

**CASINO MANAGEMENT AREA EIS AND
MURWILLUMBAH MANAGEMENT AREA EIS
SUPPORTING DOCUMENT No. 8**

**SOILS REPORT
CASINO AND MURWILLUMBAH MANAGEMENT AREAS
NORTHERN REGION
STATE FORESTS OF NEW SOUTH WALES**

by

VENESS & ASSOCIATES

1994



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for
State Forests of New South Wales

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DISCLAIMER

The findings of this report are based on the author's analysis and interpretation of the survey results. Views and interpretations presented in the report are those of the author and not necessarily those of the State Forests of New South Wales. The recommendations of the report are the opinion of the author.

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PREFACE & DISCLAIMER

Much of the work described in this report was undertaken during 1992 and the resulting report was presented to Margules and the then Forestry Commission in August 1992. At that time, the Standard Erosion Mitigation Conditions (SEMC) were in force.

Following the Department of Conservation and Land Management (CaLM) submission on the Wingham Management Area EIS in November 1992, and the release of the Standard Erosion Mitigation Guidelines for Logging (SEMGL) in March 1993 (which replaced the SEMC), additional work was undertaken for this Casino / Murwillumbah soils study. This included: the determination of soil erodibility classification, as defined in Appendix 1 (ii) of the SEMGL; determination of subsoil organic matter at each of the 33 sampling sites; superimposition of erosivity on the soil mapping unit map; and determination of erosion hazard classes as defined in Appendix 2 (ii) of the SEMGL. In this final draft, soil erodibility has also been determined by the SOILOSS K factor sub-routine and some further refinements have been made to the erosion hazard assessment section.

Veness & Associates has certain professional concerns with the application of USLE technology to forest lands. As the directors of Veness & Associates, it is the authors' professional opinion that it is inappropriate to apply USLE technology to the broad scale land assessment at which a forestry EIS is performed. Veness & Associates is further concerned about the use of the USLE factor values which may be wholly inappropriate for forest soils. Despite these reservations, the USLE technology has been applied, following the methodology outlined by the Department of Conservation and Land Management, and erosion hazard classes have been derived. This has been done so at the request of our client, State Forests of New South Wales, and should in no way be taken as professional endorsement of this methodology by Veness & Associates.

Consequently, Veness & Associates accepts no responsibility for the reliability or accuracy of erodibility and erosion hazard assessments derived from the CaLM technology. Veness & Associates reserves the right to present, in the appropriate forum, technically based criticism of the current method of applying USLE technology to forest lands.

SOILS REPORT

CASINO / MURWILLUMBAH FORESTRY MANAGEMENT AREA

EIS STUDY

1.0 INTRODUCTION

At the request of Margules Groome Poyry Pty Limited, who is compiling Environmental Impact Statements for the New South Wales Forestry Commission's Grafton Management Area and Casino / Murwillumbah Management Area, Veness & Associates Pty Limited was contracted to survey the soils.

This report records the findings of the Casino / Murwillumbah survey, with occasional reference to the Grafton study, where appropriate.

1.1 BRIEF AND LIMITS OF THIS STUDY

The State forests and relevant crown timber areas within the Casino / Murwillumbah Management Area (hereafter referred to as the study area) consist of approximately 158,500 hectares.

The brief set for this study was to examine the soils of the study area, based on geological groupings, and to determine their susceptibility to erosion as a consequence of the proposed forestry activity being addressed in the EIS document.

1.2 TIMING OF THIS STUDY

The fieldwork for this Casino / Murwillumbah study was undertaken by Veness & Associates over a total of 353 man hours during the period from January 1992 to June 1992. Variable weather conditions were experienced in the study area during this period.

1.3 METHODOLOGY

1.3.1 General Procedure

The general methodology procedure used to undertake this study is as follows:

- the geology of the whole study area was examined from available published sources
- aerial photograph interpretation was used to examine and check the geological boundaries

- preliminary grouping of rock types was undertaken, in terms of the different soils that are likely to develop on them (for example, soils occurring on the basalts are likely to be different from soils occurring on the granitoids). Refer to Table 1 in Section 2 which illustrates this grouping
- the resulting geological boundaries were pencilled in on a 1:125 000 field map
- fieldwork was undertaken. This comprised:
 - geological boundaries were field checked, modified where appropriate, and inked on to the field map
 - copies of the appropriate 1:25 000 topographic maps were used to locate soil description sites. Due attention was given to ensuring that, as far as practicable, each of the terrain components occurring within each soil unit was subjected to soil sampling and / or description. The location of each site was located on the 1:25 000 maps
 - soils occurring on each rock type within each geological group were examined and fully described. This step served as a check to ensure that soils described within rock types were indeed similar enough to group together. This also explains the variation and range of soil description site numbering. Each new soil site was given a leading two digit number to identify its group, followed by a trailing two digit number to identify its location. If a new soil was similar to one already described, the new soil inherited the former's leading two digit number
 - soil samples were collected at sites selected on their ability to be representative of the unit in which they occurred. These samples were analysed for key chemical and physical properties
- soil boundaries were then drawn up, based on the geological groupings and the similarities and/or differences of soil characteristics
- all of the data generated at each site within each soil mapping unit was collated. This forms the basis of the soil field descriptions in Section 3
- based on the assembled soil data, assessment of erosion hazard was performed

1.3.2 Methodology Detail

Aerial photograph interpretation was undertaken over most of the study area using photographs supplied by the then Forestry Commission of NSW to gain an impression of the geology and topography.

The geology of the study area was examined using existing available sources. Refinement of this geological data (and especially boundaries) presented in these sources was undertaken through aerial photograph interpretation and field checking.

The study area's soils were surveyed to determine the location and characteristics of the various soil mapping units.

The soils of the study area were mapped at a scale of 1:125 000, using the relevant Forestry Commission 1:125 000 State Forest sheets as base maps. Field mapping was undertaken using the relevant CMA 1:25 000 topographic map sheets.

Soils at 128 sites were described in the field. Of these, 33 sites were also sampled for laboratory analysis. At each site, a soil pit was dug or an existing road batter was excavated back to an unweathered face. Examination through soil augering was not used due to the inadequacy of this method in determining soil layer boundaries, soil consistence characteristics and soil structure.

At each of these sites, soils were fully described following detailed field examination. The characteristics examined were:

- | | |
|---|---|
| - surface condition | - horizon depth and colour |
| - boundary distinctness and shape | - presence of watertable |
| - texture grade and sand fraction | - plasticity type and stickiness |
| - consistence and coherence | - structure grade |
| - primary ped size and shape | - secondary size and shape |
| - fabric | - presence of cutans |
| - ped porosity | - crack size |
| - stone amount, shape, distribution, size, weathering and lithology | |
| - amount and distribution of roots | - amount of bioturbation (faunal mixing) |
| - presence of pans | - presence, form, amount and size of inclusions |

Apart from these 128 description sites, numerous other observations were made to ensure consistency within soil mapping units.

The location of all description sites was dependent on the degree of access afforded by the existing road network and the prevailing weather conditions. Within these parameters, description site locations were chosen to cover the range of terrain units occurring within each soil mapping unit and to give a representative coverage throughout the whole study area. The exception to this approach relates to the three description sites which were located within the soil unit developed on granitoid material. This was not a factor of the size of this very small unit, rather it reflects the general perception that granitic soils must be erodible. However, this is not necessarily the case as is demonstrated by the results of the testing of the soils, as presented in Section 3 later in this report. (Access into some parts of Billilimbra, Ewingar and Washpool State Forests was limited due to both a lack of existing roading and the weather conditions current at that time.) The landform elements described by McDonald et al. (1990) were used to identify the various terrain components.

The relevant soils information from each description site was recorded on soil data cards. For the sake of convenience, only the cards for each of the 33 sampling sites are included in this report. They are found at Appendix 1. The remaining cards have been lodged with State Forests.

The principal profile form (Northcote, 1979) and Great Soil Group (Stace et al. 1968) were determined for each soil (where applicable).

Soil pH was determined in the field using Raupach solution. Soil colours were determined using Oyama & Takehara (1970) colour charts. In the soil descriptions, all colours refer to the moist soil unless indicated otherwise.

Soil samples were collected from each layer within each soil at each of the 33 sampling sites, generating a total of 122 samples for physical analyses. The laboratory tests undertaken were Particle Size Analysis, Dispersion Percentage and Emerson Aggregate Test. The testing methods used were those recommended and used by the Soil Conservation Service of NSW (now known as the Department of Conservation and Land Management - Soil Conservation Section). Erosion hazard classes are given for each soil mapping unit.

The 128 soil description site locations are shown on Figures 1a and 1b in Appendix 5.

Any erosion observed to be occurring within the study area was to be noted. This observation took place during both the aerial photograph interpretation program (which primarily looked at geological boundaries and terrain) and during the extensive fieldwork program.

No reference to mass wasting occurs in this report due to the absence of any significant examples being recorded. Obviously, some minor slumping of road batters can occur but these examples are not significant enough to warrant a further mention.

Soil erosion hazard assessment was performed using three different approaches which are presented in Section 4. The first was that carried out by the authors prior to the development and release of the SEMGL. This involved interpretation of laboratory and profile data to determine general erodibility characteristics of each soil mapping unit. Combined with field observations of existing erosion, this data was used to present an assessment of erosion hazard for each soil mapping unit. This assessment did not address variations of slope, rainfall or vegetation within soil mapping units as it was intended to be a broad planning scale assessment. Variation in these factors would have been addressed, and appropriate modifications to the erosion hazard made, at the harvest planning stage.

The second erosion hazard assessment was performed using methods set out in Appendix 1 and Appendix 2 of the SEMGL. This assessment allowed for variations in slope, rainfall erosivity and soil erodibility. The third method was similar in approach to the second but relied solely on output generated by the computer program SOILOSS (Rosewell & Edwards, 1988). Further details of the methodology are provided in Section 4.

An assessment of the effectiveness and applicability of the SEMGL procedures for erosion and sediment control was made, based partly on the observed erosion but mostly on the interpretation of field and laboratory soils data.

1.3.3 Comments on the Methodology

In reviewing the earlier draft of this report, the Department of Conservation and Land Management (CaLM) were critical of the fact that the study did not adopt a soil landscape approach to soil mapping. However, soil landscape mapping would entail a degree of survey intensiveness that is not, in the opinion of the authors, appropriate to areas managed for forestry. Atkinson (1992) stated the CaLM program of soil landscape mapping was being performed at scales of 1:250 000 and 1:100 000 with the latter being for areas of greatest land development pressure with the intended objectives to delineate areas with limitations or potential soil related hazards to urban and rural development (Atkinson, 1992; Chapman & Murphy, 1989). Forestry is a much less intensive form of management than even rural development and consequently a relatively broad scale of mapping is considered appropriate. In the authors' opinion, the soil characteristics which are of relevance to forestry management (erodibility, nutrient supply, roading suitability, etc) meaningfully vary at only a relatively coarse scale which is closely related to parent material. As some rock types are quite similar in this respect, it was meaningful to combine them in to geological groupings to define soil mapping units. The more detailed variations within these mapping units which might be delineated by soil landscape mapping are not believed to be of major importance to this broad scale of land resource assessment for forestry purposes.

The authors therefore stand by their professional judgement in not applying a full soil landscape study approach.

2.0 GEOLOGY

While this study was not a geological examination of the study area per se, the geological boundary information gained from geological maps, aerial photograph interpretation and field observations has been included because of both the influence that the underlying lithospheric material exerts on the development of soils in the area, and the fact that the study area's soils were examined from a geological point of view.

The geological units of the study area were taken from the 1:500 000 New England geological sheet, and the 1:250 000 Grafton, Maclean, Tweed Heads and Warwick geological sheets. As per all of the NSW 1:250 000 geological maps, the codes, boundaries and units shown on the edge of one sheet often do not agree with those on an adjoining sheet. Thus, geological boundaries were field checked, where roading access allowed, and mapping modifications made where appropriate. Twenty eight different rock types have been delineated within the study area and are presented in Figures 2a and 2b in Appendix 5. The rock type names used are those listed on the various geological sheets.

2.1 SEQUENCE OF GEOLOGICAL EVENTS

The following description gives a general idea of the sequence of geological events which led to the present distribution of rock types in the Casino / Murwillumbah area.

In the Ordovician-Silurian Period 430-500 million years ago (m.y.a.), a vast area of largely fine-grained sediments with some volcanics were deposited. These sediments have since been metamorphosed and all contain abundant quartz veins. They presently occur in Washpool and Ewingar State Forests (SFs). The next geological event occurred during the Silurian Period 395-430 m.y.a. when clay-rich sediments were deposited in the area now occupied by Mooball, Burringbar and Nullum SFs, near Murwillumbah. They have since been metamorphosed.

No further rocks were introduced to the study area before the Permian Period, 225-280 m.y.a. In the Lower Permian the Drake Volcanics erupted onto an area through the present Washpool, Billilimbra and Ewingar SFs. Also the Dumbudgery Creek Granodiorite intruded the oldest sediments (θ-S) and probably contributed to their metamorphism. This granodiorite now outcrops in a small part of Ewingar S.F. In the Middle Permian the Bungulla Porphyritic Adamellite intruded the same old sediments. This latter pluton was itself isolated by a further intrusion of the Stanthorpe Adamellite in the Upper Permian. Both now outcrop in the Billilimbra and Ewingar SFs.

In the Triassic Period, 190-225 m.y.a., the Chillingham Volcanics of rhyolite, rhyolitic tuff and claystone were deposited in the Nullum SF area. Also, the first sediments of the Clarence-Moreton Basin were deposited. This basin is oriented north-south and displays similar rock outcrops towards both western and eastern outer edges. Those sediments outcropping within the study area belong to the Marburg Formation, and consist of sequences of sandstone, siltstone and claystone, with some conglomerate. Examples occur in Sugarloaf, Keybarbin and part Mount Marsh S.Fs along the western boundary, and in the far east of Tabbimoble S.F. along the eastern boundary of the basin. Overlying these

sediments are the medium to fine-grained sedimentary deposits of the Walloon (and Mallanganee) Coal Measures. They now extend down the western side of the basin from the Richmond Range S.F. in the north-west, through Cherry Tree, Mount Pikapene and Mount Belmore S.Fs to Mount Marsh S.F. in the south. They reappear along the eastern side of the basin and pass, from north to south, through Wollumbin, Mebbin, Tabbimoble, Devils Pulpit and Mororo S.Fs.

These sediments were overlain by the two youngest formations which occur in this southern part of the Clarence-Moreton Basin. Firstly, in the Upper Jurassic Period about 150 m.y.a., quartz sandstones and feldspathic quartz sandstones were deposited as the Kangaroo Creek Sandstone. They dominate in the more central areas of the basin, in Mount Belmore, Mount Marsh and Doubleduke S.Fs., and also appear in lesser amounts in Fullers, Banyabba, Gibberagee, Bungwalbin, Tabbimoble and Devils Pulpit S.Fs. Also, the Woodenbong Beds were deposited north of a facies boundary between this and the Kangaroo Creek Sandstone. Outcrops occur in the NW corner of Richmond Range S.F. and in part of Eden Creek S.F. Lastly, in the Cretaceous Period 65-136 m.y.a., lithic sandstone, siltstone, claystone and minor coal sequences were deposited and are collectively called the Grafton Formation. These rocks occupy the middle part, or geologically youngest part, of the basin. They outcrop in the following state forests: Royal Camp, Fullers, Camira, Carwong, Braemar, Ellangowan, Myrtle, Whiporie, Banyabba, Gibberagee and Bungawalbin.

65 million years ago, in the Tertiary Period, an active period of volcanism occurred. The areas of interest to this study are all north of Casino. A Mount Warning complex of trachytes and basalts in Wollumbin S.F. represents the stump of an enormous central volcano whose lavas are found in the nearby McPherson Range and Lamington Plateau. The Lamington Volcanics are largely basalts and rhyolites and extend as far west as the Richmond Range S.F. This includes the Lismore Basalt of Boorabee, Bungabee, Mebbin, Nullum, Whian Whian and Goonengerry S.Fs, the Blue Knob Basalt and the Nimbin Rhyolite of Nullum, Whian Whian and Goonengerry S.Fs. A trachyte plug (Mount Belmore S.F.) and numerous, tiny remnants of basaltic flows also occur throughout the general area (two minor occurrences within part Gibberagee, Mount Belmore and Mount Marsh S.Fs).

Most recently extensive areas of Quaternary alluvial sediments occur within the Clarence-Moreton Basin, especially around the township of Whiporie. The State forests in which the major encroachments have occurred are: Braemar, Bungwalbin, Whiporie, Gibberagee, Tabbimoble, Doubleduke and Mororo.

The 28 rock types occurring in the study area which have been discussed above, are listed below in Table 1. From them, the nine different geological groups listed below have been determined, in terms of the soils developed on them.

- | | |
|-------------------------------|----------------------------|
| - Alluvials | - Basalts |
| - Metasediments | - Granites |
| - Grafton Formation sediments | - Kangaroo Creek Sandstone |
| - Walloon Coal Measures | - Marburg Sediments |
| - Eruptive volcanics | |

The relationship between the 28 rock types and the nine geological groups is also shown in Table 1 as follows:

Table 1: Relationship between rock types and geological units in the study area

ROCK TYPE		GEOLOGICAL GROUP	
Map Code	Name	Description	Soil Map Map Code
Qa	unnamed sediments (Quaternary)	alluvial mud, silt, sand, gravel deposits	A
Twe	part Mt Warning Central Complex	trachyte	B
Twb	part Mt Warning Central Complex	basalt	B
Tmb	part Lamington Volcanics	basalt	B
Tml	part Lamington Volcanics	basalt, minor tuff & agglomerate	B
Tll	part Lamington Volcanics	basalt	B
Tlb	Lismore Basalt (pt Lamington Volcanics)	basalt (agglomerate, bole)	B
Tp	unnamed Tertiary volcanics	trachyte plugs	B
Tv	unnamed Tertiary extrusive volcanics	basalts & dolerites	B
0-S	Ordovician - Silurian sediments	argillites, phyllites, slates & intermediate volcanics all with abundant quartz veins	C
Pzn	Neranleigh - Fernvale "Group"	greywacke, slate, phyllite, quartz	C
Pgdw	Dumbudgery Creek Granodiorite	granodiorite	D
Pab	Bungulla Porphyritic Adamellite	very coarsely porphyritic in feldspar, sphene-rich adamellite	D
Pas	Stanthorpe Adamellite	Biotite adamellite	D
Kg	Grafton Formation	lithic sandstone, siltstone, claystone & minor coal	E
Js	Woodenbong Beds	medium feldspathic to feldspathic sublabile sandstone, siltstone	F
Jk	Kangaroo Creek Sandstone	quartz sandstone & feldspathic quartz sandstone, often iron-rich	F
Jw	Walloon Coal Measures	sandstone, siltstone, shale and coal	G
Jws	Mallanganee Coal Measures	massive feldspathic quartz sandstone facies	G
RJb	Bundamba Group Marburg Formation	sandstone, shale, conglomerate	H
Ilm	Marburg Sandstone (part Bundamba Group)	" feldspathic sandstone, pebbly in part	H
RJm	Marburg Formation	" sandstone, siltstone with some coal. Silicified fossil wood as base equivalent to Blaxland Fossil Wood Conglomerate Member H	H
Jmr	Koukandowie Sandstone	" sandstone and siltstone, with Blaxland Fossil Wood Conglomerate Member at base	H
Plv	Drake Volcanics	acid to intermediate eruptives with minor interbedded sediments	I
Pld	part Drake Volcanics	acid to intermediate eruptives with minor interbedded sediments	I
Rc	Chillingham Volcanics	rhyolite, rhyolitic tuff, claystone	I
Tur	Nimbin Rhyolite (pt Lamington Volcanics)	rhyolite, obsidian, pitchstone, tuff, agglomerate	I
Tnb	Blue Knob Basalt	basalt and andesite	I

3.0 SOILS

The various soil mapping units recorded in the study area are described below, followed by a discussion on the differences between each unit. The results of the laboratory analyses are presented and discussed.

The erosion hazard associated with these soils will be discussed later in Section 4.

3.1 SOIL MAPPING UNITS

On the basis of the information presented in Section 2 above, the study area is divided into nine main geological groups. The soils occurring throughout the study area were examined within each of these geological groups resulting in the recording of nine different soil units. (The soils occurring on each of the nine geological provinces are similar enough to group into a common soil unit, thus resulting in nine separate soil mapping units). The location of these soil mapping units is shown in Figures 1a and 1b in Appendix 5. These soil mapping units are as follows:

Map Code	Soil Unit
A	- Soil Mapping Unit A - soils developed on alluvials
B	- Soil Mapping Unit B - soils developed on basalts
C	- Soil Mapping Unit C - soils developed on metasediments
D	- Soil Mapping Unit D - soils developed on granitoids
E	- Soil Mapping Unit E - soils developed on Grafton Formation
F	- Soil Mapping Unit F - soils developed on Kangaroo Creek Sandstones
G	- Soil Mapping Unit G - soils developed on Walloon Coal Measures
H	- Soil Mapping Unit H - soils developed on Marburg Sediments
I	- Soil Mapping Unit I - soils developed on volcanics

Each of these soil units is described below. Each soil unit description is an amalgamation of all the data recorded within each unit at each of the relevant 128 description sites. The number of sites described for each soil mapping unit is set out in Table 2 below.

Within each soil mapping unit the number of sites in each of six existing terrain components is recorded in Table 3. Further detail in respect of the terrain situations of each soil description site is included later in section 3.2.

TABLE 2: Number of soil description sites within each soil mapping unit

Soil Mapping Unit	No. of sampled description sites	No. of other description sites	Total No. of description sites
A	2	8	10
B	6	9	15
C	2	4	6
D	3	3	6
E	3	21	24
F	2	19	21
G	6	15	21
H	4	4	8
I	5	12	17
TOTAL	33	95	128

TABLE 3: Location of soil description sites in terms of terrain components, for each Soil Mapping Unit

Terrain Component	Soil Mapping Unit									Total
	A	B	C	D	E	F	G	H	I	
Crest					5			1	1	7
Ridgeline		1	1		2	3	5	2	5	19
Upper slope		7	3	4	6	8	8	2	8	45
Midslope	3	4		1	7	5	3	1	2	25
Lower slope		3	2	1	2	4	5	2	1	17
Flat	7				2	1				10
Total No. sites	10	15	6	6	24	21	21	8	17	128

It should be noted that not all soil layers described for each soil mapping unit are necessarily present at all sites. This variation in soil layering highlights the need to examine a number of soil sites within each unit before an understanding of that unit can be gained. The occurrence of each layer at the various sampled description sites can be gauged by examining each unit's soil data cards presented in Appendix 1.

The description of each soil unit is given as a summary which precedes a more detailed version. The detailed soil description lists the appearance and behaviour of each soil examined during the fieldwork. The parameters used in this description are mostly self-explanatory except for the following:

- bioturbation which refers to the mixing of soil particles by the soil fauna, chiefly ants and worms. The degree to which this occurs gives a good indication of the biological activity within that soil which in turn reflects favourable soil physical and chemical properties
- coherence which refers to the structure grade of the soil. The higher the grade the more pedal the soil
- consistence is divided into two parts which are separated by a slash within the descriptions. These two parts describe the amount of finger and thumb force which is required to disrupt peds and the behaviour of that disrupted soil when sheared between the palms of the hands. Together they reflect the soils ped strength, the amount of clay present and, where applicable, the effects of soil moisture in working the soil
- colour is recorded in the layer descriptions as moist unless otherwise indicated

For a definition of these and other technical terms used in this report, refer to McDonald et al (1990) and/or Houghton & Charman (1986).

3.2 SOIL FIELD DESCRIPTIONS

Each of the soil mapping units is described below. The summary at the beginning of each description is a non-technical, "plain English" version, keeping in mind the general EIS readership. This is followed by a more detailed and technical version. The use of the term "soil materials" is not used in the specific soil landscape context – rather, it is consistent with common usage as are the terms "parent materials", "lithospheric materials", etc.

3.2.1 Soil Mapping Unit A – (soils developed on alluvials)

3.2.1.1 Summary

These soils encroach into forest areas along boundaries and up creek lines. They tend to be well-developed clayey soils which reflect the surrounding sedimentary hillslope soils.

In general they consist of a brownish black, pedal, silty clay loam to silty clay topsoil over a bleached, dull brown, weakly to moderately pedal, sandy clay loam or fine sandy clay loam lower topsoil layer, over a brownish black, greyish brown or dull yellow orange, acid, pedal, light to light medium clay master colour subsoil layer. At depth these layers may be underlain by other, genetically different alluvial clay layers.

Ten sites were described within this unit. Of these, seven were located on an alluvial flat

situation, with slopes up to 2% but commonly less than 1%. The remaining three sites were located in a midslope or midslope to lower slope situation.

3.2.1.2 Dominant soil materials

Northcote Codings: Uf 6.23, Uf 6.33, Gn 2.94, Gn 3.04, Gn 3.11, Gn 3.41, Gn 3.74; Dy 4.11, Dy 5.31, Dy 5.41

Great Soil Groups: Structured plastic clays, Yellow podzolic soils

Surface Condition: friable with up to 10% surface stone (ironstone), 2 – 6mm in size

3.2.1.3 Description

Layer 1 (slightly moist to wet)

Diagnostic features: brownish black to greyish brown, moderately pedal silty clay loam to silty light clay

Occurrence: always present as an A or A11 horizon or topsoil layer, 3 – 25cm thick

Colour: brownish black (7.5YR 3/2, 10YR 2/3, 3/1) to greyish brown (7.5YR 4/2)

pH: strongly to slightly acid (pH 4.5 – 6.0)

Texture: silty clay loam or silty light clay; also fine sandy clay loam, sandy clay loam, loam, fine sandy, light sandy clay loam or sandy loam, all normal plastic

Stickiness: usually slight, but sometimes moderate

Structure: weakly to strongly pedal with sub-angular blocky peds 20 – 100mm breaking to crumb and sub-angular blocky peds 5 – 10mm diameter, and earthy or rough-faced porous ped fabric

Coherence: weak to moderate

Stone content: 0 – <2% of rounded pebbles up to 6mm in size may be present

Roots: usually abundant

Faunal mixing: abundant

Inclusions: charcoal fragments may occur

Boundary: sharp or clear and even or wavy to layers 2, 3, 4, or 5

Layer 2 (slightly moist to wet)

Diagnostic features: brownish black or dark brown, moderately pedal light sandy clay loam or silty light clay

Occurrence: uncommonly present as an A12 horizon or lower topsoil layer, 5 – 12cm thick

Colour: brownish black (7.5YR 3/2) or dark brown (10YR 3/3)

pH: moderately acid (pH 5.0)

Texture: light sandy clay loam or silty light clay, normal plastic

Stickiness: slight to moderate

Structure: moderately pedal with sub-angular blocky peds 50 – 200mm breaking to 5 – 20mm, and rough-faced porous ped fabric

Coherence: weak

Stone content: none present

Roots: many

Faunal mixing: abundant

Inclusions: none observed

Boundary: clear and wavy to layers 3 or 5

Layer 3 (moderately moist to wet)

Diagnostic features: dull brown, usually bleached, weakly to moderately pedal sandy clay loam or fine sandy clay loam

Occurrence: commonly present as an A2 horizon or lower topsoil layer, 7 – 25cm thick

Colour: dull brown (7.5YR 5/3(m), 6/3(d); 7.5YR 6/3(m), 8/1(d)), but ranges from brown (10YR 4/4(m), 6/4(d)) to dull yellowish brown (10YR 5/3(m), 7/3(d)) and greyish yellow brown (10YR 5/2(m), 7/2(d))

pH: strongly to slightly acid (pH 4.5 – 6.0)

Texture: sandy clay loam or fine sandy clay loam and rarely clayey sand, all normal plastic

Stickiness: slight to moderate

Structure: weakly to moderately pedal with sub-angular blocky peds 20 – 100mm breaking to 5 – 20mm and earthy or rough-faced porous ped fabric

Coherence: weak to moderate

Stone content: <2 – 20% rounded to sub-angular ironstone fragments up to 20mm in size occur

Roots: common to many

Faunal mixing: usually abundant

Inclusions: charcoal fragments may occur

Boundary: sharp to gradual and even or wavy to layer 5

Layer 4 (slightly moist to wet)

Diagnostic features: dull brown, pedal light clay

Occurrence: sometimes present immediately underlying Layer 1, as a B1 horizon or upper subsoil layer, 11 – 22cm thick

Colour: dull brown (7.5YR 5/3) or greyish brown (7.5YR 4/2)

pH: strongly acid (pH 4.0)

Texture: light clay, normal plastic

Stickiness: slight

Structure: moderately to strongly pedal with sub-angular blocky peds 20 – 200mm breaking to angular blocky and sub-angular blocky peds 2 – 10mm diameter, and smooth-faced dense or rough-faced porous ped fabric

Coherence: moderate to strong

Stone content: none observed

Roots: common

Faunal mixing: many infilled faunal burrows occur

Inclusions: charcoal fragments or soft iron nodules may occur

Boundary: sharp to gradual and even to layer 5

Layer 5 (moderately moist to wet)

Diagnostic features: brownish black or greyish brown, pedal light clay

Occurrence: always present as a B2 or B21 horizon, or master colour subsoil layer, 15 – 38+cm thick

Colour: brownish black (5YR 3/1, 10YR 3/2), greyish brown (7.5YR 4/2, 5/2) or dull yellow orange (10YR 6/3, 7/4)

pH: strongly to slightly acid (pH 4.0 – 6.0)

Texture: usually light to light medium clays, all normal plastic

Stickiness: slight to moderate

Structure: moderately to strongly pedal with angular blocky and sub-angular blocky peds 20 – 200mm breaking to <2 – 10mm diameter, and smooth-faced dense ped fabric

Coherence: moderate to strong

Stone content: usually none are present; rarely 50 – 90% rounded and sub-rounded ironstone fragments occur up to 60mm in size

Roots: few to common

Faunal mixing: few to abundant

Inclusions: none observed

Boundary: clear and even to layers 6 or 7

Layer 6 (moderately moist)

Diagnostic features: greyish brown, strongly pedal light medium clay

Occurrence: rarely present as a B22 horizon or lower subsoil layer, 27+cm thick

Colour: greyish brown (7.5YR 4/2)

pH: strongly acid (pH 4.5)

Texture: light medium clay, normal plastic

Stickiness: moderate

Structure: strongly pedal with angular blocky peds 50 – 100mm breaking to <2mm, and smooth-faced porous ped fabric

Coherence: strong

Stone content: no stones

Roots: few

Faunal mixing: few

Inclusions: none observed

Boundary: not reached at depth

Layer 7 (moderately moist)

Diagnostic features: black, strongly pedal light clay

Occurrence: rarely present as a D1 horizon or different genetic layer, 27+cm thick

Colour: black (5YR 1.71)

pH: moderately acid (pH 5.0)

Texture: light clay, normal plastic

Stickiness: slight

Structure: strongly pedal with sub-angular blocky peds 100 – 200mm breaking to angular blocky peds 2 – 5mm diameter, and smooth-faced dense ped fabric

Coherence: not recorded

Stone content: no stones are present

Roots: few

Faunal mixing: rare

Inclusions: none observed

Boundary: not reached at depth

3.2.2 Soil Mapping Unit B – (soils developed on basalts)

3.2.2.1 Summary

These soils are most common in the Richmond Range and Eden Creek State Forests. They also occur throughout Bungabbee and Boorabee State Forests, and in the western half of Mebbin State Forest.

They are generally described as having a topsoil layer over two subsoil layers. Other layers are uncommon to rare and, therefore, will not be mentioned here. In summary then, a brownish black, moderately acid to slightly alkaline, strongly pedal, moderately coherent, strongly bioturbated clay loam or silty clay loam topsoil layer is underlain by a dark reddish brown, neutral to strongly acid, strongly pedal, stony, coherent, moderately to strongly bioturbated light clay, light medium clay, medium clay or heavy clay master colour subsoil layer sometimes over a dark reddish brown, neutral to moderately acid, strongly pedal, coherent, weakly bioturbated light to medium clay lower subsoil layer. At depths below 50cm a strongly weathered igneous rock layer occurs. This was not always reached at every site, especially where the subsoil was very deep, 100 – 150+cm, over the weathered layer.

Of the fifteen description sites recorded within this unit, seven were located in an upper slope situation (gradients ranging from 12% to 32%), one in an upper slope to midslope situation (16%), three midslope (10 – 13%), three lower slope (8% to 14%) and one on a ridgeline (35%).

3.2.2.2 Dominant soil materials

Northcote Codings: Uf 5.3; Gn 3.11, Gn 3.14, Gn 3.22, Gn 4.51; Dr 4.11 and Dr 4.21

Great Soil Groups: Structured sub-plastic clays, Krasnozems and Chocolate soils

Surface Condition: self-mulching litter layer with mycelium is common and the surface is often stony with rounded and sub-rounded basalt fragments up to 600mm in size, in varying amounts up to 10%

3.2.2.3 Description

Layer 1 (slightly to moderately moist)

Diagnostic features: brownish black, strongly pedal clay loam to silty clay loam

Occurrence: always present as a topsoil layer or A, A1, A11 horizon 3 – 45cm thick but usually <10cm thick

Colour: usually brownish black (5YR 2/1, 2/2; 7.5YR 2/2, 3/2; 10YR 3/2) or very dark reddish brown (2.5YR 2/2, 5YR 2/3)

pH: moderately acid to slightly alkaline (pH 5.5 – 8.0)

Texture: commonly clay loam or silty clay loam, all normal plastic

Stickiness: slight to moderate

Structure: strongly pedal with round and sub-angular blocky peds 10 – 100mm breaking to crumb or lenticular peds <2 – 5mm diameter, and smooth-faced slowly porous or, most commonly, rough-faced porous ped fabric

Coherence: weak to moderate

Stone content: 0 – 10% rounded to angular igneous fragments may be present, most commonly up to 20mm in size but not so commonly up to 600mm in size

Roots: abundant

Faunal mixing: abundant

Inclusions: charcoal fragments are usually present

Boundary: sharp or clear and wavy to irregular to layers 2, 3, 4 or 5

Layer 2 (moderately moist)

Diagnostic features: brownish black, pedal, fine sandy clay loam

Occurrence: rarely present as a lower topsoil layer or A12 horizon, 22 – 28cm thick

Colour: brownish black (7.5YR 2/2) or greyish yellow brown (10YR 5/2)

pH: moderately to slightly acid (pH 5.0 – 6.0)

Texture: fine sandy clay loam or silty clay, normal plastic

Stickiness: slight to moderate

Structure: moderately to strongly pedal with sub-angular blocky peds 20 – 100mm breaking to lenticular peds <2mm diameter, and rough-faced porous ped fabric

Coherence: weak to moderate

Stone content: up to 10% rounded or sub-rounded igneous fragments occur up to 60mm in size

Roots: abundant

Faunal mixing: abundant

Inclusions: charcoal fragments are present

Boundary: sharp or clear and wavy or irregular to layer 5

Layer 3 (slightly moist)

Diagnostic features: brownish black to dark brown, strongly pedal light clay

Occurrence: uncommonly present as a lower topsoil layer or unbleached A2 horizon, 17 – 23cm thick

Colour: brownish black (7.5YR 3/2) or dark brown (7.5YR 3/4); also very dark reddish brown (5YR 2/4)

pH: slightly acid to neutral (pH 6.0 – 7.0)

Texture: light clay or silty light clay, normal plastic

Stickiness: slight to moderate

Structure: strongly pedal with sub-angular blocky peds 20 – 100mm breaking to sub-angular, angular blocky or lenticular 2 – 5mm diameter, and rough-faced or smooth-faced porous ped fabric

Coherence: moderate to strong

Stone content: 0 – 10% sub-angular and angular igneous fragments may occur up to 20mm in size

Roots: abundant to many

Faunal mixing: abundant

Inclusions: charcoal fragments may occur

Boundary: sharp, clear or gradual and wavy or irregular to layers 4 or 5

Layer 4 (slightly moist to wet)

Diagnostic features: dark reddish brown, strongly pedal light medium clay

Occurrence: uncommonly present as an upper subsoil layer or B1 horizon, 13 – 47cm thick

Colour:	dark reddish brown (2.5YR 3/3, 5YR 3/4) or very dark reddish brown (5YR 2/3) or brownish black (7.5YR 2/2)
pH:	moderately acid to neutral (pH 5.5 – 7.0)
Texture:	light clay, light medium clay or medium clay, all normal plastic
Stickiness:	moderate to slight
Structure:	strongly pedal with sub-angular blocky or lenticular peds 20 – 100mm breaking to lenticular peds 2 – 5mm diameter, and smooth-faced slowly porous ped fabric
Coherence:	moderate to strong
Stone content:	up to 20% rounded to sub-angular igneous fragments occur up to 200mm in size
Roots:	many to abundant
Faunal mixing:	abundant
Inclusions:	charcoal fragments may occur
Boundary:	sharp, clear or gradual and wavy or irregular to layer 5

Layer 5 (slightly moist to wet)

Diagnostic features: dark reddish brown, strongly pedal light medium clay

Occurrence: always present as a master colour subsoil layer or B2 horizon, 25 – 98+cm thick

Colour: dark reddish brown (2.5YR 3/4, 5YR 3/2, 3/4, 3/6) or brown (7.5YR 4/3, 4/4, 4/6); also very dark reddish brown (5YR 2/3, 2/4) or dark brown (7.5YR 3/3, 3/4)

pH: strongly acid to neutral (pH 4.5 – 7.0)

Texture: usually light medium clay, normal plastic but ranges from silty light clay to heavy clay, normal plastic or super-plastic

Stickiness: slight to moderate

Structure: strongly pedal with sub-angular blocky, angular blocky or lenticular peds 20 – 200mm diameter breaking to lenticular <2 – 5mm diameter, and rough-faced or smooth-faced, slowly porous ped fabric

Coherence: slight to strong

Stone content: nil up to 50% rounded to angular, igneous fragments may occur up to 200mm in size

Roots: common to abundant

Faunal mixing: common to abundant

Inclusions: charcoal fragments usually occur

Boundary: clear or gradual and wavy or irregular to layers 6, 7 or 8

Layer 6 (slightly to moderately moist)

Diagnostic features: dark reddish brown, strongly pedal light medium clay

Occurrence: uncommonly present as a lower subsoil layer or B3 horizon, 48+cm thick

Colour: dark reddish brown (5YR 3/3, 3/4); also greyish brown (5YR 4/2) dark brown (10YR 3/3) or dull yellowish brown (10YR 5/3)

pH: moderately acid to neutral (pH 5.5 – 7.0)

Texture: light medium clay, medium clay or light clay, normal plastic or super-plastic

Stickiness: slight

Structure: strongly pedal with lenticular or sub-angular blocky peds 20 – 100mm breaking to lenticular peds <2 – 5mm diameter, and smooth-faced slowly porous to dense ped fabric

Coherence: not recorded

Stone content: 0 – 20% rounded and sub-rounded igneous fragments may occur up to 200mm in size

Roots: common

Faunal mixing: common but decreasing with depth

Inclusions: none observed

Boundary: not reached at depth

Layer 7 (slightly moist)

Diagnostic features: bright brown, pedal, light medium clay

Occurrence: probably rarely present but not always reached at depth as a transitional layer or BC horizon, 19+cm thick

Colour: bright brown (7.5YR 5/6)

pH: moderately acid (pH 5.0)

Texture: light medium clay, normal plastic

Stickiness: slight

Structure: moderately pedal with rough-faced porous ped fabric

Coherence: moderate

Stone content: igneous stone fragments occur

Roots: few

Faunal mixing: uncommon

Inclusions: none observed

Boundary: not reached at depth

Layer 8

Diagnostic features: >90% igneous, strongly weathered igneous bedrock

Occurrence: always present but not always reached at depth as a weathered bedrock layer or C horizon at >64cm depth

3.2.3 Soil Mapping Unit C - (soils developed on metasediments)

3.2.3.1 Summary

These soils occur in two distinct, geographically separate locations: in the Mooball, Burringbar and northern arm of Nullum State Forests south of Murwillumbah, and in most of Washpool and the south-eastern parts of Ewingar State Forests, west of Baryulgil. Both areas are steep.

They are, however, similar in terms of their physical characteristics. They are clay soils with one topsoil layer over two subsoil layers. They generally consist of a dark reddish

brown, slightly acid, strongly pedal, coherent, strongly bioturbated silty light clay to light clay topsoil layer over a reddish brown, slightly acid, strongly pedal, coherent, strongly bioturbated light to light medium clay master colour subsoil layer. This layer usually grades into a strongly weathered, moderately acid argillite rock layer at depths ranging from 44cm to 140cm or greater.

Of the six description sites recorded within this unit, three were located in an upper slope situation (gradients ranging from 8% to 33%), two in a lower slope situation (6% – 25%) and one on a ridgeline (10%).

3.2.3.2 Dominant soil materials

Northcote Codings: Uf 5.22, Uf 6.21, Uf 6.31, Uf 6.33

Great Soil Groups: Structured plastic clays and Krasnozems

Surface Conditions: self-mulching with up to 20% sub-angular and angular quartz and argillite, phyllite and slate fragments occur up to 200mm in size

3.2.3.3 Description

Layer 1 (slightly to moderately moist)

Diagnostic features: dark reddish brown, acid, strongly pedal, silty light clay or light clay

Occurrence: always present as a topsoil layer or A horizon, 8 – 22cm thick

Colour: dark reddish brown (2.5YR 3/3, 5YR 3/2, 3/3), also very dark reddish brown (5YR 2/3) or brownish black (10YR 2/2)

pH: slightly acid (pH 6.0 – 6.5)

Texture: silty light clay or light clay, subplastic or normal plastic

Stickiness: usually moderate but may also be slight

Structure: strongly pedal with sub-angular blocky peds 20 – 100mm breaking to crumbs and occasionally angular blocky peds 2 – 5mm diameter, and rough-faced porous and sometimes smooth-faced slowly porous ped fabric

Coherence: moderate to strong

Stone content: <2 – 20% sub-angular and angular quartz and metamorphic rock fragments occur up to 200mm in size

Roots: abundant

Faunal mixing: abundant
Inclusions: charcoal fragments occur at all sites
Boundary: sharp or clear and even or wavy to layers 2 or 4

Layer 2 (slightly to moderately moist)

Diagnostic features: reddish brown, slightly acid, strongly pedal light to light medium clay
Occurrence: usually present as an upper subsoil layer or B1, B11 horizon, 13 – 29cm thick
Colour: reddish brown (5YR 4/6, 2.5YR 4/6), or dark reddish brown (5YR 3/3)
pH: slightly acid (pH 6.0)
Texture: light or light medium clay, normal plastic
Stickiness: moderate
Structure: strongly pedal with sub-angular blocky peds 20 – 100mm breaking to crumbs <2mm diameter, and smooth-faced slowly porous to dense or rough-faced porous ped fabric
Coherence: moderate
Stone content: <2 – 20% sub-angular and angular metamorphic rock fragments occur up to 20mm in size
Roots: many

Faunal mixing: abundant
Inclusions: charcoal fragments are usually present
Boundary: clear to gradual and even to wavy to layers 3 or 4

Layer 3 (moderately moist)

Diagnostic features: reddish brown, acid, strongly pedal light medium clay
Occurrence: sometimes present as an upper subsoil layer or B12 horizon, 26cm thick
Colour: reddish brown (2.5YR 4/6)

pH: moderately acid (pH 5.5)

Texture: light medium clay, normal plastic

Stickiness: moderate

Structure: strongly pedal with sub-angular blocky peds 20 – 100mm in size breaking to lenticular and angular blocky peds <2mm in diameter, and smooth-faced slowly porous to dense ped fabric

Coherence: strong

Stone content: <2% of metamorphic and quartz fragments occur up to 6mm in size

Roots: not recorded

Faunal mixing: not recorded

Inclusions: charcoal fragments occur

Boundary: gradual and even to layer 4

Layer 4 (slightly to moderately moist)

Diagnostic features: reddish brown, acid, strongly pedal light medium clay

Occurrence: always present as a master colour subsoil layer or B2 horizon, 24 – 68+cm thick

Colour: usually reddish brown (2.5YR 4/8, 5YR 4/8); also dark reddish brown (2.5YR 3/6), or dull yellowish brown (10YR 5/4)

pH: moderately to slightly acid (pH 5.0 – 6.0)

Texture: light to light medium clay, normal plastic

Stickiness: moderate

Structure: strongly pedal with sub-angular blocky peds 20 – 100mm, breaking to angular blocky and lenticular <2mm diameter and smooth-faced slowly porous to dense, or rough-faced porous ped fabric

Coherence: weak to moderate

Stone content: <2 – 50% sub-angular and angular metamorphic rock fragments occur up to 200mm in size

Roots: many

Faunal mixing: common to abundant

Inclusions: charcoal fragments may occur at some sites

Boundary: gradual or sharp and irregular or broken to layers 5 or 6

Layer 5 (moderately moist)

Diagnostic features: reddish brown, acid, pedal light medium clay

Occurrence: sometimes present as a transition layer or B3, BC horizon, 22+cm thick (upper boundary at 60cm depth)

Colour: reddish brown (2.5YR 4/8)

pH: moderately acid (pH 5.5)

Texture: light medium clay, normal plastic

Stickiness: slight

Structure: moderately to strongly pedal with sub-angular blocky peds 20 – 50mm breaking to angular blocky peds <2mm diameter

Coherence: moderate

Stone content: 50 – 90% angular metamorphic rock fragments occur up to 60mm in size

Roots: many

Faunal mixing: common

Inclusions: none observed

Boundary: not recorded

Layer 6

Diagnostic features: strongly weathered rock

Occurrence: always present but not always reached at depth as a weathered rock layer or C horizon, 75 – 156+cm thick

Colour: not recorded

pH: moderately acid (pH 5.5)

Texture: not obtainable

Stickiness:	not obtainable
Structure:	not obtainable
Coherence:	not obtainable
Stone content:	>90% metamorphic rock fragments occur
Roots:	uncommon
Faunal mixing:	absent
Inclusions:	none
Boundary:	not recorded

Layer 7

Diagnostic features: unweathered rock

Occurrence: always present but rarely reached at depth as a rock layer or R horizon, below 140cm depth

No other details were recorded for this layer

3.2.4 Soil Mapping Unit D – (soils developed on granitoids)

3.2.4.1 Summary

These soils occur in the very steep country of the Billilimbra and Ewingar State Forests.

They typically consist of a brownish black, slightly to strongly acid, moderately to strongly pedal, moderately coherent, strongly bioturbated, stony, silty light clay or light clay, commonly over an unbleached A2 horizon or lower topsoil layer which is a dark reddish brown to dark brown, slightly to moderately acid, pedal, stony, silty clay loam or light clay. This layer commonly overlies a reddish brown to dull yellowish brown, slightly to moderately acid, pedal, strongly bioturbated, weakly to moderately coherent, stony, light to medium clay upper subsoil layer, over a bright reddish brown, slightly to strongly acid, pedal, strongly bioturbated, weakly to moderately coherent, stony, light to light medium clay master colour subsoil layer. This layer grades into a strongly weathered granite rock layer, which comes in at depths between 50cm and 92cm or greater.

Of the six description sites recorded within this unit, four were located in an upper slope situation (gradients ranging from 8% to 20%), one in a midslope situation (8%) and one in a midslope to lower slope situation (12%).

3.2.4.2 Dominant soil materials

Northcote Codings: Uf 4.43, Uf 5.11, Uf 6.2(4); Gn 3.14; Dy 4.11

Great Soil Groups: Structured subplastic and plastic clays, Krasnozems, Yellow podzolic soils

Surface Condition: loose and sandy or self-mulching or friable usually with a thin layer of scattered sand grains on the surface and a plant litter layer of varying thickness. Usually there are some rounded to angular stones present up to 600+mm in size, but generally up to 60mm. These are igneous fragments but feldspar, quartz and mica crystals are also commonly present.

3.2.4.3 Description

Layer 1 (moderately moist)

Diagnostic features: brownish black, acid, pedal silty light clay to light clay

Occurrence: always present as an A, A1, A11 horizon, 2 - 30cm thick

Colour: brownish black (5YR 2/2, 2/1, 7.5YR 2/2), and ranges from very dark reddish brown (2.5YR 2/2) to dark brown (10YR 3/4)

pH: strongly to slightly acid (pH 4.5 - 6.5)

Texture: silty light clay or light clay, one subplastic, the others normal plastic; also some sandy loam, clay loam or silty clay loam

Stickiness: slight to moderate

Structure: usually strongly pedal, but also moderately or weakly pedal, with sub-angular blocky and round peds, and rarely platy peds 20 - 100mm in size, breaking to round peds and crumbs 2 - 10 mm diameter, and earthy smooth-faced or rough-faced porous ped fabric

Coherence: moderate to strong

Stone content: 0 - 50% rounded to angular igneous rock fragments and feldspar quartz and mica crystals may occur from 2 - >600mm in size

Roots: abundant

Faunal mixing: abundant

Inclusions: charcoal fragments are usually present

Boundary: sharp to clear and even or wavy to layers 2, 3 or 6

Layer 2 (moderately moist)

Diagnostic features: dull reddish brown, acid, weakly or strongly pedal, light to light medium clay

Occurrence: sometimes present as a lower topsoil layer or A12 horizon, 8 – 16cm thick

Colour: dull reddish brown (5YR 4/3) or dark brown (10YR 3/3)

pH: moderately acid (pH 5.0 – 5.5)

Texture: usually light to light medium clay, but also light sandy clay loam, all normal plastic

Stickiness: slight

Structure: weakly or strongly pedal with sub-angular blocky and round peds 50 – 100mm breaking, in the more strongly pedal case, to angular blocky, round and crumb peds <2 – 10mm in size, and earthy or smooth-faced porous ped fabric

Coherence: weak to moderate

Stone content: 0 – 20% sub-angular and angular igneous and quartz feldspar fragments may occur up to 20mm in size

Roots: abundant

Faunal mixing: abundant

Inclusions: charcoal fragments occur

Boundary: clear to sharp and wavy to layers 4 or 5

Layer 3 (moderately moist)

Diagnostic features: reddish brown, acid, pedal, sandy light clay or light clay

Occurrence: commonly present as a lower topsoil layer or unbleached A2 horizon, 12 – 23cm thick

Colour: reddish brown (5YR 4/6), dark reddish brown (2.5YR 3/3), or dark brown (7.5YR 3/3)

pH: moderately to slightly acid (pH 5.0 – 6.0)

Texture: sandy light clay, light clay or silty clay loam, normal plastic

Stickiness: slight

Structure: moderately to strongly pedal with sub-angular blocky and some round peds 20 – 100mm, breaking to angular blocky and round peds 2 – 10mm diameter, and smooth-faced or rough-faced porous ped fabric

Coherence: moderate

Stone content: 10 – 50% sub-rounded to angular quartz feldspar crystals or igneous rock fragments occur up to 60mm in size, although some may range from 200 to >600mm in size

Roots: many to abundant

Faunal mixing: abundant

Inclusions: charcoal fragments occur

Boundary: clear or gradual and wavy to layers 5 or 6

Layer 4 (moderately moist)

Diagnostic features: dull reddish brown, acid, pedal sandy clay loam

Occurrence: rarely present as a transition layer or A3 horizon, 10cm thick

Colour: dull reddish brown (5YR 4/4)

pH: moderately acid (pH 5.5)

Texture: sandy clay loam

Stickiness: slight

Structure: moderately pedal (held together largely by mycelium threads) with sub-angular blocky peds 50 – 100mm

Coherence: moderate

Stone content: 10 – 20% sub-angular and angular igneous rock fragments and quartz and feldspar crystal fragments occur up to 20mm in size

Roots: many

Faunal mixing: abundant

Inclusions: charcoal fragments occur

Boundary: not recorded

Layer 5 (moderately moist)

Diagnostic features: reddish brown to bright reddish brown, acid, pedal, light to medium clay

Occurrence: commonly present as an upper subsoil layer or B1 horizon, 10 – 19cm thick

Colour: reddish brown (5YR 4/8) to bright reddish brown (5YR 5/6) or dull yellowish brown (10YR 4/3)

pH: moderately to slightly acid (pH 5.0 – 6.0)

Texture: light, light medium or medium clay, all normal plastic

Stickiness: slight

Structure: moderately to strongly pedal with sub-angular blocky peds 50 – 100mm breaking to angular blocky, round and crumb peds <2 – 10mm in diameter, and smooth-faced or rough-faced, slowly porous to porous ped fabric

Coherence: weak to moderate

Stone content: either nil or up to 50% sub-rounded to angular igneous fragments and quartz and feldspar crystal fragments may occur up to 60mm in size

Roots: common to many

Faunal mixing: many to abundant

Inclusions: charcoal fragments usually occur

Boundary: clear to gradual and wavy to layer 6

Layer 6 (moderately moist)

Diagnostic features: bright reddish brown or reddish brown, acid, pedal light to light medium clay

Occurrence: always present as a master colour subsoil layer or B2 horizon, 20 – 46cm thick

Colour:	bright reddish brown (5YR 5/8) or reddish brown (5YR 4/8), and ranges from dark reddish brown (2.5YR 3/6) to yellowish brown (10YR 5.8)
pH:	strongly to slightly acid (pH 4.5 – 5.0)
Texture:	light or light medium clay, normal plastic
Stickiness:	slight
Structure:	moderately to strongly pedal with sub-angular blocky and occasionally some lenticular peds 20 – 100mm breaking to angular blocky, sub-angular blocky, round, granular or crumb peds <2 – 10mm diameter, and smooth-faced slowly porous to rough-faced porous ped fabric
Coherence:	weak to moderate
Stone content:	0 – 50% rounded to angular igneous fragments and quartz, feldspar and mica crystal fragments may occur up to 600mm in size
Roots:	common to many
Faunal mixing:	common to abundant, predominantly many
Inclusions:	charcoal fragments occasionally occur but not at all sites
Boundary:	gradual and wavy to layers 7 or 8

Layer 7 (moderately moist)

Diagnostic features:	very stony, slightly acid light clay
Occurrence:	rarely present as a transition layer or BC horizon, 10cm thick
Colour:	not recorded
pH:	slightly acid (pH 6.0)
Texture:	light clay, normal plastic
Stickiness:	slight
Structure:	moderately pedal
Coherence:	weak
Stone content:	50 – 90% rounded to angular igneous fragments occur up to 200mm in size

Roots: common

Faunal mixing: common

Inclusions: none observed

Boundary: not recorded

Layer 8

Diagnostic features: strongly weathered igneous rock

Occurrence: always present but not always reached at depth as a weathered layer or C horizon, 40+cm thick and located below 50 – 90cm depth

No other parameters were recorded for this layer

3.2.5 Soil Mapping Unit E – (soils developed on Grafton Formation sediments)

3.2.5.1 Summary

The soils in this unit predominate in the central forests of Bungawalbin, Braemar, Ellangowan, Carwong, Royal Camp, Camira, Myrtle, Whiporie, Banyabba and Gibberagee, unless otherwise overlain by Quaternary alluvium of the same-named unit. Terrain is very gently to gently undulating.

The soils are best divided into topsoils and subsoils because of the strong distinction between their relative field textures.

The topsoil generally consists of brownish black to dark reddish brown, slightly to strongly acid, moderately pedal, weakly to moderately coherent, strongly bioturbated sandy loam to fine sandy clay loam, with every texture in between. This layer has a sharp to clear boundary to either a brown, slightly to moderately acid, moderately pedal, moderately coherent, strongly bioturbated, light sandy clay loam, sandy clay loam, silty or fine sandy clay loam, sandy or silty light clay lower topsoil layer, or a brown, slightly to strongly acid, weakly to strongly pedal, weakly to moderately coherent, moderately to strongly bioturbated light sandy clay loam or light clay (textures range from sand to heavy clay) generally unbleached lower topsoil layer, or both. These layers show a sharp to clear boundary to the underlying subsoil.

The upper subsoil layer or transition layer is rare and is described as a reddish brown to bright reddish brown, moderately pedal sandy clay loam. The master colour subsoil layer is always present as a reddish brown, dark reddish brown, brown or greyish brown, slightly to strongly acid, strongly pedal, strongly to very strongly coherent, weakly bioturbated, light to heavy clay. It is commonly underlain by a dark reddish brown to dull brown, usually acid, strongly pedal, strongly coherent, weakly bioturbated light medium clay or heavy clay lower subsoil layer. The subsoil layers change, through a clear boundary to a strongly weathered sedimentary rock layer, which has pockets of strongly pedal light medium clay, below 43 – 87cm depth.

Of the 24 description sites recorded within this unit, five were located in an upper slope situation (gradients ranging from 2% to 20%), one in an upper slope to midslope situation (27%), seven in a midslope situation (1% - 13%), two lower slope (4% - 6%), two ridgetop (8% - 12%), five hilltop (1% - 8%), and one each in a drainage flat (1%) and gullyline (4%).

3.2.5.2 Dominant soil materials

Northcote Codings: Gn 2.21, Gn 2.41, Gn 3.04, Gn 3.11, Gn 3.14, Gn 3.16, Gn 3.21, Gn 3.24, Gn 3.91, Gn 3.94; Dr 1.11 Dr 4.11, Dr 4.41, Dr 5.11, Dr 5.41; Dy 1.41, Dy 5.11, Dy 5.41

Great Soil Groups: Yellow earths, Yellow-brown earths, Chocolate soils, Euchrozems, Red podzolic soils, Lateritic podzolic soils, Yellow podzolic soils and Minimal prairie soils

Surface Condition: friable, firm, crusting, soft or loose, with litter layer, often in the form of sand grains over the top, with thin plant litter cover, or the top may be quite stony. Surface stone ranges from 0 - 20% rounded to angular, iron-rich, sedimentary fragments up to 200mm in size

3.2.5.3 Description

Layer 1 (usually slightly moist)

Diagnostic features: brownish black, dark brown or brown, pedal sandy loam to fine sandy clay loam

Occurrence: always present as a topsoil layer or A, A1, A11 horizon, 1 - 24cm thick

Colour: brownish black (7.5YR 3/2, 10YR 3/2), dark brown (7.5YR 3/3) or brown (7.5YR 4/3, 4/4) and ranges from black (7.5YR 1.71, 2/1) to dull reddish brown (5YR 4/4, 4/3)

pH: strongly to slightly acid (pH 4.5 - 6.5)

Texture: this ranges from sandy loam to fine sandy clay loam but is commonly fine sandy loam, sandy clay loam or silty clay loam, all normal plastic

Stickiness: usually slight to moderate

Structure: weakly or moderately pedal with platy, round or sub-angular blocky peds 5 - 50mm breaking to crumbs, round, platy or sub-angular blocky peds 2 - 10mm diameter, and earthy or rough-faced porous ped fabric

Coherence:	weak to moderate
Stone content:	0 – 20% rounded to sub-angular ironstone, quartz or sedimentary rock fragments may occur up to 200mm in size
Roots:	abundant
Faunal mixing:	abundant
Inclusions:	charcoal fragments occur at most sites
Boundary:	sharp and even or wavy to layers 2, 3, 5 or 7

Layer 2 (slightly to moderately moist)

Diagnostic features: brown pedal sandy clay loam

Occurrence: commonly present as a lower topsoil layer or A12 horizon 5 – 35cm thick

Colour: commonly brown (7.5YR 4/3, 4/4, 4/6) dark brown (7.5YR 3/3, 3/4) or brownish black (7.5YR 3/2)

pH: moderately to slightly acid (pH 5.5 – 6.5)

Texture: this is highly variable and ranges from fine sandy loam through sandy clay loam to light clay, all normal plastic

Stickiness: slight to moderate

Structure: weakly to moderately pedal with sub-angular blocky peds 20 – 100mm breaking to round and sub-angular blocky peds 5 – 10mm diameter, and earthy or rough-faced porous ped fabric

Coherence: weak to moderate

Stone content: 0 – 50% round to angular sedimentary quartz fragments may occur up to 60mm in size

Roots: many to abundant

Faunal mixing: abundant

Inclusions: charcoal fragments commonly occur

Boundary: sharp or clear and even or wavy to layer 3 or more commonly to layer 6 or 7

Layer 3 (usually slightly to moderately moist)

Diagnostic features: brown or dull brown, weakly to strongly pedal light clay

Occurrence: commonly present as a bleached or unbleached lower topsoil layer or A2, A21 horizon, 5 – 37cm thick

Colour: brown (7.5YR 4/3, 4/4) or dull brown (7.5YR 5/3, 5/4); also dull reddish brown (5YR 4/3) greyish brown (5YR 5/2) or dull orange (5YR 6/4). Bleaching of this layer is common

pH: strongly to slightly acid (pH 4.5 – 6.0)

Texture: texture of this layer is highly variable ranging from sand at the one end to heavy clay at the other. The two textures which are present more often than others are light clay and light sandy clay loam, all normal plastic

Stickiness: non-sticky to moderate

Structure: weakly, moderately or strongly pedal with sub-angular blocky peds 10 – 200mm diameter breaking, in the more strongly pedal cases, to round, sub-angular blocky, angular blocky, lenticular or platy peds 5 – 10mm diameter, and earthy, smooth-faced or rough-faced porous to slowly porous ped fabric. Also on two occasions the structure was apedal single-grained or apedal massive

Coherence: weak to moderate

Stone content: 0 – 10% rounded to angular ironstone sedimentary or quartz fragments may occur, commonly up to 20mm in size

Roots: few to abundant

Faunal mixing: few to abundant (highly variable)

Inclusions: charcoal fragments may occur

Boundary: always sharp and even, wavy or irregular to layer 7 and clear and irregular to layer 4

Layer 4 (slightly moist)

Diagnostic features: yellowish brown, weakly pedal fine sandy loam

Occurrence: very rarely present as a lower bleached topsoil layer or A22 horizon, 28cm thick

Colour: yellowish brown (10YR 5/6)

pH:	not recorded
Texture:	fine sandy loam
Stickiness:	slight
Structure:	weakly pedal with round peds 5 – 20mm diameter and earthy porous ped fabric
Coherence:	not recorded
Stone content:	20 – 50% rounded sedimentary fragments occur up to 20mm in size
Roots:	few
Faunal mixing:	common
Inclusions:	none observed
Boundary:	sharp to layer 7

Layer 5 (slightly moist)

Diagnostic features: brownish black, weakly pedal loamy sand

Occurrence:	very rarely present as a lower topsoil layer or A3 horizon, 12cm thick
Colour:	brownish black (10YR 3/2)
pH:	not recorded
Texture:	loamy sand, loose
Stickiness:	non-sticky
Structure:	weakly pedal with round peds 10 – 20mm diameter and earthy porous ped fabric
Coherence:	not recorded
Stone content:	none
Roots:	common
Faunal mixing:	common
Inclusions:	none observed

Boundary: diffuse and wavy to layer 7

Layer 6 (slightly moist)

Diagnostic features: reddish brown to dull yellowish brown, moderately pedal, sandy clay loam

Occurrence: rarely present as a transitional layer or B1 horizon, 13 – 24 cm thick

Colour: ranges from reddish brown (5YR 4/6) or bright reddish brown (5YR 5/6) through dark brown (7.5YR 3/4) to dull yellowish brown (10YR 4/3)

pH: not recorded

Texture: sandy clay loam, also fine sandy loam or light clay, normal plastic

Stickiness: slight to moderate

Structure: moderately pedal with sub-angular blocky peds 20 – 100mm breaking to sub-angular blocky, round or lenticular peds 5 – 10mm diameter, and earthy or rough-faced porous ped fabric

Coherence: not recorded

Stone content: 10 – 20% rounded and sub-rounded quartz fragments occur up to 20mm in size

Roots: common

Faunal mixing: usually abundant

Inclusions: charcoal fragments commonly occur

Boundary: usually clear and wavy to layer 7

Layer 7 (slightly to moderately moist)

Diagnostic features: reddish brown, strongly pedal light medium clay

Occurrence: always present as a master colour subsoil layer or B2, B21 horizon, 10 – 51+cm thick

Colour: usually reddish brown (2.5YR 4/8, 4/6); also dark reddish brown (2.5YR 3/6, 5YR 3/6), brown (7.5YR 4/6, 4/3, 10YR 4/6) or greyish brown (7.5YR 6/2, 5/2, 4/2). Other not so common colours range from dull reddish brown (5YR 5/4, 4/4) to dull yellow orange (10YR 6/3)

pH:	strongly to slightly acid (pH 4.5 – 6.0)
Texture:	usually light medium clay, light clay or heavy clay, all normal plastic. Less commonly textures of sandy loam, fine sandy loam, light sandy clay loam, fine sandy clay loam and sandy light clay also occur
Stickiness:	slight to moderate
Structure:	usually strongly pedal but also can be weak to moderate with lenticular, angular-blocky and sub-angular blocky peds 20 – 200mm diameter breaking to <2 – 10mm diameter, and earthy or rough-faced porous ped fabric or smooth-faced slowly porous to dense ped fabric
Coherence:	moderate to very strong
Stone content:	0 – 50% rounded to angular quartz sedimentary or ironstone fragments can occur up to 60mm in size
Roots:	few to common
Faunal mixing:	common, becoming less common with depth
Inclusions:	charcoal fragments may be present and rarely manganese nodules may occur
Boundary:	clear and wavy to layer 9, and rarely gradual to layers 8 or 10

Layer 8 (wet)

Diagnostic features:	greyish brown, strongly pedal, light medium clay
Occurrence:	very rarely present as a lower subsoil layer or B22 horizon, 35+cm thick
Colour:	greyish brown (7.5YR 4/2)
pH:	moderately acid (pH 5.0)
Texture:	light medium clay, normal plastic
Stickiness:	slight
Structure:	strongly pedal with angular blocky and sub-angular blocky peds 100 – 200mm breaking to sub-angular blocky peds 2 – 5mm diameter, and smooth-faced dense ped fabric
Coherence:	not recorded

Stone content: not recorded

Roots: few

Faunal mixing: uncommon

Inclusions: none observed

Boundary: not reached at depth

Layer 9 (usually moderately moist to wet)

Diagnostic features: dark reddish brown to dull brown, strongly pedal, light medium clay

Occurrence: commonly present as a lower subsoil layer or B3 horizon, 13 – 46+cm thick

Colour: dark reddish brown (2.5YR 3/6) or dull brown (7.5YR 5/3, 6/3). Other less common colours range from reddish brown (2.5YR 4/8) to dull yellow (2.5Y 6/4)

pH: strongly acid to slightly alkaline (pH 4.5 – 8.5)

Texture: light medium clay with some heavy clay, normal plastic

Stickiness: slight to moderate

Structure: strongly pedal with sub-angular blocky, angular blocky or lenticular peds 50 – 200mm breaking to <2 – 5mm diameter, and smooth-faced, slowly porous to dense ped fabric

Coherence: moderate to strong

Stone content: 0 – 90% rounded to angular, sedimentary, iron-rich pebbles may occur up to 60mm in size

Roots: few to common on ped faces

Faunal mixing: uncommon to rare. Normally at this depth open channels are observed with no mixing of soil either within the layer or across layers

Inclusions: none observed

Boundary: sharp to clear and broken to layer 10

Layer 10 (soil moisture not recorded)

Diagnostic features:	very strongly weathered rock with some light medium clay
Occurrence:	always present but not always reached at depth as a weathered rock layer or C horizon at depth, below 43 - 87cm
Colour:	not recorded
pH:	not recorded
Texture:	light medium clay, normal plastic
Stickiness:	slight
Structure:	not recorded
Coherence:	not recorded
Stone content:	50 - 90% angular, strongly weathered, sedimentary stones are present up to 60mm in size
Roots:	few
Faunal mixing:	rare
Inclusions:	none observed
Boundary:	not reached at depth

3.2.6 Soil Mapping Unit F - (soils developed on Kangaroo Creek Sandstone)

3.2.6.1 Summary

These soils predominantly occur on Kangaroo Creek Sandstones in the Mount Belmore, Mount Marsh, and Doubleduke State Forests. Other smaller localities are in part Banyabba, part Gibberagee, part Richmond Range, and part Eden Creek State Forests.

