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Lot 5 DP 823737 Hermitage Road
Soil, Land and Agricultural Resource Assessment
Belford Land Group

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Soil, Land and Agricultural Resource Assessment

Belford Land Group



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DOCUMENT CONTROL

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1 INTRODUCTION

1.1 Project Background

Belford Land Group engaged SLR Consulting Australia Pty Ltd to undertake a Soil, Land and Agricultural Resource Assessment on approximately 305 hectares of land located at Lot 5 DP 823737 Hermitage Road, Pokolbin (the Site). The Site is 2.2 kilometres (km) from the Hermitage Road intersection with the New England Highway and approximately 14 km from Singleton, as shown in **Figure 1**.

Belford Land Group proposes a rural subdivision with lot sizes of approximately 10 hectares capable of supporting small scale agricultural activities such as viticulture and orchards.

Under Singleton Council's Local Environment Plan (2013) minimum lot size for rural subdivision is 40 hectares, and as such have requested Belford Land Group to address the following factors in their revised planning proposal:

- Assessment of the Site's agricultural capability, particularly for viticulture or other intensive agricultural activities.
- Assessment of soil salinity within the Site.
- Assessment of the Site's capacity to accommodate on-site sewage management.
- Assessment of potential for soil contamination from previous agricultural activities.

2 METHODOLOGY

2.1 Field Survey

SLR used a qualitative integrated free survey utilising samples collected by SLR field staff to map soil boundaries within the Project Application Area. An integrated survey assumes that many land characteristics are interdependent and tend to occur in correlated sets (NCST, 2008). Background reference information including observable air photography and topographic maps, were used to predict the distribution of soil attributes in the field. Characteristics evaluated include geology, landform and vegetation. A free survey is a conventional form of integrated survey and its strength lies in its ability to assess soil and land at medium to detailed-scales (NCST, 2008). Survey points are located irregularly, according to the survey teams' expertise and judgement to enable the delineation of soil boundaries.

The field survey was undertaken at a scale of 1:25,000 and is shown **Figure 2**. This survey scale was adopted to offer an adequate dataset of soil types within the Site. The soil profiles were assessed in accordance with *the Australian Soil and Land Survey Field Handbook* (NCST, 2009) soil classification procedures. Detailed soil profile descriptions were logged using soil data sheets and the information recorded consisted of the following parameters as specified in **Table 1**.

Photographs and GPS locations were taken at each site and all soil core holes were backfilled immediately following field assessment.

Table 1 – Detailed Profile Description Parameters

Descriptor	Application
Horizon Depth	Weathering characteristics, soil development
Field Colour	Permeability, susceptibility to dispersion /erosion
Field Texture Grade	Erodibility, hydraulic conductivity, moisture retention, root penetration
Boundary Distinctness and Shape	Erosional / dispositional status, textural grade
Consistence Force	Structural stability, dispersion, ped formation
Structure Pedality Grade	Soil structure, root penetration, permeability, aeration
Structure Ped & Size	Soil structure, root penetration, permeability, aeration
Stones – Amount & Size	Water holding capacity, weathering status, erosional / depositional character
Roots – Amount & Size	Effective rooting depth, vegetative sustainability
Ants, Termites, Worms etc.	Biological mixing depth

SLR conducted a site inspection on 22nd October 2014 where soil samples from six sites were collected for laboratory analysis. A further six observations were recorded within the Site where soil profile exposure occurred, such as at gully lines and dam catchments. Observations are contained in **Appendix A**.

2.2 Laboratory Soil Assessment

Soil samples from six soil profile sites were utilised in the laboratory testing programme. Samples were analysed to:

- Classify soil taxonomic classes;
- Determine soil salinity levels; and
- Determine suitability of soil for intensive agricultural activity.
- Determine suitability for on-site wastewater management.

Soil samples of approximately 1 – 2 kg were collected from each soil layer where appropriate. In total, twenty four soil samples were sent to the Department of Primary Industries Soil Conservation Service Scone Research Centre for analysis. Certificate of Analyses for these results are contained in **Appendix B**. The selected physical and chemical laboratory analysis parameters and their relevant applications are listed in **Table 2**.

Table 2 – Laboratory Analysis Parameters

Property	Application
Physical:	
Coarse fragments (>2mm)	Soil workability; root development; droughtiness
Particle size distribution (<2mm)	Nutrient retention; exchange properties; erodibility; droughtiness; workability; permeability; sealing; drainage; interpretation of most other physical and chemical properties and soil qualities
Aggregate stability (Emerson Aggregate Test (EAT))	Susceptibility to surface sealing under rainfall or irrigation; effect of raindrop impact and slaking; permeability; infiltration; aeration; seedling emergence; correlation with other properties
K-factor	Soil erodibility rating under the Universal Soil Loss Equation
Chemical:	
Soil reaction (pH)	Nutrient availability; nutrient fixation; toxicities (especially Al, Mn); liming; sodicity; correlation with other physical, chemical and biological properties
Electrical conductivity (EC)	Appraisal of salinity hazard in soil substrates or groundwater, total soluble salts
Cation Exchange Capacity (CEC) and exchangeable cations	Nutrient status; calculation of exchangeable sodium percentage (ESP); assessment of other physical and chemical properties, especially dispersivity, shrink – swell, water movement, aeration
Organic Carbon (OC)	Nutrient status; indication of soil fertility

The laboratory methods used by Scone Research Centre for each physical and chemical parameter are provided in **Table 3**.

Table 3 – Laboratory Test Methods

Analyte	Method
Particle size distribution & coarse fragments	Sieve & hydrometer
Texture	Marshall (1947)
Colour	Munsell described colour
pH	1:5 soil/water extract
Electrical Conductivity (EC)	1:5 soil/water extract
Cation Exchange Capacity (CEC)	(AgTU)+ extraction

2.3 Soil Order Classification

SLR adopted the Australian Soil Classification system nomenclature (Isbell, 2002) to identify and label soil types within the Site. The standard is routinely used as the soil classification system in Australia and will form the key descriptor throughout this report. In this system soil layers are termed horizons and for the solum these include the A and B horizons.

2.4 Soil Suitability for Viticulture

According to SESL Environment & Soil Sciences (2010) the ideal characteristics of a soil suitable for vineyard production include:

- Good drainage and soil texture;
- Good water-holding capacity at depth;
- Low to moderate inherent fertility; and
- Free rooting soil depth greater than 50 cm.

