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**SOILS AND LAND SUITABILITY  
OF LEICHHARDT DOWNS SECTION,  
BURDEKIN RIVER IRRIGATION AREA  
PART A**

**T. E. Donnollan, J. I. McClurg and R. J. Tucker**  
**Land Resources Branch**



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## Queensland Government Technical Report

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SOILS AND LAND SUITABILITY OF  
LEICHHARDT DOWNS SECTION, BURDEKIN RIVER IRRIGATION AREA

PART A - SUMMARY OF SOILS AND LAND SUITABILITY ASSESSMENT

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**ABSTRACT**

A 1:25 000 soil survey and a land suitability evaluation were undertaken for Leichhardt Downs Section in the Burdekin River Irrigation Area. The survey, the first of a number of proposed high intensity surveys, provides information to assist the Queensland Water Resources Commission with resubdivision and farm design for the proposed irrigation areas of the Burdekin River Irrigation Area (BRIA).

Seven hundred and sixty-five unique map areas (UMAs) representing 70 different soil types on six landscape units (LUs) were mapped and are shown on the accompanying soils map. Soils of landscape units 1, 2 and 3 of alluvial origin occupy about 45% of the total area of 9711 ha. Of these, cracking clays make up 30% with sodic duplex soils occupying the remainder. Non-calcic brown soils are present on about half the area of landscape unit 5 (gently undulating rises on an intrusive rock complex) which occupies 25% of the total area. A wide range of soils occur on the miscellaneous alluvial landforms of landscape unit 6, especially on the creek and relict alluvial landforms. Landscape unit 4 (gently undulating rises on acid intrusive rocks, pediments and prior streams) only occupies 181 ha of the survey area.

The suitability of the land for sugar-cane, grain crops, small crops, mangos and rice was assessed for each UMA. An area of 7699 ha is suitable (classes 1, 2, and 3) for sugar-cane, 5644 ha for grain crops, 2764 for small crops, 2974 for mangos and 3350 ha are suitable for rice. A total of 2511 ha is suitable for both sugar-cane and grain crops as well as rice. The lands classed as unsuitable (classes 4 and 5) for irrigation of any crops comprise 1577 ha.

It is likely that some land degradation will be caused by salinisation, flooding and erosion but this can be decreased by adopting adequate protective measures in susceptible areas.

As many of the soils present a number of management problems, the development of specialised irrigation techniques will be required to ensure sustained economic crop production.

## 1. INTRODUCTION

This report, part A, summarises the results of the first of a series of 1:25 000 soil surveys being undertaken in the Lower Burdekin Valley. These surveys are designed to provide detailed land resource information and an assessment of land suitability to assist in resubdivision and farm design throughout the Burdekin River Irrigation Area (BRIA) by the Queensland Water Resources Commission (QWRC).

This survey area, Leichhardt Downs Section, comprises some 9711 ha and is located on the right bank of the Burdekin River. The Burdekin River forms the western boundary from approximately 36 km upstream from Home Hill in the south to the boundary of the South Burdekin Water Board Area in the north. The southern and eastern boundaries lie 200 to 500 m upslope of the Elliot Main Channel which approximately follows the 35 m contour. The lower slopes of Stokes Range form the northern boundary. A plan showing the location of the area in respect to other proposed 1:25 000 soil surveys of the BRIA is shown in Figure 1.