The terrain is moderately steep on side slopes and more gentle on ridgelines and footslopes.

The soils generally consist of a brownish black, slightly to strongly acid, weakly to moderately pedal, weakly coherent, strongly bioturbated, loamy sand or sandy loam topsoil layer, over either a dark brown to brown, moderately acid, weakly to moderately pedal, weakly coherent, bioturbated, clayey sand lower topsoil layer, or a brown to dull yellowish brown (bleached or unbleached) slightly to moderately acid, weakly pedal, weakly coherent, moderately bioturbated, clayey sand, loamy sand or light sandy clay loam lower topsoil layer, sometimes over a brown, slightly to moderately acid, moderately pedal,

weakly coherent, moderately bioturbated, clayey sand or sandy clay loam transition layer or upper subsoil layer.

The master colour subsoil layer is always present and is characterised by a bright brown to yellow brown, slightly to strongly acid, weakly to strongly pedal, weakly to moderately coherent, weakly bioturbated (except where the layer is directly overlain by the topsoil layer, in which case it is strongly bioturbated), clayey sand, sandy light clay or light medium clay, occasionally over a dull yellow orange, moderately acid, strongly pedal, moderately coherent, light medium clay lower subsoil layer. This sharply changes to strongly weathered, bright brown sandstone at depths between 50 – 140+cm.

Of the 21 description sites recorded within this unit, eight were located in an upper slope situation (gradients ranging from 7% to 27%), five in a midslope situation (10% – 22%), two lower slope (7% – 17%), three ridgetop (8% – 18%), two footslope (2% – 12%), and one in a drainage flat (<1%).

3.2.6.2 Dominant soil materials

Northcote Codings: Uc 4.21, Uc 4.24, Uc 6, Uc 6.14; Gn 2.14, Gn 2.21, Gn 3.11, Gn 3.21; Dr 5.11, Dr 5.21; Db 3.41; Dy 1.11, Dy 4.11, Dy 4.21, Dy 5.21, Dy 5.31, Dy 5.41

Great Soil Groups: Sands, Structured sands, Earthy sands, Yellow earths, Red earths, Krasnozems, Red podzolic soils, Yellow podzolic soils

Surface Condition: thin, loose, sandy or crusting up to 1cm; organic matter can be present. Usually there are no stones but there may be up to 2% rounded quartz or coarse quartz sandstone pebbles, up to 20mm in size

3.2.6.3 Description

Layer 1 (slightly to moderately moist)

Diagnostic features: brownish black, weakly to moderately pedal, loamy sand to sandy loam

Occurrence: always present as an A, A1, A11 horizon, 2 – 35cm thick

Colour: brownish black (7.5YR 3/2, 2/2, 2/3) but can range from dark reddish brown (5YR 3/3) to dull yellowish brown (10YR 5/3)

pH: strongly to slightly acid (pH 4.0 – 6.5)

Texture: usually loamy sand or sandy loam but texture may be as clayey as fine sandy clay loam, all normal plastic

Stickiness:	non-sticky to slight
Structure:	weakly to moderately pedal with round and sub-angular blocky peds 10 – 100mm breaking to crumbs, granular, round or sub-angular blocky peds <2 – 10 mm diameter, and earthy, sandy or rough-faced porous ped fabric
Coherence:	weak
Stone content:	usually no stones are present; occasionally there are up to 10% rounded, sub-angular or angular quartz or coarse quartz sandstone fragments up to 20mm in size
Roots:	many to abundant
Faunal mixing:	usually abundant
Inclusions:	charcoal fragments usually occur
Boundary:	sharp or clear and even, wavy or broken to layers 2, 3, 5 or 6

Layer 2 (slightly to moderately moist)

Diagnostic features:	dark brown to brown, weakly to moderately pedal, clayey sand
Occurrence:	occasionally present as an A12 horizon or lower topsoil layer, 7 – 58+cm thick
Colour:	dark brown (7.5YR 3/3) or brown (7.5YR 4/4, 4/3), but ranges from brownish black (7.5YR 3/2) to yellowish brown (10YR 5/6)
pH:	moderately acid (pH 5.5)
Texture:	clayey sand or loamy sand but also light sandy clay loam, loam fine sandy, normal plastic
Stickiness:	usually slight
Structure:	weakly to moderately pedal with round and sub-angular blocky peds 10 – 100mm breaking to round sub-angular and angular blocky peds 2 – 10mm diameter, and earthy, sandy or rough-faced porous ped fabric
Coherence:	weak
Stone content:	0 – 10% rounded sub-angular or angular quartz or quartz sandstone fragments up to 60mm in size may occur
Roots:	common to many

Faunal mixing: many to abundant, infilled faunal channels can be observed

Inclusions: charcoal fragments are usually present

Boundary: clear or gradual and wavy to layers 3, 4, 5 or 6

Layer 3 (slightly to moderately moist)

Diagnostic features: brown to dull yellowish brown weakly to moderately pedal, loamy sand or clayey sand

Occurrence: commonly present as a second topsoil layer (i.e. present where layer 2 is not present) or either bleached or unbleached A2 horizon, 13 – 38cm thick

Colour: dull yellowish brown (10YR 4/3, 5/3) or brown (7.5YR 4/3, 4/4) also dark reddish brown (5YR 3/3) and dull yellow orange (10YR 6/4). This layer is usually not bleached

pH: moderately to slightly acid (pH 5.0 – 6.5)

Texture: loamy sand, clayey sand or light sandy clay loam, normal plastic

Stickiness: non-sticky to slight

Structure: weakly to moderately pedal with round and sub-angular blocky peds 10 – 100mm diameter which break, in the moderately pedal cases to round peds 5 – 10mm diameter, and earthy, sandy or rough-faced porous ped fabric

Coherence: weak

Stone content: stones are not usually present but at one site up to 90% rounded quartz and coarse-grained quartz sandstone fragments up to 20mm diameter occurred, with some bigger floaters up to 200mm on the slope

Roots: common to abundant

Faunal mixing: common

Inclusions: charcoal fragments may occur

Boundary: sharp, clear or gradual and usually wavy to either layer 4 or more commonly layers 5 or 6

Layer 4 (slightly to moderately moist)

Diagnostic features: dark brown to brown, pedal clayey sand or silty clay loam

Occurrence: rarely present as a transition layer or A3 horizon, 6 – 29cm thick
Colour: dark brown (7.5YR 3/3) or brown (7.5YR 4/6)
pH: not recorded
Texture: clayey sand or silty clay loam, normal plastic
Stickiness: slight to moderate
Structure: moderately pedal with sub-angular blocky peds 20 – 50mm breaking to round peds 5 – 10mm diameter, and rough-faced porous ped fabric
Coherence: not recorded
Stone content: none present
Roots: many
Faunal mixing: common
Inclusions: charcoal fragments may occur
Boundary: sharp or clear and wavy or irregular to layer 6

Layer 5 (slightly to moderately moist)

Diagnostic features: brown, weakly to moderately pedal clayey sand or sandy clay loam

Occurrence: sometimes present as an upper subsoil layer or B1 horizon, 8 – 27cm thick
Colour: brown (7.5YR 4/4, 4/6) and ranges from dark brown (7.5YR 3/3) to orange (7.5YR 6/6)
pH: moderately to slightly acid (pH 5.5 – 6.0)
Texture: clayey sand, sandy clay loam or light clay, all normal plastic
Stickiness: non-sticky to moderate
Structure: usually weakly to moderately pedal with sub-angular blocky, angular blocky or round peds 10 – 100mm, breaking in the more pedal cases to 2 – 20mm diameter, and earthy, sandy, smooth-faced or rough-faced porous ped fabric
Coherence: weak

Stone content: 0 – 10% rounded to angular ironstone or sedimentary fragments may occur up to 20mm in size

Roots: usually common

Faunal mixing: common

Inclusions: charcoal fragments commonly occur

Boundary: clear and wavy or broken to layer 6

Layer 6 (slightly moist to wet)

Diagnostic features: bright brown or yellow brown, weakly to strongly pedal clayey sand, sandy clay or light medium clay

Occurrence: always present as a master colour subsoil layer or B2, B21 horizon, 13 – 70+cm thick

Colour: bright brown (7.5YR 5/6, 5/8) or yellow brown (10YR 5/6, 5/8) and ranges from reddish brown (2.5YR 4/8) to bright yellowish brown (10YR 6/6)

pH: strongly to slightly acid (pH 4.5 – 6.0)

Texture: clayey sand, sandy light clay or light medium clay, all normal plastic

Stickiness: non-sticky to moderate

Structure: weakly, moderately or strongly pedal with round and sub-angular blocky peds 5 – 100mm diameter breaking to round sub-angular blocky, angular blocky or lenticular peds 2 – 10mm diameter, and either earthy, sandy or rough-faced porous ped fabric or smooth-faced, slowly porous to dense ped fabric

Coherence: weak to moderate

Stone content: usually no stones are present but there may be <2 – 90% rounded to angular quartz or iron-rich quartz sandstone fragments up to 600mm in size

Roots: many to few

Faunal mixing: common and becoming less common with depth

Inclusions: charcoal fragments may occur but these tend to be less common than in overlying layers

Boundary: sharp, clear or gradual and wavy to layers 7, 8, 9 or 10

Layer 7 (moderately moist to wet)

Diagnostic features: bright brown, apedal to weakly pedal sandy light clay

Occurrence: rarely present as a lower subsoil layer or B22 horizon, 15 – 43+cm thick

Colour: bright brown (7.5YR 5/6); also dull yellow orange (10YR 6/4) or brown (7.5YR 4/4)

pH: moderately acid (pH 5.0)

Texture: sandy light clay or loamy sand, normal plastic

Stickiness: non-sticky to slight

Structure: either apedal massive or weakly pedal with sub-angular blocky and platy peds 10 – 50mm diameter, and earthy, sandy or rough-faced porous ped fabric

Coherence: slight

Stone content: up to 2% sub-angular and angular quartz fragments may occur up to 20mm in size

Roots: few

Faunal mixing: rare

Inclusions: none observed

Boundary: sharp or clear and even to layers 8 or 10

Layer 8 (slightly moist)

Diagnostic features: dull yellow orange, strongly pedal light medium clay

Occurrence: occasionally present as a lower subsoil layer or B3 horizon, 16 – 31+cm thick

Colour: dull yellow orange (10YR 6/4, 7/2); also bright brown (7.5YR 5/6) or dull yellowish brown (10YR 5/3)

pH: moderately acid (pH 5)

Texture: normally light medium clay and rarely loamy sand, all normal plastic

Stickiness: non-sticky to slight

Structure: strongly pedal with angular and sub-angular blocky peds 50 - 100mm breaking to lenticular peds <2 - 5mm diameter, and smooth-faced slowly porous ped fabric

Coherence: usually moderate

Stone content: none observed at any site

Roots: few

Faunal mixing: rare

Inclusions: none observed

Boundary: gradual and wavy to layer 9

Layer 9

Diagnostic features: bright brown, weakly pedal, strongly weathered rock layer

Occurrence: always present but not usually reached at depth and a transitional layer or C horizon, 32+cm thick

Colour: bright brown (7.5YR 5/8)

pH: not recorded

Texture: not obtainable

Stickiness: not obtainable

Structure: weakly pedal with sub-angular blocky peds 20 - 50mm diameter

Coherence: not obtainable

Stone content: >90% stones

Roots: few

Faunal mixing: none

Inclusions: none

Boundary: not reached at depth

3.2.7 Soil Mapping Unit G – (soils developed on Walloon Coal Measures)

3.2.7.1 Summary

These soils occupy areas adjacent to basalt soils in the Richmond Range State Forest, and also dominate in the Cherry Tree State Forest. South of this they occur exclusively in Mount Pikapene State Forest and partly extend southwards into Mount Belmore State Forest. Terrain is generally moderately gentle throughout.

The soils consist of a brownish black, slightly to strongly acid, pedal, weakly to moderately coherent, strongly bioturbated light sandy clay loam, clay loam, silty light clay or light clay topsoil, uncommonly over a dull yellowish brown, usually bleached, slightly to strongly acid, pedal, moderately coherent, strongly bioturbated, light sandy clay loam, sandy clay loam or light clay lower topsoil layer, sometimes over a brown, slightly to strongly acid, strongly pedal, either moderately coherent and strongly bioturbated or strongly to very strongly coherent and weakly bioturbated, light medium clay upper subsoil layer. The boundary between the overlying layer (A1, A12, A2, B1) and the master colour subsoil layer, which always occurs, is usually sharp to clear, but may also be gradual. This layer is characterised by a reddish brown, slightly to strongly acid, moderately to very strongly coherent, strongly to weakly bioturbated at depth, slightly stony, strongly pedal, light to light medium clay. This is commonly underlain by a yellowish brown to greyish yellow brown, slightly to moderately acid, pedal, moderately coherent, non to weakly bioturbated, light medium clay. At depth is the strongly weathered sedimentary bedrock which extends to the unweathered rocks through a thickness of 12 – 85+cm.

Of the 21 description sites recorded within this unit, eight were located in an upper slope situation (gradients ranging from 5% to 32%), three in a midslope situation (7% – 20%), five lower slope (4% – 20%), and five ridgetop (3% – 47%).

3.2.7.2 Dominant soil materials

Northcote Codings: Uf 5.22, Uf 5.31, Uf 6.31, Uf 6.33, Uf 6.34; Gn 3.14, Gn 3.84, Gn 3.91, Gn 3.94; Dr 2.21, Dr 4.11, Dr 4.21, Dr 5.11, Dr 5.21; Db 0.41;

Great Soil Groups: Structured plastic and sub-plastic clays, Krasnozems, Xanthozems, Chocolate soils, Red podzolic soils, Yellow podzolic soils

Surface Condition: gravelly, firm, rarely hard-setting or friable with some stones and a plant litter layer up to 1cm thick. One soil had a crust but this is unusual. Surface stones range from 0 – 20% and are rounded, sub-rounded, sub-angular or angular and range in size from 2 – 600mm although they are generally up to 60mm in size, and they may be lithic sandstone, ironstone or quartz fragments

3.2.7.3 Description

Layer 1 (usually slightly to moderately moist)

Diagnostic features:	brownish black, pedal light clay
Occurrence:	always present as an A A1 or A11 horizon or topsoil layer, 2 – 38cm thick
Colour:	usually brownish black (5YR 2/2, 7.5YR 2/2, 3/2, 10YR 2/2, 3/2) but can range from dark reddish brown (5YR 3/2) to greyish yellow brown (10YR 4/2, 5/2)
pH:	usually strongly to slightly acid (pH 4.5 – 6.5)
Texture:	light clay, light sandy clay loam, clay loam or silty light clay, all normal plastic
Stickiness:	slight to moderate
Structure:	usually moderately to strongly pedal with round and sub-angular blocky peds 10 – 100mm breaking to angular blocky, sub-angular blocky, granular and crumb peds <2 – 20mm diameter, and smooth-faced or rough-faced, porous to dense ped fabric
Coherence:	weak to moderate
Stone content:	0 – 20% rounded to angular quartz, lithic sandstone or ironstone pebbles may occur up to 60mm in size
Roots:	many to abundant
Faunal mixing:	abundant
Inclusions:	charcoal fragments usually occur and rarely, soft iron nodules may also occur
Boundary:	sharp to gradual and even or wavy to layers 2, 3, 4 or 5

Layer 2 (slightly to moderately moist)

Diagnostic features:	dark reddish brown, pedal light sandy clay loam
Occurrence:	rarely present as a A12 horizon or lower topsoil layer, 15 – 33cm thick
Colour:	dark reddish brown (5YR 3/2); also greyish brown (7.5YR 4/2), brown (7.5YR 4/4) or bright yellowish brown (10YR 6/6)

pH:	moderately to slightly acid (pH 5.0 – 6.0)
Texture:	light sandy clay loam, clay loam, or light clay, all normal plastic
Stickiness:	slight to moderate
Structure:	moderately pedal with sub-angular blocky peds 50 – 100mm breaking to 5 – 20mm diameter, and rough-faced porous ped fabric
Coherence:	weak to moderate
Stone content:	<2 – 10% rounded to sub-angular, quartz, sedimentary or ironstone fragments occur up to 20mm in size
Roots:	many to common
Faunal mixing:	abundant
Inclusions:	charcoal fragments usually occur
Boundary:	sharp to gradual and even to irregular to layers 3 or 5

Layer 3 (slightly to moderately moist)

Diagnostic features:	dull yellowish brown, pedal light sandy clay loam, sandy clay loam or light clay
Occurrence:	uncommonly present as a bleached A2 horizon or lower topsoil layer, 9 – 26cm thick
Colour:	dull yellowish brown (10YR 5/3, 5/4) but ranges from dark reddish brown (5YR 3/6) to dull yellow orange (10YR 7/4)
pH:	strongly to slightly acid (pH 4.5 – 6.0)
Texture:	light sandy clay loam, sandy clay loam, or light clay, all normal plastic
Stickiness:	slight
Structure:	usually moderately pedal with sub-angular blocky peds 20 – 100mm breaking to 2 – 10mm diameter, and rough-faced porous ped fabric
Coherence:	moderate
Stone content:	usually 2 – 10% rounded and sub-rounded quartz lithic sandstone or ironstone pebbles occur up to 20mm in size
Roots:	many to common

Faunal mixing: abundant

Inclusions: charcoal fragments usually occur, rarely soft iron nodules also can occur

Boundary: sharp or clear and usually wavy to layers 4 or 5

Layer 4 (moderately moist)

Diagnostic features: brown, strongly pedal light medium clay

Occurrence: sometimes present as a B1 horizon or upper subsoil layer, 9 – 23cm thick

Colour: brown (7.5YR 4/6, 4/4) but ranges from dark reddish brown (5YR 3/4) to dull yellowish brown (10YR 5/4)

pH: strongly to slightly acid (pH 4.5 – 6.0)

Texture: usually light medium clay but also light clay or light sandy clay loam, all normal plastic

Stickiness: slight to moderate

Structure: strongly pedal with sub-angular blocky peds 20 – 100mm breaking to lenticular, angular blocky or sub-angular blocky peds <2 – 5mm diameter, and smooth-faced dense to slowly porous ped fabric

Coherence: moderate to very strong

Stone content: <2 – 10% rounded to angular lithic sandstone or ironstone pebbles occur up to 20mm in size

Roots: many to common

Faunal mixing: common

Inclusions: charcoal fragments are usually present

Boundary: clear to gradual and wavy to layer 5

Layer 5 (slightly moist to wet)

Diagnostic features: reddish brown, pedal light medium clay

Occurrence: always present as a B2, B21 horizon or master colour subsoil horizon, 8 – 51cm thick

Colour:	usually reddish brown (2.5YR 4/8, 5YR 4/6, 4/8) or dark reddish brown (2.5YR 3/6, 5YR 3/6); also brown (7.5YR 4/6, 10YR 4/4) and greyish brown (7.5YR 4/2, 5/2)
pH:	strongly to slightly acid (pH 4.5 – 6.0)
Texture:	light to light medium clays, normal plastic; rarely super-plastic heavy clays
Stickiness:	slight to moderate
Structure:	moderately to strongly pedal with sub-angular blocky, lenticular or prismatic peds 20 – 200mm breaking to lenticular, angular blocky or sub-angular blocky peds <2 – 10mm diameter, and smooth-faced slowly porous to dense ped fabric
Coherence:	moderate
Stone content:	0 – 10% rounded to angular quartz lithic sandstone or ironstone fragments may occur usually up to 20mm in size but sometimes up to 200mm diameter
Roots:	many to common
Faunal mixing:	common in the upper part of the layer but decreasing with depth
Inclusions:	charcoal fragments occasionally occur; rarely manganese or iron nodules also occur
Boundary:	gradual and wavy to layers 6, 7 or 9

Layer 6 (moderately moist)

Diagnostic features:	dark reddish brown, pedal light medium clay
Occurrence:	very rarely present as a B22 horizon or lower subsoil layer, <30 – 59cm thick
Colour:	dark reddish brown (2.5YR 3/4) or bright brown (7.5YR 5/6)
pH:	moderately acid (pH 5.0)
Texture:	light to light medium clay, normal plastic or super-plastic heavy clay
Stickiness:	slight

Structure: strongly pedal with angular and sub-angular blocky peds 50 – 100mm breaking to lenticular and angular blocky peds 2 – 10mm diameter, and smooth-faced slowly porous ped fabric

Coherence: moderate

Stone content: <2% angular and sub-angular sedimentary fragments occur up to 200mm in size

Roots: common

Faunal mixing: uncommon

Inclusions: none observed

Boundary: clear to diffuse and wavy to layer 7

Layer 7 (moderately moist to wet)

Diagnostic features: greyish yellow brown, pedal light medium clay

Occurrence: commonly present as a B3 horizon or lower subsoil layer, 16 – 52+cm thick

Colour: usually either greyish yellow brown (10YR 4/2) or yellowish brown (10YR 5/6) but can range from brown (7.5YR 4/6) to bright yellowish brown (10YR 6/6)

pH: moderately to slightly acid (pH 5.0 – 6.0)

Texture: normally light to light medium clay, all normal plastic and rarely super-plastic heavy clay

Stickiness: slight to moderate

Structure: moderately to strongly pedal with lenticular, angular blocky or sub-angular blocky peds 20 – 200mm breaking to <2 – 20mm diameter, and smooth-faced slowly porous to dense ped fabric

Coherence: moderate

Stone content: 0 – 90%, but usually up to 10% sub-angular and angular sedimentary or ironstone fragments occur up to 20mm in size and occasionally up to 200mm in size

Roots: few to common

Faunal mixing: uncommon to rare

Inclusions: charcoal fragments are not normally observed and rarely, manganese nodules are observed

Boundary: clear to diffuse and wavy to layers 8, 9 or 10

Layer 8 (moderately moist)

Diagnostic features: none have been recorded for this layer

Occurrence: very rarely present as a transitional layer or BC horizon, 27+cm thick

Layer 9 (slightly to moderately moist)

Diagnostic features: very stony, weathered bedrock

Occurrence: always present but not always reached at depth as a C horizon or weathered parent material layer, at depth >52cm

Colour: not recorded

pH: not recorded

Texture: not obtainable

Stickiness: not obtainable

Structure: orthogonal to oblique planar void pattern is apparent

Coherence: not obtainable

Stone content: >90% angular stones are present up to 60mm in size

Roots: few to common

Faunal mixing: none

Inclusions: none

Boundary: sharp to gradual to layer 10

Layer 10 (slightly moist to dry)

Diagnostic features: rock

Occurrence: always present but usually not reached at depth as an R horizon or unweathered bedrock at >60cm depth

Colour: not recorded

pH:	not obtainable
Texture:	not obtainable
Stickiness:	not obtainable
Structure:	oblique to orthogonal planar void pattern is faintly observable
Coherence:	not obtainable
Stone content:	100% sedimentary rock
Roots:	not present
Faunal mixing:	none
Inclusions:	none

3.2.8 Soil Mapping Unit H – (soils developed on Marburg sediments)

3.2.8.1 Summary

These soils occur in three, widely separated localities in the management areas: the largest of the three localities occurs in the Sugarloaf, Keybarbin and part Mount Marsh State Forests, east of the Clarence River and east and north of Baryulgil. The smaller locality is in parts of Wollumbin and Nullum State Forests south-west of Murwillumbah, and the smallest site is in the eastern-most area of Tabbimoble State Forest, east of the Pacific Highway.

In general the terrain is gentle to flat, except for those areas where the bedrock outcrops as modified escarpments. In these instances the terrain tends to be steeper and quite broken (e.g. Site 0902).

The soils are generally dark coloured, sandy and weakly to moderately pedal in the topsoil and redder, clayey and moderately to strongly pedal in the subsoil.

In more detail then, a brownish black to very dark reddish brown, neutral to moderately acid, weakly to moderately pedal, weakly to moderately coherent, strongly bioturbated sandy (loamy sand to fine sandy clay loam) topsoil layer has a sharp boundary to either, sometimes a bleached, dull brown to greyish yellow brown, moderately acid, moderately pedal, weakly coherent, light sandy clay loam or sandy clay loam lower topsoil layer, or commonly a dark reddish brown to dull yellow orange, slightly acid, pedal, weakly to moderately coherent, commonly bioturbated, more clayey (fine sandy clay loam to medium clay) transition or upper subsoil layer, or both. These layers have a sharp to clear boundary to a dark reddish brown to bright yellowish brown, moderately acid, strongly pedal, coherent, commonly bioturbated, light, light medium or heavy clay master colour subsoil layer. This layer sometimes overlies a bright brown, moderately acid, pedal, light to light medium clay transition or lower subsoil layer, always over a strongly weathered

iron-rich sandstone layer, below 58 – 72cm depth. This is occasionally observed to grade into unweathered rock below 96cm depth.

Of the eight description sites recorded within this unit, two were located in an upper slope situation (gradients ranging from 20% to 23%), one in a midslope situation (12%), two lower slope (5% – 9%), one hilltop flat (3%), and two ridgetop (12% – 40%).

3.2.8.2 Dominant soil materials

Northcote Codings: Uf 5.32; Gn 2.21, Gn 3.11; Dy 4.11, Dy 5.21, Dy 5.41

Great Soil Groups: Krasnozems, Yellow earths, Yellow podzolic soils

Surface Condition: loose to friable or crusting with a plant litter layer up to 1cm thick. Stones are usually present in amounts up to 20%. They may be angular to rounded and up to 200mm in size and consist of iron-rich sandstone fragments and quartz fragments

3.2.8.3 Description

Layer 1 (slightly moist to wet)

Diagnostic features: brownish black, weakly acid, pedal loamy sand to light clay

Occurrence: always present as an A, A1 horizon, 3 – 18cm thick

Colour: commonly brownish black (7.5YR 2/2, 10YR 2/2, 3/2) or very dark reddish brown (5YR 2/3)

pH: moderately acid to neutral (pH 5.5 – 7.0)

Texture: generally sandy but highly variable, ranging from loamy sand through to light clay with sandy loam, light sandy clay loam, loam fine sandy, silty clay loam and fine sandy clay loam being textured in between those two extremes

Stickiness: slight

Structure: weakly to strongly pedal with sub-angular blocky and round peds 10 – 100mm, breaking to sub-angular blocky, round, granular and crumb peds 2 – 10mm in size, and earthy or rough-faced porous fabric

Coherence: weak to moderate

Stone content: usually 2 – 10% rounded to angular, iron-rich sandstone and quartz fragments are present up to 200mm in size but generally around 2 – 20mm in size

Roots: many to abundant
Faunal mixing: abundant
Inclusions: charcoal fragments may occur
Boundary: usually sharp and even to layers 2, 3 or 4

Layer 2 (slightly moist or wet)

Diagnostic features: dull brown, acid, moderately pedal, light sandy clay loam or sandy clay loam
Occurrence: sometimes present as a bleached A2 horizon, 18 – 21cm thick
Colour: dull brown (7.5YR 5/4) or greyish yellow brown (10YR 6/2)
pH: moderately acid (pH 5.0)
Texture: either a light sandy clay loam or a sandy clay loam
Stickiness: slight
Structure: moderately pedal with sub-angular blocky and round peds 20 – 100mm in size breaking to 2 – 10mm diameter, and earthy, sandy or rough-faced porous ped fabric
Coherence: very weak
Stone content: <2 – 50% rounded, sub-rounded or sub-angular stones occur, ranging in size from 2 – 60mm. They consist of quartz and sedimentary fragments
Roots: common
Faunal mixing: many
Inclusions: none observed
Boundary: sharp and wavy to layers 3 or 4

Layer 3 (moderately moist to wet)

Diagnostic features: dull yellow orange, slightly acid, pedal fine sandy clay loam
Occurrence: commonly present as transition layer or B1 horizon, 23 – 30cm thick

Colour: dull yellow orange (10YR 6/4) or bright yellowish brown (10YR 6/8); also dark reddish brown (2.5YR 3/4) and bright brown (7.5YR 5/6)
pH: slightly acid (pH 6.0)
Texture: usually clayey – fine sandy clay loam, silty light clay or medium clay, and rarely sandy – sandy loam, all normal plastic
Stickiness: slight to moderate
Structure: moderately to strongly pedal with sub-angular blocky and round peds 20 – 100mm breaking to 2 – 20mm diameter, and rough-faced or earthy porous ped fabric
Coherence: very weak to moderate
Stone content: <2 – 20% rounded and sub-rounded quartz and iron-rich sandstone fragments occur up to 60mm in size
Roots: common
Faunal mixing: common to many
Inclusions: charcoal fragments are observed
Boundary: clear to gradual and wavy to layer 4

Layer 4 (moderately moist to wet)

Diagnostic features: dark reddish brown or bright yellowish brown, acid, pedal light to light medium clay
Occurrence: always present as a master colour subsoil layer or B2, B21 horizon, 19 – 35cm thick
Colour: dark reddish brown (5YR 3/6, 2.5YR 3/6) or bright yellowish brown (10YR 6/6) and includes other colours ranging from reddish brown (5YR 4/8) to yellowish brown (10YR 5/6)
pH: moderately to slightly acid (pH 5.5 – 6.5)
Texture: light clay to light medium clay, normal plastic. Other less common textures which can occur are sandy loam, sandy light clay or heavy clay, normal plastic
Stickiness: usually slight (rarely moderate or non-sticky)

Structure: moderately to strongly pedal with predominantly sub-angular blocky, with some lenticular, angular blocky and round peds 50 – 100mm breaking to lenticular, angular blocky or sub-angular blocky with some platy and round peds <2 – 20mm diameter, and smooth-faced dense or rough-faced porous ped fabric

Coherence: weak to very strong

Stone content: 0 – 20% rounded and sub-rounded quartz and iron-rich sandstone fragments may occur up to 200mm in size

Roots: common

Faunal mixing: common

Inclusions: charcoal was observed at some sites

Boundary: diffuse or gradual and wavy to layers 5, 6 or 7

Layer 5 (wet)

Diagnostic features: dull yellowish brown, alkaline, strongly pedal light medium clay

Occurrence: rarely present as a lower subsoil layer or B22 horizon, 99+cm thick

Colour: dull yellowish brown (10YR 5/4)

pH: slightly alkaline (pH 8.0)

Texture: light medium clay, normal plastic

Stickiness: slight

Structure: strongly pedal with lenticular peds 50 – 100mm breaking to 2 – 5mm diameter, and smooth-faced dense ped fabric

Coherence: not recorded

Stone content: 2 – 10% sub-rounded to angular sedimentary fragments occur up to 200mm in size

Roots: not recorded

Faunal mixing: not recorded

Inclusions: not recorded

Boundary: not recorded

Layer 6 (slightly to moderately moist)

Diagnostic features: bright brown, acid, pedal light medium clay

Occurrence: sometimes present as a transition layer or B3 horizon, 27 – 48cm thick

Colour: bright brown (7.5YR 5/6, 5/8) or reddish brown (2.5YR 4/8)

pH: strongly to moderately acid (pH 5.0 – 5.5)

Texture: light or light medium clay, normal plastic

Stickiness: slight to moderate

Structure: moderately to strongly pedal with sub-angular blocky and lenticular peds 20 – 100mm breaking to 2 – 10mm diameter, and smooth-faced dense ped fabric

Coherence: not recorded

Stone content: 2 – 50% rounded to sub-angular, sedimentary fragments occur up to 200mm in size

Roots: common

Faunal mixing: many

Inclusions: none observed

Boundary: sharp and broken or diffuse to layers 7 or 8

Layer 7

Diagnostic features: strongly weathered sandstone

Occurrence: always present but not always reached at depth as a weathered rock layer or C horizon, at or below 58 – 72cm depth.

No other parameters were recorded for this layer

Layer 8

Diagnostic features: unweathered rock

Occurrence: always present but rarely reached at depth as an unweathered rock layer or R horizon, below 96cm depth

No other parameters were recorded for this layer

3.2.9 Soil Mapping Unit I – (soils developed on volcanics)

3.2.9.1 Summary

These soils occupy all of Whian Whian and Goonengerry State Forests, the majority of Nullum State Forest in the north-east, and a significant portion of Ewingar State Forest in the far west of the Casino Management Area.

The soils can be described as a brownish black, dark brown or dark reddish brown, slightly to strongly acid, strongly pedal, moderately coherent, strongly bioturbated, sandy clay loam, silty clay loam, silty clay or light clay topsoil layer usually over either a brownish black, acid, strongly pedal, coherent, strongly bioturbated, silty light clay or light clay lower topsoil layer or a dark reddish brown to bright yellowish brown, acid, pedal, coherent, strongly bioturbated silty light clay to light clay bleached or unbleached lower topsoil layer, or both, over a reddish brown, dull reddish brown or bright reddish brown, acid, strongly pedal, coherent, strongly bioturbated light to light medium clay upper subsoil layer over a dark reddish brown, reddish brown or bright reddish brown, acid, strongly pedal, coherent, strongly bioturbated light to light medium clay master colour subsoil layer over a strongly weathered igneous rock layer, below 47 – 91cm depth.

Of the 17 description sites recorded within this unit, eight were located in an upper slope situation (gradients ranging from 4% to 18%), two in a midslope situation (6% – 12%), one lower slope (10%), one hilltop (5%), and five ridgeline (9% – 40%).

3.2.9.2 Dominant soil materials

Northcote Codings: Uf 2, Uf 5.22, Uf 5.23, Uf 6.21, Uf 6.31; Gn 3.11, Gn 3.14, Gn 3.71, Gn 3.74, Gn 4.81; Dr 4.41; Dy 4.11

Great Soil Groups: Structured plastic and sub-plastic clays, Krasnozems, Red podzolic soils, Yellow podzolic soils

Surface Condition: usually self-mulching with a plant litter layer up to about 1cm thick with varying degrees of decomposing roots, twigs, leaves and bark, also charcoal fragments and up to 50% stones may occur. These are rounded to angular up to 600mm in size and are composed of igneous tuff

3.2.9.3 Description

Layer 1 (slightly to moderately moist)

Diagnostic features: brownish black, dark brown or dark reddish brown pedal silty clay loam to silty light clay

Occurrence:	always present as a topsoil layer or A, A1, A11 horizon 3 – 26cm thick
Colour:	commonly brownish black (5YR 2/2, 7.5YR 2/2, 3/2) dark brown (7.5YR 3/4, 3/3, 10YR 3/3) dark reddish brown (5YR 3/4, 3/3, 3/2, 3/6) or very dark reddish brown (2.5YR 2/2, 5YR 2/3)
pH:	strongly to slightly acid (pH 4.5 – 6.5)
Texture:	usually silty clay loam or silty light clay; also sandy clay loam or light clay, usually normal plastic with some sub-plastic
Stickiness:	usually moderate, sometimes slight
Structure:	moderately to strongly pedal, with sub-angular blocky and round peds 10 – 100mm breaking to crumbs, granular, round, sub-angular blocky, angular or lenticular peds <2 – 10mm diameter, and sandy, smooth-faced or rough-faced porous ped fabric
Coherence:	moderate to weak
Stone content:	0 – 50%, but usually 10 – 20% rounded to angular igneous tuff fragments occur up to 600mm in size
Roots:	abundant
Faunal mixing:	abundant
Inclusions:	charcoal fragments usually occur
Boundary:	usually sharp or clear and even or wavy to layers 2, 3, 4 or 6

Layer 2 (slightly to moderately moist)

Diagnostic features: brownish black, pedal, silty light clay to light clay

Occurrence:	uncommonly present as a lower topsoil layer or A12 horizon, 11 – 24cm thick
Colour:	brownish black (7.5YR 2/2, 3/2, 10YR 2/3), and ranges from very dark reddish brown (2.5YR 2/3) to dull yellowish brown (10YR 5/4)
pH:	strongly to slightly acid (pH 4.5 – 6.5)
Texture:	usually silty light clay or light clay, all normal plastic, also sandy clay loam
Stickiness:	slight to moderate

Structure:	moderately to strongly pedal with sub-angular blocky and angular blocky peds 20 – 100mm breaking to crumb, granular, lenticular angular blocky or sub-angular blocky peds <2 – 10mm diameter, and smooth-faced or rough-faced porous ped fabric
Coherence:	moderate to weak
Stone content:	2 – 20% rounded to angular igneous tuff fragments occur up to 200mm in size
Roots:	usually abundant
Faunal mixing:	abundant
Inclusions:	charcoal fragments commonly occur
Boundary:	clear and even or wavy to layers 3, 4 or 6

Layer 3 (slightly to moderately moist)

Diagnostic features:	dark reddish brown or bright yellowish brown, pedal, light clay
Occurrence:	sometimes present as a lower topsoil layer or bleached and unbleached A2 horizon 7 – 38cm thick
Colour:	commonly dark reddish brown (5YR 3/4, 3/6) to brown (7.5YR 4/6, 10YR 4/6, 6/6) unbleached, or dark brown (7.5YR 5/6) to bright yellowish brown (10YR 6/6, 7/6) bleached
pH:	strongly to slightly acid (pH 4.5 – 6.0)
Texture:	usually silty light clay or light clay, also sandy clay loam or light medium clay, all normal plastic
Stickiness:	usually slight, sometimes moderate
Structure:	moderately to strongly pedal with sub-angular blocky, angular blocky or lenticular peds 10 – 100mm breaking to <2 – 10mm diameter, and smooth-faced slowly porous or rough-faced porous ped fabric
Coherence:	moderate to weak, sometimes strong
Stone content:	10 – 20% rounded and sub-rounded igneous or sedimentary rock fragments occur up to 200 mm in size
Roots:	many

Faunal mixing: abundant
Inclusions: charcoal fragments commonly occur
Boundary: usually sharp to clear and wavy to layers 4 or 6

Layer 4 (slightly to moderately moist)

Diagnostic features: reddish brown to bright reddish brown, pedal, light to light medium clay
Occurrence: sometimes present as an upper subsoil layer or B1, B11 horizon, 10 – 42cm thick
Colour: reddish brown (2.5YR 4/6, 5YR 4/6), bright reddish brown (5YR 5/6, 5/8) or dull reddish brown (5YR 4/4)
pH: strongly to slightly acid (pH 4.5 – 6.0)
Texture: light to light medium clay, or silty light clay, all normal plastic
Stickiness: slight to moderate
Structure: mainly strongly pedal with sub-angular blocky, angular blocky or lenticular peds 20 – 100mm breaking to angular blocky and lenticular peds <2 – 5mm diameter, and smooth-faced slowly porous or rough-faced porous ped fabric
Coherence: weak to moderate, sometimes strong
Stone content: 0 – 50% rounded to angular, igneous tuff fragments up to 600mm in size may occur
Roots: many
Faunal mixing: many to abundant
Inclusions: charcoal fragments may occur
Boundary: sharp to gradual and wavy to layers 5 or 6

Layer 5 (slightly to moderately moist)

Diagnostic features: bright reddish brown, strongly pedal light medium clay
Occurrence: rarely present as an upper subsoil layer or B12 horizon, 26cm thick

Colour:	bright reddish brown (5YR 5/6)
pH:	moderately acid (pH 5.5)
Texture:	light medium clay, normal plastic
Stickiness:	slight
Structure:	strongly pedal with sub-angular blocky peds 20 – 100mm breaking to angular blocky peds <2mm diameter, and smooth-faced slowly porous ped fabric
Coherence:	moderate
Stone content:	no stones are present
Roots:	many
Faunal mixing:	abundant
Inclusions:	charcoal fragments are commonly observed
Boundary:	wavy to layer 6

Layer 6 (slightly to moderately moist)

Diagnostic features:	dark reddish brown to bright reddish brown, pedal light to light medium clay
Occurrence:	always present as a master colour subsoil layer or B2 horizon 27 – 193+cm thick
Colour:	commonly dark reddish brown (2.5YR 3/6), reddish brown (2.5YR 4/8) or bright reddish brown (5YR 5/8); colours range from brown (7.5YR 4/3) to bright yellowish brown (10YR 6/6)
pH:	strongly to slightly acid (pH 4.0 – 6.0)
Texture:	usually light to light medium clay, normal plastic; also sandy light clay or silty light clay
Stickiness:	slight to moderate
Structure:	moderately to strongly pedal with lenticular, sub-angular blocky or angular blocky peds 20 – 100mm, breaking to lenticular or angular blocky peds <2 – 5mm diameter, and smooth-faced slowly porous or rough-faced porous ped fabric

Coherence:	moderate to weak
Stone content:	0 – >90% rounded to angular igneous fragments may occur up to 600mm in size
Roots:	common to many
Faunal mixing:	many to abundant
Inclusions:	charcoal fragments sometimes occur
Boundary:	sharp to gradual and wavy to layers 7, 8 or 9

Layer 7 (slightly to moderately moist)

Diagnostic features:	dark reddish brown, pedal light to light medium clay
Occurrence:	rarely present as a lower subsoil layer or B3 horizon, 36+cm thick
Colour:	dark reddish brown (5YR 3/6), bright brown (2.5YR 5/8) or yellow orange (7.5YR 7/8)
pH:	strongly acid (pH 4.5)
Texture:	light to light medium clay, normal plastic
Stickiness:	slight to moderate
Structure:	moderately to strongly pedal with lenticular and sub-angular blocky peds 20 – 100mm, breaking to lenticular and angular blocky peds <2mm diameter, and smooth-faced slowly porous ped fabric
Coherence:	moderate
Stone content:	0 – 50% rounded and sub-rounded igneous fragments may occur up to 60mm in size
Roots:	common
Faunal mixing:	uncommon to rare
Inclusions:	sometimes charcoal fragments may occur
Boundary:	not reached at depth

Layer 8 (slightly moist)

Diagnostic features: a mixture of strongly weathered rock fragments and soil

Occurrence: probably often present but not usually reached at depth as a transitional layer or BC horizon, at 130cm depth and thickness is 70+cm

No other parameters were recorded for this layer

Layer 9

Diagnostic features: strongly weathered igneous bedrock

Occurrence: always present but not usually reached at depth as a weathered bedrock layer or C horizon, below 47 – 91cm depth

Stone content: > 90% rounded to sub-rounded igneous rock fragments up to 600mm in size occur

Roots: rare

Faunal mixing: absent

Inclusions: absent

Boundary: boundary was not reached at depth

No other parameters have been recorded for this layer

3.3 SOIL LABORATORY ANALYSIS

Various soil samples were collected from throughout the study area for a range of laboratory analyses. The results of these analyses are presented below.

3.3.1 Results

3.3.1.1 Physical Analyses

Laboratory analyses were carried out on 122 soil samples collected from a total of 34 sampling sites. The results of these physical analyses, presented below in Table 4, have been grouped into the nine different soil mapping units.

Note that two different sets of values are presented for the Particle Size Analysis test. One set of values represents the results which include the percentage proportion of gravels, while the second set of values, presented inside square brackets (i.e., []) represents the results where the proportion of gravels has been excluded.

TABLE 4: Results of soil laboratory physical analyses

Site	Layer	Horizon	PARTICLE SIZE ANALYSIS (%)					D%	EAT
			Clay	Silt	Fine Sand	Coarse Sand	Gravel		
Soil Mapping Unit A – Alluvials									
1301	1	A11	22 [26]	15 [18]	47 [55]	1 [1]	15	6	8
1301	2	A12	28 [34]	25 [30]	29 [35]	1 [1]	17	21	8
1301	3	B2	27 [52]	10 [19]	15 [29]	0	48	19	3(2)
1301	4	D1	31 [66]	6 [13]	10 [21]	0	53	11	3(1)
1306	1	A1	12	9	24	55	0	21	8
1306	2	A2	14 [14]	5 [5]	24 [25]	55 [56]	2	21	2(1)
1306	3	B2	12	6	26	56	0	17	2(1)
Soil Mapping Unit B – Basalts									
0102	1	A	23 [31]	23 [31]	20 [26]	9 [12]	25	18	8
0102	2	B2	54 [66]	12 [15]	11 [13]	5 [6]	18	11	6
0201	1	A11	18 [25]	27 [37]	25 [35]	2 [3]	28	19	8
0201	2	A12	20 [28]	26 [36]	24 [33]	2 [3]	28	26	3(3)
0201	3	B2	20 [34]	15 [26]	21 [36]	2 [4]	42	20	3(1)
0201	4	B3	16 [25]	10 [15]	29 [45]	10 [15]	35	30	3(3)
0503	1	A	20 [27]	22 [29]	29 [39]	4 [5]	25	5	3(2)
0503	2	B1	18 [32]	14 [25]	22 [39]	2 [4]	44	14	3(2)
0503	3	B2	21 [41]	10 [20]	19 [37]	1 [2]	49	17	3(1)
0503	4	B3	17 [29]	11 [19]	21 [36]	9 [16]	42	22	3(3)
1201	1	A	14 [16]	27 [31]	38 [44]	8 [9]	13	16	8
1201	2	B2	45 [54]	16 [19]	19 [22]	4 [5]	16	5	2(1)
1201	3	B3	43 [54]	14 [17]	22 [28]	1 [1]	20	23	3(3)
1701	1	A1	32 [44]	15 [21]	18 [25]	7 [10]	28	8	8
1701	2	A2	61 [66]	16 [17]	13 [14]	3 [3]	7	13	3(1)
1701	3	B1	72 [74]	14 [14]	9 [9]	3 [3]	2	1	5
1701	4	B2	78 [81]	13 [13]	3 [3]	3 [3]	3	1	5
1801	1	A	22 [31]	16 [23]	23 [33]	9 [13]	30	19	2(1)
1801	2	B1	21 [30]	13 [18]	28 [39]	9 [13]	29	30	2(1)
1801	3	B2	23 [34]	13 [19]	21 [31]	10 [16]	33	36	2(1)
Soil Mapping Unit C – Metasediments									
1401	1	A	10 [21]	15 [31]	16 [33]	7 [15]	52	22	8
1401	2	B2	15 [21]	25 [35]	19 [27]	12 [17]	29	70	2(2)
2202	1	A	26 [31]	14 [16]	39 [46]	6 [7]	15	3	8
2202	2	B11	41 [43]	17 [18]	36 [37]	2 [2]	4	11	3(2)
2202	3	B12	45 [46]	17 [17]	36 [36]	1 [1]	1	15	3(1)
2202	4	B2	51 [55]	17 [18]	23 [26]	1 [1]	8	3	2(1)
Soil Mapping Unit D – Granitoids									
2101	1	A1	10 [10]	20 [21]	56 [59]	10 [10]	4	25	8
2101	2	A2	12 [14]	19 [22]	40 [47]	15 [17]	14	30	2(1)
2101	3	B2	12 [24]	6 [12]	22 [45]	9 [19]	51	21	2(1)

Site	Layer	Horizon	PARTICLE SIZE ANALYSIS (%)					D%	EAT
			Clay	Silt	Fine Sand	Coarse Sand	Gravel		
Soil Mapping Unit D cont'd									
2404	1/2	A11/A12	10 [12]	4 [5]	25 [30]	44 [53]	17	17	8
2404	3	A3	14 [16]	9 [10]	24 [26]	43 [48]	10	17	8
2404	4	B1	32 [37]	5 [6]	20 [23]	30 [34]	13	3	3(2)
2404	5	B2	43 [49]	5 [6]	17 [20]	22 [25]	13	2	3(1)
2501	1	A1	9 [16]	6 [11]	21 [36]	21 [37]	43	15	8
2501	2	A2	13 [19]	8 [12]	18 [26]	29 [43]	32	22	8
2501	3	B1	16 [23]	10 [14]	13 [19]	30 [44]	31	37	2(1)
2501	4	B2	21 [34]	8 [13]	9 [15]	23 [38]	39	20	2(1)
Soil Mapping Unit E - Grafton Formation									
1109	1	A1	13 [16]	19 [23]	48 [57]	3 [4]	17	20	2(1)
1109	2	A2	17 [23]	19 [25]	36 [48]	3 [4]	25	35	2(1)
1109	3	B2	42 [54]	13 [17]	23 [29]	0 [0]	22	22	2(1)
1109	4	B3	39 [52]	13 [17]	22 [30]	1 [1]	25	28	2(1)
1114	1	A11	20 [23]	15 [17]	37 [44]	14 [16]	14	22	8
1114	2	A12	12 [13]	27 [30]	42 [47]	9 [10]	10	40	2(1)
1114	3	A2	10 [12]	31 [37]	37 [44]	6 [7]	16	59	2(3)
1114	4	B2	42 [54]	8 [10]	23 [30]	5 [6]	22	9	2(1)
1114	5	B3	28 [39]	13 [18]	24 [34]	6 [9]	29	54	2(3)
1124	1	A1	7 [8]	8 [8]	41 [42]	42 [43]	2	40	2(1)
1124	2	A2	6 [6]	13 [14]	30 [32]	45 [48]	6	58	2(1)
1124	3	B2	37 [48]	4 [5]	23 [30]	13 [17]	23	32	2(1)
Soil Mapping Unit F - Kangaroo Creek Sandstone									
0601	1	A11	14 [15]	12 [12]	38 [39]	33 [34]	3	5	8
0601	2	A12	20 [22]	12 [13]	26 [29]	33 [36]	9	12	2(1)
0601	3	B1	29 [30]	10 [10]	18 [19]	40 [41]	3	12	2(1)
0601	4	B21	30 [30]	7 [7]	15 [15]	47 [48]	1	9	2(2)
0601	5	B22	25 [26]	6 [6]	9 [9]	57 [59]	3	14	2(2)
0601	6	B3	24 [38]	11 [17]	18 [29]	10 [16]	37	7	2(2)
0602	3	B21	5	10	40	45	0	55	8
0707	1	A1	5	5	22	68	0	57	8
0707	2	A2	6	4	28	62	0	62	3(2)
0707	3	B1	7 [7]	2 [2]	32 [32]	58 [59]	1	75	n.a.
0707	4	B2	5 [7]	1 [2]	18 [26]	45 [65]	31	75	n.a.
Soil Mapping Unit G - Walloon Coal Measures									
0404	1	A11	16 [17]	15 [16]	47 [52]	14 [15]	8	42	8
0404	2	A12	22 [26]	15 [18]	36 [42]	12 [14]	15	15	3(2)
0404	3	B2	29 [40]	11 [15]	27 [37]	6 [8]	27	30	3(3)
0404	4	B3	29 [38]	10 [13]	32 [41]	6 [8]	23	46	2(2)
0407	1	A	29 [38]	12 [16]	31 [41]	4 [5]	24	9	2(2)
0407	2	B2	39 [53]	10 [14]	22 [30]	2 [3]	27	25	5
0407	3	B3	36 [43]	20 [24]	23 [28]	4 [5]	17	33	2(2)

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Site	Layer	Horizon	PARTICLE SIZE ANALYSIS (%)					D%	EAT
			Clay	Silt	Fine Sand	Coarse Sand	Gravel		
Soil Mapping Unit G cont'd									
0408	1	A	32 [40]	20 [25]	27 [33]	2 [2]	19	26	2(1)
0408	2	B2	36 [46]	18 [23]	22 [28]	2 [3]	22	31	2(1)
0408	3	B3	28 [57]	9 [18]	11 [23]	1 [2]	51	42	2(2)
0413	1	A	27 [29]	26 [28]	35 [37]	6 [6]	6	15	3(2)
0413	2	B1	39 [43]	25 [27]	19 [21]	8 [9]	9	13	2(1)
0413	3	B21	47 [56]	15 [18]	18 [21]	4 [5]	16	5	2(1)
0413	4	B22	51 [63]	12 [15]	15 [18]	3 [4]	19	3	2(1)
0415	1	A1	10 [11]	20 [22]	58 [64]	3 [3]	9	26	8
0415	2	A2	12 [17]	14 [19]	43 [60]	3 [4]	28	48	2(1)
0415	3	B2	46 [62]	9 [12]	17 [23]	2 [3]	26	10	2(2)
1002	1	A11	12 [13]	13 [14]	36 [38]	33 [35]	6	30	8
1002	2	A12	13 [15]	12 [14]	35 [40]	28 [31]	12	33	2(1)
1002	3	A2	12 [15]	9 [12]	34 [44]	23 [29]	22	59	2(2)
1002	4	B2	30 [35]	5 [6]	22 [25]	29 [34]	14	26	2(2)
Soil Mapping Unit H - Marburg Sediments									
0802	1	A	18 [22]	8 [10]	48 [58]	8 [10]	18	36	2(1)
0802	2	B2	44 [48]	7 [8]	39 [42]	2 [2]	8	25	3(3)
0802	3	B3	31 [41]	8 [11]	34 [44]	3 [4]	24	24	3(2)
0902	1	A1	5 [6]	4 [5]	40 [52]	29 [37]	22	60	3(2)
0902	2	A2	6 [10]	6 [10]	19 [32]	29 [48]	40	64	n.a.
0902	3	B2	23 [27]	5 [6]	49 [59]	7 [8]	16	61	2(2)
0902	4	B3	29 [35]	9 [11]	41 [50]	3 [4]	18	54	2(2)
1601	1	A	19 [22]	11 [12]	38 [43]	20 [23]	12	14	8
1601	2	B1	25	16	42	17	0	57	2(1)
1601	3	B2	25	19	43	13	0	53	2(2)
2001	1	A1	7 [7]	7 [7]	48 [49]	37 [37]	1	38	2(1)
2001	2	A2	6 [6]	7 [7]	39 [41]	44 [46]	4	63	2(1)
2001	3	B1	38 [48]	6 [8]	17 [22]	17 [22]	22	44	2(1)
2001	4	B2	44 [47]	6 [6]	18 [20]	25 [27]	7	37	2(1)
Soil Mapping Unit I - volcanics									
1501	1	A1	11 [19]	13 [22]	22 [38]	12 [21]	42	12	8
1501	2	A2	20 [29]	18 [26]	17 [25]	14 [20]	31	18	2(1)
1501	3	B1	22 [32]	16 [24]	16 [24]	14 [20]	32	36	2(1)
1501	4	B2	36 [51]	8 [11]	14 [21]	12 [17]	30	4	5
1903	1	A1	26 [38]	15 [22]	22 [31]	6 [9]	31	12	8
1903	2	A2	41 [49]	22 [26]	18 [21]	3 [4]	16	0	3(1)
1903	3	B2	50 [56]	21 [23]	17 [19]	2 [2]	10	2	5
1902	4	B3	49 [54]	23 [26]	14 [16]	4 [4]	10	0	5

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Site	Layer	Horizon	PARTICLE SIZE ANALYSIS (%)					D%	EAT
			Clay	Silt	Fine Sand	Coarse Sand	Gravel		
Soil Mapping Unit I cont'd									
1908	1	A11	18 [20]	16 [18]	36 [41]	19 [21]	11	8	8
1908	2	A12	23 [26]	18 [20]	30 [33]	19 [21]	10	9	8
1908	3	A2	26 [30]	17 [20]	22 [26]	20 [24]	15	16	2(1)
1908	4	B1	26 [36]	12 [17]	20 [28]	14 [19]	28	5	2(1)
1908	5	B2	14 [22]	6 [9]	37 [58]	7 [11]	36	7	2(1)
2302	1	A	15 [19]	10 [13]	44 [56]	9 [12]	22	4	8
2302	2	B1	20 [23]	18 [21]	41 [48]	7 [8]	14	3	8
2302	3	B2	28 [38]	18 [25]	23 [32]	4 [5]	27	2	3(3)
2303	1	A	16 [16]	26 [27]	50 [51]	6 [6]	2	20	3(2)
2303	2	B11	31 [32]	23 [24]	40 [42]	2 [2]	4	24	3(1)
2303	3	B12	41 [46]	17 [19]	29 [32]	3 [3]	10	11	6
2303	4	B2	48 [49]	20 [20]	30 [31]	0	2	3	2(1)
n.a. = not attainable									

3.3.1.2 Organic Matter

Samples from the surface layer and the top of the subsoil layer at each of the 33 sampling sites were analysed to determine organic matter content. This information, required for consideration in Section 4, is presented below.

TABLE 5: Results of Organic Matter content

TOPSOIL				ORGANIC MATTER SUBSOIL			
Site	Horizon	Depth (cm)	OM %	Site	Horizon	Depth (cm)	OM %
Soil Mapping Unit A - Alluvials							
1301	A11	0-3	20.50	1301	B2	8-23	4.59
1306	A1	0-17	1.39	1306	B2	42-80+	0.138
Soil Mapping Unit B - Basalts							
0102	A	0-45	4.00	0102	B2	45-90	1.44
0201	A11	0-12	5.50	0201	B2	40-94	1.23
0503	A	0-3	8.03	0503	B1	13-27	4.53
1201	A	0-7	8.82	1201	B2	7-56	2.10
1701	A1	0-24	9.39	1701	B1	43-90	1.42
1801	A	0-12	4.41	1801	B1	12-57	0.993

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TOPSOIL				ORGANIC MATTER			
				SUBSOIL			
Site	Horizon	Depth (cm)	OM %	Site	Horizon	Depth (cm)	OM %
Soil Mapping Unit C - Metasediments							
1401	A	0-22	7.11	1401	B2	22-65	1.45
2202	A	0-13	15.30	2202	B11	13-26	7.68
Soil Mapping Unit D - Granitoids							
2101	A1	0-15	7.07	2101	B2	38-60+	0.677
2404	A11/12	0-10	3.30	2402	B1	20-36	0.841
2501	A1	0-30	8.82	2501	B1	48-67	1.04
Soil Mapping Unit E - Grafton Formation							
1109	A1	0- 4	13.00	1109	B2	9-38	1.00
1114	A11	0- 7	3.38	1114	B2	35-49	0.802
1124	A1	0- 5	4.80	1124	B2	32-75+	0.464
Soil Mapping Unit F - Kangaroo Creek Sandstone							
0601	A11	0- 7	8.26	0601	B1	16-33	0.975
0707	A1	0-15	2.02	0707	B1	43-70	0.332
Soil Mapping Unit G - Walloon Coal Measures							
0404	A11	0-10	2.83	0404	B2	25-33	0.586
0407	A	0- 3	7.06	0407	B2	3-19	1.61
0408	A	0- 9	6.24	0408	B2	9-47	4.35
0413	A	0-16	6.48	0413	B1	16-32	2.55
0415	A1	0-27	4.21	0415	B2	53-76+	0.777
Soil Mapping Unit H - Marburg Sediments							
0802	A	0- 5	3.94	0802	B2	5-40	0.860
0902	A1	0- 5	7.22	0902	B2	22-48	0.611
1601	A	0-12	7.37	1601	B1	12-35	0.533
2001	A1	0- 3	4.63	2001	B1	24-54	1.32
Soil Mapping Unit I - volcanics							
1501	A1	0-16	11.30	1501	B1	38-62	1.22
1903	A1	0-16	5.04	1903	B2	35-81	0.269
1908	A11	0- 6	9.91	1908	B1	37-53	1.51
2302	A	0-15	16.40	2302	B1	15-57	10.20
2303	A	0-16	7.86	2303	B11	16-29	3.37

3.3.2 Discussion of Results

The results shown in Table 4 assist in the determination of the degree of erodibility of each of the soil units within the study area. Each of the three physical tests undertaken indicate specific aspects of the soil and its behaviour to erosive forces. When the results of these tests are combined, a good overview of the soil's erodibility is gained.