Each detailed site was assessed using both field and laboratory parameters to determine whether the soil type at each site was suitable for vineyard establishment and production.

2.5 On-Site Wastewater Management

Soil texture from field and laboratory analysis was used to determine soil suitability for on-site wastewater management. Utilising the Muswellbrook Shire Council On-Site Wastewater Sizing Assessment, each of the detailed soil profiles were assessed for suitability and disposal sizing requirements. Assumptions used in the calculations were:

- An area of ten hectares with one dwelling per lot;
- Five persons per dwelling;
- No water saving devices installed with reticulated town water supply;

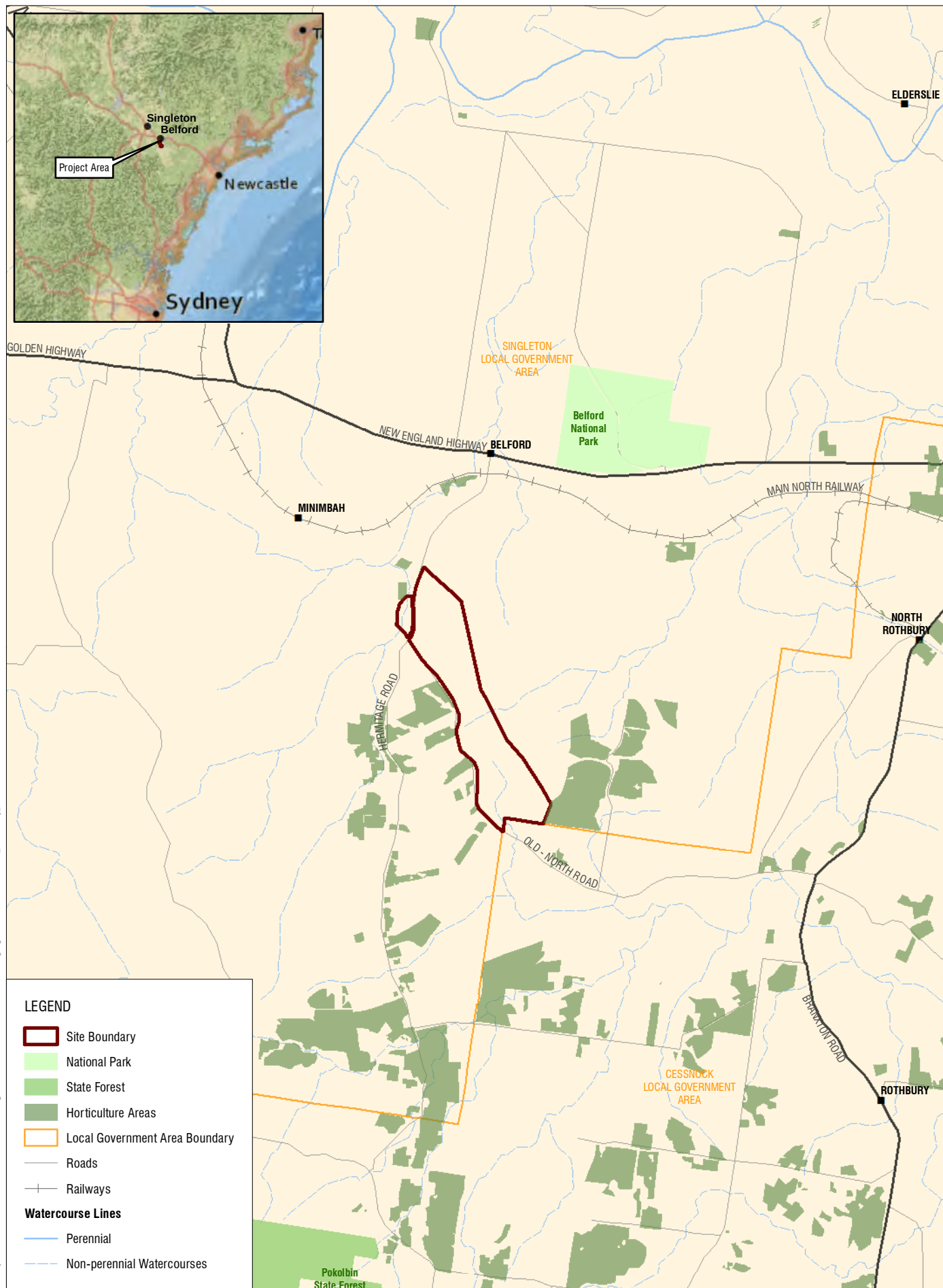
- Wastewater flow rate 900 litres per day; and
- Primary treatment via septic tank, not disinfected with disposal via absorption trench.

