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CONTAMINATED LAND STUDY

Proposed Rezoning of Land

at

1 Abbotsford Road, PICTON

Prepared for:

Berten Pty Ltd

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1	14/02/2013	First Draft Report
2	29/04/13	Final
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Executive Summary

A Preliminary contaminated land study (the Study) was conducted during late 2012 and early 2013 over land located at 1 Abbotsford Road Picton (the "Property"). The Study was prepared in support of a rezoning application which will enable the Property to be subdivided under part R5 Large Lot Residential, part E3 Environmental Management and part RE1 Public Recreation as defined in Wollondilly Shire Councils' Local Environmental Plan 2011.

The objective of this Study is:

"To determine if there is any expectation of contamination of the study area associated with previous agricultural land uses and the likely sources of that contamination and whether there is a need for remediation before a change to the land use zoning."

Areas of Environmental Concern were noted at a number of locations throughout the study area and were identified. These processes included:

- Physical inspection of the Property;
- Review of historical aerial photos;
- Compilation of property owner responses to a contamination questionnaire;
- Review of Wollondilly Shire Council records;
- Review of historical land titles; and
- Review of NSW EPA Contamination Sites Register

Given the objective of the study, it was concluded that there is some potential that contamination may have occurred and that such contamination remains to the present day. The likely sources of the contamination are considered to be:

- The application of pesticides, herbicides and fertilizers used to increase the agricultural productivity of land; and

- Construction and application of infrastructure and other like activities in support of agricultural enterprises.

Potential contaminants have been listed for all identified AECs. However, these have been provided for guidance only, as only a full assessment of each AEC will determine which potential contaminants should be tested.

Based on the results of this Study, a number of development controls are recommended where land within the Property is to be developed by way of subdivision or other activities requiring development consent. These controls entail a detailed Phase 2 contaminated site assessments and where appropriate, remediation of any confirmed contamination.

It is not possible at this stage, to develop a specific schedule of actions and types of remediation works that will need to be undertaken should contamination be confirmed at any one site. This is because the extent and level of contaminants are currently unknown.

Each identified contamination site will have its own unique characteristics and will require a unique remediation solution which will be dependent upon the ultimate land use. In general terms however, future development can be based on the following criteria; viz:

- Contaminated sites are left untreated;
- On-site treatment of contamination;
- Off-site treatment of contaminated materials and return of materials to original site;
- Removal of contaminated materials to an appropriately licensed waste facility; or
- Consolidation and isolation of contaminated materials on-site by a properly designed barrier.

It is concluded that an assessment of the Property has identified a number of Areas of Environmental Concern. These AECs' are the result of activities associated with current and past agricultural activities. These AEC's have been documented and subject to a preliminary Phase 1 assessment.
As a result of this work, the implementation of a number of development controls are recommended where land within the Property is to be developed by way of subdivision or other activities requiring development consent. These include:

- Completion of Phase 2 contamination Assessment;
- Preparation of a Remediation Action Plan (RAP) where appropriate;
- Completion of Remedial Works where applicable.

It should be noted that future assessments will be subject to an amendment to the National Environment Protection (Assessment of Site Contamination) Measure. The amendment to the Assessment of Site Contamination NEPM was officially approved on 12th April, 2013, and took effect in each jurisdiction on 16 May 2013. A transition period of up to 12 months for full implementation of the amended ASC NEPM.

In NSW, the Amendment will be approved under s.105 of the *Contaminated Land Management Act 1997*. The EPA has a duty to take the Amendment into consideration when relevant and site audits have to be carried out in accordance with the Amendment, once approved.

Provided that the above program is carried out to the satisfaction of the SEPP 55 guidelines and criteria outlined in the amended NEPM, it is concluded that there appears to be no impediment related to contamination issues which might prevent the rezoning of the Property to take place.

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ABBREVIATIONS

AEC	Area of Environmental Concern
BTEX	Benzene, Toluene, Ethylbenzene, Xylene
GIPA	Government Information (Public Access) Act
HBIL's	Health Based Investigation Levels
HSS Pty Ltd	Harvest Scientific Services Pty Ltd
LGA	Local Government Area
Metals	Heavy metals: Arsenic, Cadmium, Chromium, Copper, Lead, Manganese, Mercury, Nickel and Zinc.
OCs	Organochlorine pesticides / insecticides
OPs	Organophosphate pesticides / insecticides
PAH	Poly Aromatic Hydrocarbons
TPH	Total Petroleum Hydrocarbons

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1.0 INTRODUCTION

A contaminated land study (the Study) was conducted during late 2012 and early 2013 over land located at 1 Abbotsford Road, Picton (the "Property"). The study was prepared in support of a rezoning application which will enable the Property to be subdivided under part R5 Large Lot Residential, part E3 Environmental Management and part RE1 Public Recreation as defined in Wollondilly Shire Councils' Local Environmental Plan 2011.
This Study is one of many specialist studies being carried out over the Property and its contents and preparation are based on guidelines issued by Wollondilly Shire Council (2012). These guidelines are outlined as follows:

Output

- *A preliminary 'desk top' Contaminated Site report as required in accordance with SEPP 55 - Remediation of Land.*
- *Field Verification of potential contamination sites.*
- *Recommendation for the future development controls for the management and assessment of these potential contamination sites at the development application stage.*

Objectives

- *To determine if there is any expectation of contamination of the study area associated with previous agricultural land uses and the likely sources of that contamination and whether there is a need for remediation before a change to the land use zoning.*

Tasks/Methodology

- *Perform a 'desk top' review the Wollondilly Contaminated Lands Register to establish if there is any record of contamination within the study area with field verification.*
- *A preliminary Contaminated Site Investigation is required in accordance with SEPP 55 –*
- *Remediation of Land of the site to determine the level of contamination as a consequence of previous agricultural land uses.*
- *In undertaking a Contaminated Site Investigation, the consultant will be provided with land use history, aerial photography and other relevant information held by Council to assist in the preliminary determination;*
- *Dependent on the level of potential contamination develop a schedule of actions and types of remediation works that will need to be undertaken prior to rezoning and/or at the development application stage.'*

It should be noted that this Study does not seek to delineate with any accuracy, the extent and depth of any potentially contaminated site (defined herein as an Area of Environmental Concern or "AEC"), merely to note its presence for future reference. For that reason, no invasive sampling has been undertaken as this is outside the scope of the brief.
Whilst the assessment is based on the NSW EPA (1995 AND 2011) guidelines for 'Consultants Reporting on Contaminated Sites' - Phase 1, the level of detail in this Study is limited. It is understood that in the event of the rezoning proposal being accepted by Wollondilly Shire Council and the Department of Planning and Industry (DOPI), a more detailed Phase 2 contamination assessment of the Property will be required.

2.0 SITE DETAILS

2.1. Property details

The Property subject to this Contamination Study is identified as 1 Abbotsford Road, Picton (part Lot 1 DP 1086066).

2.2. Location and General Description

The Property is comprised of one portion of land located approximately 5 kilometres north-west of Picton. The Property is split by Fairleys Road and Abbotsford Road on its eastern extremity, with the bulk of the Property lying to the west and south of Abbotsford Road as depicted on Figure 1.

The property is currently used for beef cattle and sheep grazing. Previously, its main use was for dairying purposes and was supported by significant dairy industry infrastructure. The remnants of an old homestead ("Abbotsford") remain, but the Property is otherwise unoccupied.

