Preliminary Contaminated Site Investigation
For proposed Rezoning at
Lot 4 DP635505,
150 Lismore Rd,
BANGALOW, NSW 2479

Melaleuca Group Pty Ltd

Report Number: 642 Version 1

Revision History

Revision	Date	Description	Prepared By	Distribution
A	20/05/2021	Draft	Dr Melissa Van Zwieten	A More, M Lyndon (NRLS)
B	21/05/2021	Final	Dr Melissa Van Zwieten	A More, M Lyndon (NRLS)

Date: 21st May 2021

Prepared for:
A More

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Executive Summary

Melaleuca Group Pty Ltd has been engaged by A More to complete a Preliminary (Contamination) Site Investigation (PSI) for Lot 4 DP635505, 150 Lismore Rd, Bangalow, NSW 2479. This investigation is to assess the potential risk for landusers at the site to allow for the approval of a rezoning proposal. The proposal is to rezone the southern portion of the site from RU1 Primary Production to IN1 General Industrial.

It is considered the site has potentially been used for Agricultural purposes for over 100 years with the majority of pursuits likely to have been low intensity such as grazing. That is, no intensive Agricultural pursuits are known to have occurred on the site. No historical structures are known to have existed.

The Investigation Area consists of lands in the southern portion of the site, south of Maori Creek. The Investigation Area is approximately 1.5ha. However, this includes some lands in close proximity to the creek and considered too low lying for the purposes of future development (i.e. riparian corridor). As such the Investigation Area was reduced to approximately 1ha.

A review of available historical imagery from 1958 has confirmed the verbal history provided to Melaleuca Group.

However, to determine with surety if soils at the site may be impacted by past landuses and the range of COCs identified, 21 samples were collected for laboratory analysis for the heavy metals of Lead and Arsenic. In addition, these samples were analysed for Organochlorine pesticides. Sample locations were based on a systematic sampling grid.

The results indicate soil contamination of the study area has not occurred by the Lead or Arsenic nor by any of the Organochlorine pesticides tested.

Based on the findings of this Preliminary Site Investigation, it is considered the Investigation Area would not represent a significant risk of harm to end users of the proposed Rezoning and subsequent Industrial land uses.

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Table of Contents

1. Introduction

1.1 General

Melaleuca Group Pty Ltd has been engaged by A More to undertake a Preliminary (Contaminated) Site Investigation (PSI) and prepare a report for Lot 4 DP635505, 150 Lismore Rd, Bangalow NSW 2479. This investigation is to assess the potential risk for landusers at the site to allow for the approval of a rezoning proposal. The proposal is to rezone the southern portion of the site from RU1 Primary Production to IN1 General Industrial. Please refer to **Figure 1** for the site locality plan and **Figure 2** for the proposed site layout.

The objective of this preliminary investigation has been to determine if land contamination has occurred from historical and current land use activities occurring on site or immediately nearby. To determine if the site poses a significant risk of harm to end users (and nearby sensitive receptors), soil samples have been collected and analysed for a range of contaminants typically associated with the land uses identified as having occurred on site. The results of the soil analysis are compared to relevant EPA acceptable levels in order to assess the significance of risk.

This investigation is to Stage 1 of the Managing Land Contamination Planning Guidelines (DUAP and EPA, 1998). If contamination levels exceed the adopted EPA acceptable levels, a detailed investigation is then required (i.e. a Stage 2 investigation). If the contamination levels are below the relevant acceptable levels, and information gathered as part of the investigation also supports that contamination was unlikely to have occurred; only a Stage 1 investigation would be required.

This preliminary investigation has been used to identify the following:

- Past and present potentially contaminating activities occurring on or near the site; and
- The presence of Potential Contaminants of Concern associated with the identified land uses.

The investigation will also:

- Discuss the site condition;
- Provide a preliminary assessment of the site's contamination status; and
- Assess the need for further investigations.

Relevant documents considered in the preparation of this investigation included:

- Council of Standards Australia (2005) *AS 4482.1-2005 Guide to the sampling and investigation of potentially contaminated soil – Non-volatile and semi-volatile compounds*;
- NSW DEC (2017) *Contaminated Sites – Guidelines for the NSW Site Auditor Scheme 3rd Edition*;
- NSW EPA (1995) *Contaminated Sites – Sampling Design Guidelines*;
- NSW EPA (2020) *Consultants reporting on contaminated land, Contaminated land guidelines*; and
- National Environment Protection Council (NEPC) (2013) *National Environment Protection (Assessment of Site Contamination) Measure*

This preliminary assessment report is written in accordance with NSW EPA (2020) Consultants reporting on contaminated land, Contaminated land guidelines and the Northern Rivers Regional Councils (NRRC) Regional Policy for the Management of Contaminated Land (NRRC 2006).

1.2 Limitations

The findings of this report are based on the objectives and scope of work outlined above. Melaleuca Group Pty Ltd performed the services in a manner consistent with the normal level of care and expertise exercised by members of the environmental assessment profession. No warranties or guarantees expressed or implied, are given. Subject to the scope of the work, Melaleuca Group Pty Ltd assessment is limited strictly to identifying typical environmental conditions associated with the subject site, and does not include evaluation of any other issues. This report does not comment on any regulatory issues arising from the findings, for which a legal opinion should be sought. This report relates only to the objectives and scope of work stated, and does not relate to any other works undertaken for the client.

The report and conclusions are based on the information obtained at the time of the assessment. Changes to the subsurface conditions may occur subsequent to the investigation described herein, through natural processes or through the intentional or accidental addition of contaminants, and these conditions may change with space and time.

The site history and associated uses, areas of use, and potential contaminants were determined based on the activities described in the scope of work. Additional site information held by the client, regulatory authorities or in the public domain, which was not provided to Melaleuca Group Pty or was not sourced by Melaleuca Group Pty Ltd under the scope of work, may identify additional uses, areas of concern and/or potential contaminants. The information sources referenced have been used to determine the site history and desktop information regarding local subsurface conditions. Whilst Melaleuca Group Pty Ltd has used reasonable care to avoid reliance on data and information that is inaccurate and unsuitable, Melaleuca Group Pty Ltd is not able to verify the accuracy or completeness of all information and data made available.

Further chemicals or categories of chemicals may exist at the site, which were not identified in the site history, and which may not be expected at the site. The absence of any identified hazardous or toxic materials on the subject site should not be interpreted as a warranty or guarantee that such materials do not exist on the site. If additional certainty is required, additional site history or desktop studies, or environmental sampling and analysis should be commissioned.

Similarly, ground conditions including material types/composition can vary between sampling locations. Additionally, contaminants and combination of these can vary between sampling locations. These aspects should be considered when extrapolating between sampling locations. At each sampling location, the nature, extent and concentration of contamination is inferred only. However, the laboratory test methods used to characterise the contamination at each sampling location are also subject to limitations and provide only an approximation of the contaminant concentrations.

