades, waste storage and treatment or wood preservation (*Managing Land Contamination: Planning Guidelines*; ANZECC & NHMRC 1992 *The Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites* (the '*Managing Land Contamination: Planning Guidelines*'). However, there is evidence of agricultural/horticultural activities but the risk for contamination associated with same is deemed low.

5.3 Observations

The desktop assessment, site inspection and interviews investigated potential sources of contamination on the site and noted the following:

- there was no evidence of waste being stored
- there was no evidence of extensive imported fill material
- there was no visual evidence of extensive chemical usage or storage
- there was no evidence of underground or aboveground fuel storage tanks
- there was no evidence of wastewater treatment systems
- there was no evidence of potential asbestos containing materials on the soil surface
- there was no evidence of plant stress or unhealthy vegetation
- there was no evidence of odours or soil staining

6 SOIL ANALYSIS & CLASSIFICATION

6.1 Analysis

As detailed earlier, one soil sample was collected from the site and analysed in the laboratory for a range of potential soil contaminants and the results are provided in the appendices (*Appendix G - Soil Laboratory Chemical Analysis Results*). An interpretation of these results is also provided in the appendices (*Appendix H - Soil Chemistry Interpretation*). The soil chemistry data assessed can be used

to highlight any unusual soil chemical characteristics that may indicate unusual soil or site history and/or an increased likelihood of soil contamination. In addition, the analysis results for potential soil contaminants can be used to verify or refute the presence of contaminants in the soils on the site.

6.2 Results

For land and soil represented by the one soil sample (S3), the soil analysis data indicated typical and expected soil chemical characteristics which have not been significantly adversely impacted by contaminants. All soil contaminant levels were below a level considered to present a risk to human health and all levels were below levels to instigate further investigation. The main contaminant typically associated with substations was low and not of concern (Polychlorinated Biphenyls (PCB) being less than the laboratory analysis Limit of Reporting (LOR) of <0.1 mg/kg indicating no recordable amount present). In addition, soil contaminants typically associated with historical agricultural pesticide use were also low and are not of concern.

6.3 Conclusions

Based on the results detailed herein, it can be concluded that the site is not contaminated and contaminated land does not exist on the site. No toxic levels of contaminants that are likely to be toxic to human health or the environment were detected. This assessment indicates that the site has a very low risk of contamination. No further investigations or remedial action are recommended.

7 CONCEPTUAL SITE MODEL

A conceptual site model (CSM) is a representation of site-related information regarding contamination sources, receptors and exposure pathways between sources and receptors. It is advantageous to compile a CSM to identify any potential contamination pathways or receptors which theoretically may be exposed to contamination. Based on the results of this PSI, we have compiled a basic CSM, given the site is deemed uncontaminated.

The highest risks of contamination were associated with potential surface water run-off from the Yanco Substation located adjacent to the eastern boundary of the site, which presents a risk for land contamination due to ongoing maintenance activities and the potential use of dielectric fluids. Based on the results, it was concluded that the site is not contaminated, contaminated land does not exist on the site, and no toxic levels of contaminants (to human health or the environment) were detected. Therefore, the site does not present any potential or known contamination impacts.

As none of the results were excessive or toxic, no contamination or exposure mechanisms have been identified. Whilst no soil contamination was identified, and the site is covered by a significant mantle (2+ metres) of natural clay dominant soil on relatively flat topography, the most significant risk of potential contaminant mobilisation is through either excess surface water run-off or percolation of surface water down through the soil profile to groundwater beneath the site. Site and district hydrogeological information indicates that any groundwater beneath the site is likely to occur at depths greater than 5 m is therefore not particularly vulnerable to surface contamination. It is likely that shallow aquifer groundwater (5 to 20 metre deep) flows in southerly direction towards the incised Murrumbidgee River. The soils on the site are clay dominant and this, combined with adequate soil cation exchange capacity, limits the potential for excessive leaching of soil water solution borne contaminants down through the soil profile. The potential receptors of groundwater from beneath the site are beneficial groundwater users within an approximately 1 kilometre vicinity of the site and/or the incised Murrumbidgee River and its associated environs to the south of the site.

Excess surface water collecting and moving off the site has the potential to mobilise contaminants. The site has been subject to earthworks to facilitate border check (flood) irrigation water application for agricultural production. These earthworks include shallow earthen surface water drains designed to remove excess surface water from the site. In addition, surrounding land consists of an excess surface water capture and irrigation reuse system. Therefore, only in times of exceedingly wet climatic conditions would sufficient excess surface water accumulate and then leave the site, and in this case surface water movement is likely to be to the south of the site towards the Murrumbidgee River. This excess surface water could then potentially impact the Murrumbidgee River and its riparian environs.

In the cases of both groundwater and surface water, possible receptors include human and ecological receptors, and exposure pathways are potentially continuous, particularly in relation to the surface waters. The possible exposure pathways in connection with groundwater are more limited; likely being confined to groundwater bores and/or where groundwater enters incised district waterways. It is not likely that surface water or groundwater from the site is a source of untreated drinking water for humans however, some stock watering from these resources could occur.

Because the site is deemed uncontaminated, and the probability of significant leaching to groundwater and/or excess surface water run-off leaving the site are both limited, there is a low likelihood of contaminant mobilisation on or adjoining the site.

8 SUMMARY & CONCLUSIONS

This PSI concludes that there is no evidence of potentially land contaminating activities having occurred on the site other than agricultural/horticultural uses, which we deem to present a negligible risk of contamination. This PSI indicated that the most potential for land contamination from land use adjacent to the site was from the adjoining Yanco Substation. The detailed assessment of site history, environmental features on and adjoining the site, the thorough site inspection, and the analysis of one soil sample from the key area on the site, did not indicate any heightened risk of land contamination on the site. Based on the results detailed herein, it can be concluded that the site is not contaminated and contaminated land does not exist on the site and the site has a very low risk of contamination. No toxic levels of contaminants that are likely to be toxic to human health or the environment were detected. No further contamination assessments are recommended.

9 APPENDICES

9.1 Appendix A - Locality Plan



Image sourced from Google Earth 2024.

9.2 Appendix B - Site Plans



Image B1: Layout of the site showing the location from which the soil sample (S3) was collected - image sourced from Google Earth 2024.