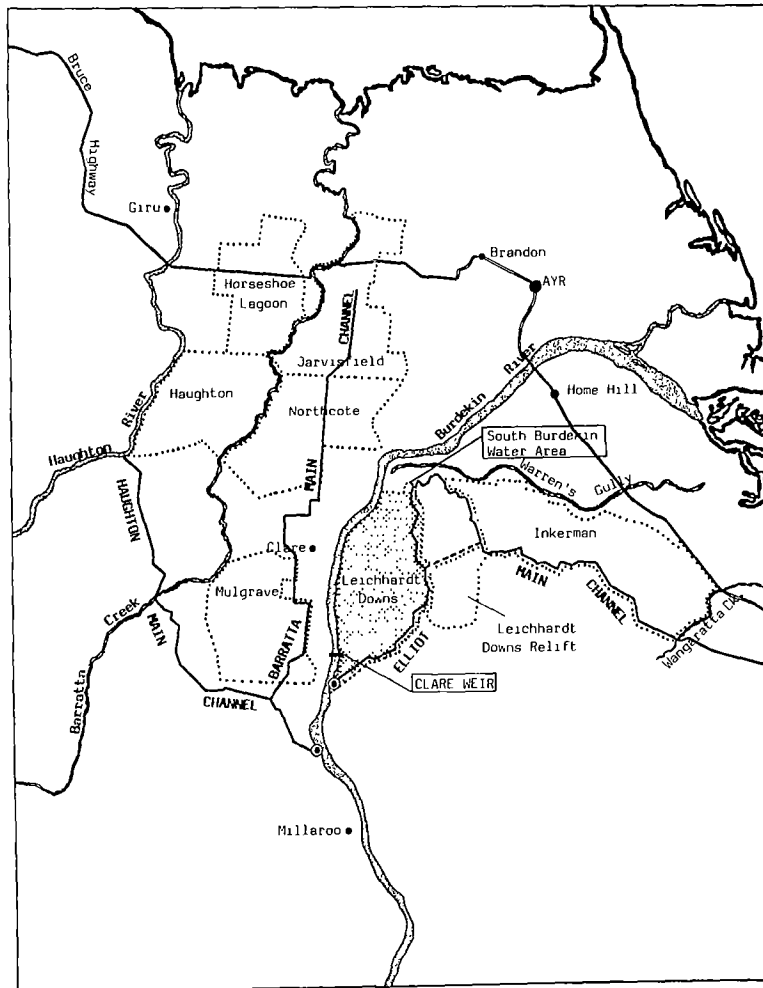


Figure 1. Locality plan



Part A presents a summary of soil and land use information that will meet the immediate needs of many users. More details of the physical environment, the soils, their physical and chemical attributes, as well as land use implications, are presented in a separate report, part B.

## 2. LANDSCAPE UNITS AND SOIL TYPES

Thompson (1977) identified six topographic forms separated on the basis of geological and geomorphological differences in the area during a low intensity soil survey. Soil profile classes as defined by Thompson and Reid (1982), and modified where necessary to account for the much greater density of observations carried out during this high intensity survey, were the basis for classifying soils in this survey. Since these publications above, some terms and definitions relating to the components of soil and land surveys have changed. Where appropriate, these new terms have been used in this publication. Landscape unit\* replaces the term topographic form. The term soil profile class has been replaced by soil type\*.

Those soil morphological characteristics considered important determinants of irrigated land use were the main criteria for determining soil types. Each soil type is identified by an alpha numeric code, a number for the landscape unit on which the soil is found, the appropriate subdivision of the primary profile form (Northcote 1979) and a letter for each separate soil type within that landscape unit and subdivision of the primary profile form. For example; for soil type 1Ugd, '1' denotes landscape unit 1; 'Ug' indicates a subdivision of the primary profile form (in this case uniform, fine textured seasonally cracking soil [cracking clay]); and 'd' separates this soil type from other fine textured, seasonally cracking soil types within landscape unit 1.

Table 1 gives a brief description of each landscape unit with its component soil types and predominant natural vegetation.

Variants were used to distinguish those profiles which were similar to an existing soil type but differed in one or more of those soil attributes which were important indicators of land use potential. Variants were distinguished by a number after the soil type symbols. The variants are listed and described on the soils map.

## 3. CHEMICAL AND PHYSICAL ATTRIBUTES OF THE SOILS

Twenty-five soil profiles representing 19 soil types were sampled and analysed. A number of profiles were also sampled and analysed to characterise an experimental site established within the survey area and during the survey by Thompson (1977). The more important chemical and physical attributes of these analysed soil types are summarised in Table 2.

\* See glossary.