The results of this assessment are based upon site inspections and fieldwork conducted by Melaleuca Group Pty Ltd personnel and information provided by the client. All conclusions regarding the property area are the professional opinions of the Melaleuca Group Pty Ltd personnel involved with the project, subject to the qualifications made above. While normal assessments of data reliability have been made, Melaleuca Group Pty Ltd assume no responsibility or liability for errors in any data obtained from regulatory agencies, information from sources outside of Melaleuca Group Pty Ltd, or developments resulting from situations outside the scope of this project.

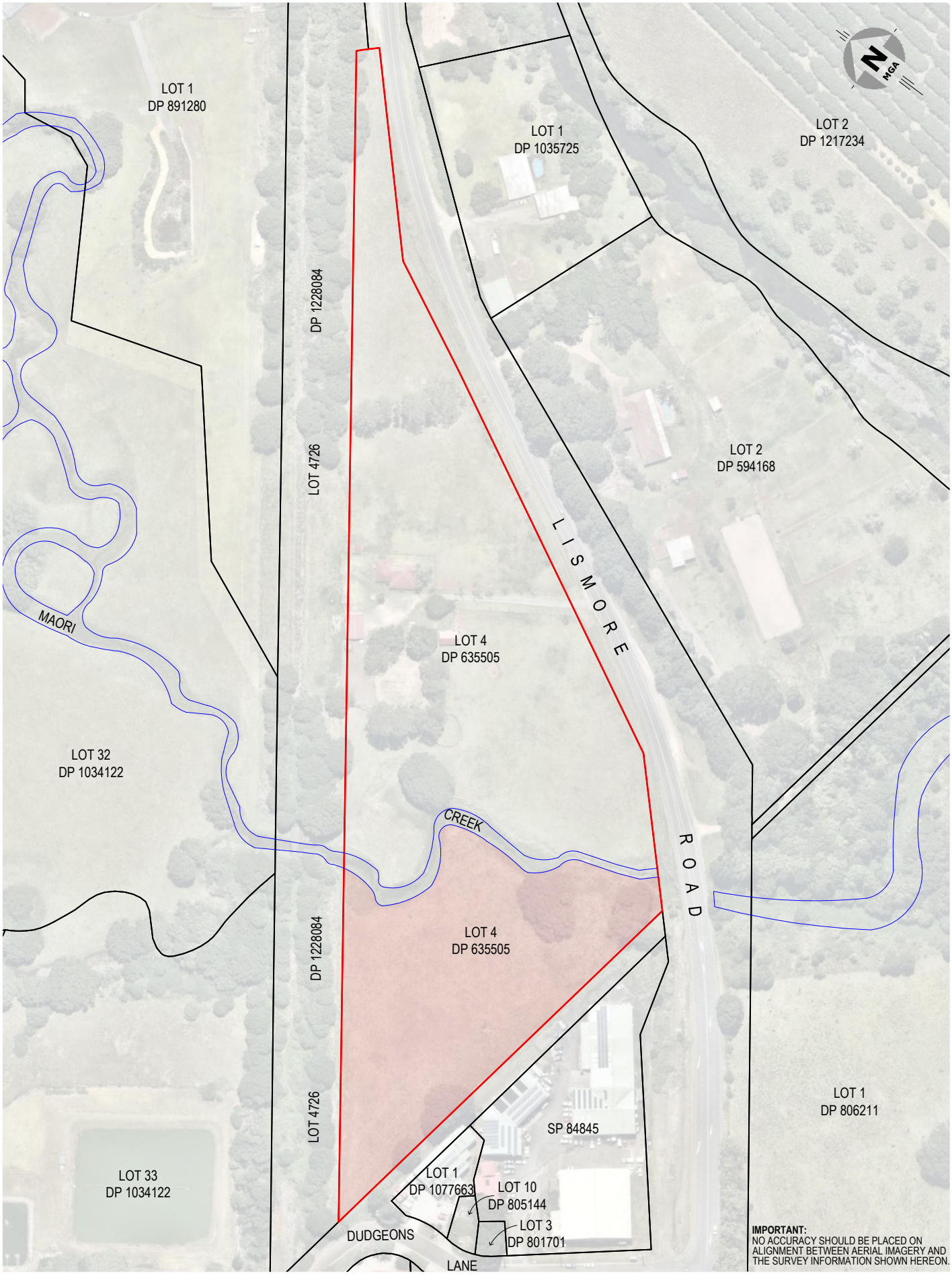

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Figure 1

NORTHERN RIVERS LAND SOLUTIONS
© 2012
76 Tamar Street
BALLINA NSW 2478
PO Box 1324
M: 0414 217 664
P: 61 2 6681 6696
F: 61 2 6681 6410
E: tony.hart@nrls.com.au
www.nrls.com.au

SCALE:	1:2500 (A4)
SURVEYOR:	
DRAWN:	BB
DATE:	5th APR '18
CAD REF:	18023-01
CLIENT:	MORE
PROJECT:	
LGA:	BYRON
SOURCE:	AERIAL: NEARMAPS