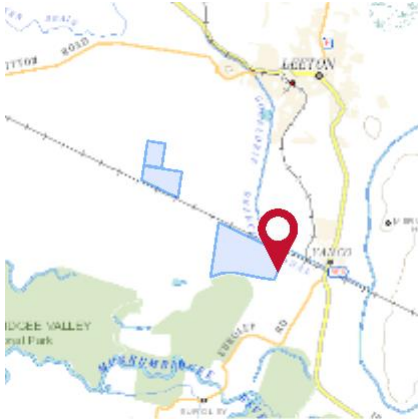


Image B2: The thick pink boundary line denotes the outer boundary of Lot 521 and Lot 516 at 120 Houghton Road, Yanco whilst the thin pink line denotes the internal parcel boundary between the two Lots - image sourced from Lotsearch.

9.3 Appendix C - Property Report

Property Report

120 HOUGHTON ROAD YANCO 2703



Property Details

Address: 120 HOUGHTON ROAD YANCO 2703
 Lot/Section 144/-/DP751703 516/-/DP751745 521/-/DP751745
 /Plan No: 80/-/DP751703 82/-/DP751703
 Council: LEETON SHIRE COUNCIL

Summary of planning controls

Planning controls held within the Planning Database are summarised below. The property may be affected by additional planning controls not outlined in this report. Please contact your council for more information.

Local Environmental Plans	Leeton Local Environmental Plan 2014 (pub. 10-6-2014)
Land Zoning	RU1 - Primary Production: (pub. 21-4-2023)
Height Of Building	NA
Floor Space Ratio	NA
Minimum Lot Size	150 ha
Heritage	NA
Land Reservation Acquisition	NA
Foreshore Building Line	NA
Groundwater Vulnerability	Groundwater Vulnerable
Local Provisions	Murrumbidgee Irrigation Area
Terrestrial Biodiversity	Biodiversity

Detailed planning information

State Environmental Planning Policies which apply to this property

State Environmental Planning Policies can specify planning controls for certain areas and/or types of development. They can also identify the development assessment system that applies and the type of environmental assessment that is required.

This report provides general information only and does not replace a Section 10.7 Certificate (formerly Section 149)



Property Report

120 HOUGHTON ROAD YANCO 2703

- State Environmental Planning Policy (Biodiversity and Conservation) 2021: Excluded (pub. 21-10-2022)
- State Environmental Planning Policy (Biodiversity and Conservation) 2021: Land Application (pub. 2-12-2021)
- State Environmental Planning Policy (Building Sustainability Index: BASIX) 2004: Land Application (pub. 25-6-2004)
- State Environmental Planning Policy (Exempt and Complying Development Codes) 2008: Land Application (pub. 12-12-2008)
- State Environmental Planning Policy (Housing) 2021: Land Application (pub. 26-11-2021)
- State Environmental Planning Policy (Industry and Employment) 2021: Land Application (pub. 2-12-2021)
- State Environmental Planning Policy (Planning Systems) 2021: Land Application (pub. 2-12-2021)
- State Environmental Planning Policy (Primary Production) 2021: Land Application (pub. 2-12-2021)
- State Environmental Planning Policy (Resilience and Hazards) 2021: Land Application (pub. 2-12-2021)
- State Environmental Planning Policy (Resources and Energy) 2021: Land Application (pub. 2-12-2021)
- State Environmental Planning Policy (Transport and Infrastructure) 2021: Land Application (pub. 2-12-2021)
- State Environmental Planning Policy No 65—Design Quality of Residential Apartment Development: Land Application (pub. 26-7-2002)

Other matters affecting the property

Information held in the Planning Database about other matters affecting the property appears below. The property may also be affected by additional planning controls not outlined in this report. Please speak to your council for more information

Land near Electrical Infrastructure	This property may be located near electrical infrastructure and could be subject to requirements listed under ISEPP Clause 45. Please contact Essential Energy for more information.
Local Aboriginal Land Council	LEETON AND DISTRICT
Regional Plan Boundary	Riverina Murray

This report provides general information only and does not replace a Section 10.7 Certificate (formerly Section 149)

9.4 Appendix D - Desktop Assessment Data Sources

Dataset Listing

Datasets contained within this report, detailing their source and data currency:

Dataset Name	Custodian	Supply Date	Currency Date	Update Frequency	Dataset Buffer (m)	No. Features On-site	No. Features within 100m	No. Features within Buffer
Cadastre Boundaries	NSW Department of Customer Service - Spatial Services	04/01/2024	04/01/2024	Quarterly	-	-	-	-
Topographic Data	NSW Department of Customer Service - Spatial Services	22/08/2022	22/08/2022	Annually	-	-	-	-
List of NSW contaminated sites notified to EPA	Environment Protection Authority	12/01/2024	14/12/2023	Monthly	1000m	0	0	0
Contaminated Land Records of Notice	Environment Protection Authority	12/01/2024	12/01/2024	Monthly	1000m	0	0	0
Former Gasworks	Environment Protection Authority	24/01/2024	14/07/2021	Quarterly	1000m	0	0	0
Notices under the POEO Act 1997	Environment Protection Authority	17/01/2024	17/01/2024	Monthly	1000m	0	0	1
National Waste Management Facilities Database	Geoscience Australia	26/05/2022	07/03/2017	Annually	1000m	0	0	0
National Liquid Fuel Facilities	Geoscience Australia	20/09/2023	07/09/2020	Annually	1000m	0	0	0
EPA PFAS Investigation Program	Environment Protection Authority	15/01/2024	21/11/2023	Monthly	2000m	0	0	0
Defence PFAS Investigation & Management Program - Investigation Sites	Department of Defence	05/02/2024	05/02/2024	Monthly	2000m	0	0	0
Defence PFAS Investigation & Management Program - Management Sites	Department of Defence	05/02/2024	05/02/2024	Monthly	2000m	0	0	0
Airservices Australia National PFAS Management Program	Airservices Australia	05/02/2024	05/02/2024	Monthly	2000m	0	0	0
Defence Controlled Areas	Department of Defence	12/01/2024	12/01/2024	Quarterly	2000m	0	0	0
Defence 3 Year Regional Contamination Investigation Program	Department of Defence	24/01/2024	02/09/2022	Quarterly	2000m	0	0	0
National Unexploded Ordnance (UXO)	Department of Defence	12/01/2024	12/01/2024	Quarterly	2000m	0	0	0
EPA Other Sites with Contamination Issues	Environment Protection Authority	13/11/2023	15/12/2022	Annually	1000m	0	0	0
Licensed Activities under the POEO Act 1997	Environment Protection Authority	15/01/2024	15/01/2024	Monthly	1000m	1	2	3
Delicensed POEO Activities still regulated by the EPA	Environment Protection Authority	15/01/2024	15/01/2024	Monthly	1000m	0	0	0
Former POEO Licensed Activities now revoked or surrendered	Environment Protection Authority	15/01/2024	15/01/2024	Monthly	1000m	3	3	4
UBD Business Directories (Premise & Intersection Matches)	Hardie Grant			Not required	150m	0	0	0
UBD Business Directories (Road & Area Matches)	Hardie Grant			Not required	150m	-	0	0
UBD Business Directory Dry Cleaners & Motor Garages/Service Stations (Premise & Intersection Matches)	Hardie Grant			Not required	500m	0	0	0
UBD Business Directory Dry Cleaners & Motor Garages/Service Stations (Road & Area Matches)	Hardie Grant			Not required	500m	-	0	0
Points of Interest	NSW Department of Customer Service - Spatial Services	13/11/2023	13/11/2023	Quarterly	1000m	0	0	3
Tanks (Areas)	NSW Department of Customer Service - Spatial Services	13/11/2023	13/11/2023	Quarterly	1000m	0	0	0
Tanks (Points)	NSW Department of Customer Service - Spatial Services	13/11/2023	13/11/2023	Quarterly	1000m	0	0	0
Major Easements	NSW Department of Customer Service - Spatial Services	31/01/2024	31/01/2024	Quarterly	1000m	1	6	8
State Forest	Forestry Corporation of NSW	12/12/2023	11/12/2023	Annually	1000m	0	0	0
NSW National Parks and Wildlife Service Reserves	NSW Office of Environment & Heritage	16/02/2023	31/12/2022	Annually	1000m	0	1	1
Hydrogeology Map of Australia	Commonwealth of Australia (Geoscience Australia)	06/02/2024	19/08/2019	Annually	1000m	2	2	2

Dataset Name	Custodian	Supply Date	Currency Date	Update Frequency	Dataset Buffer (m)	No. Features On-site	No. Features within 100m	No. Features within Buffer
Temporary Water Restriction (Botany Sands Groundwater Source) Order 2018	NSW Department of Planning, Industry and Environment	09/05/2023	23/02/2018	Annually	1000m	0	0	0
National Groundwater Information System (NGIS) Boreholes	Bureau of Meteorology; Water NSW	18/04/2023	13/07/2022	Annually	2000m	5	5	20
NSW Seamless Geology Single Layer: Rock Units	Department of Regional NSW	06/12/2023	31/05/2023	Annually	1000m	1	2	3
NSW Seamless Geology – Single Layer: Trendlines	Department of Regional NSW	06/12/2023	31/05/2023	Annually	1000m	0	0	0
NSW Seamless Geology – Single Layer: Geological Boundaries and Faults	Department of Regional NSW	06/12/2023	31/05/2023	Annually	1000m	0	0	0
Naturally Occurring Asbestos Potential	NSW Dept. of Industry, Resources & Energy	04/12/2015	24/09/2015	Annually	1000m	0	0	0
Atlas of Australian Soils	Australian Bureau of Agriculture and Resource Economics and Sciences (ABARES)	12/01/2024	17/02/2011	Annually	1000m	1	1	1
Environmental Planning Instrument Acid Sulfate Soils	NSW Department of Planning, Industry and Environment	02/02/2024	01/09/2023	Monthly	500m	0	-	-
Atlas of Australian Acid Sulfate Soils	CSIRO	12/01/2024	21/02/2013	Annually	1000m	1	1	1
Dryland Salinity - National Assessment	National Land and Water Resources Audit	18/07/2014	12/05/2013	Annually	1000m	0	0	0
Mining Subsidence Districts	NSW Department of Customer Service - Subsidence Advisory NSW	24/01/2024	24/01/2024	Quarterly	1000m	0	0	0
Current Mining Titles	NSW Department of Industry	24/01/2024	24/01/2024	Monthly	1000m	0	0	0
Mining Title Applications	NSW Department of Industry	24/01/2024	24/01/2024	Monthly	1000m	0	0	0
Historic Mining Titles	NSW Department of Industry	24/01/2024	24/01/2024	Monthly	1000m	9	9	9
Environmental Planning Instrument SEPP State Significant Precincts	NSW Department of Planning, Industry and Environment	02/02/2024	08/09/2023	Monthly	1000m	0	0	0
Environmental Planning Instrument Land Zoning	NSW Department of Planning, Industry and Environment	02/02/2024	19/01/2024	Monthly	1000m	1	3	7
Commonwealth Heritage List	Australian Government Department of the Agriculture, Water and the Environment	20/10/2023	13/04/2022	Annually	1000m	0	0	0
National Heritage List	Australian Government Department of the Agriculture, Water and the Environment	20/10/2023	13/04/2022	Annually	1000m	0	0	0
State Heritage Register - Curtilages	NSW Department of Planning, Industry and Environment	24/01/2024	24/11/2023	Quarterly	1000m	0	0	0
Environmental Planning Instrument Local Heritage	NSW Department of Planning, Industry and Environment	02/02/2024	19/01/2024	Monthly	1000m	0	0	0
Bush Fire Prone Land	NSW Rural Fire Service	26/02/2024	20/11/2023	Monthly	1000m	0	2	2
NSW Native Vegetation Type Map	NSW Department of Planning and Environment	26/05/2023	12/12/2022	Quarterly	1000m	24	44	177
Ramsar Wetlands of Australia	Australian Government Department of Agriculture, Water and the Environment	09/05/2023	01/11/2022	Annually	1000m	0	0	0
Groundwater Dependent Ecosystems	Bureau of Meteorology	28/10/2022	26/10/2022	Annually	1000m	2	3	4
Inflow Dependent Ecosystems Likelihood	Bureau of Meteorology	28/10/2022	26/10/2022	Annually	1000m	3	4	5
NSW BioNet Species Sightings	NSW Office of Environment & Heritage	29/11/2023	29/11/2023	Weekly	10000m	-	-	-