Table 1 Landscape units and major distinguishing attributes of the soil types, Leichhardt Downs Section, Burdekin River Irrigation Area

Landscape unit	Landform element	Soil type	Major distinguishing attributes	Great soil group	PPF	Predominant natural vegetation
Local alluvial plains and associated pediments	Low lying flats and drainage depressions	1Uga	0.02m moderate self mulch over dark to grey medium clay to 0.05 - 0.15m over alkaline dark to grey medium to heavy clay to 1.5+m, moderate to strong gilgai	Black earth - grey clay	Ug5.16 Ug5.24	Low open woodland of poplar gum and carbeen with cabbage gum, beefwood and broad leaf tea-tree associated with Tussock grassland of cane grass and blue grasses
		1Ugc	Hard setting surface over brown-mottled dark light to light medium clay to 0.05 - 0.10m A1 horizon frequently over bleached A2 horizon to 0.08 - 0.15m over alkaline dark to grey medium to heavy clay to 1.5+m, weak gilgai	Black earth - (bleached) black earth - (bleached) grey clay	Ug5.16 Ug2 Ug3.1	Low open woodland of poplar gum and cabbage gum with carbeen, beefwood and broad leaf tea-tree associated with Tussock grassland of blue grasses, brown top and cane grass
		1Ugd	0.02m weak self mulch over brown-mottled grey light medium to medium clay to 0.05 - 0.15m over alkaline grey to yellow-grey medium to heavy clay to 1.5+m, weak to moderate gilgai	Grey clay	Ug5.28 Ug5.24	Low open woodland of poplar gum and carbeen with cabbage gum and beefwood associated in poorly drained areas with Tussock grassland of blue grasses and cane grass with brown top and black spear grass associated.
		1Ugf	Weakly self mulching to hard setting surface over grey to dark light to light medium clay A1 horizon to 0.05 - 0.15m over bleached A2 horizon to 0.15 - 0.30m over grey medium clay to 0.40 - 0.80m over alkaline grey to yellow-brown medium to heavy clay to 1.5+m, weak to moderate gilgai	(Bleached) grey clay	Ug3.2 Ug2	Low open woodland of poplar gum and cabbage gum with carbeen, beefwood and broad leaf tea-tree associated with Tussock grassland of blue grasses, black spear grass and brown top
		1Uge	Depression: Weakly self mulching to hard setting surface over dark to grey light to light medium clay to 0.10 - 0.20m over alkaline dark to grey medium clay to 0.45 - 0.80m over yellow-brown to grey medium clay to 1.5+m	Black earth-grey clay	Ug5.16 Ug5.24	Low open woodland of poplar gum and cabbage gum with beefwood associated with Tussock grassland of cane grass, black spear grass and blue grasses
			Mound: 0.02m moderate self mulch over grey light to medium clay to 0.05 - 0.15m over yellow-brown to grey medium clay to 1.5+m	Grey clay	Ug5.24 Ug5.28	

Table 1 (Cont'd)