3.3.2.1 Particle Size Analysis

The Particle Size Analysis test (PSA) proportions the amounts of clay, silt, fine sand, coarse sand and gravel which exist in a given sample, on a percentage basis. Thus, layer 1 of sample 1301 consists of 22% clay, 15% silt, and so on, including 15% gravel. To negate the effect of the gravel content, and concentrate only on the soil fraction (i.e. <2 mm), the proportion of clay, silt, fine sand and coarse sand on a percentage basis have been recalculated and are presented as the value in the square brackets. Thus, without gravel content, layer 1 of sample 1301 consists of 26% clay, 18% silt, and so on.

Given the geological basis of the soil mapping, the soils tested reflect the lithology from which they have been formed. The fine-grained soils derived from the metasediments, basalts and volcanics have the highest clay contents (excluding gravels) while the granitic soils are the sandiest soil unit. Note also that in most cases, the soils are gravelly throughout.

3.3.2.2 Dispersion Percentage

The Dispersion Percentage (D%) test indicates the proportion of the soil fraction less than 0.005 mm (i.e. the clay and some of the fine silt material) that will disperse on wetting. Consequently, the results of this test should normally be read in conjunction with the PSA results.

A sample which has a very high D% value (e.g. 90%) and a high clay content (e.g. 45%) would be more dispersive than a sample with the same D% value and a low clay content (e.g. 10%).

An interpretation of the D% values can be based on the following, taken from Simpson & Veness (1984):

TABLE 6: Interpretation of D% values

D % Value	Comment
>67%	severely erodible; unstable
37-67%	moderately erodible
17-37%	slightly erodible
<17%	stable

It should be noted that the interpretation of these values should also take into account the PSA and EAT (see Section 3.3.2.3) data.

When the results of the Dispersion % values in Table 4 are read in this context, none of the soils sampled within the study area has a high dispersion problem. Two thirds of the 17 samples with a medium dispersion value (say, greater than 50 – 60%) have a correspondingly low to medium clay content (i.e. less than 20% when the gravels are excluded) while the remaining six samples have medium to high clay contents ranging from 21% [without gravels] (1401 layer 2) to 39% (1114/5).

All of the soils derived from sediments (i.e. soil mapping units E, F, G and H) have D% values ranging from very low (3%) to high (75%). Likewise, the metasediment-derived soils range from very low (3%) to high (70%). The D% values for the alluvial soils are very low to low (6% to 21%) as they are for the basaltic soils (1% to 36%), the granitic soils (2% to 37%), and the volcanically derived soils (2% to 36%). None of the samples tested recorded very high D% values.

Throughout the study area, each of the 36 samples with high clay contents (> 40%), especially without gravels, correspond to very low to low D% values (up to 50%), with fourteen of these samples recording D% values of <10%. It is interesting to note that the highest D% values generally correspond to low clay contents while the highest clay contents generally correspond to low or very low D% values.

Thus, from a Dispersion Percentage point of view, all of the soils in the study area, represented by the results of those tested in Table 4, are considered to be stable, with a generally low, but sometimes moderate, erosion potential.

3.3.2.3 Emerson Aggregate Test

The Emerson Aggregate Test (EAT) classifies soil aggregates based on their coherence when immersed in water. As stated in Houghton & Charman (1986), this test uses natural peds, with the first separation being based on slaking. Those aggregates that do not slake are placed in class 7 if they swell and class 8 if they do not. Of those which do slake, those which show complete soil dispersion are placed in class 1 and those showing only partial dispersion are placed in class 2. Those showing no dispersion are remoulded and reimmersed in water. Aggregates which disperse after remoulding are placed in class 3 and those which do not are further separated by the presence or absence of carbonate or gypsum. Those with carbonate or gypsum fall into class 4 while those without are made up into a 1:5 soil:water suspension and shaken. Those soils which then show dispersion are placed in class 5 and those which show flocculation fall into class 6. Classes 2 and 3 are further subdivided into four subclasses with an increasing tendency to disperse with an increase in numerical value. The degree of stability of soils increases from class 1 through to class 8, with classes 1 and 2 generally being considered to be unstable, class 3 generally considered to be stable while classes 4 to 8 are considered to be stable. (Charman, 1978).

As shown in Table 4, there is a range of EAT values for the samples tested. EAT values for three samples (site 0707, layers 3 & 4, and site 0902 layer 2) could not be attained due

to the lack of naturally occurring aggregates. Of the other 119 samples 48% (57 samples) have a class 2 EAT, 22% (26 samples) have a class 3 EAT and the remaining 30% (36 samples) have EAT classes 5 to 8.

The samples having a class 2 EAT value range from very low clay contents of 6% [without gravels] (1124/2 and 2001/2) to very high clay contents up to 63% [without gravels] (0413/4). Those samples with high to very high clay contents generally have low D% values while conversely, those samples with low clay contents usually have up to medium to high D% values. Consequently the soil layers represented by these class 2 EAT values are considered to have a generally moderate, but sometimes low, erosion potential.

The 26 class 3 samples have very low to low D% values, ranging from 0% to 30% (with the exception of 0902/1 and 0707/2 which have D% values of 60% and 62% but only 6% clay contents), and generally medium to high clay contents. The soil layers represented by these class 3 samples are thus considered to have a generally low erosion potential.

The remaining 36 samples which have EAT values of 5 to 8 are, by definition, considered to be stable. There is a good correlation between these samples and very low to low and sometimes medium (0602/3 and 0707/1) D% values, despite clay contents ranging from 5% to 81% (without gravels).

From an EAT point of view therefore, the soils in the study area are considered to range from a generally low erosion potential to a sometimes moderate erosion potential.

4.0 EROSION HAZARD

Due to the historical evolution of this report, erosion hazard has been examined in three ways, each placing emphasis on slightly different aspects. The first simply examines the laboratory results and marries the soils' predicted behaviour to field observation and the authors' experience. The second examines the soils through the SEMGL Appendix 1 and Appendix 2 which use descriptive variables to determine erodibility and erosion hazard. The third uses CaLM's SOILOSS computer program to calculate the USLE 'K' factor and the predicted soil loss for a given set of parameters. The results of each of these, while not significantly differing from each other, are presented in this chapter.

4.1 METHOD 1: PRE SEMGL ASSESSMENT

In the original version of this report, erosion hazard was assessed within the framework of the definition given by Houghton & Charman (1986). By this definition erosion hazard is determined by the susceptibility of a parcel of land to the prevailing agents of erosion. It is dependent on a combination of climate, landform, soil, land use and land management factors. The qualitative categories of erosion hazard used are low, moderate, high, very high and extreme.

Extreme erosion hazard implies that erosion will occur to such an extent that it will be normally uneconomic to address satisfactorily. Very high erosion hazard implies significant erosion occurring during and after development, even with intensive soil conservation measures. High erosion hazard implies significant erosion during development, with short-term erosion controlled by simple soil conservation measures but long-term erosion control requiring intensive measures. Moderate erosion hazard implies that significant erosion may occur during development, but short- and long-term erosion problems can be avoided by adopting appropriate soil conservation measures during development. Low erosion hazard results in no appreciable erosion during or after development.

This assessment found that the lands within the Casino / Murwillumbah EIS study area under a forest land use and under a forest harvesting land management operation, as is currently practised by NSW State Forests, would incur a low to moderate erosion hazard based on the Houghton & Charman definition. Consequently, this implies that significant erosion may occur during development of the particular land use (in this case forestry operations). However, provided appropriate soil conservation measures are adopted during development both short-term and long-term erosion problems may be avoided (Houghton & Charman, 1986). The soil erosion and sedimentation safeguards contained within the SEMGL are appropriate in respect of these measures, as discussed below in Section 5.

4.2 METHOD 2 & 3: EROSION HAZARD ASSESSMENT BASED ON SEMGL

4.2.1 Methodology

Both of these methods are based on a technique originally developed by CaLM (1992) which uses a computer program, SOILOSS (Rosewell & Edwards, 1988) to generate predicted soil loss values as an indicator of erosion hazard. SOILOSS is based on the Universal Soil Loss Equation or USLE (Wischmeier & Smith, 1978):

$$A = R * K * L * S * P * C$$

where

- A is the average annual soil loss (t/ha)
- R is the rainfall erosivity factor
- K is the soil erodibility factor
- L is the slope length factor
- S is the slope steepness factor
- P is the support practice factor, a measure of the effect on erosion of soil conservation measures such as contour cultivation and bank systems
- C is the crop and cover management factors

In order to obtain an erosion hazard from the calculated soil loss, the following erosion hazard classes have been defined (CaLM, 1993):

Class	Soil Loss
LOW	<40 t/ha/yr
MODERATE	40 – 400 t/ha/yr
HIGH	400 – 800 t/ha/yr
EXTREME	>800 t/ha/yr

The USLE output is in tonnes/hectare/year i.e. it is the long-term average value based on the factor inputs also being long-term averages. Because of the revegetation and long rotation aspects of forest management CaLM adopted the assumption that the entire predicted soil loss occurs in year 1 and so the figures provided above would be divided by the rotation length to give an actual average annual soil loss for the whole rotation.

One of the key factor inputs, soil erodibility (K), can be determined from laboratory data (soil particle size analysis, organic matter) and structure and profile permeability. SOILOSS has a subroutine to calculate K from these inputs. Appendix 1 (ii) of the SEMGL provides a means of estimating K if laboratory data is not available. Appendix 2 (ii) of the SEMGL provides a method of determining erosion hazard from varying combinations of K, S and R.

Method 2 below is based solely on the appendices from the SEMGL. Method 3 estimates erosion hazard directly from the SOILOSS program (versions earlier than 5.1).

4.2.2 Method 2: Applying SEMGL Appendices 1 and 2

4.2.2.1 Soil erodibility

Data from each of the soil mapping units were collated in to the format of the soil erodibility classification as set out in Appendix 1 (ii) of the SEMGL. The results are attached to this report at Appendix 2 and the results summarised below in Table 7. It can be seen that the results do not significantly differ from the conclusion reached by Method 1.

Despite the similarity in results with Method 1, some problems are experienced in applying Appendix 1 (ii) to forest soils of the study area. Organic matter contents in the forest soils cover a range much greater than that of the appendix. Twenty nine out of the 33 topsoil samples exceeded the 3% value considered to indicate topsoils of high organic matter content. Likewise, 17 out of the 33 subsoil samples exceeded the subsoil 1% value. The choices of soil structure, texture and lithology did not cover the conditions for the forest soils. Nor do many of the forest soils easily fit the soil classifications in the SEMGL Appendix. Much of the data collected during the soil survey of the study area is not catered for in the appendix which is not surprising since the original source was aimed at agricultural rather than forest soils.

TABLE 7: Summary of soil erodibility classification for each soil mapping unit, based on the SEMGL's Appendix 1 (ii)

Soil Mapping Unit	SOIL ERODIBILITY CLASSIFICATION		
	Whole Unit	Topsoil	Subsoil
A (alluvials)	low to moderate	low to moderate	low to moderate
B (basalts)	generally low, sometimes mod	low	low to moderate
C (metased's)	generally low, sometimes mod	low	low to moderate
D (granitoids)	low to moderate	low	low to moderate
E (Grafton Form'n)	low to moderate	low to moderate	moderate
F (K'roo Ck ss)	low to moderate	low to moderate	low to moderate
G (Walloon Coal)	low to moderate	low to moderate	low to moderate
H (Marburg Seds)	low to moderate	low to moderate	low to moderate
I (volcanics)	low, sometimes moderate	low, sometimes mod	low, sometimes mod

4.2.2.2 Erosivity

Erosivity is the "potential ability to cause erosion" (Houghton & Charman, 1986) and is commonly referred to in respect of rainfall. An erosivity map of the study area, prepared from data contained within Australian Rainfall and Runoff (Pilgrim, 1987) according to the method of Rosewell & Turner (1992) was prepared by the Forestry Commission (Figure 1a and 1b in Appendix 5). Also refer to Maps 5 and 6 in Volume A of the Casino Management Area EIS.

4.2.2.3 Slopes and Erosion Hazard Classes

Appendix 2 (i) of the SEMGL utilises soil erodibility (from Appendix 1 (ii)), slope and rainfall erosivity to produce four classes of erosion hazard viz, low, moderate, high and extreme.

To determine erosion hazard in the SEMGL context, the study area was examined to determine the maximum slope gradients for the range of erosivities, on a per soil unit basis (using Figures 1a and 1b), in order to determine erosion hazard classes occurring within each soil mapping unit. (The relevant CMA 1:25 000 topographic maps were used to measure slope gradients. This exercise was not meant to be a slope analysis study. It did not record the range of slopes occurring within each Soil Mapping Unit but rather gave an indication of the maximum slopes occurring. Consequently, neither lower slopes nor necessarily the highest occurring slope values have been recorded. However, it should be appreciated that the "maximum" slopes recorded do actually occur.) The data generated by this exercise is presented in Appendix 3 for each of the Soil Mapping Units. The results of this exercise are summarised below in Table 8.

The authors have some difficulty reconciling the definition of erosion hazard in Houghton & Charman (1986), with some of the assessed erosion hazard classes in Table 8. This viewpoint stems from examination of the study area as it exists today through API and extensive fieldwork. Despite decades of past forestry activity, there is no real evidence to support the high to extreme erosion hazard classifications, the ramifications of which, according to the definition of Houghton & Charman, would otherwise be observable. Nevertheless, extreme erosion hazard has been found to exist within soil mapping units B, C, D, E, F, G, H and I. Appendix 3 shows the erosivity and slope circumstances under which high or extreme hazard occurs in each mapping unit. These conditions could be used as a warning to managers that wherever they exist, more detailed erosion hazard assessment and more careful harvest planning is required.

TABLE 8: Summary of soil erosion hazard classification for each soil mapping unit, based on the SEMGL's Appendix 2 (ii)

Soil Mapping Unit	Appendix 2 (ii) Erosivity	SEMGL Erosion Hazard Class
A	<4000	Moderate
B	<4000 <6000 <8000	Moderate to High Extreme High to Extreme
C	<2000 <4000 <8000	Moderate Moderate to High Extreme
D	<2000 <4000	Moderate to High Extreme
E	<4000	Moderate to Extreme
F	<4000	Moderate to Extreme
G	<4000 <6000 <8000	Moderate to Extreme High to Extreme Extreme
H	<2000 <4000 <8000	Moderate Moderate to High Extreme
I	<2000 <4000 <8000	Moderate Moderate to High Extreme

4.2.3 Method 3: The SOILOSS Method

This assessment utilised SOILOSS to determine a soil erodibility (K) value and erosion hazard rating for all sampling sites. The variation of K value by terrain unit was also determined as far as the data allowed (there were some gaps in this analysis since the study was not a soil landscape study as explained earlier). An erodibility value was then determined for each soil mapping unit based on a composite of topsoil and subsoil as there

was very little variation in K value with terrain. SOLOSS was used to derive a table of erosion hazards that would occur for various combinations of erodibility, slope steepness and rainfall erosivity. This was performed for two C values, 0.45 and 0.1, for comparative purposes.

4.2.3.1 Erodibility of terrain units

The results of K value determination for each of the sampling locations are provided in Appendix 4. These K values have been arranged according to the terrain units in which they occurred (Table 9). It can be seen that there are a number of gaps in the table which stem from some of the units not being sampled and from the fact that some of the terrain units did not occur within the relevant soil mapping unit. Where terrain units were not sampled this was generally because they had a low frequency of occurrence and would therefore have a low likelihood of interacting with logging operations. The majority of soil mapping units had samples from ridgelines, upper slopes and/or mid slopes. These are the terrain units that will be most frequently subjected to logging operations since access to logged areas is most commonly from major ridgelines. There are no strong patterns within any of the soil mapping units to suggest a relationship between terrain unit and K value.

TABLE 9: Erodibility (K) values for terrain components for each soil mapping unit

Unit	T E R R A I N				Flat
	Ridge	Upper Slope	Midslope	Lower Slope	
A	Topsoil				.008 - .017
	Subsoil				.014 - .015
B	Topsoil	.006 - .031	.020	.016 - .025	
	Subsoil	.008 - .038	.006	.027 - .041	
C	Topsoil			.006 - .023	
	Subsoil			.009 - .044	
D	Topsoil	.009 - .022	.010		
	Subsoil	.033 - .036	.023		
E	Topsoil	.011	.026		.029
	Subsoil	.019	.023		.016
F	Topsoil	.012		.012	
	Subsoil	.018		.018	
G	Topsoil	.018	.026 - .044	.023	.017 - .032
	Subsoil	.019	.013 - .024	.023	.016 - .034
H	Topsoil	.011	.014		.026 - .029
	Subsoil	.039	.042		.014 - .022
I	Topsoil	.020	.004 - .016	.004	
	Subsoil	.027	.007 - .025	.020	

4.2.3.2 Erodibility of each soil mapping unit

From the preceding discussion, there appears to be no basis for further subdividing soil mapping units into areas of different K value by terrain unit. Hence a K value for each soil mapping unit was obtained primarily from a composite of K values from topsoil and subsoil layers. The results are shown in Table 10. The use of a composite value is based on the fact that snig track soil disturbance varies considerably within a logged area and often within short distances. Sometimes subsoil is exposed and sometimes only very shallow disturbance occurs. The composite K value gives a reasonable balance between the range of conditions that could be expected.

TABLE 10: Erodibility (K) values and erodibility ratings for each soil mapping unit using SOILOSS

Unit	Topsoil value / range	Subsoil value / range	Whole Soil Average 'K'	Unit Erodibility rating
A	.008 – .017	.014 – .015	.014	LOW
B	.006 – .031	.006 – .041	.020	LOW – MOD
C	.006 – .023	.009 – .044	.021	MOD
D	.009 – .022	.023 – .036	.022	LOW – MOD
E	.011 – .029	.016 – .023	.021	LOW – MOD
F	.012	.018	.015	LOW
G	.017 – .032	.013 – .034	.024	MOD
H	.011 – .029	.014 – .042	.025	MOD
I	.004 – .020	.007 – .027	.015	LOW

4.2.3.3 Erosion hazard assessment

The SOILOSS program was used twice on data from the topsoil and the upper subsoil layer from each of the sampling sites to determine erosion hazard. The first time, the different variables for each of the factors were chosen from the data which had already been collected for the study area's soils. These included a variation in rainfall zone, erosivity and particle size analyses results. 'P' was constant at 1.0 while 'C' was constant at 0.003 (refer to discussion below). Soil structure was taken usually as '3' but sometimes varied, depending on the secondary ped size. (The four SOILOSS choices for soil structure do not fit comfortably when dealing with these forest soils – this is a reflection on its greater applicability for agricultural soils.) Permeability was determined from Charman & Murphy (1991) [Table 10.4 which determined permeability from texture and structure data]. Slope steepness was the value recorded in the field at each sampling site. SOILOSS gives a choice of 0 – 300 metres for slope length. Various values were chosen, depending on each site's field situation.

The second set of calculations adopted a P factor of 1, a C value of 0.45 and a slope length of 10 metres.

In determining 'C', SOILOSS's handbook directs the user to its appendix D which lists suggested 'C' factors for permanent (mulch) cover, improved pasture, permanent pasture, undisturbed forest land and rangeland, scrub, etc. The section dealing with forest situations lists a range of 'C' factors from 0.0001 to 0.009, depending on the area covered by tree canopy and organic layer. While 0.003 (representing the mean value of 45 – 70% canopy and 75 – 85% organic layer cover; also representative of the lower end of 20 – 40 % canopy and 40 – 70% organic layer cover) was used for the first set of calculations, the requirements' use of 0.45 does not appear in the forest situation of appendix D. Rather, this value can be found in the scrub situation representing no appreciable canopy and zero percent ground cover.

The results of these two sets of calculations are summarised below in Table 11. The detail of these calculations are presented in Appendix 4.

TABLE 11: Erodibility (K) values and erosion hazard for sampled sites using SOILOSS

Unit	Site	First Set Topsoil			Second Set Topsoil			First Set Subsoil			Second Set Subsoil		
		'K'	Soil Loss C=.003	Erosion Hazard	Soil Loss C=.45	Erosion Hazard		'K'	Soil Loss C=.003	Erosion Hazard	Soil Loss C=.45	Erosion Hazard	
A	1301	.008	.02	LOW	1.0	LOW		.015	.04	LOW	1.9	LOW	
	1306	.017	.02	LOW	1.8	LOW		.014	.02	LOW	1.4	LOW	
B	0102	.020	2.5	LOW	68	MOD		.006	.76	LOW	20	LOW	
	0201	.031	5.4	LOW	148	MOD		.038	6.6	LOW	181	MOD	
	0503	.016	.62	LOW	17	LOW		.027	1.1	LOW	29	LOW	
	1201	.012	.61	LOW	20	LOW		.015	.76	LOW	25	LOW	
	1701	.006	1.9	LOW	57	MOD		.008	2.8	LOW	75	MOD	
	1801	.025	2.9	LOW	81	MOD		.041	4.8	LOW	133	MOD	
C	1401	.023	8.8	LOW	241	MOD		.044	17	LOW	461	HIGH	
	2202	.006	.08	LOW	2.3	LOW		.009	.12	LOW	3.4	LOW	
D	2101	.022	2.5	LOW	84	MOD		.036	4.1	LOW	137	MOD	
	2404	.010	.19	LOW	5.4	LOW		.023	.44	LOW	12	LOW	
	2501	.009	.24	LOW	6.3	LOW		.033	.84	LOW	23	LOW	
E	1109	.011	.25	LOW	8.7	LOW		.019	.45	LOW	15	LOW	
	1114	.029	.26	LOW	10	LOW		.016	.15	LOW	5.5	LOW	
	1124	.026	.32	LOW	11	LOW		.023	.28	LOW	9.5	LOW	
F	0601	.012	.24	LOW	6.9	LOW		.018	.38	LOW	10	LOW	
	0707	.012	.64	LOW	17	LOW		.018	.96	LOW	26	LOW	
G	0404	.032	1.1	LOW	30	LOW		.034	1.2	LOW	32	LOW	
	0407	.026	1.9	LOW	53	MOD		.024	1.8	LOW	49	MOD	
	0408	.018	.29	LOW	9.5	LOW		.019	.29	LOW	10	LOW	
	0413	.023	.97	LOW	27	LOW		.023	.96	LOW	27	LOW	
	0415	.044	1.5	LOW	41	MOD		.013	.45	LOW	12	LOW	
H	1002	.017	.78	LOW	21	LOW		.016	.73	LOW	20	LOW	
	0802	.029	.64	LOW	17	LOW		.022	.48	LOW	13	LOW	
	0902	.014	1.6	LOW	53	MOD		.042	4.7	LOW	158	MOD	
	1601	.011	.65	LOW	32	LOW		.039	.09	LOW	112	MOD	
	2001	.026	.40	LOW	11	LOW		.014	.22	LOW	6	LOW	
I	1501	.004	.91	LOW	27	LOW		.025	6.3	LOW	170	MOD	
	1903	.016	3.3	LOW	90	MOD		.015	3	LOW	85	MOD	
	1908	.004	.37	LOW	11	LOW		.020	2.1	LOW	56	MOD	
	2302	.008	.51	LOW	15	LOW		.007	.50	LOW	13	LOW	
	2303	.020	.94	LOW	26	LOW		.027	1.3	LOW	35	LOW	

The results of this table demonstrate the effect of choosing a C value of 0.45 (which denotes a zero ground cover which is commensurate with the blading off of snig tracks) and a C value of 0.003 which probably more realistically reflects the actual conditions of snig tracks to be used in the proposed forestry operations.

Table 12 provides indicative results of erosion hazard assessments for different levels of soil erodibility (K), rainfall erosivity (R) and slope steepness (S) for two different levels of cover (C). The variables used in the SEMGL for K, R and S have been used here to compare the effect of a C value of 0.45 to a C value of 0.1 which equates to a groundcover of 40% without any allowance being made for canopy cover. The resultant erosion hazards for these two different values of C are shown to illustrate the sensitivity of the method to the selection of particular values. The selection of standard C and P values by CaLM has been a somewhat subjective exercise and is therefore a current weakness in the method.

TABLE 12: Calculation of erosion hazard for each erodibility class - a comparison between the SEMGL's Appendix 2 ('C' = 0.45 [bare ground]) and a new value ('C' = 0.10) which allows for a 40% ground cover

SEMGL Appendix 2 (C = 0.45)							Recalculated (C = 0.10)					
Erodibility - LOW (<0.02)												
Erosivity	Slope (degrees / [%])						Slope (degrees / [%])					
	10 [17.6]	15 [26.8]	20 [36.4]	25 [46.6]	30 [57.7]	35 [70.0]	10 [17.6]	15 [26.8]	20 [36.4]	25 [46.6]	30 [57.7]	35 [70.0]
<2000	L	M	M	M	M	M	L	L	L	L	M	M
<4000	M	M	M	M	M	H	L	L	M	M	M	M
<6000	M	M	M	H	H	H	L	M	M	M	M	M
<8000	M	M	H	H	E	E	L	M	M	M	M	M
Erodibility - MODERATE (<0.04)												
Erosivity	Slope (degrees / [%])						Slope (degrees / [%])					
	10 [17.6]	15 [26.8]	20 [36.4]	25 [46.6]	30 [57.7]	35 [70.0]	10 [17.6]	15 [26.8]	20 [36.4]	25 [46.6]	30 [57.7]	35 [70.0]
<2000	M	M	M	M	H	H	L	L	M	M	M	M
<4000	M	M	H	H	E	E	L	M	M	M	M	M
<6000	M	H	H	E	E	E	M	M	M	M	M	M
<8000	M	H	E	E	E	E	M	M	M	M	M	H
Erodibility - HIGH (<0.06)												
Erosivity	Slope (degrees / [%])						Slope (degrees / [%])					
	10 [17.6]	15 [26.8]	20 [36.4]	25 [46.6]	30 [57.7]	35 [70.0]	10 [17.6]	15 [26.8]	20 [36.4]	25 [46.6]	30 [57.7]	35 [70.0]
<2000	M	M	M	H	H	H	L	M	M	M	M	M
<4000	M	H	H	E	E	E	M	M	M	M	M	H
<6000	M	H	E	E	E	E	M	M	M	M	H	H
<8000	H	E	E	E	E	E	M	M	M	H	H	H

4.3 COMMENTS ON EROSION HAZARD METHODOLOGY

4.3.1 Soil Loss Estimates

The technique of applying SOILOSS to determine erosion hazard necessarily generates a value of soil loss. To some readers, the implied values of a high (>400 tonnes/ha/year) or extreme (>800 t/ha/yr) erosion hazard may be quite alarming. However, it must be stressed that these figures are used merely to obtain an objective indication of relative erosion hazard given certain site factors. There are many reasons why the actual soil loss would be much less than that predicted by SOILOSS. Even more importantly, the predicted soil loss does not imply 'lost from the logging area'; it simply implies 'moved from point A to point B'. Point A and point B may be quite close or quite distant. This is to say that the USLE, on which SOILOSS is based, has no transport function. However, research on erosion in logged forests indicates that transport distances are relatively small (see Lacey, 1993). Reasons why the soil loss estimates are less than would actually occur are as follows:

- the version of SOILOSS used is known to significantly overestimate erosion on slopes greater than 9%. This is one of the most significant revisions to the new version of SOILOSS which is based on RUSLE (the Revised Universal Soil Loss Equation) rather than the USLE (Rosewell, 1993). On slopes steeper than about 35% snig tracks are often benched to allow safe machinery operation. This means that the erodible surface has a much lesser slope than the natural slope but in addition there is a cut batter, which is not handled by SOILOSS.
- the P factor assumed is 1.0. This is the value used for soil cultivated up and down the slope. The level of disturbance assumed, i.e. bare soil snig tracks, does not parallel that of soil cultivated up and down the slope. The main difference is that cultivation disrupts internal soil cohesiveness and provides ready formed channels for rill initiation once overland flow commences. Snig tracks retain internal cohesiveness and contain few if any ready formed channels.
- the soil loss figures generated are assumed to be for a long-term situation. This implies that the long-term rainfall erosivity (R) is received by the soil surface which is maintained at average values of P and C as selected. This long-term or average R value is dependent on the range of rainfall intensities with both short and long return intervals being received. The problem is that P and C values are not stable in forest situations. C in particular declines rapidly as vegetation and litter layers recover.

The probability of the average R value being received during that window of elevated C value is therefore quite low due to the dependence on some low probability high intensity rainfall being received. There is no doubt that, in the long-term, some compartments will receive the average or above average R but they will be in the minority.

- the USLE was derived principally for arable land and therefore may not take into account factors important in erosion processes on forest soil. One of these is the high level of gravels commonly found in forest soils. High gravel tends to act as a cover across the soil surface lowering the potential for particle detachment.

4.3.2 Erosion Hazard Classes

The above comments about the methodology are intended simply to point out that the soil loss figures should not be taken literally.

Of greater concern is that whilst the numbers generated by SOILOSS may be reasonably objective, the same does not apply to the erosion hazard class boundaries.

The authors do not believe that CaLM has adequately justified the choice of the particular erosion hazard class boundaries with any evidence of how the predicted numbers relate to reality. The classes are not consistent with other erosion hazard assessment methodology based on the USLE. For example, Morse & Rosewell (1993) presented a similar method for assessing erosion hazard for urban land. In their method, the erosion hazard classes are defined as Class 1: computed soil loss <300 t/ha/yr (regular erosion and sediment control plans are able to ensure sediment pollution remains at acceptable levels), Class 2: computed soil loss 300 - 900 t/ha/yr (special measures may be needed), and Class 3: computed soil loss >900 t/ha/yr (very stringent controls needed which may render work uneconomic). There are two reasons why the upper limit of 900 t/ha/yr for urban land makes the 800 t/ha/yr for forest land seem much too low. i) The efficiency of transport to receiving waters will be much greater in urban development so less sediment pollution will occur from forest areas for the same computed soil loss. ii) The area of contiguous disturbed land is much greater in urban development than in native forest logging and so the total amount of sediment generated will also be much greater.

There is a need for the erosion hazard classes to be demonstrably related to a definition of erosion hazard such as that of Houghton & Charman (1986). In conducting extensive fieldwork and API for this report, the authors never observed erosion of a severity that would match the extreme or high erosion hazard definition of Houghton & Charman (1986). It is maintained that the reason for this is the nature of the land use. Certainly, if the land was cleared and put to a more intensive use such as agriculture or urban development, then the manifestations of a high or extreme hazard might eventuate. Indeed such examples were observed in agricultural lands adjacent to forest land in the study area. In conclusion, the definition of erosion hazard should be framed with a particular land use in mind.

5.0 IMPACT MITIGATION

All of the soils within the study area are stable, under their current land use and land management regime. It should be appreciated that even a stable soil can erode if inappropriate land management is practised. The results of this can be observed on some eroded farmlands adjacent to the State forest lands within the study area.

To remain stable, the soils within the study area should be protected through vegetative cover and sound land management practices such as those which result from, and are consistent with, the current land use and land management to which these soils are subjected within the state forest regime. Thus, within the study area, the current forestry land management and land use strategies help to ensure the stability of the soil resource. This is principally due to the relatively undisturbed nature of the area and more particularly because of the good basal vegetative ground cover that is retained. To combat the onset of erosion on areas of disturbance occurring during harvesting/roading operations, a number of specific conditions are adhered to. These are discussed below in this Section.

5.1 GENERAL COMMENT

The Standard Erosion Mitigation Conditions (SEMC) were drawn up a number of years ago by the then Soil Conservation Service of NSW and the NSW Forestry Commission. Designed to minimise soil erosion and maintain water quality, these conditions allowed for a number of measures to be installed during and after logging and roading activities.

At the time that this study was first undertaken in 1992, the SEMC's were in operation. However, the more recently developed Standard Erosion Mitigation Guidelines for Logging (SEMGL), released in March 1993, now direct forestry operation activities in New South Wales on a day-to-day basis.

In a memorandum of understanding between CaLM and State Forests, it has been deemed that while the SEMC constituted a guide rather than prescriptive standards, the SEMGL are to be adapted and form the basis to produce enforceable conditions.

5.2 THE CONDITIONS

The following section of this report discusses the effectiveness of the SEMGL conditions in respect of limiting any accelerated erosion or land degradation during forest harvesting or roading activities, within the study area. These conditions are designed to be a minimum guideline, intended to mitigate against erosion which might lead to soil movement and water turbidity and sedimentation in excess of natural levels. Briefly, these conditions are organised around the following activities:

- construction of road and snig tracks
- retention of filter and protection strips
- snigging and timber extraction
- groundcover management
- felling operations
- log dumps

Each of these activities will be taken in turn and the relevance of their associated conditions, as they relate to the study area, will be briefly discussed.

5.2.1 Roothing

A distinction is made in the conditions between "roads" and "snig and timber extraction tracks".

The roading conditions relate to the planning, location, formation, engineering constraints, batter stabilisation and drainage of roads as well as to clearing, crossing of drainage lines, and the rehabilitation of borrow pits, construction of bridges and culverts, repairing damaged roads and ongoing grading maintenance. Providing these conditions are adhered to, the construction and maintenance of roads should not present any long-term or significant erosion threat.

In respect of the construction and use of tracks and snig tracks, these conditions become more specific regarding their drainage, stabilisation and maintenance. There is adequate scope within these conditions for appropriate specifications to be applied to tracks within the study area to ensure erosion and land degradation does not occur. These will be dealt with later in Section 5.2.5

While the soil materials occurring within the study area are deemed to be relatively stable, the slope gradients occurring on the "minor" roads dictate that attention must be given to the proper construction of cross bank drains and the incorporation of seed and fertiliser where appropriate. The conditions cater for this and also dictate the proper disposal of road drainage water.

The flexibility contained within the SEMGL allows detailed conditions to be applied to specific situations. This is adequate to ensure that any normal roading operation that is carried out within the study area will not result in any significant erosion, providing specific instances are recognised and addressed. Obviously, this means that attention must be given to incorporating specific conditions in the case of minor roads being constructed on steep slopes. In this respect, roads can only be constructed where ground slopes exceed 30 degrees if engineering design and stabilisation techniques ensure road and batter stability.

Also of importance is the need for regular maintenance, especially that involving the desilting of table drains and especially culverts. A few areas were observed during the fieldwork period where maintenance was required. These were: a short 200 metre section on the steep downgrade on Paw Paw Skids Road (Richmond Range S.F.), two kilometres east of the intersection with Peacock Creek Road, where rilling up to 50 cm deep had developed; and in Camira S.F., Benders Rails Road requires the construction of culverts and / or cross drains at both ends. Other, non-erosion related instances of maintenance requirements were observed, such as the need for the reconstruction of culverts / bridges which have been destroyed by recent fires. (It is appreciated that the inclement weather conditions experienced during the fieldwork period for this study could well account for the above road surface grading maintenance works not being undertaken at that time.) Interestingly enough, there appears to be no such maintenance requirement contained within the SEMGL conditions.

5.2.2 Groundcover Management

The conditions recognise that groundcover management techniques are necessary to minimise soil erosion and sedimentation for operations associated with such activities as roading, snig tracks and log dumps.

These conditions call for minimising ground cover disturbance and destruction during logging operations and aim at achieving at least 70% groundcover. Apart from staff training in these matters, these conditions also outline effective groundcover management and re-establishment procedures.

Such procedures should be adequate to maintain a good basal groundcover within the areas disturbed by forestry operations.

5.2.3 Retention of Filter and Protection Strips

The conditions call for the retention of filter strips, of dimensions to be specified, on watercourses generally having catchment areas of 100 hectares or more or 40 hectares where erosion hazard is high. Protection strips are more generally applicable and are to be at least 10 metres wide on each side of specified drainage features.

It is considered that the operation of this condition within the study area is adequate and appropriate to prevent the sedimentation of flowlines, given the relative stable nature of the study area's soils.

5.2.4 Felling Operations

Felling activities within or into filter or protection strips or drainage lines are subject to a number of conditions. Adherence to these should ensure that erosion in proximity to streams is prevented and that filter strips function effectively at trapping any sediment mobilised from upslope disturbances.

5.2.5 Snigging and Timber Extraction

These conditions provide for uphill snigging, the drainage of snigging and extraction tracks and the retention of soil material and vegetative matter.

In areas of high erosion hazard, snigging and timber extraction is not permitted from areas with slopes over 25 degrees if track construction is required. For areas of low or moderate erosion hazard, snigging and timber extraction is not permitted from areas with slopes greater than 30 degrees if track construction is necessary.

Snig track and timber extraction activities in areas of extreme erosion hazard will only be permitted in specified circumstances relating to months of low erosivity, timing of soil and groundcover handling, and the limitation to slopes less than 30 degrees.

Where snig and extraction tracks are constructed, proper drainage is required through the installation of cross banks at a specified spacing and size. Providing due care is taken to install this required cross bank drainage at the specified spacing, no unacceptable erosion should occur as a result of forestry operations.

Snig tracks are not permitted to be bladed-off (i.e. the removal of muddy surface layers to provide better traction) and the retention of groundcover in the form of logging slash and existing vegetation is required as far as practicable.

5.2.6 Log Dumps

These conditions relate to the uphill location of log dumps, as well as their construction, drainage and subsequent rehabilitation. They allow for the removal, storage and respreading of topsoil as well as the ripping of specified areas to overcome the effects of compaction. Uphill locations minimise disturbance near streams and lead to snig track patterns which diverge rather than converge down the slope which reduces concentration of overland flow. Adherence to the safeguards allowed for in these conditions should ensure against any significant erosion.

5.3 INTERACTION WITH FORESTRY OPERATIONS

Given the low to moderate erodibility classification of the soils throughout the study area, and the appropriateness of the existing (SEMGL) erosion mitigation conditions, the impact of forestry operations on this soil resource should be negligible, providing the Standard Erosion Mitigation Guidelines for Logging conditions are adhered to. The guidelines adequately provide protection of the soil resource and receiving waters from the range of forestry operation activities. Based on current observation of the effects of past logging and forest operations within the study area, the implementation of similar conditions (under SEMC) has helped maintain the stability and proper management of the study area's soil resource.

6.0 RECOMMENDATIONS

A number of issues have become evident during the compilation of this soils report which could be acted upon to improve and enhance the protection of the soil resource within the study area. These issues are treated separately below.

6.1 RELIANCE ON SEMGL VALUES

While the procedures contained within the SEMGL are considered appropriate guidelines for forestry operation activities, the basis on which soil erodibility and erosion hazard are classified should be subject to review and amendment based on improved scientific knowledge and understanding. This is especially important given that, according to the Memorandum of Understanding between CaLM and State Forests, the interpretation of erosion hazard, erosivity and erodibility parameters "will be consistent with standards established by CaLM in Appendix 1, 2 and 3 of the SEMGL or as subsequently amended as a consequence of scientifically-based review and consultation".

It has been demonstrated in Section 4 of this report that such standards as set out in the SEMGL appendices require urgent review and amendment.

The emphasis of the SEMGL on snig tracks with zero ground cover is a major concern. Whilst this may serve as a convenient reference condition, it overlooks the very powerful sediment trapping role of undisturbed forest floor (Lacey, 1993). This sediment trapping efficiency may be less on steep slopes so there is a need to investigate the role of undisturbed forest floor and filter strips in interrupting sediment transport. This should be built into the erosion hazard assessment procedure.

Therefore, it is recommended that:

- a series of erosion hazard tables be drawn up for snig tracks of varying degrees of ground cover to enable the use of a prescriptive value which is closer to reality
- more realistic erosion hazard values be calculated for various forestry operations outside the construction of snig tracks and that these more generally applicable values be used, rather than those currently listed in the SEMGL, to determine whether forestry operations can, or cannot, be undertaken
- urgent emphasis be placed on the investigation of the role and mechanics of soil movement in the forest situation

6.2 DETERMINATION OF ERODIBILITY

Appendix 1 in the SEMGL presents a table whereby soil erodibility classification can be easily determined. In light of the non-applicability of this table to the forest soils that were examined in this soils report, it is recommended that:

- the table in Appendix 1 (ii) of the SEMGL's be replaced by an erodibility classification system whereby the soil characteristics peculiar to forest soils are recognised since forest soils are very different from, and behave differently to, agricultural soils from which the SEMGL table is derived

6.3 USE OF USLE TECHNOLOGY

Some of the shortcomings of current USLE technology, referred to in this report, relate to the inappropriate choice of soil structure categories, the biased weighting of a 'C' factor of 0.45, the inadequate levels of organic matter (and the need to identify the effects of having "high" forest organic matter levels), and the emphasis that the USLE places on soil loss and not soil movement.

Therefore, it is recommended that:

- as the values chosen for input to SOILOSS, particularly C and P, along with the overprediction on steeper land, are almost certainly overstating erosion hazard on forest land, the inputs to SOILOSS should be modified to reflect the forest situation and erosion hazard classes which should more reliably reflect real risks
- a better measure of soil movement, rather than soil loss, be developed as the basis of forestry operations. In time, this will mean either replacing, or substantially modifying the USLE. Until that time, USLE technology should only serve the purpose of a guideline rather than that of a prescription
- any such measure deals with realistic forest soil characteristics

6.4 ROLE OF THE HARVESTING PLAN

While it has not been discussed specifically in this report, the Harvesting Plan, prepared on an individual compartment basis, plays an important role in assessing specific soil characteristics and the impact that proposed forestry operations have on them.

To date, the Harvesting Plan has realistically dealt in "broad brush" terms. However, a greater emphasis is being placed on this instrument which runs the very real risk of falling

victim to its own complexity. A proposal to group a number of compartments together to widen the area covered at this more detailed level of planning has been discussed between State Forests and CaLM. This has occurred within the context of preparing a draft framework for Erosion Hazard and Sediment Control Strategies (EH&SCS). This development is seen as a vital link between the generalised level of information that must necessarily be contained within an EIS study and the detailed level that is required if meaningful day-to-day management decisions are to be made from an informed position.

Therefore, it is recommended that:

- the proposed Erosion Hazard and Sedimentation Control Strategy approach be adopted
- in light of the above recommendations, the role that the USLE is to play in the EH&SCS be reviewed

6.5 FURTHER SOIL DATA COLLECTION

The data base of soils information compiled for this and the many other forestry EIS studies is extensive. This information ought to be capitalised upon by collecting further data from similar, adjacent lands within the same soil mapping units but which are under a land use, such as farming and/or grazing activities.

By examining these geographically and pedologically related soils, the real difference between forest soils and agricultural soils, primarily resulting from the effects of each land use, can be documented and fully appreciated. This especially relates to factors dealing with soil structure, bioturbation, organic matter, nutrient status, compaction, permeability, erodibility and ultimately erosion hazard.

Therefore, it is recommended that:

- the acquisition of soil data from agricultural lands immediately adjacent to State forest lands be undertaken and the results used to derive realistic expectations on the behaviour of forest soils

7.0 CONCLUSION

The various geological units occurring, and the soils derived on them within the study area have been examined and described. Nine main soil mapping units have been delineated. The soils' erodibility has been assessed and discussed. It has been found that, at the scale of mapping undertaken, the soils throughout the study area are quite stable, with a low to moderate erodibility classification. Based on observation of the results of past forestry operations within the study area, the stable nature of these soils is largely maintained under the existing forestry land use and land management practices.

Erosion hazard has been assessed across the study area and mitigation measures, primarily through the existing Standard Erosion Mitigation Guidelines for Logging conditions have been discussed. Providing the safeguards contained in the SEMGL are implemented and adhered to, it is concluded that there should be little, if any, significant detrimental erosion or sedimentation within the study area as a result of the proposed forestry operations.

With respect to the SEMGL method of assessing erosion hazard, it is concluded that the soil erodibility and erosion hazard classifications resulting from the use of this approach do not accurately reflect the behaviour of these soils. Consequently, the use of soil loss models in forest situations should be reviewed to reflect on-going research, operational experience and subsequent improved scientific knowledge and understanding.



J.A. Veness
(Directors)



R.A. Veness

VENESS & ASSOCIATES Pty Limited
12th May, 1994

REFERENCES

- Atkinson, G (1992) Soil Survey and Mapping ' in Charman, P.E.V. & Murphy, B.W. (Eds.)
(1991) Soils - Their Properties and Management A Soil Conservation Handbook for New South Wales Sydney University Press
- CaLM (1992) Soil Conservation Issues - Compartments 168-170, Oakes State Forest. Department of Conservation and Land Management Consultancy Report for Forestry Commission of New South Wales
- CaLM (1993) Guidelines for the preparation of environmental impact statements. Department of Conservation and Land Management, Sydney
- Chapman, G.A. & Murphy, C.L. (1989) Soil Landscapes of the Sydney 1:100 000 sheet. Soil Conservation Service of NSW, Sydney
- Charman, P.E.V. (1978) Soils of New South Wales - Their Characterisation, Classification and Conservation Soil Conservation Service of NSW Technical Handbook No. 1
- Charman, P.E.V. & Murphy, B.W. (1991) Soils - Their Properties and Management A Soil Conservation Handbook for New South Wales Sydney University Press
- Houghton, P.D. & Charman, P.E.V. (1986) Glossary of Terms used in Soil Conservation Soil Conservation Service of NSW
- Lacey, S.T. (1993) Soil deformation and erosion in forestry. Technical Report. Research Division, Forestry Commission of New South Wales, Sydney
- McDonald, R.C., Isbell, R.F., Speight, J.G., Walker, J. & Hopkins, M.S. (1990) Australian Soil and Land Survey - Field Handbook. Second Edition. Inkata Press, Melbourne
- Morse, R and Rosewell, C.J. (1993) Application of the USLE to classifying urban lands. Proceedings of the 24th Congress of the International Erosion Control Association, Indianapolis, 169-184
- Northcote, K.H. (1966) Atlas of Australian Soils - Sheet 3 Sydney Canberra Bourke Armidale Area - with explanatory data. CSIRO Melbourne University Press

Northcote, K.H. (1979) A Factual Key for the Recognition of Australian Soils CSIRO Rellim Publications, Adelaide

Oyama, M. & Takehara, H. (1970) Revised Standard Soil Colour Charts Ministry of Agriculture and Forestry, Japan

Pilgrim, D.H. (Ed.) (1987) Australian Rainfall and Runoff. A guide to flood estimation. Institute of Engineers, Canberra

Rosewell, C.J. (1993) SOILOSS: a program to assist in the selection of management practices to reduce erosion. Department of Conservation and Land Management, Gunnedah. Technical Handbook No. 11. 2nd edition

Rosewell, C.J. & Edwards, K. (1988) SOILOSS. A program to assist in the selection of management practices to reduce erosion. Soil Conservation Service of New South Wales. Technical Handbook No. 11

Rosewell, C.J. & Turner, J.B. (1992) Rainfall erosivity in New South Wales. Department of Conservation and Land Management, Technical Report No. 20, Sydney

Simpson, R.P. & Veness, J.A. (1984) Saxonvale Mine Out-of-Pit Emplacement - effects on erosion and hydrology Soil Conservation Service of NSW

Stace, H.C.T., Hubble, G.D., Brewer, R., Northcote, K.H., Sleeman, J.R., Mulcahy, M.J. & Hallsworth, E.G. (1968) A Handbook of Australian Soils Rellim Publications, Adelaide

Wischmeier, W.H. & Smith, D.D. (1978) Predicting rainfall erosion losses - a guide to conservation planning. Agricultural Handbook 537, United States Department of Agriculture, Washington, D.C.

APPENDIX 1
Soil Data Cards

VENESS & ASSOCIATES PTY LIMITED

Environmental and Natural Resource Consultants
308 N° 661 GRAFTON/CASINO/MURWILLAH

SITE No. 1302

spot

Qa

BKAEMAR

Stoake Rd

By 7-11

Record Type	Same as Site No.	Form No.
0001		
SOIL PROPERTIES RECORD 'A'		
Layer Status	Dominant Colour (Munsell Code)	Moisture Characteristics
Horizon	Moist	Primary
Lower Average Depth (m)	Dry	Secondary
Mo	Mo	Mo
11A	2.5	1.0
11B	3.6	1.0
11C	4.5	1.0
11D	5.5	1.0
11E	6.5	1.0
11F	7.5	1.0
11G	8.5	1.0
11H	9.5	1.0
11I	10.5	1.0
11J	11.5	1.0
11K	12.5	1.0
11L	13.5	1.0
11M	14.5	1.0
11N	15.5	1.0
11O	16.5	1.0
11P	17.5	1.0
11Q	18.5	1.0
11R	19.5	1.0
11S	20.5	1.0
11T	21.5	1.0
11U	22.5	1.0
11V	23.5	1.0
11W	24.5	1.0
11X	25.5	1.0
11Y	26.5	1.0
11Z	27.5	1.0

Record Type
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0001

SOIL PROPERTIES RECORD 'B'

BOUNDARY DISTINCTIONS

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WATER-TABLE

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VENESS & ASSOCIATES PTY LIMITED

Environmental and Natural Resource Consultants

SITE No. 1305

661 - Grafton / Casino / Murwillumbah

6/13/74

sub

Da

DOUBLEDUKE

track off Lockleys Rd.

516486 676944p

Layer	Level	Depth	Material	Characteristics	Notes
1	Horizon	0-10	Topsoil	Dark, rich, silty	
2	Horizon	10-20	Clay	Dark, silty, clayey	
3	Horizon	20-30	Clay	Dark, silty, clayey	
4	Horizon	30-40	Clay	Dark, silty, clayey	
5	Horizon	40-50	Clay	Dark, silty, clayey	

Layer	Level	Depth	Material	Characteristics	Notes
1	Horizon	0-10	Topsoil	Dark, rich, silty	
2	Horizon	10-20	Clay	Dark, silty, clayey	
3	Horizon	20-30	Clay	Dark, silty, clayey	
4	Horizon	30-40	Clay	Dark, silty, clayey	
5	Horizon	40-50	Clay	Dark, silty, clayey	

SURFACE CONDITIONS

Crust
Hard set
Not hard set

Flat - 01

BOUNDARY

DEFINITION

HA01	None
HA02	Shrub (100 mm)
HA03	Shrub (100 mm)
HA04	Shrub (100 mm)
HA05	Shrub (100 mm)

GRADE

GA01	None
GA02	None
GA03	None
GA04	None
GA05	None

TEXTURE

TA01	None
TA02	None
TA03	None
TA04	None
TA05	None

GRAIN

GR01	None
GR02	None
GR03	None
GR04	None
GR05	None

PLASTICITY TYPE

PL01	None
PL02	None
PL03	None
PL04	None
PL05	None

STICKINESS

ST01	None
ST02	None
ST03	None
ST04	None
ST05	None

WATER TABLE

WT01	None
WT02	None
WT03	None
WT04	None
WT05	None

CONCRETE

CO01	None
CO02	None
CO03	None
CO04	None
CO05	None

CRACKS

CR01	None
CR02	None
CR03	None
CR04	None
CR05	None

STONES

ST01	None
ST02	None
ST03	None
ST04	None
ST05	None

CONCRETE

CO01	None
CO02	None
CO03	None
CO04	None
CO05	None

CRACKS

CR01	None
CR02	None
CR03	None
CR04	None
CR05	None

STONES

ST01	None
ST02	None
ST03	None
ST04	None
ST05	None

CONCRETE

CO01	None
CO02	None
CO03	None
CO04	None
CO05	None

CRACKS

CR01	None
CR02	None
CR03	None
CR04	None
CR05	None

VENESS & ASSOCIATES PTY LIMITED

Environmental and Natural Resource Consultants

SITE No. 1306

661 - Grafton / Casino / Murwillumbah

5/2/74

Full

Da

DOUBLEDUKE

Range Rd

516426 676616d

Layer	Level	Depth	Material	Characteristics	Notes
1	Horizon	0-10	Topsoil	Dark, rich, silty	
2	Horizon	10-20	Clay	Dark, silty, clayey	
3	Horizon	20-30	Clay	Dark, silty, clayey	
4	Horizon	30-40	Clay	Dark, silty, clayey	
5	Horizon	40-50	Clay	Dark, silty, clayey	

Layer	Level	Depth	Material	Characteristics	Notes
1	Horizon	0-10	Topsoil	Dark, rich, silty	
2	Horizon	10-20	Clay	Dark, silty, clayey	
3	Horizon	20-30	Clay	Dark, silty, clayey	
4	Horizon	30-40	Clay	Dark, silty, clayey	
5	Horizon	40-50	Clay	Dark, silty, clayey	

SURFACE CONDITIONS

Crust
Hard set
Not hard set

Flat 07

BOUNDARY

DEFINITION

HA01	None
HA02	Shrub (100 mm)
HA03	Shrub (100 mm)
HA04	Shrub (100 mm)
HA05	Shrub (100 mm)

GRADE

GA01	None
GA02	None
GA03	None
GA04	None
GA05	None

TEXTURE

TA01	None
TA02	None
TA03	None
TA04	None
TA05	None

GRAIN

GR01	None
GR02	None
GR03	None
GR04	None
GR05	None

PLASTICITY TYPE

PL01	None
PL02	None
PL03	None
PL04	None
PL05	None

STICKINESS

ST01	None
ST02	None
ST03	None
ST04	None
ST05	None

WATER TABLE

WT01	None
WT02	None
WT03	None
WT04	None
WT05	None

CONCRETE

CO01	None
CO02	None
CO03	None
CO04	None
CO05	None

CRACKS

CR01	None
CR02	None
CR03	None
CR04	None
CR05	None

STONES

ST01	None
ST02	None
ST03	None
ST04	None
ST05	None

CONCRETE

CO01	None
CO02	None
CO03	None
CO04	None
CO05	None

CRACKS

CR01	None
CR02	None
CR03	None
CR04	None
CR05	None

STONES

ST01	None
ST02	None
ST03	None
ST04	None
ST05	None

CONCRETE

CO01	None
CO02	None
CO03	None
CO04	None
CO05	None

CRACKS

CR01	None
CR02	None
CR03	None
CR04	None
CR05	None

1

VENESS & ASSOCIATES PTY LIMITED

Environmental and Natural Resource Consultants

Site No. 1310

661 - ~~Grafton~~ / Casino / ~~Robinson Rd~~ Grafton
 499500 6771450

Aspect	Top	Side	Bottom
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9
10	10	10	10
11	11	11	11
12	12	12	12
13	13	13	13
14	14	14	14
15	15	15	15
16	16	16	16
17	17	17	17
18	18	18	18
19	19	19	19
20	20	20	20
21	21	21	21
22	22	22	22
23	23	23	23
24	24	24	24
25	25	25	25
26	26	26	26
27	27	27	27
28	28	28	28
29	29	29	29
30	30	30	30
31	31	31	31
32	32	32	32
33	33	33	33
34	34	34	34
35	35	35	35
36	36	36	36
37	37	37	37
38	38	38	38
39	39	39	39
40	40	40	40
41	41	41	41
42	42	42	42
43	43	43	43
44	44	44	44
45	45	45	45
46	46	46	46
47	47	47	47
48	48	48	48
49	49	49	49
50	50	50	50
51	51	51	51
52	52	52	52
53	53	53	53
54	54	54	54
55	55	55	55
56	56	56	56
57	57	57	57
58	58	58	58
59	59	59	59
60	60	60	60
61	61	61	61
62	62	62	62
63	63	63	63
64	64	64	64
65	65	65	65
66	66	66	66
67	67	67	67
68	68	68	68
69	69	69	69
70	70	70	70
71	71	71	71
72	72	72	72
73	73	73	73
74	74	74	74
75	75	75	75
76	76	76	76
77	77	77	77
78	78	78	78
79	79	79	79
80	80	80	80
81	81	81	81
82	82	82	82
83	83	83	83
84	84	84	84
85	85	85	85
86	86	86	86
87	87	87	87
88	88	88	88
89	89	89	89
90	90	90	90
91	91	91	91
92	92	92	92
93	93	93	93
94	94	94	94
95	95	95	95
96	96	96	96
97	97	97	97
98	98	98	98
99	99	99	99
100	100	100	100

SURFACE CAUTION

Crust
 Hard set
 Not hard set

BOUNDARY

STRUCTURE

STONE SIZE

TEXTURE

MINIATURE

GRAIN

ROOTS

ROOTS

ROOTS

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VENESS & ASSOCIATES PTY LIMITED

Environmental and Natural Resource Consultants

Site No. 1301

661 - ~~Grafton~~ / Casino / ~~Robinson Rd~~ Grafton
 502660 6765630

Aspect	Top	Side	Bottom
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9
10	10	10	10
11	11	11	11
12	12	12	12
13	13	13	13
14	14	14	14
15	15	15	15
16	16	16	16
17	17	17	17
18	18	18	18
19	19	19	19
20	20	20	20
21	21	21	21
22	22	22	22
23	23	23	23
24	24	24	24
25	25	25	25
26	26	26	26
27	27	27	27
28	28	28	28
29	29	29	29
30	30	30	30
31	31	31	31
32	32	32	32
33	33	33	33
34	34	34	34
35	35	35	35
36	36	36	36
37	37	37	37
38	38	38	38
39	39	39	39
40	40	40	40
41	41	41	41
42	42	42	42
43	43	43	43
44	44	44	44
45	45	45	45
46	46	46	46
47	47	47	47
48	48	48	48
49	49	49	49
50	50	50	50
51	51	51	51
52	52	52	52
53	53	53	53
54	54	54	54
55	55	55	55
56	56	56	56
57	57	57	57
58	58	58	58
59	59	59	59
60	60	60	60
61	61	61	61
62	62	62	62
63	63	63	63
64	64	64	64
65	65	65	65
66	66	66	66
67	67	67	67
68	68	68	68
69	69	69	69
70	70	70	70
71	71	71	71
72	72	72	72
73	73	73	73
74	74	74	74
75	75	75	75
76	76	76	76
77	77	77	77
78	78	78	78
79	79	79	79
80	80	80	80
81	81	81	81
82	82	82	82
83	83	83	83
84	84	84	84
85	85	85	85
86	86	86	86
87	87	87	87
88	88	88	88
89	89	89	89
90	90	90	90
91	91	91	91
92	92	92	92
93	93	93	93
94	94	94	94
95	95	95	95
96	96	96	96
97	97	97	97
98	98	98	98
99	99	99	99
100	100	100	100

SURFACE CAUTION

Crust
 Hard set
 Not hard set

BOUNDARY

STRUCTURE

STONE SIZE

TEXTURE

MINIATURE

GRAIN

ROOTS

ROOTS

ROOTS

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VENESS & ASSOCIATES PTY LIMITED

Environmental and Natural Resource Consultants

SITE NO. 1802

661 MURWILLUMBAH

60451

Layer Status	Layer	Depth (m)	Soil No.	Soil at	Soil
1	Horizon	0.00	1802	1802	1802
2	1.1	0.00	1802	1802	1802
3	1.2	0.00	1802	1802	1802
4	1.3	0.00	1802	1802	1802
5	1.4	0.00	1802	1802	1802
6	1.5	0.00	1802	1802	1802
7	1.6	0.00	1802	1802	1802
8	1.7	0.00	1802	1802	1802
9	1.8	0.00	1802	1802	1802
10	1.9	0.00	1802	1802	1802
11	2.0	0.00	1802	1802	1802
12	2.1	0.00	1802	1802	1802
13	2.2	0.00	1802	1802	1802
14	2.3	0.00	1802	1802	1802
15	2.4	0.00	1802	1802	1802
16	2.5	0.00	1802	1802	1802
17	2.6	0.00	1802	1802	1802
18	2.7	0.00	1802	1802	1802
19	2.8	0.00	1802	1802	1802
20	2.9	0.00	1802	1802	1802
21	3.0	0.00	1802	1802	1802
22	3.1	0.00	1802	1802	1802
23	3.2	0.00	1802	1802	1802
24	3.3	0.00	1802	1802	1802
25	3.4	0.00	1802	1802	1802
26	3.5	0.00	1802	1802	1802
27	3.6	0.00	1802	1802	1802
28	3.7	0.00	1802	1802	1802
29	3.8	0.00	1802	1802	1802
30	3.9	0.00	1802	1802	1802
31	4.0	0.00	1802	1802	1802
32	4.1	0.00	1802	1802	1802
33	4.2	0.00	1802	1802	1802
34	4.3	0.00	1802	1802	1802
35	4.4	0.00	1802	1802	1802
36	4.5	0.00	1802	1802	1802
37	4.6	0.00	1802	1802	1802
38	4.7	0.00	1802	1802	1802
39	4.8	0.00	1802	1802	1802
40	4.9	0.00	1802	1802	1802
41	5.0	0.00	1802	1802	1802
42	5.1	0.00	1802	1802	1802
43	5.2	0.00	1802	1802	1802
44	5.3	0.00	1802	1802	1802
45	5.4	0.00	1802	1802	1802
46	5.5	0.00	1802	1802	1802
47	5.6	0.00	1802	1802	1802
48	5.7	0.00	1802	1802	1802
49	5.8	0.00	1802	1802	1802
50	5.9	0.00	1802	1802	1802
51	6.0	0.00	1802	1802	1802
52	6.1	0.00	1802	1802	1802
53	6.2	0.00	1802	1802	1802
54	6.3	0.00	1802	1802	1802
55	6.4	0.00	1802	1802	1802
56	6.5	0.00	1802	1802	1802
57	6.6	0.00	1802	1802	1802
58	6.7	0.00	1802	1802	1802
59	6.8	0.00	1802	1802	1802
60	6.9	0.00	1802	1802	1802
61	7.0	0.00	1802	1802	1802
62	7.1	0.00	1802	1802	1802
63	7.2	0.00	1802	1802	1802
64	7.3	0.00	1802	1802	1802
65	7.4	0.00	1802	1802	1802
66	7.5	0.00	1802	1802	1802
67	7.6	0.00	1802	1802	1802
68	7.7	0.00	1802	1802	1802
69	7.8	0.00	1802	1802	1802
70	7.9	0.00	1802	1802	1802
71	8.0	0.00	1802	1802	1802
72	8.1	0.00	1802	1802	1802
73	8.2	0.00	1802	1802	1802
74	8.3	0.00	1802	1802	1802
75	8.4	0.00	1802	1802	1802
76	8.5	0.00	1802	1802	1802
77	8.6	0.00	1802	1802	1802
78	8.7	0.00	1802	1802	1802
79	8.8	0.00	1802	1802	1802
80	8.9	0.00	1802	1802	1802
81	9.0	0.00	1802	1802	1802
82	9.1	0.00	1802	1802	1802
83	9.2	0.00	1802	1802	1802
84	9.3	0.00	1802	1802	1802
85	9.4	0.00	1802	1802	1802
86	9.5	0.00	1802	1802	1802
87	9.6	0.00	1802	1802	1802
88	9.7	0.00	1802	1802	1802
89	9.8	0.00	1802	1802	1802
90	9.9	0.00	1802	1802	1802
91	10.0	0.00	1802	1802	1802
92	10.1	0.00	1802	1802	1802
93	10.2	0.00	1802	1802	1802
94	10.3	0.00	1802	1802	1802
95	10.4	0.00	1802	1802	1802
96	10.5	0.00	1802	1802	1802
97	10.6	0.00	1802	1802	1802
98	10.7	0.00	1802	1802	1802
99	10.8	0.00	1802	1802	1802
100	10.9	0.00	1802	1802	1802
101	11.0	0.00	1802	1802	1802
102	11.1	0.00	1802	1802	1802
103	11.2	0.00	1802	1802	1802
104	11.3	0.00	1802	1802	1802
105	11.4	0.00	1802	1802	1802
106	11.5	0.00	1802	1802	1802
107	11.6	0.00	1802	1802	1802
108	11.7	0.00	1802	1802	1802
109	11.8	0.00	1802	1802	1802
110	11.9	0.00	1802	1802	1802
111	12.0	0.00	1802	1802	1802
112	12.1	0.00	1802	1802	1802
113	12.2	0.00	1802	1802	1802
114	12.3	0.00	1802	1802	1802
115	12.4	0.00	1802	1802	1802
116	12.5	0.00	1802	1802	1802
117	12.6	0.00	1802	1802	1802
118	12.7	0.00	1802	1802	1802
119	12.8	0.00	1802	1802	1802
120	12.9	0.00	1802	1802	1802
121	13.0	0.00	1802	1802	1802
122	13.1	0.00	1802	1802	1802
123	13.2	0.00	1802	1802	1802
124	13.3	0.00	1802	1802	1802
125	13.4	0.00	1802	1802	1802
126	13.5	0.00	1802	1802	1802
127	13.6	0.00	1802	1802	1802
128	13.7	0.00	1802	1802	1802
129	13.8	0.00	1802	1802	1802
130	13.9	0.00	1802	1802	1802
131	14.0	0.00	1802	1802	1802
132	14.1	0.00	1802	1802	1802
133	14.2	0.00	1802	1802	1802
134	14.3	0.00	1802	1802	1802
135	14.4	0.00	1802	1802	1802
136	14.5	0.00	1802	1802	1802
137	14.6	0.00	1802	1802	1802
138	14.7	0.00	1802	1802	1802
139	14.8	0.00	1802	1802	1802
140	14.9	0.00	1802	1802	1802
141	15.0	0.00	1802	1802	1802
142	15.1	0.00	1802	1802	1802
143	15.2	0.00	1802	1802	1802
144	15.3	0.00	1802	1802	1802
145	15.4	0.00	1802	1802	1802
146	15.5	0.00	1802	1802	1802
147	15.6	0.00	1802	1802	1802
148	15.7	0.00	1802	1802	1802
149	15.8	0.00	1802	1802	1802
150	15.9	0.00	1802	1802	1802
151	16.0	0.00	1802	1802	1802
152	16.1	0.00	1802	1802	1802
153	16.2	0.00	1802	1802	1802
154	16.3	0.00	1802	1802	1802
155	16.4	0.00	1802	1802	1802
156	16.5	0.00	1802	1802	1802
157	16.6	0.00	1802	1802	1802
158	16.7	0.00	1802	1802	1802
159	16.8	0.00	1802	1802	1802
160	16.9	0.00	1802	1802	1802
161	17.0	0.00	1802	1802	1802
162	17.1	0.00	1802	1802	1802
163	17.2	0.00	1802	1802	1802
164	17.3	0.00	1802	1802	1802
165	17.4	0.00	1802	1802	1802
166	17.5	0.00	1802	1802	1802
167	17.6	0.00	1802	1802	1802
168	17.7	0.00	1802	1802	1802
169	17.8	0.00	1802	1802	1802
170	17.9	0.00	1802	1802	1802
171	18.0	0.00	1802	1802	1802
172	18.1	0.00	1802	1802	1802
173	18.2	0.00	1802	1802	1802
174	18.3	0.00	1802	1802	1802
175	18.4	0.00	1802	1802	1802
176	18.5	0.00	1802	1802	1802
177	18.6	0.00	1802	1802	1802
178	18.7	0.00	1802	1802	1802
179	18.8	0.00	1802	1802	1802
180	18.9	0.00	1802	1802	1802
181	19.0	0.00	1802	1802	1802
182	19.1	0.00	1802	1802	1802
183	19.2	0.00	1802	1802	1802
184	19.3	0.00	1802	1802	1802
185	19.4	0.00	1802	1802	1802
186	19.5	0.00	1802	1802	1802
187	19.6	0.00	1802	1802	1802
188	19.7	0.00	1802	1802	1802
189	19.8	0.00	1802	1802	1802
190	19.9	0.00	1802	1802	1802
191	20.0	0.00	1802	1802	1802
192	20.1	0.00	1802	1802	1802
193	20.2	0.00	1802	1802	1802
194	20.3	0.00	1802	1802	1802
195	20.4	0.00	1802	1802	1802
196	20.5	0.00	1802	1802	1802
197	20.6	0.00	1802	1802	1802
198	20.7	0.00	1802	1802	1802
199	20.8	0.00	1802	1802	1802
200	20.9	0.00	1802	1802	1802
201	21.0	0.00	1802	1802	1802
202	21.1	0.00	1802	1802	1802
203	21.2	0.00	1802	1802	1802
204	21.3	0.00	1802	1802	1802
205	21.4	0.00	1802	1802	1802
206	21.5	0.00	1802	1802	1802
207	21.6	0.00	1802	1802	1802
208	21.7	0.00	1802	1802	1802
209	21.8	0.00	1802	180	