LOCALITY PLAN
LOT 4 IN DP635505
150 LISMORE ROAD, BANGALOW

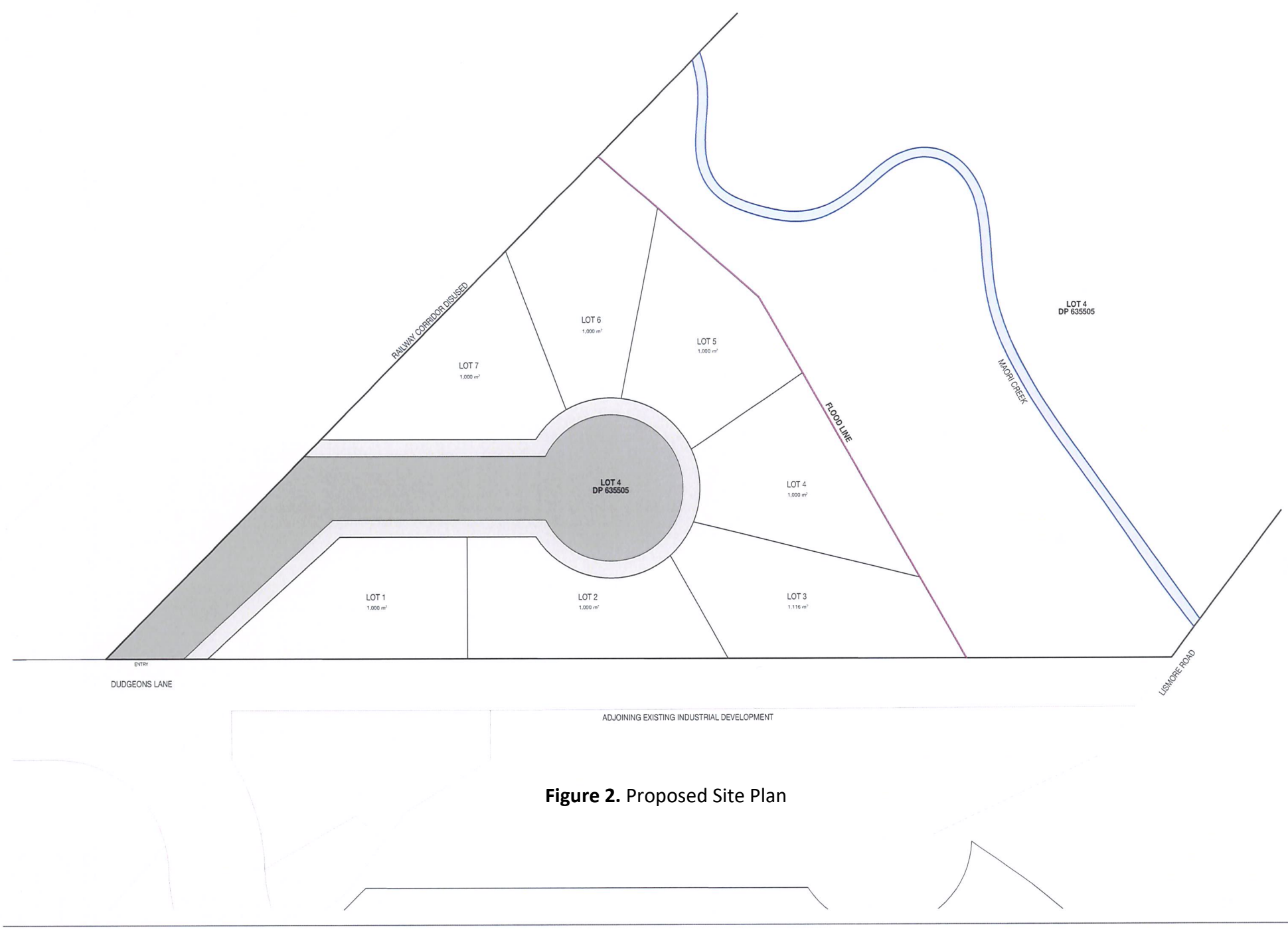

Figure 2. Proposed Site Plan

Beach Architects
24 Charlotte Street Bangalow
NSW 2479
p: 0410746249
e: info@beacharchitects.com.au
w: www.beacharchitects.com.au

project
PROPOSED MIXED-USE DEVELOPMENT

address
150 Lismore Road
Bangalow

client
Andrew More

project stage
LAND REZONING

drawing name
Concept Site Plan E

project number	drawn by	checked
93	DC	DC

drawing #	scale	revision
02	see below	05

scale bar
0 5m 10m 15m 20m

drawing orientation

revision details

Rev.	Issue Name	Issued By	Issue Date	CO
05	Concept site	Dan	14/4/21	05

2. The Site

2.1 Site Identification

The subject site is approximately 4.65 ha.in size and irregular in shape. The site has two (2) road frontages. Lismore Road forms the eastern boundary of the site and access to the northern portions of the site and dwelling is from this road. Dudgeons Lane allows access into the current Investigation Area being located in the south-west corner of the allotment. That is, only the area south of Maori Creek (i.e. forms northern boundary) is the subject of this investigation and as such, access is from Dudgeons Lane. Industrial lands from the remainder of the southern boundary of the site. The disused Northern Rivers Railway forms the western boundary of the site.

Surrounding land uses include Rural-residential properties along with Industrial. Bangalow's Sewage Treatment Plant is located west of the site (on other site of disused railway). The site is located approximately 1.8 m south-west of the Bangalow CBD.

As indicated, the entire site is not the subject of this investigation. The Investigation Area is the area south of Maori Creek and includes both the riparian corridor and usable lands. As such, the total area is approximately 1.5ha, however, the usable land is estimated at approximately 1ha.

2.2 Zoning

The land is zoned RU1 Primary Production under the Byron LEP 2014. Lands surrounding the site are either similarly zoned (i.e. RU1 Primary Production) or zoned IN1 General Industrial (lands adjoining and to south).

2.3 Site Usages

The Site as a whole is considered to have been used for a number of Agricultural activities. It appears, usage has only been for the low-intensity activity of grazing.

Historical aerial images from 1958, 1979, 1987, 1991, 1997 (available from https://portal.spatial.nsw.gov.au/portal/apps/webappviewer/index.html?id=f7c215b873864d44bccddda8075238cb) and Google Earth images from 2004 were reviewed.

In the 1958 image, no structures are visible on the property. Similarly, no evidence of intensive Agriculture such as cropping is evident. Surrounding lands appear similar indicating broadscale grazing is likely on the site and surrounds. This site is relatively devoid of treed vegetation. No intensive Agricultural pursuits are evident. The site is presumed to have been once part of a larger holding. A review of available parish maps from 1917 and 1969 indicate the possibility of a larger allotment that extended to the north and east and west (i.e. nearly to outskirts of Bangalow and both beyond the railway to the west and Lismore Rd to the east). It is noted Dudgeons Lane formed the southern boundary of the site in 1958.

The 1979 image indicates the site still being used for grazing purposes. Few trees are present on the site with the exception of some trees along the western boundary. The Sewage Treatment Plant to the west can be seen in this image. Few other changes in landuses are visible in this image.

Industrial landuses to the south of the site are apparent in the 1987 image with these increasing in subsequent aerial imagery. Grazing is still apparent on the site. No dwellings or any other structures are visible. Tree growth is still considered low.

The current dwelling can be seen on imagery from 1991. This dwelling is located in the northern section of the site and well outside the bounds of the current Investigation Area.

Imagery from 1997 (to date) continues to show a site that is relatively devoid of trees, a single dwelling and no intensive Agricultural practices such as cropping.

This same imagery (i.e. 1997 to date) show the Industrial estate expansion. Dudgeons Lane is rerouted in the 1997 image. Increases in residential dwellings in the locality is apparent, especially with the expansion of Bangalow.

Thereby, in summary, it appears the site was predominantly used for non-intensive agricultural activities (i.e. grazing). If any intensive practices were undertaken at the site (and specifically within the Investigation Area), these were short-term activities and not captured by images.

Available historical imagery to 1997 are provided in Appendix A. General views of the Investigation Area in its current (2021) condition are also provided in Appendix A.

2.4 Inventory of Known Chemicals and Wastes and their Location

An inventory of chemicals and/or wastes stored at the site was not available. However, it is assumed, some general chemical use for property maintenance would have occurred throughout the site's history. It is surmised this would have been minimal as the site has only been used for grazing purposes. No historical structures are known to have existed within Investigation Area.

2.5 Possible Contaminant Sources

Despite the lack of recent or major use of chemicals at the site, historical use may be possible at the site. Table 1 below lists the sources of potential contamination at the site and their associated contaminants of concern.