2.6 Soil Contamination Assessment

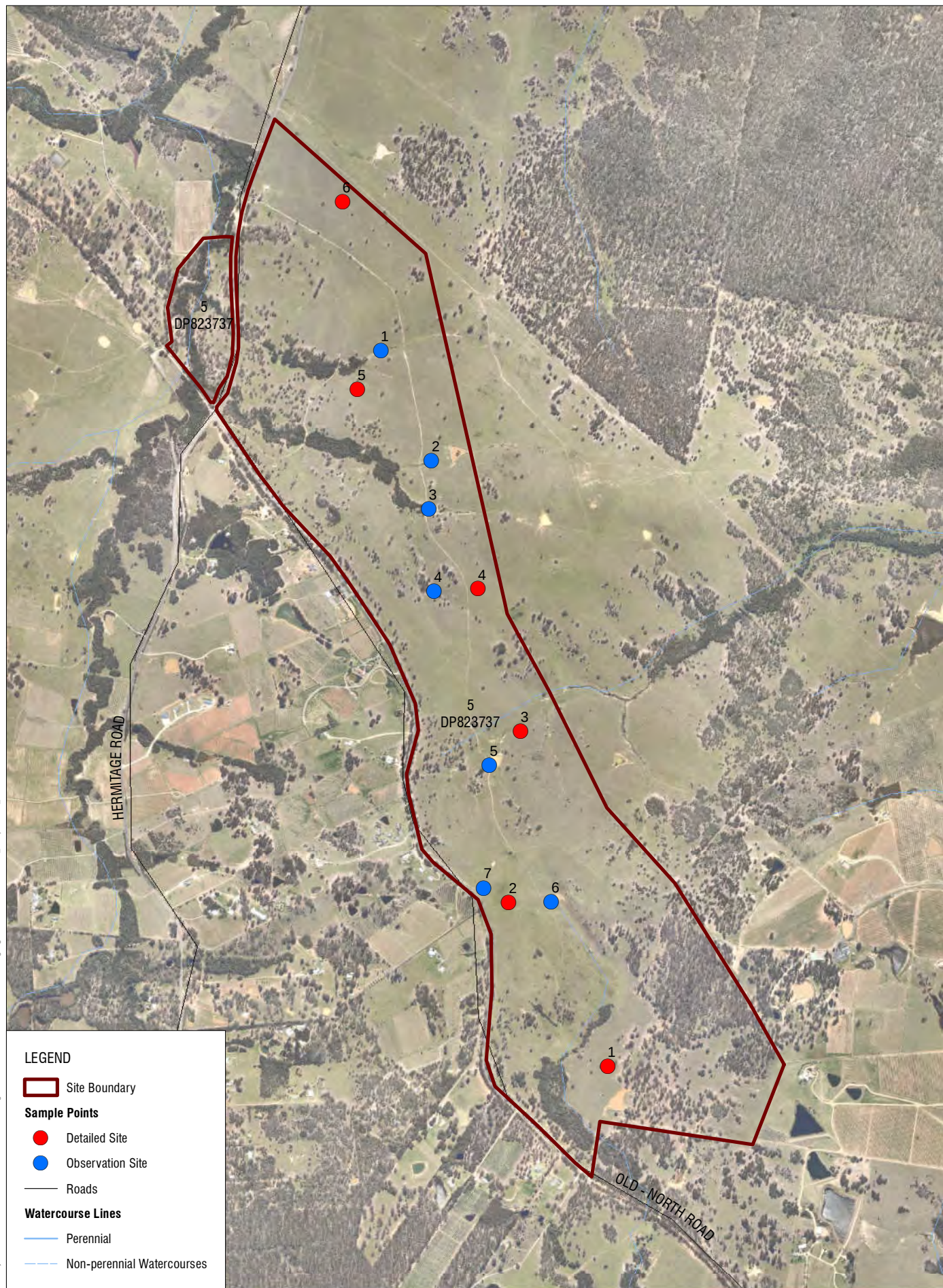
Site inspection was carried out to identify potential sources of contamination from previous agricultural activities. Areas of potential soil contamination include:

- Disused cattle or sheep dips;
- Disused intensive animal production areas such as piggeries, chicken sheds or dairies;
- Chemical drum disposal areas;
- Disused fuel storage areas; and
- Dilapidated buildings or sheds.

Should areas of potential contamination be encountered, soil samples will be collected for further testing by ALS Lismore.



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LEGEND

Site Boundary

Sample Points

● Detailed Site
● Observation Site

— Roads

Watercourse Lines

— Perennial
 - - - Non-perennial Watercourses



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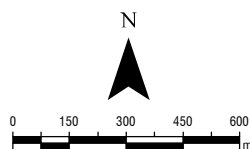
Date: 27/11/2014

Drawn by: LH

Scale: 1:20,000

Sheet Size: A4

Projection: GDA 1994 MGA Zone 56



JBA Urban Planning Consultants

HERMITAGE ROAD LAND ASSESSMENT

Sample Points

FIGURE 2

3 ASSESSMENT RESULTS

3.1 Agricultural Capability

The dominant soil type found within the Site was a Brown Sodosol. Sodosols are soils with a clear or abrupt texture contrast between the A horizons and sodic B horizons which are not strongly acidic (greater than pH 5.5). The *Interim Protocol for site verification and mapping of biophysical strategic land* (2013) classes all orders of Sodosols as having moderately low inherent fertility.

The minor soil type found within the Site was a Red Kurosol. Kurosols are soils with a strong texture contrast between the A horizons and strongly acidic (less than pH 5.5) B horizons. Natric Kurosols are classed by The *Interim Protocol for site verification and mapping of biophysical strategic land* (2013) as having moderately low inherent fertility.

All soils found within the Site have suitable physical and chemical characteristics for the establishment of small scale intensive agricultural production such as vineyards and olive groves. Areas where pH is less than 5.5 can be ameliorated using agricultural lime, whilst area where the A horizon is strongly sodic can be ameliorated using gypsum.

Site 2 recorded a salinity level of slightly saline at 35-45 cm, whilst all other sites were non-saline at less than 50 cm soil depth. Some areas of soil salinity within the Site were found at depth greater than 50 cm, with four of the six sites recording salinity levels of slight to moderate, which is within suitable levels for vineyard or olive establishment and production. Given the soil types and topography of the Site the risk of increasing soil salinity is low.

Following are the field assessment and laboratory analysis for each of the six detailed sites.

Detailed Site 1 – Brown Sodosol

Table 4: Site 1 – Brown Sodosol (Summary)

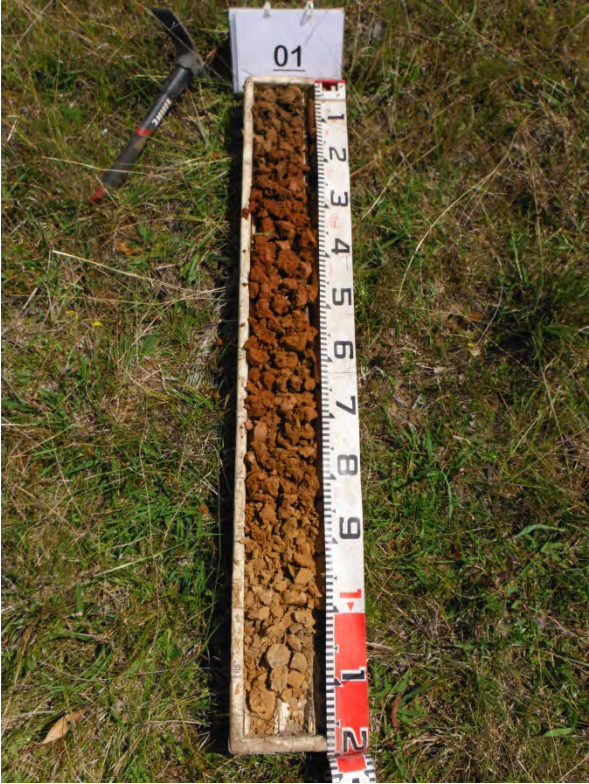
Site Description	
 Plate 1 – Soil Core Profile 1	 Plate 2 – Landscape Looking South-East
ASC Name	Brown Sodosol
Representative Observation Site	1
Dominant Slope Association	Mid-slope gently to moderately inclined (3 – 5%)
Land Use	Cattle grazing native grasses
Vegetation	Spotted Gum
Soil Drainage	Well drained 0-25 cm, moderately drained from 25-80 cm
Water Holding Capacity >50 cm	Good with 44% clay
Soil Texture	Loam at surface graduating to a heavy clay at depth
Inherent Soil Fertility	Moderately Low
Free Rooting Depth	80 cm