Landscape unit	Landform element	Soil type	Major distinguishing attributes	Great soil group	PPF	Predominant natural vegetation
Local alluvial plains and associated pediments	Pediments and slightly elevated flats	1Db <sub>a</sub>	0.05 - 0.15m brown to dark clay loam A horizon bleached throughout or near base over alkaline brown medium to heavy clay B horizon to 0.35 - 0.40m over strongly alkaline yellow-brown light medium clay D horizon to 1.5+m	Solodic-solodized solonetz	Db1.33 Db1.43	Low open woodland of cabbage gum and beefwood with false sandalwood and broad leaf tea-tree associated with Open tussock grassland of blue grasses and black spear grass
		1Dy <sub>a</sub>	0.05 - 0.10m grey sandy clay loam to clay loam A horizon bleached throughout or near base over alkaline grey medium clay B horizon to 0.50 - 0.90m over strongly alkaline grey to brown medium clay B horizon to 1.5+m	Solodic-solodized solonetz	Dy2.43 Dy2.33	Low to tall shrubland of false sandalwood and beefwood or Low open woodland of cabbage gum, poplar gum and scattered false sandalwood with Open tussock grassland of black spear grass and blue grasses
		1Dy <sub>b</sub>	0.10 - 0.15m dark to brown sandy loam to clay loam A horizon bleached throughout or near base over alkaline grey light to light medium clay B horizon to 0.40 - 0.60m over strongly alkaline yellow-brown to light grey sandy clay loam to sandy clay D horizon to 1.5+m	Solodic-solodized solonetz	Dy2.33 Dy2.43	Low woodland to low open woodland of cabbage gum, poplar gum, carbeen, beefwood and false sandalwood with Tussock grassland of black spear grass and blue grasses
		1Dy <sub>c</sub>	0.05 - 0.10m brown-mottled dark to brown clay loam A1 horizon over bleached A2 horizon to 0.10 - 0.15m over alkaline grey medium to heavy clay B horizon to 0.40 - 0.80m over strongly alkaline grey to yellow-brown medium clay B horizon to 1.5+m	Solodic-solodized solonetz	Dy2.43 Dy2.33	Low open woodland of cabbage gum, poplar gum and beefwood with carbeen and false sandalwood associated with Tussock grassland of blue grasses and black spear grass
		1Dd <sub>a</sub>	0.05 - 0.10m brown-mottled dark to grey clay loam A1 horizon over bleached A2 horizon to 0.10 - 0.15m over alkaline dark medium to heavy clay B horizon to 0.60 - 1.20m over grey light to medium clay B or D horizon to 1.5+m	Solodic-solodized solonetz	Dd1.43 Dd1.33	Low open woodland of poplar gum and carbeen with cabbage gum, beefwood and willow wattle associated with Tussock grassland of black spear grass and blue grasses with kangaroo grass associated
Burdekin River alluvial plain	Low lying flats	2Ug <sub>a</sub>	0.01 - 0.02m weak to moderate self mulch over grey to dark medium to heavy clay to 0.05 - 0.10m over alkaline grey to dark medium to heavy clay to 1.00 - 1.35m over brown medium to heavy clay to 1.5+m, weak glistol	Grey clay - black earth	Ug5.25 Ug5.29 Ug5.15	Low open woodland to low woodland of carbeen and poplar gum with broad leaf tea-tree and beefwood associated with Tussock grassland of cane grass and blue grasses

Table 1 (Cont'd)

Landscape unit	Landform element	Soil type	Major distinguishing attributes	Great soil group	PPF	Predominant natural vegetation
Burdekin River alluvial plain	Low lying flats	2Ugb	0.01 - 0.02m weak to moderate self mulch over dark to grey light to light medium clay to 0.05 - 0.10m over alkaline dark to grey medium to heavy clay to 0.75 - 1.00m over brown light to medium clay D horizon to 1.5+m, weak gilgai	Black earth - grey clay	Ug5.17	Low open woodland of poplar gum and carbeen with broad leaf tea-tree associated
					Ug5.2	with Tussock grassland of cane grass and blue grasses
		2Ugc	Weakly self mulching to hardsetting surface over brown-mottled dark to grey light to light medium clay to 0.05 - 0.10m over alkaline grey medium to heavy clay to 1.5+m, weak to moderate gilgai	Grey clay	Ug5.28	Low open woodland to low woodland of poplar gum with cabbage gum, carbeen, broad leaf tea-tree and beefwood associated
					Ug5.29	with Tussock grassland of cane and blue grasses
		2Ugd	Weakly self mulching to hard setting surface over bleached brown-mottled grey light to light medium clay to 0.10 - 0.25m over brown-mottled grey medium to heavy clay to 1.00 - 1.20 m over yellow-brown to grey light to medium clay to 1.5+m, strongly alkaline at and below 0.90 - 1.20m, moderate to strong gilgai	(Bleached) grey clay	Ug3.2	Low open woodland to low woodland or occasionally woodland of poplar gum and carbeen with broad leaf tea-tree associated
					Ug2	with Tussock grassland of blue grasses, kangaroo grass and black spear grass
		2Uge	Weakly self mulching to hard setting surface over occasionally bleached brown-mottled dark grey light to light medium clay to 0.05 - 0.25 m over brown - mottled grey medium to heavy clay to 0.80 - 1.30m over brown to grey light to medium clay to 1.5+m, strongly alkaline above or at 0.60m, weak to moderate gilgai	Grey clay - (bleached) grey clay	Ug5.29	Low open woodland to low woodland of poplar gum with carbeen and cabbage gum associated
					Ug5.25	with Tussock grassland of blue grasses, black spear grass and kangaroo grass
Ug5.28						
2Ugg	0.01 - 0.02m moderate self mulch over grey medium to heavy clay to 0.10 - 0.20m over grey medium to heavy clay to 1.20 - 1.40m over yellow-brown to grey medium to heavy clay to 1.5+m, strongly alkaline at and below 0.60 - 0.90m, moderate to strong gilgai	Grey clay	Ug5.29	Low open woodland to low woodland of poplar gum with carbeen and broad leaf tea-tree associated		
			Ug5.24	with Tussock grassland of blue grasses and cane grass		
			Ug5.28			
2Ugh	0.01 - 0.02m moderate self mulch over brown-mottled grey medium to heavy clay to 0.10 - 0.15m over grey medium to heavy clay to 1.5+m, strongly alkaline at and below 0.30m, moderate to strong gilgai	Grey clay	Ug5.28	Isolated trees to low open woodland of carbeen, poplar gum and cabbage gum		
			Ug5.24	with Tussock grassland of blue grasses, cane grass and Flinders grass		