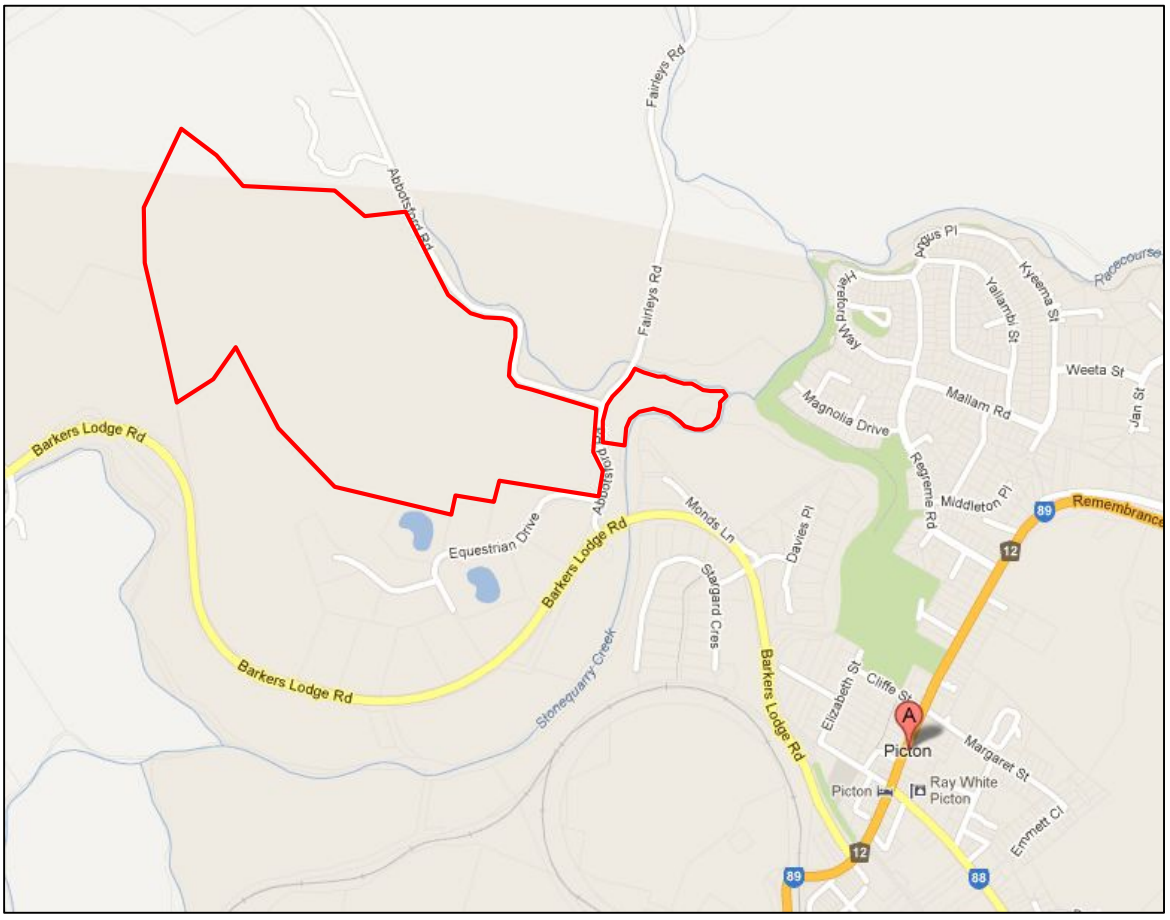


Figure 1. Location of Abbotsford Property (red boundary). Source: Google Maps, 2012.

2.3. Local Government Area

The Property is located within Wollondilly Shire Council (WSC) Local Government Area(LGA).

2.4. Catchment Area

The subject land is not located within a scheduled catchment area administered under the Drinking Water Catchments Regional Environmental Plan (REP) No. 1.

3.0 PROPERTY CHARACTERISTICS

3.1. Geology

Based on the 1:100,000 Wollongong to Port Hacking geological map sheet (Sherwin and Holmes 1982), the Property is underlain by Bringelly Shale which in turn is underlain by Ashfield Shale. The ridgetops within the Property are generally dominated by Bringelly Shales which are composed of shales, carbonaceous claystone, lithic sandstones and laminates. A thin layer of sandstone (Minchenbury Sandstone) often separates the Bringelly Shales from the Ashfield Shales. Quaternary sediments occupy the low lying drainage areas. The geology of the property and its immediate surrounds is illustrated in Figure 2.

The property is located close to but not within the Picton and Wilton Mine Subsidence Districts.

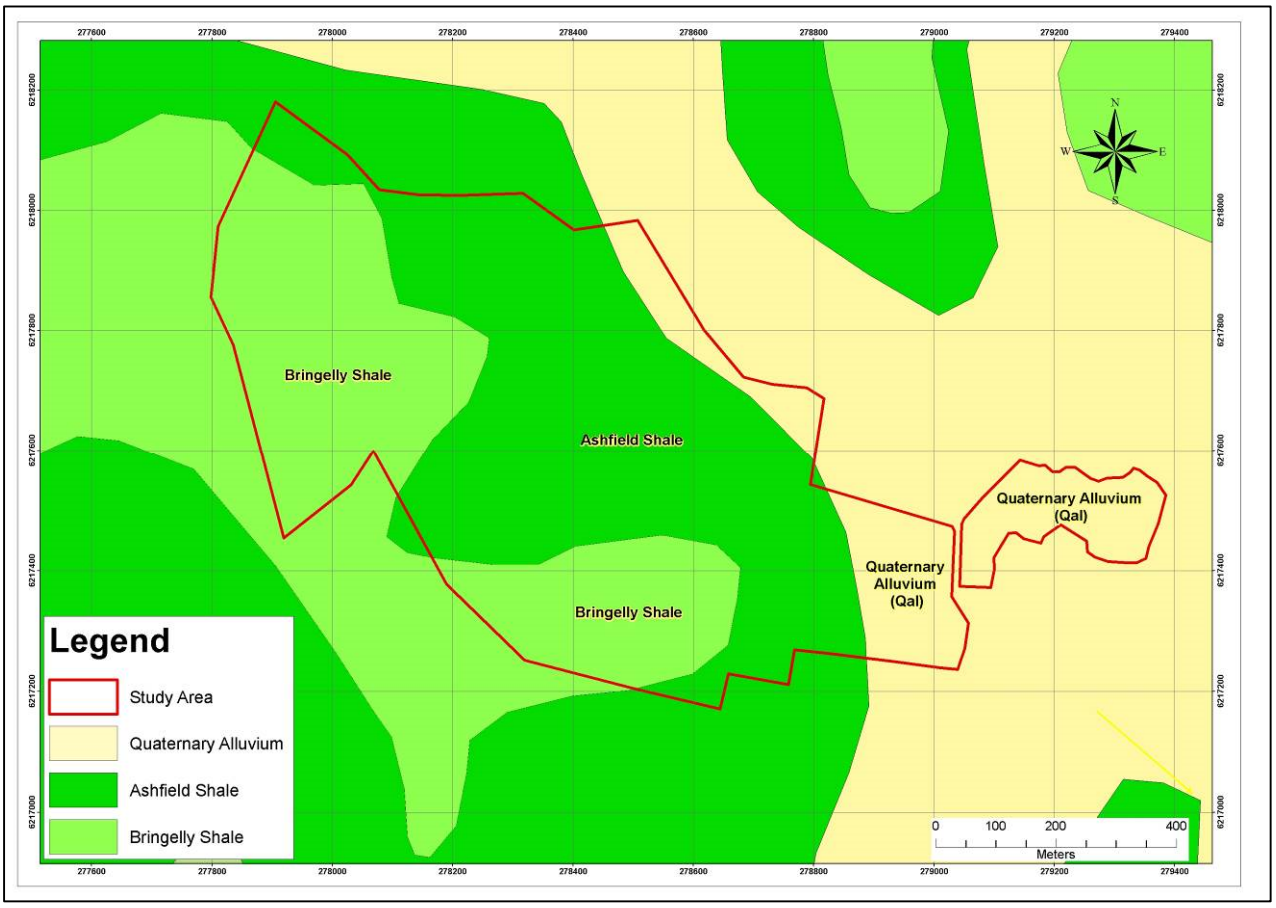


Figure 2: Regional Geology in and around the Abbotsford Property

3.2. Soil Landscape Groups

Based on the 1:100,000 Soil Landscapes of Wollongong to Port Hacking map sheet (Hazelton and Tille, 1990), soils on this Property are comprised of the Picton and Monkey Creek Soil Landscape Groups respectively. The distribution of these soil landscape groups are illustrated in Figure 3.