Table 5: Site 1 – Brown Sodosol (Analysis)

Horizon	Depth (m)	Description		
A1	0.00 – 0.10	Dark brown loam with weak pedality and weak consistence. Moderately acidic, marginally sodic and non-saline. Moderate CEC with <5% coarse fragments <10 mm. Well drained with many coarse roots. Clear and wavy boundary.		
B21	0.10 – 0.25	Strong brown heavy clay with moderate pedality and weak consistence. Slightly acidic, sodic and non-saline. Moderate CEC with no coarse fragments. Well drained with many coarse roots. Clear and wavy boundary.		
B22	0.25 – 0.60	Strong brown heavy clay with strong pedality and moderate consistence. Strongly acidic, sodic and non-saline. Moderate CEC with no coarse fragments. Moderately drained with 5% distinct grey mottles and many coarse roots. Gradual and wavy boundary.		
B23	0.60 -0.80	Strong brown heavy clay with strong pedality and strong consistence. Strongly acidic, strongly sodic and slightly saline. Moderate CEC with no coarse fragments. Moderately drained with 10% distinct grey mottles and common coarse roots. Clear and wavy boundary.		
BC	+0.80	Weathered sandstone (not laboratory tested)		
Horizon	ECe		Laboratory pH	
	dS/m	Rating	Value	Rating
A1	9.5	Non-Saline	6.0	Moderately Acidic
B21	5.8	Non-Saline	6.1	Slightly Acidic
B22	5.8	Non-Saline	5.5	Strongly Acidic
B23	8.6	Slightly Saline	5.1	Strongly Acidic
Horizon	CEC		ESP	
	cmol/kg	Rating	%	Rating
A1	12.7	Moderate	9.4	Marginally Sodic
B21	19.9	Moderate	10.1	Sodic
B22	21.8	Moderate	13.8	Sodic
B23	23.4	Moderate	18.4	Strongly Sodic

Detailed Site 2 – Brown Sodosol

Table 6: Site 2 – Brown Sodosol (Summary)

Site Description	
 Plate 3 – Soil Core Profile 2	 Plate 4 – Landscape looking North-East
ASC Name	Brown Sodosol
Representative Observation Sites	2, 3, 4, 6
Dominant Slope Association	Upper slope moderately inclined (5 – 10%)
Land Use	Cattle grazing native grass pasture
Vegetation	Spotted Gum
Soil Drainage	Well drained 0-25 cm, moderately drained from 25-100 cm
Water Holding Capacity >50 cm	Good with 55% clay
Soil Texture	Loamy sand at surface graduating to a heavy clay at depth
Inherent Soil Fertility	Moderately Low
Free Rooting Depth	100 cm

Table 7: Site 2 – Brown Sodosol (Analysis)

Horizon	Depth (m)	Description		
A1	0.00 – 0.10	Dark brown loamy sand with weak pedality and weak consistence. Moderately acidic, sodic and slightly saline. Low CEC with <5% coarse fragments <10 mm. Well drained with many coarse roots. Clear and wavy boundary.		
A2	0.10 – 0.25	Bleached, dark-greyish-brown loam, apedal with loose consistence. Slightly acidic, strongly sodic and non-saline. Low CEC with 30% coarse fragments <25 mm. Rapidly drained with many coarse roots. Abrupt and wavy boundary.		
B21	0.25 – 0.50	Yellowish-brown heavy clay with strong pedality and strong consistence. Neutral pH, marginally sodic and slightly saline. High CEC with <5% coarse fragments <10 mm. Moderately drained with 5% distinct grey mottles and many coarse roots. Gradual and wavy boundary.		
B22	0.50 – 1.00	Olive yellow heavy clay with strong pedality and strong consistence. Mildly alkaline, strongly sodic and moderately saline. Moderate CEC with 5% coarse fragments <10 mm. Moderately drained with 5% distinct grey mottles and common coarse roots.		
Horizon	ECe		Laboratory pH	
	dS/m	Rating	Value	Rating
A1	2.1	Slightly Saline	5.6	Moderately Acidic
A2	0.3	Non-Saline	6.4	Slightly Acidic
B22	2.3	Slightly Saline	7.2	Neutral
B22	5.6	Moderately Saline	7.6	Mildly Alkaline
Horizon	CEC		ESP	
	cmol/kg	Rating	%	Rating
A1	9.5	Low	10.5	Sodic
A2	6.2	Low	17.7	Strongly Sodic
B21	25.6	High	9.8	Marginally Sodic
B22	23.8	Moderate	16.0	Strongly Sodic

Detailed Site 3 – Brown Sodosol

Table 8: Site 3 – Brown Sodosol (Summary)