Table 1 (Cont'd)

Landscape unit	Landform element	Soil type	Major distinguishing attributes	Great soil group	PPF	Predominant natural vegetation
Burdekin River alluvial plain	Low lying flats	2Dyc	0.05 - 0.10m brown-mottled dark to grey loam A1 horizon over bleached A2 horizon to 0.12 - 0.25m over alkaline brown-mottled grey medium to heavy clay B horizon to 1.10 - 1.30m over grey to yellow-brown light to medium clay D horizon to 1.5+m, moderate to strong gllgal	Solodic-solodized solonetz	Dy3.33 Dy3.43	Low open woodland to open woodland of poplar gum and cabbage gum with Tussock grassland of blue grasses, black spear grass and kangaroo grass
	Slightly elevated flats	2Dba	0.03 - 0.05m brown clay loam A1 horizon over bleached A2 horizon to 0.05 - 0.10m over brown medium clay B horizon to 1.00 - 1.5+m over brown sandy clay to light - medium clay D horizon to 1.5+m, strongly alkaline at and below 0.30m	Solodic-solodized solonetz	Db1.43 Db1.33	Low to tall shrubland of false sandalwood and beefwood with cabbage gum, poplar gum and carbeen associated with Open to sparse tussock grassland of blue grasses, black spear grass, purple top Rhodes grass and button grass
		2Dbb	0.05 - 0.15m dark to brown clay loam A1 horizon over bleached A2 horizon to 0.12 - 0.20m over brown medium clay B horizon to 1.20 - 1.5+m over brown sandy clay to light-medium clay D horizon to 1.5+m, strongly alkaline above or at 0.60m	Solodic-solodized solonetz	Db1.33 Db1.43	Low open woodland of poplar gum, carbeen and cabbage gum with beefwood and mimosa associated with Tussock grassland of purple top Rhodes grass, black spear grass and blue grasses
		2Dbc	0.05 - 0.20m brown-mottled dark to grey loam to clay loam A1 horizon over bleached A2 horizon to 0.20 - 0.35m over brown-mottled grey to brown medium clay B horizon to 1.00 - 1.5+m over brown sandy clay to light medium clay D horizon to 1.5+m, strongly alkaline at and below 0.90 - 1.20m	Solodic-solodized solonetz	Dy3.43 Dy3.33 Db2.43 Db2.33	Low open woodland to low woodland of poplar gum, carbeen and cabbage gum with Tussock grassland of black spear grass, blue grasses and kangaroo grass
		2Dbd	0.10 - 0.20m dark to brown loam to fine sandy clay loam A1 horizon over bleached A2 horizon to 0.20 - 0.35m over grey to brown medium to heavy clay B horizon to 0.70 - 1.00m over brown light to medium clay D horizon to 1.5+m, strongly alkaline at and below 0.60m	Solodic-solodized solonetz	Dy2.43 Dy2.33 Db1.43 Db1.33	Low open woodland to woodland of cabbage gum, carbeen and poplar gum with Tussock grassland of black spear grass, blue grasses and kangaroo grass
		2Dbe	0.05 - 0.10m brown-mottled dark to grey loam to clay loam A1 horizon over bleached A2 horizon to 0.12 - 0.20m over red-mottled brown medium to heavy clay B horizon to 1.15 - 1.25m over brown light to medium clay D horizon to 1.5+m, strongly alkaline at and below 0.90 - 1.20m	Solodic-solodized solonetz	Db2.43 Db2.33	Low open woodland to open woodland of poplar gum, cabbage gum and carbeen with beefwood associated with Tussock grassland of black spear grass, blue grasses and kangaroo grass