9.5 Appendix E - Historical Aerial Imagery



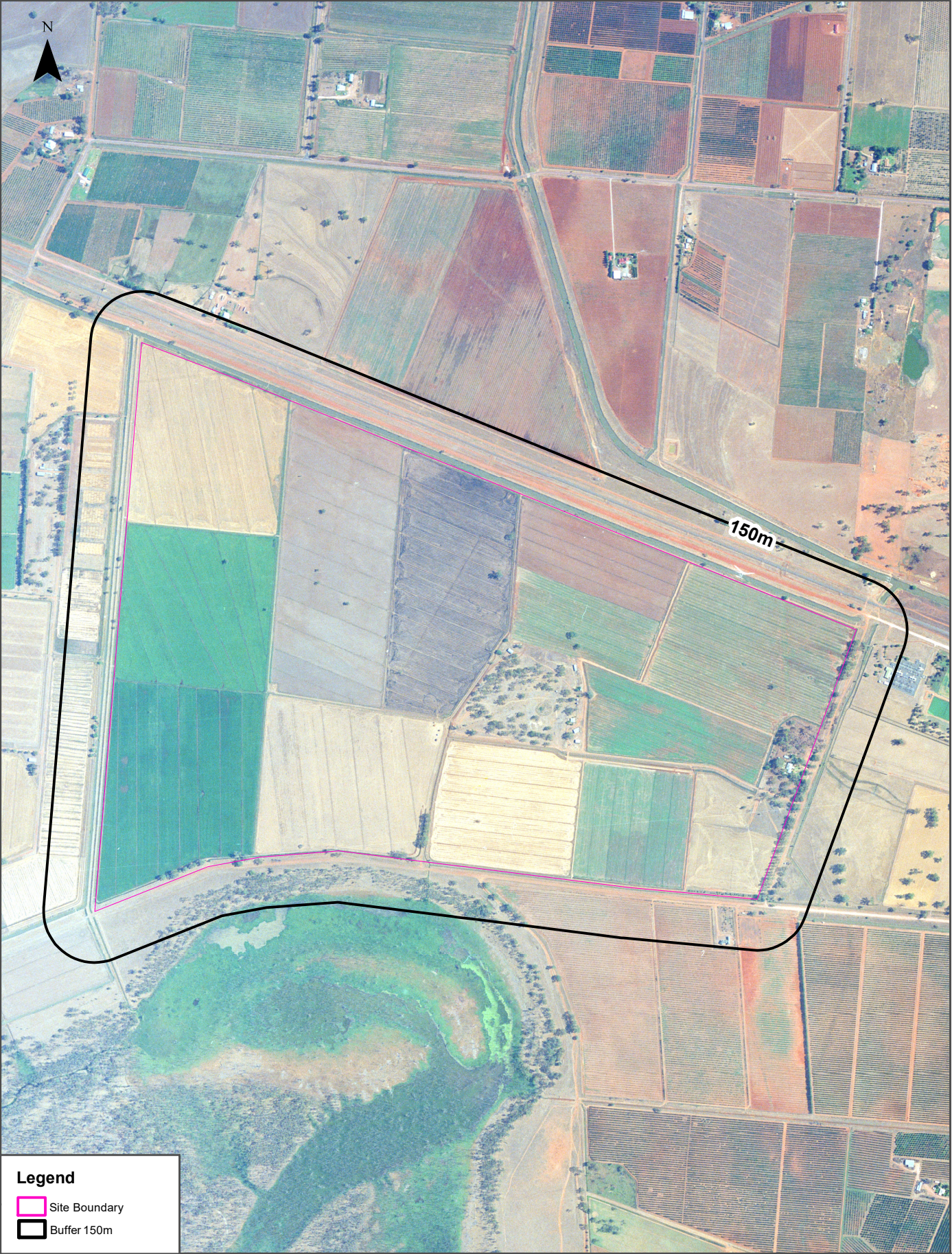
Scale: 0 180 360 540 720 Meters	Data Source Aerial Imagery: © Aerometrex Pty Ltd	Coordinate System: GDA 1994 MGA Zone 56	Date: 28 February 2024
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Scale: 0 180 360 540 720 Meters	Data Source Aerial Imagery: © 2024 Google Inc, used with permission. Google and the Google logo are registered trademarks of Google Inc.	Coordinate System: GDA 1994 MGA Zone 56	Date: 27 February 2024
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Scale: 0 180 360 540 720 Meters	Data Source Aerial Imagery: © NSW Department of Customer Service	Coordinate System: GDA 1994 MGA Zone 56	Date: 28 February 2024
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Scale: 0 180 360 540 720 Meters	Data Source Aerial Imagery: © NSW Department of Customer Service	Coordinate System: GDA 1994 MGA Zone 56	Date: 28 February 2024
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Scale: 0 180 360 540 720 Meters	Data Source Aerial Imagery: © 2024 Geoscience Australia	Coordinate System: GDA 1994 MGA Zone 56	Date: 27 February 2024
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Scale: 0 180 360 540 720 Meters	Data Source Aerial Imagery: © 2024 Geoscience Australia	Coordinate System: GDA 1994 MGA Zone 56	Date: 27 February 2024
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9.6 Appendix F - Site Environmental Features

9.6.1 Geology & Landscape

The site is located in the Murray Darling Basin of south-eastern Australia and is founded on Cenozoic alluvial floodplain deposits which typically consist of alluvial riverine and lacustrine deposits influenced by intervening aeolian activity and consisting of poorly consolidated clay, silt, sand and gravel. Land to the northeast of the site is documented as consisting of Quaternary mixed colluvial, alluvial and aeolian deposits consisting of poorly consolidated sands. The site and property are located in a relatively flat landscape originally consisting of flat terrain with subtle undulations typical of a Prior Stream Landscape, consisting of prior streams, near, mid and far floodplains, and swamps. Significant anthropogenic intervention over the past 150 years has altered the original landscape surface to facilitate road construction, access, irrigation water supply and drainage. The site is predominantly flat but has a slight surface slope created through land forming to facilitate excess surface water drainage for agricultural production.