Table 1: Potential Contaminants of Concern for Identified Activities

Identified Contaminant Source	Potential Contaminants	Targeted Contaminants
Agricultural Activities		
General maintenance (e.g. pasture management)	**Fertiliser** (Calcium phosphate, Calcium Sulfate, nitrates, ammonium sulfate, carbonates, potassium, copper, magnesium, molybdenum, boron, cadmium) **Fungicides** (carbamates, copper sulfate, copper chloride, sulfur, chromium, zinc) Herbicides (Ammonium Thyocyanate, carbamates, organochlorines, organophosphates, arsenic, mercury, triazines) **Pesticides** (Arsenic, lead, organochlorines, organophosphates, sodium tetraborate, carbamates, sulfur, synthetic pyrethroids)	**Metals** (Arsenic and Lead being common constituents of pesticides or Lead-based paints) **Pesticides** (a-BHC, Hexachlorobenzene, b-BHC, g-BHC (Lindane), d-BHC, Heptachlor, Aldrin, Heptachlor epoxide, transchlordane, Endosulfan I, cischlordane, Dieldrin, 4,4-DDE, Endrin, Endosulfan II, 4,4-DDD, Endosulfan sulfate, 4,4-DDT, Methoxyxhlor.

2.6 Historic Use of Adjacent Land

Historically, the general location has been dominated by a similar history as that outlined above (Section 2.3). That is, neighbouring properties are generally considered to have been used for grazing purposes only. The Sewage Treatment Plant is evident to the west from 1979 and the Industrial Estate to the south, appear to have commenced in the 1980s. Residential development has also occurred in the locality.

2.7 Local Usage of Ground/Surface Waters

A search of existing licensed groundwater bores within 250 m of the Investigation Area was conducted using the WaterNSW (2021) website. Only one (1) borehole is recorded within 250m. This groundwater bore (GW306083) is located approximately 220m north-west from the Investigation Area. The groundwater bore is described as being 5.9m deep, date of construct is 2006 as a Monitoring Bore. The Water Bearing Zone is recorded as being between 3.5 to 5.9m bgl with the Standing Water Level as 3.5m bgl. The location is considered upstream of the site. Given the topography, soil conditions and distance to nearest groundwater bore, it is considered unlikely any Contaminants of Concern, if located, would migrate to groundwater.

2.8 State and Local Authority Records

2.8.1 Contaminated Land Records

A search of the Contaminated Land Record (EPA 2021a) for the Byron Local Government Area (LGA) did not identify any site notices relating to the site or adjoining the site.

2.8.2 Protection of the Environment Operations Act Licenses

A search of the current list (EPA, 2021b) of licensed activities as per Schedule 1 of the Protection of the Environment Operations Act 1997 identified the Bangalow Sewage Treatment Plant to the west as holding a POEO licence.

2.8.3 Cattle Tick Dip Sites

The closest cattle dip site is known as DUDGEONS. This dip site is located approximately 900m to the south of the Site and Investigation Area and well outside the bounds of the 250m Investigation Buffer.

A search of the NSW Department of Primary Industry (DPI) Cattle Dip Site Locator tool (https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator) indicates the status of the dip site is 'lapsed' (which means the dip is still standing, capable of dipping operations either immediately or with some minor refurbishment).

3. Site Inspection and Condition

3.1 Topography

The Investigation Area is considered to be relatively flat to gently sloping for the majority of the area. The area includes some steep embankments of Maori Creek. Elevation across the site ranges from approximately 45 to 50m AHD. The Investigation Area has similar elevations.

3.2 Visible Signs of Contamination

The Investigation Area was investigated on foot in order to identify any signs of contamination. No obvious signs of contamination (such as plant stress, surface spills, waste materials, odours etc.) were evident during the site investigation.

A visual inspection of adjacent land to the Investigation Area was also completed. There were no clearly visible signs of contamination adjoining the Investigation Area.

3.3 Flooding Potential

The Investigation Area in general is not mapped as flood liable. However, areas immediately adjacent to Maori Creek are mapped in the 1 in 100 yr flood zone.

3.4 Locally Sensitive Environments

There are no known sensitive environments adjacent to the site such as Coastal Wetlands or Littoral Rainforest (SEPP (Coastal Management) 2018). The areas immediately adjacent to Maori Creek are identified on the Biodiversity Values Map (*Biodiversity Conservation Act* 2016).

3.5 Local Geology and Soil Description

NSW DPI (2004) describes the geology of the majority of the Investigation Area as Tertiary volcanics - Lismore Basalts. The area in the vicinity of Maori Creek is described as having an alluvial geology (Quaternary Valley fill). Morand (1994) describes the geology of the entire Investigation Area as being Lamington Volcanics: Lismore Basalts - Tertiary basalt with bole and minor agglomerate.

The Investigation Area is mapped by Morand (1994) as being the residual soil landscape unit *Ewingsdale* (ew) which are described as:

> **Landscape** – very low to low undulating hills and rises on Lismore Basalts. Relief 10-30m, sloes 3-10%. Extensively cleared closed-forest, now generally sod grassland.
>
> **Soils** – deep (100-300cm), well-drained Krasnozems (Gn3.11, Gn4.11, Uf5.21, Uf6).
>
> **Limitations** – soils of low available water-holding capacity and high aluminium toxicity potential with localised stoniness. Localised mass movement hazard (shallow slumping along drainage lines).

While only upper soils (i.e. samples collected in upper 0-150mm) were investigated, observations made and soils encountered in this Investigation Area were considered consistent to that described above.

3.6 Location and Extent of Imported and Locally Derived Fill

No fill (imported or site-derived) was observed during site investigations.

3.7 Location of Bore Hole Tests

All soil samples were taken from surface samples, thus no boreholes were constructed for this investigation.

3.8 Depth to Groundwater Table

Depth to groundwater was not investigated for this investigation. Given the elevation and topography of the site, it is considered likely groundwater would be relatively deep. However, some perched groundwater may be shallow and in connection to Maori Creek. Thereby, while it is acknowledged some perched groundwater may exist, these aquifers are likely to be relatively small.

3.9 Local Meteorology

The average annual rainfall recorded at the Byron Bay (Cape Byron Automated Weather Station; closest open station) is 1,458.6mm, with the highest volume of rainfall (>100mm) generally falling between December through to April (June also records an average rainfall >100mm). The driest months are July to September. The average maximum temperature is 28.1°C (in summer) and the average minimum temperature is 12.3°C (in winter). Rainfall is considered to be relatively consistent between Bangalow and Byron, however, temperatures would be expected to have a broader range given further from the coastline.

4. Conceptual Site Model Development

A Conceptual Site Model (CSM) considers all the site-specific geophysical characteristics along with the contamination source, potential receptors and pathways to the receptors. This is a dynamic process that is constantly being updated during the investigation process as additional information becomes available. Prior to completing field work, a CSM was developed to allow for the design of a sampling strategy.

Figure 3 illustrates the Preliminary Conceptual Site Model with the various considerations provided in the following sections.

4.1 Areas of Environmental Concern

The Area of Environmental Concern (i.e. the entire Investigation Area) is considered to be that which coincides with past use of the site (grazing).

4.2 Potential Contaminants of Concern

A range of possible contamination sources and targeted COCs are detailed in Table 1, Section 2.5. These PCOCs are summarised in Table 2 below based on the historical landuses at the site (and within the Investigation Area. That is, the PCOCs listed are considered the most likely to have been used and/or provide an indicator for usage rates of chemicals at the site.