Table 1 (Cont'd)

Landscape unit	Landform element	Soil type	Major distinguishing attributes	Great soil group	PPF	Predominant natural vegetation
Burdekin River alluvial plain	Slightly elevated flats	2Dya	0.05 - 0.10m brown-mottled dark to brown clay loam A horizon bleached throughout or near base over grey medium to heavy clay B horizon to 0.90 - 1.5+m over brown sandy clay to light medium clay D horizon to 1.5+m, strongly alkaline at and below 0.60m	Solodic-solodized solonetz	Dy2.33 Dy2.43	Low open woodland to woodland of poplar gum, cabbage gum and carbeen with beefwood and broad leaf tea-tree associated  with Tussock grassland of blue grasses and kangaroo grass
		2Dyb	0.05 - 0.10m brown-mottled dark grey to brown loam to clay loam A1 horizon over bleached A2 horizon to 0.12 - 0.20m over grey medium to heavy clay B horizon to 0.90 - 1.5+m over brown light to medium clay D horizon to 1.5+m, strongly alkaline above or at 0.60m	Solodic-solodized solonetz	Dy2.33 Dy2.43	Low open woodland of cabbage gum and poplar gum with beefwood associated  with Tussock grassland of black spear grass, blue grasses and purple top Rhodes grass
		2Ddb	0.05 - 0.12m brown-mottled dark to grey loam to clay loam A1 horizon bleached throughout or near base over dark to grey medium to heavy clay B horizon to 0.65 - 1.00m over brown light to medium clay D horizon to 1.5+m, strongly alkaline at and below 0.30m	Solodic-solodized solonetz	Dd1.33 Dy2.33 Dd1.43	Low open woodland of beefwood, cabbage gum and poplar gum or low to tall shrubland of false sandalwood and beefwood  with Open tussock grassland of black spear grass, blue grasses, purple top Rhodes grass and kangaroo grass
Local alluvial plain	Plain	3Uga	0.02m moderate medium self mulch over dark heavy clay to 0.90 - 1.20m over grey heavy clay to 1.5+m, strongly alkaline above or at 0.60m, carbonate present above or at 0.75m, moderate to strong gligal	Black earth	Ug5.16	Tussock grassland of cane grass and blue grasses
		3Ugd	0.02m strong coarse self mulch over dark heavy clay to 0.75 to 1.20m over grey heavy clay to 1.5+m, strongly alkaline at or below 0.90m, carbonate present below 0.75m, moderate to strong gligal	Black earth	Ug5.16	Tussock grassland of cane grass and blue grasses with brown top and Flinders grass associated
		3Uge	0.02m weak self mulch over brown-mottled dark medium clay to 0.10 - 0.15m over alkaline dark heavy clay to 0.90 - 1.20m over brown light to medium clay D horizon to 1.5+m, weak to moderate gligal	Black earth	Ug5.17	Tussock grassland of cane grass and blue grasses

Table 1 (Cont'd)