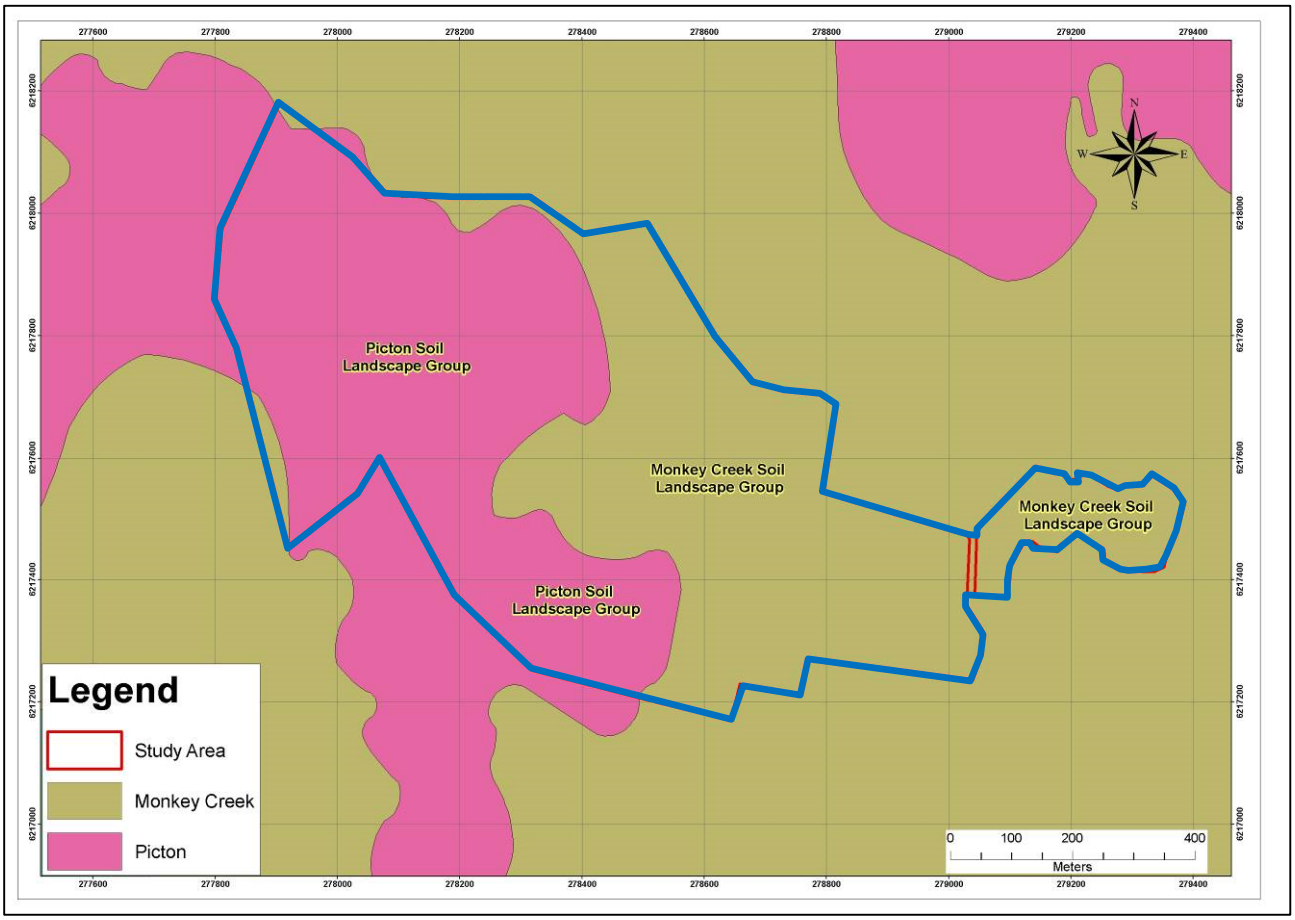


Figure 3: Soil Landscape Groups located in and around the Abbotsford Property

3.3. Slope and Topography

The slope and topography of the Property is dominated by a northwest-southeast trending ridge line with a centrally located and northerly trending sub-ridge line. The maximum vertical relief across the property is approximately 60 metres.

Slopes range from 0-5% around the lower lying (drainage) areas to between 15 and 40% for the side slopes. The ridge tops are characterized by narrow (generally less than 15-20 metres) flat areas breaking quickly into very steep slopes. These features are illustrated in Figure 4.

3.4. Vegetation

Save for some limited clumps of native bush on the southern side of the Property, the banks of Stonequarry Creek and introduced timbers in around the old homestead, virtually the entire property has been denuded of all native vegetation. Much of the Property is subject to established pasture grasses suitable for the grazing of cattle and/or sheep.

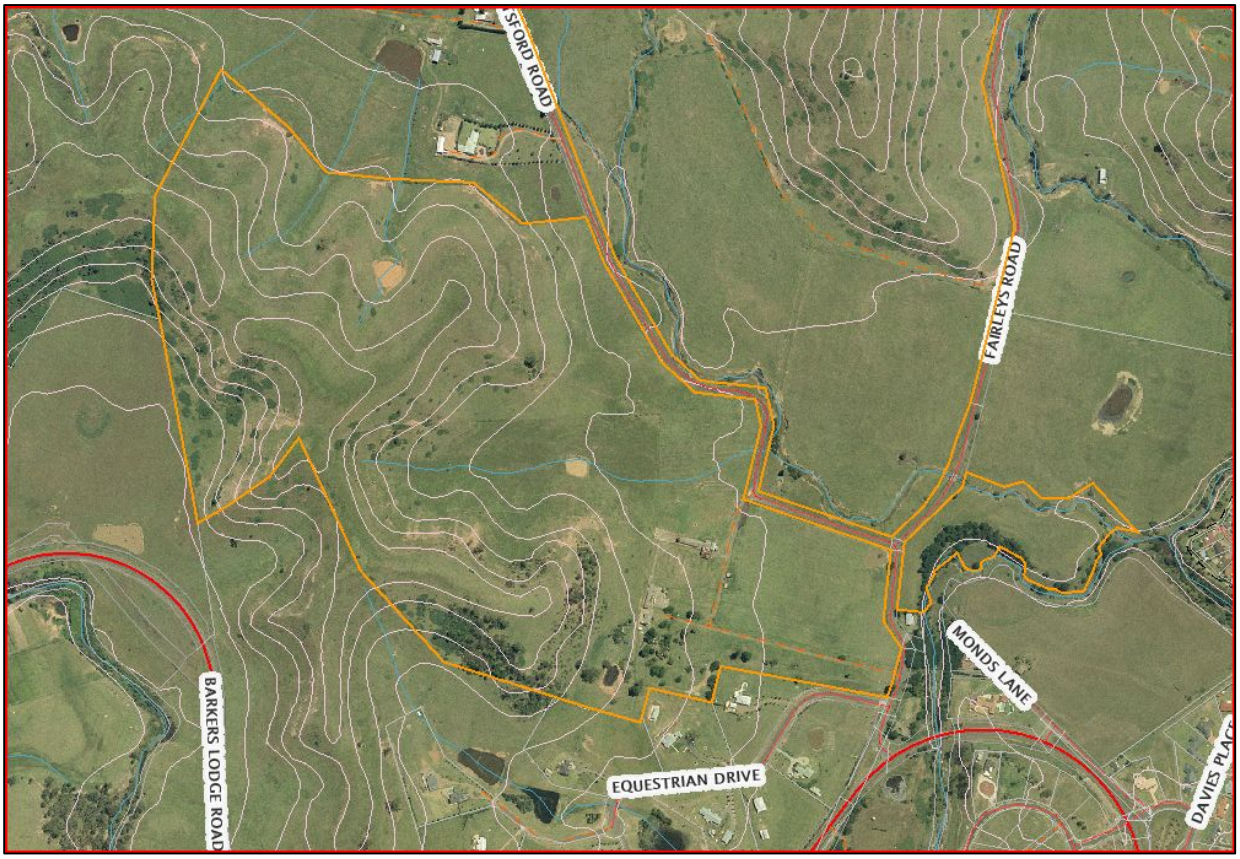


Figure 4: Topographic, vegetation and drainage features in and around the Abbotsford property

3.5. Buildings

The property is host to the ruins of the "Abbotsford" homestead as well as a number of structures related to past dairying and cattle grazing operations. These include a number of sheds, a silo and numerous yards. The Property is currently unoccupied.

3.6. Drainage Lines and Dams

The property is host to three small dams and minor intermittent drainage lines, all of which are tributaries to Matthews Creek which is located at the eastern extremity of the Property.

3.7 Groundwater

A search was made of the natural resources atlas (www.nratlas.nsw.gov.au), for water bores that may occur within or in close proximity to the boundaries of the Property. The search (see Figure 5) indicates the presence of several water bores near but outside the boundaries of the Property. Data regarding a selection of nearby bores is attached as Appendix 1 and summarised in Table 1.