Table 2 Potential Contaminants of Concern based on Areas of Concern

Area of Environmental Concern	Potential Contaminants of Concern
Investigation Area Agricultural Activities: Grazing	**Heavy Metals** (e.g. Lead from lead-based paints on historical structures, if once present (none known); Arsenic from pesticides) **Organochlorine Pesticides** (e.g. Dieldrin often used as an insecticide)

4.3 Potential Impacts on Groundwater

In general, it is not considered likely that any PCOCs would have migrated to groundwater. Groundwater is considered likely to be deep. However, if shallow perched aquifers do exist, the clay content of the local soils is likely to bind with PCOCs. That is, the majority of COCs are known to bind tightly to organic matter and clay particles. As the uppers soils of the site are considered relatively high in clay and/or organic matter, it is considered any COCs present would be bound to the upper soil layers. As such, leaching of any PCOC is considered unlikely. Only with physical soil movement (i.e. burial) would impact soils have an opportunity to come in contact with groundwater.

4.4 Potential Exposure Pathways and Receptors of Contamination

Potential Exposure pathways are through contact with soils impacted by COCs. This contact may occur on or off-site through soil ingestion and/or inhalation. Transport mechanisms can be through wind and water erosion, soil movement (i.e. by man) and/or leaching of COCs into groundwater.

Potential receptors include on and off-site residents and sensitive ecosystems in the locality.

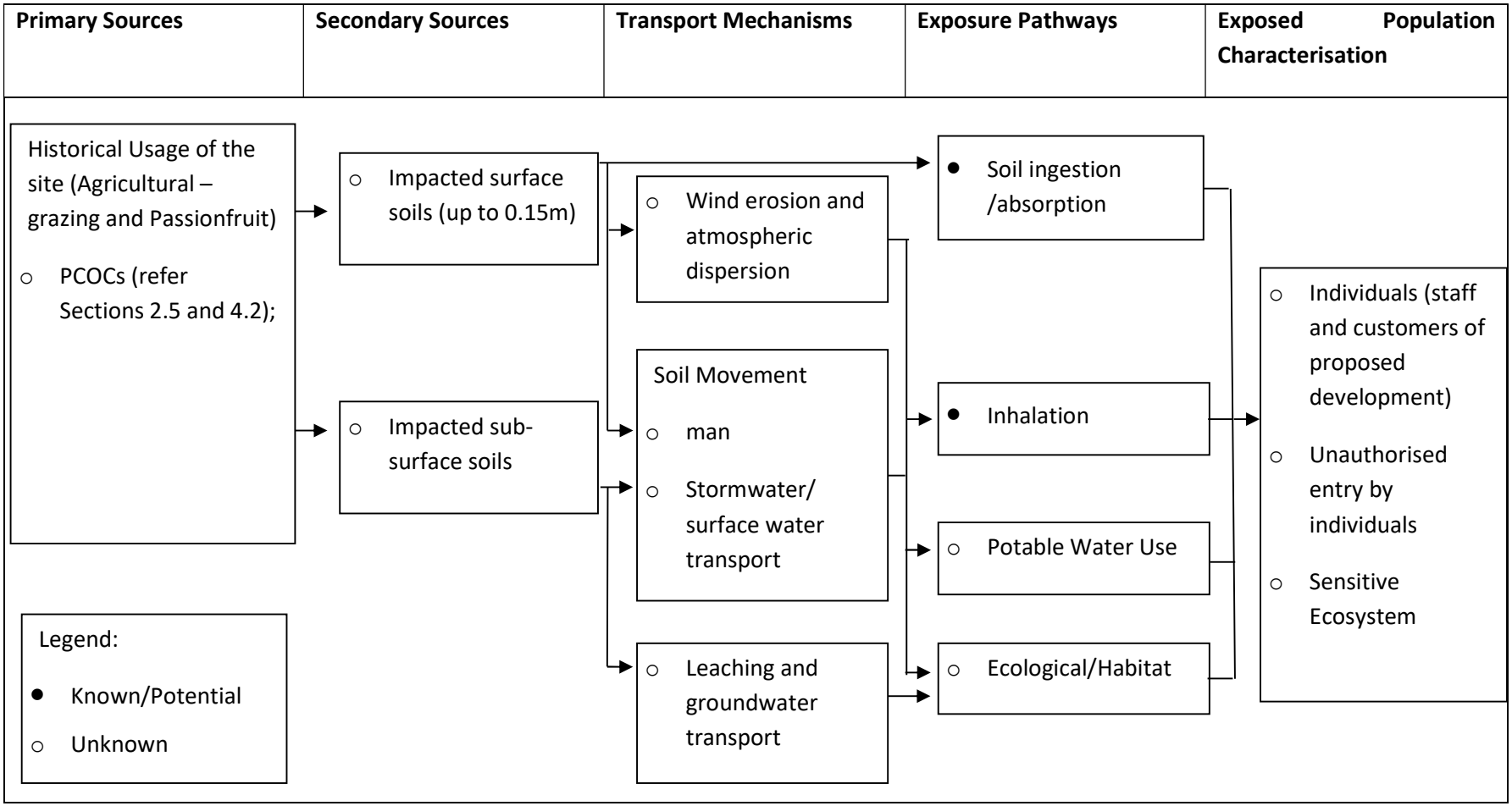

Figure 3. Preliminary Conceptual Site Model - Flow Diagram

5. Sampling and Analysis Plan and Sampling Methodology

5.1 Sampling, Analysis and Data Quality Objective (DQOs)

The objective of this preliminary investigation is to gather information with regard to the type, location, concentration and distribution of contaminants to determine if the subject site represents a risk of harm to end users and sensitive receptors. To determine this, soil sampling and laboratory analysis has been conducted upon surface soils collected from the study area.

5.2 Rationale

While the Investigation Area is considered to be approximately 1.5ha in size this also includes lands immediately adjacent to Maori Creek. These areas have been excluded from sampling as it is considered highly unlikely any structures would have been placed this close to the creek. Further, any intensive agricultural pursuits also would not have occurred in these areas.

As such, the area identified for soil sample was considered approximately 1 ha. The NSW EPA Sampling Guidelines indicates a minimum of 21 samples should be collected across this area. With no evidence of structures of intensive agricultural pursuits, it was determined this was considered appropriate and sample locations were based on a systematic grid-like pattern. **Figure 4** indicates the location of each individual sample point.

All soils were found to be Red Clay Loam consistent with the *Ewingsdale* soil landscape. Samples were analysed for Lead and Arsenic and organochlorine (OC) pesticides (including Aldrin, Cis-chlordane, Trans-chlordane, HCB, DDD, DDE, DDT, Alpha-BHC, Beta-BHC, Delta-BHC, Lindane, Dieldrin, Endrin, Heptachlor, Heptachor epoxide, Alpha-endosulfan, Beta-endosulfan, Endosulfan sulfate, Methoxychlor).

Organophosphate (OP) pesticides were not analysed as the site history did not identify any likelihood of these pesticides occurring and no elevated levels of OC or arsenic were identified at the site (samples are stored for OP analysis if required). The bacterial decomposition of OP pesticide is very rapid and the occurrence of elevated levels of OP's in the environment is rare (i.e. based on over 1000 soils analysed in soils of Northern NSW by EAL).