9.6.2 Climate

An indication of typical climatic variables was obtained from the Bureau of Meteorology Yanco Agricultural Institute Weather Station (No. 074037) (with data from 1957 to 2024) which is located approximately 4.5 km southeast of the site. This indicates that the district is generally characterised by warm to hot temperatures averaging 18 to 32°C in the summer months, and cool to mild temperatures averaging 5 to 15°C in the winter months. Moderate rainfall occurs, falling fairly evenly throughout the autumn to spring months at approximately 36-38 mm/month and 32 mm/month in the summer months. The long-term average annual rainfall approximates 428 mm and average annual evaporation approximates 1,600 mm.

9.6.3 Topography & Drainage

As detailed above, the site is predominantly flat but has a slight surface slope created through land forming to facilitate excess surface water drainage for agricultural production (*Image F1*). Slightly higher elevation land occurs to the northeast of the site whilst lower elevation land occurs to the south of the site. It is not likely that excess surface water run-on would impact the site due to its location in the landscape and the existing water authority and farm irrigation water supply channels, the latter which occur adjacent to the northern and eastern boundaries of the site. Accumulations of excess surface water on the site would drain to the western boundary of the site and enter the aforementioned farm drainage system. The soil profile on the site is moderately to poorly drained however, site drainage is generally adequate as the site has adequate surface slope to facilitate acceptable surface water drainage. There was no evidence of excessive surface water pooling or water accumulation on the site.



Image F1: The site is located in a predominantly flat landscape but has a slight surface slope created through land forming to facilitate excess surface water drainage for agricultural production.

9.6.4 Soils

Assessment - The soils on the site were investigated utilising a 100 mm (4 inch) diameter hand soil auger (*Image F2*) with the soil profile examined to depths of 40 to 80 cm below the surface at numerous locations across the site. This soil survey facilitated detailed assessment of soil physical characteristics and of soil variations across the site.

Geology - The site is located in the Murray Darling Basin of south-eastern Australia and is founded on Cenozoic alluvial floodplain deposits which typically consist of alluvial riverine and lacustrine deposits influenced by intervening aeolian activity and consisting of poorly consolidated clay, silt, sand and gravel. Land to the northeast of the site is documented as consisting of Quaternary mixed colluvial, alluvial and aeolian deposits consisting of poorly consolidated sands.

Taxonomy - The New South Wales Government central resource for sharing and enabling environmental data (<https://datasets.seed.nsw.gov.au> (SEED facility)) documents the site as consisting of the Great Soil Group *Red-brown Earths* and the Australian Soil Classification (ASC) (*Isbell 2021*) *Chromosols*. The Great Soil Group *Grey, Brown and Red Clays* and the Australian Soil Classification (ASC) (*Isbell 2021*) *Vertosols* occur to the west of the site. The site assessment of soil physical

characteristics confirmed that the soils across the site consist of Red-Brown Earths (Great Soil Group) and are Chromosols (ASC). Chromosols and Red-Brown Earths are duplex soils with dominant red, orange or yellow colouring, particularly in the subsoils. The soils across the site consist of approximately 20 cm of light brown loam surface soil overlying dull to bright red-brown clay, medium clay subsoils (Image F2).



Image F2: The soils on the site are classified as Chromosols and Red-Brown Earths which are duplex soils with red subsoil colouring.

Soil Physical Characteristics - The soil profile, which is relatively uniform across the site, consists of 20 cm of a light brown loam surface soil which is poorly structured, massive, moderately friable and is susceptible to slaking and crusting. This topsoil relatively abruptly grades into the clay dominant initial subsoil layer which consists of dull to bright red-brown medium clay. This subsoil is slightly friable and is well structured typically consisting of moderate to strong subangular blocky structure. Deeper subsoil layers (> 40cm depth) grade into grey-brown, light to medium clays with fine, subangular blocky structure and traces of natural lime (calcium carbonate). Lime content gradually increases down the soil profile and cannot be discerned in the surface soil or upper subsoil, but increases to 1 to 2% in the deeper subsoil below depths of 40 cm and consists of fine powdery deposits and nodules, the latter < 5 mm in diameter. Clay content is likely to approximate 25% in the surface soils and 45% in the subsoils.

Soil profile drainage is moderate to poor with slow profile permeability. Typical effective agricultural crop root depths are likely to approximate 40 cm. Apart from limited soil profile drainage and a relatively tough structure, the soil profiles have no significant physical or chemical barriers to plant root penetration or water infiltration in the upper 1.0 m of the soil profile.

The soil surface consists of soil clods, peds and partially slaked peds and when not influenced by agricultural machinery (ploughing), is relatively flat and uniform. No evidence of gilgais were noted. The soil profile does not contain any rock with the exception of traces of small (< 5mm in diameter) natural lime (calcium carbonate) nodules at depths greater than 40cm. Bedrock would be at depths of greater than 100 m. The soils are not susceptible to perched watertables and are not susceptible to erosion.

Soil Chemical Characteristics - Two surface soil samples and two subsoil samples were collected from representative locations on the site. These samples were analysed for agronomic soil parameters and the results are provided in *Table F1*.

Table F1: Surface soil and subsoil agronomic soil chemistry laboratory analysis results.