Table 1: Summary of ground water bore data

Water Bore ID	Depth (m)	SWL (m)	Yield	Geology	Salinity
GW 105228	63	23	1.2-1.8	Clay/shale/Sandstone	Fresh
GW 108155	51	5	0.5-6.4	Clay/shale/Sandstone	Fresh
GW 111771	120	1.5	0.25-1.15	Clay/shale/Sandstone	180-320

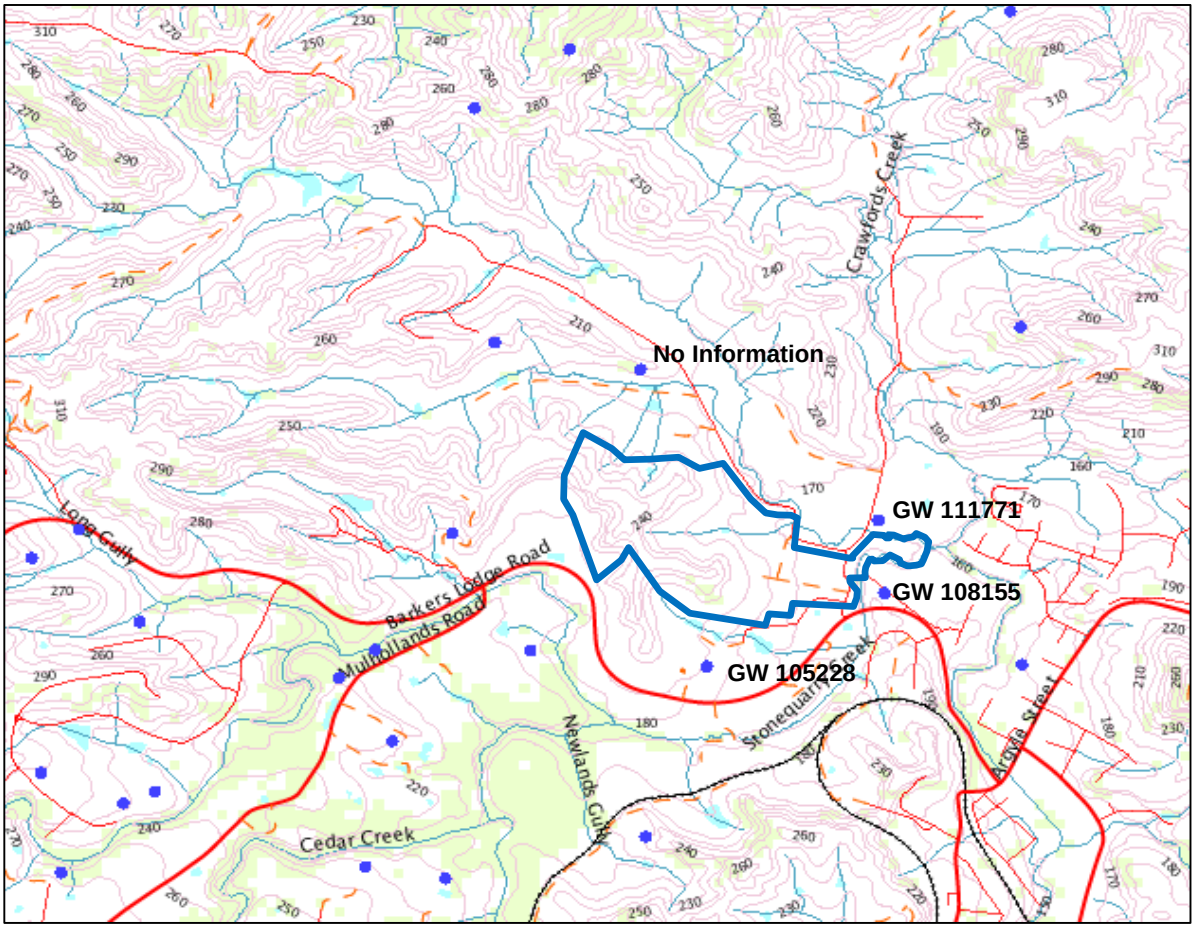


Figure 5: Water bore locations within close proximity to the Property.

3.8 Existing Property Features and Walk-over

A site walk-over was undertaken by a Senior Environmental Scientist from Harvest Scientific Services Pty Ltd during December, 2012 and January, 2013. Observations from the walk-over are discussed in detail in Sections 4 and 5.

3.9 Proposed Land Uses of the Study Area

It is proposed that the study area is to be host to residential development of a greater density than currently exists. It is understood that the minimum allotment size will be 4000 m^2 upon the completion of the rezoning process.

4 REVIEW OF FIELD AND HISTORICAL DATA OBSERVATIONS

4.1 Overview

The objective of the various assessments described in the following sections is to determine whether current or historical activities have led to contamination on the Property which could be harmful to human health. The desired outcome of these assessments is to delineate whether any portion of the Property can be considered as an AEC which may then require invasive investigation should the land on which any particular AEC be located upon, be subject to a residential development proposal.

For the benefit of this report, an AEC is defined as part of the land surface and subsurface which has been subjected to filling by imported materials, is covered by man-made structures or has been subjected to some form of chemical or physical treatment, any of all of which may result in a potential contamination event or issue. The delineation of any AEC will require further investigation (usually invasive) in order for it to be dealt with under any proposed development scenario.

It should be noted that an invasive investigation of any one AEC may lead to one of several results, viz;

- The AEC is found to be benign and not associated with any contamination;
- The AEC is found to be moderately contaminated but within acceptable limits as determined by the proposed future land use on which the AEC is located upon; and
- The AEC is found to be contamination which exceeds acceptable limits as determined by the proposed future land use on which the AEC is located upon. In this case, steps to remediate the AEC will need to be undertaken.

As the scope of the work undertaken on the Property is preliminary in nature, it can only generate an appreciation of the types of contamination that could be encountered, should development proposals such as a subdivision be approved. Furthermore, as this work does not entail any invasive investigations, the real limits on any one identified AEC are unknown.

Hence, whilst the Study has identified the location of a number of AEC's, their full assessment can only be advanced once development proposals are submitted for the land so affected. Furthermore, more detailed investigations may lead to the discovery of additional AEC's which are currently not obvious.

The following sections describe a number of investigative processes which have resulted in the identification of a number of AEC's.

4.2 Field Inspection of Property

A field inspection of the entire Property was conducted during December, 2012 and January 2013. This work was critical in obtaining an appreciation of existing site conditions and determining any obvious potential contamination issues. It should be noted that the extent of the inspection was limited to suit the scope of the brief. To that extent, there is thus the possibility that not all potentially contaminated sites were actually observed or identified.
Field observations together with the location of identified AEC's have been recorded in Table 3. The location of each AEC is illustrated on Figure 6. A photographic record is attached as Appendix 2.

4.3 Review of Aerial Photography

Historical aerial photos were sourced from the NSW Land and Property Management Authority (LPMA) and observations are summarised in Table 2. All photos are stored in the offices of Harvest Scientific Services Pty Ltd and are available upon request by authorised persons.

Observations together with the location of identified AEC's have been recorded in Table 4 and the location of each AEC is illustrated on Figure 7.

Table 2: Review of aerial photography					
Photo No.	**LPMA File No.**	**Locality Identifier**	**Date of Photo**	**Scale**	**Comments**
1	581_5025	Run 9	5/7/55	?	B/W. Warragamba Catchment. Moderate quality.
2	1414_5086	Run 32	22/10/65	?	B/W. Wollongong-Port Hacking. Good quality.
3	1907_5054	Run 30	6/7/70	?	B/W. Wollongong. Good quality.
4	2714_274	Run 29	14/5/78	1:16,000	B/W. B/W. Wollongong. Good quality.
5	3411	Run 8	8/10/84	1:16,000	Colour. Wollongong. Good quality.
6	3636	Run 8	29/8/88	1:16,300	Colour. Wollongong ISG. Good quality.
7	3754	Run 8	5/10/90	1:16,000	Colour. Wollongong. Good quality.
8	4178	Run 4	4/1/94	1:25,000	Colour. Wollongong. Good quality.
9	4324 (M2046)	Run 40	25/7/96	1:16,000	Colour.
10	4599(M2300)	Run 5	22/2/02	1:25,000	Colour. Wollongong.
11	4942 (M2512)	Run 4	20/12/05	1:25,000	Colour. Wollongong.

Note: The quality of these photos varied considerably and the level of detail – particularly for such a small site, is limited. Although they merely represent a "snapshot" in time, these photos are useful for determining the presence of significant infrastructure (such as buildings, roads etc) and changes to the surrounding areas which may have implications for any assessment of the land and its proposed development.

4.4 Interview with Property Owners and/or Occupiers

The current property owners and/or occupiers or their representatives were forwarded a questionnaire in relation to potential contamination issues associated with the Property. A copy of the completed questionnaire is attached as Appendix 3.