VENESS & ASSOCIATES PTY LIMITED

Environmental and Natural Resource Consultants

SOG N° 661 GRAFTON/CASINO/MURWILLAH

ITEM NO. 0103

SPOT

BOORABEE

Tlb

56824 683122

Soil Type		Same as Site No.	Site No.	Soil Properties Record 'A'
Lower Status	Upper Status	Depth (m)	Moisture	Texture
11A	11B	0.00	11A	11B
11C	11D	0.00	11C	11D
11E	11F	0.00	11E	11F
11G	11H	0.00	11G	11H
11I	11J	0.00	11I	11J
11K	11L	0.00	11K	11L
11M	11N	0.00	11M	11N
11O	11P	0.00	11O	11P
11Q	11R	0.00	11Q	11R
11S	11T	0.00	11S	11T
11U	11V	0.00	11U	11V
11W	11X	0.00	11W	11X
11Y	11Z	0.00	11Y	11Z
11AA	11AB	0.00	11AA	11AB
11AC	11AD	0.00	11AC	11AD
11AE	11AF	0.00	11AE	11AF
11AG	11AH	0.00	11AG	11AH
11AI	11AJ	0.00	11AI	11AJ
11AK	11AL	0.00	11AK	11AL
11AM	11AN	0.00	11AM	11AN
11AO	11AP	0.00	11AO	11AP
11AQ	11AR	0.00	11AQ	11AR
11AS	11AT	0.00	11AS	11AT
11AU	11AV	0.00	11AU	11AV
11AW	11AX	0.00	11AW	11AX
11AY	11AZ	0.00	11AY	11AZ
11BA	11BB	0.00	11BA	11BB
11BC	11BD	0.00	11BC	11BD
11BE	11BF	0.00	11BE	11BF
11BG	11BH	0.00	11BG	11BH
11BI	11BJ	0.00	11BI	11BJ
11BK	11BL	0.00	11BK	11BL
11BM	11BN	0.00	11BM	11BN
11BO	11BP	0.00	11BO	11BP
11BQ	11BR	0.00	11BQ	11BR
11BS	11BT	0.00	11BS	11BT
11BU	11BV	0.00	11BU	11BV
11BW	11BX	0.00	11BW	11BX
11BY	11BZ	0.00	11BY	11BZ
11CA	11CB	0.00	11CA	11CB
11CC	11CD	0.00	11CC	11CD
11CE	11CF	0.00	11CE	11CF
11CG	11CH	0.00	11CG	11CH
11CI	11CJ	0.00	11CI	11CJ
11CK	11CL	0.00	11CK	11CL
11CM	11CN	0.00	11CM	11CN
11CO	11CP	0.00	11CO	11CP
11CQ	11CR	0.00	11CQ	11CR
11CS	11CT	0.00	11CS	11CT
11CU	11CV	0.00	11CU	11CV
11CW	11CX	0.00	11CW	11CX
11CY	11CZ	0.00	11CY	11CZ
11DA	11DB	0.00	11DA	11DB
11DC	11DD	0.00	11DC	11DD
11DE	11DF	0.00	11DE	11DF
11DG	11DH	0.00	11DG	11DH
11DI	11DJ	0.00	11DI	11DJ
11DK	11DL	0.00	11DK	11DL
11DM	11DN	0.00	11DM	11DN
11DO	11DP	0.00	11DO	11DP
11DQ	11DR	0.00	11DQ	11DR
11DS	11DT	0.00	11DS	11DT
11DU	11DV	0.00	11DU	11DV
11DW	11DX	0.00	11DW	11DX
11DY	11DZ	0.00	11DY	11DZ
11EA	11EB	0.00	11EA	11EB
11EC	11ED	0.00	11EC	11ED
11EE	11EF	0.00	11EE	11EF
11EG	11EH	0.00	11EG	11EH
11EI	11EJ	0.00	11EI	11EJ
11EK	11EL	0.00	11EK	11EL
11EM	11EN	0.00	11EM	11EN
11EO	11EP	0.00	11EO	11EP
11EQ	11ER	0.00	11EQ	11ER
11ES	11ET	0.00	11ES	11ET
11EU	11EV	0.00	11EU	11EV
11EW	11EX	0.00	11EW	11EX
11EY	11EZ	0.00	11EY	11EZ
11FA	11FB	0.00	11FA	11FB
11FC	11FD	0.00	11FC	11FD
11FE	11FF	0.00	11FE	11FF
11FG	11FH	0.00	11FG	11FH
11FI	11FJ	0.00	11FI	11FJ
11FK	11FL	0.00	11FK	11FL
11FM	11FN	0.00	11FM	11FN
11FO	11FP	0.00	11FO	11FP
11FQ	11FR	0.00	11FQ	11FR
11FS	11FT	0.00	11FS	11FT
11FU	11FV	0.00	11FU	11FV
11FW	11FX	0.00	11FW	11FX
11FY	11FZ	0.00	11FY	11FZ
11GA	11GB	0.00	11GA	11GB
11GC	11GD	0.00	11GC	11GD
11GE	11GF	0.00	11GE	11GF
11GG	11GH	0.00	11GG	11GH
11GI	11GJ	0.00	11GI	11GJ
11GK	11GL	0.00	11GK	11GL
11GM	11GN	0.00	11GM	11GN
11GO	11GP	0.00	11GO	11GP
11GQ	11GR	0.00	11GQ	11GR
11GS	11GT	0.00	11GS	11GT
11GU	11GV	0.00	11GU	11GV
11GW	11GX	0.00	11GW	11GX
11GY	11GZ	0.00	11GY	11GZ
11HA	11HB	0.00	11HA	11HB
11HC	11HD	0.00	11HC	11HD
11HE	11HF	0.00	11HE	11HF
11HG	11HH	0.00	11HG	11HH
11HI	11HJ	0.00	11HI	11HJ
11HK	11HL	0.00	11HK	11HL
11HM	11HN	0.00	11HM	11HN
11HO	11HP	0.00	11HO	11HP
11HQ	11HR	0.00	11HQ	11HR
11HS	11HT	0.00	11HS	11HT
11HU	11HV	0.00	11HU	11HV
11HW	11HX	0.00	11HW	11HX
11HY	11HZ	0.00	11HY	11HZ
11IA	11IB	0.00	11IA	11IB
11IC	11ID	0.00	11IC	11ID
11IE	11IF	0.00	11IE	11IF
11IG	11IH	0.00	11IG	11IH
11II	11IJ	0.00	11II	11IJ
11IK	11IL	0.00	11IK	11IL
11IM	11IN	0.00	11IM	11IN
11IO	11IP	0.00	11IO	11IP
11IQ	11IR	0.00	11IQ	11IR
11IS	11IT	0.00	11IS	11IT
11IU	11IV	0.00	11IU	11IV
11IW	11IX	0.00	11IW	11IX
11IY	11IZ	0.00	11IY	11IZ
11JA	11JB	0.00	11JA	11JB
11JC	11JD	0.00	11JC	11JD
11JE	11JF	0.00	11JE	11JF
11JG	11JH	0.00	11JG	11JH
11JI	11JJ	0.00	11JI	11JJ
11JK	11JL	0.00	11JK	11JL
11JM	11JN	0.00	11JM	11JN
11JO	11JP	0.00	11JO	11JP
11JQ	11JR	0.00	11JQ	11JR
11JS	11JT	0.00	11JS	11JT
11JU	11JV	0.00	11JU	11JV
11JW	11JX	0.00	11JW	11JX
11JY	11JZ	0.00	11JY	11JZ
11KA	11KB	0.00	11KA	11KB
11KC	11KD	0.00	11KC	11KD
11KE	11KF	0.00	11KE	11KF
11KG	11KH	0.00	11KG	11KH
11KI	11KJ	0.00	11KI	11KJ
11KK	11KL	0.00	11KK	11KL
11KM	11KN	0.00	11KM	11KN
11KO	11KP	0.00	11KO	11KP
11KQ	11KR	0.00	11KQ	11KR
11KS	11KT	0.00	11KS	11KT
11KU	11KV	0.00	11KU	11KV
11KW	11KX	0.00	11KW	11KX
11KY	11KZ	0.00	11KY	11KZ
11LA	11LB	0.00	11LA	11LB
11LC	11LD	0.00	11LC	11LD
11LE	11LF	0.00	11LE	11LF
11LG	11LH	0.00	11LG	11LH
11LI	11LJ	0.00	11LI	11LJ
11LK	11LL	0.00	11LK	11LL
11LM	11LN	0.00	11LM	11LN
11LO	11LP	0.00	11LO	11LP
11LQ	11LR	0.00	11LQ	11LR
11LS	11LT	0.00	11LS	11LT
11LU	11LV	0.00	11LU	11LV
11LW	11LX	0.00	11LW	11LX
11LY	11LZ	0.00	11LY	11LZ
11MA	11MB	0.00	11MA	11MB
11MC	11MD	0.00	11MC	11MD
11ME	11MF	0.00	11ME	11MF
11MG	11MH	0.00	11MG	11MH
11MI	11MJ	0.00	11MI	11MJ
11MK	11ML	0.00	11MK	11ML
11MM	11MN	0.00	11MM	11MN
11MO	11MP	0.00	11MO	11MP
11MQ	11MR	0.00	11MQ	11MR
11MS	11MT	0.00	11MS	11MT
11MU	11MV	0.00	11MU	11MV
11MW	11MX	0.00	11MW	11MX
11MY	11MZ	0.00	11MY	11MZ
11NA	11NB	0.00	11NA	11NB
11NC	11ND	0.00	11NC	11ND
11NE	11NF	0.00	11NE	11NF
11NG	11NH	0.00	11NG	11NH
11NI	11NJ	0.00	11NI	11NJ
11NK	11NL	0.00	11NK	11NL
11NM	11NN	0.00	11NM	11NN
11NO	11NP	0.00	11NO	11NP
11NQ	11NR	0.00	11NQ	11NR
11NS	11NT	0.00	11NS	11NT
11NU	11NV	0.00	11NU	11NV
11NW	11NX	0.00	11NW	11NX
11NY	11NZ	0.00	11NY	11NZ
11OA	11OB	0.00	11OA	11OB
11OC	11OD	0.00	11OC	11OD
11OE	11OF	0.00	11OE	11OF
11OG	11OH	0.00	11OG	11OH
11OI	11OJ	0.00	11OI	11OJ
11OK	11OL	0.00	11OK	11OL
11OM	11ON	0.00	11OM	11ON
11OO	11OP	0.00	11OO	11OP
11OQ	11OR	0.00	11OQ	11OR
11OS	11OT	0.00	11OS	11OT
11OU	11OV	0.00	11OU	11OV
11OW	11OX	0.00	11OW	11OX
11OY	11OZ	0.00	11OY	11OZ
11PA	11PB	0.00	11PA	11PB
11PC	11PD	0.00	11PC	11PD
11PE	11PF	0.00	11PE	11PF
11PG	11PH	0.00	11PG	11PH
11PI	11PJ	0.00	11PI	11PJ
11PK	11PL	0.00	11PK	11PL
11PM	11PN	0.00	11PM	11PN
11PO	11PP	0.00	11PO	11PP
11PQ	11PR	0.00	11PQ	11PR
11PS	11PT	0.00	11PS	11PT
11PU	11PV	0.00	11PU	11PV
11PW	11PX	0.00	11PW	11PX
11PY	11PZ	0.00	11PY	11PZ
11QA	11QB	0.00	11QA	11QB
11QC	11QD	0.00	11QC	11QD

VENESS & ASSOCIATES PTY LIMITED

Environmental and Natural Resource Consultants
508 N° 661 GRAFTON/CASINO/MURWILLAH

SITE No. 0101

FULL

BUNGABEE S.F. T16

510380 6921660

6/3/11

Access Type		Sample at Site No	Test No. of Samples														
0 3 3 1																	
SOIL PROPERTIES RECORD 'A'																	
Layer Status		Dominant Colour (Munsell Code)	Moisture Characteristics	Texture													
Soil Type	Horizon	Luminance Density (L*)	Moist	V/C	Dry	Primary				Secondary				mm	gr	As Spec. in	
						Coarse	Medium	Fine	%	Coarse	Medium	Fine	%				
11A		45	5.1	YR 2/1													517.0
11B		49.0	5.1	YR 2/1													517.0
11																	
12																	
13																	
14																	
15																	
16																	
17																	
18																	
19																	

Soil Type		Sample at Site No.		Test No. of Samples	
Horizon	Moist	Dry	Primary	Secondary	mm
10A	4.5	5.1	YR 2/1		15-20
10B	4.5	5.1	YR 2/1		15-20
11					
12					
13					
14					
15					

136 Mid slope - gentle - below break of slope bet. very steep upper
more gentle lower slope.

SOIL PROPERTIES RECORD 'B'

Soil Type Sample at Site No.
0 3 3 1

BOUNDARY DEFINITION

	1 2 3 4 5 6	
M.A.01		Name
M.A.02		Shrub 1-25 mm
M.A.03		Clear 125-50 mm
M.A.04		Grass 150-100 mm
M.A.05		Diffuse 125-100 mm

TEXTURE

40002	_____	_____
40003	_____	_____
40004	_____	_____

TEXTURE

CLASSIFICATION

GRADE

0001	0	3	3	1	Soils
0002	0	3	3	1	Latitude Band
0003	0	3	3	1	Climate Band
0004	0	3	3	1	Ecology Band

PLASTICITY TYPE

001		Layer
002		Layer, Non Saturated
003		Thin Layer
004		Heavy Clay Layer
005		Clay Layer
006		Thin Clay Layer
007		Thin Saturated Clay Layer

STICKINESS

0-6		Light Minimum Clay
0-1		Medium Clay
0-3		Heavy Clay

PLASTICITY TYPE



WATER TABLE

Soil Type	Sample at Site No.	Test No. of Samples			
0 3 3 1					
Layer Status	Dominant Colour (Munsell Code)	Moisture Characteristics	Texture		
Horizon	Moist	Dry	Primary	Secondary	mm
10A	4.5	5.1	YR 2/1		15-20
10B	4.5	5.1	YR 2/1		15-20
11					
12					
13					
14					
15					

CONSISTENCE

Soil Type		Sample at Site No.		Test No. of Samples	
0 3 3 1					
Layer Status	Dominant Colour (Munsell Code)	Moisture Characteristics	Texture		
Horizon	Moist	Dry	Primary	Secondary	mm
10A	4.5	5.1	YR 2/1		15-20
10B	4.5	5.1	YR 2/1		15-20
11					
12					
13					
14					
15					

CRACKING TEST

0-1	1	2	3	4	Very Weak Force
0-2	1	2	3	4	Weak Force
0-3	1	2	3	4	Medium Force
0-4	1	2	3	4	Strong Force
0-5	1	2	3	4	Very Strong Force

HEATING TEST

SHRINKAGE TEST

0-1		Underlay
0-2		No Change
0-3		Loam
0-4		Peat

STRUCTURE

UAG1	_____	Agave Lingo Gr.
UAG2	_____	Agave Lingo
UAG3	_____	Wm. Palm
UAG4	_____	Mossy Palm
UAG5	_____	Elm Palm

ROOTS

0 3 3 1	4.5	5.1	YR 2/1		15-20
0 3 3 2	4.5	5.1	YR 2/1		15-20
0 3 3 3	4.5	5.1	YR 2/1		15-20
0 3 3 4	4.5	5.1	YR 2/1		15-20
0 3 3 5	4.5	5.1	YR 2/1		15-20
0 3 3 6	4.5	5.1	YR 2/1		15-20
0 3 3 7	4.5	5.1	YR 2/1		15-20
0 3 3 8	4.5	5.1	YR 2/1		15-20
0 3 3 9	4.5	5.1	YR 2/1		15-20
0 3 3 10	4.5	5.1	YR 2/1		15-20
0 3 3 11	4.5	5.1	YR 2/1		15-20
0 3 3 12	4.5	5.1	YR 2/1		15-20
0 3 3 13	4.5	5.1	YR 2/1		15-20
0 3 3 14	4.5	5.1	YR 2/1		15-20
0 3 3 15	4.5	5.1	YR 2/1		15-20
0 3 3 16	4.5	5.1	YR 2/1		15-20
0 3 3 17	4.5	5.1	YR 2/1		15-20
0 3 3 18	4.5	5.1	YR 2/1		15-20
0 3 3 19	4.5	5.1	YR 2/1		15-20
0 3 3 20	4.5	5.1	YR 2/1		15-20
0 3 3 21	4.5	5.1	YR 2/1		15-20
0 3 3 22	4.5	5.1	YR 2/1		15-20
0 3 3 23	4.5	5.1	YR 2/1		15-20
0 3 3 24	4.5	5.1	YR 2/1		15-20
0 3 3 25	4.5	5.1	YR 2/1		15-20
0 3 3 26	4.5	5.1	YR 2/1		15-20
0 3 3 27	4.5	5.1	YR 2/1		15-20
0 3 3 28	4.5	5.1	YR 2/1		15-20
0 3 3 29	4.5	5.1	YR 2/1		15-20
0 3 3 30	4.5	5.1	YR 2/1		15-20
0 3 3 31	4.5	5.1	YR 2/1		15-20
0 3 3 32	4.5	5.1	YR 2/1		15-20
0 3 3 33	4.5	5.1	YR 2/1		15-20
0 3 3 34	4.5	5.1	YR 2/1		15-20
0 3 3 35	4.5	5.1	YR 2/1		15-20
0 3 3 36	4.5	5.1	YR 2/1		15-20
0 3 3 37	4.5	5.1	YR 2/1		15-20
0 3 3 38	4.5	5.1	YR 2/1		15-20
0 3 3 39	4.5	5.1	YR 2/1		15-20
0 3 3 40	4.5	5.1	YR 2/1		15-20
0 3 3 41	4.5	5.1	YR 2/1		15-20
0 3 3 42	4.5	5.1	YR 2/1		15-20
0 3 3 43	4.5	5.1	YR 2/1		15-20
0 3 3 44	4.5	5.1	YR 2/1		15-20
0 3 3 45	4.5	5.1	YR 2/1		15-20
0 3 3 46	4.5	5.1	YR 2/1		15-20
0 3 3 47	4.5	5.1	YR 2/1		15-20
0 3 3 48	4.5	5.1	YR 2/1		15-20
0 3 3 49	4.5	5.1	YR 2/1		15-20
0 3 3 50	4.5	5.1	YR 2/1		15-20
0 3 3 51	4.5	5.1	YR 2/1		15-20
0 3 3 52	4.5	5.1	YR 2/1		15-20
0 3 3 53	4.5	5.1	YR 2/1		15-20
0 3 3 54	4.5	5.1	YR 2/1		15-20
0 3 3 55	4.5	5.1	YR 2/1		15-20
0 3 3 56	4.5	5.1	YR 2/1		15-20
0 3 3 57	4.5	5.1	YR 2/1		15-20
0 3 3 58	4.5	5.1	YR 2/1		15-20
0 3 3 59	4.5	5.1	YR 2/1		15-20
0 3 3 60	4.5	5.1	YR 2/1		15-20
0 3 3 61	4.5	5.1	YR 2/1		15-20
0 3 3 62	4.5	5.1	YR 2/1		15-20
0 3 3 63	4.5	5.1	YR 2/1		15-20
0 3 3 64	4.5	5.1	YR 2/1		15-20
0 3 3 65	4.5	5.1	YR 2/1		15-20
0 3 3 66	4.5	5.1	YR 2/1		15-20
0 3 3 67	4.5	5.1	YR 2/1		15-20
0 3 3 68	4.5	5.1	YR 2/1		15-20
0 3 3 69	4.5	5.1	YR 2/1		15-20
0 3 3 70	4.5	5.1	YR 2/1		15-20
0 3 3 71	4.5	5.1	YR 2/1		15-20
0 3 3 72	4.5	5.1	YR 2/1		15-20
0 3 3 73	4.5	5.1	YR 2/1		15-20
0 3 3 74	4.5	5.1	YR 2/1		15-20
0 3 3 75	4.5	5.1	YR 2/1		15-20
0 3 3 76	4.5	5.1	YR 2/1		15-20
0 3 3 77	4.5	5.1	YR 2/1		15-20
0 3 3 78	4.5	5.1	YR 2/1		15-20
0 3 3 79	4.5	5.1	YR 2/1		15-20
0 3 3 80	4.5	5.1	YR 2/1		15-20
0 3 3 81	4.5	5.1	YR 2/1		15-20
0 3 3 82	4.5	5.1	YR 2/1		15-20
0 3 3 83	4.5	5.1	YR 2/1		15-20
0 3 3 84	4.5	5.1	YR 2/1		15-20
0 3 3 85	4.5	5.1	YR 2/1		15-20
0 3 3 86	4.5	5.1	YR 2/1		15-20
0 3 3 87	4.5	5.1	YR 2/1		15-20
0 3 3 88	4.5	5.1	YR 2/1		15-20
0 3 3 89	4.5	5.1	YR 2/1		15-20
0 3 3 90	4.5	5.1	YR 2/1		15-20
0 3 3 91	4.5	5.1	YR 2/1		15-20
0 3 3 92	4.5	5.1	YR 2/1		15-20
0 3 3 93	4.5	5.1	YR 2/1		15-20
0 3 3 94	4.5	5.1	YR 2/1		15-20
0 3 3 95	4.5	5.1	YR 2/1		15-20
0 3 3 96	4.5	5.1	YR 2/1		15-20
0 3 3 97	4.5	5.1	YR 2/1		15-20
0 3 3 98	4.5	5.1	YR 2/1		15-20
0 3 3 99	4.5	5.1	YR 2/1		15-20
0 3 3 100	4.5	5.1	YR 2/1		15-20

ROOT DISTRIBUTION

Primary					Soil Type		Sample at Site No.	
1	2	3	4	5			1	2
					Flow	US 81		
X					Laminar	US 82	X	
					Fractured	US 83		
					Consolidated	US 84		
						US 85		

ROOTS

_____	Round	YES
_____	Crater	YES
_____	Crown	YES
PARIS		
UPR: _____	_____	_____

ROOT DISTRIBUTION

CUTANE	
U001	Moist
U002	Fine (100%)
U003	Common (10-20%)
U004	Heavy (2-5%)

ROOTS

U102		0.000
CRACK SIZE		
U101		0.000
U102		0.000

ROOT DISTRIBUTION

STONES	
AMOUNT OF STONES	
VALUE	1 2 3 4 5
VALUE	1 2 3 4 5
VALUE	1 2 3 4 5
VALUE	1 2 3 4 5

ROOTS

VADP 1																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
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ROOT DISTRIBUTION

VCB 1		100%
VCB 2		100%
VCB 3		100%
VCB 4		100%

VENESS & ASSOCIATES PTY LIMITED

Environmental and Natural Resource Consultants
508 N° 661 GRAFTON/CASINO/MURWILLAH

SITE No. 0201

FULL

EDEN CREEK S.F. Tml

494330 6046860

PLAQUE 101 100
(CHECK STAGE)

6/3/11

Record Type		Sample at Site No.	Test No. of Samples			
0 3 3 1						
494433 684686p						
SOIL PROPERTIES RECORD 'A'						
Layer Status		Dominant Colour (Munsell Code)	Moisture Characteristics		Texture	
Layer No.	Horizon	Moist	Dry	Primary	Secondary	mm
				1 2 3 4 5 6 7 8 9 10	1 2 3 4 5 6 7 8 9 10	mm
11A	1	2.5	1.5	YR		15-20
11B	2	4.5	5.1	YR		15-20
12	3	4.5	5.1	YR		15-20
13	4	3.0	1.5	YR		15-20
14						
15						
16						
17						
18						
19						
20						

Soil Type		Sample at Site No.	Test No. of Samples
0	3	3	1
Layer Status	Dominant Colour (Munsell Code)	Moisture Characteristics	Texture
Horizon	Moist	Dry	Primary
10A	4.5	5.1	YR 2/1
10B	4.5	5.1	YR 2/1
11			
12			
13			
14			
15			

Upper slope relatively steep soil

SOIL PROPERTIES RECORD 'B'

Soil Type Sample at Site No.
0 3 3 1

BOUNDARY DEFINITION

	1	2	3	4	5	
10A	1	2	3	4	5	100%
10B	1	2	3	4	5	100%
11	1	2	3	4	5	100%
12	1	2	3	4	5	100%
13	1	2	3	4	5	100%
14	1	2	3	4	5	100%
15	1	2	3	4	5	100%

TEXTURE

VENESS & ASSOCIATES PTY LIMITED

Environmental and Natural Resource Consultants

SOC N° 661 GRAFTON/CASINO/MURWILLAH

SITE No. 0501

spot

RICHMOND RANGE Tmb

476249 682752p

Consolidate

Dr 2-11

SOIL PROPERTIES RECORD 'A'

Layer	Soil Type	Soil No.	Soil Name	Soil Description	Soil Characteristics	Soil Test Results
Horizon	Soil Type	Soil No.	Soil Name	Soil Description	Soil Characteristics	Soil Test Results
11A	11A	11A	11A	11A	11A	11A
11B	11B	11B	11B	11B	11B	11B
11C	11C	11C	11C	11C	11C	11C
11D	11D	11D	11D	11D	11D	11D
11E	11E	11E	11E	11E	11E	11E
11F	11F	11F	11F	11F	11F	11F
11G	11G	11G	11G	11G	11G	11G
11H	11H	11H	11H	11H	11H	11H
11I	11I	11I	11I	11I	11I	11I
11J	11J	11J	11J	11J	11J	11J

Soil Type	Soil No.	Soil Name	Soil Description	Soil Characteristics	Soil Test Results
11A	11A	11A	11A	11A	11A
11B	11B	11B	11B	11B	11B
11C	11C	11C	11C	11C	11C
11D	11D	11D	11D	11D	11D
11E	11E	11E	11E	11E	11E
11F	11F	11F	11F	11F	11F
11G	11G	11G	11G	11G	11G
11H	11H	11H	11H	11H	11H
11I	11I	11I	11I	11I	11I
11J	11J	11J	11J	11J	11J

Soil Type: 11A
Soil No.: 11A
Soil Name: 11A

SOIL PROPERTIES RECORD 'B'

Soil Type	Soil No.	Soil Name	Soil Description	Soil Characteristics	Soil Test Results
11A	11A	11A	11A	11A	11A
11B	11B	11B	11B	11B	11B
11C	11C	11C	11C	11C	11C
11D	11D	11D	11D	11D	11D
11E	11E	11E	11E	11E	11E
11F	11F	11F	11F	11F	11F
11G	11G	11G	11G	11G	11G
11H	11H	11H	11H	11H	11H
11I	11I	11I	11I	11I	11I
11J	11J	11J	11J	11J	11J

Soil Type	Soil No.	Soil Name	Soil Description	Soil Characteristics	Soil Test Results
11A	11A	11A	11A	11A	11A
11B	11B	11B	11B	11B	11B
11C	11C	11C	11C	11C	11C
11D	11D	11D	11D	11D	11D
11E	11E	11E	11E	11E	11E
11F	11F	11F	11F	11F	11F
11G	11G	11G	11G	11G	11G
11H	11H	11H	11H	11H	11H
11I	11I	11I	11I	11I	11I
11J	11J	11J	11J	11J	11J

Upper slope - gentle. 500m post Lawlaw Skid Rd.

Water repellent
22 ploughy
parous

VENESS & ASSOCIATES PTY LIMITED

Environmental and Natural Resource Consultants

SOC N° 661 GRAFTON/CASINO/MURWILLAH

SITE No. 0501

spot

RICHMOND RANGE Tmb.

471330 683197p

Consolidate

Dr 2-21

SOIL PROPERTIES RECORD 'A'

Layer	Soil Type	Soil No.	Soil Name	Soil Description	Soil Characteristics	Soil Test Results
Horizon	Soil Type	Soil No.	Soil Name	Soil Description	Soil Characteristics	Soil Test Results
11A	11A	11A	11A	11A	11A	11A
11B	11B	11B	11B	11B	11B	11B
11C	11C	11C	11C	11C	11C	11C
11D	11D	11D	11D	11D	11D	11D
11E	11E	11E	11E	11E	11E	11E
11F	11F	11F	11F	11F	11F	11F
11G	11G	11G	11G	11G	11G	11G
11H	11H	11H	11H	11H	11H	11H
11I	11I	11I	11I	11I	11I	11I
11J	11J	11J	11J	11J	11J	11J

Soil Type	Soil No.	Soil Name	Soil Description	Soil Characteristics	Soil Test Results
11A	11A	11A	11A	11A	11A
11B	11B	11B	11B	11B	11B
11C	11C	11C	11C	11C	11C
11D	11D	11D	11D	11D	11D
11E	11E	11E	11E	11E	11E
11F	11F	11F	11F	11F	11F
11G	11G	11G	11G	11G	11G
11H	11H	11H	11H	11H	11H
11I	11I	11I	11I	11I	11I
11J	11J	11J	11J	11J	11J

Soil Type: 11A
Soil No.: 11A
Soil Name: 11A

SOIL PROPERTIES RECORD 'B'

Soil Type	Soil No.	Soil Name	Soil Description	Soil Characteristics	Soil Test Results
11A	11A	11A	11A	11A	11A
11B	11B	11B	11B	11B	11B
11C	11C	11C	11C	11C	11C
11D	11D	11D	11D	11D	11D
11E	11E	11E	11E	11E	11E
11F	11F	11F	11F	11F	11F
11G	11G	11G	11G	11G	11G
11H	11H	11H	11H	11H	11H
11I	11I	11I	11I	11I	11I
11J	11J	11J	11J	11J	11J

Soil Type	Soil No.	Soil Name	Soil Description	Soil Characteristics	Soil Test Results
11A	11A	11A	11A	11A	11A
11B	11B	11B	11B	11B	11B
11C	11C	11C	11C	11C	11C
11D	11D	11D	11D	11D	11D
11E	11E	11E	11E	11E	11E
11F	11F	11F	11F	11F	11F
11G	11G	11G	11G	11G	11G
11H	11H	11H	11H	11H	11H
11I	11I	11I	11I	11I	11I
11J	11J	11J	11J	11J	11J

Upper slope - steep. 22L

4 Scarcely
22 But.

W. Huffy
shrub

VENESS & ASSOCIATES PTY LIMITED

Environmental and Natural Resource Consultants

SOC N° 661 CRAFTON/CASINO/MUDWILL'N

Site No. 0505

Spot

RICHMOND RANGE Tmb Cambridge Plateau forest Drive
474660/612630

SOIL PROPERTIES RECORD 'A'

Layer	Lithology	Lithology Description	Dominant Colour (Munsell Code)		Moisture Characteristics		Tens
			Moist	Dry	Primary	Secondary	
11A			5YR 2/2				
11B			5YR 2/2				
11C			5YR 2/2				
11D			5YR 2/2				
11E			5YR 2/2				
11F			5YR 2/2				
11G			5YR 2/2				
11H			5YR 2/2				
11I			5YR 2/2				
11J			5YR 2/2				
11K			5YR 2/2				
11L			5YR 2/2				
11M			5YR 2/2				
11N			5YR 2/2				
11O			5YR 2/2				
11P			5YR 2/2				
11Q			5YR 2/2				
11R			5YR 2/2				
11S			5YR 2/2				
11T			5YR 2/2				
11U			5YR 2/2				
11V			5YR 2/2				
11W			5YR 2/2				
11X			5YR 2/2				
11Y			5YR 2/2				
11Z			5YR 2/2				

Layer	Moisture Characteristics	Tens
11A		
11B		
11C		
11D		
11E		
11F		
11G		
11H		
11I		
11J		
11K		
11L		
11M		
11N		
11O		
11P		
11Q		
11R		
11S		
11T		
11U		
11V		
11W		
11X		
11Y		
11Z		

Assess Type Site No.

SOIL PROPERTIES RECORD 'B'

BOUNDARY DEFINITIONS		STRUCTURE GRADE		STONE SIZE	
11A		11A		11A	
11B		11B		11B	
11C		11C		11C	
11D		11D		11D	
11E		11E		11E	
11F		11F		11F	
11G		11G		11G	
11H		11H		11H	
11I		11I		11I	
11J		11J		11J	
11K		11K		11K	
11L		11L		11L	
11M		11M		11M	
11N		11N		11N	
11O		11O		11O	
11P		11P		11P	
11Q		11Q		11Q	
11R		11R		11R	
11S		11S		11S	
11T		11T		11T	
11U		11U		11U	
11V		11V		11V	
11W		11W		11W	
11X		11X		11X	
11Y		11Y		11Y	
11Z		11Z		11Z	

TEXTURE AND GRADE		ROOTS AMOUNT		FANS	
11A		11A		11A	
11B		11B		11B	
11C		11C		11C	
11D		11D		11D	
11E		11E		11E	
11F		11F		11F	
11G		11G		11G	
11H		11H		11H	
11I		11I		11I	
11J		11J		11J	
11K		11K		11K	
11L		11L		11L	
11M		11M		11M	
11N		11N		11N	
11O		11O		11O	
11P		11P		11P	
11Q		11Q		11Q	
11R		11R		11R	
11S		11S		11S	
11T		11T		11T	
11U		11U		11U	
11V		11V		11V	
11W		11W		11W	
11X		11X		11X	
11Y		11Y		11Y	
11Z		11Z		11Z	

VENESS & ASSOCIATES PTY LIMITED

Environmental and Natural Resource Consultants

SOC N° 661 CRAFTON/CASINO/MUDWILL'N

Site No. 0506

Spot

CRAFTON TREE NORTH, Jk Hogarth Rye Rd
474660/612630

SOIL PROPERTIES RECORD 'A'

Layer	Lithology	Lithology Description	Dominant Colour (Munsell Code)		Moisture Characteristics		Tens
			Moist	Dry	Primary	Secondary	
11A			5YR 2/2				
11B			5YR 2/2				
11C			5YR 2/2				
11D			5YR 2/2				
11E			5YR 2/2				
11F			5YR 2/2				
11G			5YR 2/2				
11H			5YR 2/2				
11I			5YR 2/2				
11J			5YR 2/2				
11K			5YR 2/2				
11L			5YR 2/2				
11M			5YR 2/2				
11N			5YR 2/2				
11O			5YR 2/2				
11P			5YR 2/2				
11Q			5YR 2/2				
11R			5YR 2/2				
11S			5YR 2/2				
11T			5YR 2/2				
11U			5YR 2/2				
11V			5YR 2/2				
11W			5YR 2/2				
11X			5YR 2/2				
11Y			5YR 2/2				
11Z			5YR 2/2				

Layer	Moisture Characteristics	Tens
11A		
11B		
11C		
11D		
11E		
11F		
11G		
11H		
11I		
11J		
11K		
11L		
11M		
11N		
11O		
11P		
11Q		
11R		
11S		
11T		
11U		
11V		
11W		
11X		
11Y		
11Z		

Assess Type Site No.

SOIL PROPERTIES RECORD 'B'

BOUNDARY DEFINITIONS		STRUCTURE GRADE		STONE SIZE	
11A		11A		11A	
11B		11B		11B	
11C		11C		11C	
11D		11D		11D	
11E		11E		11E	
11F		11F		11F	
11G		11G		11G	
11H		11H		11H	
11I		11I		11I	
11J		11J		11J	
11K		11K		11K	
11L		11L		11L	
11M		11M		11M	
11N		11N		11N	
11O		11O		11O	
11P		11P		11P	
11Q		11Q		11Q	
11R		11R		11R	
11S		11S		11S	
11T		11T		11T	
11U		11U		11U	
11V		11V		11V	
11W		11W		11W	
11X		11X		11X	
11Y		11Y		11Y	
11Z		11Z		11Z	

TEXTURE AND GRADE		ROOTS AMOUNT		FANS	
11A		11A		11A	
11B		11B		11B	
11C		11C		11C	
11D		11D		11D	
11E		11E		11E	
11F		11F		11F	
11G		11G		11G	
11H		11H		11H	
11I		11I		11I	
11J		11J		11J	
11K		11K		11K	
11L		11L		11L	
11M		11M		11M	
11N		11N		11N	
11O		11O		11O	
11P		11P		11P	
11Q		11Q		11Q	
11R		11R		11R	
11S		11S		11S	
11T		11T		11T	
11U		11U		11U	
11V		11V		11V	
11W		11W		11W	
11X		11X		11X	
11Y		11Y		11Y	
11Z		11Z		11Z	

VENESS & ASSOCIATES PTY LIMITED

Environmental and Natural Resource Consultants

503 N° 661 GRAFTON/CASINO/MURWILLAH

SITE No. 1201

PULL

TP

Wyman Ch Rd.

4734006770970

inf 202 MORE

1/20201001

SOIL PROPERTIES RECORD 'A'

Sample Type	Sample No.	Test No.
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
10	10	10
11	11	11
12	12	12
13	13	13
14	14	14
15	15	15
16	16	16
17	17	17
18	18	18
19	19	19
20	20	20
21	21	21
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70	70	70
71	71	71
72	72	72
73	73	73
74	74	74
75	75	75
76	76	76
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78	78	78
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80	80	80
81	81	81
82	82	82
83	83	83
84	84	84
85	85	85
86	86	86
87	87	87
88	88	88
89	89	89
90	90	90
91	91	91
92	92	92
93	93	93
94	94	94
95	95	95
96	96	96
97	97	97
98	98	98
99	99	99
100	100	100

Test No.	Result
1	1
2	2
3	3
4	4
5	5
6	6
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10	10
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84	84
85	85
86	86
87	87
88	88
89	89
90	90
91	91
92	92
93	93
94	94
95	95
96	96
97	97
98	98
99	99
100	100

Record Type 1 Site No. 1201

SOIL PROPERTIES RECORD 'B'

BOUNDARY

DEFINITION

1201

1202

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STRUCTURE

GRADE

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STONE SIZE

GRADE

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STONE SIZE

GRADE

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STONE SIZE

GRADE

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VENESS & ASSOCIATES PTY LIMITED

Environmental and Natural Resource Consultants

Site No. 1401

661

MURWILLUMBAH

Struct. plastic clay

Ulf 6.33

Sample Type	Sample No.	Depth (m)	Moisture Content (%)	Plasticity Index	Soil Description
1A	1	0.0-0.5	21.4	10.2	Light grey clay
1B	2	0.5-1.0	20.5	10.2	Light grey clay
1C	3	1.0-1.5	19.8	10.2	Light grey clay
1D	4	1.5-2.0	19.8	10.2	Light grey clay
1E	5	2.0-2.5	19.8	10.2	Light grey clay
1F	6	2.5-3.0	19.8	10.2	Light grey clay
1G	7	3.0-3.5	19.8	10.2	Light grey clay
1H	8	3.5-4.0	19.8	10.2	Light grey clay
1I	9	4.0-4.5	19.8	10.2	Light grey clay
1J	10	4.5-5.0	19.8	10.2	Light grey clay
1K	11	5.0-5.5	19.8	10.2	Light grey clay
1L	12	5.5-6.0	19.8	10.2	Light grey clay
1M	13	6.0-6.5	19.8	10.2	Light grey clay
1N	14	6.5-7.0	19.8	10.2	Light grey clay
1O	15	7.0-7.5	19.8	10.2	Light grey clay
1P	16	7.5-8.0	19.8	10.2	Light grey clay
1Q	17	8.0-8.5	19.8	10.2	Light grey clay
1R	18	8.5-9.0	19.8	10.2	Light grey clay
1S	19	9.0-9.5	19.8	10.2	Light grey clay
1T	20	9.5-10.0	19.8	10.2	Light grey clay

SURFACE CAUTION

Crust
Hard set
Not hard set & self match

Lower plane 25%

BOUNDARY DATA-SHAPES

Sample No.	Sample Type	Sample No.	Sample Type
1A	1	1A	1
1B	2	1B	2
1C	3	1C	3
1D	4	1D	4
1E	5	1E	5
1F	6	1F	6
1G	7	1G	7
1H	8	1H	8
1I	9	1I	9
1J	10	1J	10
1K	11	1K	11
1L	12	1L	12
1M	13	1M	13
1N	14	1N	14
1O	15	1O	15
1P	16	1P	16
1Q	17	1Q	17
1R	18	1R	18
1S	19	1S	19
1T	20	1T	20

TEXTURE SAND-FRACTION

Sample No.	Sample Type	Sample No.	Sample Type
1A	1	1A	1
1B	2	1B	2
1C	3	1C	3
1D	4	1D	4
1E	5	1E	5
1F	6	1F	6
1G	7	1G	7
1H	8	1H	8
1I	9	1I	9
1J	10	1J	10
1K	11	1K	11
1L	12	1L	12
1M	13	1M	13
1N	14	1N	14
1O	15	1O	15
1P	16	1P	16
1Q	17	1Q	17
1R	18	1R	18
1S	19	1S	19
1T	20	1T	20

ROOTS

Sample No.	Sample Type	Sample No.	Sample Type
1A	1	1A	1
1B	2	1B	2
1C	3	1C	3
1D	4	1D	4
1E	5	1E	5
1F	6	1F	6
1G	7	1G	7
1H	8	1H	8
1I	9	1I	9
1J	10	1J	10
1K	11	1K	11
1L	12	1L	12
1M	13	1M	13
1N	14	1N	14
1O	15	1O	15
1P	16	1P	16
1Q	17	1Q	17
1R	18	1R	18
1S	19	1S	19
1T	20	1T	20

CLAY

Sample No.	Sample Type	Sample No.	Sample Type
1A	1	1A	1
1B	2	1B	2
1C	3	1C	3
1D	4	1D	4
1E	5	1E	5
1F	6	1F	6
1G	7	1G	7
1H	8	1H	8
1I	9	1I	9
1J	10	1J	10
1K	11	1K	11
1L	12	1L	12
1M	13	1M	13
1N	14	1N	14
1O	15	1O	15
1P	16	1P	16
1Q	17	1Q	17
1R	18	1R	18
1S	19	1S	19
1T	20	1T	20

PLASTICITY TYPE

Sample No.	Sample Type	Sample No.	Sample Type
1A	1	1A	1
1B	2	1B	2
1C	3	1C	3
1D	4	1D	4
1E	5	1E	5
1F	6	1F	6
1G	7	1G	7
1H	8	1H	8
1I	9	1I	9
1J	10	1J	10
1K	11	1K	11
1L	12	1L	12
1M	13	1M	13
1N	14	1N	14
1O	15	1O	15
1P	16	1P	16
1Q	17	1Q	17
1R	18	1R	18
1S	19	1S	19
1T	20	1T	20

STICKINESS

Sample No.	Sample Type	Sample No.	Sample Type
1A	1	1A	1
1B	2	1B	2
1C	3	1C	3
1D	4	1D	4
1E	5	1E	5
1F	6	1F	6
1G	7	1G	7
1H	8	1H	8
1I	9	1I	9
1J	10	1J	10
1K	11	1K	11
1L	12	1L	12
1M	13	1M	13
1N	14	1N	14
1O	15	1O	15
1P	16	1P	16
1Q	17	1Q	17
1R	18	1R	18
1S	19	1S	19
1T	20	1T	20

WATER-TABLE

Sample No.	Sample Type	Sample No.	Sample Type
1A	1	1A	1
1B	2	1B	2
1C	3	1C	3
1D	4	1D	4
1E	5	1E	5
1F	6	1F	6
1G	7	1G	7
1H	8	1H	8
1I	9	1I	9
1J	10	1J	10
1K	11	1K	11
1L	12	1L	12
1M	13	1M	13
1N	14	1N	14
1O	15	1O	15
1P	16	1P	16
1Q	17	1Q	17
1R	18	1R	18
1S	19	1S	19
1T	20	1T	20

CONCRETE

Sample No.	Sample Type	Sample No.	Sample Type
1A	1	1A	1
1B	2	1B	2
1C	3	1C	3
1D	4	1D	4
1E	5	1E	5
1F	6	1F	6
1G	7	1G	7
1H	8	1H	8
1I	9	1I	9
1J	10	1J	10
1K	11	1K	11
1L	12	1L	12
1M	13	1M	13
1N	14	1N	14
1O	15	1O	15
1P	16	1P	16
1Q	17	1Q	17
1R	18	1R	18
1S	19	1S	19
1T	20	1T	20

RELATIONS

Sample No.	Sample Type	Sample No.	Sample Type
1A	1	1A	1
1B	2	1B	2
1C	3	1C	3
1D	4	1D	4
1E	5	1E	5
1F	6	1F	6
1G	7	1G	7
1H	8	1H	8
1I	9	1I	9
1J	10	1J	10
1K	11	1K	11
1L	12	1L	12
1M	13	1M	13
1N	14	1N	14
1O	15	1O	15
1P	16	1P	16
1Q	17	1Q	17
1R	18	1R	18
1S	19	1S	19
1T	20	1T	20

STRUCTURE DATA-SHAPES

Sample No.	Sample Type	Sample No.	Sample Type
1A	1	1A	1
1B	2	1B	2
1C	3	1C	3
1D	4	1D	4
1E	5	1E	5
1F	6	1F	6
1G	7	1G	7
1H	8	1H	8
1I	9	1I	9
1J	10	1J	10
1K	11	1K	11
1L	12	1L	12
1M	13	1M	13
1N	14	1N	14
1O	15	1O	15
1P	16	1P	16
1Q	17	1Q	17
1R	18	1R	18
1S	19	1S	19
1T	20	1T	20

TEXTURE SAND-FRACTION

Sample No.	Sample Type	Sample No.	Sample Type
1A	1	1A	1
1B	2	1B	2
1C	3	1C	3
1D	4	1D	4
1E	5	1E	5
1F	6	1F	6
1G	7	1G	7
1H	8	1H	8
1I	9	1I	9
1J	10	1J	10
1K	11	1K	11
1L	12	1L	12
1M	13	1M	13
1N	14	1N	14
1O	15	1O	15
1P	16	1P	16
1Q	17	1Q	17
1R	18	1R	18
1S	19	1S	19
1T	20	1T	20

ROOTS

Sample No.	Sample Type	Sample No.	Sample Type
1A	1	1A	1
1B	2	1B	2
1C	3	1C	3
1D	4	1D	4
1E	5	1E	5
1F	6	1F	6
1G	7	1G	7
1H	8	1H	8
1I	9	1I	9
1J	10	1J	10
1K	11	1K	11
1L	12	1L	12
1M	13	1M	13
1N	14	1N	14
1O	15	1O	15
1P	16	1P	16
1Q	17	1Q	17
1R	18	1R	18
1S	19	1S	19
1T	20	1T	20

CLAY

Sample No.	Sample Type	Sample No.	Sample Type
1A	1	1A	1
1B	2	1B	2
1C	3	1C	3
1D	4	1D	4
1E	5	1E	5
1F	6	1F	6
1G	7	1G	7
1H	8	1H	8
1I	9	1I	9
1J	10	1J	10
1K	11	1K	11
1L	12	1L	12
1M	13	1M	13
1N	14	1N	14
1O	15	1O	15
1P	16	1P	16
1Q	17	1Q	17
1R	18	1R	18
1S	19	1S	19
1T	20	1T	20

PLASTICITY TYPE

Data Summary		1 2 3 4 5					Periods	
Unit 1	✓							1-5
Unit 2	✓							

VENESS & ASSOCIATES PTY LIMITED

Environmental and Natural Resource Consultants

661 - Grafton / Casino / Macmillanbah

Handpool Rd
44753676924

SITE No. 2202

Project Name: Same as Site No. 2202

G-5

ENVIROBAR

Lionsville Rd

44753676924

Layer	Soil	Moisture Content (%)	Moisture Characteristic	Notes
1	Horizon	Moist	Primary	SH
2	Horizon	Moist	Primary	SH
3	Horizon	Moist	Primary	SH
4	Horizon	Moist	Primary	SH
5	Horizon	Moist	Primary	SH
6	Horizon	Moist	Primary	SH
7	Horizon	Moist	Primary	SH
8	Horizon	Moist	Primary	SH
9	Horizon	Moist	Primary	SH
10	Horizon	Moist	Primary	SH

Layer	Soil	Moisture Content (%)	Moisture Characteristic	Notes
1	Horizon	Moist	Primary	SH
2	Horizon	Moist	Primary	SH
3	Horizon	Moist	Primary	SH
4	Horizon	Moist	Primary	SH
5	Horizon	Moist	Primary	SH
6	Horizon	Moist	Primary	SH
7	Horizon	Moist	Primary	SH
8	Horizon	Moist	Primary	SH
9	Horizon	Moist	Primary	SH
10	Horizon	Moist	Primary	SH

SURFACE CAUTION

Crust
Hard set
Not hard set

BOUNDARY DEFINITION

HA01: 1.0 m
HA02: 1.0 m
HA03: 1.0 m
HA04: 1.0 m
HA05: 1.0 m

FEATURES

HA01: 1.0 m
HA02: 1.0 m
HA03: 1.0 m
HA04: 1.0 m
HA05: 1.0 m

GRADES

HA01: 1.0 m
HA02: 1.0 m
HA03: 1.0 m
HA04: 1.0 m
HA05: 1.0 m

PLASTICITY TYPE

HA01: 1.0 m
HA02: 1.0 m
HA03: 1.0 m
HA04: 1.0 m
HA05: 1.0 m

STICKINESS

HA01: 1.0 m
HA02: 1.0 m
HA03: 1.0 m
HA04: 1.0 m
HA05: 1.0 m

WATER-TABLES

HA01: 1.0 m
HA02: 1.0 m
HA03: 1.0 m
HA04: 1.0 m
HA05: 1.0 m

CONSTRUCTIVE

HA01: 1.0 m
HA02: 1.0 m
HA03: 1.0 m
HA04: 1.0 m
HA05: 1.0 m

STRUCTURE

HA01: 1.0 m
HA02: 1.0 m
HA03: 1.0 m
HA04: 1.0 m
HA05: 1.0 m

FEATURES

HA01: 1.0 m
HA02: 1.0 m
HA03: 1.0 m
HA04: 1.0 m
HA05: 1.0 m

GRADES

HA01: 1.0 m
HA02: 1.0 m
HA03: 1.0 m
HA04: 1.0 m
HA05: 1.0 m

PLASTICITY TYPE

HA01: 1.0 m
HA02: 1.0 m
HA03: 1.0 m
HA04: 1.0 m
HA05: 1.0 m

STICKINESS

HA01: 1.0 m
HA02: 1.0 m
HA03: 1.0 m
HA04: 1.0 m
HA05: 1.0 m

WATER-TABLES

HA01: 1.0 m
HA02: 1.0 m
HA03: 1.0 m
HA04: 1.0 m
HA05: 1.0 m

CONSTRUCTIVE

HA01: 1.0 m
HA02: 1.0 m
HA03: 1.0 m
HA04: 1.0 m
HA05: 1.0 m

STONE SIZE

HA01: 1.0 m
HA02: 1.0 m
HA03: 1.0 m
HA04: 1.0 m
HA05: 1.0 m

FEATURES

HA01: 1.0 m
HA02: 1.0 m
HA03: 1.0 m
HA04: 1.0 m
HA05: 1.0 m

GRADES

HA01: 1.0 m
HA02: 1.0 m
HA03: 1.0 m
HA04: 1.0 m
HA05: 1.0 m

PLASTICITY TYPE

HA01: 1.0 m
HA02: 1.0 m
HA03: 1.0 m
HA04: 1.0 m
HA05: 1.0 m

STICKINESS

HA01: 1.0 m
HA02: 1.0 m
HA03: 1.0 m
HA04: 1.0 m
HA05: 1.0 m

WATER-TABLES

HA01: 1.0 m
HA02: 1.0 m
HA03: 1.0 m
HA04: 1.0 m
HA05: 1.0 m

CONSTRUCTIVE

HA01: 1.0 m
HA02: 1.0 m
HA03: 1.0 m
HA04: 1.0 m
HA05: 1.0 m

VENESS & ASSOCIATES PTY LIMITED

Environmental and Natural Resource Consultants

661 - Grafton / Casino / Macmillanbah

Handpool Rd
444446762824

SITE No. 2202

Project Name: Same as Site No. 2202

G-5

ENVIROBAR

Handpool Rd

444446762824

Layer	Soil	Moisture Content (%)	Moisture Characteristic	Notes
1	Horizon	Moist	Primary	SH
2	Horizon	Moist	Primary	SH
3	Horizon	Moist	Primary	SH
4	Horizon	Moist	Primary	SH
5	Horizon	Moist	Primary	SH
6	Horizon	Moist	Primary	SH
7	Horizon	Moist	Primary	SH
8	Horizon	Moist	Primary	SH
9	Horizon	Moist	Primary	SH
10	Horizon	Moist	Primary	SH

Layer	Soil	Moisture Content (%)	Moisture Characteristic	Notes
1	Horizon	Moist	Primary	SH
2	Horizon	Moist	Primary	SH
3	Horizon	Moist	Primary	SH
4	Horizon	Moist	Primary	SH
5	Horizon	Moist	Primary	SH
6	Horizon	Moist	Primary	SH
7	Horizon	Moist	Primary	SH
8	Horizon	Moist	Primary	SH
9	Horizon	Moist	Primary	SH
10	Horizon	Moist	Primary	SH

SURFACE CAUTION

Crust
Hard set
Not hard set

BOUNDARY DEFINITION

HA01: 1.0 m
HA02: 1.0 m
HA03: 1.0 m
HA04: 1.0 m
HA05: 1.0 m

FEATURES

HA01: 1.0 m
HA02: 1.0 m
HA03: 1.0 m
HA04: 1.0 m
HA05: 1.0 m

GRADES

HA01: 1.0 m
HA02: 1.0 m
HA03: 1.0 m
HA04: 1.0 m
HA05: 1.0 m

PLASTICITY TYPE

HA01: 1.0 m
HA02: 1.0 m
HA03: 1.0 m
HA04: 1.0 m
HA05: 1.0 m

STICKINESS

HA01: 1.0 m
HA02: 1.0 m
HA03: 1.0 m
HA04: 1.0 m
HA05: 1.0 m

WATER-TABLES

HA01: 1.0 m
HA02: 1.0 m
HA03: 1.0 m
HA04: 1.0 m
HA05: 1.0 m

CONSTRUCTIVE

HA01: 1.0 m
HA02: 1.0 m
HA03: 1.0 m
HA04: 1.0 m
HA05: 1.0 m

STRUCTURE

HA01: 1.0 m
HA02: 1.0 m
HA03: 1.0 m
HA04: 1.0 m
HA05: 1.0 m

FEATURES

HA01: 1.0 m
HA02: 1.0 m
HA03: 1.0 m
HA04: 1.0 m
HA05: 1.0 m

GRADES

HA01: 1.0 m
HA02: 1.0 m
HA03: 1.0 m
HA04: 1.0 m
HA05: 1.0 m

PLASTICITY TYPE

HA01: 1.0 m
HA02: 1.0 m
HA03: 1.0 m
HA04: 1.0 m
HA05: 1.0 m

STICKINESS

HA01: 1.0 m
HA02: 1.0 m
HA03: 1.0 m
HA04: 1.0 m
HA05: 1.0 m

WATER-TABLES

HA01: 1.0 m
HA02: 1.0 m
HA03: 1.0 m
HA04: 1.0 m
HA05: 1.0 m

CONSTRUCTIVE

HA01: 1.0 m
HA02: 1.0 m
HA03: 1.0 m
HA04: 1.0 m
HA05: 1.0 m

STONE SIZE

HA01: 1.0 m
HA02: 1.0 m
HA03: 1.0 m
HA04: 1.0 m
HA05: 1.0 m

FEATURES

HA01: 1.0 m
HA02: 1.0 m
HA03: 1.0 m
HA04: 1.0 m
HA05: 1.0 m

GRADES

HA01: 1.0 m
HA02: 1.0 m
HA03: 1.0 m
HA04: 1.0 m
HA05: 1.0 m

PLASTICITY TYPE

HA01: 1.0 m
HA02: 1.0 m
HA03: 1.0 m
HA04: 1.0 m
HA05: 1.0 m

STICKINESS

HA01: 1.0 m
HA02: 1.0 m
HA03: 1.0 m
HA04: 1.0 m
HA05: 1.0 m

WATER-TABLES

HA01: 1.0 m
HA02: 1.0 m
HA03: 1.0 m
HA04: 1.0 m
HA05: 1.0 m

CONSTRUCTIVE

HA01: 1.0 m
HA02: 1.0 m
HA03: 1.0 m
HA04: 1.0 m
HA05: 1.0 m

VENESS & ASSOCIATES PTY LIMITED

Environmental and Natural Resource Consultants

SITE No. 2202

661 - Grafton / Casino / Macaulata P.D.

11/5/22

6.0m

6-5

WASHPOOL

Redburn Cl. Rd

445210675912p

Layer	State	Location	Depth	Material	Notes
1	1	1	1	1	1
2	2	2	2	2	2
3	3	3	3	3	3
4	4	4	4	4	4
5	5	5	5	5	5
6	6	6	6	6	6
7	7	7	7	7	7
8	8	8	8	8	8
9	9	9	9	9	9
10	10	10	10	10	10

Layer	State	Location	Depth	Material	Notes
1	1	1	1	1	1
2	2	2	2	2	2
3	3	3	3	3	3
4	4	4	4	4	4
5	5	5	5	5	5
6	6	6	6	6	6
7	7	7	7	7	7
8	8	8	8	8	8
9	9	9	9	9	9
10	10	10	10	10	10

SURFACE CONDITIONS

Crust
Hard set
Not hard set

lower slope 67%

BOUNDARY

DISTINCTIONS

Layer	State	Location	Depth	Material	Notes
1	1	1	1	1	1
2	2	2	2	2	2
3	3	3	3	3	3
4	4	4	4	4	4
5	5	5	5	5	5
6	6	6	6	6	6
7	7	7	7	7	7
8	8	8	8	8	8
9	9	9	9	9	9
10	10	10	10	10	10

TEXTURE

MANIPULATION

GRAIN

ROOTS

ROOTS

ROOTS

ROOTS

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VENESS & ASSOCIATES PTY LIMITED

Environmental and Natural Resource Consultants

SITE No. 2201

661 - Grafton / Casino / Macaulata P.D.

11/5/22

6.0m

6-5

WASHPOOL

Macaulata P.D.