Polychlorinated Biphenyls (PCBs) were not analysed, as a source of contamination was not identified (i.e. PCB sources identified from electrical supply industry or mining). TPH and BTEX were also not analysed on the soils as these organic analytes are only typically analysed for service station sites, or at sites with above or under-ground onsite hydrocarbon storage. Similarly, Poly-Aromatic Hydrocarbons (PAH) was not analysed as this COC is usually associated with fill material which were not located on the site.

5.3 Sampling Methodology

Surface samples (0 – 150mm depth) were collected using a stainless-steel spade, with soil being placed in snap lock plastic sample bags. The sampling procedure utilised in this investigation was in accordance with AS 4482.1 – 2005.

All soil samples were placed into an esky with ice bricks, and delivered to the Environmental Analysis Laboratory at Southern Cross University, Lismore. Refer to Appendix B for the laboratory certificate.

Figure 4. Sampling Plan.

6. Basis for Assessment Criteria

The acceptable limits of the parameters tested are based on the NSW DEC (2017) Contaminated Sites - Guidelines for the NSW Site Auditor Scheme (3rd Edition) and the NEPM (2013) guidelines. In particular Column 1 of Table 'Soil Investigation Levels for Urban Redevelopment Sites in NSW'. Column 1 represents Human - Based Investigation Levels (HBIL) for developments being 'Residential with gardens and accessible soil including children's daycare centres, preschools, primary schools, town houses or villas'. The investigation levels adopted for this investigation are presented below in Table 3.

Table 3: Soil investigation levels of key COCs (NEPC 2013).

Contaminant	Acceptable Limit Column 1 (mg/kg)	Ecological Investigation Limit
Arsenic	100	100
Lead	300	1,100
OC's (aldrin and dieldrin)	6	..
OC's (DDT, DDD, DDE)	240	..

6.1 Background Levels

Metals occur naturally within soils and are a natural constituent of geological materials that erode and assist in the formation of soils. The background levels of metals analysed, obtained from ANZECC and NHMRC (1992) Table 4 'Environmental Soil Quality Guidelines', are presented below in Table 4.

Table 4: Background ranges for potential contaminants.

Contaminant	Background Range (mg/kg)
Arsenic	0.2 – 30
Lead	<2 – 200

7. Results

The results from the laboratory soil testing regime and comparison to the guideline limits is provided below in Table 5. The soil sampling numbers correlate with the soil sampling locations as shown on **Figure 4**.

Results for both Lead and Arsenic are provided below. For organochlorine pesticides, 27 chemical constitutes of these organochlorine pesticides were tested for. A summary of these results are provided below with full results provided in Appendix B.

All metals were found to be within expected background ranges and below the adopted assessment criteria.

Organochlorine pesticides were below detection levels in all samples.

The duplicate sample returned similar concentrations for all Contaminants of Concern tested, thereby provides quality assurance on the field and laboratory testing effort. The rinsate sample also returned acceptable results (i.e. metals below detection levels).

Table 5: Results – Heavy Metals and Organochlorine Chemicals

Contaminant	SP1	SP2	SP3	SP4	SP5	SP6	SP7	Acceptable Limit (mg/kg)	Background Range (mg/kg)
Arsenic (mg/kg)	4	2	2	2	2	5	2	**100**	**0.2 – 30**
Lead (mg/kg)	9	7	7	21	21	27	7	**300**	**<2 – 200**
DDT (mg/kg)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**240**	**<0.2**
Aldrin + Dieldrin (mg/kg)	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	**6**	**<0.2**
Other Organochlorine Pesticides- SUM (mg/Kg)	ND	ND	ND	ND	ND	ND	ND	**..***	**<0.2**

ND: Not Detected; *Other Organochlorine limits exist. If detected, these chemicals would have been presented

Table 5 (cont): Results – Heavy Metals and Organochlorine Chemicals

Contaminant	SP8	SP9	SP10	SP11	SP12	SP13	SP14	Acceptable Limit (mg/kg)	Background Range (mg/kg)
Arsenic (mg/kg)	2	1	2	2	2	1	1	**100**	**0.2 – 30**
Lead (mg/kg)	7	7	12	19	21	7	10	**300**	**<2 – 200**
DDT (mg/kg)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**240**	**<0.2**
Aldrin + Dieldrin (mg/kg)	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	**6**	**<0.2**
Other Organochlorine Pesticides- SUM (mg/Kg)	ND	ND	ND	ND	ND	ND	ND	**..***	**<0.2**

*Other Organochlorine limits exist. If detected, these chemicals would have been presented

Table 5 (cont): Results – Heavy Metals and Organochlorine Chemicals

Contaminant	SP15	SP16	SP17	SP18	SP19	SP20	SP21	Acceptable Limit (mg/kg)	Background Range (mg/kg)
Arsenic (mg/kg)	2	2	1	1	1	1	1	**100**	**0.2 – 30**
Lead (mg/kg)	19	18	8	8	16	10	13	**300**	**<2 – 200**
DDT (mg/kg)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**240**	**<0.2**
Aldrin + Dieldrin (mg/kg)	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	**6**	**<0.2**
Other Organochlorine Pesticides- SUM (mg/Kg)	ND	ND	ND	ND	ND	ND	ND	**..***	**<0.2**

*Other Organochlorine limits exist. If detected, these chemicals would have been presented

8. Discussion and Conclusion

A Preliminary (Contamination) Site investigation (PSI) for the development at the site was warranted to ensure past land uses have not resulted in contamination. If located, the PSI would identify the requirement for additional investigations.

It is considered the site has potentially been used for Agricultural purposes for over 100 years with the majority of pursuits likely to have been low intensity such as grazing. It is known the site was clear of treed vegetation in 1958 representing a 63-year history for the site (and Investigation Area).

A review of available historical imagery (from 1958) has confirmed the verbal history provided to Melaleuca Group. No intensive agricultural pursuits such as cropping areas were observed indicating with the predominant landuse has been grazing.

However, to determine if soils at the site may be impacted by the range of COCs identified, 21 samples were collected for laboratory analysis for the heavy metals of Lead and Arsenic. In addition, these samples were analysed for Organochlorine pesticides. Samples were located in a systematic grid-like pattern across the area.

The results indicate soil contamination of the study area has not occurred by the Lead or Arsenic nor by any of the Organochlorine pesticides tested.

Based on the findings of this Preliminary Site Investigation, it is considered the Investigation Area would not represent a significant risk of harm to end users of the proposed rezoning proposal.

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Appendices

Appendix A: Historical Information and Site Photographs

Figure A1. 1958 Historical Aerial of Investigation Area and surrounding area of site. Approximate location of Investigation Area is circled.