SOIL ANALYSIS RESULTS		Soil Sample ID				Statistics		
Sampling Location		Sample 1		Sample 2				
GPS Coordinates		34°36'2.04"S 146°23'25.40"E		34°36'4.32"S 146°23'37.40"E				
	Horizon	Topsoil	Subsoil	Topsoil	Subsoil			
Sample I.D.		S1 A1	S1 B1	S2 A1	S2 B1			
Parameter	Units					Min	Max	Average
Nitrate Nitrogen	mg/kg	159	21	113	13	13	159	76.5
Ammonium Nitrogen	mg/kg	6	2	5	3	2	6	4
Total Nitrogen	%	0.29	0.14	0.24	0.10	0.10	0.29	0.19
Olsen Phosphorus	mg/kg	54	10	42	2	2	54	27
Colwell Phosphorus	mg/kg	132	29	104	6	6	132	68
Total Phosphorus	mg/kg	579	236	501	159	159	579	369
Colwell Potassium	mg/kg	479	141	328	182	141	479	282.5
Skene Potassium	mg/kg	475	119	305	185	119	475	271
Sulphur (KCl 40)	mg/kg	27.7	6.1	23.5	9.3	6.1	27.7	16.7
Organic Carbon	%	2.4	0.8	1.7	0.4	0.4	2.4	1.3
Organic Matter	%	4.2	1.3	2.9	0.7	0.7	4.2	2.3
Salinity (EC - H ₂ O1:5)	dS/m	0.447	0.076	0.292	0.130	0.076	0.447	0.236
Chloride	mg/kg	54	14	50	20	14	54	34
pH (CaCl ₂)	pH	5.3	5.3	5.5	6.6	5.3	6.6	5.7
pH (H ₂ O)	pH	5.8	6.2	5.9	7.8	5.8	7.8	6.4
Copper (DTPA)	mg/kg	1.5	2.3	1.8	2.1	1.5	2.3	1.9
Zinc (DTPA)	mg/kg	2.7	0.6	2.4	0.3	0.3	2.7	1.5
Manganese (DTPA)	mg/kg	24	12	43	11	11	43	23
Iron (DTPA)	mg/kg	115	140	90	27	27	140	93
Boron	mg/kg	1.2	0.7	0.9	2.4	0.7	2.4	1.3
Exchangeable Ca	meq/100g	10.0	5.8	8.0	10.5	5.8	10.5	8.6
Exchangeable Mg	meq/100g	2.5	2.2	2.5	10.5	2.2	10.5	4.4
Exchangeable K	meq/100g	1.1	0.3	0.7	0.5	0.3	1.1	0.7
Aluminium (Exch.)	mg/kg	0.032	0.047	0.024	0.042	0.024	0.047	0.03625
CEC -Cation Ex. Cap.	meq/100g	14	9	12	23	9	23	14
Ca:Mg Ratio	ratio	4.0	2.7	3.2	1.0	1.0	4.0	2.7
ESP - Exchng. Na %	%	1.4	2.6	3.0	7.9	1.4	7.9	3.7

Soil pH – The surface soil pH ($\text{pH}(\text{H}_2\text{O})_{1:5}$) levels ranged from 5.8 to 5.9 which are moderately acidic but typical. Subsoil pH levels ranged from 6.2 to 7.8 which are slightly acidic to slightly alkaline but are also typical. Soil layers in these soil profiles typically gradually become more alkaline with depth.

Salinity & Chloride – Soil salinity levels, measured as EC (Electrical Conductivity ($\text{EC}_{1:5}$) and chloride), were low in the surface soils ($\text{EC} = 0.29 - 0.45 \text{ dS/m}$; $\text{Cl} = 50 - 54 \text{ mg/kg}$). Levels were lower in the subsoils ($\text{EC} = 0.08 - 0.13 \text{ dS/m}$; $\text{Cl} = 14 - 20 \text{ mg/kg}$). These levels are low which indicates that salinity is not currently a problem on this site.

Phosphorus – Soil phosphorus levels, measured as Olsen Plant Available Phosphorus (Olsen P), ranged from 42 to 54 mg/kg in the surface soils and from 2 to 10 mg/kg in the subsoils. Colwell and Total Phosphorus levels corresponded with Olsen Phosphorous levels. These soil phosphorus levels are moderate to high for agricultural production indicating regular historical phosphorus fertiliser applications. Levels are slightly higher than desirable in the subsoils. However, these soil phosphorus levels are typical of these soil types under this land use in this district and are not of concern.

Nitrogen – Nitrogen is a transient element and typically varies over crop growing season in agricultural soils. Surface soil nitrate nitrogen levels were high (nitrate N = 113 - 159 mg/kg) and subsoil levels were significantly lower but slightly higher than desirable (nitrate N = 13 - 21 mg/kg). Surface soil ammonium nitrogen levels were at typical adequate levels (ammonium N = 13 - 21 mg/kg) and subsoil levels were low (ammonium N = 2 - 3 mg/kg). Total Nitrogen levels corresponded with these top these soil nitrogen levels are typical of nitrogen in an agricultural system and the higher levels are likely to be a result of recent, past, agricultural fertiliser applications.

Potassium - These soil types in this district typically inherently contain adequate levels of potassium. Soil potassium levels, measured as Skene Potassium (Skene K), were at good adequate levels in both the surface soils (305 to 475 mg/kg Skene K) and the subsoils (119 - 185 mg/kg Skene K). These levels are typical of these soil types in this district and provide sufficient potassium for agriculture.

Sulphur – The surface soils contain typical levels of sulphur (measured as Sulphur KCl 40) with higher levels recorded in the surface soils (24 - 28 mg/kg) and lower levels recorded in the subsoils (6 - 9 mg/kg). These levels are typical of these soil types under this land use and surface soil levels are likely to have been enhanced by past agricultural fertiliser and/or gypsum applications.

Cation Exchange Capacity - The cation exchange capacity (CEC) of these soils was adequate to good, reflects soil clay content and indicates a good capacity to retain nutrients. Levels in both the surface soils and the subsoils ranged from 9 to 23 meq/100g. These levels are typical and are not of concern.

Ca:Mg Ratio - The surface soil calcium/magnesium ratio (Ca:Mg) was adequate to good ranging from 3.2 to 4.0 which indicates sufficient soil calcium levels to help enhance and maintain soil structure. The subsoil Ca:Mg levels were low ranging from 1.0 to 2.7 which indicates low subsoil calcium levels which are typical of these soil types and which increases the susceptibility of the subsoils to poor structure.

Sodicity (ESP) - Soil sodium (sodicity) levels, measured as the exchangeable sodium percentage (ESP), were low in the surface soils with ESP levels ranging from 1 to 4. Subsoil sodicity ranged from low to slightly elevated with subsoil ESP levels ranging from 3 to 8. These levels are typical of these soil types under this land-use in this district and are far from excessive. Subsoil sodicity in these soil types can be elevated which can adversely impact soil structure. These levels are not of concern.