4418506754910

Layer	State	Location	Depth	Material	Notes
1	1	1	1	1	1
2	2	2	2	2	2
3	3	3	3	3	3
4	4	4	4	4	4
5	5	5	5	5	5
6	6	6	6	6	6
7	7	7	7	7	7
8	8	8	8	8	8
9	9	9	9	9	9
10	10	10	10	10	10

Layer	State	Location	Depth	Material	Notes
1	1	1	1	1	1
2	2	2	2	2	2
3	3	3	3	3	3
4	4	4	4	4	4
5	5	5	5	5	5
6	6	6	6	6	6
7	7	7	7	7	7
8	8	8	8	8	8
9	9	9	9	9	9
10	10	10	10	10	10

SURFACE CONDITIONS

Crust
Hard set
Not hard set

lower slope - 10%

BOUNDARY

DISTINCTIONS

Layer	State	Location	Depth	Material	Notes
1	1	1	1	1	1
2	2	2	2	2	2
3	3	3	3	3	3
4	4	4	4	4	4
5	5	5	5	5	5
6	6	6	6	6	6
7	7	7	7	7	7
8	8	8	8	8	8
9	9	9	9	9	9
10	10	10	10	10	10

TEXTURE

MANIPULATION

GRAIN

ROOTS

ROOTS

ROOTS

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661 - Grafton / Casino / Murwillumbah

Gn 3.14

[illegible]

SURFACE CONDITION

Crust
Hard set
Not hard set

Upper slope 10% above steep ridge top

BOUNDARY CONDITIONS		STRUCTURE GRADE		STONE SIZE	
UAB1	None	UAB1	Aggreg. Temp. Gr. max	UAB1	2.0 mm
UAB2	Slabs 1200 mm	UAB2	Aggreg. Moist.	UAB2	5-20 mm
UAB3	Slabs 1200 mm	UAB3	High Pressure	UAB3	75-100 mm
UAB4	Columns 100-100 mm	UAB4	Medium Pressure	UAB4	100-200 mm
UAB5	Columns 100-100 mm	UAB5	Strong Pressure	UAB5	>200 mm
TEXTURE		SILICA		STONE CHARACTERISTICS	
UAB1	None	UAB1	Primary	UAB1	Metamorphic
UAB2	Impure	UAB2	Secondary	UAB2	Metamorphic
UAB3	Impure	UAB3	Secondary	UAB3	Metamorphic
UAB4	Impure	UAB4	Secondary	UAB4	Metamorphic
TEXTURE		SILICA		STONE CHARACTERISTICS	
UAB1	None	UAB1	Primary	UAB1	Metamorphic
UAB2	Impure	UAB2	Secondary	UAB2	Metamorphic
UAB3	Impure	UAB3	Secondary	UAB3	Metamorphic
UAB4	Impure	UAB4	Secondary	UAB4	Metamorphic
TEXTURE		SILICA		STONE CHARACTERISTICS	
UAB1	None	UAB1	Primary	UAB1	Metamorphic
UAB2	Impure	UAB2	Secondary	UAB2	Metamorphic
UAB3	Impure	UAB3	Secondary	UAB3	Metamorphic
UAB4	Impure	UAB4	Secondary	UAB4	Metamorphic
TEXTURE		SILICA		STONE CHARACTERISTICS	
UAB1	None	UAB1	Primary	UAB1	Metamorphic
UAB2	Impure	UAB2	Secondary	UAB2	Metamorphic
UAB3	Impure	UAB3	Secondary	UAB3	Metamorphic
UAB4	Impure	UAB4	Secondary	UAB4	Metamorphic
TEXTURE		SILICA		STONE CHARACTERISTICS	
UAB1	None	UAB1	Primary	UAB1	Metamorphic
UAB2	Impure	UAB2	Secondary	UAB2	Metamorphic
UAB3	Impure	UAB3	Secondary	UAB3	Metamorphic
UAB4	Impure	UAB4	Secondary	UAB4	Metamorphic
TEXTURE		SILICA		STONE CHARACTERISTICS	
UAB1	None	UAB1	Primary	UAB1	Metamorphic
UAB2	Impure	UAB2	Secondary	UAB2	Metamorphic
UAB3	Impure	UAB3	Secondary	UAB3	Metamorphic
UAB4	Impure	UAB4	Secondary	UAB4	Metamorphic
TEXTURE		SILICA		STONE CHARACTERISTICS	
UAB1	None	UAB1	Primary	UAB1	Metamorphic
UAB2	Impure	UAB2	Secondary	UAB2	Metamorphic
UAB3	Impure	UAB3	Secondary	UAB3	Metamorphic
UAB4	Impure	UAB4	Secondary	UAB4	Metamorphic
TEXTURE		SILICA		STONE CHARACTERISTICS	
UAB1	None	UAB1	Primary	UAB1	Metamorphic
UAB2	Impure	UAB2	Secondary	UAB2	Metamorphic
UAB3	Impure	UAB3	Secondary	UAB3	Metamorphic
UAB4	Impure	UAB4	Secondary	UAB4	Metamorphic
TEXTURE		SILICA		STONE CHARACTERISTICS	
UAB1	None	UAB1	Primary	UAB1	Metamorphic
UAB2	Impure	UAB2	Secondary	UAB2	Metamorphic
UAB3	Impure	UAB3	Secondary	UAB3	Metamorphic
UAB4	Impure	UAB4	Secondary	UAB4	Metamorphic
TEXTURE		SILICA		STONE CHARACTERISTICS	
UAB1	None	UAB1	Primary	UAB1	Metamorphic
UAB2	Impure	UAB2	Secondary	UAB2	Metamorphic
UAB3	Impure	UAB3	Secondary	UAB3	Metamorphic
UAB4	Impure	UAB4	Secondary	UAB4	Metamorphic
TEXTURE		SILICA		STONE CHARACTERISTICS	
UAB1	None	UAB1	Primary	UAB1	Metamorphic
UAB2	Impure	UAB2	Secondary	UAB2	Metamorphic
UAB3	Impure	UAB3	Secondary	UAB3	Metamorphic
UAB4	Impure	UAB4	Secondary	UAB4	Metamorphic
TEXTURE		SILICA		STONE CHARACTERISTICS	
UAB1	None	UAB1	Primary	UAB1	Metamorphic
UAB2	Impure	UAB2	Secondary	UAB2	Metamorphic
UAB3	Impure	UAB3	Secondary	UAB3	Metamorphic
UAB4	Impure	UAB4	Secondary	UAB4	Metamorphic
TEXTURE		SILICA		STONE CHARACTERISTICS	
UAB1	None	UAB1	Primary	UAB1	Metamorphic
UAB2	Impure	UAB2	Secondary	UAB2	Metamorphic
UAB3	Impure	UAB3	Secondary	UAB3	Metamorphic
UAB4	Impure	UAB4	Secondary	UAB4	Metamorphic
TEXTURE		SILICA		STONE CHARACTERISTICS	
UAB1	None	UAB1	Primary	UAB1	Metamorphic
UAB2	Impure</				

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661 - Grafton / Casino / Murrumbidgee

STANDARD. 01
11F 5.11

Site No. 2601

Spot

Pass (aim)

661 - Grafton / Casino / Murwillumbah

BILLIMORA

44150067694pp

platacha

Record Type	Same as Site No.	Total No. of Labels
0 0 0 0 1		

Lever Status		Dominant Colour (Adjacent Cells)	Morpho Characteristics		Tera
Upper	Lower		Primary	Secondary	
None	Lower Anterior Ditch (ml)	None	U	Y	Dry
11A	11G	5198 12A			
11B	11H	5198 1211			
11C	11I				
11D	11J				
11E	11K				
11F	11L				
11G	11M				
11H	11N				
11I	11O				
11J	11P				
11K	11Q				
11L	11R				
11M	11S				
11N	11T				
11O	11U				
11P	11V				
11Q	11W				
11R	11X				
11S	11Y				
11T	11Z				
11U	11AA				
11V	11AB				
11W	11AC				
11X	11AD				
11Y	11AE				
11Z	11AF				
11AA	11AG				
11AB	11AH				
11AC	11AI				
11AD	11AJ				
11AE	11AK				
11AF	11AL				
11AG	11AM				
11AH	11AN				
11AI	11AO				
11AJ	11AP				
11AK	11AQ				
11AL	11AR				
11AM	11AS				
11AN	11AT				
11AO	11AU				
11AP	11AV				
11AQ	11AW				
11AR	11AX				
11AS	11AY				
11AT	11AZ				
11AU	11BA				
11AV	11BB				
11AW	11BC				
11AX	11BD				
11AY	11BE				
11AZ	11BF				
11BA	11BG				
11BB	11BH				
11BC	11BI				
11BD	11BJ				
11BE	11BK				
11BF	11BL				
11BG	11BM				
11BH	11BN				
11BI	11BO				
11BJ	11BP				
11BK	11BQ				
11BL	11BR				
11BM	11BS				
11BN	11BT				
11BO	11BU				
11BP	11BV				
11BQ	11BW				
11BR	11BX				
11BS	11BY				
11BT	11BZ				
11BU	11CA				
11BV	11CB				
11BW	11CC				
11BX	11CD				
11BY	11CE				
11BZ	11CF				
11CA	11CG				
11CB	11CH				
11CC	11CI				

SURFACE CONDITION

Crust 11
Hard set 11
Not hard set 11

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[illegible]

VENESS & ASSOCIATES PTY LIMITED

Environmental and Natural Resource Consultants

661 - Grafton / Casino / Murwillumbah

STRUCT. PLASTIC CLAY

Uff 6-2(a)

SITE No. 2402

Spot	Pass	Billumbra	Berry Rd
443706765680			
Level Status	Dominant Colour (Munsell Code)	Moisture Characteristics	Time
Primary	Secondary		
1.1	1.2	1.3	1.4
1.5	1.6	1.7	1.8
1.9	1.10	1.11	1.12
1.13	1.14	1.15	1.16
1.17	1.18	1.19	1.20
1.21	1.22	1.23	1.24
1.25	1.26	1.27	1.28
1.31	1.32	1.33	1.34
1.35	1.36	1.37	1.38
1.41	1.42	1.43	1.44
1.45	1.46	1.47	1.48
1.51	1.52	1.53	1.54
1.55	1.56	1.57	1.58
1.61	1.62	1.63	1.64
1.65	1.66	1.67	1.68
1.71	1.72	1.73	1.74
1.75	1.76	1.77	1.78
1.81	1.82	1.83	1.84
1.85	1.86	1.87	1.88
1.91	1.92	1.93	1.94
1.95	1.96	1.97	1.98
2.01	2.02	2.03	2.04
2.05	2.06	2.07	2.08
2.11	2.12	2.13	2.14
2.15	2.16	2.17	2.18
2.21	2.22	2.23	2.24
2.25	2.26	2.27	2.28
2.31	2.32	2.33	2.34
2.35	2.36	2.37	2.38
2.41	2.42	2.43	2.44
2.45	2.46	2.47	2.48
2.51	2.52	2.53	2.54
2.55	2.56	2.57	2.58
2.61	2.62	2.63	2.64
2.65	2.66	2.67	2.68
2.71	2.72	2.73	2.74
2.75	2.76	2.77	2.78
2.81	2.82	2.83	2.84
2.85	2.86	2.87	2.88
2.91	2.92	2.93	2.94
2.95	2.96	2.97	2.98
3.01	3.02	3.03	3.04
3.05	3.06	3.07	3.08
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3.15	3.16	3.17	3.18
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3.35	3.36	3.37	3.38
3.41	3.42	3.43	3.44
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3.75	3.76	3.77	3.78
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4.05	4.06	4.07	4.08
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4.21	4.22	4.23	4.24
4.25	4.26	4.27	4.28
4.31	4.32	4.33	4.34
4.35	4.36	4.37	4.38
4.41	4.42	4.43	4.44
4.45	4.46	4.47	4.48
4.51	4.52	4.53	4.54
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6.01	6.02	6.03	6.04
6.05	6.06	6.07	6.08
6.11	6.12	6.13	6.14
6.15	6.16	6.17	6.18
6.21	6.22	6.23	6.24
6.25	6.26	6.27	6.28
6.31	6.32	6.33	6.34
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6.41	6.42	6.43	6.44
6.45	6.46	6.47	6.48
6.51	6.52	6.53	6.54
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7.05	7.06	7.07	7.08
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7.55	7.56	7.57	7.58
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7.65	7.66	7.67	7.68
7.71	7.72	7.73	7.74
7.75	7.76	7.77	7.78
7.81	7.82	7.83	7.84
7.85	7.86	7.87	7.88
7.91	7.92	7.93	7.94
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8.65	8.66	8.67	8.68
8.71	8.72	8.73	8.74
8.75	8.76	8.77	8.78
8.81	8.82	8.83	8.84
8.85	8.86	8.87	8.88
8.91	8.92	8.93	8.94
8.95	8.96	8.97	8.98
9.01	9.02	9.03	9.04
9.05	9.06	9.07	9.08
9.11	9.12	9.13	9.14
9.15	9.16	9.17	9.18
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9.45	9.46	9.47	9.48
9.51	9.52	9.53	9.54
9.55	9.56	9.57	9.58
9.61	9.62	9.63	9.64
9.65	9.66	9.67	9.68
9.71	9.72	9.73	9.74
9.75	9.76	9.77	9.78
9.81	9.82	9.83	9.84
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9.95	9.96	9.97	9.98
10.01	10.02	10.03	10.04
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10.15	10.16	10.17	10.18
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10.85	10.86	10.87	10.88
10.91	10.92	10.93	10.94
10.95	10.96	10.97	10.98
11.01	11.02	11.03	11.04
11.05	11.06	11.07	11.08
11.11	11.12	11.13	11.14
11.15	11.16	11.17	11.18
11.21	11.22	11.23	11.24
11.25	11.26	11.27	11.28
11.31	11.32	11.33	11.34
11.35	11.36	11.37	11.38
11.41	11.42	11.43	11.44
11.45	11.46	11.47	11.48
11.51	11.52	11.53	11.54
11.55	11.56	11.57	11.58
11.61	11.62	11.63	11.64
11.65	11.66	11.67	11.68
11.71	11.72	11.73	11.74
11.75	11.76	11.77	11.78
11.81	11.82	11.83	11.84
11.85	11.86	11.87	11.88
11.91	11.92	11.93	11.94
11.95	11.96	11.97	11.98
12.01	12.02	12.03	12.04
12.05	12.06	12.07	12.08
12.11	12.12	12.13	12.14
12.15	12.16	12.17	12.18
12.21	12.22	12.23	12.24
12.25	12.26	12.27	12.28
12.31	12.32	12.33	12.34
12.35	12.36	12.37	12.38
12.41	12.42	12.43	12.44
12.45	12.46	12.47	12.48
12.51	12.52	12.53	12.54
12.55	12.56	12.57	12.58
12.61	12.62	12.63	12.64
12.65	12.66	12.67	12.68
12.71	12.72	12.73	12.74
12.75	12.76	12.77	12.78
12.81	12.82	12.83	12.84
12.85	12.86	12.87	12.88
12.91	12.92	12.93	12.94
12.95	12.96	12.97	12.98
13.01	13.02	13.03	13.04
13.05	13.06	13.07	13.08
13.11	13.12	13.13	13.14
13.15	13.16	13.17	13.18
13.21	13.22	13.23	13.24
13.25	13.26	13.27	13.28
13.31	13.32	13.33	13.34
13.35	13.36	13.37	13.38
13.41	13.42	13.43	13.44
13.45	13.46	13.47	13.48
13.51	13.52	13.53	13.54
13.55	13.56	13.57	13.58
13.61	13.62	13.63	13.64
13.65	13.66	13.67	13.68
13.71	13.72	13.73	13.74
13.75	13.76	13.77	13.78
13.81	13.82	13.83	13.84
13.85	13.86	13.87	13.88
13.91	13.92	13.93	13.94
13.95	13.96	13.97	13.98
14.01	14.02	14.03	14.04
14.05	14.06	14.07	14.08
14.11	14.12	14.13	14.14
14.15	14.16	14.17	14.18
14.21	14.22	14.23	14.24
14.25	14.26	14.27	14.28
14.31	14.32	14.33	14.34
14.35	14.36	14.37	14.38
14.41	14.42	14.43	14.44
14.45	14.46	14.47	14.48
14.51	14.52	14.53	14.54
14.55	14.56	14.57	14.58
14.61	14.62	14.63	14.64
14.65	14.66	14.67	14.68
14.71	14.72	14.73	14.74
14.75	14.76		

VENESS & ASSOCIATES PTY LIMITED

Environmental and Natural Resource Consultants

yps

SITE No. 1121

661 - Grafton / Casino / Macarthur Creek

Dy 5-11

Spot
Kg
BAN4A88A
4999166749866

Algibine Trail

Layer	Surface	Dominant Colour (Munsell Code)	Moisture Character (Primary / Secondary)	Texture
1	100	7.5YR 6/2	Moist	Clay
2	100	7.5YR 6/2	Moist	Clay
3	100	7.5YR 6/2	Moist	Clay
4	100	7.5YR 6/2	Moist	Clay
5	100	7.5YR 6/2	Moist	Clay

Layer	Surface	Dominant Colour (Munsell Code)	Moisture Character (Primary / Secondary)	Texture
1	100	7.5YR 6/2	Moist	Clay
2	100	7.5YR 6/2	Moist	Clay
3	100	7.5YR 6/2	Moist	Clay
4	100	7.5YR 6/2	Moist	Clay
5	100	7.5YR 6/2	Moist	Clay

SURFACE CONDITION

Crust
Hard set
Not hard set

Lower slope 6%

BOUNDARY

HAZ1
HAZ2
HAZ3
HAZ4
HAZ5

STRUCTURE

US01
US02
US03
US04
US05

STONE SIZE

VS01
VS02
VS03
VS04
VS05

HAZ1

HAZ2
HAZ3
HAZ4
HAZ5

US01

US02
US03
US04
US05

VS01

VS02
VS03
VS04
VS05

HAZ1

HAZ2
HAZ3
HAZ4
HAZ5

US01

US02
US03
US04
US05

VS01

VS02
VS03
VS04
VS05

HAZ1

HAZ2
HAZ3
HAZ4
HAZ5

US01

US02
US03
US04
US05

VS01

VS02
VS03
VS04
VS05

HAZ1

HAZ2
HAZ3
HAZ4
HAZ5

US01

US02
US03
US04
US05

VS01

VS02
VS03
VS04
VS05

HAZ1

HAZ2
HAZ3
HAZ4
HAZ5

US01

US02
US03
US04
US05

VS01

VS02
VS03
VS04
VS05

HAZ1

HAZ2
HAZ3
HAZ4
HAZ5

US01

US02
US03
US04
US05

VS01

VS02
VS03
VS04
VS05

HAZ1

HAZ2
HAZ3
HAZ4
HAZ5

US01

US02
US03
US04
US05

VS01

VS02
VS03
VS04
VS05

HAZ1

HAZ2
HAZ3
HAZ4
HAZ5

US01

US02
US03
US04
US05

VS01

VS02
VS03
VS04
VS05

HAZ1

HAZ2
HAZ3
HAZ4
HAZ5

US01

US02
US03
US04
US05

VS01

VS02
VS03
VS04
VS05

HAZ1

HAZ2
HAZ3
HAZ4
HAZ5

US01

US02
US03
US04
US05

VS01

VS02
VS03
VS04
VS05

HAZ1

HAZ2
HAZ3
HAZ4
HAZ5

US01

US02
US03
US04
US05

VS01

VS02
VS03
VS04
VS05

VENESS & ASSOCIATES PTY LIMITED

Environmental and Natural Resource Consultants

SITE No. 1123

661 - Grafton / Casino / Macarthur Creek

En 3-34

Spot
Kg
GIBBERASTE
5110606762926

Calibus Rd

Layer	Surface	Dominant Colour (Munsell Code)	Moisture Character (Primary / Secondary)	Texture
1	100	7.5YR 6/2	Moist	Clay
2	100	7.5YR 6/2	Moist	Clay
3	100	7.5YR 6/2	Moist	Clay
4	100	7.5YR 6/2	Moist	Clay
5	100	7.5YR 6/2	Moist	Clay

Layer	Surface	Dominant Colour (Munsell Code)	Moisture Character (Primary / Secondary)	Texture
1	100	7.5YR 6/2	Moist	Clay
2	100	7.5YR 6/2	Moist	Clay
3	100	7.5YR 6/2	Moist	Clay
4	100	7.5YR 6/2	Moist	Clay
5	100	7.5YR 6/2	Moist	Clay

SURFACE CONDITION

Crust
Hard set
Not hard set

Mid slope 5%

BOUNDARY

HAZ1
HAZ2
HAZ3
HAZ4
HAZ5

STRUCTURE

US01
US02
US03
US04
US05

STONE SIZE

VS01
VS02
VS03
VS04
VS05

HAZ1

HAZ2
HAZ3
HAZ4
HAZ5

US01

US02
US03
US04
US05

VS01

VS02
VS03
VS04
VS05

HAZ1

HAZ2
HAZ3
HAZ4
HAZ5

US01

US02
US03
US04
US05

VS01

VS02
VS03
VS04
VS05

HAZ1

HAZ2
HAZ3
HAZ4
HAZ5

US01

US02
US03
US04
US05

VS01

VS02
VS03
VS04
VS05

HAZ1

HAZ2
HAZ3
HAZ4
HAZ5

US01

US02
US03
US04
US05

VS01

VS02
VS03
VS04
VS05

HAZ1

HAZ2
HAZ3
HAZ4
HAZ5

US01

US02
US03
US04
US05

VS01

VS02
VS03
VS04
VS05

HAZ1

HAZ2
HAZ3
HAZ4
HAZ5

US01

US02
US03
US04
US05

VS01

VS02
VS03
VS04
VS05

HAZ1

HAZ2
HAZ3
HAZ4
HAZ5

US01

US02
US03
US04
US05

VS01

VS02
VS03
VS04
VS05

HAZ1

HAZ2
HAZ3
HAZ4
HAZ5

US01

US02
US03
US04
US05

VS01

VS02
VS03
VS04
VS05

HAZ1

HAZ2
HAZ3
HAZ4
HAZ5

US01

US02
US03
US04
US05

VS01

VS02
VS03
VS04
VS05

HAZ1

HAZ2
HAZ3
HAZ4
HAZ5

US01

US02
US03
US04
US05

VS01

VS02
VS03
VS04
VS05

HAZ1

HAZ2
HAZ3
HAZ4
HAZ5

US01

US02
US03
US04
US05

VS01

VS02
VS03
VS04
VS05

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Environmental and Natural Resource Consultants

508 N° 661 GRAFTON/CASINO/MURWILLAH

SITE No. 1117

Spot

kg

CAMIRA

Carnegie Rd - north side

4941636766936

SOIL PROPERTIES RECORD 'A'

Room Type	Same as Site No.	Test No. of Sample
0 0 0 1		
LAYER STATUS		Depth (m)
Horizon	Layer Average Depth (m)	
11A	1.1	1.1
11B	1.2	1.2
11C	1.3	1.3
11D	1.4	1.4
11E	1.5	1.5
11F	1.6	1.6
11G	1.7	1.7
11H	1.8	1.8
11I	1.9	1.9
11J	2.0	2.0

Room Type	Same as Site No.	Test No. of Sample
0 0 0 1		
LAYER STATUS		Depth (m)
Horizon	Layer Average Depth (m)	
11A	1.1	1.1
11B	1.2	1.2
11C	1.3	1.3
11D	1.4	1.4
11E	1.5	1.5
11F	1.6	1.6
11G	1.7	1.7
11H	1.8	1.8
11I	1.9	1.9
11J	2.0	2.0

Not reaching ground

up per slope ~ 6.7

Dr 4-11

Record Type Same as Site No. 0 0 0 1

SOIL PROPERTIES RECORD 'B'

BOUNDARY DEFINITIONS

RA01	None
RA02	Sharp (125 mm)
RA03	Clear (125-100 mm)
RA04	Gravelly (150-100 mm)
RA05	Gravelly (150-100 mm)

TEXTURE

TA01	None
TA02	None
TA03	None
TA04	None
TA05	None

STRUCTURE

UA01	None
UA02	None
UA03	None
UA04	None
UA05	None

ROOTS

WA01	None
WA02	None
WA03	None
WA04	None
WA05	None

PLASTICITY TYPE

QA01	None
QA02	None
QA03	None
QA04	None
QA05	None

STICKINESS

SP01	None
SP02	None
SP03	None
SP04	None
SP05	None

WATER TABLE

WA01	None
WA02	None
WA03	None
WA04	None
WA05	None

CONSEQUENCE

TA01	None
TA02	None
TA03	None
TA04	None
TA05	None

DISINTEGRATION

TA01	None
TA02	None
TA03	None
TA04	None
TA05	None

STONES

UA01	None
UA02	None
UA03	None
UA04	None
UA05	None

CONCRETE & INCLUSIONS

UA01	None
UA02	None
UA03	None
UA04	None
UA05	None

COIN

UA01	None
UA02	None
UA03	None
UA04	None
UA05	None

STONES

UA01	None
UA02	None
UA03	None
UA04	None
UA05	None

BOUNDARY DEFINITIONS

RA01	None
RA02	Sharp (125 mm)
RA03	Clear (125-100 mm)
RA04	Gravelly (150-100 mm)
RA05	Gravelly (150-100 mm)

TEXTURE

TA01	None
TA02	None
TA03	None
TA04	None
TA05	None

STRUCTURE

UA01	None
UA02	None
UA03	None
UA04	None
UA05	None

ROOTS

WA01	None
WA02	None
WA03	None
WA04	None
WA05	None

PLASTICITY TYPE

QA01	None
QA02	None
QA03	None
QA04	None
QA05	None

STICKINESS

SP01	None
SP02	None
SP03	None
SP04	None
SP05	None

WATER TABLE

WA01	None
WA02	None
WA03	None
WA04	None
WA05	None

CONSEQUENCE

TA01	None
TA02	None
TA03	None
TA04	None
TA05	None

DISINTEGRATION

TA01	None
TA02	None
TA03	None
TA04	None
TA05	None

STONES

UA01	None
UA02	None
UA03	None
UA04	None
UA05	None

CONCRETE & INCLUSIONS

UA01	None
UA02	None
UA03	None
UA04	None
UA05	None

COIN

UA01	None
UA02	None
UA03	None
UA04	None
UA05	None

STONES

UA01	None
UA02	None
UA03	None
UA04	None
UA05	None

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Environmental and Natural Resource Consultants

508 N° 661 GRAFTON/CASINO/MURWILLAH

SITE No. 1110

Spot

kg

SMIRK

Carnegie Rd just west of Disc Rd

4941636766936

SOIL PROPERTIES RECORD 'A'

Room Type	Same as Site No.	Test No. of Sample
0 0 0 1		
LAYER STATUS		Depth (m)
Horizon	Layer Average Depth (m)	
11A	1.1	1.1
11B	1.2	1.2
11C	1.3	1.3
11D	1.4	1.4
11E	1.5	1.5
11F	1.6	1.6
11G	1.7	1.7
11H	1.8	1.8
11I	1.9	1.9
11J	2.0	2.0

Room Type	Same as Site No.	Test No. of Sample
0 0 0 1		
LAYER STATUS		Depth (m)
Horizon	Layer Average Depth (m)	
11A	1.1	1.1
11B	1.2	1.2
11C	1.3	1.3
11D	1.4	1.4
11E	1.5	1.5
11F	1.6	1.6
11G	1.7	1.7
11H	1.8	1.8
11I	1.9	1.9
11J	2.0	2.0

Not reaching ground

Dr 5-1

Record Type Same as Site No. 0 0 0 1

SOIL PROPERTIES RECORD 'B'

BOUNDARY DEFINITIONS

RA01	None
RA02	Sharp (125 mm)
RA03	Clear (125-100 mm)
RA04	Gravelly (150-100 mm)
RA05	Gravelly (150-100 mm)

TEXTURE

TA01	None
TA02	None
TA03	None
TA04	None
TA05	None

STRUCTURE

UA01	None
UA02	None
UA03	None
UA04	None
UA05	None

ROOTS

WA01	None
WA02	None
WA03	None
WA04	None
WA05	None

PLASTICITY TYPE

QA01	None
QA02	None
QA03	None
QA04	None
QA05	None

STICKINESS

SP01	None
SP02	None
SP03	None
SP04	None
SP05	None

WATER TABLE

WA01	None
WA02	None
WA03	None
WA04	None
WA05	None

CONSEQUENCE

TA01	None
TA02	None
TA03	None
TA04	None
TA05	None

DISINTEGRATION

TA01	None
TA02	None
TA03	None
TA04	None
TA05	None

STONES

UA01	None
UA02	None
UA03	None
UA04	None
UA05	None

CONCRETE & INCLUSIONS

UA01	None
UA02	None
UA03	None
UA04	None
UA05	None

COIN

UA01	None
UA02	None
UA03	None
UA04	None
UA05	None

STONES

UA01	None
UA02	None
UA03	None
UA04	None
UA05	None

BOUNDARY DEFINITIONS

RA01	None
RA02	Sharp (125 mm)
RA03	Clear (125-100 mm)
RA04	Gravelly (150-100 mm)
RA05	Gravelly (150-100 mm)

TEXTURE

TA01	None
TA02	None
TA03	None
TA04	None
TA05	None

STRUCTURE

UA01	None
UA02	None
UA03	None
UA04	None
UA05	None

ROOTS

WA01	None
WA02	None
WA03	None
WA04	None
WA05	None

PLASTICITY TYPE

QA01	None
QA02	None
QA03	None
QA04	None
QA05	None

STICKINESS

SP01	None
SP02	None
SP03	None
SP04	None
SP05	None

WATER TABLE

WA01	None
WA02	None
WA03	None
WA04	None
WA05	None

CONSEQUENCE

TA01	None
TA02	None
TA03	None
TA04	None
TA05	None

DISINTEGRATION

TA01	None
TA02	None
TA03	None
TA04	None
TA05	None

STONES

UA01	None
UA02	None
UA03	None
UA04	None
UA05	None

CONCRETE & INCLUSIONS

UA01	None
UA0	

VENESS & ASSOCIATES PTY LIMITED

Environmental and Natural Resource Consultants

661 - Grafton / Casino / Murrumbidgee

Dy 201

SITE No. 112.4

FINLL

Kg

BAMBARCA

Boch. form P.

496346675543b

Figure No.		Scale		Title			
200-41		200-40		No. of Layers			
4963066755436							
Layer Name		Dominant Color (Munsell Code)		Main Characteristic		Time	
				Primary	Secondary	Moisture	SP
Horizon		Moist	W/C	Gr	Gr	Gr	Gr
		(m)					
1	1A	0.05	10YR 5/6				10.0
2	2A	0.10	10YR 5/6				10.0
3	3A	0.15	10YR 5/6				10.0
4	4A	0.20	10YR 5/6				10.0
5	5A	0.25	10YR 5/6				10.0
6	6A	0.30	10YR 5/6				10.0
7	7A	0.35	10YR 5/6				10.0
8	8A	0.40	10YR 5/6				10.0
9	9A	0.45	10YR 5/6				10.0
10	10A	0.50	10YR 5/6				10.0
11	11A	0.55	10YR 5/6				10.0
12	12A	0.60	10YR 5/6				10.0
13	13A	0.65	10YR 5/6				10.0
14	14A	0.70	10YR 5/6				10.0
15	15A	0.75	10YR 5/6				10.0
16	16A	0.80	10YR 5/6				10.0
17	17A	0.85	10YR 5/6				10.0
18	18A	0.90	10YR 5/6				10.0
19	19A	0.95	10YR 5/6				10.0
20	20A	1.00	10YR 5/6				10.0
21	21A	1.05	10YR 5/6				10.0
22	22A	1.10	10YR 5/6				10.0
23	23A	1.15	10YR 5/6				10.0
24	24A	1.20	10YR 5/6				10.0
25	25A	1.25	10YR 5/6				10.0
26	26A	1.30	10YR 5/6				10.0
27	27A	1.35	10YR 5/6				10.0
28	28A	1.40	10YR 5/6				10.0
29	29A	1.45	10YR 5/6				10.0
30	30A	1.50	10YR 5/6				10.0
31	31A	1.55	10YR 5/6				10.0
32	32A	1.60	10YR 5/6				10.0
33	33A	1.65	10YR 5/6				10.0
34	34A	1.70	10YR 5/6				10.0
35	35A	1.75	10YR 5/6				10.0
36	36A	1.80	10YR 5/6				10.0
37	37A	1.85	10YR 5/6				10.0
38	38A	1.90	10YR 5/6				10.0
39	39A	1.95	10YR 5/6				10.0
40	40A	2.00	10YR 5/6				10.0
41	41A	2.05	10YR 5/6				10.0
42	42A	2.10	10YR 5/6				10.0
43	43A	2.15	10YR 5/6				10.0
44	44A	2.20	10YR 5/6				10.0
45	45A	2.25	10YR 5/6				10.0
46	46A	2.30	10YR 5/6				10.0
47	47A	2.35	10YR 5/6				10.0
48	48A	2.40	10YR 5/6				10.0
49	49A	2.45	10YR 5/6				10.0
50	50A	2.50	10YR 5/6				10.0
51	51A	2.55	10YR 5/6				10.0
52	52A	2.60	10YR 5/6				10.0
53	53A	2.65	10YR 5/6				10.0
54	54A	2.70	10YR 5/6				10.0
55	55A	2.75	10YR 5/6				10.0
56	56A	2.80	10YR 5/6				10.0
57	57A	2.85	10YR 5/6				10.0
58	58A	2.90	10YR 5/6				10.0
59	59A	2.95	10YR 5/6				10.0
60	60A	3.00	10YR 5/6				10.0
61	61A	3.05	10YR 5/6				10.0
62	62A	3.10	10YR 5/6				10.0
63	63A	3.15	10YR 5/6				10.0
64	64A	3.20	10YR 5/6				10.0
65	65A	3.25	10YR 5/6				10.0
66	66A	3.30	10YR 5/6				10.0
67	67A	3.35	10YR 5/6				10.0
68	68A	3.40	10YR 5/6				10.0
69	69A	3.45	10YR 5/6				10.0
70	70A	3.50	10YR 5/6				10.0
71	71A	3.55	10YR 5/6				10.0
72	72A	3.60	10YR 5/6				10.0
73	73A	3.65	10YR 5/6				10.0
74	74A	3.70	10YR 5/6				10.0
75	75A	3.75	10YR 5/6				10.0
76	76A	3.80	10YR 5/6				10.0
77	77A	3.85	10YR 5/6				10.0
78	78A	3.90	10YR 5/6				10.0
79	79A	3.95	10YR 5/6				10.0
80	80A	4.00	10YR 5/6				10.0
81	81A	4.05	10YR 5/6				10.0
82	82A	4.10	10YR 5/6				10.0
83	83A	4.15	10YR 5/6				10.0
84	84A	4.20	10YR 5/6				10.0
85	85A	4.25	10YR 5/6				10.0
86	86A	4.30	10YR 5/6				10.0
87	87A	4.35	10YR 5/6				10.0
88	88A	4.40	10YR 5/6				10.0
89	89A	4.45	10YR 5/6				10.0
90	90A	4.50	10YR 5/6				10.0
91	91A	4.55	10YR 5/6				10.0
92	92A	4.60	10YR 5/6				10.0
93	93A	4.65	10YR 5/6				10.0
94	94A	4.70	10YR 5/6				10.0
95	95A	4.75	10YR 5/6				10.0
96	96A	4.80	10YR 5/6				10.0
97	97A	4.85	10YR 5/6				10.0
98	98A	4.90	10YR 5/6				10.0
99	99A	4.95	10YR 5/6				10.0
100	100A	5.00	10YR 5/6				10.0
101	101A	5.05	10YR 5/6				10.0
102	102A	5.10	10YR 5/6				10.0
103	103A	5.15	10YR 5/6				10.0
104	104A	5.20	10YR 5/6				10.0
105	105A	5.25	10YR 5/6				10.0
106	106A	5.30	10YR 5/6				10.0
107	107A	5.35	10YR 5/6				10.0
108	108A	5.40	10YR 5/6				10.0
109	109A	5.45	10YR 5/6				10.0
110	110A	5.50	10YR 5/6				10.0
111	111A	5.55	10YR 5/6				10.0
112	112A	5.60	10YR 5/6				10.0
113	113A	5.65	10YR 5/6				10.0
114	114A	5.70	10YR 5/6				10.0
115	115A	5.75	10YR 5/6				10.0
116	116A	5.80	10YR 5/6				10.0
117	117A	5.85	10YR 5/6				10.0
118	118A	5.90	10YR 5/6				10.0
119	119A	5.95	10YR 5/6				10.0
120	120A	6.00	10YR 5/6				10.0
121	121A	6.05	10YR 5/6				10.0
122	122A	6.10	10YR 5/6				10.0
123	123A	6.15	10YR 5/6				10.0
124	124A	6.20	10YR 5/6				10.0
125	125A	6.25	10YR 5/6				10.0
126	126A	6.30	10YR 5/6				10.0
127	127A	6.35	10YR 5/6				10.0
128	128A	6.40	10YR 5/6				10.0
129	129A	6.45	10YR 5/6				10.0
130	130A	6.50	10YR 5/6				10.0
131	131A	6.55	10YR 5/6				10.0
132	132A	6.60	10YR 5/6				10.0
133	133A	6.65	10YR 5/6				10.0
134	134A	6.70	10YR 5/6				10.0
135	135A	6.75	10YR 5/6				10.0
136	136A	6.80	10YR 5/6				10.0
137	137A	6.85	10YR 5/6				10.0
138	138A	6.90	10YR 5/6				10.0
139	139A	6.95	10YR 5/6				10.0
140	140A	7.00	10YR 5/6				10.0
141	141A	7.05	10YR 5/6				10.0
142	142A	7.10	10YR 5/6				10.0
143	143A	7.15	10YR 5/6				10.0
144	144A	7.20	10YR 5/6				10.0
145	145A	7.25	10YR 5/6				10.0
146	146A	7.30	10YR 5/6				10.0
147	147A	7.35	10YR 5/6				10.0
148	148A	7.40	10YR 5/6				10.0
149	149A	7.45	10YR 5/6				10.0
150	150A	7.50	10YR 5/6				10.0

VENESS & ASSOCIATES PTY LIMITED

Environmental and Natural Resource Consultants

SITE No. 1119

661 - ~~Casino~~ / Casino / ~~Whiporie~~

shallow pebbly soil
Gr 3-94

soot

Kg

WHIPORIE

off

503280 6768306

Sample Type	Station or Site no	Year of Survey
00001		

Layer Status		Designation Category (Reference Code)	Metric Characteristic		Time	
Material	Location Addressed (m)		Primary	Secondary	Start	End
1	Harpoon					
2						
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JOB N° 661 GRAFTON/CASINO/MURWILL'H

font

 $\cdot K_3$

CAMERA

Greene Rd.

4915906767070

[illegible]

4915966767076

SOIL PROPERTIES RECORD 'A'

Record Type	Sample No	Yr. of Sample												
0000														
Layer Status			Dominant Colour (Munsell Code)				Moisture Characteristics				Temp			
Type of Soil	Horizon	Layer Average Depth (m)	Moist	VIC	Dry	Primary				Secondary		Moisture	Air Dry	
						W	L	C	M	W	L			C
110000														
11A	1	2.1	2.5	10	2/10	2/10	10	2/10						
11B	2	2.6	2.5	10	2/10	2/10	10	2/10						
11C	3	2.3	2.5	10	2/10	2/10	10	2/10						
11D	4	2.5	2.5	10	2/10	2/10	10	2/10						
11E	5	2.5	2.5	10	2/10	2/10	10	2/10						

Dr. L. H.

Dr 5:1

KPS

(20th, 5th, 10th, 15th, 20th, 25th, 30th, 35th, 40th, 45th, 50th, 55th, 60th, 65th, 70th, 75th, 80th, 85th, 90th, 95th, 100th)

Address Type	Save as Site No.
• • • • •	

BOUNDARY CONTINUITY

RA01 Note

RA02 Slope 1:20 mm

RA03 Clear 120-60 mm

RA04 Grout 100-150 mm

RA05 Offset LP 150 mm

SHAPE

RP01 Step

RP02 Vary

RP03 Slope

RP04 Slope

TEXTURE

MAGNIFICATION

FA01 Flat

FA02 Square 1:1

GRADE

GR01 Soil

GR02 Lawn

GR03 Lawn

GR04 Lawn

GR05 Lawn

GR06 Lawn

GR07 Lawn

GR08 Lawn

GR09 Lawn

GR10 Lawn

GR11 Lawn

GR12 Lawn

GR13 Lawn

GR14 Lawn

GR15 Lawn

GR16 Lawn

GR17 Lawn

GR18 Lawn

GR19 Lawn

GR20 Lawn

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GR116 Lawn

GR117 Lawn

GR118 Lawn

GR119 Lawn

GR120 Lawn

GR121 Lawn

GR122 Lawn

GR123 Lawn

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GR125 Lawn

GR126 Lawn

GR127 Lawn

GR128 Lawn

GR129 Lawn

GR13

661 - ~~Gaffney~~ / Casino / ~~Atlantic City~~

SITE No. 1118

310

K_g

MYRTLE

Worfield Rd.

Gn 3.11

11 986266776666

Assess Type		Same as Site no		Total No. of					
00001		1		1					
Layer Name				Dominant Color (Shade Code)		Mixture Characteristics		Tons	
						Primary Secondary			
Layer Average Depth (m)				Moisture		Dry		Wet	
1.7				2.4		1.1		2.3	
2.3				5.5		2.1		2.1	
3.3				5.5		2.1		2.1	
4.1				5.5		2.1		2.1	
5.1				5.5		2.1		2.1	
6.1				5.5		2.1		2.1	
7.1				5.5		2.1		2.1	
8.1				5.5		2.1		2.1	
9.1				5.5		2.1		2.1	
10.1				5.5		2.1		2.1	
11.1				5.5		2.1		2.1	
12.1				5.5		2.1		2.1	
13.1				5.5		2.1		2.1	
14.1				5.5		2.1		2.1	
15.1				5.5		2.1		2.1	
16.1				5.5		2.1		2.1	
17.1				5.5		2.1		2.1	
18.1				5.5		2.1		2.1	
19.1				5.5		2.1		2.1	
20.1				5.5		2.1		2.1	
21.1				5.5		2.1		2.1	
22.1				5.5		2.1		2.1	
23.1				5.5		2.1		2.1	
24.1				5.5		2.1		2.1	
25.1				5.5		2.1		2.1	
26.1				5.5		2.1		2.1	
27.1				5.5		2.1		2.1	
28.1				5.5		2.1		2.1	
29.1				5.5		2.1		2.1	
30.1				5.5		2.1		2.1	
31.1				5.5		2.1		2.1	
32.1				5.5		2.1		2.1	
33.1				5.5		2.1		2.1	
34.1				5.5		2.1		2.1	
35.1				5.5		2.1		2.1	
36.1				5.5		2.1		2.1	
37.1				5.5		2.1		2.1	
38.1				5.5		2.1		2.1	
39.1				5.5		2.1		2.1	
40.1				5.5		2.1		2.1	
41.1				5.5		2.1		2.1	
42.1				5.5		2.1		2.1	
43.1				5.5		2.1		2.1	
44.1				5.5		2.1		2.1	
45.1				5.5		2.1		2.1	
46.1				5.5		2.1		2.1	
47.1				5.5		2.1		2.1	
48.1				5.5		2.1		2.1	
49.1				5.5		2.1		2.1	
50.1				5.5		2.1		2.1	
51.1				5.5		2.1		2.1	
52.1				5.5		2.1		2.1	
53.1				5.5		2.1		2.1	
54.1				5.5		2.1		2.1	
55.1				5.5		2.1		2.1	
56.1				5.5		2.1		2.1	
57.1				5.5		2.1		2.1	
58.1				5.5		2.1		2.1	
59.1				5.5		2.1		2.1	
60.1				5.5		2.1		2.1	
61.1				5.5		2.1		2.1	
62.1				5.5		2.1		2.1	
63.1				5.5		2.1		2.1	
64.1				5.5		2.1		2.1	
65.1				5.5		2.1		2.1	
66.1				5.5		2.1		2.1	
67.1				5.5		2.1		2.1	
68.1				5.5		2.1		2.1	
69.1				5.5		2.1			

SURFACE CONDITION

Crust	1
Head set	1
Not head set	2

Very good hilltop 42

BOUNDARY CONDITIONS		STRUCTURE		STONE	
UAG1	None	UAG1	Aggregates Straps Grout	VDG1	7.5 mm
UAG2	Slurry (120 mm)	UAG2	Aggregates Mass	VDG2	9.5 mm
UAG3	Clay (150 mm)	UAG3	Mass Plasticity	VDG3	15-60 mm
UAG4	Grout (150-180 mm)	UAG4	Grout Plasticity	VDG4	20-100 mm
UAG5	Grout (> 180 mm)	UAG5	Grout Plasticity	VDG5	70-100 mm
UAG6	Grout (> 180 mm)	UAG6	Grout Plasticity	VDG6	> 100 mm
GRADE		FLOOR SLAB		STONE GRADING	
UG1	None	UG1	4.5 mm	UG1	Non-graded
UG2	None	UG2	3.0 mm	UG2	Non-graded
UG3	None	UG3	1.5 mm	UG3	Non-graded
UG4	None	UG4	1.0 mm	UG4	Non-graded
UG5	None	UG5	0.5 mm	UG5	Non-graded
UG6	None	UG6	0.25 mm	UG6	Non-graded
UG7	None	UG7	0.15 mm	UG7	Non-graded
UG8	None	UG8	0.075 mm	UG8	Non-graded
UG9	None	UG9	0.045 mm	UG9	Non-graded
UG10	None	UG10	0.025 mm	UG10	Non-graded
TEXTURE		FLOOR SLAB		STONE GRADING	
TS1	None	TS1	4.5 mm	TS1	Non-graded
TS2	None	TS2	3.0 mm	TS2	Non-graded
TS3	None	TS3	1.5 mm	TS3	Non-graded
TS4	None	TS4	1.0 mm	TS4	Non-graded
TS5	None	TS5	0.5 mm	TS5	Non-graded
TS6	None	TS6	0.25 mm	TS6	Non-graded
TS7	None	TS7	0.15 mm	TS7	Non-graded
TS8	None	TS8	0.075 mm	TS8	Non-graded
TS9	None	TS9	0.045 mm	TS9	Non-graded
TS10	None	TS10	0.025 mm	TS10	Non-graded
GRADE		FLOOR SLAB		STONE GRADING	
GS1	None	GS1	4.5 mm	GS1	Non-graded
GS2	None	GS2	3.0 mm	GS2	Non-graded
GS3	None	GS3	1.5 mm	GS3	Non-graded
GS4	None	GS4	1.0 mm	GS4	Non-graded
GS5	None	GS5	0.5 mm	GS5	Non-graded
GS6	None	GS6	0.25 mm	GS6	Non-graded
GS7	None	GS7	0.15 mm	GS7	Non-graded
GS8	None	GS8	0.075 mm	GS8	Non-graded
GS9	None	GS9	0.045 mm	GS9	Non-graded
GS10	None	GS10	0.025 mm	GS10	Non-graded
PLASTICITY TYPE		FLOOR SLAB		STONE GRADING	
PT1	None	PT1	4.5 mm	PT1	Non-graded
PT2	None	PT2	3.0 mm	PT2	Non-graded
PT3	None	PT3	1.5 mm	PT3	Non-graded
PT4	None	PT4	1.0 mm	PT4	Non-graded
PT5	None	PT5	0.5 mm	PT5	Non-graded
PT6	None	PT6	0.25 mm	PT6	Non-graded
PT7	None	PT7	0.15 mm	PT7	Non-graded
PT8	None	PT8	0.075 mm	PT8	Non-graded
PT9	None	PT9	0.045 mm	PT9	Non-graded
PT10	None	PT10	0.025 mm	PT10	Non-graded
STICKINESS		FLOOR SLAB		STONE GRADING	
ST1	None	ST1	4.5 mm	ST1	Non-graded
ST2	None	ST2	3.0 mm	ST2	Non-graded
ST3	None	ST3	1.5 mm	ST3	Non-graded
ST4	None	ST4	1.0 mm	ST4	Non-graded
ST5	None	ST5	0.5 mm	ST5	Non-graded
ST6	None	ST6	0.25 mm	ST6	Non-graded
ST7	None	ST7	0.15 mm	ST7	Non-graded
ST8	None	ST8	0.075 mm	ST8	Non-graded
ST9	None	ST9	0.045 mm	ST9	Non-graded
ST10	None	ST10	0.025 mm	ST10	Non-graded
WATER TABLE		FLOOR SLAB		STONE GRADING	
WT1	None	WT1	4.5 mm	WT1	Non-graded
WT2	None	WT2	3.0 mm	WT2	Non-graded
WT3	None	WT3	1.5 mm	WT3	Non-graded
WT4	None	WT4	1.0 mm	WT4	Non-graded
WT5	None	WT5	0.5 mm	WT5	Non-graded
WT6	None	WT6	0.25 mm	WT6	Non-graded
WT7	None	WT7	0.15 mm	WT7	Non-graded
WT8	None	WT8	0.075 mm	WT8	Non-graded
WT9	None	WT9	0.045 mm	WT9	Non-graded
WT10	None	WT10	0.025 mm	WT10	Non-graded
CONCRETE CURING TEST		CONCRETE		STONE GRADING	
CT1	None	CT1	4.5 mm	CT1	Non-graded
CT2	None	CT2	3.0 mm	CT2	Non-graded
CT3	None	CT3	1.5 mm	CT3	Non-graded
CT4	None	CT4	1.0 mm	CT4	Non-graded
CT5	None	CT5	0.5 mm	CT5	Non-graded
CT6	None	CT6	0.25 mm	CT6	Non-graded
CT7	None	CT7	0.15 mm	CT7	Non-graded
CT8	None	CT8	0.075 mm	CT8	Non-graded
CT9	None	CT9	0.045 mm	CT9	Non-graded
CT10	None	CT10	0.025 mm	CT10	Non-graded
WEARING TEST		WEARING		STONE GRADING	
WE1	None	WE1	4.5 mm	WE1	Non-graded
WE2	None	WE2	3.0 mm	WE2	Non-graded
WE3	None	WE3	1.5 mm	WE3	Non-graded
WE4	None	WE4	1.0 mm	WE4	Non-graded
WE5	None	WE5	0.5 mm	WE5	Non-graded
WE6	None	WE6	0.25 mm	WE6	Non-graded
WE7	None	WE7	0.15 mm	WE7	Non-graded
WE8	None	WE8	0.075 mm	WE8	Non-graded
WE9	None	WE9	0.045 mm	WE9	Non-graded
WE10	None	WE10	0.025 mm	WE10	Non-graded
CONCRETE CURING TEST		CONCRETE		STONE GRADING	
CT1	None	CT1	4.5 mm	CT1	Non-graded
CT2	None	CT2	3.0 mm	CT2	Non-graded
CT3	None	CT3	1.5 mm	CT3	Non-graded
CT4	None	CT4	1.0 mm	CT4	Non-graded
CT5	None	CT5	0.5 mm	CT5	Non-graded
CT6	None	CT6	0.25 mm	CT6	Non-graded
CT7	None	CT7	0.15 mm	CT7	Non-graded
CT8	None	CT8	0.075 mm	CT8	Non-graded
CT9	None	CT9	0.045 mm	CT9	Non-graded
CT10	None	CT10	0.025 mm	CT10	Non-graded
WEARING TEST		WEARING		STONE GRADING	
WE1	None	WE1	4.5 mm	WE1	Non-graded
WE2	None	WE2	3.0 mm	WE2	Non-graded
WE3	None	WE3	1.5 mm	WE3	Non-graded
WE4	None	WE4	1.0 mm	WE4	Non-graded
WE5	None	WE5	0.5 mm	WE5	Non-graded
WE6	None	WE6	0.25 mm	WE6	Non-graded
WE7	None	WE7	0.15 mm	WE7	Non-graded
WE8	None	WE8	0.075 mm	WE8	Non-graded
WE9	None	WE9	0.045 mm	WE9	Non-graded
WE10	None	WE10	0.025 mm	WE10	Non-graded
CONCRETE CURING TEST		CONCRETE		STONE GRADING	
CT1	None	CT1	4.5 mm	CT1	Non-graded
CT2	None	CT2	3.0 mm	CT2	Non-graded
CT3	None	CT3	1.5 mm	CT3	Non-graded
CT4	None	CT4	1.0 mm	CT4	Non-graded
CT5	None	CT5	0.5 mm	CT5	Non-graded
CT6	None	CT6	0.25 mm	CT6	Non-graded
CT7	None	CT7	0.15 mm	CT7	Non-graded
CT8	None	CT8	0.075 mm	CT8	Non-graded
CT9	None	CT9	0.045 mm	CT9	Non-graded
CT10	None	CT10	0.025 mm	CT10	Non-graded
WEARING TEST		WEARING		STONE GRADING	
WE1	None	WE1	4.5 mm	WE1	Non-graded
WE2	None	WE2	3.0 mm	WE2	Non-graded
WE3	None	WE3	1.5 mm	WE3	Non-graded
WE4	None	WE4	1.0 mm	WE4	Non-graded
WE5	None	WE5	0.5 mm	WE5	Non-graded
WE6	None	WE6	0.25 mm	WE6	Non-graded
WE7	None	WE7	0.15 mm	WE7	Non-graded
WE8	None	WE8	0.075 mm	WE8	Non-graded
WE9	None	WE9	0.045 mm	WE9	Non-graded
WE10	None	WE10	0.025 mm	WE10	Non-graded
CONCRETE CURING TEST		CONCRETE		STONE GRADING	
CT1	None	CT1	4.5 mm	CT1	Non-graded
CT2	None	CT2	3.0 mm	CT2	Non-graded
CT3	None	CT3	1.5 mm	CT3	Non-graded
CT4	None	CT4	1.0 mm	CT4	Non-graded
CT5	None	CT5	0.5 mm	CT5	Non-graded
CT6	None	CT6	0.25 mm	CT6	Non-graded
CT7	None	CT7	0.15 mm	CT7	Non-graded
CT8	None	CT8	0.075 mm	CT8	Non-graded
CT9	None	CT9	0.045 mm	CT9	Non-graded
CT10	None	CT10	0.025 mm	CT10	Non-graded
WEARING TEST		WEARING		STONE GRADING	
WE1	None	WE1	4.5 mm	WE1	Non-graded
WE2	None	WE2	3.0 mm	WE2	Non-graded
WE3	None	WE3	1.5 mm	WE3	Non-graded
WE4	None	WE4	1.0 mm	WE4	Non-graded
WE5	None	WE5	0.5 mm	WE5	Non-graded
WE6	None	WE6	0.25 mm	WE6	Non-graded
WE7	None	WE7	0.15 mm	WE7	Non-graded
WE8	None	WE8	0.075 mm	WE8	Non-graded
WE9	None	WE9	0.045 mm	WE9	Non-graded
WE10	None	WE10	0.025 mm	WE10	Non-graded
CONCRETE CURING TEST		CONCRETE		STONE GRADING	
CT1	None	CT1	4.5 mm	CT1	Non-graded
CT2	None	CT2	3.0 mm	CT2	Non-graded
CT3	None	CT3	1.5 mm	CT3	Non-graded
CT4	None	CT4	1.0 mm	CT4	Non-graded
CT5	None	CT5	0.5 mm	CT5	Non-graded
CT6	None	CT6	0.25 mm	CT6	Non-graded
CT7	None	CT7	0.15 mm	CT7	Non-graded
CT8	None	CT8	0.075 mm	CT8	Non-graded
CT9	None	CT9	0.045 mm	CT9	Non-graded
CT10	None	CT10	0.025 mm	CT10	Non-graded
WEARING TEST		WEARING		STONE GRADING	
WE1	None	WE1	4.5 mm	WE1	Non-graded
WE2	None	WE2	3.0 mm	WE2	Non-graded
WE3	None	WE3	1.5 mm	WE3	Non-graded
WE4	None	WE4	1.0 mm	WE4	Non-graded
WE5	None	WE5	0.5 mm	WE5	Non-graded
WE6	None	WE6	0.25 mm	WE6	Non-graded
WE7	None	WE7	0.15 mm	WE7	Non-graded
WE8	None	WE8	0.075 mm	WE8	Non-graded
WE9	None	WE9	0.045 mm	WE9	Non-graded
WE10	None	WE10	0.025 mm	WE10	Non-graded
CONCRETE CURING TEST		CONCRETE		STONE GRADING	
CT1	None	CT1	4.5 mm	CT1	Non-graded
CT2	None	CT2	3.0 mm	CT2	Non-graded
CT3	None	CT3	1.5 mm	CT3	Non-graded
CT4	None	CT4	1.0 mm	CT4	Non-graded
CT5	None	CT5	0.5 mm	CT5	Non-graded
CT6	None	CT6	0.25 mm	CT6	Non-graded
CT7	None	CT7	0.15 mm	CT7	Non-graded
CT8	None	CT8	0.075 mm	CT8	Non-graded
CT9	None	CT9	0.045 mm	CT9	Non-graded
CT10	None	CT10	0.025 mm	CT10	Non-graded
WEARING TEST		WEARING		STONE GRADING	
WE1	None	WE1	4.5 mm	WE1	Non-graded
WE2	None	WE2	3.0 mm	WE2	Non-graded
WE3	None	WE3	1.5 mm	WE3	Non-graded
WE4	None	WE4	1.0 mm	WE4	Non-graded
WE5	None	WE5	0.5 mm	WE5	Non-graded
WE6	None	WE6	0.25 mm	WE6	Non-graded
WE7	None	WE7	0.15 mm	WE7	Non-graded
WE8	None	WE8	0.075 mm	WE8	Non-graded
WE9	None	WE9	0.045 mm	WE9	Non-graded
WE10	None	WE10	0.025 mm	WE10	Non-graded
CONCRETE CURING TEST		CONCRETE		STONE GRADING	
CT1	None	CT1	4.5 mm	CT1	Non-graded
CT2	None	CT2	3.0 mm	CT2	Non-graded
CT3	None	CT3	1.5 mm	CT3	Non-graded
CT4	None	CT4	1.0 mm	CT4	Non-graded
CT5	None	CT5	0.5 mm	CT5	Non-graded
CT6	None	CT6	0.25 mm	CT6	Non-graded
CT7	None	CT7	0.15 mm	CT7	Non-graded
CT8	None	CT8	0.075 mm	CT8	Non-graded
CT9	None	CT9	0.045 mm	CT9	Non-graded
CT10	None	CT10	0.025 mm	CT10	Non-graded
WEARING TEST		WEARING		STONE GRADING	
WE1	None	WE1	4.5 mm	WE1	Non-graded
WE2	None	WE2	3.0 mm	WE2	Non-graded
WE3	None	WE3	1.5 mm	WE3	Non-graded
WE4	None	WE4	1.0 mm	WE4	Non-graded
WE5	None	WE5	0.5 mm	WE5	Non-graded
WE6	None	WE6	0.25 mm	WE6	Non-graded
WE7	None	WE7	0.15 mm	WE7	Non-graded
WE8	None	WE8	0.075 mm	WE8	Non-graded
WE9	None	WE9	0.045 mm	WE9	Non-graded
WE10	None	WE10	0.025 mm	WE10	Non-graded
CONCRETE CURING TEST		CONCRETE		STONE GRADING	
CT1	None	CT1	4.5 mm	CT1	Non-graded
CT2	None	CT2	3.0 mm	CT2	Non-graded
CT3	None	CT3	1.5 mm	CT3	Non-graded
CT4	None	CT4	1.0 mm	CT4	Non-graded
CT5	None	CT5	0.5 mm	CT5	Non-graded
CT6	None	CT6	0.25 mm	CT6	Non-graded
CT7	None	CT7	0.15 mm	CT7	Non-graded
CT8	None	CT8	0.075 mm	CT8	Non-graded
CT9	None	CT9	0.045 mm	CT9	Non-graded
CT10	None	CT10	0.025 mm	CT10	Non-graded
WEARING TEST		WEARING		STONE GRADING	
WE1	None	WE1	4.5 mm	WE1	Non-graded
WE2	None	WE2	3.0 mm	WE2	Non-graded
WE3	None	WE3	1.5 mm	WE3	Non-graded
WE4	None	WE4	1.0 mm	WE4	Non-graded
WE5	None	WE5	0.5 mm	WE5	Non-graded
WE6	None	WE6	0.25 mm	WE6	Non-graded
WE7	None	WE7	0.15 mm	WE7	Non-graded
WE8	None	WE8	0.075 mm	WE8	Non-graded
WE9	None	WE9	0.045 mm	WE9	Non-graded
WE10	None	WE10	0.025 mm	WE10	Non-graded
CONCRETE CURING TEST		CONCRETE		STONE GRADING	
CT1	None	CT1	4.5 mm	CT1	Non-graded
CT2	None	CT2	3.0 mm	CT2	Non-graded
CT3	None	CT3	1.5 mm	CT3	Non-graded
CT4	None	CT4	1.0 mm	CT4	Non-graded
CT5	None	CT5	0.5 mm	CT5	Non-graded
CT6	None	CT6	0.25 mm	CT6	Non-graded</

VENESS & ASSOCIATES PTY LIMITED

Environmental and Natural Resource Consultants
SOG N° 661 GRAFTON/CASINO/MURWILLAH

Site No. 100b

Spot

Kg

BUNGAWALBIN

Mill Rd

D63.51

SOIL PROPERTIES RECORD 'A'

Layer	Horizon	Lower Average Depth (m)	Moisture Content (%)	Plasticity	Consistency	Texture
1	11A	0.0-0.1	10.0	CL	Stiff	Clay
2	11B	0.1-0.2	10.0	CL	Stiff	Clay
3	11C	0.2-0.3	10.0	CL	Stiff	Clay
4	11D	0.3-0.4	10.0	CL	Stiff	Clay
5	11E	0.4-0.5	10.0	CL	Stiff	Clay
6	11F	0.5-0.6	10.0	CL	Stiff	Clay
7	11G	0.6-0.7	10.0	CL	Stiff	Clay

Layer	Horizon	Lower Average Depth (m)	Moisture Content (%)	Plasticity	Consistency	Texture
1	11A	0.0-0.1	10.0	CL	Stiff	Clay
2	11B	0.1-0.2	10.0	CL	Stiff	Clay
3	11C	0.2-0.3	10.0	CL	Stiff	Clay
4	11D	0.3-0.4	10.0	CL	Stiff	Clay
5	11E	0.4-0.5	10.0	CL	Stiff	Clay
6	11F	0.5-0.6	10.0	CL	Stiff	Clay
7	11G	0.6-0.7	10.0	CL	Stiff	Clay

SOIL PROPERTIES RECORD 'B'

Layer	Horizon	Lower Average Depth (m)	Moisture Content (%)	Plasticity	Consistency	Texture
1	11A	0.0-0.1	10.0	CL	Stiff	Clay
2	11B	0.1-0.2	10.0	CL	Stiff	Clay
3	11C	0.2-0.3	10.0	CL	Stiff	Clay
4	11D	0.3-0.4	10.0	CL	Stiff	Clay
5	11E	0.4-0.5	10.0	CL	Stiff	Clay
6	11F	0.5-0.6	10.0	CL	Stiff	Clay
7	11G	0.6-0.7	10.0	CL	Stiff	Clay

BOUNDARY DEFINITIONS

11A	CL	CLAY
11B	CL	CLAY
11C	CL	CLAY
11D	CL	CLAY
11E	CL	CLAY
11F	CL	CLAY
11G	CL	CLAY

TEXTURE

11A	CL	CLAY
11B	CL	CLAY
11C	CL	CLAY
11D	CL	CLAY
11E	CL	CLAY
11F	CL	CLAY
11G	CL	CLAY

ROOT DISTRIBUTION

11A	CL	CLAY
11B	CL	CLAY
11C	CL	CLAY
11D	CL	CLAY
11E	CL	CLAY
11F	CL	CLAY
11G	CL	CLAY

GRASS

11A	CL	CLAY
11B	CL	CLAY
11C	CL	CLAY
11D	CL	CLAY
11E	CL	CLAY
11F	CL	CLAY
11G	CL	CLAY

PLASTICITY TYPE

11A	CL	CLAY
11B	CL	CLAY
11C	CL	CLAY
11D	CL	CLAY
11E	CL	CLAY
11F	CL	CLAY
11G	CL	CLAY

STICKINESS

11A	CL	CLAY
11B	CL	CLAY
11C	CL	CLAY
11D	CL	CLAY
11E	CL	CLAY
11F	CL	CLAY
11G	CL	CLAY

WATER TABLE

11A	CL	CLAY
11B	CL	CLAY
11C	CL	CLAY
11D	CL	CLAY
11E	CL	CLAY
11F	CL	CLAY
11G	CL	CLAY

CONSISTENCY

11A	CL	CLAY
11B	CL	CLAY
11C	CL	CLAY
11D	CL	CLAY
11E	CL	CLAY
11F	CL	CLAY
11G	CL	CLAY

CHARACTERISTICS

11A	CL	CLAY
11B	CL	CLAY
11C	CL	CLAY
11D	CL	CLAY
11E	CL	CLAY
11F	CL	CLAY
11G	CL	CLAY

CONCRETE & INCLUSIONS

11A	CL	CLAY
11B	CL	CLAY
11C	CL	CLAY
11D	CL	CLAY
11E	CL	CLAY
11F	CL	CLAY
11G	CL	CLAY

STONES

11A	CL	CLAY
11B	CL	CLAY
11C	CL	CLAY
11D	CL	CLAY
11E	CL	CLAY
11F	CL	CLAY
11G	CL	CLAY

STONES

11A	CL	CLAY
11B	CL	CLAY
11C	CL	CLAY
11D	CL	CLAY
11E	CL	CLAY
11F	CL	CLAY
11G	CL	CLAY

STONES

11A	CL	CLAY
11B	CL	CLAY
11C	CL	CLAY
11D	CL	CLAY
11E	CL	CLAY
11F	CL	CLAY
11G	CL	CLAY

VENESS & ASSOCIATES PTY LIMITED

Environmental and Natural Resource Consultants
SOG N° 661 GRAFTON/CASINO/MURWILLAH

Site No. 100c

Spot

Kg

BUNGAWALBIN

Trails linking Swampy - rangeland Edo. Hamlet

SOIL PROPERTIES RECORD 'A'

Layer	Horizon	Lower Average Depth (m)	Moisture Content (%)	Plasticity	Consistency	Texture
1	11A	0.0-0.1	10.0	CL	Stiff	Clay
2	11B	0.1-0.2	10.0	CL	Stiff	Clay
3	11C	0.2-0.3	10.0	CL	Stiff	Clay
4	11D	0.3-0.4	10.0	CL	Stiff	Clay
5	11E	0.4-0.5	10.0	CL	Stiff	Clay
6	11F	0.5-0.6	10.0	CL	Stiff	Clay
7	11G	0.6-0.7	10.0	CL	Stiff	Clay

Layer	Horizon	Lower Average Depth (m)	Moisture Content (%)	Plasticity	Consistency	Texture
1	11A	0.0-0.1	10.0	CL	Stiff	Clay
2	11B	0.1-0.2	10.0	CL	Stiff	Clay
3	11C	0.2-0.3	10.0	CL	Stiff	Clay
4	11D	0.3-0.4	10.0	CL	Stiff	Clay
5	11E	0.4-0.5	10.0	CL	Stiff	Clay
6	11F	0.5-0.6	10.0	CL	Stiff	Clay
7	11G	0.6-0.7	10.0	CL	Stiff	Clay

SOIL PROPERTIES RECORD 'B'

Layer	Horizon	Lower Average Depth (m)	Moisture Content (%)	Plasticity	Consistency	Texture
1	11A	0.0-0.1	10.0	CL	Stiff	Clay
2	11B	0.1-0.2	10.0	CL	Stiff	Clay
3	11C	0.2-0.3	10.0	CL	Stiff	Clay
4	11D	0.3-0.4	10.0	CL	Stiff	Clay
5	11E	0.4-0.5	10.0	CL	Stiff	Clay
6	11F	0.5-0.6	10.0	CL	Stiff	Clay
7	11G	0.6-0.7	10.0	CL	Stiff	Clay

BOUNDARY DEFINITIONS

11A	CL	CLAY
11B	CL	CLAY
11C	CL	CLAY
11D	CL	CLAY
11E	CL	CLAY
11F	CL	CLAY
11G	CL	CLAY

TEXTURE

11A	CL	CLAY
11B	CL	CLAY
11C	CL	CLAY
11D	CL	CLAY
11E	CL	CLAY
11F	CL	CLAY
11G	CL	CLAY

ROOT DISTRIBUTION

11A	CL	CLAY
11B	CL	CLAY
11C	CL	CLAY
11D	CL	CLAY
11E	CL	CLAY
11F	CL	CLAY
11G	CL	CLAY

GRASS

11A	CL	CLAY
11B	CL	CLAY
11C	CL	CLAY
11D	CL	CLAY
11E	CL	CLAY
11F	CL	CLAY
11G	CL	CLAY

PLASTICITY TYPE

11A	CL	CLAY
11B	CL	CLAY
11C	CL	CLAY
11D	CL	CLAY
11E	CL	CLAY
11F	CL	CLAY
11G	CL	CLAY

STICKINESS

11A	CL	CLAY
11B	CL	CLAY
11C	CL	CLAY
11D	CL	CLAY
11E	CL	CLAY
11F	CL	CLAY
11G	CL	CLAY

WATER TABLE

11A	CL	CLAY
11B	CL	CLAY
11C	CL	CLAY
11D	CL	CLAY
11E	CL	CLAY
11F	CL	CLAY
11G	CL	CLAY

CONSISTENCY

11A	CL	CLAY
11B	CL	CLAY
11C	CL	CLAY
11D	CL	CLAY
11E	CL	CLAY
11F	CL	CLAY
11G	CL	CLAY

CHARACTERISTICS

11A	CL	CLAY
11B	CL	CLAY
11C	CL	CLAY
11D	CL	CLAY
11E	CL	CLAY
11F	CL	CLAY
11G	CL	CLAY

CONCRETE & INCLUSIONS

11A	CL	CLAY
11B	CL	CLAY
11C	CL	CLAY
11D	CL	CLAY
11E	CL	CLAY
11F	CL	CLAY
11G	CL	CLAY

STONES

11A	CL	CLAY
11B	CL	CLAY
11C	CL	CLAY
11D	CL	CLAY
11E	CL	CLAY
11F	CL	CLAY
11G	CL	CLAY

STONES

11A	CL	CLAY
11B	CL	CLAY
11C	CL	CLAY
11D	CL	CLAY
11E	CL	CLAY
11F	CL	CLAY
11G	CL	CLAY

STONES

11A	CL	CLAY
11B	CL	CLAY
11C	CL	CLAY
11D	CL	CLAY
11E	CL	CLAY
11F	CL	CLAY
11G	CL	CLAY

VENESS & ASSOCIATES PTY LIMITED

Environmental and Natural Resource Consultants

508 N° 661 GRAFTON/CASINO/MURWILLAH

SITE No. 101

508C

Kg.