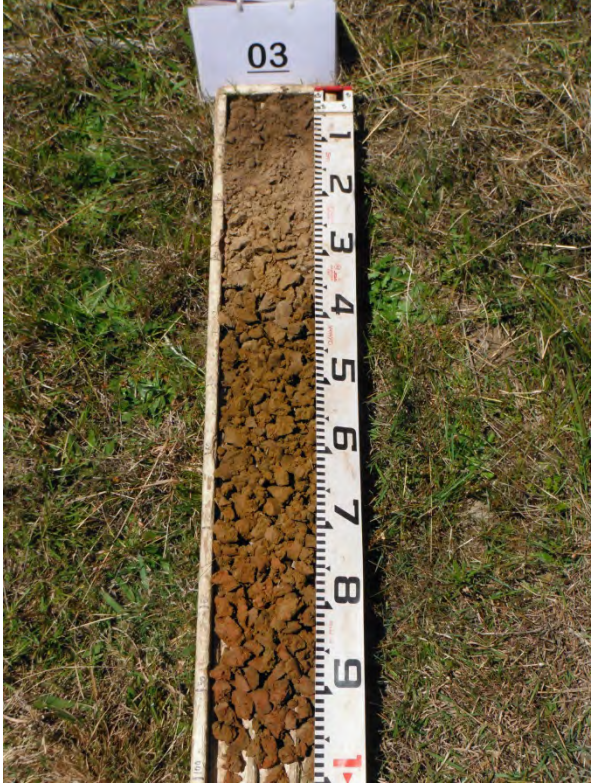
Site Description	
 Plate 5 – Soil Core Profile 3	 Plate 6 – Landscape looking South
ASC Name	Brown Sodosol
Representative Observation Sites	2, 3, 4, 6
Dominant Slope Association	Lower slope gently to moderately inclined (3 – 5%)
Land Use	Cattle grazing native grass pasture
Vegetation	Spotted Gum, Casurina, Black Cypress Pine
Soil Drainage	Well drained 0-25 cm, moderately drained from 25-90 cm
Water Holding Capacity >50 cm	Good with 44% clay
Soil Texture	Loam at surface graduating to a heavy clay at depth
Inherent Soil Fertility	Moderately Low
Free Rooting Depth	90 cm

Table 9: Site 3 – Brown Sodosol (Analysis)

Horizon	Depth (m)	Description		
A1	0.00 – 0.10	Dark brown loam with weak pedality and weak consistence. Moderately acidic, strongly sodic and non-saline. Low CEC with no coarse fragments. Well drained with many coarse roots. Clear and even boundary.		
A2	0.10 – 0.25	Bleached brown loam with weak pedality and weak consistence. Slightly acidic, strongly sodic and non- saline. Low CEC with <5% coarse fragments <10 mm. Rapidly drained with many coarse roots. Abrupt and even boundary.		
B21	0.25 – 0.75	Yellowish-brown heavy clay with moderate pedality and strong consistence. Slightly acidic strongly sodic and non-saline. Moderate CEC with <5% coarse fragments <10 mm. Moderately drained with 5% distinct red mottles and common coarse roots. Gradual and even boundary.		
B22	0.75 – 0.90	Strong brown heavy clay with strong pedality and strong consistence. Slightly acidic, strongly sodic and moderately saline. Moderate CEC with no coarse fragments. Moderately drained with 10% distinct yellow mottles and common coarse roots.		
Horizon	ECe		Laboratory pH	
	dS/m	Rating	Value	Rating
A1	0.2	Non-Saline	5.8	Moderately Acidic
A2	0.1	Non-Saline	6.3	Slightly Acidic
B21	1.5	Non-Saline	6.2	Slightly Acidic
B22	6.5	Moderately Saline	5.4	Strongly Acidic
Horizon	CEC		ESP	
	cmol/kg	Rating	%	Rating
A1	6.5	Low	20.0	Strongly Sodic
A2	6.1	Low	23.0	Strongly Sodic
B21	14.3	Moderate	22.4	Strongly Sodic
B22	19.1	Moderate	26.7	Strongly Sodic

Detailed Site 4 – Brown Sodosol

Table 10: Site 4 – Brown Sodosol (Summary)

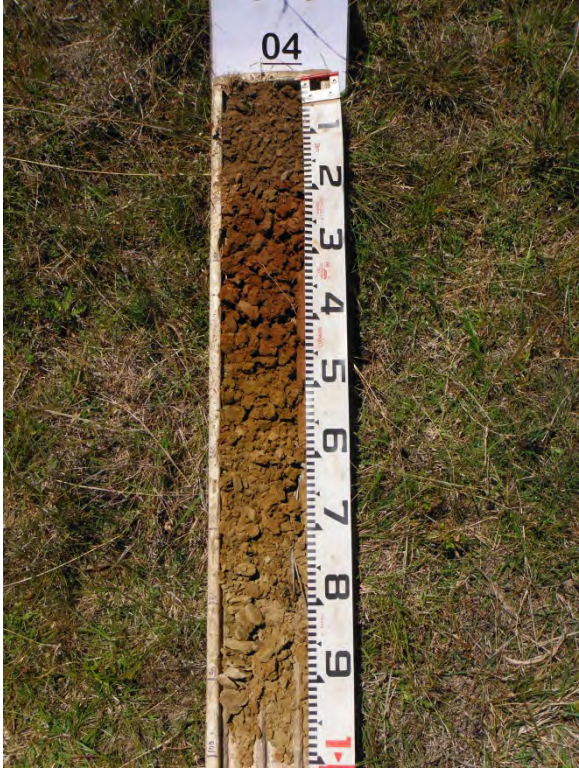
Site Description	
 Plate 7 – Profile Pit 4	 Plate 8 – Landscape looking North-West
ASC Name	Brown Sodosol
Representative Observation Sites	2, 3, 4, 6
Dominant Slope Association	Mid-slope flat to gently inclined (1 – 3%)
Land Use	Cattle grazing native grass pasture
Vegetation	Spotted Gum
Soil Drainage	Well drained 0-20 cm, moderately drained from 25-80 cm
Water Holding Capacity >50 cm	Good with 35% clay
Soil Texture	Loam at surface graduating to a heavy clay at depth
Inherent Soil Fertility	Moderately Low
Free Rooting Depth	80 cm

Table 11: Site 4 – Brown Sodosol (Analysis)