Organic Carbon - Soil organic carbon is an indicator of soil organic matter content and these results indicate typical, marginal to good soil organic matter levels. As is typical of surface soil organic carbon levels in agricultural soils, levels were higher in the surface soils (organic carbon = 1.7 to 2.4 %) and, as would be expected, levels were low in the subsoils (organic carbon = 0.4 to 0.8 %). These levels are typical and are not of concern.

Trace Elements - Based on the soil samples analysed, the results indicate that these soils have adequate to good copper and zinc levels), good and adequate manganese and iron levels, and adequate boron levels. Soil aluminium levels were low which is good. These results are typical of these soil types under this land-use in this district and are not of concern.

Soil Chemistry Summary - The soil chemistry analysis results indicate soils with chemical characteristics typical of these soil types under this land-use in this district. The surface soils were acidic which can adversely impact agricultural production. Soil salinity levels low which is good. The soils had good and adequate macronutrient levels (nitrogen, phosphorus, potassium and sulphur), adequate organic matter levels and typical and adequate micronutrient levels (copper, zinc, iron, manganese and boron). The soils had low sodicity and adequate calcium in the surface soils however, calcium levels were low and sodicity slightly elevated in the subsoils. None of these levels are considered excessive or contamination. These soils are not susceptible to elevated salinity and there was no evidence of saline conditions on or adjoining the site. Based on soil science experience and a search of publicly available records, there is no record of acid sulphate soils on or in the vicinity of the site and the soils are not susceptible to the development of acid sulphate conditions. The soils are also not particularly susceptible to perched watertables or erosion. These soil chemical characteristics indicate good fertility for agricultural production however, the low soil organic matter levels, combined with slightly elevated sodicity and low soil calcium levels, make the soils are set will to soil structural decline and particularly slaking, hard setting and dispersion. These soil chemical characteristics do not indicate any elevated risk of soil contamination.

9.6.5 Groundwater

A search of publicly available groundwater information indicated a number of groundwater monitoring bores and an irrigation bore in the vicinity of the site however, these did not have any recorded information on groundwater depth or quality and the status of the bores was generally unknown. The district and the landscape are known for sporadic, shallow (in the upper 20 m) aquifers (typically in shoe-string sands in the Lower Murray Shallow Alluvium) which can yield low volumes of variable quality groundwater. Historically, the district may have been susceptible to shallow groundwater (1 to 4 metres below the natural surface) and associated water table induced salinity however, this was exacerbated by wet climatic conditions, poor surface water management and inefficient irrigation practices. Over the past 20 years the depth to shallow groundwater has increased (5 to 10 metres below the natural surface) and now rarely causes adverse impacts. The site is not generally susceptible to shallow water table induced salinity due to its moderate elevation position in the landscape. No evidence of shallow groundwater or salinity were evident on or adjoining the site and the landholder reports no evidence of salinity on or adjoining the site over the longer term. In deeper (40 to 300 metre) aquifers, groundwater yield and quality are generally good with low salinity levels however, some aquifers can contain elevated salinity groundwater. As detailed earlier, the site has access to deep aquifer groundwater through an irrigation bore and this is likely to be extracting groundwater from the Calivil Formation (depths up to 140 m) or the Renmark Group, the latter overlying basement rock at depths between 140 m to 350 m.

9.6.6 Vegetation

There are no trees and no native or remnant vegetation on the site. Planted native trees are located parallel to the eastern fenced boundary of the site (*Image F3*). There are some weeds concentrated along the flood irrigation channel along the eastern boundary of the site. In recent times, land on the site and on irrigation areas to the west and south of the site have been utilised for rotational winter cropping and grazing. The site currently contains canola stubble and the landowner indicated he will continue a winter cropping rotation, most likely barley in winter 2024. Over a 30 year period, the landowner indicated he grew lucerne for half of that time and other summer and winter crops for the other half. The landowner also advised that historically the site may have been used for rice production in a minor way. The landscape is Older Terrace Riverine Floodplain which would have originally supported Riverine Plains Grassy Woodland which would naturally have consisted of Riverine Grassy Forest and Riverine Grassy Chenopod Woodland ecosystems, which includes Grey Box, Yellow Box and River Red Gum Forests, Black Box Woodlands, White Cypress Woodlands and Native Grasslands.



Image F3: Facing south from the northeast corner of the site; eastern boundary fence line and planted native trees adjacent to the Yanco Substation (left); irrigation channel with floodgates and minor weed and couch grass coverage (foreground); canola stubble (right).

9.7 Appendix G - Soil Laboratory Chemical Analysis Results



CERTIFICATE OF ANALYSIS

Work Order : EM2404625
Client : CADEEMA PTY LTD
Contact : BRI DANCE
Address : 24 Dunkirk Avenue
SHEPPARTON VIC 3630
Telephone : ----
Project : C375
Order number : ----
C-O-C number : ----
Sampler : BRIONY DANCE
Site : ----
Quote number : EN/222
No. of samples received : 1
No. of samples analysed : 1

Page : 1 of 5
Laboratory : Environmental Division Melbourne
Contact : Customer Services EM
Address : 4 Westall Rd Springvale VIC Australia 3171
Telephone : +61-3-8549 9600
Date Samples Received : 22-Mar-2024 11:00
Date Analysis Commenced : 26-Mar-2024
Issue Date : 02-Apr-2024 16:25



Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Dilani Fernando	Laboratory Coordinator	Melbourne Inorganics, Springvale, VIC
Jarwis Nheu	Non-Metals Team Leader	Melbourne Inorganics, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Organics, Springvale, VIC



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EP068: Where reported, Total Chlordane (sum) is the sum of the reported concentrations of cis-Chlordane and trans-Chlordane at or above the LOR.
- EP068: Where reported, Total OCP is the sum of the reported concentrations of all Organochlorine Pesticides at or above LOR.