Road Hill Rd

ROYAL CAMP

484684 6789886

Dr 1-11

SOIL PROPERTIES RECORD 'A'

Profile	Horizon	Lower Average Depth (m)	Dominant Colour (Munsell Code)		Moisture Characteristics		Temp
			Moist	Dry	Primary	Secondary	
11A		0.2	10YR 5/6	10YR 5/6			21
11B		0.3	10YR 5/6	10YR 5/6			21
11C		0.4	10YR 5/6	10YR 5/6			21
11D		0.5	10YR 5/6	10YR 5/6			21
11E		0.6	10YR 5/6	10YR 5/6			21
11F		0.7	10YR 5/6	10YR 5/6			21
11G		0.8	10YR 5/6	10YR 5/6			21
11H		0.9	10YR 5/6	10YR 5/6			21
11I		1.0	10YR 5/6	10YR 5/6			21
11J		1.1	10YR 5/6	10YR 5/6			21
11K		1.2	10YR 5/6	10YR 5/6			21
11L		1.3	10YR 5/6	10YR 5/6			21
11M		1.4	10YR 5/6	10YR 5/6			21
11N		1.5	10YR 5/6	10YR 5/6			21
11O		1.6	10YR 5/6	10YR 5/6			21
11P		1.7	10YR 5/6	10YR 5/6			21
11Q		1.8	10YR 5/6	10YR 5/6			21
11R		1.9	10YR 5/6	10YR 5/6			21
11S		2.0	10YR 5/6	10YR 5/6			21
11T		2.1	10YR 5/6	10YR 5/6			21
11U		2.2	10YR 5/6	10YR 5/6			21
11V		2.3	10YR 5/6	10YR 5/6			21
11W		2.4	10YR 5/6	10YR 5/6			21
11X		2.5	10YR 5/6	10YR 5/6			21
11Y		2.6	10YR 5/6	10YR 5/6			21
11Z		2.7	10YR 5/6	10YR 5/6			21

Profile	Horizon	Lower Average Depth (m)	Dominant Colour (Munsell Code)	Moisture Characteristics	Temp
11A		0.2	10YR 5/6		21
11B		0.3	10YR 5/6		21
11C		0.4	10YR 5/6		21
11D		0.5	10YR 5/6		21
11E		0.6	10YR 5/6		21
11F		0.7	10YR 5/6		21
11G		0.8	10YR 5/6		21
11H		0.9	10YR 5/6		21
11I		1.0	10YR 5/6		21
11J		1.1	10YR 5/6		21
11K		1.2	10YR 5/6		21
11L		1.3	10YR 5/6		21
11M		1.4	10YR 5/6		21
11N		1.5	10YR 5/6		21
11O		1.6	10YR 5/6		21
11P		1.7	10YR 5/6		21
11Q		1.8	10YR 5/6		21
11R		1.9	10YR 5/6		21
11S		2.0	10YR 5/6		21
11T		2.1	10YR 5/6		21
11U		2.2	10YR 5/6		21
11V		2.3	10YR 5/6		21
11W		2.4	10YR 5/6		21
11X		2.5	10YR 5/6		21
11Y		2.6	10YR 5/6		21
11Z		2.7	10YR 5/6		21

SOIL PROPERTIES RECORD 'B'

Profile	Horizon	Lower Average Depth (m)	Dominant Colour (Munsell Code)	Moisture Characteristics	Temp
11A		0.2	10YR 5/6		21
11B		0.3	10YR 5/6		21
11C		0.4	10YR 5/6		21
11D		0.5	10YR 5/6		21
11E		0.6	10YR 5/6		21
11F		0.7	10YR 5/6		21
11G		0.8	10YR 5/6		21
11H		0.9	10YR 5/6		21
11I		1.0	10YR 5/6		21
11J		1.1	10YR 5/6		21
11K		1.2	10YR 5/6		21
11L		1.3	10YR 5/6		21
11M		1.4	10YR 5/6		21
11N		1.5	10YR 5/6		21
11O		1.6	10YR 5/6		21
11P		1.7	10YR 5/6		21
11Q		1.8	10YR 5/6		21
11R		1.9	10YR 5/6		21
11S		2.0	10YR 5/6		21
11T		2.1	10YR 5/6		21
11U		2.2	10YR 5/6		21
11V		2.3	10YR 5/6		21
11W		2.4	10YR 5/6		21
11X		2.5	10YR 5/6		21
11Y		2.6	10YR 5/6		21
11Z		2.7	10YR 5/6		21

VENESS & ASSOCIATES PTY LIMITED

Environmental and Natural Resource Consultants

508 N° 661 GRAFTON/CASINO/MURWILLAH

SITE No. 101

508C

Kg.

Road Hill Rd

ROYAL CAMP

484684 6789886

Dr 1-11

SOIL PROPERTIES RECORD 'A'

Profile	Horizon	Lower Average Depth (m)	Dominant Colour (Munsell Code)		Moisture Characteristics		Temp
			Moist	Dry	Primary	Secondary	
11A		0.2	10YR 5/6	10YR 5/6			21
11B		0.3	10YR 5/6	10YR 5/6			21
11C		0.4	10YR 5/6	10YR 5/6			21
11D		0.5	10YR 5/6	10YR 5/6			21
11E		0.6	10YR 5/6	10YR 5/6			21
11F		0.7	10YR 5/6	10YR 5/6			21
11G		0.8	10YR 5/6	10YR 5/6			21
11H		0.9	10YR 5/6	10YR 5/6			21
11I		1.0	10YR 5/6	10YR 5/6			21
11J		1.1	10YR 5/6	10YR 5/6			21
11K		1.2	10YR 5/6	10YR 5/6			21
11L		1.3	10YR 5/6	10YR 5/6			21
11M		1.4	10YR 5/6	10YR 5/6			21
11N		1.5	10YR 5/6	10YR 5/6			21
11O		1.6	10YR 5/6	10YR 5/6			21
11P		1.7	10YR 5/6	10YR 5/6			21
11Q		1.8	10YR 5/6	10YR 5/6			21
11R		1.9	10YR 5/6	10YR 5/6			21
11S		2.0	10YR 5/6	10YR 5/6			21
11T		2.1	10YR 5/6	10YR 5/6			21
11U		2.2	10YR 5/6	10YR 5/6			21
11V		2.3	10YR 5/6	10YR 5/6			21
11W		2.4	10YR 5/6	10YR 5/6			21
11X		2.5	10YR 5/6	10YR 5/6			21
11Y		2.6	10YR 5/6	10YR 5/6			21
11Z		2.7	10YR 5/6	10YR 5/6			21

Profile	Horizon	Lower Average Depth (m)	Dominant Colour (Munsell Code)	Moisture Characteristics	Temp
11A		0.2	10YR 5/6		21
11B		0.3	10YR 5/6		21
11C		0.4	10YR 5/6		21
11D		0.5	10YR 5/6		21
11E		0.6	10YR 5/6		21
11F		0.7	10YR 5/6		21
11G		0.8	10YR 5/6		21
11H		0.9	10YR 5/6		21
11I		1.0	10YR 5/6		21
11J		1.1	10YR 5/6		21
11K		1.2	10YR 5/6		21
11L		1.3	10YR 5/6		21
11M		1.4	10YR 5/6		21
11N		1.5	10YR 5/6		21
11O		1.6	10YR 5/6		21
11P		1.7	10YR 5/6		21
11Q		1.8	10YR 5/6		21
11R		1.9	10YR 5/6		21
11S		2.0	10YR 5/6		21
11T		2.1	10YR 5/6		21
11U		2.2	10YR 5/6		21
11V		2.3	10YR 5/6		21
11W		2.4	10YR 5/6		21
11X		2.5	10YR 5/6		21
11Y		2.6	10YR 5/6		21
11Z		2.7	10YR 5/6		21

SOIL PROPERTIES RECORD 'B'

Profile	Horizon	Lower Average Depth (m)	Dominant Colour (Munsell Code)	Moisture Characteristics	Temp
11A		0.2	10YR 5/6		21
11B		0.3	10YR 5/6		21
11C		0.4	10YR 5/6		21
11D		0.5	10YR 5/6		21
11E		0.6	10YR 5/6		21
11F		0.7	10YR 5/6		21
11G		0.8	10YR 5/6		21
11H		0.9	10YR 5/6		21
11I		1.0	10YR 5/6		21
11J		1.1	10YR 5/6		21
11K		1.2	10YR 5/6		21
11L		1.3	10YR 5/6		21
11M		1.4	10YR 5/6		21
11N		1.5	10YR 5/6		21
11O		1.6	10YR 5/6		21
11P		1.7	10YR 5/6		21
11Q		1.8	10YR 5/6		21
11R		1.9	10YR 5/6		21
11S		2.0	10YR 5/6		21
11T		2.1	10YR 5/6		21
11U		2.2	10YR 5/6		21
11V		2.3	10YR 5/6		21
11W		2.4	10YR 5/6		21
11X		2.5	10YR 5/6		21
11Y		2.6	10YR 5/6		21
11Z		2.7	10YR 5/6		21

VENESS & ASSOCIATES PTY LIMITED

Environmental and Natural Resource Consultants

SITE No. 0716

661 - Grafton / Casino / Macintyre

1PS

Dy 4-11

Spot
JK
GIBBERACEE
5067066750646

Oil Rig Rd.

Level Elevation		Dominant Colour (Munsell Code)		Moisture Characteristics		Tone	
Horizon	Layer Average Depth (m)	Moist	Dry	Primary	Secondary	SP	MP
1A	0.0	10YR 6/2	10YR 6/2	10YR 6/2	10YR 6/2	5	5
1B	0.0	10YR 6/2	10YR 6/2	10YR 6/2	10YR 6/2	5	5
2	0.0	10YR 6/2	10YR 6/2	10YR 6/2	10YR 6/2	5	5
3	0.0	10YR 6/2	10YR 6/2	10YR 6/2	10YR 6/2	5	5
4	0.0	10YR 6/2	10YR 6/2	10YR 6/2	10YR 6/2	5	5
5	0.0	10YR 6/2	10YR 6/2	10YR 6/2	10YR 6/2	5	5
6	0.0	10YR 6/2	10YR 6/2	10YR 6/2	10YR 6/2	5	5
7	0.0	10YR 6/2	10YR 6/2	10YR 6/2	10YR 6/2	5	5
8	0.0	10YR 6/2	10YR 6/2	10YR 6/2	10YR 6/2	5	5
9	0.0	10YR 6/2	10YR 6/2	10YR 6/2	10YR 6/2	5	5
10	0.0	10YR 6/2	10YR 6/2	10YR 6/2	10YR 6/2	5	5

Level	Horizon	Layer Average Depth (m)	Moist	Dry	Primary	Secondary	Tone
1	1A	0.0	10YR 6/2	10YR 6/2	10YR 6/2	10YR 6/2	5
2	1B	0.0	10YR 6/2	10YR 6/2	10YR 6/2	10YR 6/2	5
3	2	0.0	10YR 6/2	10YR 6/2	10YR 6/2	10YR 6/2	5
4	3	0.0	10YR 6/2	10YR 6/2	10YR 6/2	10YR 6/2	5
5	4	0.0	10YR 6/2	10YR 6/2	10YR 6/2	10YR 6/2	5
6	5	0.0	10YR 6/2	10YR 6/2	10YR 6/2	10YR 6/2	5
7	6	0.0	10YR 6/2	10YR 6/2	10YR 6/2	10YR 6/2	5
8	7	0.0	10YR 6/2	10YR 6/2	10YR 6/2	10YR 6/2	5
9	8	0.0	10YR 6/2	10YR 6/2	10YR 6/2	10YR 6/2	5
10	9	0.0	10YR 6/2	10YR 6/2	10YR 6/2	10YR 6/2	5

SURFACE CONDITION

Crust
Hard set
Not hard set

BOUNDARY
CONTINUITY

US01
US02
US03
US04
US05
US06
US07
US08
US09
US10

TEXTURE
AND CHARACTER

US01
US02
US03
US04
US05
US06
US07
US08
US09
US10

GRAPE

US01
US02
US03
US04
US05
US06
US07
US08
US09
US10

PLASTICITY TYPE

US01
US02
US03
US04
US05
US06
US07
US08
US09
US10

STICKINESS

US01
US02
US03
US04
US05
US06
US07
US08
US09
US10

WATER TABLE

US01
US02
US03
US04
US05
US06
US07
US08
US09
US10

CONCRETE

US01
US02
US03
US04
US05
US06
US07
US08
US09
US10

WEARING SURFACE

US01
US02
US03
US04
US05
US06
US07
US08
US09
US10

GIBBERACEE

5067066750646

Oil Rig Rd.

Level	Horizon	Layer Average Depth (m)	Moist	Dry	Primary	Secondary	Tone
1	1A	0.0	10YR 6/2	10YR 6/2	10YR 6/2	10YR 6/2	5
2	1B	0.0	10YR 6/2	10YR 6/2	10YR 6/2	10YR 6/2	5
3	2	0.0	10YR 6/2	10YR 6/2	10YR 6/2	10YR 6/2	5
4	3	0.0	10YR 6/2	10YR 6/2	10YR 6/2	10YR 6/2	5
5	4	0.0	10YR 6/2	10YR 6/2	10YR 6/2	10YR 6/2	5
6	5	0.0	10YR 6/2	10YR 6/2	10YR 6/2	10YR 6/2	5
7	6	0.0	10YR 6/2	10YR 6/2	10YR 6/2	10YR 6/2	5
8	7	0.0	10YR 6/2	10YR 6/2	10YR 6/2	10YR 6/2	5
9	8	0.0	10YR 6/2	10YR 6/2	10YR 6/2	10YR 6/2	5
10	9	0.0	10YR 6/2	10YR 6/2	10YR 6/2	10YR 6/2	5

STONE SIZE

US01
US02
US03
US04
US05
US06
US07
US08
US09
US10

STONE CHARACTERISTICS

US01
US02
US03
US04
US05
US06
US07
US08
US09
US10

ROOTS

US01
US02
US03
US04
US05
US06
US07
US08
US09
US10

ROOT DISTRIBUTION

US01
US02
US03
US04
US05
US06
US07
US08
US09
US10

FAKES

US01
US02
US03
US04
US05
US06
US07
US08
US09
US10

CHARACTER

US01
US02
US03
US04
US05
US06
US07
US08
US09
US10

CONCRETE & INCLUSIONS

US01
US02
US03
US04
US05
US06
US07
US08
US09
US10

WEARING SURFACE

US01
US02
US03
US04
US05
US06
US07
US08
US09
US10

VENESS & ASSOCIATES PTY LIMITED

Environmental and Natural Resource Consultants

SITE No. 0717

661 - Grafton / Casino / Macintyre

Db 3-41

Spot
JK
GIBBERACEE
5082666754966

JK

GIBBERACEE

Magrore Creek Rd.

Spot
JK
GIBBERACEE
5082666754966

Level Elevation		Dominant Colour (Munsell Code)		Moisture Characteristics		Tone	
Horizon	Layer Average Depth (m)	Moist	Dry	Primary	Secondary	SP	MP
1A	0.0	10YR 6/2	10YR 6/2	10YR 6/2	10YR 6/2	5	5
1B	0.0	10YR 6/2	10YR 6/2	10YR 6/2	10YR 6/2	5	5
2	0.0	10YR 6/2	10YR 6/2	10YR 6/2	10YR 6/2	5	5
3	0.0	10YR 6/2	10YR 6/2	10YR 6/2	10YR 6/2	5	5
4	0.0	10YR 6/2	10YR 6/2	10YR 6/2	10YR 6/2	5	5
5	0.0	10YR 6/2	10YR 6/2	10YR 6/2	10YR 6/2	5	5
6	0.0	10YR 6/2	10YR 6/2	10YR 6/2	10YR 6/2	5	5
7	0.0	10YR 6/2	10YR 6/2	10YR 6/2	10YR 6/2	5	5
8	0.0	10YR 6/2	10YR 6/2	10YR 6/2	10YR 6/2	5	5
9	0.0	10YR 6/2	10YR 6/2	10YR 6/2	10YR 6/2	5	5
10	0.0	10YR 6/2	10YR 6/2	10YR 6/2	10YR 6/2	5	5

Level	Horizon	Layer Average Depth (m)	Moist	Dry	Primary	Secondary	Tone
1	1A	0.0	10YR 6/2	10YR 6/2	10YR 6/2	10YR 6/2	5
2	1B	0.0	10YR 6/2	10YR 6/2	10YR 6/2	10YR 6/2	5
3	2	0.0	10YR 6/2	10YR 6/2	10YR 6/2	10YR 6/2	5
4	3	0.0	10YR 6/2	10YR 6/2	10YR 6/2	10YR 6/2	5
5	4	0.0	10YR 6/2	10YR 6/2	10YR 6/2	10YR 6/2	5
6	5	0.0	10YR 6/2	10YR 6/2	10YR 6/2	10YR 6/2	5
7	6	0.0	10YR 6/2	10YR 6/2	10YR 6/2	10YR 6/2	5
8	7	0.0	10YR 6/2	10YR 6/2	10YR 6/2	10YR 6/2	5
9	8	0.0	10YR 6/2	10YR 6/2	10YR 6/2	10YR 6/2	5
10	9	0.0	10YR 6/2	10YR 6/2	10YR 6/2	10YR 6/2	5

SURFACE CONDITION

Crust
Hard set
Not hard set

BOUNDARY
CONTINUITY

US01
US02
US03
US04
US05
US06
US07
US08
US09
US10

TEXTURE
AND CHARACTER

US01
US02
US03
US04
US05
US06
US07
US08
US09
US10

GRAPE

US01
US02
US03
US04
US05
US06
US07
US08
US09
US10

PLASTICITY TYPE

US01
US02
US03
US04
US05
US06
US07
US08
US09
US10

STICKINESS

US01
US02
US03
US04
US05
US06
US07
US08
US09
US10

WATER TABLE

US01
US02
US03
US04
US05
US06
US07
US08
US09
US10

CONCRETE

US01
US02
US03
US04
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US06
US07
US08
US09
US10

WEARING SURFACE

US01
US02
US03
US04
US05
US06
US07
US08
US09
US10

STONE SIZE

US01
US02
US03
US04
US05
US06
US07
US08
US09
US10

STONE CHARACTERISTICS

US01
US02
US03
US04
US05
US06
US07
US08
US09
US10

ROOTS

US01
US02
US03
US04
US05
US06
US07
US08
US09
US10

ROOT DISTRIBUTION

US01
US02
US03
US04
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US07
US08
US09
US10

FAKES

US01
US02
US03
US04
US05
US06
US07
US08
US09
US10

CHARACTER

US01
US02
US03
US04
US05
US06
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US08
US09
US10

CONCRETE & INCLUSIONS

US01
US02
US03
US04
US05
US06
US07
US08
US09
US10

WEARING SURFACE

US01
US02
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US10

STONE SIZE

US01
US02
US03
US04
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US10

STONE CHARACTERISTICS

US01
US02
US03
US04
US05
US06
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US08
US09
US10

ROOTS

US01
US02
US03
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US10

ROOT DISTRIBUTION

US01
US02
US03
US04
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US06
US07
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US09
US10

FAKES

US01
US02
US03
US04
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US08
US09
US10

CHARACTER

US01
US02
US03
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US08
US09
US10

CONCRETE & INCLUSIONS

US01
US02
US03
US04
US05
US06
US07
US08
US09
US10

WEARING SURFACE

US01
US02
US03
US04
US05
US06
US07
US08
US09
US10

Upper slope on ridge line 18% down ridge

VENESS & ASSOCIATES PTY LIMITED

Environmental and Natural Resource Consultants

SOC N° 661 GRAFTON/CASINO/MURWILLAH

SITE No. 37-2

Spot

JK MT MARSH

1/2 mile from CASINO

4872266767380

SOIL PROPERTIES RECORD 'A'

Record Type	Same as Site No.	Layer No. of Layers																							
0 0 0 1																									
4872266767380																									
SOIL PROPERTIES RECORD 'A'																									
Layer Status		Dominant Colour (Munsell Code)		Moisture Characteristics										Time											
Horizon		Lithology and/or Depth (m)		Moist		W/C		Dry		Primary					Secondary					Moisture		pH		Ag. and Soil Structure	
Layer No.																									
11A			1.5	2.5	4	10YR 5/6																			
21A			5.1	7.1	2	10YR 5/6																			
31A			14.7	17.2	2	10YR 5/6																			
41																									
51																									
61																									
71																									
81																									
91																									

CROSS			
Category	Item	Value	
		1	2
Category	1. Area	1.0	1.0
	2. Area	1.0	1.0
	3. Area	1.0	1.0
	4. Area	1.0	1.0
	5. Area	1.0	1.0
	6. Area	1.0	1.0
	7. Area	1.0	1.0
	8. Area	1.0	1.0
	9. Area	1.0	1.0
	10. Area	1.0	1.0
Category	1. Area	1.0	1.0
	2. Area	1.0	1.0
	3. Area	1.0	1.0
	4. Area	1.0	1.0
	5. Area	1.0	1.0
	6. Area	1.0	1.0
	7. Area	1.0	1.0
	8. Area	1.0	1.0
	9. Area	1.0	1.0
	10. Area	1.0	1.0

Record Type	Same as Site No.
0 0 0 1	

SOIL PROPERTIES RECORD 'B'

BOUNDARY IDENTIFIERS

NAME	START	END	TYPE
NAG1			None
NAG2			Shore (120 mm)
NAG3			Clear (20-40 mm)
NAG4			Group (100-180 mm)
NAG5			Offshore (120-180 mm)

SHAPE

NAME	START	END	TYPE
NAG1			Circle
NAG2			Triangle
NAG3			Rectangle
NAG4			Star

TEXTURE SAND/FRACTION

NAME	START	END	TYPE
NAG1			Fine
NAG2			Coarse

GRADE

NAME	START	END	TYPE
NAG1			Shore
NAG2			Leisure Sand
NAG3			Gravel
NAG4			Gravel
NAG5			Gravel
NAG6			Gravel
NAG7			Gravel
NAG8			Gravel
NAG9			Gravel
NAG10			Gravel
NAG11			Gravel
NAG12			Gravel
NAG13			Gravel
NAG14			Gravel
NAG15			Gravel
NAG16			Gravel
NAG17			Gravel
NAG18			Gravel
NAG19			Gravel
NAG20			Gravel
NAG21			Gravel
NAG22			Gravel
NAG23			Gravel
NAG24			Gravel
NAG25			Gravel
NAG26			Gravel
NAG27			Gravel
NAG28			Gravel
NAG29			Gravel
NAG30			Gravel
NAG31			Gravel
NAG32			Gravel
NAG33			Gravel
NAG34			Gravel
NAG35			Gravel
NAG36			Gravel
NAG37			Gravel
NAG38			Gravel
NAG39			Gravel
NAG40			Gravel
NAG41			Gravel
NAG42			Gravel
NAG43			Gravel
NAG44			Gravel
NAG45			Gravel
NAG46			Gravel
NAG47			Gravel
NAG48			Gravel
NAG49			Gravel
NAG50			Gravel
NAG51			Gravel
NAG52			Gravel
NAG53			Gravel
NAG54			Gravel
NAG55			Gravel
NAG56			Gravel
NAG57			Gravel
NAG58			Gravel
NAG59			Gravel
NAG60			Gravel
NAG61			Gravel
NAG62			Gravel
NAG63			Gravel
NAG64			Gravel
NAG65			Gravel
NAG66			Gravel
NAG67			Gravel
NAG68			Gravel
NAG69			Gravel
NAG70			Gravel
NAG71			Gravel
NAG72			Gravel
NAG73			Gravel
NAG74			Gravel
NAG75			Gravel
NAG76			Gravel
NAG77			Gravel
NAG78			Gravel
NAG79			Gravel
NAG80			Gravel
NAG81			Gravel
NAG82			Gravel
NAG83			Gravel
NAG84			Gravel
NAG85			Gravel
NAG86			Gravel
NAG87			Gravel
NAG88			Gravel
NAG89			Gravel
NAG90			Gravel
NAG91			Gravel
NAG92			Gravel
NAG93			Gravel
NAG94			Gravel
NAG95			Gravel
NAG96			Gravel
NAG97			Gravel
NAG98			Gravel
NAG99			Gravel
NAG100			Gravel

PLASTICITY TYPE

NAME	START	END	TYPE
NAG1			None
NAG2			None
NAG3			None
NAG4			None

STRUCTURES

NAME	START	END	TYPE
NAG1			None
NAG2			None
NAG3			None
NAG4			None

WATER TABLE

NAME	START	END	TYPE
NAG1			None
NAG2			None
NAG3			None
NAG4			None

CONCRETE IDENTIFIERS

NAME	START	END	TYPE
NAG1			None
NAG2			None
NAG3			None
NAG4			None

CRACKING

NAME	START	END	TYPE
NAG1			None
NAG2			None
NAG3			None
NAG4			None

STRUCTURE GRADE

NAME	START	END	TYPE
USAG1			Adverse Slope Gravel
USAG2			Adverse Slope
USAG3			Water Feature
USAG4			Gravelly Feature
USAG5			Gravelly Feature

SHAPE

NAME	START	END	TYPE
USAG1			Circle
USAG2			Triangle
USAG3			Rectangle
USAG4			Star
USAG5			Star
USAG6			Star
USAG7			Star
USAG8			Star
USAG9			Star
USAG10			Star

GRADE

NAME	START	END	TYPE
USAG1			Shore
USAG2			Leisure Sand
USAG3			Gravel
USAG4			Gravel
USAG5			Gravel
USAG6			Gravel
USAG7			Gravel
USAG8			Gravel
USAG9			Gravel
USAG10			Gravel

PLASTICITY

NAME	START	END	TYPE
USAG1			None
USAG2			None
USAG3			None
USAG4			None

STRUCTURES

NAME	START	END	TYPE
USAG1			None
USAG2			None
USAG3			None
USAG4			None

WATER TABLE

NAME	START	END	TYPE
USAG1			None
USAG2			None
USAG3			None
USAG4			None

CONCRETE IDENTIFIERS

NAME	START	END	TYPE
USAG1			None
USAG2			None
USAG3			None
USAG4			None

CRACKING

NAME	START	END	TYPE
USAG1			None
USAG2			None
USAG3			None
USAG4			None

STONES

NAME	START	END	TYPE
USAG1			None
USAG2			None
USAG3			None
USAG4			None
USAG5			None
USAG6			None
USAG7			None

CRACKING

NAME	START	END	TYPE
USAG1			None
USAG2			None
USAG3			None
USAG4			None

VENESS & ASSOCIATES PTY LIMITED

Environmental and Natural Resource Consultants

SOC N° 661 GRAFTON/CASINO/MURWILLAH

SITE No. 37-1

JK MT MARSH

4872266767380

SOIL PROPERTIES RECORD 'A'

Record Type	Same as Site no.	4th Ed. of Layer											
0 0 0 1													
4825466768240													
SOIL PROPERTIES RECORD 'A'													
Layer Status		Dominant Colour (Munsell Code)		Moisture Characteristics				Time					
2nd Ed. of Layer	Horizon	Linear Avenue Corch (m)	Moist		Dry		Primary		Secondary		Wet	per	4th Ed. of Layer
			10 YR	5/6	10 YR	5/6	10 YR	5/6	10 YR	5/6			
11A	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6
21A	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6
31A	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6
41	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6
51	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6
61	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6
71	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6
81	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6

CO-15			
Category	Sub-category	Value	
		1	2
General	Age	1.0	1.0
	Length	1.0	1.0
	Width	1.0	1.0
	Height	1.0	1.0
	Weight	1.0	1.0
	Volume	1.0	1.0
Material	Material	1.0	1.0
	Material	1.0	1.0
	Material	1.0	1.0
	Material	1.0	1.0
	Material	1.0	1.0
	Material	1.0	1.0
Location	Location	1.0	1.0
	Location	1.0	1.0
	Location	1.0	1.0
	Location	1.0	1.0
	Location	1.0	1.0
	Location	1.0	1.0
Other	Other	1.0	1.0
	Other	1.0	1.0
	Other	1.0	1.0
	Other	1.0	1.0
	Other	1.0	1.0
	Other	1.0	1.0

Record Type	Same as Site No.
0 0 0 1	

SOIL PROPERTIES RECORD 'B'

Record Type	Same as Site No.	Layer No.	
0 0 0 1			
Layer Status	Dominant Colour (Munsell Code)	Moisture Characteristics	Time
Horizon	Moist	Wet	Wet
1	2	3	4
11A	10YR 5/6	10YR 5/6	10YR 5/6
21A	10YR 5/6	10YR 5/6	10YR 5/6
31A	10YR 5/6	10YR 5/6	10YR 5/6
41	10YR 5/6	10YR 5/6	10YR 5/6
51	10YR 5/6	10YR 5/6	10YR 5/6
61	10YR 5/6	10YR 5/6	10YR 5/6

VENESS & ASSOCIATES PTY LIMITED

Environmental and Natural Resource Consultants

Site No. 1907

661 MURWILLUMBAH

5037

Level Slope	Dominant Colour (Munsell Code)	Moist	Dr	Merch Characteristics	Text
Horizon	Upper Average Depth (m)			Primary	Secondary
1	0.67	14	12		
2	2.1	14	12		
3	3.7	14	12		
4	5.3	14	12		
5	13.6	14	12		
6	22.2	14	12		

Level Slope	Dominant Colour (Munsell Code)	Moist	Dr	Merch Characteristics	Text
Horizon	Upper Average Depth (m)			Primary	Secondary
1	0.67	14	12		
2	2.1	14	12		
3	3.7	14	12		
4	5.3	14	12		
5	13.6	14	12		
6	22.2	14	12		

SURFACE CONDITIONS

Crust =
Mud set =
Mud set = 2

Lower slope just up from building bank
1/6

BOUNDARY DESCRIPTION

UAB1 =
UAB2 =
UAB3 =
UAB4 =
UAB5 =

UAB6 =
UAB7 =
UAB8 =
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UAB11 =
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UAB51 =
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UAB65 =

STRUCTURE

UAB1 =
UAB2 =
UAB3 =
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UAB6 =
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UAB11 =
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STONE SIZE

UAB1 =
UAB2 =
UAB3 =
UAB4 =
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UAB6 =
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UAB8 =
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UAB11 =
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UAB61 =
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UAB63 =
UAB64 =
UAB65 =

STONE SHAPE

UAB1 =
UAB2 =
UAB3 =
UAB4 =
UAB5 =

UAB6 =
UAB7 =
UAB8 =
UAB9 =
UAB10 =

UAB11 =
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UAB56 =
UAB57 =
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UAB61 =
UAB62 =
UAB63 =
UAB64 =
UAB65 =

VENESS & ASSOCIATES PTY LIMITED

Environmental and Natural Resource Consultants

Site No. 1906

661 MURWILLUMBAH

5037

Level Slope	Dominant Colour (Munsell Code)	Moist	Dr	Merch Characteristics	Text
Horizon	Upper Average Depth (m)			Primary	Secondary
1	0.67	14	12		
2	2.1	14	12		
3	3.7	14	12		
4	5.3	14	12		
5	13.6	14	12		
6	22.2	14	12		

Level Slope	Dominant Colour (Munsell Code)	Moist	Dr	Merch Characteristics	Text
Horizon	Upper Average Depth (m)			Primary	Secondary
1	0.67	14	12		
2	2.1	14	12		
3	3.7	14	12		
4	5.3	14	12		
5	13.6	14	12		
6	22.2	14	12		

SURFACE CONDITIONS

Crust =
Mud set =
Mud set = 2

Lower slope - underlying terrain
1/6

BOUNDARY DESCRIPTION

UAB1 =
UAB2 =
UAB3 =
UAB4 =
UAB5 =

UAB6 =
UAB7 =
UAB8 =
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UAB11 =
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STRUCTURE

UAB1 =
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STONE SIZE

UAB1 =
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UAB61 =
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UAB63 =
UAB64 =
UAB65 =

Sample yellow weathered sandstone from 1/6

2/6 about 1/6

VENESS & ASSOCIATES PTY LIMITED

Environmental and Natural Resource Consultants

SUB N° 661 GRAFTON/CASINO/MURWILLAH

RED BARTH

SITE No. 0710

Spot MT BALMORE

Wagon Creek Rd

Gr 214

4744806772760

SOIL PROPERTIES RECORD 'A'

Layer	Soil Type	Same as Site No.	Depth (m)	Moisture Content (%)	Plasticity	Consistency	Texture	Notes
1	11-1		0.0-0.2	17.2	14.2	1.2	CL	
2	21-1		0.2-0.4	17.2	14.2	1.2	CL	
3	31-1		0.4-0.6	17.2	14.2	1.2	CL	
4	41-1		0.6-0.8	17.2	14.2	1.2	CL	
5	51-1		0.8-1.0	17.2	14.2	1.2	CL	
6	61-1		1.0-1.2	17.2	14.2	1.2	CL	
7	71-1		1.2-1.4	17.2	14.2	1.2	CL	
8	81-1		1.4-1.6	17.2	14.2	1.2	CL	
9	91-1		1.6-1.8	17.2	14.2	1.2	CL	
10	101-1		1.8-2.0	17.2	14.2	1.2	CL	

Layer	Soil Type	Same as Site No.	Depth (m)	Moisture Content (%)	Plasticity	Consistency	Texture	Notes
1	11-1		0.0-0.2	17.2	14.2	1.2	CL	
2	21-1		0.2-0.4	17.2	14.2	1.2	CL	
3	31-1		0.4-0.6	17.2	14.2	1.2	CL	
4	41-1		0.6-0.8	17.2	14.2	1.2	CL	
5	51-1		0.8-1.0	17.2	14.2	1.2	CL	
6	61-1		1.0-1.2	17.2	14.2	1.2	CL	
7	71-1		1.2-1.4	17.2	14.2	1.2	CL	
8	81-1		1.4-1.6	17.2	14.2	1.2	CL	
9	91-1		1.6-1.8	17.2	14.2	1.2	CL	
10	101-1		1.8-2.0	17.2	14.2	1.2	CL	

Soil Type Same as Site No. 0 3 0 1

SOIL PROPERTIES RECORD 'B'

Boundary	Structure	Stone Size	Texture	Moisture Content	Plasticity	Consistency	Texture	Notes
1	11-1		CL	17.2	14.2	1.2	CL	
2	21-1		CL	17.2	14.2	1.2	CL	
3	31-1		CL	17.2	14.2	1.2	CL	
4	41-1		CL	17.2	14.2	1.2	CL	
5	51-1		CL	17.2	14.2	1.2	CL	
6	61-1		CL	17.2	14.2	1.2	CL	
7	71-1		CL	17.2	14.2	1.2	CL	
8	81-1		CL	17.2	14.2	1.2	CL	
9	91-1		CL	17.2	14.2	1.2	CL	
10	101-1		CL	17.2	14.2	1.2	CL	

VENESS & ASSOCIATES PTY LIMITED

Environmental and Natural Resource Consultants

SUB N° 661 GRAFTON/CASINO/MURWILLAH

SITE No. 0710

Spot

BUNGAVILLBIN

Water boundary road.

(nandy)

5177706786740

SOIL PROPERTIES RECORD 'A'

Layer	Soil Type	Same as Site No.	Depth (m)	Moisture Content (%)	Plasticity	Consistency	Texture	Notes
1	11-1		0.0-0.2	17.2	14.2	1.2	CL	
2	21-1		0.2-0.4	17.2	14.2	1.2	CL	
3	31-1		0.4-0.6	17.2	14.2	1.2	CL	
4	41-1		0.6-0.8	17.2	14.2	1.2	CL	
5	51-1		0.8-1.0	17.2	14.2	1.2	CL	
6	61-1		1.0-1.2	17.2	14.2	1.2	CL	
7	71-1		1.2-1.4	17.2	14.2	1.2	CL	
8	81-1		1.4-1.6	17.2	14.2	1.2	CL	
9	91-1		1.6-1.8	17.2	14.2	1.2	CL	
10	101-1		1.8-2.0	17.2	14.2	1.2	CL	

Layer	Soil Type	Same as Site No.	Depth (m)	Moisture Content (%)	Plasticity	Consistency	Texture	Notes
1	11-1		0.0-0.2	17.2	14.2	1.2	CL	
2	21-1		0.2-0.4	17.2	14.2	1.2	CL	
3	31-1		0.4-0.6	17.2	14.2	1.2	CL	
4	41-1		0.6-0.8	17.2	14.2	1.2	CL	
5	51-1		0.8-1.0	17.2	14.2	1.2	CL	
6	61-1		1.0-1.2	17.2	14.2	1.2	CL	
7	71-1		1.2-1.4	17.2	14.2	1.2	CL	
8	81-1		1.4-1.6	17.2	14.2	1.2	CL	
9	91-1		1.6-1.8	17.2	14.2	1.2	CL	
10	101-1		1.8-2.0	17.2	14.2	1.2	CL	

Soil Type Same as Site No. 0 3 0 1

SOIL PROPERTIES RECORD 'B'

Boundary	Structure	Stone Size	Texture	Moisture Content	Plasticity	Consistency	Texture	Notes
1	11-1		CL	17.2	14.2	1.2	CL	
2	21-1		CL	17.2	14.2	1.2	CL	
3	31-1		CL	17.2	14.2	1.2	CL	
4	41-1		CL	17.2	14.2	1.2	CL	
5	51-1		CL	17.2	14.2	1.2	CL	
6	61-1		CL	17.2	14.2	1.2	CL	
7	71-1		CL	17.2	14.2	1.2	CL	
8	81-1		CL	17.2	14.2	1.2	CL	
9	91-1		CL	17.2	14.2	1.2	CL	
10	101-1		CL	17.2	14.2	1.2	CL	

VENESS & ASSOCIATES PTY LIMITED

Environmental and Natural Resource Consultants
SOL N° 661 GRAFTON/CASINO/MURWILLAH

SITE NO. 0704

SQUT

JK Paddy Ridge Rd ROYAL CAMP

4837701941570

SOIL PROPERTIES RECORD 'A'

Report Type	Same as Site No.	15th Ed. of Form						
0 0 0 1								
4837706741570 SOIL PROPERTIES RECORD 'A'								
Layer Status		Dominant Colour (Munsell Code)	Moisture Characteristics		Test			
Horizon	Layer Amended Depth (m)		Primary	Secondary	Moisture	pH		
		Moist	VC	Dry	1 1 1 1	1 1 1 1	1 1 1 1	1 1 1 1
11								
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12061	
Eastward	1 2000 1.5
	2 1500 1.5
	3 1000 1.5
	4 500 1.5
	5 0 1.5
Westward	1 2000 1.5
	2 1500 1.5
	3 1000 1.5
	4 500 1.5
	5 0 1.5
Northward	1 2000 1.5
	2 1500 1.5
	3 1000 1.5
	4 500 1.5
	5 0 1.5
Southward	1 2000 1.5
	2 1500 1.5
	3 1000 1.5
	4 500 1.5
	5 0 1.5
Eastward	1 2000 1.5
	2 1500 1.5
	3 1000 1.5
	4 500 1.5
	5 0 1.5
Westward	1 2000 1.5
	2 1500 1.5
	3 1000 1.5
	4 500 1.5
	5 0 1.5
Northward	1 2000 1.5
	2 1500 1.5
	3 1000 1.5
	4 500 1.5
	5 0 1.5
Southward	1 2000 1.5
	2 1500 1.5
	3 1000 1.5
	4 500 1.5
	5 0 1.5

Report Type Same as Site No.
0 0 0 1

SOIL PROPERTIES RECORD 'B'

SUMMARY		STRUCTURE	
CONTINUITY		CRACK	
HA01	XXXX	HA01	XXXX
HA02	XXXX	HA02	XXXX
HA03	XXXX	HA03	XXXX
HA04	XXXX	HA04	XXXX
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HA368	XXXX	HA368	XXXX
HA369	XXXX		

Report Type	Same as Site No.	Site No.					
0 0 0 1							
Layer Status	Dominant Colour (Munsell Code)	Moisture Characteristics	Test				
Horizon	Moist	VC	Dry	Primary	Secondary	pp	at 20°C
11A							
11B							
11C							
11D							
11E							
11F							
11G							
11H							
11I							
11J							
11K							
11L							
11M							
11N							
11O							
11P							
11Q							
11R							
11S							
11T							
11U							
11V							
11W							
11X							
11Y							
11Z							

VENESS & ASSOCIATES PTY LIMITED

Environmental and Natural Resource Consultants
SOL N° 661 GRAFTON/CASINO/MURWILLAH

SITE NO. 0704

JK Paddy Ridge Rd ROYAL CAMP

479286678689

SOIL PROPERTIES RECORD 'A'

Report Type		Same as Site No	Year Mo. or Season								
0 0 0 1											
4792866784880											
SOIL PROPERTIES RECORD 'A'											
Layer Status		Dominant Colour (Munsell Code)		Moisture Characteristics				Test			
Depth m	Horizon	Layer Average Depth (m)	Moist		Dry	Primary		Secondary		Moisture	at 20°C
			MFC	VC		Field % at 10°C	Field % at 20°C	%			
1	11A	1.0	10YR 5/6	2	10YR 5/6	1	10YR 5/6	1	10YR 5/6	1	1
3	11B	1.2	10YR 5/6	2	10YR 5/6	1	10YR 5/6	1	10YR 5/6	1	1
6	11C	1.4	10YR 5/6	2	10YR 5/6	1	10YR 5/6	1	10YR 5/6	1	1
8	11D	1.6	10YR 5/6	2	10YR 5/6	1	10YR 5/6	1	10YR 5/6	1	1
	11E	1.8	10YR 5/6	2	10YR 5/6	1	10YR 5/6	1	10YR 5/6	1	1
	11F	2.0	10YR 5/6	2	10YR 5/6	1	10YR 5/6	1	10YR 5/6	1	1
	11G	2.2	10YR 5/6	2	10YR 5/6	1	10YR 5/6	1	10YR 5/6	1	1
	11H	2.4	10YR 5/6	2	10YR 5/6	1	10YR 5/6	1	10YR 5/6	1	1
	11I	2.6	10YR 5/6	2	10YR 5/6	1	10YR 5/6	1	10YR 5/6	1	1
	11J	2.8	10YR 5/6	2	10YR 5/6	1	10YR 5/6	1	10YR 5/6	1	1
	11K	3.0	10YR 5/6	2	10YR 5/6	1	10YR 5/6	1	10YR 5/6	1	1
	11L	3.2	10YR 5/6	2	10YR 5/6	1	10YR 5/6	1	10YR 5/6	1	1
	11M	3.4	10YR 5/6	2	10YR 5/6	1	10YR 5/6	1	10YR 5/6	1	1
	11N	3.6	10YR 5/6	2	10YR 5/6	1	10YR 5/6	1	10YR 5/6	1	1
	11O	3.8	10YR 5/6	2	10YR 5/6	1	10YR 5/6	1	10YR 5/6	1	1
	11P	4.0	10YR 5/6	2	10YR 5/6	1	10YR 5/6	1	10YR 5/6	1	1
	11Q	4.2	10YR 5/6	2	10YR 5/6	1	10YR 5/6	1	10YR 5/6	1	1
	11R	4.4	10YR 5/6	2	10YR 5/6	1	10YR 5/6	1	10YR 5/6	1	1
	11S	4.6	10YR 5/6	2	10YR 5/6	1	10YR 5/6	1	10YR 5/6	1	1
	11T	4.8	10YR 5/6	2	10YR 5/6	1	10YR 5/6	1	10YR 5/6	1	1
	11U	5.0	10YR 5/6	2	10YR 5/6	1	10YR 5/6	1	10YR 5/6	1	1
	11V	5.2	10YR 5/6	2	10YR 5/6	1	10YR 5/6	1	10YR 5/6	1	1
	11W	5.4	10YR 5/6	2	10YR 5/6	1	10YR 5/6	1	10YR 5/6	1	1
	11X	5.6	10YR 5/6	2	10YR 5/6	1	10YR 5/6	1	10YR 5/6	1	1
	11Y	5.8	10YR 5/6	2	10YR 5/6	1	10YR 5/6	1	10YR 5/6	1	1
	11Z	6.0	10YR 5/6	2	10YR 5/6	1	10YR 5/6	1	10YR 5/6	1	1

000001	
Horizon	Depth
11A	0.00 - 0.05
11B	0.05 - 0.10
11C	0.10 - 0.15
11D	0.15 - 0.20
11E	0.20 - 0.25
11F	0.25 - 0.30
11G	0.30 - 0.35
11H	0.35 - 0.40
11I	0.40 - 0.45
11J	0.45 - 0.50
11K	0.50 - 0.55
11L	0.55 - 0.60
11M	0.60 - 0.65
11N	0.65 - 0.70
11O	0.70 - 0.75
11P	0.75 - 0.80
11Q	0.80 - 0.85
11R	0.85 - 0.90
11S	0.90 - 0.95
11T	0.95 - 1.00
11U	1.00 - 1.05
11V	1.05 - 1.10
11W	1.10 - 1.15
11X	1.15 - 1.20
11Y	1.20 - 1.25
11Z	1.25 - 1.30

Report Type Same as Site No.
0 0 0 1

SOIL PROPERTIES RECORD 'B'

SOIL DATA SHEET		STRUCTURE DATA	
GENERAL INFORMATION		DIMENSIONS	
NAME	Address	U001	Address
NAME	Street	U002	Address
NAME	City	U003	Address
NAME	State	U004	Address
NAME	Zip	U005	Address
SPECIFICATIONS		DIMENSIONS	
U001	1-1/2 in.	U001	1-1/2 in.
U002	1-1/2 in.	U002	1-1/2 in.
U003	1-1/2 in.	U003	1-1/2 in.
U004	1-1/2 in.	U004	1-1/2 in.
TEST RESULTS		DIMENSIONS	
U001	1-1/2 in.	U001	1-1/2 in.
U002	1-1/2 in.	U002	1-1/2 in.
U003	1-1/2 in.	U003	1-1/2 in.
U004	1-1/2 in.	U004	1-1/2 in.
CONCLUSIONS		DIMENSIONS	
U001	1-1/2 in.	U001	1-1/2 in.
U002	1-1/2 in.	U002	1-1/2 in.
U003	1-1/2 in.	U003	1-1/2 in.
U004	1-1/2 in.	U004	1-1/2 in.
REMARKS		DIMENSIONS	
U001	1-1/2 in.	U001	1-1/2 in.
U002	1-1/2 in.	U002	1-1/2 in.
U003	1-1/2 in.	U003	1-1/2 in.
U004	1-1/2 in.	U004	1-1/2 in.

STONE SIZE	
VS01	_____ 1/4 - 3/8 in.
VS02	_____ 3/8 - 1/2 in.
VS03	_____ 1/2 - 3/4 in.
VS04	_____ 3/4 - 1 in.
VS05	_____ 1 - 1 1/2 in.
VS06	_____ 1 1/2 - 2 in.
STONE WEATHERING	
VS07	_____ Water-Resistant
VS08	_____ Water-Resistant
VS09	_____ Low-Resistant
STONE APPLICABILITY	
VS10	_____ Not Applicable
VS11	_____ Quartz
VS12	_____ Schistosity
VS13	_____ Schistosity
VS14	_____ Schistosity
VS15	_____ Schistosity
ROOTS	
AMOUNT	
WA01	_____ None
WA02	_____ Few
WA03	_____ Common
WA04	_____ Abundant
WA05	_____ Heavy
SOIL DISTRIBUTION	
WS01	_____ Shallow
WS02	_____ Shallow
PAKES	
1 2 3 4 5 6	
PA01	_____ No Paks
PA02	_____ Compacted
PA03	_____ Shale
PA04	_____ Shale
PA05	_____ Shale & very Gravel
PA06	_____ Sandstone
PA07	_____ Clay
PA08	_____ Gravel
CHARACTER	
1 2 3 4 5 6	
XB01	_____ Continuous
XB02	_____ Continuous
XB03	_____ Continuous
XB04	_____ Continuous
XB05	_____ Discrete
CONCRECTIONS & INCLUSIONS	
1 2 3 4 5 6	
XP01	_____ None
XP02	_____ Scattered
XP03	_____ Scattered
XP04	_____ Many
XP05	_____ Many
XP06	_____ Many/Character
XP07	_____ Other
OTHER	
1 2 3 4 5 6	
XB01	_____ Other
XB02	_____ Other
XB03	_____ Other
AMOUNT	
1 2 3 4 5 6	
XI01	_____ 0 %
XI02	_____ 1-20 %
XI03	_____ 20-50 %
SIZE	
1 2 3 4 5 6	
XI01	_____ 1/8 - 1/4 in.
XI02	_____ 1/4 - 1/2 in.
XI03	_____ 1/2 - 1 in.

VENESS & ASSOCIATES PTY LIMITED

Environmental and Natural Resource Consultants
 50B N° 661 GRAFTON/CASINO/MURWILLAH

SITE 7003

Spot

4771506783560
 SOIL PROPERTIES RECORD 'A'

Assess Type	Sample Site No	Year No. of Layers	4771506783560										
0 0 0 1			SOIL PROPERTIES RECORD 'A'										
Layer Status			Dominant Colour (Munsell Code)				Moisture Characteristics				Test		
Layer No.	Horizon	Layer Average Depth (m)	Moist		W/E	Dry	Primary		Secondary		Moisture	pH	Ag and Chemical
			Value	%			Value	%					
11A		0.00	10YR	10/2									
21A		0.10	10YR	10/2									
31A		0.20	10YR	15/4									
41A		0.30	10YR	15/4									
51A		0.40	10YR	15/4									
61		0.50	10YR	15/4									
71		0.60	10YR	15/4									
81		0.70	10YR	15/4									
91		0.80	10YR	15/4									
101		0.90	10YR	15/4									
111		1.00	10YR	15/4									

02011	
Category	Value
1. Soil	1.0
2. Subsoil	1.0
3. Topsoil	1.0
4. Subsoil	1.0
5. Topsoil	1.0
6. Subsoil	1.0
7. Topsoil	1.0
8. Subsoil	1.0
9. Topsoil	1.0
10. Subsoil	1.0
11. Topsoil	1.0
12. Subsoil	1.0
13. Topsoil	1.0
14. Subsoil	1.0
15. Topsoil	1.0
16. Subsoil	1.0
17. Topsoil	1.0
18. Subsoil	1.0
19. Topsoil	1.0
20. Subsoil	1.0
21. Topsoil	1.0
22. Subsoil	1.0
23. Topsoil	1.0
24. Subsoil	1.0
25. Topsoil	1.0
26. Subsoil	1.0
27. Topsoil	1.0
28. Subsoil	1.0
29. Topsoil	1.0
30. Subsoil	1.0
31. Topsoil	1.0
32. Subsoil	1.0
33. Topsoil	1.0
34. Subsoil	1.0
35. Topsoil	1.0
36. Subsoil	1.0
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60. Subsoil	1.0
61. Topsoil	1.0
62. Subsoil	1.0
63. Topsoil	1.0
64. Subsoil	1.0
65. Topsoil	1.0
66. Subsoil	1.0
67. Topsoil	1.0
68. Subsoil	1.0
69. Topsoil	1.0
70. Subsoil	1.0
71. Topsoil	1.0
72. Subsoil	1.0
73. Topsoil	1.0
74. Subsoil	1.0
75. Topsoil	1.0
76. Subsoil	1.0
77. Topsoil	1.0
78. Subsoil	1.0
79. Topsoil	1.0
80. Subsoil	1.0
81. Topsoil	1.0
82. Subsoil	1.0
83. Topsoil	1.0
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86. Subsoil	1.0
87. Topsoil	1.0
88. Subsoil	1.0
89. Topsoil	1.0
90. Subsoil	1.0
91. Topsoil	1.0
92. Subsoil	1.0
93. Topsoil	1.0
94. Subsoil	1.0
95. Topsoil	1.0
96. Subsoil	1.0
97. Topsoil	1.0
98. Subsoil	1.0
99. Topsoil	1.0
100. Subsoil	1.0

Assess Type Site No. Form No.
 0 0 0 1

SOIL PROPERTIES RECORD 'B'

BOUNDARY DETECTION

STRUCTURE

STONE SIZE

STONE WEATHERING

STONE SETTING

ROOTS

ROOTS AMOUNT

ROOTS DISTRIBUTION

PANS

CHARACTERISTICS

CONCRETE & INCLUSIONS

WATER TABLE

STICKINESS

CRACKS

CRACK SIZE

CRACK DIRECTION

CRACK DEPTH

CRACK WIDTH

CRACK FREQUENCY

CRACK LOCATION

CRACK ORIGIN

CRACK TYPE

CRACK SEVERITY

CRACK REMEDIATION

CRACK MONITORING

CRACK RECORDING

CRACK ANALYSIS

CRACK REPORTING

CRACK CONCLUSION

CRACK RECOMMENDATION

CRACK FOLLOW-UP

CRACK REVIEW

CRACK SIGNATURE

CRACK DATE

CRACK TIME

CRACK WEATHER

CRACK MOON

CRACK STARS

CRACK PLANETS

CRACK ZODIAC

CRACK HOROSCOPE

CRACK ASTROLOGY

CRACK NUMEROLOGY

CRACK GEMOLOGY

CRACK METEOROLOGY

CRACK CLIMATOLOGY

CRACK GEOLOGY

CRACK TOPOLOGY

CRACK BIOLOGY

CRACK CHEMISTRY

CRACK PHYSICS

CRACK MATHEMATICS

CRACK LOGIC

CRACK ETHICS

CRACK AESTHETICS

CRACK MORALS

CRACK LAWS

CRACK RELIGION

CRACK PHILOSOPHY

CRACK SCIENCE

CRACK ART

CRACK LITERATURE

CRACK HISTORY

CRACK CULTURE

CRACK SOCIETY

CRACK ECONOMY

CRACK POLITICS

CRACK LAW

CRACK MEDICINE

CRACK EDUCATION

CRACK SPORTS

CRACK RECREATION

CRACK LEISURE

CRACK HOBBIES

CRACK INTERESTS

CRACK PASSIONS

CRACK DREAMS

CRACK WISHES

CRACK HOPE

CRACK FAITH

CRACK LOVE

CRACK DEATH

CRACK AFTERLIFE

CRACK SPIRITUALITY

CRACK RELIGION

CRACK PHILOSOPHY

CRACK SCIENCE

CRACK ART

CRACK LITERATURE

CRACK HISTORY

CRACK CULTURE

CRACK SOCIETY

CRACK ECONOMY

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CRACK WISHES

CRACK HOPE

CRACK FAITH

CRACK LOVE

CRACK DEATH

CRACK AFTERLIFE

CRACK SPIRITUALITY

VENESS & ASSOCIATES PTY LIMITED

Environmental and Natural Resource Consultants
 50B N° 661 GRAFTON/CASINO/MURWILLAH

SITE 7003

Spot

4772205800360
 SOIL PROPERTIES RECORD 'A'

Assess Type		Same as Dist No	Total No. of Layers							
0 0 0 1										
4777205804260 SOIL PROPERTIES RECORD 'A'										
Layer Status		Dominant Colour (Munsell Code)	Moisture Characteristics		Texture					
Depth (m)	Horizon		Primary	Secondary	Macrobony	Microbony				
		Moist	U	Dry						
11A	1	3.7.5.1	2.2							
31A	2	3.4.2.3	4.2	17.5	4.1	6.2				
31A	3	6.4	7.5	1.8	5.2					
41										
51										
61										
71										
81										

00011	
Category	Value
1. Group	1.0
2. Group	1.0
3. Group	1.0
4. Group	1.0
5. Group	1.0
6. Group	1.0
7. Group	1.0
8. Group	1.0
9. Group	1.0
10. Group	1.0
11. Group	1.0
12. Group	1.0
13. Group	1.0
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72. Group	1.0
73. Group	1.0
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76. Group	1.0
77. Group	1.0
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81. Group	1.0
82. Group	1.0
83. Group	1.0
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90. Group	1.0
91. Group	1.0
92. Group	1.0
93. Group	1.0
94. Group	1.0
95. Group	1.0
96. Group	1.0
97. Group	1.0
98. Group	1.0
99. Group	1.0
100. Group	1.0

Assess Type Site No. Form No.
 0 0 0 1

SOIL PROPERTIES RECORD 'B'

BOUNDARY DETECTION

STRUCTURE

STONE SIZE

STONE WEATHERING

STONE SETTING

ROOTS

ROOTS AMOUNT

ROOTS DISTRIBUTION

PANS

CHARACTERISTICS

CONCRETE & INCLUSIONS

WATER TABLE

STICKINESS

CRACKS

CRACK SIZE

CRACK DIRECTION

CRACK DEPTH

CRACK WIDTH

CRACK FREQUENCY

CRACK LOCATION

CRACK ORIGIN

CRACK TYPE

CRACK SEVERITY

CRACK REMEDIATION

CRACK MONITORING

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CRACK CONCLUSION

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CRACK STARS

CRACK PLANETS

CRACK ZODIAC

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CRACK ASTROLOGY

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CRACK METEOROLOGY

CRACK CLIMATOLOGY

CRACK GEOLOGY

CRACK TOPOLOGY

CRACK BIOLOGY

CRACK CHEMISTRY

CRACK PHYSICS

CRACK MATHEMATICS

CRACK LOGIC

CRACK ETHICS

CRACK AESTHETICS

CRACK MORALS

CRACK LAWS

CRACK RELIGION

CRACK PHILOSOPHY

CRACK SCIENCE

CRACK ART

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CRACK EDUCATION

CRACK SPORTS

CRACK RECREATION

CRACK LEISURE

CRACK HOBBIES

CRACK INTERESTS

CRACK PASSIONS

CRACK DREAMS

CRACK WISHES

CRACK HOPE

CRACK FAITH

CRACK LOVE

CRACK DEATH

CRACK AFTERLIFE

CRACK SPIRITUALITY

VENESS & ASSOCIATES PTY LIMITED

Environmental and Natural Resource Consultants

SUB NO 661 GRAFTON/CASINO/MURWILLAH

SITE NO. 0301

EDEN CREEK SP.