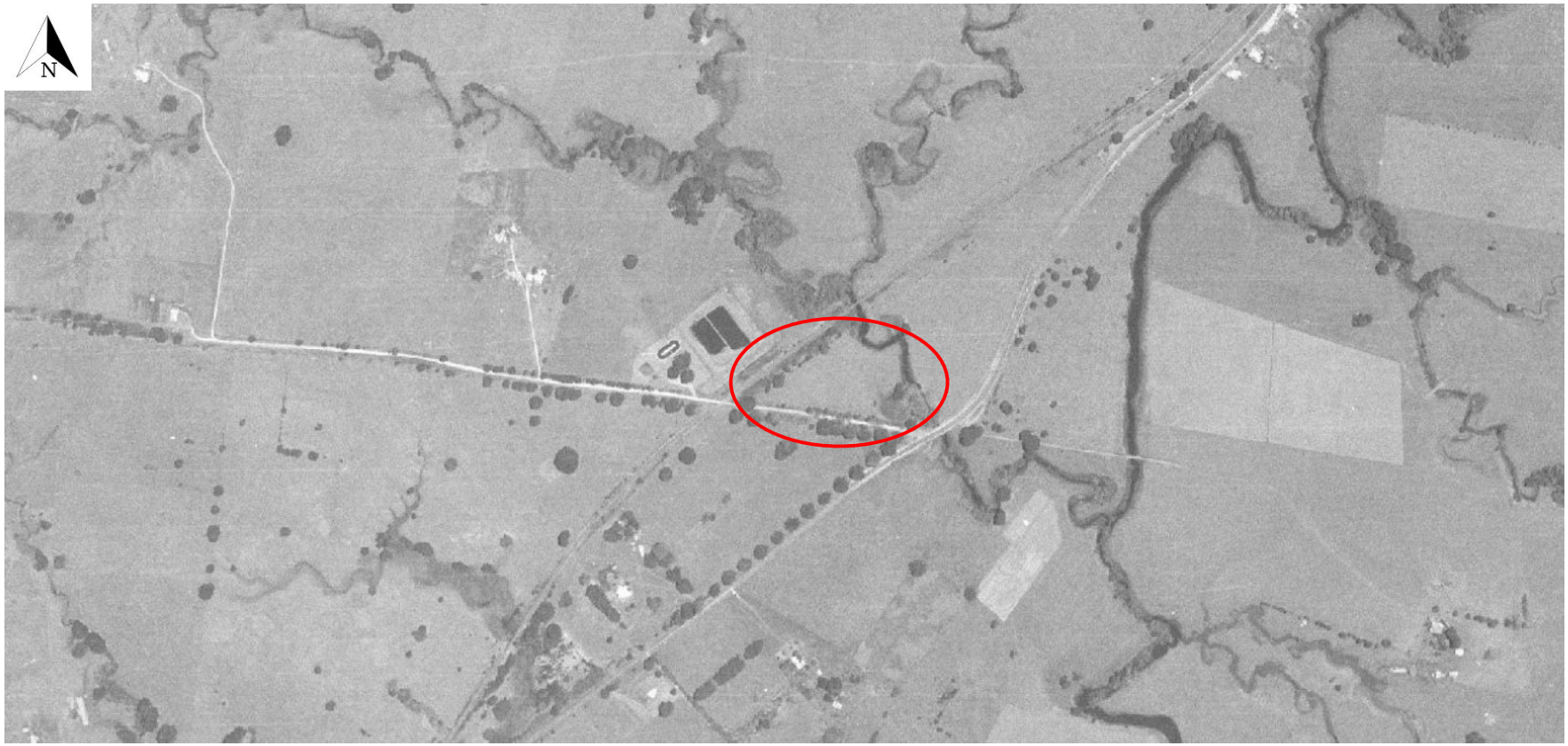

Figure A2. 1979 Historical Aerial of Investigation Area and surrounding area of site. Approximate location of Investigation Area is circled.

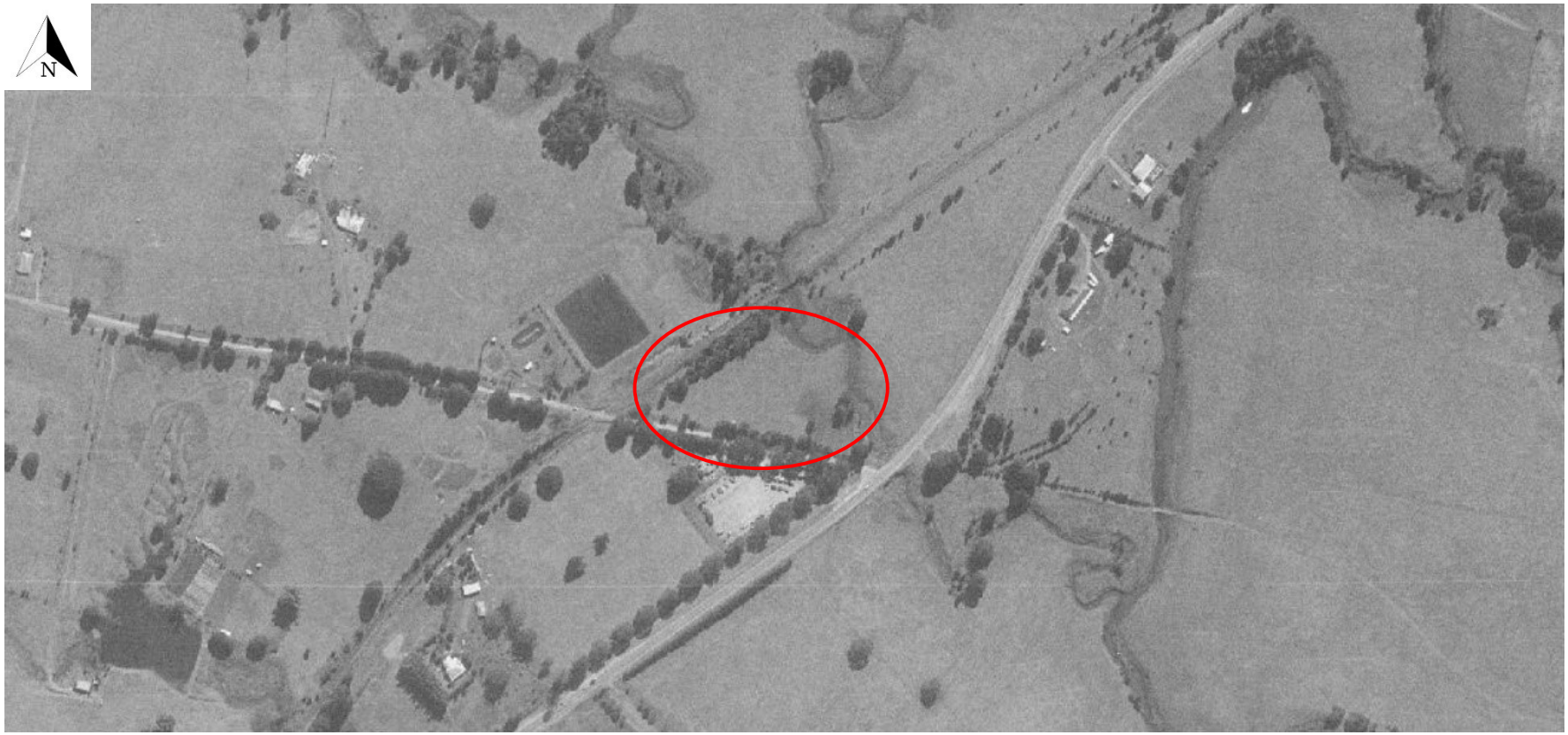

Figure A3. 1987 Historical Aerial of Investigation Area and surrounding area of site. Approximate location of Investigation Area is circled.