Landscape unit	Landform element	Soil type	Major distinguishing attributes	Great soil group	PPF	Predominant natural vegetation
Local alluvial plain	Plain	3Ugf	0.01 - 0.02m weak self mulch over dark silty clay to 0.10 - 0.30m over alkaline dark medium clay to 0.80 - 1.00m over dark to grey medium to heavy clay to 1.5+m	Black earth	Ug5.1 Ug5.16	Low open woodland of carbeen and poplar gum with grey bloodwood associated with Tussock grassland of blue grasses, Rhodes grass, black spear grass and cane grass
	Plain margins bordering other landscape units	3Ugk	0.01 - 0.02m weak to moderate self mulch over brown-mottled grey medium clay to 0.10 - 0.15m over alkaline grey to yellow-grey medium clay to 1.20 - 1.5m over yellow light-medium to medium clay 2Bc horizon to 1.5+m, moderate to strong glistal	Grey clay	Ug5.2 Ug5.28	Low open woodland of poplar gum and carbeen with broad leaf tea-tree associated with Tussock grassland of cane grass and blue grasses with para-grass associated
Gently undulating rises on acid intrusive rocks, pediments and prior streams	Pediments	4Ucc	0.10 - 0.30m dark to brown coarse sand to sandy loam A1 horizon over bleached A2 horizon to 0.40 - 0.90m over acid grey to yellow-brown coarse sand to sandy loam B horizon to 1.00 - 1.5+m, over coarse sand or hard rock to 1.5+m	No suitable group, affinities with podzol	Uc2.12 Uc2.21	Woodland to low woodland of cabbage gum, poplar gum and grey bloodwood with quinine bush and broad leaf tea-tree associated with Open tussock grassland of black spear grass and giant spear grass
	Pediments and prior streams	4DbA	0.05 - 0.20m brown sandy loam to sandy clay loam A1 horizon over bleached A2 horizon to 0.20 - 0.25m over alkaline brown medium clay B horizon to 0.45 - 1.5+m, over coarse sand D horizon to 1.5+m	Solodic-solodized solonetz	Db1.43 Db1.33	Open woodland of poplar gum, grey ironbark, red bloodwood and cabbage gum with beefwood associated with Open tussock grassland of giant spear grass, black spear grass, wire grass and blue grasses
		4Dyg	0.10 - 0.20m dark to yellow-brown loam to clay loam A1 horizon over bleached A2 horizon to 0.15 - 0.30m over grey to yellow-brown medium clay B horizon to 0.80 - 1.5+m over sandy clay to light clay D horizons or rock, alkaline at and below 0.60m	Solodic-solodized solonetz	Dy2.33 Dy2.43	Low open woodland to woodland of cabbage gum, grey ironbark, poplar gum and broad leaf tea-tree with bullock and false sandalwood associated with Tussock to open tussock grassland of black spear grass, kangaroo and blue grasses with wire grass and purple top Rhodes grass associated

Table 1 (Cont'd)

Landscape unit	Landform element	Soil type	Major distinguishing attributes	Great soil group	PPF	Predominant natural vegetation
Gently undulating rises on acid intrusive rocks, pediments and prior streams	Pediments and prior streams	4Dyh	0.10 - 0.20m dark to grey light sandy clay loam to clay loam A1 horizon over bleached A2 horizon to 0.15 - 0.30m over brown-mottled grey medium clay B horizon to 0.75 - 1.5m over gravelly sandy clay to light clay D horizon or rock, alkaline at and below 0.30m	Solodic-solodized solonetz	Dy3.43 Dy3.33	Low open woodland to woodland of carbeen, cabbage gum and broad leaf tea-tree with beefwood, grey ironbark and false sandalwood associated with Open tussock grassland of purple top Rhodes grass, love grass, wire grass and blue grasses
Gently undulating rises on an intrusive rock complex	No fixed slope position	5Uga	0.02m moderate to strong self mulch over dark medium to heavy clay to 0.05 - 0.12m over alkaline dark to grey medium to heavy clay to 0.70 - 1.00m over decomposing rock	Black earth	Ug5.12 Ug5.14	Isolated trees to low open woodland of cabbage gum, grey ironbark and poplar gum with carbeen associated with Tussock grassland of blue grasses, cane grass and Rhodes grasses  Occasionally only grassland present
		5Ugb	Weakly self mulching to hard setting surface over grey to dark light to light medium clay A1 horizon to 0.10 - 0.20m occasionally over bleached A2 to 0.15 - 0.25m, over alkaline grey to dark medium clay to 0.40 - 0.80m over grey to yellow-brown medium clay to 0.70 - 1.0m over decomposing rock	Grey clay - black earth - (bleached) grey clay	Ug5.22 Ug5.14 Ug3.2	Isolated trees to low open woodland of cabbage gum and poplar gum with grey ironbark and grey and red bloodwood associated with Tussock grassland of black spear grass, blue grasses and cane grass
	Upper and mid slopes	5Dra	0.15 - 0.30m dark to brown clay loam A horizon over acid to neutral red medium clay to 0.70 - 1.20m over decomposing rock	Non-calclc brown soil	Dr2.12 Dr2.11	Low open woodland to low woodland of grey ironbark and red bloodwood with poplar gum and grey bloodwood associated with Tussock grassland of black spear grass, giant spear grass, kangaroo grass and blue grasses
		5Dya	0.15 - 0.25m dark to brown sandy clay loam to clay loam A horizon over acid to neutral yellow-brown medium clay to 0.70 - 1.00m over decomposing rock	No suitable group, yellow equivalent of non-calclc brown soil	Dy2.12 Dy2.11	Low open woodland to low woodland of poplar gum, red bloodwood and grey ironbark with carbeen and grey bloodwood associated with Tussock grassland of black spear grass, giant spear grass and kangaroo grass