JS

603-11

SP-11
486666838244

SOIL PROPERTIES RECORD 'A'

Litter Status	Litter Average Depth (mm)	Dominant Colour (Munsell Code)		Moisture Characteristics		Tens
		Moist	Dry	Primary	Secondary	
11A	11	5YR 13/2				
11B	11	5YR 13/2				
11C	11	5YR 13/2				
11D	11	5YR 13/2				
11E	11	5YR 13/2				
11F	11	5YR 13/2				
11G	11	5YR 13/2				
11H	11	5YR 13/2				
11I	11	5YR 13/2				
11J	11	5YR 13/2				

Grain Size	Percentage
2mm	10
4mm	10
6mm	10
10mm	10
20mm	10
40mm	10
60mm	10
100mm	10
200mm	10
400mm	10
600mm	10
1000mm	10

SP-11
486666838244

Lower Midslope - veg gully 137

SOIL PROPERTIES RECORD 'B'

SP-11
486666838244

BOUNDARY DESCRIPTION

SP-11
486666838244

STRUCTURE

SP-11
486666838244

STONE SIZE

SP-11
486666838244

STONE DISTRIBUTION

SP-11
486666838244

ROOTS

SP-11
486666838244

FAH

SP-11
486666838244

CLIMATE

SP-11
486666838244

PLASTICITY TYPE

SP-11
486666838244

STICKINESS

SP-11
486666838244

WATER TABLE

SP-11
486666838244

COMBUSTIBILITY

SP-11
486666838244

DRAGGING TEST

SP-11
486666838244

STONE DISTRIBUTION

SP-11
486666838244

100m downward
7-10cm 11-15
10-20cm 12-15
20-28cm 81-15
28-30cm 82-15
This soil is
2 conifer
d little should
be regarded
in the 15m

VENESS & ASSOCIATES PTY LIMITED

Environmental and Natural Resource Consultants

SUB NO 661 GRAFTON/CASINO/MURWILLAH

SITE NO. 0601

RICHMOND RANGE

JS

Fine qtz / felds ssf

603-11

SP-11
4690266834976

SOIL PROPERTIES RECORD 'A'

Litter Status	Litter Average Depth (mm)	Dominant Colour (Munsell Code)		Moisture Characteristics		Tens
		Moist	Dry	Primary	Secondary	
11A	11	5YR 13/2				
11B	11	5YR 13/2				
11C	11	5YR 13/2				
11D	11	5YR 13/2				
11E	11	5YR 13/2				
11F	11	5YR 13/2				
11G	11	5YR 13/2				
11H	11	5YR 13/2				
11I	11	5YR 13/2				
11J	11	5YR 13/2				

Grain Size	Percentage
2mm	10
4mm	10
6mm	10
10mm	10
20mm	10
40mm	10
60mm	10
100mm	10
200mm	10
400mm	10
600mm	10
1000mm	10

SP-11
4690266834976

Upper slope 273

SOIL PROPERTIES RECORD 'B'

SP-11
4690266834976

BOUNDARY DESCRIPTION

SP-11
4690266834976

STRUCTURE

SP-11
4690266834976

STONE SIZE

SP-11
4690266834976

STONE DISTRIBUTION

SP-11
4690266834976

ROOTS

SP-11
4690266834976

FAH

SP-11
4690266834976

CLIMATE

SP-11
4690266834976

PLASTICITY TYPE

SP-11
4690266834976

STICKINESS

SP-11
4690266834976

WATER TABLE

SP-11
4690266834976

COMBUSTIBILITY

SP-11
4690266834976

DRAGGING TEST

SP-11
4690266834976

STONE DISTRIBUTION

SP-11
4690266834976

VENESS & ASSOCIATES PTY LIMITED

Environmental and Natural Resource Consultants

303 N° 661 GRAFTON/CASINO/MURWILLAH

SITE No. 0601

Full

RICHMOND RANGE

JS

qtz - med to coarse

Gn 3-21

4683306834500

Feldspar

SOIL PROPERTIES RECORD 'A'

Record Type		Sample No.	Core No.	4683306834500										fieldspar	
0 0 0 1		SOIL PROPERTIES RECORD 'A'													
Layer Status				Dominant Color (Munsell Color)				Marine Character (MS)				Test			
Horizon				Layer Average Depth (m)				Primary				Secondary			
								Moist				Dry			
				Moist				Dry				Moist			
				W/C				W/C				W/C			
				Grav				Grav				Grav			
				Grav				Grav				Grav			
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				Grav</											

Upper slope - moderately steep. ?

76

SOIL PROPERTIES RECORD 'B'

Sample Type: Topsoil

Sample No.: 0001

SOIL PROPERTIES RECORD 'B'

BOUNDARY DESCRIPTION

N001	Topsoil
N002	Gravel 1-25 mm
N003	Clay 15-60 mm
N004	Gravel 15-100 mm
N005	Gravel 15-100 mm

STRUCTURE GRADE

U001	Adhesive Single Gravel
U002	Adhesive Single Gravel
U003	Adhesive Single Gravel
U004	Adhesive Single Gravel
U005	Adhesive Single Gravel

STONE SIZE

V001	1-6 mm
V002	6-20 mm
V003	20-60 mm
V004	60-120 mm
V005	120-250 mm
V006	>250 mm

TEXTURE

F001	Fine
F002	Coarse

PER SIZE

U001	4.75 mm
U002	7.5 mm
U003	15 mm
U004	30 mm
U005	60 mm
U006	120 mm
U007	250 mm
U008	500 mm
U009	1000 mm

STONE DISTRIBUTION

V001	Non-structural
V002	Waste Material
V003	Storage Material

GRADE

G001	Topsoil
G002	Gravel 1-25 mm
G003	Gravel 15-60 mm
G004	Gravel 15-100 mm
G005	Gravel 15-100 mm
G006	Gravel 15-100 mm
G007	Gravel 15-100 mm
G008	Gravel 15-100 mm
G009	Gravel 15-100 mm
G010	Gravel 15-100 mm
G011	Gravel 15-100 mm
G012	Gravel 15-100 mm
G013	Gravel 15-100 mm
G014	Gravel 15-100 mm
G015	Gravel 15-100 mm
G016	Gravel 15-100 mm
G017	Gravel 15-100 mm
G018	Gravel 15-100 mm
G019	Gravel 15-100 mm
G020	Gravel 15-100 mm
G021	Gravel 15-100 mm
G022	Gravel 15-100 mm
G023	Gravel 15-100 mm
G024	Gravel 15-100 mm
G025	Gravel 15-100 mm
G026	Gravel 15-100 mm
G027	Gravel 15-100 mm
G028	Gravel 15-100 mm
G029	Gravel 15-100 mm
G030	Gravel 15-100 mm
G031	Gravel 15-100 mm
G032	Gravel 15-100 mm
G033	Gravel 15-100 mm
G034	Gravel 15-100 mm
G035	Gravel 15-100 mm
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G037	Gravel 15-100 mm
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G042	Gravel 15-100 mm
G043	Gravel 15-100 mm
G044	Gravel 15-100 mm
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G046	Gravel 15-100 mm
G047	Gravel 15-100 mm
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G052	Gravel 15-100 mm
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G067	Gravel 15-100 mm
G068	Gravel 15-100 mm
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G085	Gravel 15-100 mm
G086	Gravel 15-100 mm
G087	Gravel 15-100 mm
G088	Gravel 15-100 mm
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G090	Gravel 15-100 mm
G091	Gravel 15-100 mm
G092	Gravel 15-100 mm
G093	Gravel 15-100 mm
G094	Gravel 15-100 mm
G095	Gravel 15-100 mm
G096	Gravel 15-100 mm
G097	Gravel 15-100 mm
G098	Gravel 15-100 mm
G099	Gravel 15-100 mm
G100	Gravel 15-100 mm

PER SHAPE

U001	Round
U002	Round
U003	Round
U004	Round
U005	Round
U006	Round
U007	Round
U008	Round
U009	Round
U010	Round

ROOTS

R001	None
R002	None
R003	None
R004	None
R005	None
R006	None
R007	None
R008	None
R009	None
R010	None

PLASTICITY TYPE

P001	Non-plastic
P002	Non-plastic
P003	Non-plastic
P004	Non-plastic

CLAY

U001	Non-plastic
U002	Non-plastic
U003	Non-plastic
U004	Non-plastic
U005	Non-plastic
U006	Non-plastic
U007	Non-plastic
U008	Non-plastic
U009	Non-plastic
U010	Non-plastic

FAHRE

F001	Non-plastic
F002	Non-plastic
F003	Non-plastic
F004	Non-plastic
F005	Non-plastic
F006	Non-plastic
F007	Non-plastic
F008	Non-plastic
F009	Non-plastic
F010	Non-plastic

PER COMPOSITION

U001	Non-plastic
U002	Non-plastic
U003	Non-plastic
U004	Non-plastic
U005	Non-plastic
U006	Non-plastic
U007	Non-plastic
U008	Non-plastic
U009	Non-plastic
U010	Non-plastic

CHARACTERISTICS

C001	Non-plastic
C002	Non-plastic
C003	Non-plastic
C004	Non-plastic
C005	Non-plastic
C006	Non-plastic
C007	Non-plastic
C008	Non-plastic
C009	Non-plastic
C010	Non-plastic

STICKINESS

S001	Non-plastic
S002	Non-plastic
S003	Non-plastic
S004	Non-plastic

CRACK SIZE

U001	Non-plastic
U002	Non-plastic
U003	Non-plastic
U004	Non-plastic
U005	Non-plastic
U006	Non-plastic
U007	Non-plastic
U008	Non-plastic
U009	Non-plastic
U010	Non-plastic

CONCRETE & INCLUSIONS

I001	Non-plastic
I002	Non-plastic
I003	Non-plastic
I004	Non-plastic
I005	Non-plastic
I006	Non-plastic
I007	Non-plastic
I008	Non-plastic
I009	Non-plastic
I010	Non-plastic

WATER TABLE

W001	Non-plastic
W002	Non-plastic
W003	Non-plastic
W004	Non-plastic

STONES

U001	Non-plastic
U002	Non-plastic
U003	Non-plastic
U004	Non-plastic
U005	Non-plastic
U006	Non-plastic
U007	Non-plastic
U008	Non-plastic
U009	Non-plastic
U010	Non-plastic

COMB

C001	Non-plastic
C002	Non-plastic
C003	Non-plastic
C004	Non-plastic
C005	Non-plastic
C006	Non-plastic
C007	Non-plastic
C008	Non-plastic
C009	Non-plastic
C010	Non-plastic

CONCRETE

C001	Non-plastic
C002	Non-plastic
C003	Non-plastic
C004	Non-plastic
C005	Non-plastic
C006	Non-plastic
C007	Non-plastic
C008	Non-plastic
C009	Non-plastic
C010	Non-plastic

CRACK

U001	Non-plastic
U002	Non-plastic
U003	Non-plastic
U004	Non-plastic
U005	Non-plastic
U006	Non-plastic
U007	Non-plastic
U008	Non-plastic
U009	Non-plastic
U010	Non-plastic

COMB

C001	Non-plastic
C002	Non-plastic
C003	Non-plastic
C004	Non-plastic
C005	Non-plastic
C006	Non-plastic
C007	Non-plastic
C008	Non-plastic
C009	Non-plastic
C010	Non-plastic

SHRINKAGE

S001	Non-plastic
S002	Non-plastic
S003	Non-plastic
S004	Non-plastic

STONE DISTRIBUTION

U001	Non-plastic
U002	Non-plastic
U003	Non-plastic
U004	Non-plastic
U005	Non-plastic
U006	Non-plastic
U007	Non-plastic
U008	Non-plastic
U009	Non-plastic
U010	Non-plastic

COMB

C001	Non-plastic
C002	Non-plastic
C003	Non-plastic
C004	Non-plastic
C005	Non-plastic
C006	Non-plastic
C007	Non-plastic
C008	Non-plastic
C009	Non-plastic
C010	Non-plastic

base of 15
rows to be
some water
movement
over 16.
for building
in clastic bed
- fine

water
repellent

VENESS & ASSOCIATES PTY LIMITED

Environmental and Natural Resource Consultants

661 - Grafton / Casino / Murwillumbah

Gn 3-74

DATE No. 0415

FULL

Jw

TABBSMOBILE

1-3km off Dargie Rd.

524566778282

Layer Status	Layer Average Depth (m)	Soil Colour (Munsell Code)	Moisture Characteristics	Texture
Horizon	Moist	Moist	Moist	Moist
1A1	27	10YR 4/2		Silt
1A2	32	10YR 4/2		Silt
1B1	47	10YR 4/2		Silt
1B2	52	10YR 4/2		Silt
1C1	57	10YR 4/2		Silt
1C2	62	10YR 4/2		Silt
1C3	67	10YR 4/2		Silt
1C4	72	10YR 4/2		Silt
1C5	77	10YR 4/2		Silt
1C6	82	10YR 4/2		Silt
1C7	87	10YR 4/2		Silt
1C8	92	10YR 4/2		Silt
1C9	97	10YR 4/2		Silt
1C10	102	10YR 4/2		Silt
1C11	107	10YR 4/2		Silt
1C12	112	10YR 4/2		Silt
1C13	117	10YR 4/2		Silt
1C14	122	10YR 4/2		Silt
1C15	127	10YR 4/2		Silt
1C16	132	10YR 4/2		Silt
1C17	137	10YR 4/2		Silt
1C18	142	10YR 4/2		Silt
1C19	147	10YR 4/2		Silt
1C20	152	10YR 4/2		Silt
1C21	157	10YR 4/2		Silt
1C22	162	10YR 4/2		Silt
1C23	167	10YR 4/2		Silt
1C24	172	10YR 4/2		Silt
1C25	177	10YR 4/2		Silt
1C26	182	10YR 4/2		Silt
1C27	187	10YR 4/2		Silt
1C28	192	10YR 4/2		Silt
1C29	197	10YR 4/2		Silt
1C30	202	10YR 4/2		Silt
1C31	207	10YR 4/2		Silt
1C32	212	10YR 4/2		Silt
1C33	217	10YR 4/2		Silt
1C34	222	10YR 4/2		Silt
1C35	227	10YR 4/2		Silt
1C36	232	10YR 4/2		Silt
1C37	237	10YR 4/2		Silt
1C38	242	10YR 4/2		Silt
1C39	247	10YR 4/2		Silt
1C40	252	10YR 4/2		Silt
1C41	257	10YR 4/2		Silt
1C42	262	10YR 4/2		Silt
1C43	267	10YR 4/2		Silt
1C44	272	10YR 4/2		Silt
1C45	277	10YR 4/2		Silt
1C46	282	10YR 4/2		Silt
1C47	287	10YR 4/2		Silt
1C48	292	10YR 4/2		Silt
1C49	297	10YR 4/2		Silt
1C50	302	10YR 4/2		Silt
1C51	307	10YR 4/2		Silt
1C52	312	10YR 4/2		Silt
1C53	317	10YR 4/2		Silt
1C54	322	10YR 4/2		Silt
1C55	327	10YR 4/2		Silt
1C56	332	10YR 4/2		Silt
1C57	337	10YR 4/2		Silt
1C58	342	10YR 4/2		Silt
1C59	347	10YR 4/2		Silt
1C60	352	10YR 4/2		Silt
1C61	357	10YR 4/2		Silt
1C62	362	10YR 4/2		Silt
1C63	367	10YR 4/2		Silt
1C64	372	10YR 4/2		Silt
1C65	377	10YR 4/2		Silt
1C66	382	10YR 4/2		Silt
1C67	387	10YR 4/2		Silt
1C68	392	10YR 4/2		Silt
1C69	397	10YR 4/2		Silt
1C70	402	10YR 4/2		Silt
1C71	407	10YR 4/2		Silt
1C72	412	10YR 4/2		Silt
1C73	417	10YR 4/2		Silt
1C74	422	10YR 4/2		Silt
1C75	427	10YR 4/2		Silt
1C76	432	10YR 4/2		Silt
1C77	437	10YR 4/2		Silt
1C78	442	10YR 4/2		Silt
1C79	447	10YR 4/2		Silt
1C80	452	10YR 4/2		Silt
1C81	457	10YR 4/2		Silt
1C82	462	10YR 4/2		Silt
1C83	467	10YR 4/2		Silt
1C84	472	10YR 4/2		Silt
1C85	477	10YR 4/2		Silt
1C86	482	10YR 4/2		Silt
1C87	487	10YR 4/2		Silt
1C88	492	10YR 4/2		Silt
1C89	497	10YR 4/2		Silt
1C90	502	10YR 4/2		Silt
1C91	507	10YR 4/2		Silt
1C92	512	10YR 4/2		Silt
1C93	517	10YR 4/2		Silt
1C94	522	10YR 4/2		Silt
1C95	527	10YR 4/2		Silt
1C96	532	10YR 4/2		Silt
1C97	537	10YR 4/2		Silt
1C98	542	10YR 4/2		Silt
1C99	547	10YR 4/2		Silt
1C100	552	10YR 4/2		Silt

Layer Status	Layer Average Depth (m)	Soil Colour (Munsell Code)	Moisture Characteristics	Texture
Horizon	Moist	Moist	Moist	Moist
1A1	27	10YR 4/2		Silt
1A2	32	10YR 4/2		Silt
1B1	47	10YR 4/2		Silt
1B2	52	10YR 4/2		Silt
1C1	57	10YR 4/2		Silt
1C2	62	10YR 4/2		Silt
1C3	67	10YR 4/2		Silt
1C4	72	10YR 4/2		Silt
1C5	77	10YR 4/2		Silt
1C6	82	10YR 4/2		Silt
1C7	87	10YR 4/2		Silt
1C8	92	10YR 4/2		Silt
1C9	97	10YR 4/2		Silt
1C10	102	10YR 4/2		Silt
1C11	107	10YR 4/2		Silt
1C12	112	10YR 4/2		Silt
1C13	117	10YR 4/2		Silt
1C14	122	10YR 4/2		Silt
1C15	127	10YR 4/2		Silt
1C16	132	10YR 4/2		Silt
1C17	137	10YR 4/2		Silt
1C18	142	10YR 4/2		Silt
1C19	147	10YR 4/2		Silt
1C20	152	10YR 4/2		Silt
1C21	157	10YR 4/2		Silt
1C22	162	10YR 4/2		Silt
1C23	167	10YR 4/2		Silt
1C24	172	10YR 4/2		Silt
1C25	177	10YR 4/2		Silt
1C26	182	10YR 4/2		Silt
1C27	187	10YR 4/2		Silt
1C28	192	10YR 4/2		Silt
1C29	197	10YR 4/2		Silt
1C30	202	10YR 4/2		Silt
1C31	207	10YR 4/2		Silt
1C32	212	10YR 4/2		Silt
1C33	217	10YR 4/2		Silt
1C34	222	10YR 4/2		Silt
1C35	227	10YR 4/2		Silt
1C36	232	10YR 4/2		Silt
1C37	237	10YR 4/2		Silt
1C38	242	10YR 4/2		Silt
1C39	247	10YR 4/2		Silt
1C40	252	10YR 4/2		Silt
1C41	257	10YR 4/2		Silt
1C42	262	10YR 4/2		Silt
1C43	267	10YR 4/2		Silt
1C44	272	10YR 4/2		Silt
1C45	277	10YR 4/2		Silt
1C46	282	10YR 4/2		Silt
1C47	287	10YR 4/2		Silt
1C48	292	10YR 4/2		Silt
1C49	297	10YR 4/2		Silt
1C50	302	10YR 4/2		Silt
1C51	307	10YR 4/2		Silt
1C52	312	10YR 4/2		Silt
1C53	317	10YR 4/2		Silt
1C54	322	10YR 4/2		Silt
1C55	327	10YR 4/2		Silt
1C56	332	10YR 4/2		Silt
1C57	337	10YR 4/2		Silt
1C58	342	10YR 4/2		Silt
1C59	347	10YR 4/2		Silt
1C60	352	10YR 4/2		Silt
1C61	357	10YR 4/2		Silt
1C62	362	10YR 4/2		Silt
1C63	367	10YR 4/2		Silt
1C64	372	10YR 4/2		Silt
1C65	377	10YR 4/2		Silt
1C66	382	10YR 4/2		Silt
1C67	387	10YR 4/2		Silt
1C68	392	10YR 4/2		Silt
1C69	397	10YR 4/2		Silt
1C70	402	10YR 4/2		Silt
1C71	407	10YR 4/2		Silt
1C72	412	10YR 4/2		Silt
1C73	417	10YR 4/2		Silt
1C74	422	10YR 4/2		Silt
1C75	427	10YR 4/2		Silt
1C76	432	10YR 4/2		Silt
1C77	437	10YR 4/2		Silt
1C78	442	10YR 4/2		Silt
1C79	447	10YR 4/2		Silt
1C80	452	10YR 4/2		Silt
1C81	457	10YR 4/2		Silt
1C82	462	10YR 4/2		Silt
1C83	467	10YR 4/2		Silt
1C84	472	10YR 4/2		Silt
1C85	477	10YR 4/2		Silt
1C86	482	10YR 4/2		Silt
1C87	487	10YR 4/2		Silt
1C88	492	10YR 4/2		Silt
1C89	497	10YR 4/2		Silt
1C90	502	10YR 4/2		Silt
1C91	507	10YR 4/2		Silt
1C92	512	10YR 4/2		Silt
1C93	517	10YR 4/2		Silt
1C94	522	10YR 4/2		Silt
1C95	527	10YR 4/2		Silt
1C96	532	10YR 4/2		Silt
1C97	537	10YR 4/2		Silt
1C98	542	10YR 4/2		Silt
1C99	547	10YR 4/2		Silt
1C100	552	10YR 4/2		Silt

Islands like
dip
with part of
floodplain

SURFACE CONDITIONS

Crust
Hard set
Not hard set

Upper slope - very gentle terrain 82-102

BOUNDARY CONDITIONS

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STRUCTURE

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STONE SIZE

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VENESS & ASSOCIATES PTY LIMITED

Environmental and Natural Resource Consultants

SUB N° 661 CRAFTON/CASINO/MURWILLAH

SITE No. 0510

Spot

JW Small's Road

MT PIKAPENE 470 62 6717 340

SOIL PROPERTIES RECORD 'A'

Level	Station	Depth (m)	Dominant Colour (Munsell Code)		Moisture Characteristics		Temp
			Moist	Dry	Primary	Secondary	
1	11A	0.00 - 0.10	10YR 5/6	10YR 5/6			15
2	11B	0.10 - 0.20	10YR 5/6	10YR 5/6			15
3	11C	0.20 - 0.30	10YR 5/6	10YR 5/6			15
4	11D	0.30 - 0.40	10YR 5/6	10YR 5/6			15
5	11E	0.40 - 0.50	10YR 5/6	10YR 5/6			15
6	11F	0.50 - 0.60	10YR 5/6	10YR 5/6			15
7	11G	0.60 - 0.70	10YR 5/6	10YR 5/6			15
8	11H	0.70 - 0.80	10YR 5/6	10YR 5/6			15
9	11I	0.80 - 0.90	10YR 5/6	10YR 5/6			15
10	11J	0.90 - 1.00	10YR 5/6	10YR 5/6			15

Level	Station	Depth (m)	Moisture Characteristics	Temp
1	11A	0.00 - 0.10		15
2	11B	0.10 - 0.20		15
3	11C	0.20 - 0.30		15
4	11D	0.30 - 0.40		15
5	11E	0.40 - 0.50		15
6	11F	0.50 - 0.60		15
7	11G	0.60 - 0.70		15
8	11H	0.70 - 0.80		15
9	11I	0.80 - 0.90		15
10	11J	0.90 - 1.00		15

Structure: clay
UF 6.33

Assess Type Site No. 0501

SOIL PROPERTIES RECORD 'B'

BOUNDARY DEFINITION		STRUCTURE GRADE		STONE SIZE	
1	11A	1	11A	1	11A
2	11B	2	11B	2	11B
3	11C	3	11C	3	11C
4	11D	4	11D	4	11D
5	11E	5	11E	5	11E
6	11F	6	11F	6	11F
7	11G	7	11G	7	11G
8	11H	8	11H	8	11H
9	11I	9	11I	9	11I
10	11J	10	11J	10	11J

TEXTURE		ROOTS		FANS	
1	11A	1	11A	1	11A
2	11B	2	11B	2	11B
3	11C	3	11C	3	11C
4	11D	4	11D	4	11D
5	11E	5	11E	5	11E
6	11F	6	11F	6	11F
7	11G	7	11G	7	11G
8	11H	8	11H	8	11H
9	11I	9	11I	9	11I
10	11J	10	11J	10	11J

SW - erosion - total clay in the farming land in general after rain in landscape eg. new park + old Limestone + old then Mt Pikepene S. + new also near 5th section of Old main Range Rd new Runway Hwy

VENESS & ASSOCIATES PTY LIMITED

Environmental and Natural Resource Consultants

SUB N° 661 CRAFTON/CASINO/MURWILLAH

SITE No. 0501

Spot

JW MT PIKAPENE Old Limestone Rd.

474 970 6717 340

SOIL PROPERTIES RECORD 'A'

Level	Station	Depth (m)	Dominant Colour (Munsell Code)		Moisture Characteristics		Temp
			Moist	Dry	Primary	Secondary	
1	11A	0.00 - 0.10	10YR 5/6	10YR 5/6			15
2	11B	0.10 - 0.20	10YR 5/6	10YR 5/6			15
3	11C	0.20 - 0.30	10YR 5/6	10YR 5/6			15
4	11D	0.30 - 0.40	10YR 5/6	10YR 5/6			15
5	11E	0.40 - 0.50	10YR 5/6	10YR 5/6			15
6	11F	0.50 - 0.60	10YR 5/6	10YR 5/6			15
7	11G	0.60 - 0.70	10YR 5/6	10YR 5/6			15
8	11H	0.70 - 0.80	10YR 5/6	10YR 5/6			15
9	11I	0.80 - 0.90	10YR 5/6	10YR 5/6			15
10	11J	0.90 - 1.00	10YR 5/6	10YR 5/6			15

Level	Station	Depth (m)	Moisture Characteristics	Temp
1	11A	0.00 - 0.10		15
2	11B	0.10 - 0.20		15
3	11C	0.20 - 0.30		15
4	11D	0.30 - 0.40		15
5	11E	0.40 - 0.50		15
6	11F	0.50 - 0.60		15
7	11G	0.60 - 0.70		15
8	11H	0.70 - 0.80		15
9	11I	0.80 - 0.90		15
10	11J	0.90 - 1.00		15

Structure: pink clay
UF 6.31

Assess Type Site No. 0501

SOIL PROPERTIES RECORD 'B'

BOUNDARY DEFINITION		STRUCTURE GRADE		STONE SIZE	
1	11A	1	11A	1	11A
2	11B	2	11B	2	11B
3	11C	3	11C	3	11C
4	11D	4	11D	4	11D
5	11E	5	11E	5	11E
6	11F	6	11F	6	11F
7	11G	7	11G	7	11G
8	11H	8	11H	8	11H
9	11I	9	11I	9	11I
10	11J	10	11J	10	11J

TEXTURE		ROOTS		FANS	
1	11A	1	11A	1	11A
2	11B	2	11B	2	11B
3	11C	3	11C	3	11C
4	11D	4	11D	4	11D
5	11E	5	11E	5	11E
6	11F	6	11F	6	11F
7	11G	7	11G	7	11G
8	11H	8	11H	8	11H
9	11I	9	11I	9	11I
10	11J	10	11J	10	11J

VENESS & ASSOCIATES PTY LIMITED

Environmental and Natural Resource Consultants

508 N° 661 GRAFTON/CASINO/MURWILLAH

SITE No. 0403

Full SUGARLOAF SW?

MOUNT PIKAPONG

Sugarloaf Fire Trail

11/6/33

Report Type	Same as Site No	Total No of Layers								
0 0 0 1										
SOIL PROPERTIES RECORD A										
Lower Strata		Overburden Category	Moisture Characteristics				Temp			
Horizon	Liquor Average Depth (m)	Moist	Dry	Primary		Secondary		Moisture	pH	Air Dry
				%	%	%	%			
11.1	0.01	20YR 4/2								
11.2	0.02	10YR 4/2								
11.3	0.03	20YR 4/2								
11.4	0.04	20YR 4/2								
11.5	0.05	20YR 4/2								
11.6	0.06	20YR 4/2								
11.7	0.07	20YR 4/2								
11.8	0.08	20YR 4/2								
11.9	0.09	20YR 4/2								
11.10	0.10	20YR 4/2								
11.11	0.11	20YR 4/2								
11.12	0.12	20YR 4/2								
11.13	0.13	20YR 4/2								
11.14	0.14	20YR 4/2								
11.15	0.15	20YR 4/2								
11.16	0.16	20YR 4/2								
11.17	0.17	20YR 4/2								
11.18	0.18	20YR 4/2								
11.19	0.19	20YR 4/2								
11.20	0.20	20YR 4/2								

Report Type Same as Site No. 0 0 0 1

SOIL PROPERTIES RECORD 'B'

Ridge 33 along ridge with some signs of tree roots

BOUNDARY DEFINITIONS

UAG1: None
UAG2: None
UAG3: None
UAG4: None
UAG5: None

STRUCTURE

UAG1: None
UAG2: None
UAG3: None
UAG4: None
UAG5: None

STONE SIZE

UAG1: None
UAG2: None
UAG3: None
UAG4: None
UAG5: None

STONE WEATHERING

UAG1: None
UAG2: None
UAG3: None
UAG4: None
UAG5: None

TEXTURE

UAG1: None
UAG2: None
UAG3: None
UAG4: None
UAG5: None

MASS FRACTURE

UAG1: None
UAG2: None
UAG3: None
UAG4: None
UAG5: None

GRADE

UAG1: None
UAG2: None
UAG3: None
UAG4: None
UAG5: None

ROOTS

UAG1: None
UAG2: None
UAG3: None
UAG4: None
UAG5: None

ROOT DISTRIBUTION

UAG1: None
UAG2: None
UAG3: None
UAG4: None
UAG5: None

PANE

UAG1: None
UAG2: None
UAG3: None
UAG4: None
UAG5: None

CLIMATE

UAG1: None
UAG2: None
UAG3: None
UAG4: None
UAG5: None

PERMEABILITY

UAG1: None
UAG2: None
UAG3: None
UAG4: None
UAG5: None

CRACK SIZE

UAG1: None
UAG2: None
UAG3: None
UAG4: None
UAG5: None

CONCRETE & INCLUSIONS

UAG1: None
UAG2: None
UAG3: None
UAG4: None
UAG5: None

WATER-TABLE

UAG1: None
UAG2: None
UAG3: None
UAG4: None
UAG5: None

CONCRETE

UAG1: None
UAG2: None
UAG3: None
UAG4: None
UAG5: None

REINFORCING

UAG1: None
UAG2: None
UAG3: None
UAG4: None
UAG5: None

STONES

UAG1: None
UAG2: None
UAG3: None
UAG4: None
UAG5: None

STONE DISTRIBUTION

UAG1: None
UAG2: None
UAG3: None
UAG4: None
UAG5: None

VENESS & ASSOCIATES PTY LIMITED

Environmental and Natural Resource Consultants

508 N° 661 GRAFTON/CASINO/MURWILLAH

SITE No. 0404

Spot

CHERRY TREE

Jw

Waste sand to gravel size

g/z feldspathic st

RPS

Dr 2.21

Report Type	Same as Site No.	Year													
0 0 0 1															
476600679572d															
SOIL PROPERTIES RECORD 'A'															
Layer Status		Dominant Colour (Munsell Code)		Moisture Characteristics				Time							
Horizon		Ladder Assigning Design		Moist		Dry		Primary		Secondary		PH		Atmos	
Layer No.															
1	21		20.6	5Y4R/2											
2	22		2.1	5Y4R/2.6											
3	23		6.0	5Y4R/3.6											
4															
5															
6															
7															
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9															
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91															
92															
93															
94															
95															
96															
97															
98															
99															
100															

Report Type Same as Site No. 0 0 0 1

SOIL PROPERTIES RECORD 'B'

Upper slope, gentle. Rocky knob above site on a

BOUNDARY DEFINITIONS

UAG1: None
UAG2: None
UAG3: None
UAG4: None
UAG5: None

STRUCTURE

UAG1: None
UAG2: None
UAG3: None
UAG4: None
UAG5: None

STONE SIZE

UAG1: None
UAG2: None
UAG3: None
UAG4: None
UAG5: None

STONE WEATHERING

UAG1: None
UAG2: None
UAG3: None
UAG4: None
UAG5: None

TEXTURE

UAG1: None
UAG2: None
UAG3: None
UAG4: None
UAG5: None

MASS FRACTURE

UAG1: None
UAG2: None
UAG3: None
UAG4: None
UAG5: None

GRADE

UAG1: None
UAG2: None
UAG3: None
UAG4: None
UAG5: None

ROOTS

UAG1: None
UAG2: None
UAG3: None
UAG4: None
UAG5: None

ROOT DISTRIBUTION

UAG1: None
UAG2: None
UAG3: None
UAG4: None
UAG5: None

PANE

UAG1: None
UAG2: None
UAG3: None
UAG4: None
UAG5: None

CLIMATE

UAG1: None
UAG2: None
UAG3: None
UAG4: None
UAG5: None

PERMEABILITY

UAG1: None
UAG2: None
UAG3: None
UAG4: None
UAG5: None

CRACK SIZE

UAG1: None
UAG2: None
UAG3: None
UAG4: None
UAG5: None

CONCRETE & INCLUSIONS

UAG1: None
UAG2: None
UAG3: None
UAG4: None
UAG5: None

WATER-TABLE

UAG1: None
UAG2: None
UAG3: None
UAG4: None
UAG5: None

CONCRETE

UAG1: None
UAG2: None
UAG3: None
UAG4: None
UAG5: None

REINFORCING

UAG1: None
UAG2: None
UAG3: None
UAG4: None
UAG5: None

STONES

UAG1: None
UAG2: None
UAG3: None
UAG4: None
UAG5: None

STONE DISTRIBUTION

UAG1: None
UAG2: None
UAG3: None
UAG4: None
UAG5: None

VENESS & ASSOCIATES PTY LIMITED

Environmental and Natural Resource Consultants

POB N° 661 GRAFTON/CASINO/MURWILLAH

SITE NO. 0401

Full

CHERRY TREE NEST

JW

474950/679776

Structured Subplotic clay

UF 5-31

SOIL PROPERTIES RECORD 'A'

Access Type	Same as Site No.	Year of Last			
1 5 5 4					
4749506797870					
SOIL PROPERTIES RECORD 'A'					
Lower Status		Dominant Colour (Munsell Color)	Moisture Characteristics		Text
Horizon	Lower Average Depth (cm)	Moist	Wet	Dry	
		M/C	Q/C	Other	

Transition
Stone line
on boundary
L 2/3

23 with
white nodules
Basal nodules
Kun-ink with

24 m. thick with nodules

Ridge line upper slope against stone line ridge 476

SOIL PROPERTIES RECORD 'B'

Access Type	Same as Site No.	Year of Last
0 3 3 1		
BOUNDARY DEFINITION	STRUCTURE	STONE SIZE
1 11A	11A1	11A1
5 11B	11B1	11B1
7 11C	11C1	11C1
9 11D	11D1	11D1
11		
TEXTURE	ROOTS	ROOTS
1 11A	11A1	11A1
5 11B	11B1	11B1
7 11C	11C1	11C1
9 11D	11D1	11D1
11		
PLASTICITY TYPE	CRACKS	CRACKS
1 11A	11A1	11A1
5 11B	11B1	11B1
7 11C	11C1	11C1
9 11D	11D1	11D1
11		
STICKINESS	CONCRETE & INCLUSIONS	CONCRETE & INCLUSIONS
1 11A	11A1	11A1
5 11B	11B1	11B1
7 11C	11C1	11C1
9 11D	11D1	11D1
11		
WATER TABLE	STONES	STONES
1 11A	11A1	11A1
5 11B	11B1	11B1
7 11C	11C1	11C1
9 11D	11D1	11D1
11		
CONSISTENCE	CRACKS	CRACKS
1 11A	11A1	11A1
5 11B	11B1	11B1
7 11C	11C1	11C1
9 11D	11D1	11D1
11		
DRAINAGE TEST	STONES	STONES
1 11A	11A1	11A1
5 11B	11B1	11B1
7 11C	11C1	11C1
9 11D	11D1	11D1
11		

VENESS & ASSOCIATES PTY LIMITED

Environmental and Natural Resource Consultants

POB N° 661 GRAFTON/CASINO/MURWILLAH

SITE NO. 0405

Spot

RICHMOND RANGE

JW off Upper Culm Creek Rd

472660/680592

SOIL PROPERTIES RECORD 'A'

Access Type	Same as Site no.	Year of Last			
1 5 5 4					
472 664 805926					
SOIL PROPERTIES RECORD 'A'					
Lower Status		Dominant Colour (Munsell Color)	Moisture Characteristics		Temp
Lower No.	Horizon	Upper Average Depth (m)			
			Moist	Dry	
			W/C		
			Primary	Secondary	
			Colour	Value	Chroma
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Moist
			W/C		
			Moist	Dry	Mo

47 Very top 2m
is very top 2m
leaves down to
22 dist

SOIL PROPERTIES RECORD 'B'

Access Type	Same as Site No.	Year of Last
0 3 3 1		
BOUNDARY DEFINITION	STRUCTURE	STONE SIZE
1 11A	11A1	11A1
5 11B	11B1	11B1
7 11C	11C1	11C1
9 11D	11D1	11D1
11		
TEXTURE	ROOTS	ROOTS
1 11A	11A1	11A1
5 11B	11B1	11B1
7 11C	11C1	11C1
9 11D	11D1	11D1
11		
PLASTICITY TYPE	CRACKS	CRACKS
1 11A	11A1	11A1
5 11B	11B1	11B1
7 11C	11C1	11C1
9 11D	11D1	11D1
11		
STICKINESS	CONCRETE & INCLUSIONS	CONCRETE & INCLUSIONS
1 11A	11A1	11A1
5 11B	11B1	11B1
7 11C	11C1	11C1
9 11D	11D1	11D1
11		
WATER TABLE	STONES	STONES
1 11A	11A1	11A1
5 11B	11B1	11B1
7 11C	11C1	11C1
9 11D	11D1	11D1
11		
CONSISTENCE	CRACKS	CRACKS
1 11A	11A1	11A1
5 11B	11B1	11B1
7 11C	11C1	11C1
9 11D	11D1	11D1
11		
DRAINAGE TEST	STONES	STONES
1 11A	11A1	11A1
5 11B	11B1	11B1
7 11C	11C1	11C1
9 11D	11D1	11D1
11		

JOB N° 661 GRAFTON/CASINO/MURWICH

Full

Tw. Culmanan Ave Rd

SOIL PROPERTIES RECORD 'A'

Dr 25-11

5. ϕ
or 4.5
4.5
4.5

9% Lower slope - moderately gentle increases with depth.

Report Type	Source as Site No.
0 0 0 0 1	

Environmental and Natural Resource Consultants

MURWILLUMBDAH

570

五

MEBBIN

5 16646 6849936

Cadeil K

c { $\begin{matrix} \text{clap net} \\ \text{over} \\ \text{local bar} \end{matrix}$

STRUCT. PL. Agric.
C. 1163.

Upper slope 237.

Crust =
Hard set =
More hard set =

<

Gn 3:14

Crest
Haw set
Haw set

Upper slope 15!

7000 10000 20000 30000 40000 50000 60000 70000 80000 90000 100000

VCS 1		Unabhängig
VCS 2		Stark
VCS 4		Stark

63 МОПЧ

Slightly
Harsh
clays

75-37-64

Sold ⁷⁶³

Review

100

Midslope - moderate 25°

0.1 : _____
0.2 : _____
0.3 : _____
0.4 : _____
0.5 : _____

VCB 1	_____	Control Group
VCB 3	_____	Uninjured Group
VCB 2	_____	Blowfly Larvae
VCB 4	_____	Shrimp Larvae

2102 1 _____ 214 200

VENESS & ASSOCIATES PTY LIMITED

Environmental and Natural Resource Consultants

661 - Grafton / Casino / Merimbeth

DB0-41

SITE NO. 0417

spot

Jw

MORORO

unamed

523976757444

Sample Type	Sample No.	Lab. No.
1	1	1

Layer Status	Layer Average Depth (m)	Dominant Colour (Munsell Code)	Texture	Notes
1	0.5	10YR 5/2	5-6.5	
2	0.5	10YR 5/2	5-6.5	
3	0.5	10YR 5/2	5-6.5	
4	0.5	10YR 5/2	5-6.5	
5	0.5	10YR 5/2	5-6.5	

Layer Status	Layer Average Depth (m)	Dominant Colour (Munsell Code)	Texture	Notes
1	0.5	10YR 5/2	5-6.5	
2	0.5	10YR 5/2	5-6.5	
3	0.5	10YR 5/2	5-6.5	
4	0.5	10YR 5/2	5-6.5	
5	0.5	10YR 5/2	5-6.5	

SURFACE CHARACTER

Crust ☒
Hard set ☒
Not hard set ☐

Upper slope ~ 5h very gentle topography

BOUNDARY DISTINGUISH

Layer	Notes
1	None
2	None
3	None
4	None
5	None

TEXTURE

Layer	Notes
1	None
2	None
3	None
4	None
5	None

GRAIN

Layer	Notes
1	None
2	None
3	None
4	None
5	None

PLASTICITY TYPE

Layer	Notes
1	None
2	None
3	None
4	None
5	None

STRUCTURE

Layer	Notes
1	None
2	None
3	None
4	None
5	None

WATER TABLE

Layer	Notes
1	None
2	None
3	None
4	None
5	None

COMBUSTION

Layer	Notes
1	None
2	None
3	None
4	None
5	None

STICKINESS

Layer	Notes
1	None
2	None
3	None
4	None
5	None

WATER TABLE

Layer	Notes
1	None
2	None
3	None
4	None
5	None

COMBUSTION

Layer	Notes
1	None
2	None
3	None
4	None
5	None

STICKINESS

Layer	Notes
1	None
2	None
3	None
4	None
5	None

WATER TABLE

Layer	Notes
1	None
2	None
3	None
4	None
5	None

STRUCTURE

Layer	Notes
1	None
2	None
3	None
4	None
5	None

TEXTURE

Layer	Notes
1	None
2	None
3	None
4	None
5	None

GRAIN

Layer	Notes
1	None
2	None
3	None
4	None
5	None

PLASTICITY TYPE

Layer	Notes
1	None
2	None
3	None
4	None
5	None

STRUCTURE

Layer	Notes
1	None
2	None
3	None
4	None
5	None

WATER TABLE

Layer	Notes
1	None
2	None
3	None
4	None
5	None

COMBUSTION

Layer	Notes
1	None
2	None
3	None
4	None
5	None

STICKINESS

Layer	Notes
1	None
2	None
3	None
4	None
5	None

WATER TABLE

Layer	Notes
1	None
2	None
3	None
4	None
5	None

COMBUSTION

Layer	Notes
1	None
2	None
3	None
4	None
5	None

STICKINESS

Layer	Notes
1	None
2	None
3	None
4	None
5	None

WATER TABLE

Layer	Notes
1	None
2	None
3	None
4	None
5	None

STONE SIZE

Layer	Notes
1	None
2	None
3	None
4	None
5	None

STONE WEATHERING

Layer	Notes
1	None
2	None
3	None
4	None
5	None

STONE LITHOLOGY

Layer	Notes
1	None
2	None
3	None
4	None
5	None

ROOTS AMOUNT

Layer	Notes
1	None
2	None
3	None
4	None
5	None

ROOT DISTRIBUTION

Layer	Notes
1	None
2	None
3	None
4	None
5	None

PANS

Layer	Notes
1	None
2	None
3	None
4	None
5	None

CHARACTER

Layer	Notes
1	None
2	None
3	None
4	None
5	None

CONCRECTIONS & INCLUSIONS

Layer	Notes
1	None
2	None
3	None
4	None
5	None

CRACKS

Layer	Notes
1	None
2	None
3	None
4	None
5	None

STONES

Layer	Notes
1	None
2	None
3	None
4	None
5	None

STONE LITHOLOGY

Layer	Notes
1	None
2	None
3	None
4	None
5	None

ROOTS AMOUNT

Layer	Notes
1	None
2	None
3	None
4	None
5	None

VENESS & ASSOCIATES PTY LIMITED

Environmental and Natural Resource Consultants

SITE NO. 0903

661 - ~~CRAFTON/CASINO/MAURWILLAH~~

KARARUA

SOOT

JMR PT MOUNT MARSH

unrecorded title

EN 3-11

Layer	Soil No.	Soil No.	Soil No.
1	1A1	1A2	1A3
2	2A1	2A2	2A3
3	3A1	3A2	3A3
4	4A1	4A2	4A3
5	5A1	5A2	5A3
6	6A1	6A2	6A3
7	7A1	7A2	7A3
8	8A1	8A2	8A3
9	9A1	9A2	9A3
10	10A1	10A2	10A3
11	11A1	11A2	11A3
12	12A1	12A2	12A3
13	13A1	13A2	13A3
14	14A1	14A2	14A3
15	15A1	15A2	15A3
16	16A1	16A2	16A3
17	17A1	17A2	17A3
18	18A1	18A2	18A3
19	19A1	19A2	19A3
20	20A1	20A2	20A3
21	21A1	21A2	21A3
22	22A1	22A2	22A3
23	23A1	23A2	23A3
24	24A1	24A2	24A3
25	25A1	25A2	25A3
26	26A1	26A2	26A3
27	27A1	27A2	27A3
28	28A1	28A2	28A3
29	29A1	29A2	29A3
30	30A1	30A2	30A3
31	31A1	31A2	31A3
32	32A1	32A2	32A3
33	33A1	33A2	33A3
34	34A1	34A2	34A3
35	35A1	35A2	35A3
36	36A1	36A2	36A3
37	37A1	37A2	37A3
38	38A1	38A2	38A3
39	39A1	39A2	39A3
40	40A1	40A2	40A3
41	41A1	41A2	41A3
42	42A1	42A2	42A3
43	43A1	43A2	43A3
44	44A1	44A2	44A3
45	45A1	45A2	45A3
46	46A1	46A2	46A3
47	47A1	47A2	47A3
48	48A1	48A2	48A3
49	49A1	49A2	49A3
50	50A1	50A2	50A3
51	51A1	51A2	51A3
52	52A1	52A2	52A3
53	53A1	53A2	53A3
54	54A1	54A2	54A3
55	55A1	55A2	55A3
56	56A1	56A2	56A3
57	57A1	57A2	57A3
58	58A1	58A2	58A3
59	59A1	59A2	59A3
60	60A1	60A2	60A3
61	61A1	61A2	61A3
62	62A1	62A2	62A3
63	63A1	63A2	63A3
64	64A1	64A2	64A3
65	65A1	65A2	65A3
66	66A1	66A2	66A3
67	67A1	67A2	67A3
68	68A1	68A2	68A3
69	69A1	69A2	69A3
70	70A1	70A2	70A3
71	71A1	71A2	71A3
72	72A1	72A2	72A3
73	73A1	73A2	73A3
74	74A1	74A2	74A3
75	75A1	75A2	75A3
76	76A1	76A2	76A3
77	77A1	77A2	77A3
78	78A1	78A2	78A3
79	79A1	79A2	79A3
80	80A1	80A2	80A3
81	81A1	81A2	81A3
82	82A1	82A2	82A3
83	83A1	83A2	83A3
84	84A1	84A2	84A3
85	85A1	85A2	85A3
86	86A1	86A2	86A3
87	87A1	87A2	87A3
88	88A1	88A2	88A3
89	89A1	89A2	89A3
90	90A1	90A2	90A3
91	91A1	91A2	91A3
92	92A1	92A2	92A3
93	93A1	93A2	93A3
94	94A1	94A2	94A3
95	95A1	95A2	95A3
96	96A1	96A2	96A3
97	97A1	97A2	97A3
98	98A1	98A2	98A3
99	99A1	99A2	99A3
100	100A1	100A2	100A3

Layer	Soil No.	Soil No.	Soil No.
1	1A1	1A2	1A3
2	2A1	2A2	2A3
3	3A1	3A2	3A3
4	4A1	4A2	4A3
5	5A1	5A2	5A3
6	6A1	6A2	6A3
7	7A1	7A2	7A3
8	8A1	8A2	8A3
9	9A1	9A2	9A3
10	10A1	10A2	10A3
11	11A1	11A2	11A3
12	12A1	12A2	12A3
13	13A1	13A2	13A3
14	14A1	14A2	14A3
15	15A1	15A2	15A3
16	16A1	16A2	16A3
17	17A1	17A2	17A3
18	18A1	18A2	18A3
19	19A1	19A2	19A3
20	20A1	20A2	20A3
21	21A1	21A2	21A3
22	22A1	22A2	22A3
23	23A1	23A2	23A3
24	24A1	24A2	24A3
25	25A1	25A2	25A3
26	26A1	26A2	26A3
27	27A1	27A2	27A3
28	28A1	28A2	28A3
29	29A1	29A2	29A3
30	30A1	30A2	30A3
31	31A1	31A2	31A3
32	32A1	32A2	32A3
33	33A1	33A2	33A3
34	34A1	34A2	34A3
35	35A1	35A2	35A3
36	36A1	36A2	36A3
37	37A1	37A2	37A3
38	38A1	38A2	38A3
39	39A1	39A2	39A3
40	40A1	40A2	40A3
41	41A1	41A2	41A3
42	42A1	42A2	42A3
43	43A1	43A2	43A3
44	44A1	44A2	44A3
45	45A1	45A2	45A3
46	46A1	46A2	46A3
47	47A1	47A2	47A3
48	48A1	48A2	48A3
49	49A1	49A2	49A3
50	50A1	50A2	50A3
51	51A1	51A2	51A3
52	52A1	52A2	52A3
53	53A1	53A2	53A3
54	54A1	54A2	54A3
55	55A1	55A2	55A3
56	56A1	56A2	56A3
57	57A1	57A2	57A3
58	58A1	58A2	58A3
59	59A1	59A2	59A3
60	60A1	60A2	60A3
61	61A1	61A2	61A3
62	62A1	62A2	62A3
63	63A1	63A2	63A3
64	64A1	64A2	64A3
65	65A1	65A2	65A3
66	66A1	66A2	66A3
67	67A1	67A2	67A3
68	68A1	68A2	68A3
69	69A1	69A2	69A3
70	70A1	70A2	70A3
71	71A1	71A2	71A3
72	72A1	72A2	72A3
73	73A1	73A2	73A3
74	74A1	74A2	74A3
75	75A1	75A2	75A3
76	76A1	76A2	76A3
77	77A1	77A2	77A3
78	78A1	78A2	78A3
79	79A1	79A2	79A3
80	80A1	80A2	80A3
81	81A1	81A2	81A3
82	82A1	82A2	82A3
83	83A1	83A2	83A3
84	84A1	84A2	84A3
85	85A1	85A2	85A3
86	86A1	86A2	86A3
87	87A1	87A2	87A3
88	88A1	88A2	88A3
89	89A1	89A2	89A3
90	90A1	90A2	90A3
91	91A1	91A2	91A3
92	92A1	92A2	92A3
93	93A1	93A2	93A3
94	94A1	94A2	94A3
95	95A1	95A2	95A3
96	96A1	96A2	96A3
97	97A1	97A2	97A3
98	98A1	98A2	98A3
99	99A1	99A2	99A3
100	100A1	100A2	100A3

SURFACE CONDITIONS

Crust
Hard set
Non hard set

Mid slope - 12%

12% incl
down

BOUNDARY

	1	2	3	4	5	
7A01						None
7A02						Strong (<20 mm)
7A03						Clear (20-60 mm)
7A04						Granular (60-100 mm)
7A05						Gravelly (>100 mm)

VENESS & ASSOCIATES PTY LIMITED

Environmental and Natural Resource Consultants

SOC N° 661 GRAFTON/CASINO/MURWILLUMBAH

DATE NO. 0901

spot

KEYBARBIN

Jmr

red to coarse grained
folds late sst.

* Clay washed
with water & 100
rinsing, cotton
cloth of soil
between
concrete
hide down.

465466791633

SOIL PROPERTIES RECORD 'A'

Access Type		Same as Site No.	Test No.												
0 0 0 1															
4652166781973															
SOIL PROPERTIES RECORD 'A'															
Layer Status		Dominant Colour (Munsell Codes)	Moisture Characteristics	Tests											
Horizon		Upper Average Depth (m)	Primary		Secondary	Moisture	pc	Ag pH 2.5	Electrical						
Layer No.			Moist	W/C	Dry	Gravimetric	%	Gravimetric	%	Gravimetric	%	Gravimetric	%	Gravimetric	%
1		0.3/0.4	10YR 5/1	18.5	16.0										
2		0.4/0.5	10YR 5/1	18.5	16.0										
3		0.5/0.6	10YR 5/1	18.5	16.0										
4		0.6/0.7	10YR 5/1	18.5	16.0										
5		0.7/0.8	10YR 5/1	18.5	16.0										
6		0.8/0.9	10YR 5/1	18.5	16.0										
7		0.9/1.0	10YR 5/1	18.5	16.0										
8		1.0/1.1	10YR 5/1	18.5	16.0										
9		1.1/1.2	10YR 5/1	18.5	16.0										
10		1.2/1.3	10YR 5/1	18.5	16.0										
11		1.3/1.4	10YR 5/1	18.5	16.0										
12		1.4/1.5	10YR 5/1	18.5	16.0										
13		1.5/1.6	10YR 5/1	18.5	16.0										
14		1.6/1.7	10YR 5/1	18.5	16.0										
15		1.7/1.8	10YR 5/1	18.5	16.0										
16		1.8/1.9	10YR 5/1	18.5	16.0										
17		1.9/2.0	10YR 5/1	18.5	16.0										
18		2.0/2.1	10YR 5/1	18.5	16.0										
19		2.1/2.2	10YR 5/1	18.5	16.0										
20		2.2/2.3	10YR 5/1	18.5	16.0										

CROSS				
Access Type	Same as Site No.	Test No.	Test	
Layer Status	Dominant Colour (Munsell Code)	Moisture Characteristics	Test	
	Horizon	Upper Average Depth (m)	Moisture	Test
	1	0.3/0.4	Wet	W1
	2	0.4/0.5	Wet	W2
	3	0.5/0.6	Wet	W3
	4	0.6/0.7	Wet	W4
	5	0.7/0.8	Wet	W5
	6	0.8/0.9	Wet	W6
	7	0.9/1.0	Wet	W7
	8	1.0/1.1	Wet	W8
Access Type	Same as Site No.	Test No.	Test	
	1	0.3/0.4	Wet	W1
	2	0.4/0.5	Wet	W2
	3	0.5/0.6	Wet	W3
	4	0.6/0.7	Wet	W4
	5	0.7/0.8	Wet	W5
	6	0.8/0.9	Wet	W6
	7	0.9/1.0	Wet	W7
	8	1.0/1.1	Wet	W8
	9	1.1/1.2	Wet	W9

SOIL PROPERTIES RECORD 'B'

Access Type

Same as Site No.

Test No.

0 0 0 1

SOIL PROPERTIES RECORD 'B'

BOUNDARY

DEPTH (mm)

NAME

TYPE

DESCRIPTION

REMARKS

STRUCTURE

GRADE

NAME

TYPE

DESCRIPTION

REMARKS

STONE

NAME

TYPE

DESCRIPTION

REMARKS

TEXTURE

GRADE

NAME

TYPE

DESCRIPTION

REMARKS

STRUCTURE

GRADE

NAME

TYPE

DESCRIPTION

REMARKS

STONE

NAME

TYPE

DESCRIPTION

REMARKS

TEXTURE

GRADE

NAME

TYPE

DESCRIPTION

REMARKS

STRUCTURE

GRADE

NAME

TYPE

DESCRIPTION

REMARKS

STONE

NAME

TYPE

DESCRIPTION

REMARKS

TEXTURE

GRADE

NAME

TYPE

DESCRIPTION

REMARKS

STRUCTURE

GRADE

NAME

TYPE

DESCRIPTION

REMARKS

STONE

NAME

TYPE

DESCRIPTION

REMARKS

TEXTURE

GRADE

NAME

TYPE

DESCRIPTION

REMARKS

STRUCTURE

GRADE

NAME

TYPE

DESCRIPTION

REMARKS

STONE

NAME

TYPE

DESCRIPTION

REMARKS

TEXTURE

GRADE

NAME

TYPE

DESCRIPTION

REMARKS

STRUCTURE

GRADE

NAME

TYPE

DESCRIPTION

REMARKS

STONE

NAME

TYPE

DESCRIPTION

REMARKS

TEXTURE

GRADE

NAME

TYPE

DESCRIPTION

REMARKS

STRUCTURE

GRADE

NAME

TYPE

DESCRIPTION

REMARKS

STONE

NAME

TYPE

DESCRIPTION

REMARKS

TEXTURE

GRADE

NAME

TYPE

DESCRIPTION

REMARKS

STRUCTURE

GRADE

NAME

TYPE

DESCRIPTION

REMARKS

STONE

NAME

TYPE

DESCRIPTION

REMARKS

TEXTURE

GRADE

NAME

TYPE

DESCRIPTION

REMARKS

STRUCTURE

GRADE

NAME

TYPE

DESCRIPTION

REMARKS

STONE

NAME

TYPE

DESCRIPTION

REMARKS

TEXTURE

GRADE

NAME

TYPE

DESCRIPTION

REMARKS

STRUCTURE

GRADE

NAME

TYPE

DESCRIPTION

REMARKS

STONE

NAME

TYPE

DESCRIPTION

REMARKS

TEXTURE

GRADE

NAME

TYPE

DESCRIPTION

REMARKS

STRUCTURE

GRADE

NAME

TYPE

DESCRIPTION

REMARKS

STONE

NAME

TYPE

DESCRIPTION

REMARKS

VENESS & ASSOCIATES PTY LIMITED

Environmental and Natural Resource Consultants

SOC N° 661 GRAFTON/CASINO/MURWILLUMBAH

DATE NO. 0901

spot

SUGARLOAF

Jmr

very wet
-inconsistency.