Horizon	Depth (m)	Description		
A1	0.00 – 0.08	Dark brown loamy sand with weak pedality and weak consistence. Moderately acidic, sodic and non-saline. Low CEC with <10% coarse fragments <10 mm. Well drained with many coarse roots. Clear and even boundary.		
A2	0.08 – 0.20	Bleached brown loam with weak pedality and weak consistence. Slightly acidic, strongly sodic and non-saline. Low CEC with 15% coarse fragments <10 mm. Well drained with many coarse roots. Abrupt and even boundary.		
B21	0.20 – 0.45	Strong brown heavy clay with strong pedality and strong consistence. Neutral pH, non-sodic and non-saline. Moderate CEC with <5% coarse fragments <10 mm. Moderately drained with 5% distinct brown mottles and common coarse roots. Gradual and even boundary.		
B22	0.45 – 0.80	Yellowish-brown light clay with moderate pedality and strong consistence. Neutral pH, non-sodic and non-saline. Moderate CEC with <5% coarse fragments <10 mm. Moderately drained with 20% distinct red mottles and common coarse roots. Clear and even boundary.		
BC	+0.80	Weathered sandstone (not laboratory tested)		
Horizon	ECe		Laboratory pH	
	dS/m	Rating	Value	Rating
A1	1.2	Non-Saline	5.7	Moderately Acidic
A2	0.1	Non-Saline	6.1	Slightly Acidic
B21	0.2	Non-Saline	6.8	Neutral
B22	0.5	Non-Saline	7.3	Neutral
Horizon	CEC		ESP	
	cmol/kg	Rating	%	Rating
A1	11.0	Low	11.8	Sodic
A2	9.3	Low	15.1	Strongly Sodic
B21	23.4	Moderate	2.6	Non-Sodic
B22	19.6	Moderate	4.1	Non-Sodic

Detailed Site 5 – Red Kurosol

Table 12: Site 5 – Red Kurosol (Summary)

Site Description	
 Plate 9 – Profile Pit 5	 Plate 10 – Landscape Looking South-West
ASC Name	Red Kurosol (Natric)
Representative Observation Sites	5
Dominant Slope Association	Lower slope gently to moderately inclined (3 – 5%)
Land Use	Cattle grazing native grass pasture
Vegetation	Ironbark, Casurina
Soil Drainage	Well drained 0-15 cm, moderately drained from 15-70 cm
Water Holding Capacity >50 cm	Good with 38% clay
Soil Texture	Loam at surface graduating to a heavy clay at depth
Inherent Soil Fertility	Moderately Low
Free Rooting Depth	70 cm

Table 13: Site 5 – Red Kurosol (Analysis)

Horizon	Depth (m)	Description		
A1	0.00 – 0.05	Dark brown loam with weak pedality and weak consistence. Strongly acidic, non-sodic and non-saline. Low CEC with <10% coarse fragments <10 mm. Well drained with many coarse roots. Clear and even boundary.		
A2	0.05 – 0.15	Dark yellowish-brown clay loam with weak pedality and weak consistence. Strongly acidic, non-sodic and non-saline. Moderate CEC with 20% coarse fragments <10 mm. Well drained with many coarse roots. Clear and even boundary.		
B21	0.15 – 0.55	Yellowish-red heavy clay with moderate pedality and strong consistence. Strongly acidic, marginally sodic and non-saline. High CEC with no coarse fragments. Moderately drained with 10% distinct brown mottles and common coarse roots. Clear and even boundary.		
B22	0.55 – 0.70	Yellowish-brown light-medium clay with moderate pedality and moderate consistence. Moderately acidic, sodic and non-saline. Moderate CEC with <10% coarse fragments <10 mm. Moderately drained with 10% distinct red mottles and common coarse roots. Clear and even boundary.		
BC	+0.70	Weathered sandstone (not laboratory tested)		
Horizon	ECe		Laboratory pH	
	dS/m	Rating	Value	Rating
A1	0.4	Non-Saline	5.4	Strongly Acidic
A2	0.2	Non-Saline	5.5	Strongly Acidic
B21	0.8	Non-Saline	5.4	Strongly Acidic
B22	1.8	Non-Saline	5.7	Moderately Acidic
Horizon	CEC		ESP	
	cmol/kg	Rating	%	Rating
A1	11.7	Low	2.6	Non-Sodic
A2	12.5	Moderate	2.4	Non-Sodic
B21	27.6	High	6.9	Marginally Sodic
B22	23.5	Moderate	11.1	Sodic

Detailed Site 6 – Brown Sodosol

Table 14: Site 6 – Brown Sodosol (Summary)

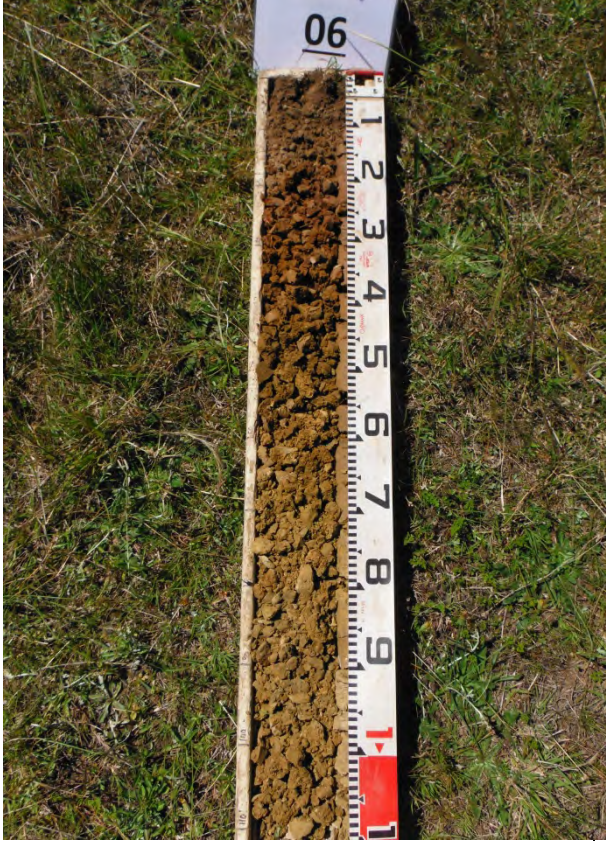
Site Description	
	
Plate 11 – Profile Pit 5	Plate 12 – Landscape Looking North
ASC Name	Brown Sodosol
Representative Observation Sites	2, 3, 4, 6
Dominant Slope Association	Lower slope gently to moderately inclined (3 – 5%)
Vegetation	Cattle grazing native grass pasture
Land Use	Red Gum
Soil Drainage	Well drained 0-15 cm, moderately drained from 15-80 cm
Water Holding Capacity >50 cm	Good with 44% clay
Soil Texture	Loamy sand at surface graduating to medium clay at depth
Inherent Soil Fertility	Moderately Low
Free Rooting Depth	80 cm

Table 15: Site 6 – Brown Sodosol (Analysis)