Page : 3 of 5
 Work Order : EM2404625
 Client : CADEEMA PTY LTD
 Project : C375



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	S3	----	----	----	----
				Sampling date / time	20-Mar-2024 13:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EM2404625-001	-----	-----	-----	-----	-----
				Result	----	----	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	1.0	%	8.0	----	----	----	----	----
EG005(ED093)T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg	<5	----	----	----	----	----
Cadmium	7440-43-9	1	mg/kg	<1	----	----	----	----	----
Chromium	7440-47-3	2	mg/kg	26	----	----	----	----	----
Copper	7440-50-8	5	mg/kg	15	----	----	----	----	----
Lead	7439-92-1	5	mg/kg	12	----	----	----	----	----
Nickel	7440-02-0	2	mg/kg	15	----	----	----	----	----
Zinc	7440-66-6	5	mg/kg	33	----	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg	<0.1	----	----	----	----	----
EP066: Polychlorinated Biphenyls (PCB)									
Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	----	----	----	----	----
EP068A: Organochlorine Pesticides (OC)									
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	----	----	----	----	----
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	----	----	----	----	----
beta-BHC	319-85-7	0.05	mg/kg	<0.05	----	----	----	----	----
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	----	----	----	----	----
delta-BHC	319-86-8	0.05	mg/kg	<0.05	----	----	----	----	----
Heptachlor	76-44-8	0.05	mg/kg	<0.05	----	----	----	----	----
Aldrin	309-00-2	0.05	mg/kg	<0.05	----	----	----	----	----
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	----	----	----	----	----
^ Total Chlordane (sum)	----	0.05	mg/kg	<0.05	----	----	----	----	----
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	----	----	----	----	----
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	----	----	----	----	----
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	----	----	----	----	----
Dieldrin	60-57-1	0.05	mg/kg	<0.05	----	----	----	----	----

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Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	S3	----	----	----	----
				Sampling date / time	20-Mar-2024 13:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EM2404625-001	-----	-----	-----	-----	-----
				Result	----	----	----	----	----
EP068A: Organochlorine Pesticides (OC) - Continued									
4,4'-DDE	72-55-9	0.05	mg/kg	<0.05	----	----	----	----	----
Endrin	72-20-8	0.05	mg/kg	<0.05	----	----	----	----	----
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	----	----	----	----	----
^ Endosulfan (sum)	115-29-7	0.05	mg/kg	<0.05	----	----	----	----	----
4,4'-DDD	72-54-8	0.05	mg/kg	<0.05	----	----	----	----	----
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	----	----	----	----	----
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	----	----	----	----	----
4,4'-DDT	50-29-3	0.2	mg/kg	<0.2	----	----	----	----	----
Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	----	----	----	----	----
Methoxychlor	72-43-5	0.2	mg/kg	<0.2	----	----	----	----	----
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg	<0.05	----	----	----	----	----
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.05	mg/kg	<0.05	----	----	----	----	----
EP068S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%	93.5	----	----	----	----	----
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.05	%	108	----	----	----	----	----
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.05	%	137	----	----	----	----	----

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Surrogate Control Limits

Sub-Matrix: SOIL		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP066S: PCB Surrogate			
Decachlorobiphenyl	2051-24-3	36	140
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	62	128
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	40	139

9.8 Appendix H - Soil Chemistry Interpretation

One soil sample collected from the site was analysed in the laboratory for a range of potential soil contaminants depending on perceived risks of same. This soil chemistry data interpretation is based on *National Environment Protection (Assessment of Site Contamination) Measure 1999 Schedule B (1) - Guideline on Investigation Levels for Soil and Groundwater* and its relevant updates. These Investigation Levels are not clean-up or response levels, nor are they desirable soil quality criteria. They are intended to prompt an appropriate site-specific assessment when they are exceeded, and the development of appropriate clean-up/response levels where required. In this assessment, two different Investigation Levels have been used including:

Health Based Investigation Levels (HILs) - these are human exposure settings based on proposed land use. The most stringent exposure settings (A) have been adopted for this assessment and this includes “*standard residential with garden/accessible soil (home-grown produce contributing less than 10% of vegetable and fruit intake; no poultry): includes children’s day-care centres, kindergartens, preschools and primary schools*”.

Ecologically Based Investigation Levels (EILs) - these are levels for ecological risk assessment to determine the potential for environmental impact.

The soil sample was analysed for moisture, total metals, mercury, polychlorinated biphenyls (PCB), organochlorine pesticides (OC), and pH. It must be recognised that the bulk of these tests are conducted on cations, and it is both the anion level (which is associated with availability) and soil pH that impacts bioavailability. Note that the laboratory analysis Limit of Reporting (LOR), indicated by a < sign, denotes no recordable amount of the constituent present.

Moisture (%) – The soil sample had a moisture level of 8% which was commensurate with levels identified in *in-situ* soil layers during sampling.

Total Arsenic – The soil total arsenic level was recorded as the LOR of < 5 mg/kg which is low by comparison to the HIL of 100 mg/kg and the EIL of 20 mg/kg.

Total Cadmium – The soil total cadmium level was low and recorded as the LOR of < 1 mg/kg by comparison with the HIL of 20 mg/kg and the EIL of 3 mg/kg.

Total Copper – The soil total copper level was 15 mg/kg which is low by comparison with the HIL of 1,000 mg/kg and the EIL of 60 mg/kg.

Total Lead – The soil total lead level was low by comparison with the HIL of 600 mg/kg and the EIL of 300 mg/kg, at 12 mg/kg.

Total Nickel – The soil total nickel level was 15 mg/kg which is low by comparison with the HIL of 1,000 mg/kg and the EIL of 60 mg/kg.

Mercury – The soil mercury level, measured as total recoverable mercury, was recorded as the LOR of < 0.1 mg/kg which is low by comparison with the HIL of 15 mg/kg and the EIL of 1 mg/kg.

Total Chromium – The soil chromium level was 26 mg/kg which is low by comparison with the HIL of 100 mg/kg and the EIL of 600 mg/kg.

Polychlorinated Biphenyls – The soil polychlorinated biphenyls (PCBs) level was recorded as the LOR of < 0.1 mg/kg which is low by comparison with the HIL of 10 mg/kg and the EIL of 1 mg/kg.

Organochlorine Pesticides – The soil sample was analysed for the presence of a range of organochlorine pesticides. All levels in these soil samples were recorded as the LOR indicating that such contaminants are not present or are present in extremely low amounts as no detectable levels were present. These levels are low by comparison with the HIL of 200 mg/kg and the EIL of 1 mg/kg.