50% HOLE

465466791633

SOIL PROPERTIES RECORD 'A'

Access Type		Same as Site no	Test No. or Name			
0 0 0 1						
465406741033 SOIL PROPERTIES RECORD 'A'						
Layer Status		Dominant Colour (Munsell Code)	Moisture Characteristics		Test	
Horizon		Upper Average Depth (m)	Primary		Secondary	
			Moist	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	Moisture
			Wet	Wet	Dry	

Access Type		Same as Site No.	Test No.
Horizon	0 0 0 1		
	1	0.3/0.4	W1
	2	0.4/0.5	W2
	3	0.5/0.6	W3
	4	0.6/0.7	W4
	5	0.7/0.8	W5
	6	0.8/0.9	W6
	7	0.9/1.0	W7
	8	1.0/1.1	W8
	9	1.1/1.2	W9
Layer Status	10	1.2/1.3	W10
	11	1.3/1.4	W11
	12	1.4/1.5	W12
	13	1.5/1.6	W13
	14	1.6/1.7	W14
	15	1.7/1.8	W15
	16	1.8/1.9	W16
	17	1.9/2.0	W17
	18	2.0/2.1	W18
	19	2.1/2.2	W19
Dominant Colour (Munsell Code)	20	2.2/2.3	W20
	21	2.3/2.4	W21
	22	2.4/2.5	W22
	23	2.5/2.6	W23
	24	2.6/2.7	W24
	25	2.7/2.8	W25
	26	2.8/2.9	W26
	27	2.9/3.0	W27
	28	3.0/3.1	W28
	29	3.1/3.2	W29
Moisture Characteristics	30	3.2/3.3	W30
	31	3.3/3.4	W31
	32	3.4/3.5	W32
	33	3.5/3.6	W33
	34	3.6/3.7	W34
	35	3.7/3.8	W35
	36	3.8/3.9	W36
	37	3.9/4.0	W37
	38	4.0/4.1	W38
	39	4.1/4.2	W39
Test	40	4.2/4.3	W40
	41	4.3/4.4	W41
	42	4.4/4.5	W42
	43	4.5/4.6	W43
	44	4.6/4.7	W44
	45	4.7/4.8	W45
	46	4.8/4.9	W46
	47	4.9/5.0	W47
	48	5.0/5.1	W48
	49	5.1/5.2	W49

SOIL PROPERTIES RECORD 'B'

SOIL PROPERTIES RECORD 'B'

Access Type Same as Site No.
0 0 0 1

BOUNDARY DEFINITIONS

HA01 ☐ None
HA02 ☐ Shale 1420 mm
HA03 ☐ Clay 120-60 mm
HA04 ☐ Gravel 180-100 mm
HA05 ☐ Gravel 12-100 mm

SHAPE

HA01 ☐ None
HA02 ☐ None
HA03 ☐ None
HA04 ☐ None
HA05 ☐ None

TEXTURE AND FABRIC

FA01 ☐ Clay
FA02 ☒ Clay (fine)

GRADE

GB01 ☐ None
GB02 ☐ Laminar Sand
GB03 ☐ Laminar Sand
GB04 ☐ Laminar Sand
GB05 ☐ Laminar Sand
GB06 ☐ Laminar Sand
GB07 ☐ Laminar Sand
GB08 ☐ Laminar Sand
GB09 ☐ Laminar Sand
GB10 ☐ Laminar Sand
GB11 ☐ Laminar Sand
GB12 ☐ Laminar Sand
GB13 ☐ Laminar Sand
GB14 ☐ Laminar Sand
GB15 ☐ Laminar Sand
GB16 ☐ Laminar Sand
GB17 ☐ Laminar Sand
GB18 ☐ Laminar Sand
GB19 ☐ Laminar Sand
GB20 ☐ Laminar Sand

PLASTICITY TYPE

GA01 ☐ None
GA02 ☐ None
GA03 ☐ None
GA04 ☐ None
GA05 ☐ None
GA06 ☐ None
GA07 ☐ None
GA08 ☐ None
GA09 ☐ None
GA10 ☐ None
GA11 ☐ None
GA12 ☐ None
GA13 ☐ None
GA14 ☐ None
GA15 ☐ None
GA16 ☐ None
GA17 ☐ None
GA18 ☐ None
GA19 ☐ None
GA20 ☐ None

STRUCTURES

SP01 ☐ None
SP02 ☐ None
SP03 ☐ None
SP04 ☐ None
SP05 ☐ None
SP06 ☐ None
SP07 ☐ None
SP08 ☐ None
SP09 ☐ None
SP10 ☐ None
SP11 ☐ None
SP12 ☐ None
SP13 ☐ None
SP14 ☐ None
SP15 ☐ None
SP16 ☐ None
SP17 ☐ None
SP18 ☐ None
SP19 ☐ None
SP20 ☐ None

WATER TABLE

WA01 ☐ None
WA02 ☐ None
WA03 ☐ None
WA04 ☐ None
WA05 ☐ None
WA06 ☐ None
WA07 ☐ None
WA08 ☐ None
WA09 ☐ None
WA10 ☐ None
WA11 ☐ None
WA12 ☐ None
WA13 ☐ None
WA14 ☐ None
WA15 ☐ None
WA16 ☐ None
WA17 ☐ None
WA18 ☐ None
WA19 ☐ None
WA20 ☐ None

CONSEQUENCE OF REMEDIATION

TA01 ☐ None
TA02 ☐ None
TA03 ☐ None
TA04 ☐ None
TA05 ☐ None
TA06 ☐ None
TA07 ☐ None
TA08 ☐ None
TA09 ☐ None
TA10 ☐ None
TA11 ☐ None
TA12 ☐ None
TA13 ☐ None
TA14 ☐ None
TA15 ☐ None
TA16 ☐ None
TA17 ☐ None
TA18 ☐ None
TA19 ☐ None
TA20 ☐ None

REACHING TEXT

RE01 ☐ None
RE02 ☐ None
RE03 ☐ None
RE04 ☐ None
RE05 ☐ None
RE06 ☐ None
RE07 ☐ None
RE08 ☐ None
RE09 ☐ None
RE10 ☐ None
RE11 ☐ None
RE12 ☐ None
RE13 ☐ None
RE14 ☐ None
RE15 ☐ None
RE16 ☐ None
RE17 ☐ None
RE18 ☐ None
RE19 ☐ None
RE20 ☐ None

STRUCTURE GRADE

US01 ☐ None
US02 ☐ None
US03 ☐ None
US04 ☐ None
US05 ☐ None

PROPERTY

US01 ☐ None
US02 ☐ None
US03 ☐ None
US04 ☐ None
US05 ☐ None
US06 ☐ None
US07 ☐ None
US08 ☐ None
US09 ☐ None
US10 ☐ None

PROPERTY

US01 ☐ None
US02 ☐ None
US03 ☐ None
US04 ☐ None
US05 ☐ None
US06 ☐ None
US07 ☐ None
US08 ☐ None
US09 ☐ None
US10 ☐ None

PROPERTY

US01 ☐ None
US02 ☐ None
US03 ☐ None
US04 ☐ None
US05 ☐ None
US06 ☐ None
US07 ☐ None
US08 ☐ None
US09 ☐ None
US10 ☐ None

PROPERTY

US01 ☐ None
US02 ☐ None
US03 ☐ None
US04 ☐ None
US05 ☐ None
US06 ☐ None
US07 ☐ None
US08 ☐ None
US09 ☐ None
US10 ☐ None

PROPERTY

US01 ☐ None
US02 ☐ None
US03 ☐ None
US04 ☐ None
US05 ☐ None
US06 ☐ None
US07 ☐ None
US08 ☐ None
US09 ☐ None
US10 ☐ None

PROPERTY

US01 ☐ None
US02 ☐ None
US03 ☐ None
US04 ☐ None
US05 ☐ None
US06 ☐ None
US07 ☐ None
US08 ☐ None
US09 ☐ None
US10 ☐ None

PROPERTY

US01 ☐ None
US02 ☐ None
US03 ☐ None
US04 ☐ None
US05 ☐ None
US06 ☐ None
US07 ☐ None
US08 ☐ None
US09 ☐ None
US10 ☐ None

PROPERTY

US01 ☐ None
US02 ☐ None
US03 ☐ None
US04 ☐ None
US05 ☐ None
US06 ☐ None
US07 ☐ None
US08 ☐ None
US09 ☐ None
US10 ☐ None

PROPERTY

US01 ☐ None
US02 ☐ None
US03 ☐ None
US04 ☐ None
US05 ☐ None
US06 ☐ None
US07 ☐ None
US08 ☐ None
US09 ☐ None
US10 ☐ None

PROPERTY

US01 ☐ None
US02 ☐ None
US03 ☐ None
US04 ☐ None
US05 ☐ None
US06 ☐ None
US07 ☐ None
US08 ☐ None
US09 ☐ None
US10 ☐ None

PROPERTY

US01 ☐ None
US02 ☐ None
US03 ☐ None
US04 ☐ None
US05 ☐ None
US06 ☐ None
US07 ☐ None
US08 ☐ None
US09 ☐ None
US10 ☐ None

PROPERTY

US01 ☐ None
US02 ☐ None
US03 ☐ None
US04 ☐ None
US05 ☐ None
US06 ☐ None
US07 ☐ None
US08 ☐ None
US09 ☐ None
US10 ☐ None

PROPERTY

US01 ☐ None
US02 ☐ None
US03 ☐ None
US04 ☐ None
US05 ☐ None
US06 ☐ None
US07 ☐ None
US08 ☐ None
US09 ☐ None
US10 ☐ None

PROPERTY

US01 ☐ None
US02 ☐ None
US03 ☐ None
US04 ☐ None
US05 ☐ None
US06 ☐ None
US07 ☐ None
US08 ☐ None
US09 ☐ None
US10 ☐ None

PROPERTY

US01 ☐ None
US02 ☐ None
US03 ☐ None
US04 ☐ None
US05 ☐ None
US06 ☐ None
US07 ☐ None
US08 ☐ None
US09 ☐ None
US10 ☐ None

PROPERTY

US01 ☐ None
US02 ☐ None
US03 ☐ None
US04 ☐ None
US05 ☐ None
US06 ☐ None
US07 ☐ None
US08 ☐ None
US09 ☐ None
US10 ☐ None

PROPERTY

US01 ☐ None
US02 ☐ None
US03 ☐ None
US04 ☐ None
US05 ☐ None
US06 ☐ None
US07 ☐ None
US08 ☐ None
US09 ☐ None
US10 ☐ None

PROPERTY

US01 ☐ None
US02 ☐ None
US03 ☐ None
US04 ☐ None
US05 ☐ None
US06 ☐ None
US07 ☐ None
US08 ☐ None
US09 ☐ None
US10 ☐ None

PROPERTY

US01 ☐ None
US02 ☐ None
US03 ☐ None
US04 ☐ None
US05 ☐ None
US06 ☐ None
US07 ☐ None
US08 ☐ None
US09 ☐ None
US10 ☐ None

VENESS & ASSOCIATES PTY LIMITED

Environmental and Natural Resource Consultants

JOB N° 661 GRAFTON/CASINO/MURWILLAH

SITE No. 0803

FULL

SUGARLOAF

JLM (1:100-651)

4628 30 6797186

SOIL PROPERTIES RECORD 'A'

Layer No.	Horizon	Lower Average Depth (m)	Dominant Colour (Munsell Code)	Moisture Characteristics	Texture
1	2	3	4	5	6
1	1A	0.00	5YR 10/2		S16-6
2	2R	0.10	5YR 10/2		S16-6
3	3R	0.20	5YR 10/2		S16-6
4	4R	0.30	5YR 10/2		S16-6
5	5R	0.40	5YR 10/2		S16-6
6	6R	0.50	5YR 10/2		S16-6
7	7R	0.60	5YR 10/2		S16-6
8	8R	0.70	5YR 10/2		S16-6
9	9R	0.80	5YR 10/2		S16-6
10	10R	0.90	5YR 10/2		S16-6
11	11R	1.00	5YR 10/2		S16-6

Layer No.	Horizon	Lower Average Depth (m)	Dominant Colour (Munsell Code)	Moisture Characteristics	Texture
1	2	3	4	5	6
1	1A	0.00	5YR 10/2		S16-6
2	2R	0.10	5YR 10/2		S16-6
3	3R	0.20	5YR 10/2		S16-6
4	4R	0.30	5YR 10/2		S16-6
5	5R	0.40	5YR 10/2		S16-6
6	6R	0.50	5YR 10/2		S16-6
7	7R	0.60	5YR 10/2		S16-6
8	8R	0.70	5YR 10/2		S16-6
9	9R	0.80	5YR 10/2		S16-6
10	10R	0.90	5YR 10/2		S16-6
11	11R	1.00	5YR 10/2		S16-6

SOIL PROPERTIES RECORD 'B'

Layer No.	Horizon	Lower Average Depth (m)	Dominant Colour (Munsell Code)	Moisture Characteristics	Texture
1	2	3	4	5	6
1	1A	0.00	5YR 10/2		S16-6
2	2R	0.10	5YR 10/2		S16-6
3	3R	0.20	5YR 10/2		S16-6
4	4R	0.30	5YR 10/2		S16-6
5	5R	0.40	5YR 10/2		S16-6
6	6R	0.50	5YR 10/2		S16-6
7	7R	0.60	5YR 10/2		S16-6
8	8R	0.70	5YR 10/2		S16-6
9	9R	0.80	5YR 10/2		S16-6
10	10R	0.90	5YR 10/2		S16-6
11	11R	1.00	5YR 10/2		S16-6

VENESS & ASSOCIATES PTY LIMITED

Environmental and Natural Resource Consultants

JOB N° 661 GRAFTON/CASINO/MURWILLAH

SITE No. 0801

Spot

SUGARLOAF

JLM

467739 68 60193

SOIL PROPERTIES RECORD 'A'

Layer No.	Horizon	Lower Average Depth (m)	Dominant Colour (Munsell Code)	Moisture Characteristics	Texture
1	2	3	4	5	6
1	1A	0.00	5YR 10/2		S16-6
2	2R	0.10	5YR 10/2		S16-6
3	3R	0.20	5YR 10/2		S16-6
4	4R	0.30	5YR 10/2		S16-6
5	5R	0.40	5YR 10/2		S16-6
6	6R	0.50	5YR 10/2		S16-6
7	7R	0.60	5YR 10/2		S16-6
8	8R	0.70	5YR 10/2		S16-6
9	9R	0.80	5YR 10/2		S16-6
10	10R	0.90	5YR 10/2		S16-6
11	11R	1.00	5YR 10/2		S16-6

Layer No.	Horizon	Lower Average Depth (m)	Dominant Colour (Munsell Code)	Moisture Characteristics	Texture
1	2	3	4	5	6
1	1A	0.00	5YR 10/2		S16-6
2	2R	0.10	5YR 10/2		S16-6
3	3R	0.20	5YR 10/2		S16-6
4	4R	0.30	5YR 10/2		S16-6
5	5R	0.40	5YR 10/2		S16-6
6	6R	0.50	5YR 10/2		S16-6
7	7R	0.60	5YR 10/2		S16-6
8	8R	0.70	5YR 10/2		S16-6
9	9R	0.80	5YR 10/2		S16-6
10	10R	0.90	5YR 10/2		S16-6
11	11R	1.00	5YR 10/2		S16-6

SOIL PROPERTIES RECORD 'B'

Layer No.	Horizon	Lower Average Depth (m)	Dominant Colour (Munsell Code)	Moisture Characteristics	Texture
1	2	3	4	5	6
1	1A	0.00	5YR 10/2		S16-6
2	2R	0.10	5YR 10/2		S16-6
3	3R	0.20	5YR 10/2		S16-6
4	4R	0.30	5YR 10/2		S16-6
5	5R	0.40	5YR 10/2		S16-6
6	6R	0.50	5YR 10/2		S16-6
7	7R	0.60	5YR 10/2		S16-6
8	8R	0.70	5YR 10/2		S16-6
9	9R	0.80	5YR 10/2		S16-6
10	10R	0.90	5YR 10/2		S16-6
11	11R	1.00	5YR 10/2		S16-6

VENESS & ASSOCIATES PTY LIMITED

Environmental and Natural Resource Consultants

PERMIT PLAN 444

SITE No. 1903

661 MURWILLUMBAH

UF2

Full Tr NULLUM 546606841164

Kronum Page 2d/ Techo bookend road

Layer Status	Layer Name	Layer Code	Material	Thickness	Notes
1	Topsoil	1A	150-154	150-154	
2	Subsoil	2A	150-154	150-154	
3	Base	3A	150-154	150-154	
4	Subgrade	4A	150-154	150-154	
5	Foundation	5A	150-154	150-154	

SURFACE CONDITIONS

Crust
Moist set
Not hard set

Upper ring ~ 15%

BOUNDARY

1A1
1A2
1A3
1A4
1A5

STRUCTURE

1A1
1A2
1A3
1A4
1A5

STONE

1A1
1A2
1A3
1A4
1A5

TEXTURE

1A1
1A2
1A3
1A4
1A5

TEXTURE

1A1
1A2
1A3
1A4
1A5

TEXTURE

1A1
1A2
1A3
1A4
1A5

PLASTICITY TYPE

1A1
1A2
1A3
1A4
1A5

PLASTICITY TYPE

1A1
1A2
1A3
1A4
1A5

PLASTICITY TYPE

1A1
1A2
1A3
1A4
1A5

STICKINESS

1A1
1A2
1A3
1A4
1A5

STICKINESS

1A1
1A2
1A3
1A4
1A5

STICKINESS

1A1
1A2
1A3
1A4
1A5

COMPRESSIVE

1A1
1A2
1A3
1A4
1A5

COMPRESSIVE

1A1
1A2
1A3
1A4
1A5

COMPRESSIVE

1A1
1A2
1A3
1A4
1A5

REMARKS

1A1
1A2
1A3
1A4
1A5

REMARKS

1A1
1A2
1A3
1A4
1A5

REMARKS

1A1
1A2
1A3
1A4
1A5

VENESS & ASSOCIATES PTY LIMITED

Environmental and Natural Resource Consultants

PERMIT PLAN 444

SITE No. 1902

661 MURWILLUMBAH

UF2

Split Tr NULLUM 53934684319d

Mondary Rd

Layer Status	Layer Name	Layer Code	Material	Thickness	Notes
1	Topsoil	1A	150-154	150-154	
2	Subsoil	2A	150-154	150-154	
3	Base	3A	150-154	150-154	
4	Subgrade	4A	150-154	150-154	
5	Foundation	5A	150-154	150-154	

SURFACE CONDITIONS

Crust
Moist set
Not hard set

Upper ring in him volume pattern above ascompant

BOUNDARY

1A1
1A2
1A3
1A4
1A5

STRUCTURE

1A1
1A2
1A3
1A4
1A5

STONE

1A1
1A2
1A3
1A4
1A5

TEXTURE

1A1
1A2
1A3
1A4
1A5

TEXTURE

1A1
1A2
1A3
1A4
1A5

TEXTURE

1A1
1A2
1A3
1A4
1A5

PLASTICITY TYPE

1A1
1A2
1A3
1A4
1A5

PLASTICITY TYPE

1A1
1A2
1A3
1A4
1A5

PLASTICITY TYPE

1A1
1A2
1A3
1A4
1A5

STICKINESS

1A1
1A2
1A3
1A4
1A5

STICKINESS

1A1
1A2
1A3
1A4
1A5

STICKINESS

1A1
1A2
1A3
1A4
1A5

COMPRESSIVE

1A1
1A2
1A3
1A4
1A5

COMPRESSIVE

1A1
1A2
1A3
1A4
1A5

COMPRESSIVE

1A1
1A2
1A3
1A4
1A5

REMARKS

1A1
1A2
1A3
1A4
1A5

REMARKS

1A1
1A2
1A3
1A4
1A5

REMARKS

1A1
1A2
1A3
1A4
1A5

APPENDIX 2

SEMGL based Soil Erodibility Classification

CASINO / MURWILLUMBAH EIS SOILS

Soil Erodibility based on Appendix 1 (ii) of the SEMGL's

SOIL MAPPING UNIT A – (soils formed on alluvials)

CHARACTERISTIC	TOPSOIL	CLASS	SUBSOIL	CLASS
ORGANIC MATTER	Range 1.39 – 20.5%; (av. 10.95%); >3%	LOW		n.a.
TEXTURE	L1 – SiCL/SLC/FSCL/SCL/Lfsy/SCL/SL (A,A11 – always)* L2 SCL-/SiLC (A12 – uncommon) L3 – SCL/FSCL/CS (A2 – common; usually bleached) MOD?	LOW	L4 – LC (B1 – sometimes) L5 – LC TO LMC (B2,B21 – always) L6 – LMC (B22 – rare) L7 – LC (D1 – rare)	LOW – MOD MOD?
STRUCTURE	moderately well structured / non-dispersive	LOW	well structured	LOW – MOD
EAT	A1 – 8; A11 – 8; A12 – 8 A2 – 2(1)	LOW MOD	B2 – 2(1), 3(2)	MOD
NORTHCOTE	Uf 6.2*, 6.3*; Gn 2.9*, 3.0, 3.1, 3.4, 3.7 Dy 4.1*, 5.3*, 5.4*	LOW MOD?		
GSG	Structured plastic clays*, Yellow podzolic soil	MOD		
GEOLOGY	alluvial mud, silt, sand, gravel	HIGH		

* = not catered for in the table in Appendix 1 (ii)

CONCLUSION: According to the table in Appendix 1 (ii) of the SEMGL's, the soils represented by this soil mapping unit have a generally low to moderate soil erodibility classification.

CASINO / MURWILLUMBAH EIS SOILS

Soil Erodibility based on Appendix 1 (ii) of the SEMGL's

SOIL MAPPING UNIT B – (soils formed on basalts)

CHARACTERISTIC	TOPSOIL	CLASS	SUBSOIL	CLASS
ORGANIC MATTER	Range 4.41 – 9.39%; (av.6.69); >3%	LOW		n.a.
TEXTURE	L1 – CL/SiCL (A,A1,A11 – always) L2 – FSCL/SiC (A12 – rare) L3 – LC/SiLC (A2 – uncommon; unbleached)	LOW LOW MOD?	L4 – LC/LMC/MC (B1 – uncommon) L5 – LMC/SiLC/HC (B2 – always) L6 – LMC/MC/LC (B3 – uncommon) L7 – LMC (BC – rare)	LOW LOW – MOD
STRUCTURE	well structured / non-dispersive	LOW	well structured	MOD
EAT	A,A1 – 8, 8, 3(2), 8, 8, 2(1) A12 – 3(3); A2 – 3(1)	LOW – MOD	B1 – 3(2), 5, 2(1) B2 – 6, 3(1), 3(1), 2(1), 5, 2(1) B3 – 3(3), 3(3), 3(3)	LOW – MOD LOW-MOD-HIGH MOD
NORTHCOTE	Uf 5.3; Gn 3.1, 3.2, 4.5; Dr 4.1, 4.2	LOW		
GSG	Structured plastic clays*, Krasnozems Chocolate soils	LOW LOW		
GEOLOGY	trachyte, basalt, tuff*, agglomerate*	MOD – LOW		

* = not catered for in the table in Appendix 1 (ii)

CONCLUSION:

According to the table in Appendix 1 (ii) of the SEMGL's, the soils represented by this soil mapping unit have a generally low, but sometimes moderate, soil erodibility classification. The topsoil layers generally have a low classification, while the subsoils have a low to moderate classification.

CASINO / MURWILLUMBAH EIS SOILS

Soil Erodibility based on Appendix 1 (ii) of the SEMGL's

SOIL MAPPING UNIT D – (soils formed on granitoids)

CHARACTERISTIC	TOPSOIL	CLASS	SUBSOIL	CLASS
ORGANIC MATTER	Range 3.3 – 8.82%; (av. 6.06%); >3%	LOW		n.a.
TEXTURE	L1 – SiLC/LC (A,A1,A11 – always) L2 – LC/LMC/SCL (A12 – sometimes) L3 – SCL/LC/SiCL (A2 – common; unbleached) L4 – SCL (A3 – rare)	LOW LOW	L5 – LC/LMC/MC (B1 – common) L6 – LC/LMC (B2 – always) L7 – LC (BC – rare)	LOW – MOD?
STRUCTURE	well structured / non-dispersive	LOW	well structured	LOW – MOD
EAT	A1,A11,A12 – 8, 8 A2 – 2(1), 8; A3 – 8	LOW LOW – MOD	B1 – 3(2), 2(1) B2 – 2(1), 3(1), 2(1)	MOD – HIGH
NORTHCOTE	Gn 3.1; Dr 4.1; Uf 4.4*, 5.1, 6.2*	LOW		
GSG	Structured plastic & sub-plastic clays*, Krasnozems Yellow podzolic soils	LOW MOD		
GEOLOGY	granodiorite, porphyritic adamellite*	HIGH		

* = not catered for in the table in Appendix 1 (ii)

CONCLUSION: According to the table in Appendix 1 (ii) of the SEMGL's, the soils represented by this soil mapping unit have a generally low to moderate soil erodibility classification.

CASINO / MURWILLUMBAH EIS SOILS

Soil Erodibility based on Appendix 1 (ii) of the SEMGL's

SOIL MAPPING UNIT C - (soils formed on metasediments)

CHARACTERISTIC	TOPSOIL	CLASS	SUBSOIL	CLASS
ORGANIC MATTER	Range 7.11 - 15.3%; (av. 11.1%); >3%	LOW		n.a.
TEXTURE	L1 - SiLC/LC (A - always)	LOW	L2 - LC/LMC (B1,B11 - usually) L3 - LMC (B12 - sometimes) L4 - LC/LMC (B2 - always) L5 - LMC (B3,BC - sometimes)	LOW - MOD?
STRUCTURE	well structured / non-dispersive	LOW	well structured	LOW
EAT	A - 8	LOW	B11 - 3(2); B12 - 3(1); B2 - 2(1), 2(2)	MOD
NORTHCOTE	Uf 5.2, 6.2*, 6.3*	LOW		
GSG	Structured plastic clays* Krasnozems	LOW		
GEOLOGY	argillite*, phyllite, slate, greywacke intermediate volcanics*, quartz*	MOD		

* = not catered for in the table in Appendix 1 (ii)

CONCLUSION: According to the table in Appendix 1 (ii) of the SEMGL's, the soils represented by this soil mapping unit have a generally low but sometimes moderate soil erodibility classification. The topsoil layers have a low classification, while the subsoils have a low to moderate classification.

CASINO / MURWILLUMBAH EIS SOILS

Soil Erodibility based on Appendix 1 (ii) of the SEMGL's

SOIL MAPPING UNIT E – (soils formed on Grafton Formation)

CHARACTERISTIC	TOPSOIL	CLASS	SUBSOIL	CLASS
ORGANIC MATTER	Range 3.38 – 13%; (av. 7.06%); >3%	LOW		n.a.
TEXTURE	L1 – SL – FSCL (FSL/SCL/SiCL) (A,A1,A11 – always) * L2 – FSCL/SCL/LC (A12 – common) L3 – LC/SLC (S-HC)(A2,A21 – common; bleached/unbleached) L4 – FSL (A22 – rare) L5 – LS (A3 – rare)	MOD – HIGH MOD MOD	L6 – SCL/FSL/LC (B1 – rare) L7 – LMC/LC/HCL (CSL/FSL/SCL/FSCL/SLC)(B2 – always) L8 – LMC (B22 – rare) L9 – LMC/HCL (B3 – common)	MOD MOD HIGH?
STRUCTURE	weak to well structured / non-dispersive	LOW	well structured	LOW – MOD
EAT	A1,A11, – 2(1), 8, 2(1) A12 – 2(1); A2 – 2(1), 2(3), 2(1)	LOW MOD	B2 – 2(1), 2(1), 2(1) B3 – 2(1), 2(3)	MOD – HIGH
NORTHCOTE	Gn 2.2*, 2.4*, 3.0, 3.1, 3.2, 3.9 Dr 1.1*, 4.1, 4.4, 5.1*, 5.4* Dy 1.4*, 5.1*, 5.4*	LOW LOW – MOD MOD?		
GSG	Chocolate soils, Euchrozems Yellow podzolic soils, Yellow-brown earths Red and Yellow podzolic soils Lateritic podzolic soils*, Minimal prairie soils*	LOW – MOD MOD		
GEOLOGY	lithic sandstone, siltstone, claystone? minor coal	HIGH MOD LOW		

* = not catered for in the table in Appendix 1 (ii)

CONCLUSION: According to the table in Appendix 1 (ii) of the SEMGL's, the soils represented by this soil mapping unit have a low to moderate soil erodibility classification. The topsoil layers generally have a low to moderate classification, while the subsoils have a moderate classification.

CASINO / MURWILLUMBAH EIS SOILS

Soil Erodibility based on Appendix 1 (ii) of the SEMGL's

SOIL MAPPING UNIT F – (soils formed on Kangaroo Creek sandstones)

CHARACTERISTIC	TOPSOIL	CLASS	SUBSOIL	CLASS
ORGANIC MATTER	Range 2.02 – 8.26%; (av. 5.14%); >3%	LOW		n.a.
TEXTURE	L1 – LS/SL/FSCL (A,A1,A11 – always) L2 – CS/LS/SCL/Lfsy (A12 – occasional) L3 – LS/CS/SCL (A2–common;bleached/unbleached) L4 – CS/SiLC (A3 – rare)	* * * MOD – * MOD?	L5 – CS/SCL/LC (B1 – sometimes) L6 – CS/SLC/LMC (B2/B21 – always) L7 – SLC/LS (B22 – rare) L8 – LMC/LS (B3 – occasional)	* * MOD? * LOW – MOD?
STRUCTURE	weak to moderately structured / non-dispersive	LOW – MOD	well structured	MOD?
EAT	A1,A11 – 8, 8 A2 – 3(2)	LOW MOD	B1 – 2(1); B21 – 2(2); B22 – 2(2); B3 – 2(2)	MOD
NORTHCOTE	Uc 4.2*, 6*, 6.1*; Gn 2.1*, 2.2*, 3.1, 3.2 Dr 5.1*, 5.2*; Dy 1.1*, 4.1*, 4.2*, 5.2*, 5.3*, 5.4* Db 3.4	LOW MOD? LOW		
GSG	Krasnozems, Sands*, Structured sands* Red & Yellow podzolic soils; Yellow & Red earths	LOW MOD		
GEOLOGY	quartz sandstone*, feldspathic quartz sandstone siltstone	MOD		

* = not catered for in the table in Appendix 1 (ii)

CONCLUSION: According to the table in Appendix 1 (ii) of the SEMGL's, the soils represented by this soil mapping unit have a low to moderate soil erodibility classification. Both the topsoil and subsoil layers generally have a low to moderate classification.

CASINO / MURWILLUMBAH EIS SOILS

Soil Erodibility based on Appendix 1 (ii) of the SEMGL's

SOIL MAPPING UNIT G – (soils formed on Walloon Coal Measures)

CHARACTERISTIC	TOPSOIL	CLASS	SUBSOIL	CLASS
ORGANIC MATTER	Range 2.83 – 7.06%; (av. 5.36%); >3%	LOW		n.a.
TEXTURE	L1 – LC/SCL/CL/SiLC (A,A1,A11 – always) L2 – SCL/CL/LC (A12 – rare) L3 – SCL/SCL/LC (A2 – sometimes; bleached)	LOW – MOD MOD MOD-HIGH	L4 – LMC/LC/SCL (B1 – sometimes) L5 – LC/LMC (B2,B21 – always) L6 – LC/LMC (B22 – rare) L7 – LC/LMC (B3 – common)	LOW LOW – MOD
STRUCTURE	moderately structured	LOW – MOD	well structured	MOD
EAT	A,A1,A11 – 8, 2(2), 2(1), 3(2), 8, 8 A12 – 3(2), 2(1); A2 – 2(1), 2(2)	LOW – MOD MOD	B1 – 2(1) B21 – 2(1) B22,B2 – 3(3), 5, 2(1), 2(1), 2(2), 2(2)	LOW – MOD – HIGH
NORTHCOTE	Uf 5.2, 5.3, 6.3* Gn 3.1, 3.8, 3.9 Dr 2.2*, 4.1, 4.2, 5.1*, 5.2* Db 0.4	LOW LOW LOW MOD?		
GSG	Structured plastic and sub-plastic clays* Krasnozems, Xanthozems, Chocolate soils Yellow and Red podzolic soils	LOW MOD		
GEOLOGY	sandstone*, shale*, coal siltstone	LOW MOD		

* = not catered for in the table in Appendix 1 (ii)

CONCLUSION: According to the table in Appendix 1 (ii) of the SEMGL's, the soils represented by this soil mapping unit have a low to moderate soil erodibility classification.

CASINO / MURWILLUMBAH EIS SOILS

Soil Erodibility based on Appendix 1 (ii) of the SEMGL's

SOIL MAPPING UNIT H – (soils formed on Marburg Sediments)

CHARACTERISTIC	TOPSOIL	CLASS	SUBSOIL	CLASS
ORGANIC MATTER	Range 3.94 – 7.37%; (av. 5.79%); >3%	LOW		n.a.
TEXTURE	L1 – LStoLC(SL/SCL/Lfsy/SiCL/FSCL)(A,A1, – always) * L2 – SCL/SCL (A2 – sometimes; bleached)	MOD?	L3 – FSCL/SiLC/MC (B1 – common) L4 – LC – LMC (SL/SiLC/MC) (B2,B21 – always) L5 – LMC (B22 – rare) L6 – LMC (B3 – sometimes)	LOW MOD MOD
STRUCTURE	weak to well structured / non- to slight dispersive	LOW – MOD	well structured	LOW – MOD
EAT	A,A1 – 2(1), 3(2), 8, 2(1) A2 – 2(1)	LOW – MOD MOD	B2 – 3(3), 2(2), 2(1), 2(2) B3 – 3(2), 2(2)	MOD MOD
NORTHCOTE	Uf 5.3; Gn 2.2*, 3.1 Dy 4.1*, 5.2*, 5.4*	LOW – MOD?		
GSG	Krasnozems Yellow podzolic soils; Yellow earths	LOW MOD		
GEOLOGY	sandstone*, shale* conglomerate*	* MOD?		

* = not catered for in the table in Appendix 1 (ii)

CONCLUSION:

According to the table in Appendix 1 (ii) of the SEMGL's, the soils represented by this soil mapping unit have a generally low to moderate soil erodibility classification. The topsoil and subsoil layers generally have a low to moderate classification.

CASINO / MURWILLUMBAH EIS SOILS

Soil Erodibility based on Appendix 1 (ii) of the SEMGL's

SOIL MAPPING UNIT I – (soils formed on volcanics)

CHARACTERISTIC	TOPSOIL	CLASS	SUBSOIL	CLASS
ORGANIC MATTER	Range 5.04 – 16.4%; (av. 10.1%); >3%	LOW		n.a.
TEXTURE	L1 – SiCL/SiLC/SCL/LC (A,A1,A11 – always) L2 – SiLC/LC (SCL) (A12 – uncommon) L3 – SiLC/LC/SCL/LMC (A2-sometimes;bleached/unbleached)MOD	LOW LOW MOD	L4 – LC/LMC/SiLC (B1,B11 – sometimes) L5 – LMC (B12 – rare) L6 – LC/LMC/(SLC/SiLC) (B2 – always) L7 – LC/LMC (B3 – rare)	LOW – MOD LOW LOW – MOD MOD
STRUCTURE	well structured / non-dispersive	LOW	well structured	LOW –MOD
EAT	A,A1,A11 – 8, 8, 8, 8, 3(2) A12 – 8 A2 – 2(1), 3(1), 2(1)	LOW – MOD LOW MOD	B1,B11 – 2(1), 2(1), 8, 3(1) B12 – 6; B2 – 5, 5, 2(1), 3(3), 2(1) B3 – 5	LOW – MOD LOW – MOD MOD
NORTHCOTE	Uf 2*, 5.2, 6.2*, 6.3* Gn 3.1, 3.7, 4.8; Dr 4.4 Dy 4.1*	LOW LOW MOD?		
GSG	Structured plastic and sub-plastic clays* Krasnozems Red and Yellow podzolic soils	* LOW MOD		
GEOLOGY	rhyolite*, tuff*, claystone*, obsidian*, pitchstone* basalt, agglomerate*, andesite*	* LOW		

* = not catered for in the table in Appendix 1 (ii)

CONCLUSION: According to the table in Appendix 1 (ii) of the SEMGL's, the soils represented by this soil mapping unit have low, but sometimes moderate, soil erodibility classification. Both the topsoil and subsoil layers generally have a low to sometimes moderate classification.

APPENDIX 3

SEMGL based Erosion Hazard Classification

CASINO / MURWILLUMBAH EIS SOILS STUDY
Soil Erosion Hazard based on Appendix 2 (ii) of the SEMGL's

SOIL MAPPING UNIT A – (soils formed on alluvials)

Erodibility (SEMGL App 1)	SEMGL Appendix 2 Erosivities	State Forest	Maximum Slope (degrees)	Erosion Hazard Class
low to moderate*	<4000	pt Eden Creek	<1	Moderate
		SF north of Royal Camp	<1	Moderate
		Royal Camp	<1	Moderate
		Mount Marsh	6	Moderate
		Carwong	2	Moderate
		Braemar	<1	Moderate
		Ellangowan	<1	Moderate
		Myrtle	<1	Moderate
		Whiporie	<1	Moderate
		Camira	3	Moderate
		Banyabba	1	Moderate
		Gibberagee	<1	Moderate
		Mount Belmore	6	Moderate
		Bungawalbin	<1	Moderate
		Doubleduke	1	Moderate
		Tabbimoble	<1	Moderate
		Devils Pulpit	1	Moderate
		Mororo	5	Moderate
		pt Gibberagee	1	Moderate

*while the soil erodibility for this unit is low to moderate, the "worst case" moderate class has been used for this table

CONCLUSION: According to the table in Appendix 2 (ii) of the SEMGL's, the soils represented by this soil mapping unit have a moderate "maximum" erosion hazard class.

CASINO / MURWILLUMBAH EIS SOILS STUDY

Soil Erosion Hazard based on Appendix 2 (ii) of the SEMGL's

SOIL MAPPING UNIT B – (soils formed on basalts)

Erodibility (SEMGL App 1)	SEMGL Appendix 2 Erosivities	State Forest	Maximum Slope (degrees)	Erosion Hazard Class
low, sometimes moderate	<4000	Richmond Range	18	Moderate
		Eden Creek	14	Moderate
		pt Eden Creek	22	Moderate
		Boorabee	39	High
		Bungabee	26	High
		Cherry Tree North	26	High
		Mount Belmore	12	Moderate
		Mount Marsh	15	Moderate
		pt Gibberagee	10	Moderate
	<6000	Boorabee	32	Extreme
		Mebbin	45	Extreme
	<8000	Wollumbin	30	Extreme
		Nullum	21	High
		Goonengarry	17	High
		Whian Whian	32	Extreme

CONCLUSION: According to the table in Appendix 2 (ii) of the SEMGL's, the soils represented by this soil mapping unit have "maximum" erosion hazard classes ranging from moderate to extreme.

CASINO / MURWILLUMBAH EIS SOILS STUDY

Soil Erosion Hazard based on Appendix 2 (ii) of the SEMGL's

SOIL MAPPING UNIT C – (soils formed on metasediments)

Erodibility (SEMGL App 1)	SEMGL Appendix 2 Erosivities	State Forest	Maximum Slope (degrees)	Erosion Hazard Class
low, sometimes moderate	<2000	Ewingar	25	Moderate
	<4000	Ewingar	29	High
		Billilimbra	18	Moderate
		Washpool	31	High
		pt Washpool	23	Moderate
	<8000	Mooball	29	Extreme
		Burringbar	34	Extreme
		Nullum	39	Extreme

CONCLUSION: According to the table in Appendix 2 (ii) of the SEMGL's, the soils represented by this soil mapping unit have "maximum" erosion hazard classes ranging from moderate to extreme.

CASINO / MURWILLUMBAH EIS SOILS STUDY

Soil Erosion Hazard based on Appendix 2 (ii) of the SEMGL's

SOIL MAPPING UNIT D – (soils formed on granitoids)

Erodibility (SEMGL App 1)	SEMGL Appendix 2 Erosivities	State Forest	Maximum Slope (degrees)	Erosion Hazard Class
low to moderate*	<2000	Ewingar	28 – 37	High
		Billilimbra	24	Moderate
	<4000	Ewingar	27	Extreme
		Billilimbra	27	Extreme

* while the soil erodibility for this unit is low to moderate, the "worst case" moderate class has been used for this table

CONCLUSION: According to the table in Appendix 2 (ii) of the SEMGL's, the soils represented by this soil mapping unit have "maximum" erosion hazard classes ranging from moderate to extreme.

CASINO / MURWILLUMBAH EIS SOILS STUDY

Soil Erosion Hazard based on Appendix 2 (ii) of the SEMGL's

SOIL MAPPING UNIT E – (soils formed on Grafton Formation)

Erodibility (SEMGL App 1)	SEMGL Appendix 2. Erosivities	State Forest	Maximum Slope (degrees)	Erosion Hazard Class
low to moderate*	<4000	Royal Camp	4	Moderate
		Fullers	6	Moderate
		Carwong	7	Moderate
		Braemar	14	Moderate
		Ellangowan	9	Moderate
		Myrtle	7	Moderate
		Whiporie	1.5	Moderate
		Camira	10	Moderate
		Banyabba	9	Moderate
		Gibberagee	17	High
		Bungawalbin	6	Moderate
		Doubleduke	2	Moderate
		Devils Pulpit	14	Moderate

* while the soil erodibility for this unit is low to moderate, the "worst case" moderate class has been used for this table

CONCLUSION: According to the table in Appendix 2 (ii) of the SEMGL's, the soils represented by this soil mapping unit have "maximum" erosion hazard classes ranging from moderate to high.

CASINO / MURWILLUMBAH EIS SOILS STUDY

Soil Erosion Hazard based on Appendix 2 (ii) of the SEMGL's

SOIL MAPPING UNIT F – (soils formed on Kangaroo Creek Sandstone)

Erodibility (SEMGL App 1)	SEMGL Appendix 2 Erosivities	State Forest	Maximum Slope (degrees)	Erosion Hazard Class
low to moderate*	<4000	Richmond Range	25	High to Extreme
		pt Richmond Range	41	Extreme
		Cherry Tree/Cherry Tree W	22	High
		Mount Belmore	36	Extreme
		pt Mount Belmore	30	Extreme
		pt Royal Camp	18	High
		Fullers	19	High
		Mount Marsh	23	High
		Banyabba	22	High
		Camira	5	Moderate
		Gibberagee	22	High
		pt Gibberagee	22	High
		Devils Pulpit	27	Extreme
		Doubleduke	24	High
		Bungawalbin	3	Moderate
		pt Eden Creek	8	Moderate
		Eden Creek	16	High

* while the soil erodibility for this unit is low to moderate, the "worst case" moderate class has been used for this table

CONCLUSION: According to the table in Appendix 2 (ii) of the SEMGL's, the soils represented by this soil mapping unit have "maximum" erosion hazard classes ranging from moderate to extreme.

CASINO / MURWILLUMBAH EIS SOILS STUDY

Soil Erosion Hazard based on Appendix 2 (ii) of the SEMGL's

SOIL MAPPING UNIT G – (soils formed on Walloon Coal Measures)

Erodibility (SEMGL App 1)	SEMGL Appendix 2 Erosivities	State Forest	Maximum Slope (degrees)	Erosion Hazard Class
low to moderate*	<4000	Richmond Range	16	High
		Cherry Tree North	19	High
		Cherry Tree	21	High
		Cherry Tree West	22	High
		Mount Pikapene	25	High to Extreme
		Mount Belmore	17	High
		pt Mount Belmore	21	High
		Mount Marsh	20	High
		pt Mount Marsh	15	Moderate to High
		Doubleduke	9	Moderate
		Sugarloaf	24	High
		Tabbimoble	6	Moderate
	<6000	Devils Pulpit	27	Extreme
		Mororo	3	Moderate
		Mebbin	17	High
		Wollumbin	22	Extreme
		Wollumbin	27	Extreme
	<8000	Wollumbin	27	Extreme

CONCLUSION: According to the table in Appendix 2 (ii) of the SEMGL's, the soils represented by this soil mapping unit have "maximum" erosion hazard classes ranging from moderate to extreme.

CASINO / MURWILLUMBAH EIS SOILS STUDY

Soil Erosion Hazard based on Appendix 2 (ii) of the SEMGL's

SOIL MAPPING UNIT H – (soils formed on Marburg Sediments)

Erodibility (SEMGL App 1)	SEMGL Appendix 2 Erosivities	State Forest	Maximum Slope (degrees)	Erosion Hazard Class
low to moderate*	<2000	Sugarloaf	17	Moderate
		Keybarbin	22	Moderate
	<4000	Sugarloaf	13	Moderate
		Keybarbin	22	High
		pt Mount Marsh	11	Moderate
		Doubleduke	3	Moderate
	<8000	Wollumbin	25	Extreme
		Nullum	32	Extreme

* while the soil erodibility for this unit is low to moderate, the "worst case" moderate class has been used for this table

CONCLUSION: According to the table in Appendix 2 (ii) of the SEMGL's, the soils represented by this soil mapping unit have "maximum" erosion hazard classes ranging from moderate to extreme.

CASINO / MURWILLUMBAH EIS SOILS STUDY

Soil Erosion Hazard based on Appendix 2 (ii) of the SEMGL's

SOIL MAPPING UNIT I – (soils formed on extrusive volcanics)

Erodibility (SEMGL App 1)	SEMGL Appendix 2 Erosivities	State Forest	Maximum Slope (degrees)	Erosion Hazard Class
low, sometimes moderate	<2000	Ewingar	24	Moderate
		Billilimbra	26	Moderate
	<4000	Billilimbra	16 – 32	Moderate to High
		Washpool	30	High
		Ewingar	23	Moderate
	<8000	Nullum	32 – 42	Extreme
		Goonengerry	16 – 42	High to Extreme
		Whian Whian East	28	Extreme
		Whian Whian	35	Extreme

CONCLUSION: According to the table in Appendix 2 (ii) of the SEMGL's, the soils represented by this soil mapping unit have "maximum" erosion hazard classes ranging from moderate to extreme.

APPENDIX 4

Erodibility (K) values

Unit	Site	Layer	Zone	R	Structure	Permeab.	K
A	1301	A11	1	3000	3	2	.008
		B2			3	3	.015
	1306	A1	1	3100	3	1	.017
		B2			3	1	.014
B	0102	A	1	3250	2	2	.020
		B2			2	3	.006
	0201	A11	2	3100	3	3	.031
		B1			2	5	.038
	0503	A	2	3100	3	2	.016
		B1			3	3	.027
	1201	A	2	3050	3	3	.015
		B2			3	3	.012
	1701	A1	1	6300	3	2	.006
		B1			3	3	.008
	1801	A	1	5500	3	3	.025
		B1			3	5	.041
	1801	A	1	5500	3	3	.025
		B1			3	5	.047
C	1401	A	1	7000	3	3	.023
		B2			3	3	.044
	2202	A	2	2200	2	3	.006
		B11			3	3	.009
D	2101	A1	2	2000	2	2	.022
		B2			3	3	.036
	2404	A11/12	2	2100	2	1	.010
		B1			3	5	.023
	2501	A1	2	2000	3	2	.009
		B1			3	6	.033
E	1109	A1	1	3100	3	2	.011
		B2			3	3	.019
	1114	A11	2	3000	3	2	.029
		B2			3	3	.016
	1124	A1	2	3100	3	3	.026
		B2			3	5	.023
F	0601	A11	2	2700	3	2	.012
		B1			3	3	.018
	0707	A1	2	3100	2	2	.012
		B1			2	2	.018
G	0404	A11	2	3100	2	2	.032
		B2			3	5	.034
	0407	A	2	3100	3	6	.026
		B2			3	5	.024
	0408	A	2	2500	3	3	.018
		B2			3	3	.019

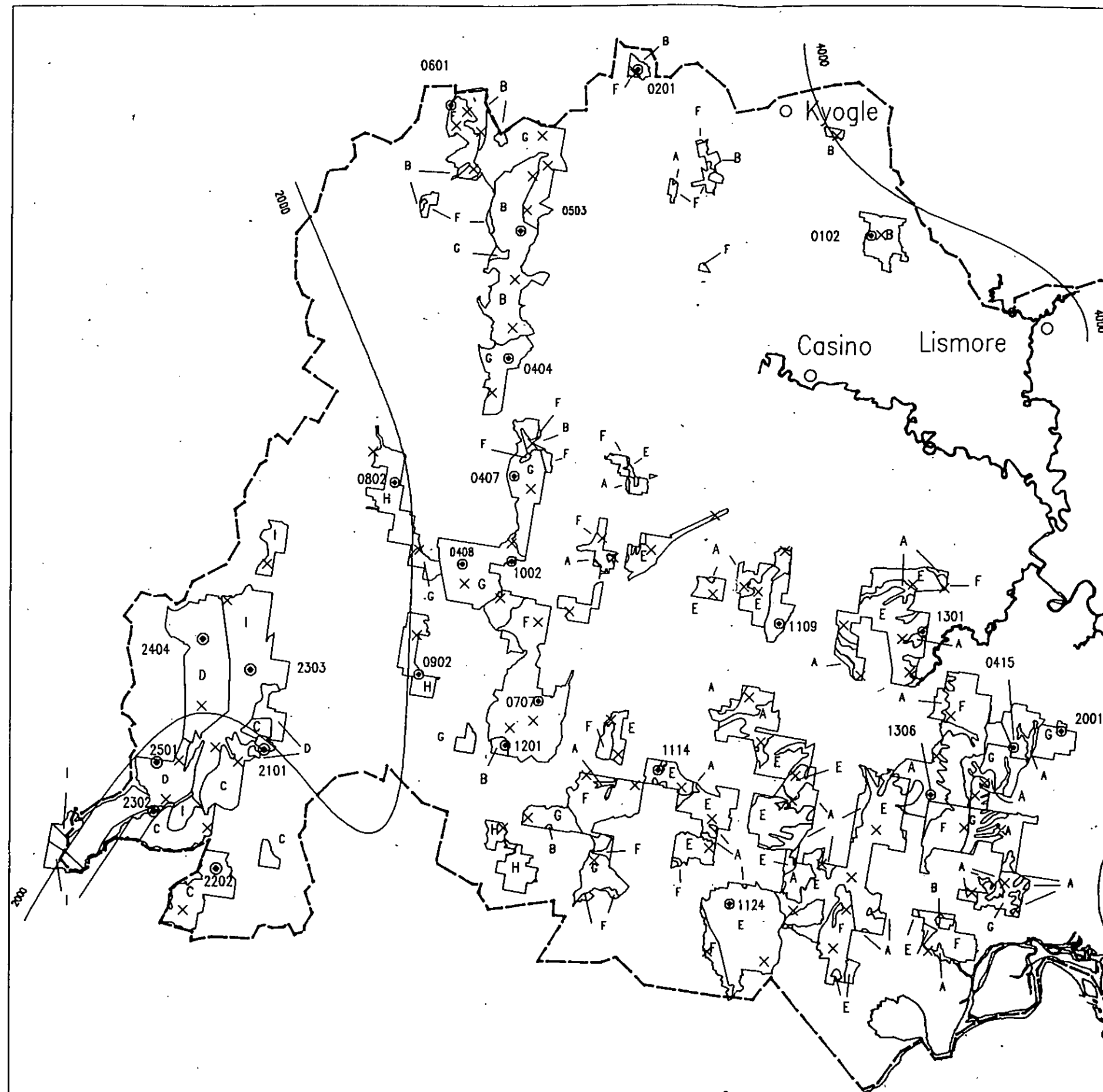
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Unit	Site	Layer	Zone	R	Structure	Permeab.	K
G	0413	A	1	5500	3	3	.023
		B1			3	3	.023
	0415	A1	1	3100	3	2	.044
					3	3	.013
	1002	A11	2	3050	2	2	.017
H	0802	A	2	2000	3	3	.016
					3	2	.029
	0902	A1	2	2100	3	1	.014
		B2			3	4	.042
	1601	A	1	6200	3	1	.011
		B1			4	2	.039
	2001	A1	1	3100	3	2	.026
		B1			3	3	.014
	1501	A1	1	8500	2	2	.004
		B1			2	3	.025
I	1903	A1	1	8600	2	3	.016
		B2			2	3	.015
	1908	A11	1	8000	2	2	.004
		B1			2	3	.020
	2302	A	1	2100	2	3	.008
		B1			2	3	.007
	2303	A	2	2200	2	3	.020
		B11			2	3	.027

APPENDIX 4: Values used to determine the erodibility (K) factor

APPENDIX 5

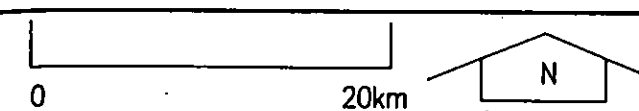
Figures



CASINO MANAGEMENT AREA

LEGEND

A	ALLUVIAL
B	BASALTS OF PLUGS AND FLOWS
C	METASEDIMENTS
D	GRANITIDS
E	GRAFTON FORMATION
F	KANGAROO CREEK SANDSTONES
G	WALLOON COAL MEASURES
H	MARBURG SEDIMENTS
I	EXTRUSIVE VOLCANICS
---	MANAGEMENT BOUNDARY.
2000	SOIL EROSIVITY TYPE
⊙ 1000	SAMPLED SOIL DESCRIPTION SITE
×	SOIL DESCRIPTION SITE
○	TOWNS
~~~~~	RIVERS

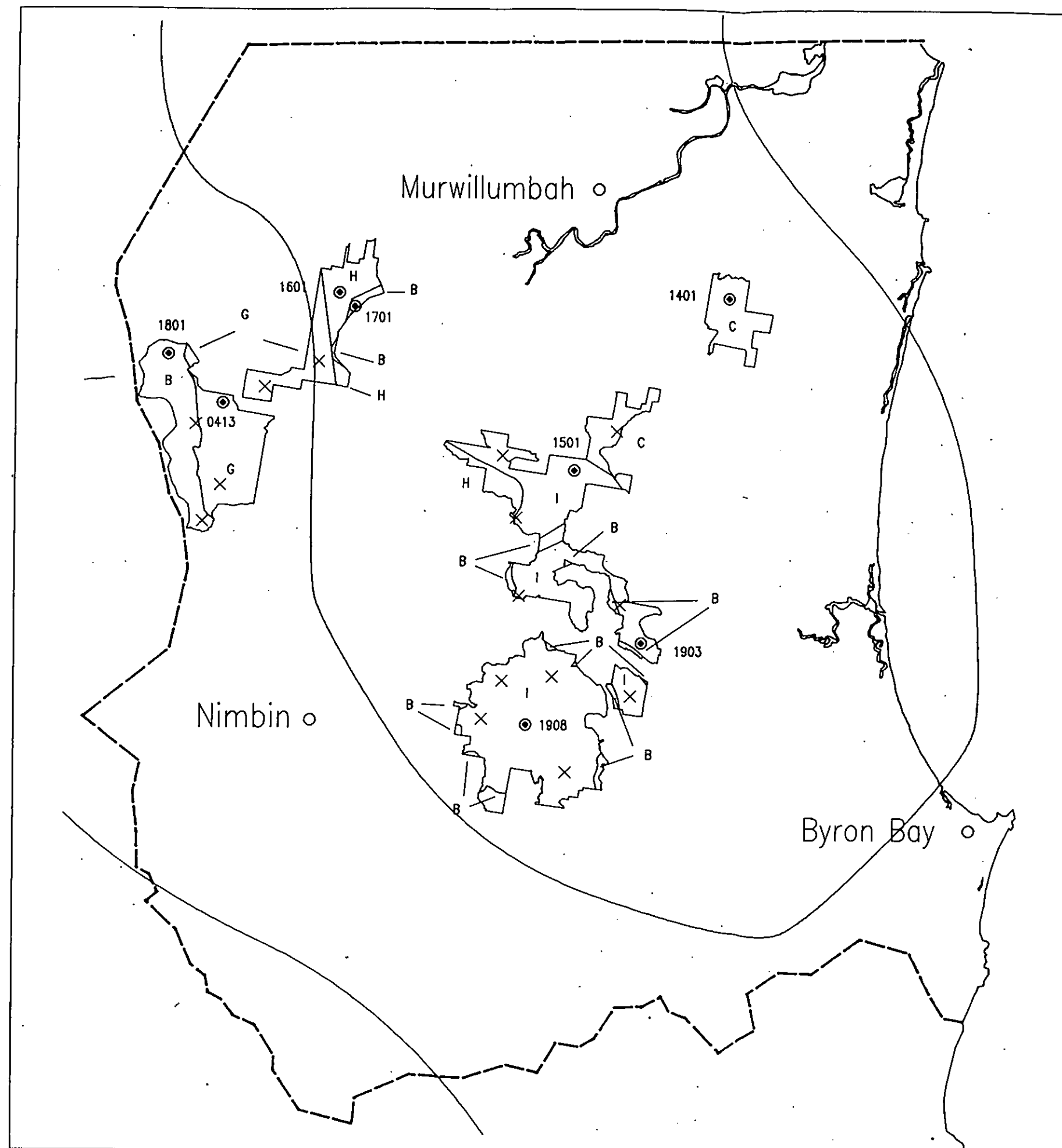


SOILS  
Casino Management Area

FIGURE

1a

Note : Also refer to Figure 8.1 and Maps 5 and 6 in Volume A of the Casino Management Area EIS

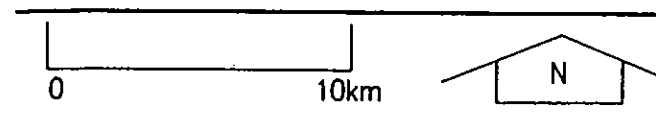


## MURWILLUMBAH MANAGEMENT AREA

### LEGEND

B	BASALTS OF PLUGS AND FLOWS
C	METASEDIMENTS
G	WALLOON COAL MEASURES
H	MARBURG SEDIMENTS
I	ERUPTIVE VOLCANICS

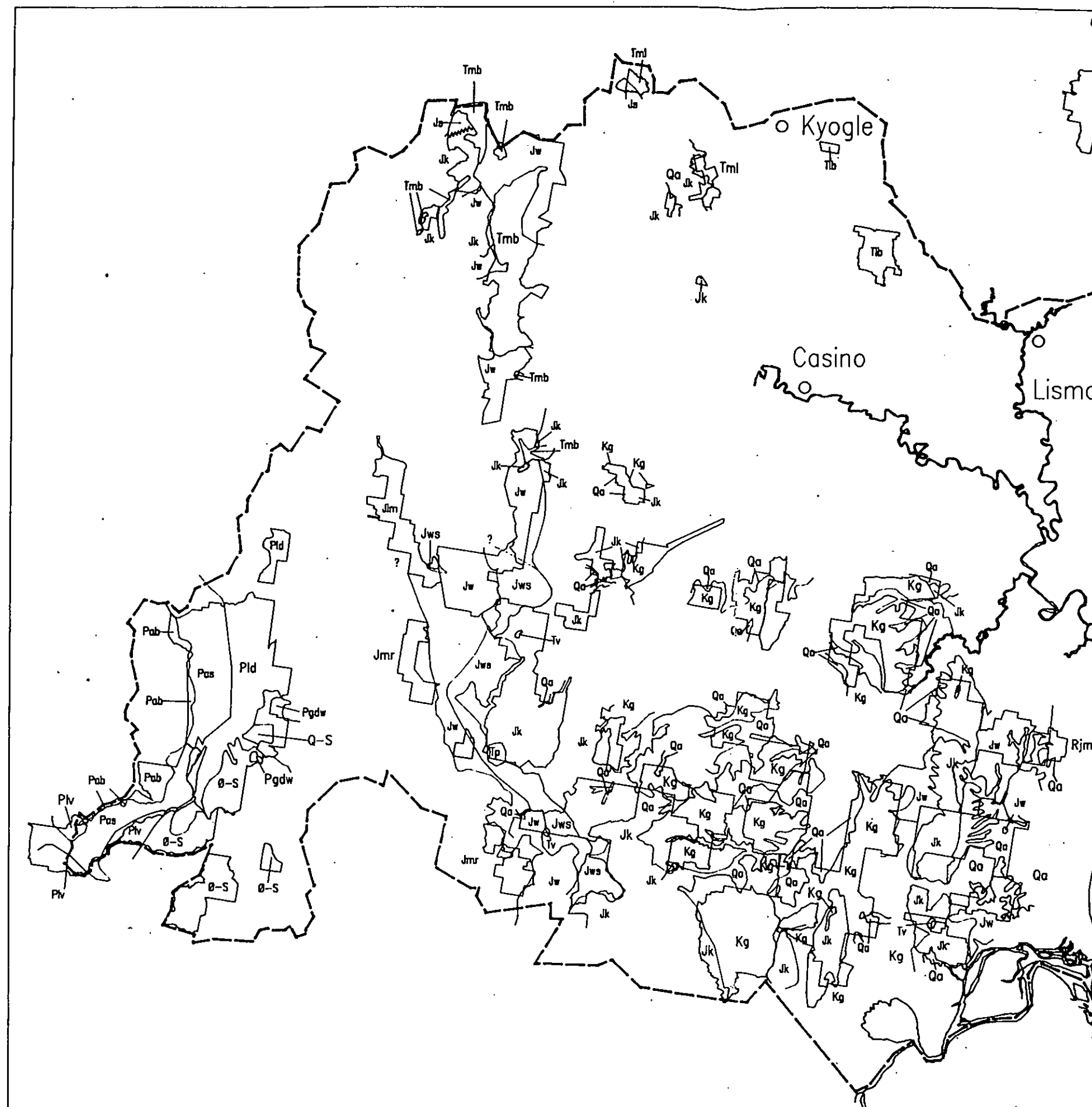
---	MANAGEMENT BOUNDARY
4000	SOIL EROSIVITY TYPE
● 1000	SAMPLED SOIL DESCRIPTION POI
×	SOIL DESCRIPTION SITE
○	TOWNS
~	RIVERS



SOILS  
Murwillumbah  
Management Area

FIGURE

1b

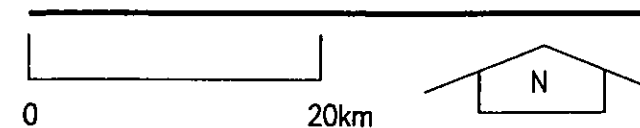


## CASINO MANAGEMENT AREA

### LEGEND

Jk	KANGAROO CREEK SANDSTONE
Jlm	MARBURG SANDSTONE
Jmr	KOUKANDOWIE SANDSTONE
Js	WOODENBONG BEDS
Jw	WALLON COAL MEASURES
Jws	MALLANGANEE COAL MEASURES
Kg	GRAFTON FORMATION
Pab	BUNGULLA PORPHYRITIC ADAMELLITE
Pas	STANTHORPE ADAMELLITE
Pgdw	DUMBUDGERY CREEK GRANODIORITE
Pld	DRAKE VOLCANICS
Plv	DRAKE VOLCANICS
Qa	SEDIMENTS
Ø-S	ORDIVICIAN-SILURIAN SEDIMENTS
Tib	LISMORE BASALT
Tmb	LAMINGTON VOLCANICS, (basalt)
Tml	LAMINGTON VOLCANICS, (agglomerate)
Tp	TERTIARY VOLCANICS
Tv	TERTIARY EXTRUSIVE VOLCANICS

---	MANAGEMENT BOUNDARY
---	GEOLOGICAL FORMATION BOUNDARY
~~~~~	FACIES BOUNDARY
○	TOWNS
~~~~~	RIVERS

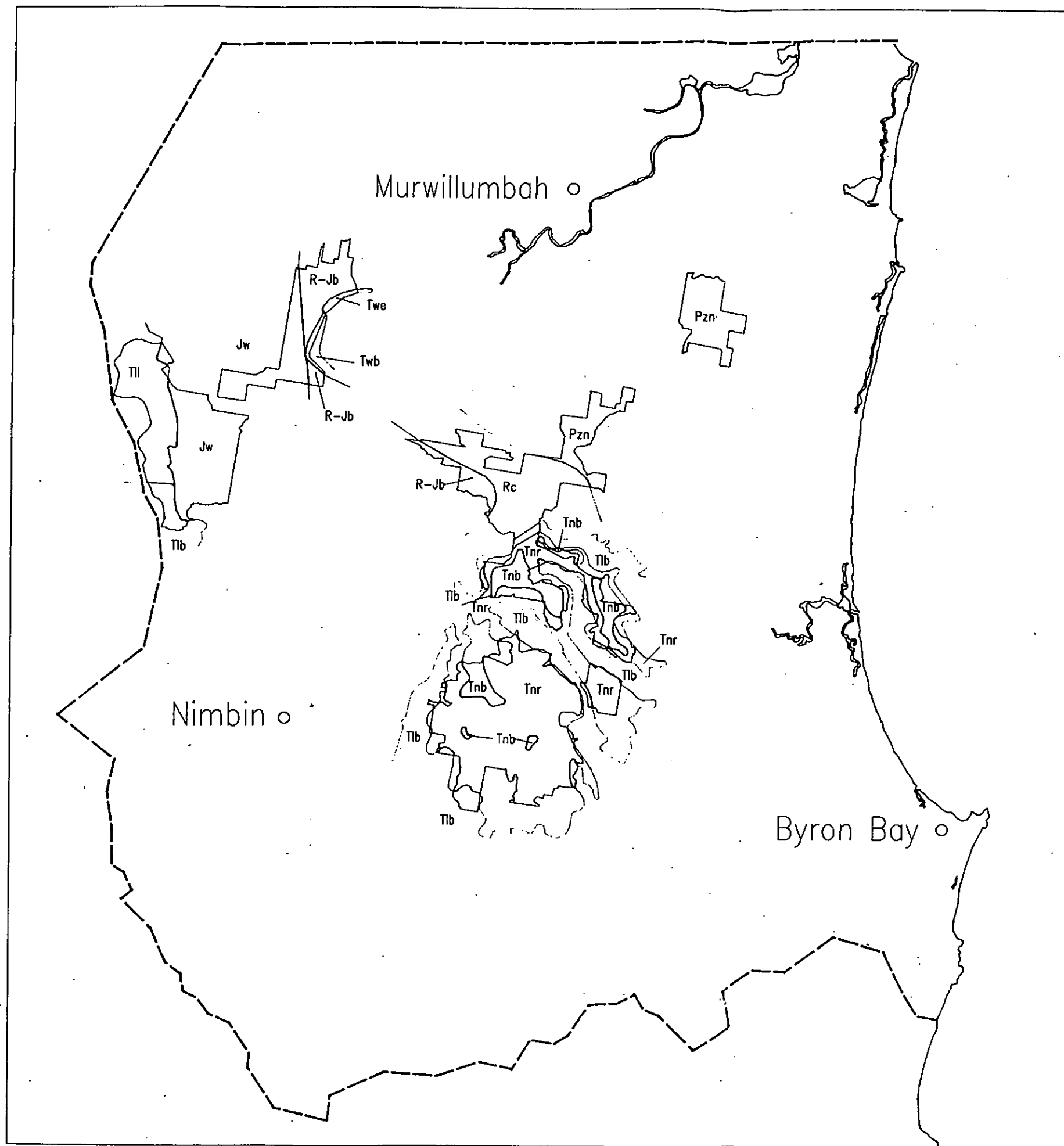


GEOLOGY  
Casino Management Area

FIGURE

2a

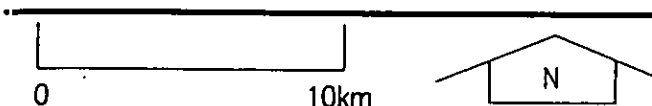
Note: Also refer to Figure 6.3 in Volume A of the Casino Management Area EIS



## MURWILLUMBAH MANAGEMENT AREA

### LEGEND

Jw	WALLOON COAL MEASURES
Pzn	NERANLEIGH-FERNVALE GROUP
Rc	CHILLINGHAM VOLCANICS
R-Jb	BUNDAMBA GROUP
Tib	LISMORE BASALT
TII	LAMINGTON BASALTS
Tnb	BLUE KNOB BASALT
Twb	MT WARNING CENTRAL COMPLEX (basalt)
Twe	MT WARNING CENTRAL COMPLEX (trachyte)
---	MANAGEMENT BOUNDARY
- - -	GEOLOGICAL FORMATION BOUNDARY
○	TOWNS
~~~~~	RIVERS



GEOLOGY
Murwillumbah
Management Area

FIGURE

2b