Horizon	Depth (m)	Description		
A1	0.00 – 0.05	Brown loamy sand with weak pedality and weak consistence. Strongly acidic, non-sodic and non-saline. Very low CEC with <5% coarse fragments <10 mm. Well drained with many coarse roots. Clear and wavy boundary.		
A2	0.05 – 0.15	Brown loam with weak pedality and weak consistence. Moderately acidic, non-sodic and non-saline. Low CEC with 15% coarse fragments <10 mm. Well drained with many coarse roots. Abrupt and wavy boundary.		
B21	0.15 – 0.40	Strong brown medium clay with strong pedality and moderate consistence. Slightly acidic, marginally sodic and non-saline. Moderate CEC with no coarse fragments. Moderately drained with 10% distinct brown mottles and common coarse roots. Gradual and wavy boundary.		
B22	0.40 – 0.80	Light olive brown medium clay with strong pedality and strong consistence. Strongly alkaline, sodic and slightly saline. High CEC with <5% coarse fragments <10 mm. Moderately drained with 10% distinct red mottles and common coarse roots. Clear and wavy boundary.		
BC	+0.80	Weathered sandstone (not laboratory tested)		
Horizon	ECe		Laboratory pH	
	dS/m	Rating	Value	Rating
A1	0.7	Non-Saline	5.5	Strongly Acidic
A2	0.1	Non-Saline	5.9	Moderately Acidic
B21	0.6	Non-Saline	6.1	Slightly Acidic
B22	3.2	Slightly Saline	8.5	Strongly Alkaline
Horizon	CEC		ESP	
	cmol/kg	Rating	%	Rating
A1	5.8	Very Low	3.4	Non-Sodic
A2	6.2	Low	4.8	Non-Sodic
B21	22.2	Moderate	8.1	Marginally Sodic
B22	27.9	High	11.8	Sodic

3.2 On-Site Wastewater Management

Table 16 below shows the area required for disposal of wastewater for each of the top two horizons for each detailed soil profile, including phosphorus disposal and wet weather storage.

Table 16: On-Site Wastewater Management

Detailed Site	Soil Texture	Horizon Depth	Disposal Area Wastewater	Disposal Area Phosphorus
1	Loam	0-10 cm	83 m ²	283 m ²
	Heavy Clay	10-25 cm	Not Suitable	Not Suitable
2	Loamy Sand	0-10 cm	43 m ²	293 m ²
	Loam	10-25 cm	83 m ²	283 m ²
3	Loam	0-10 cm	83 m ²	283 m ²
	Loam	10-25 cm	83 m ²	283 m ²
4	Loamy Sand	0-8 cm	43 m ²	293 m ²
	Loam	8-20 cm	83 m ²	283 m ²
5	Loam	0-5 cm	83 m ²	283 m ²
	Clay Loam	5-15 cm	131 m ²	273 m ²
6	Loamy Sand	0-5 cm	43 m ²	293 m ²
	Loam	15-40 cm	83 m ²	283 m ²

Soil types at all sites are suitable for wastewater disposal via primary septic tank treatment and absorption trench. Also of note is that for all detailed sites excluding site 1, the top two soil horizons are suitable for wastewater disposal utilising these methods.

3.3 Contamination Assessment

Site inspection on the 22nd October was carried out to identify potential sources of contamination from previous agricultural activities. Inspection did not reveal any potential sources of soil contamination across the Site, with the only infrastructure present being a recently constructed Colorbond shed with a concrete floor. Given this, no samples were collected for further testing. SLR believes the potential for soil contamination to be negligible.

4 CONCLUSION

The Soil, Land and Agricultural Resource Assessment carried out by SLR at Lot 5 DP 823737 Hermitage Road for the Belford Land Group compiled the following conclusions:

- Soil types within the Site would be suitable for small scale intensive agricultural activities such as vine and olive production. There are no physical or chemical constraints which would preclude these activities being conducted within the Site.
- Current soil salinity within the site is considered only minor and would not preclude small scale intensive agricultural activities such as vine and olive production, furthermore, given the soil types and topography of the Site the risk of increased soil salinity as a result of these activities would be negligible.
- All soil types detailed in this assessment are suitable for on-site wastewater disposal.
- The potential for soil contamination within the Site from previous agricultural activities is negligible.

SLR believes the proposed development of 10 hectare lots is suitable and sustainable for the soil types present within the Site, especially considering neighboring existing land use of viticulture and olive groves.

5 REFERENCES

Isbell RF (2002) The Australian Soil Classification, Revised Edition (CSIRO: Canberra, ACT)

Marshall T.J. (1947) Mechanical composition of soil in relation to field descriptions of texture, Council for Scientific and Industrial Research, Bulletin No. 224, Melbourne

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Office of Environment and Heritage and Department of Primary Industries Office of Agricultural Sustainability and Food Security (2013) Interim Protocol for Site Verification and Mapping of Biophysical Strategic Agricultural Land

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APPENDIX A

Site Observations

Observation 1 – Brown Sodosol



Exposed B horizon along dam in flow



Landscape looking West



Landscape looking North

Observation 2 – Brown Sodosol



Exposed B horizon along dam in flow



Landscape looking South-West



Landscape looking North-West

Observation 3 – Brown Sodosol



Exposed B horizon along dam in flow



Landscape looking South-West



Landscape looking North

Observation 4 – Brown Sodosol



Exposed B horizon along dam in flow



Exposed sodic B horizon along drainage line



Exposed sodic B horizon along drainage line

Observation 5 – Red Kurosol



Exposed B horizon along drainage line



Landscape looking West



Landscape looking North

Observation 6 – Brown Sodosol



Exposed B horizon along drainage line



Landscape looking West



Exposed A and B horizons

Observation 7 – Vineyard & Olive Grove



Established vineyard and olive grove on western boundary, west of Detailed Site 2



Landscape looking West



Landscape looking North



APPENDIX B

Laboratory Soil Test Results



SOIL TEST REPORT

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Scone Research Centre

REPORT NO: SCO14/220R1

REPORT TO: Murray Fraser
SLR Consulting
8-10 Kings Road
New Lambton NSW 2305

REPORT ON: Twenty four soil samples
Your ref: 630.11121

PRELIMINARY RESULTS
ISSUED: Not issued

REPORT STATUS: Final

DATE REPORTED: 18 November 2014

METHODS: Information on test procedures can be obtained from Scone
Research Centre

TESTING CARRIED OUT ON SAMPLE AS RECEIVED
THIS DOCUMENT MAY NOT BE REPRODUCED EXCEPT IN FULL

A handwritten signature in blue ink, appearing to read 'SR Young'.