Figure A4. 1991 Historical Aerial of Investigation Area and surrounding area of site. Approximate location of Investigation Area is circled.

Figure A5. 1997 Historical Aerial of Investigation Area and surrounding area of site. Approximate location of Investigation Area is circled.

Plate A1. General view Investigation Area (Photograph taken at entrance from Dudgeons Lane)

Plate A2. General north-easterly view of Investigation Area (Photography taken near SP7).

Plate A3. General westerly view of Investigation Area (Photograph taken near SP6)

Plate A4. General view of Maori Creek (Photograph taken near SP21 with southerly view).

Appendix B: Laboratory Results

RESULTS OF SOIL ANALYSIS

22 samples supplied by Melaleuca Group Pty Ltd on 7/05/2021 . Lab Job No. K6656.

Samples submitted by Melissa Van Zwieten. Your Job: Andrew More Soil.

118 Beacon Road TEVEN NSW 2478

ANALYTE	METHOD REFERENCE	Sample 1 SP1	Sample 2 SP2	Sample 3 SP3	Sample 4 SP4	Sample 5 SP5	Sample 6 SP6	Sample 7 SP7	Sample 8 SP8	Sample 9 SP9	Sample 10 SP10
	Job No.	*K6656/1*	*K6656/2*	*K6656/3*	*K6656/4*	*K6656/5*	*K6656/6*	*K6656/7*	*K6656/8*	*K6656/9*	*K6656/10*
TEXTURE (SAND, CLAY, SILT)	** inhouse	Silt	Silt	Silt	Silt	Silt	Silt	Silt	Silt	Silt	Silt
MOISTURE %	** c	32	33	32	41	36	28	32	31	37	39
ARSENIC (mg/kg DW)	*a*	4	2	2	2	2	5	2	2	1	2
LEAD (mg/kg DW)	*a*	9	7	7	21	21	27	7	7	7	12
PESTICIDE ANALYSIS SCREEN											
Hexachlorobenzene (HCB) (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor epoxide (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
o,p'-DDE (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Alpha Endosulfan (mg/kg)	*c*	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
p,p'-DDE (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin (mg/kg)	*c*	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Endrin (mg/kg)	*c*	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
o,p'-DDD (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
o,p'-DDT (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Beta Endosulfan (mg/kg)	*c*	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
p,p'-DDD (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
p,p'-DDT (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan sulphate (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Ketone (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Organochlorine Pesticides SUM (mg/kg)	*c*	*N.D.*	*N.D.*	*N.D.*	*N.D.*	*N.D.*	*N.D.*	*N.D.*	*N.D.*	*N.D.*	*N.D.*

METHODS REFERENCE:

a. [13]Nitric/HCl digest - APHA 3125 ICPMS

b. [13]Nitric/HCl digest - APHA 3120 ICPOES

c. Analysis sub-contracted - SGS report no. SE219496.. N.D. denotes Not Detected.

*** denotes these test procedure or calculation are as yet not NATA accredited but quality control data is available*

NOTES:

1a. HIL A Residential with garden/accessible soil (home grown produce <10% fruit and vegetable intake (no poultry), also includes childcare centres, preschools and primary schools

1b. HIL B Residential with minimal opportunities for soil access; includes dwellings with fully and permanently paved yard space such as high-rise buildings and apartments.

1c. HIL C Public open space such as parks, playgrounds, playing fields (e.g. ovals), secondary schools and footpaths. This does not include undeveloped public open space.

1d. HIL D Commercial/industrial, includes premises such as shops, offices, factories and industrial sites.

(REFERENCE: Health Investigation Guidelines from NEPM (National Environmental Protection, Assessment of Site Contamination, Measure), 2013; Schedule B1).

2. Environmental Soil Quality Guidelines, Page 40, ANZECC, 1992.

3a.Table 1 Maximum values of specific contaminant concentrations for classification without TCLP (NSW EPA 2014, Waste Classification Guidelines Part 1: Classifying Waste)

3b.Table 2 Maximum values for leachable concentrations and specific contaminant concentrations when used together (NSW EPA 2014, Waste Classification Guidelines Part 1: Classifying Waste)

4. Analysis conducted between sample arrival date and reporting date.

5. ** NATA accreditation does not cover the performance of this service.

6. .. Denotes not requested.

7. This report is not to be reproduced except in full.

8. All services undertaken by EAL are covered by the EAL Laboratory Services Terms and Conditions (refer scu.edu.au/eal or on request).

9. Results relate only to the samples tested.

10. This report was issued on 19/05/2021.

Additional NOTES:

DW = Dry Weight. na = no guidelines available

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Accreditation No. 14960
Accredited for compliance with ISO/IEC 17025 - Testing

checked: .....
Graham Lancaster (Nata signatory)
Laboratory Manager

Sample 11	Sample 12	Sample 13	Sample 14	Sample 15	Sample 16	Sample 17	Sample 18	Sample 19	Sample 20	Sample 21	Sample 22	*RESIDENTIAL A Guideline Limit*	
SP11	**SP12**	**SP13**	**SP14**	**SP15**	**SP16**	**SP17**	**SP18**	**SP19**	**SP20**	**SP21**	**SP18d**	***Composite - Column A***	***Individual - Column A***
K6656/11	*K6656/12*	*K6656/13*	*K6656/14*	*K6656/15*	*K6656/16*	*K6656/17*	*K6656/18*	*K6656/19*	*K6656/20*	*K6656/21*	*K6656/22*	*See note 1a*	*See note 1a*
Silt	Silt	Silt	Silt	Silt	Silt	Silt	Silt	Silt	Silt	Silt	Silt	..	..
39	30	38	33	38	37	36	34	34	31	35	31	..	..
2	2	1	1	2	2	1	1	1	1	1	1	*25*	*100*
19	21	7	10	19	18	8	8	16	10	13	8	*75*	*300*
<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	*3*	*10*
<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	*2*	*6*
<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	*2*	*6*
<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	*2*	*6*
<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	*60*	*240*
<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	..	..
<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	*60*	*240*
<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	*2*	*6*
<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	*3*	*10*
<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	*60*	*240*
<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	*60*	*240*
<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	..	..
<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	*60*	*240*
<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	*60*	*240*
<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	*68*	*270*
<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	*3*	*10*
<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	*75*	*300*
<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	*3*	*10*
N.D.	*N.D.*	*N.D.*	*N.D.*	*N.D.*	*N.D.*	*N.D.*	*N.D.*	*N.D.*	*N.D.*	*N.D.*	*N.D.*	..	..

checked: .....
Graham Lancaster (Nata signatory)
Laboratory Manager