4.5 Wollondilly Shire Council Files

Records pertaining to the Property were made available by Wollondilly Shire Council during February 2013 in response to a GIPA request. The number of records were relatively limited and were focused on land now located on the periphery of the Property. Of note are the following records:

- Community Title Subdivision at 150 Barkers Lodge Road, Picton. This property is located immediately south of the Property (between the Abbotsford homestead and Barkers Lodge Road). The subdivision was granted on 28/8/1998. Subsequent reporting covered reports covering geotechnical matters, water quality aspects and agricultural land classifications. Contamination does not appear to have been addressed as an issue during the application process.

- Soil and Water Management Plan for Lot 55 Barkers Lodge Road, Picton (report dated 14/4/1997). Contamination not an issue.

4.6 Department of Lands Title Search

Records held by the Department of Lands (Sydney) were reviewed with the main objective being to identify whether the Property was owned by entities that might suggest past contaminating activities. The records, which provide ownership details back to 1822, indicate that the Property was predominantly owned by a variety of individuals either singularly or in joint ownership.

At the times the property was leased – some to enterprises including dairying and others suggestive of low level industrial activity (Perpetual Tractor Company Ltd). It is also noted that Tess Mines NL was registered in 1973 as the registered proprietor of coal and other minerals "in and under the land".

The records over the last half century however provide no indication of "contaminating activities".

4.7 S 149 Planning Certificate

A Section 149 certificate was obtained from WSC and is attached as Appendix 4. The most notable issues include:

- An archaeological site is recorded to occur on the property;
- The Property is not affected by any road widening or road realignment;
- The Property is not affected by hazard risk restrictions, flood related development controls;
- The Property is partially bush fire prone;
- The Property is not currently affected by any nominations under section 59(2) of the Contaminated Land Management Act 1997.

4.8 NSW EPA Contaminated Sites Register

None of the properties located within the Study Area is listed on the Contaminated Sites register (EPA, 2011) held by the NSW EPA under section 58 of the Contaminated Land Management Act 1997.

4.9 Workcover Authority of NSW

Enquiries were made of the Workcover Authority of NSW for reportable incidents or activities which might suggest the presence of potential contamination issues within the Study Area. Unlike the NSW EPA Contaminated Site Register, there is no similar register that is publically available. Furthermore, information under the GIPA legislation may be made available only upon the request against a specific reportable incident, location and time. A generalised list of incidents or rulings within a geographic area is not available.

5 PRELIMINARY CONTAMINATION ASSESSMENT

5.1 Overview of Observations

A preliminary contamination assessment was conducted on the Property during 2012-13. Areas of Environmental Concern were noted at a number of locations throughout the study area and were identified as a result of the process described in Section 4 of this Study. These processes included:

- Physical inspection of the Property;
- Review of historical aerial photos;
- Compilation of property owner responses to a contamination questionnaire;
- Review of Wollondilly Shire Council records;
- Review of historical land titles; and
- Review of NSW EPA Contamination Sites Register

A summary of findings is outlined in the following sections.

5.2 Assessment of Identified AEC's

5.2.1 Field Assessment and Observations

This assessment identified several Area's of Environmental Concern (AEC's), the location of which are illustrated in Figure 6. A summary of each AEC is given in Table 3.

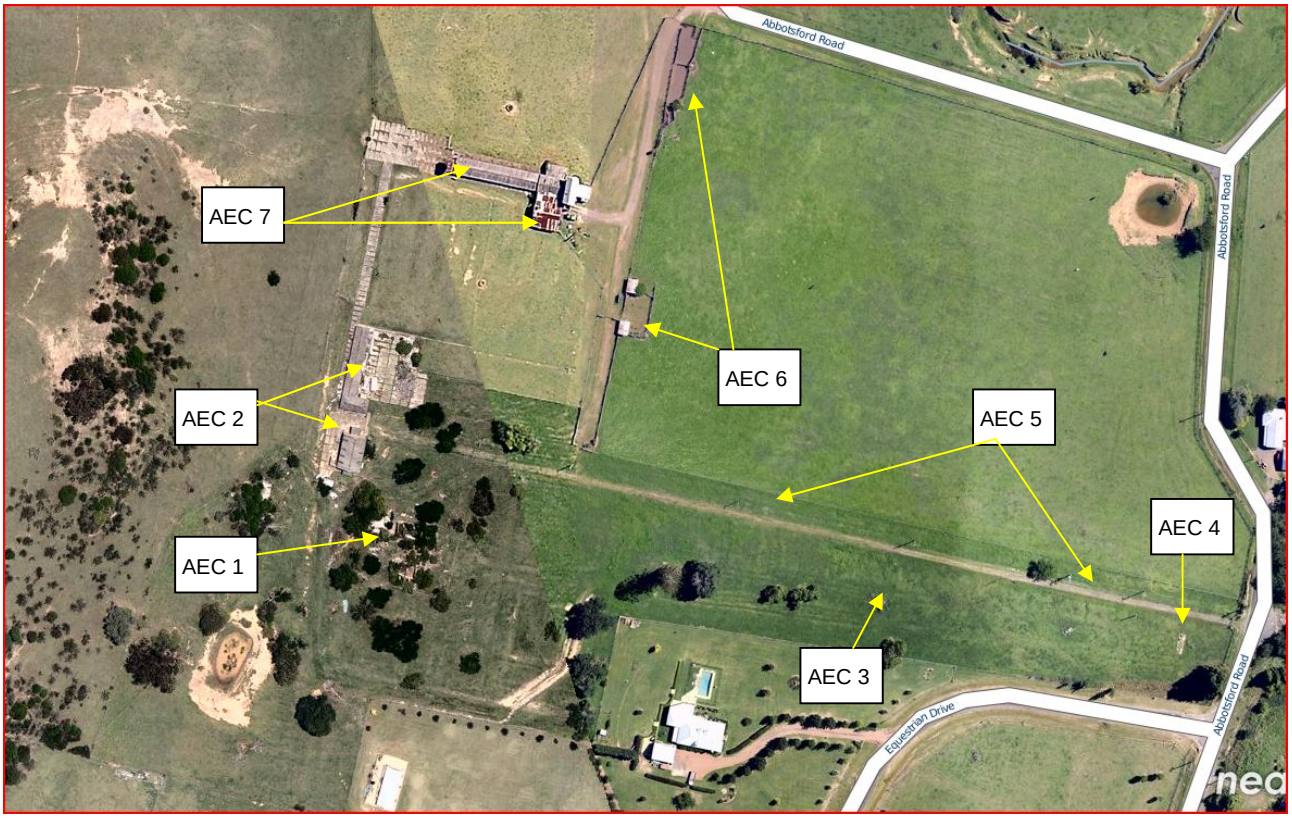


Figure 6: Location of Areas of Environmental Concern (AEC)

Table 3. Areas of Environmental Concern (AEC) identified as a result of Field Inspections			
AEC #	**Land use**	**Area affected**	**Potential contaminants**
AEC 1	Old Abbotsford residence and surrounds – now derelict. Evidence of past renovations.	~2,500m^2	Heavy metals, OC/Ops, Asbestos
AEC 2	Dairy and Milking area and immediate surrounds – now in disrepair. Probable host for farm machinery, fuels and chemicals. Extensive use of asbestos in roofing and walls.	~2,500m^2	Heavy metals, OC/Ops, Asbestos
AEC 3	Waste stockpile – mostly organic, but potentially hosting metal sheeting.	~25m^2	Heavy metals, OC/Ops, Asbestos
AEC 4	Footings from old farm building. Potential host to farm fuels and chemicals.	~200m^2	Heavy metals, TPH, BTEX,
AEC 5	Driveway from Fairleys Road to Homestead. Type of fill (at depth) used for road-base unknown.	~ 1000m^2	Heavy metals, OC/Ops, TPH, BTEX, Asbestos
AEC 6	Cattle yards and sheds.	~ 1000m^2	Heavy metals, OC/Ops, Asbestos
AEC 7	Cattle feeding shed adjacent to silo, and shed. Extensive use of asbestos roofing.	~ 1000m^2	Heavy metals, OC/Ops, TPH, BTEX, Asbestos

5.2.2 Assessment of Historical Aerial Photography

The assessment of historical aerial photography indicated that the Property has been cleared of most natural vegetation since the 1950's. A number of paddocks however have been used for pasture/crop growth. In addition, the infrastructure that was obvious in the first aerial photo still remains in the most recent photos. The only significant exception to this observation is the complete removal of built infrastructure between Abbotsford Road and the immediate drainage line located to the north. The above mentioned features are illustrated in Figure 7 and summarized in Table 5.