SR Young
(Laboratory Manager)

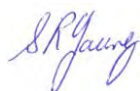
SOIL CONSERVATION SERVICE
Scone Research Centre

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Report No: SCO14/220R1
Client Reference: Murray Fraser
SLR Consulting
8-10 Kings Road
New Lambton NSW 2305

Lab No	Method	C1A/5	C2A/4	C2B/4	C5A/4 CEC & exchangeable cations (me/100g)					
	Sample Id	EC (dS/m)	pH	pH (CaCl ₂)	CEC	Na	K	Ca	Mg	Al
1	HR1 0-10	0.04	6.0	4.9	12.7	1.2	0.9	4.0	4.6	nt
2	HR1 15-25	0.07	6.1	4.9	19.9	2.0	1.2	4.9	9.5	<0.5
3	HR1 40-50	0.17	5.5	4.5	21.8	3.0	1.1	4.8	10.3	<0.5
4	HR1 65-75	0.41	5.1	4.3	23.4	4.3	0.9	4.3	10.0	<0.5
5	HR2 0-10	0.09	5.6	4.7	9.5	1.0	0.8	6.0	1.8	<0.5
6	HR2 15-25	0.03	6.4	5.3	6.2	1.1	0.5	3.0	1.1	nt
7	HR2 35-45	0.39	7.2	6.4	25.6	2.5	1.8	12.9	6.5	nt
8	HR2 55-65	0.97	7.6	6.8	23.8	3.8	1.0	11.5	6.7	nt
9	HR3 0-10	0.02	5.8	4.7	6.5	1.3	0.4	2.1	1.9	<0.5
10	HR3 15-25	0.01	6.3	5.0	6.1	1.4	0.3	1.7	1.9	<0.5
11	HR3 45-55	0.20	6.2	5.1	14.3	3.2	0.5	2.4	7.8	<0.5
12	HR3 80-90	0.66	5.4	4.8	19.1	5.1	0.4	2.2	9.1	<0.5
13	HR4 0-8	0.05	5.7	4.8	11.0	1.3	1.0	5.3	2.0	<0.5
14	HR4 10-20	0.01	6.1	5.0	9.3	1.4	0.8	5.6	2.1	<0.5
15	HR4 25-35	0.04	6.8	5.6	23.4	0.6	0.8	13.0	5.5	nt
16	HR4 50-60	0.06	7.3	6.2	19.6	0.8	0.9	10.0	4.5	nt
17	HR5 0-5	0.04	5.4	4.6	11.7	0.3	0.8	5.7	2.8	<0.5
18	HR5 5-15	0.02	5.5	4.4	12.5	0.3	0.7	4.5	3.6	0.7
19	HR5 30-40	0.14	5.4	4.4	27.6	1.9	0.5	11.1	8.8	1.4
20	HR5 60-70	0.21	5.7	4.7	23.5	2.6	0.9	9.3	7.6	0.5
21	HR6 0-5	0.03	5.5	4.5	5.8	0.2	0.5	2.3	1.4	0.5
22	HR6 5-15	0.01	5.9	4.8	6.2	0.3	0.3	2.3	1.5	0.5
23	HR6 25-35	0.08	6.1	4.9	22.2	1.8	0.3	10.1	6.6	0.5
24	HR6 50-60	0.42	8.5	7.6	27.9	3.3	0.3	17.6	7.1	nt

nt - not tested



SOIL CONSERVATION SERVICE
Scone Research Centre

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Report No: SCO14/220R1
Client Reference: Murray Fraser
SLR Consulting
8-10 Kings Road
New Lambton NSW 2305

Lab No	Method	P7B/2 Particle Size Analysis (%)					Colour	
	Sample Id	clay	silt	f sand	c sand	gravel	Dry	Moist
1	HR1 0-10	20	23	49	6	2	10YR 4/3	10YR 3/3
2	HR1 15-25	52	21	26	1	0	7.5YR 5/6	7.5YR 4/6
3	HR1 40-50	54	21	24	1	0	7.5YR 5/6	7.5YR 4/6
4	HR1 65-75	44	21	35	0	<1	7.5YR 6/4	7.5YR 5/6
5	HR2 0-10	8	12	65	12	3	10YR 4/3	10YR 3/3
6	HR2 15-25	8	11	47	7	27	10YR 6/2	10YR 4/2
7	HR2 35-45	53	8	32	5	2	10YR 6/6	10YR 5/6
8	HR2 55-65	55	10	30	4	1	2.5Y 6/6	2.5Y 6/6
9	HR3 0-10	13	18	61	8	<1	10YR 5/3	10YR 3/3
10	HR3 15-25	13	19	59	8	<1	10YR 6/3	10YR 4/3
11	HR3 45-55	44	14	35	4	3	10YR 6/4	10YR 5/6
12	HR3 80-90	16	32	49	3	<1	7.5YR 6/6	7.5YR 5/6
13	HR4 0-8	10	17	56	10	7	10YR 5/3	10YR 3/3
14	HR4 10-20	15	14	49	8	14	10YR 5/3	10YR 4/3
15	HR4 25-35	52	12	30	5	1	7.5YR 5/6	7.5YR 4/6
16	HR4 50-60	35	14	37	11	3	10YR 6/4	10YR 5/6
17	HR5 0-5	17	18	53	7	5	10YR 5/3	10YR 3/3
18	HR5 5-15	22	16	37	4	21	10YR 5/3	10YR 4/4
19	HR5 30-40	58	15	24	3	<1	7.5YR 5/6	5YR 5/8
20	HR5 60-70	38	21	33	2	6	10YR 6/6	10YR 5/6
21	HR6 0-5	8	17	67	5	3	10YR 5/3	10YR 4/3
22	HR6 5-15	10	16	57	5	12	10YR 6/3	10YR 5/3
23	HR6 25-35	47	13	37	3	<1	7.5YR 5/6	7.5YR 4/6
24	HR6 50-60	44	13	36	4	3	2.5Y 6/4	2.5Y 5/4



END OF TEST REPORT