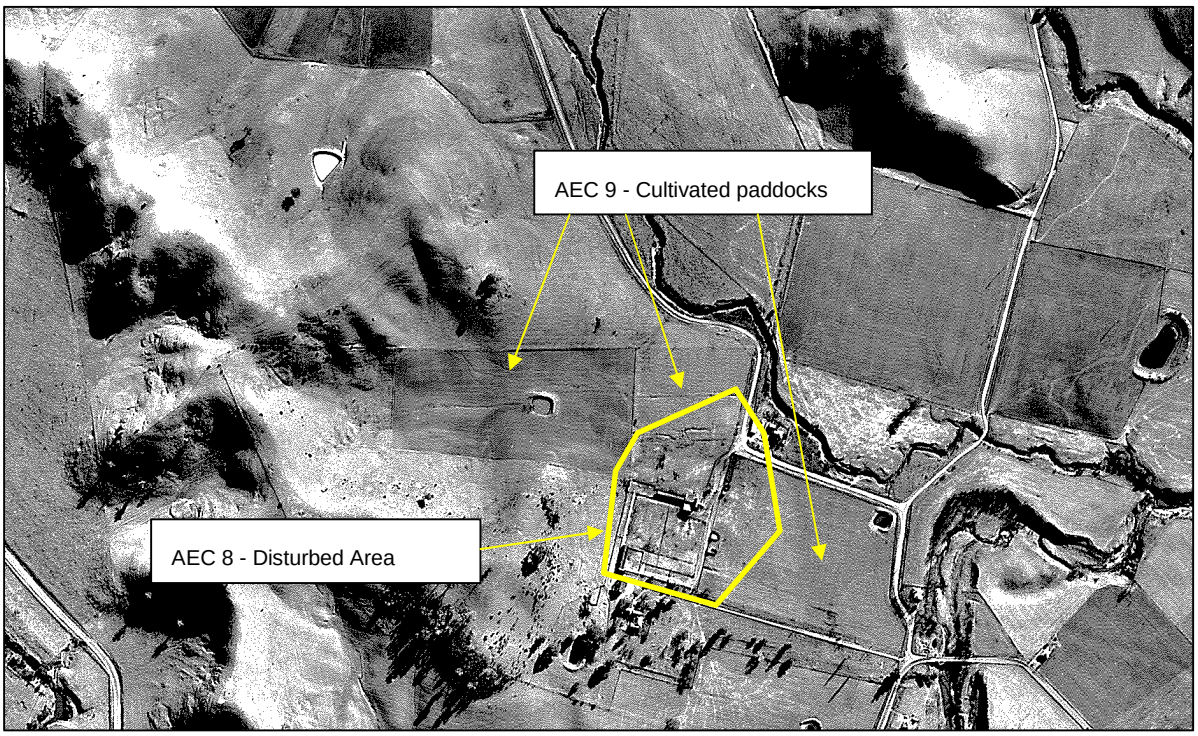


Figure 7: Scene from Air Photo 3 (1970) illustrating cultivated paddocks and disturbed area.

Table 4. Areas of Environmental Concern (AEC) identified from Historical Aerial Photography				
Air Photo	**AEC #**	**Land use**	**Area affected**	**Potential contaminants**
1		Land completely cleared, with minor trees preserved around homestead and farm infrastructure.	Entire property	
2	**AEC 8**	Potentially disturbed areas visible north and south of Feeding shed	Infrastructure zone	Heavy metals, OC/Ops, TPH, BTEX. Asbestos around infrastructure areas.
3	**AEC 9**	Much of the property split into paddocks for pasture growth. Zone of infrastructure from dairy to feed shed to Abbotsford Road and across to creek appears disturbed	Entire property	OC/Ops
4		Features less clear than above	N/A	
5		No change to above	N/A	
6		No change to above	N/A	
7		No change to above. Note drainage trail on eastern side of property (after flooding?)	N/A	
8		No change to above	N/A	
9		No change to above.	N/A	
10		No change to above	N/A	
11		No change to above	N/A	

5.2.3 Assessment of EM Survey

An Electromagnetic Survey was undertaken during the course of site investigations. This work outlined several zones of shallow high electromagnetic conductivity, which are potentially attributable to high salt contents. These zones are potentially linked to discharge plumes arising from the wash-down and/or run-off derived from the Milking Area and could potentially carry other chemical residues. The location of these plumes which are illustrated in Figure 8 and summarised in Table 5, represents an additional Area of Concern.

Other features identified by the EM survey have been covered in previous sections.

Table 5. Areas of Environmental Concern (AEC) identified as a result of an EM Survey			
AEC #	**Land use**	**Area affected**	**Potential contaminants**
AEC 10	Drainage plumes discharging from dairy infrastructure	~30,000m^2	Heavy metals, OC/Ops,

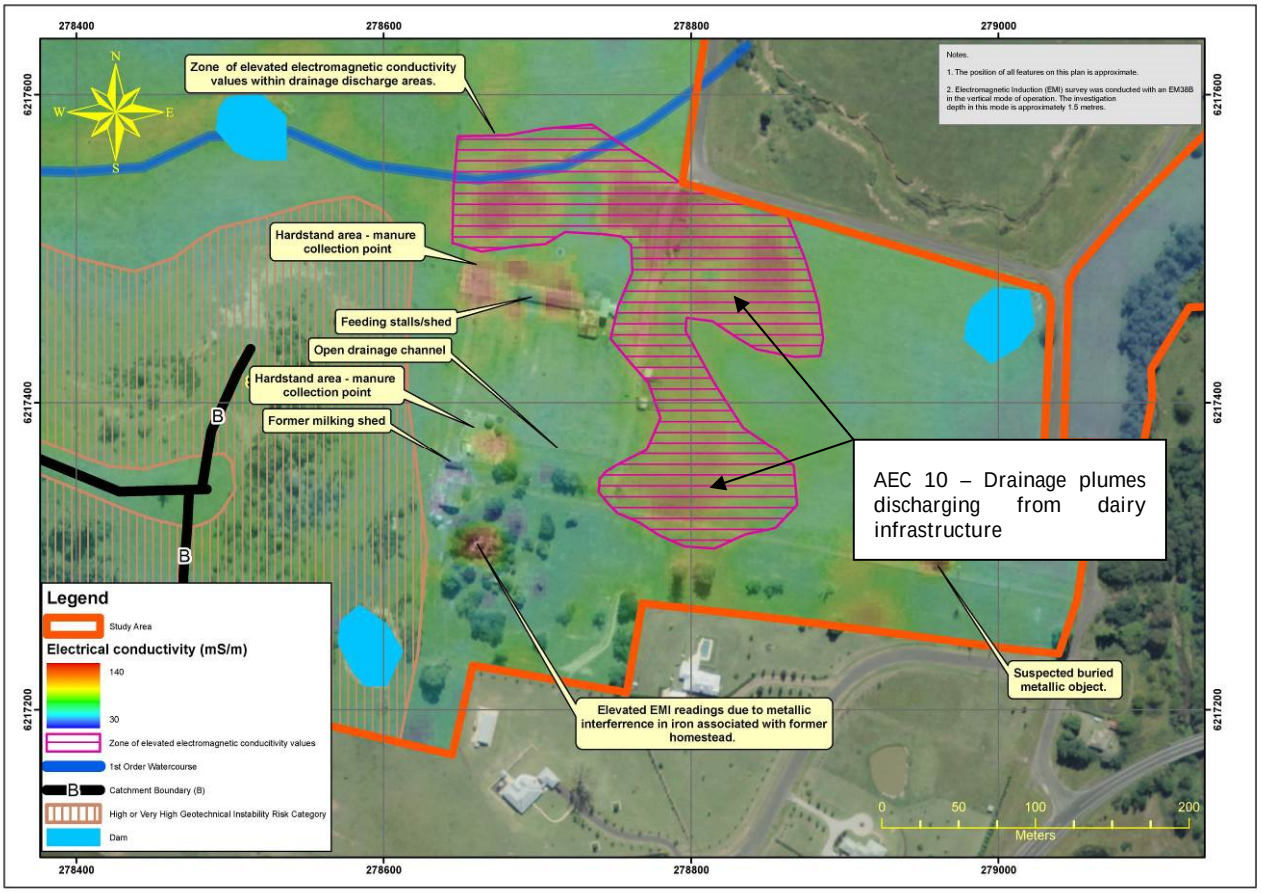


Figure 8: High conductivity plumes emanating from the Milking Shed area.

5.2.4 Assessment of Property Owner Questionnaire and Wollondilly Shire Council Records

In terms of the contamination issues outlined in the questionnaire (Appendix 3), Mr N Arber, representing the property owners, indicated that the Milking Area had an asbestos roof and that an application had been submitted to the EPA for its removal (Question 9). The response to questions 6, 7 and 8 were answered in the negative.

5.2.5 Historical Title Search

A historical title search did not reveal any specific AECs' not covered by other searches.

5.2.6 Results of Review of Wollondilly Shire Council Records

A review of Wollondilly Shire Council records revealed no specific contamination data relevant to the Property.

5.3 Results of the Assessment Process

The assessment process has indicated that a number of AECs occur throughout the Property. These AEC's are varied in nature and are associated with activities predominantly occurring many years (if not decades) ago. The principle objective of this assessment was to determine if there is any expectation of contamination associated with previous agricultural land use. This is taken to mean activities such as:

- The application of pesticides, herbicides and fertilizers used to increase the productivity of land used for agricultural purposes; and

- Construction and application of infrastructure and other like activities in support of agricultural enterprises – in this regard, the extensive use of asbestos bearing materials for roofing and cladding in much of the infrastructure should be noted.

Given that infrastructure representing dairying activities still remains in place in combination with the visual and historical record, there is some potential that contamination may have occurred and that such contamination remains to the present day. In addition, chemical residues may still be found in areas where past agricultural practices have taken place.

Potential contaminants have also been listed in Tables 4, 5 and 6. However, these are provided for guidance only, as only a full assessment of each AEC will determine which potential contaminants should be tested. Furthermore, these AECs only represent the most obvious and visible examples of potentially contaminating activities. Only a detailed assessment will provide a more confident assessment of contamination on the Property, such assessment being conducted under the auspices of a Phase 2 contamination assessment.

5.4 Conclusions

As a result of this contaminated land study, it is concluded that:

- Due to past agricultural practices there may be potential for contaminants to occur on the Property;

- No area within the Property is listed on the EPA website as contaminated or have been reported for contamination events;

- An inspection of the Property files at Council under a GIPA application did not reveal any contamination issues or events of significance.

- In general terms and subject to further detailed assessment under the guise of a Phase 2 contamination assessment, it is considered that there will be no impediment to the further subdivision of the Property as a result of the findings of this study.

5.5 Recommendations

It is recommended that areas proposed for residential development should be investigated by a detailed Phase 2 site investigation as part of the normal development approval process. This assessment is to be conducted subject to guidelines outlined in "Consultants Reporting on Contaminated Sites" (NSW EPA, 2011), details of which are provided in the following Section 6. The need for such further assessment is part of the development application process and properly identified , managed and remediated where necessary, should not by itself be an impediment to the future use of the land for large lot residential purposes.

6.0 RECOMMENDATIONS FOR THE FUTURE DEVELOPMENT CONTROLS FOR THE MANAGEMENT AND ASSESSMENT OF POTENTIAL CONTAMINATION SITES AT THE DEVELOPMENT APPLICATION STAGE.

6.1 Introduction

It is recommended that further development of the Property is to be subject to the following contamination assessment procedures: viz:

- A detailed Phase 2 site contamination assessment;
- Implementation of a Remedial Action Plan (RAP) over land found to be contaminated; and
- Validation of land that has been remediated.

These procedures are detailed in the following sections and represent the development controls that are to be implemented to assess and then manage any areas that have been identified as containing contaminants.

6.2 Detailed Phase 2 contamination assessment

The objective of a Phase 2 Contamination Assessment on all areas proposed for development is to undertake laboratory analysis of onsite soils, waters and air to determine the extent of contamination to a level that presents or potentially presents a risk of harm to human health and/or the environment. A detailed site investigation report is to be prepared which will provide detailed information on:

- Issues raised in this preliminary investigation; and
- The type, extent and level of contamination.

The assessment process will entail:

- Contaminant dispersal in air, surface water, groundwater, soil and dust;
- The potential effects of contaminants on public health, the environment and building structures;
- Off-site impacts on soil, sediment and biota where applicable; and
- The adequacy and completeness of all information available to be used in making decisions on remediation.

Contamination sampling and assessment will focus on two aspects identified by the preliminary findings of this report, viz;

- Assessment of all AECs already identified; and
- Assessment of land excluding these AECs.

A Phase 2 Contamination Assessment will initially be focused on the soils located within the area to be developed and is to include the following activities:

- A Sampling Analysis Plan (SAP) is to be prepared based on the following criteria:
  - **Volume based:** Where AEC's have been identified as being restricted to a discrete volume of material (such as a stockpile of imported earth), the sampling is to be based on a volumetric approach. The sampling density is to be determined subject to the investigators assessment of the material in question.
  - **Area based:** Where AEC's have been identified over a large area (such as a paddock where agricultural activities have taken place) a grid-based sampling protocol is to be undertaken. The sampling density is to be based on 'Table A' of the NSW EPA guidelines for 'Consultants Reporting on Contaminated Sites' (NSW EPA, 1995).

- At times there may be instances where both sampling options need to be considered. In such cases, the project environmental scientist will need to determine the optimum sampling regime so as to focus on the areas considered to have the greatest likelihood for contamination.

- The SAP is to include the following details:
  - AEC Number
  - Land Use
  - Area affected (in m2) or volume affected (m3);
  - Number of sampling locations;
  - Application of composite sampling:
  - Sample depths; and
  - Nature of laboratory analysis to be undertaken (reflecting potential contaminants that may be found). All samples are to be analyzed by a NATA registered laboratory.

- All sampling is to incorporate field and laboratory quality assurance and quality controls;

- All analytical results are to be assessed against adopted Health Based Investigation Levels (HIBL's) and Provisional phytotoxicity-based Investigation Levels (PPIL's) - where appropriate. The main references currently for these HIBL's and PPIL's include:
  - NEPC (1999 and 2006) .
  - NSW EPA (1994, 1995 and 2011)
- Where it is suspected that contamination has entered the groundwater system, an appropriate testing regime will be determined and executed; and

- A report on the findings is to be prepared and submitted as part of the conditions of consent for any proposed development.

6.3 Remediation of Contaminated Land

In the event that contamination is identified, a Remedial Action Plan (RAP) is to be submitted which will outline the measures that need to be taken to remediate the site affected. The RAP is to be completed inclusive of validation testing and reporting prior to the development being approved.

It is not possible at this stage, to develop a specific schedule of actions and types of remediation works that will need to be undertaken should contamination be confirmed at any one site. This is because the extent and level of contaminants are unknown. Each identified contamination site will have its own unique characteristics and will require a unique remediation solution which will be dependent upon the ultimate land use. In general terms however, there will be five main approaches, viz:

- Contaminated sites are left untreated;
- On-site treatment of contamination;
- Off-site treatment of contaminated materials and return of materials to original site;
- Removal of contaminated materials to an appropriately licensed waste facility; or
- Consolidation and isolation of contaminated materials on-site by a properly designed barrier.

The nature of the final land use or "exposure settings" is important in determining any treatment option (Taylor and Langley, 1998). These exposure settings (abbreviated) are:

- 'Standard' residential;
- Residential with substantial vegetable garden;
- Residential with substantial vegetable garden, poultry excluded;
- Residential with minimal opportunities for soil access;
- Parks, recreational open space and playing fields; and
- Commercial/industrial.

Each of these exposure settings have their own acceptable Health Based Investigation Level (HBIL) for any one contaminant.

In certain cases, exceedances of HBILs for a nominated land use can be dealt with by on-site vertical mixing. This has application for general broad-acre agricultural land and may or may not be appropriate for the study area.

In the case of those sites found to be contaminated with asbestos, the likely option is complete removal to an appropriate waste facility.

In conclusion, remediation options are very much dependent on the nature and level of individual contaminants in combination with the proposed land use. Until sites are fully investigated and tested, the most appropriate remediation option cannot be determined.

6.4 Validation of Remediated land

The RAP process discussed in the above section is to be completed inclusive of validation testing and reporting prior to the development being approved.

The purpose of site validation and subsequent reporting requirements is to ensure that the objectives stated in the RAP have been achieved. The extent of validation required will depend on:

- The degree of contamination originally present;
- The type of remediation processes that have been carried out; and
- The proposed land use.

Where full clean-up is not feasible or on-site containment of contamination is proposed, the need for an on-going monitoring program will be assessed. Such a program would assess a monitoring strategy, parameters to be monitored, locations frequency and reporting requirements.

6.5 Update on Contamination Guidelines

It should be noted that the environment ministers from across Australia and New Zealand recently affirmed their commitment to environment and water issues of national significance and agreed to a work plan for 2013-14 focusing on progressing national water reform, national waste policy and air quality improvements (Appendix 5). Based on the outcomes of a review commenced in 2005, the COAG Standing Council on Environment and Water approved an amendment to the National Environment Protection (Assessment of Site Contamination) Measure. The Measure establishes a nationally consistent approach to the assessment of site contamination to ensure sound environmental management practices by the community. The amendment ensures it will remain the premier document for the assessment of site contamination in Australia, used by regulators, site assessors, consultants, environmental auditors, landowners, developers and industry. The measure incorporates updated methodologies for assessing human and ecological risks and site assessment methods now in line with advances in Australia and overseas.

The amendment to the Assessment of Site Contamination NEPM was officially approved on 12th April, 2013, and took effect in each jurisdiction on 16 May 2013, the day after it was registered on the Federal Register of Legislative Instruments. The amendment includes repealing all the original schedules to the ASC NEPM and the substitution of new schedules. Implementation of the amended NEPM is the responsibility of each jurisdiction.

Regulators in the states and territories of Australia have agreed, in principle, to a transition period of up to 12 months for full implementation of the amended ASC NEPM. The transition period allows for regulators to implement any legislative or administrative steps required to put the amendment into effect.

During the 12 month transition period, regulators may allow companies to finalise and submit work, which is consistent with the original NEPM and already substantially progressed, for auditor/third party review or to submit final reports directly to the relevant jurisdiction where no auditor/third

party reviewer is involved based on appropriate justification (http://www.scew.gov.au/nepms/asc-transitional-arrangements.html).

Examples of where a site assessment would be considered substantially progressed include:

- a contract has been awarded and the Sampling and Analysis Quality Plan has been finalised and the field work has commenced or is imminent at the time of registration of the amendment; or
- the site assessment report has been submitted for auditor review.

In addition, for some newly included contaminants, some laboratory methods may not be commonly available to undertake appropriate assessment immediately following the declaration into law of the amendment. The 12 month transition period will allow laboratories time to modify relevant procedures.

With these practicalities in mind, this means that the states and territories of Australia expect that all site contamination assessment reports dated from 16 May 2014 will be consistent with the amended NEPM unless alternative arrangements have been agreed with the relevant regulator

In NSW, the Amendment will be approved under s.105 of the *Contaminated Land Management Act 1997*. The EPA has a duty to take the Amendment into consideration when relevant and site audits have to be carried out in accordance with the Amendment, once approved.

Based on the above criteria, future assessment of the Property for contamination will need to be conducted under the auspices of the amended NEPM.

7.0 SATISFACTION OF SPECIALIST STUDY GUIDELINES

Table 6 provides a summary of the Study and identifies how each of the guidelines have been met.

Table 6A: Satisfaction of Guidelines - Output

Output	How and where Guideline addressed
A preliminary 'desk top' Contaminated Site report as required in accordance with SEPP 55 - Remediation of Land.	This report in its entirety satisfies this output requirement.
Field Verification of potential contamination sites.	Sections 4 and 5 outline all of the steps taken to assess contamination on the Property. This has included field inspections and surveys as detailed in Section 4.2 and Appendix 2.
Recommendation for the future development controls for the management and assessment of these potential contamination sites at the development application stage.	Section 6 outlines a number of development controls that are to be applied where the Property is to be developed by way of subdivision or other activities requiring development consent. These controls entail a detailed Phase 2 contaminated site assessment and where appropriate, remediation of confirmed contamination.

Table 6B: Satisfaction of Guidelines - Objectives

Objectives	How and where Guideline addressed
To determine if there is any expectation of contamination of the study area associated with previous agricultural land uses and the likely sources of that contamination and whether there is a need for remediation before a change to the land use zoning.	Section 5 provides a summary of Areas of Concern considered to have potential for contamination. Each AEC, is described and its location illustrated.

Table 6C: Satisfaction of Guidelines – Tasks/Methodology

Tasks/Methodology	How and where Guideline addressed
Perform a 'desk top' review of the Wollondilly Contaminated Lands Register to establish if there is any record of contamination within the study area with field verification.	Review undertaken and covered in Section 4.5 and 5.2.6.
A preliminary Contaminated Site Investigation is required in accordance with SEPP 55 - Remediation of Land to determine the level of contamination as a consequence of previous agricultural land use.	This report in its entirety satisfies this output requirement.
In undertaking a Contaminated Site Investigation, the consultant will be provided with land use history, aerial photography and other relevant information held by Council to assist in the preliminary determination.	This information has been provided under the GIPA provisions and the results are summarised in Section 5.2.6 and summarised in Sections 4.5 to 4.9.
Dependent on the level of potential contamination develop a schedule of actions and types of remediation works that will need to be undertaken prior to rezoning and/or at the development application stage.	Any development proposal for the Property is to be subject to a Phase 2 contamination assessment as described in Section 6.

8.0 CONCLUSIONS

It is concluded that an assessment of the Property has identified a number of Areas of Environmental Concern. These AECs' are the result of activities associated with current and past agricultural activities. These AEC's have been documented and subject to a preliminary Phase 1 assessment.

As a result of this work, the implementation of a number of development controls are recommended where land within the Property is to be developed by way of subdivision or other activities requiring development consent. These include:

- Completion of Phase 2 contamination Assessment;
- Preparation of a Remediation Action Plan (RAP) where appropriate;
- Completion of Remedial Works where applicable.

Provided that the above program is carried out to the satisfaction of the SEPP 55 guidelines together with the amended NEPM criteria, it is concluded that there appears to be no impediment related to contamination issues which might prevent the rezoning of the Property to take place.

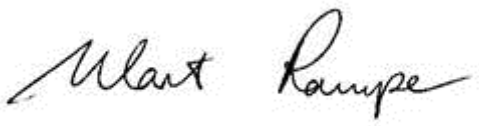
9.0 LIMITATIONS OF THIS REPORT

This report has been prepared subject to a number of limitations. These include:

- No contamination assessment can eliminate all risk. Even a rigorous professional assessment may not detect all contamination within a site. Contaminants may be present in areas that were not sampled or surveyed, or may migrate to areas which did not show any signs of contamination when sampled. Contaminant analysis cannot cover every type of contaminant that may occur, only the most likely contaminants are screened;
- Site assessment identifies actual sub-surface conditions only at those points where samples are taken and when they are taken. Data obtained from the sampling and subsequent laboratory analysis are interpreted by professional consultants and opinions are drawn about the overall sub-surface conditions, the nature and extent of the contamination, the likely impact on any proposed development and appropriate remediation measures. Actual conditions may differ from those inferred, because no professional no matter how qualified and no sub-surface exploration program, no matter how comprehensive, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than an assessment indicates. Actual conditions in areas not sampled may differ from predictions. Nothing can be done to prevent the unanticipated;
- In preparing this report, Harvest Scientific Services Pty Ltd has relied upon certain verbal information and documentation provided by the client and/or third parties. Harvest Scientific Services Pty Ltd did not attempt to independently verify the accuracy or completeness of that information. To the extent that the conclusions and recommendations in this report are based in whole or in part on such information, they are contingent on its validity. Harvest Scientific Services Pty Ltd assumes no responsibility for any consequences arising from any information or condition that was concealed, withheld, misrepresented, or otherwise not fully disclosed or available to Harvest Scientific Services Pty Ltd.
- The findings contained in this report are the result of discrete/specific methodologies used in accordance with normal practices and standards. To the best of our knowledge, they represent a reasonable interpretation of the general condition of the site in question. Under no circumstances, however, can it be considered that these findings represent the actual state of the site/sites at all points.

The application of conditions of approval or impacts of unanticipated future events could modify the outcomes described in this document. In particular, implications of climate change and/or global warming of any magnitude and extreme rainfall events have not been considered but should they occur, may have a significant impact on the site. The client agrees that such events are possible but nevertheless accepts the risk that they pose.

Prepared by:



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Principal

18/6/2013

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APPENDIX 1 Water Bore Data

APPENDIX 2 Photographic Record

APPENDIX 3 Property Owner Questionnaire

APPENDIX 4 Planning Certificate under Section 149(2)

APPENDIX 5 Communiqué by COAG (11/4/2013)