Table 1 (Cont'd)

Landscape unit	Landform element	Soil type	Major distinguishing attributes	Great soil group	PPF	Predominant natural vegetation
Gently undulating rises on an intrusive rock complex	Mid to lower slopes	5Dyb	0.10 - 0.20m dark to brown clay loam A horizon over alkaline yellow-brown light medium to medium clay to 0.90 - 1.30m over decomposing rock	No suitable group	Dy2.13	Low open to low woodland of poplar gum, cabbage gum and grey bloodwood with scattered beefwood, red bloodwood and grey Ironbark associated with Tussock grassland of black spear grass, giant spear grass, kangaroo grass and blue grasses
		5Dyf- 5Ugc	Linear gilgai complex with shelf, depression and narrow mound  Shelf: (5Dyf) 0.10 - 0.15m grey clay loam A1 horizon over bleached A2 horizon to 0.15 - 0.20m over alkaline grey medium clay B horizon to 0.80 - 1.10m over decomposing rock Depression: (5Ugc) Weakly self mulching to hard setting surface over dark light to light medium clay A1 horizon to 0.10 - 0.15m occasionally over bleached A2 horizon to 0.15 - 0.20m over alkaline dark medium clay to 0.50 - 0.90m over grey to brown medium clay to 0.90 - 1.10m over decomposing rock	Solodic-solodized solonetz  Black earth - (bleached) black earth	Dy2.43 Dy2.33  Ug5.14 Ug3.1 Ug5.13	Low open woodland of cabbage gum and poplar gum with Tussock grassland to open tussock grassland of black spear grass, blue grasses, and cane grass with kangaroo grass, brown top and Panicum spp. associated
	Lower slopes	5Dyc	0.10 - 0.20m brown-mottled dark to brown sandy clay loam to clay loam A1 horizon over bleached A2 horizon to 0.15 - 0.30m over alkaline grey medium clay B horizon to 0.40 - 1.20m over grey to yellow-grey medium clay to 0.80 - 1.50m over decomposing rock or colluvial	Solodic-solodized solonetz	Dy2.43 Dy2.33	Low open woodland of cabbage gum, poplar gum and beefwood with carbeen associated with Tussock to open tussock grassland of black spear grass, Rhodes grass and blue grasses with wire grass associated
		5Dyd	0.05 - 0.10m dark to grey sandy clay loam to clay loam A1 horizon over bleached A2 horizon to 0.10 - 0.12m over strongly alkaline grey to yellow-brown medium clay B horizon to 0.70 - 1.20m over decomposing rock or colluvial	Solodic-solodized solonetz	Dy2.43 Dy2.33	Low open woodland of cabbage gum and poplar gum with false sandalwood and beefwood associated. or Tall shrubland to tall open shrubland of false sandalwood with Open tussock grassland of black spear grass Rhodes grass and blue grasses

Table 1 (Cont'd)

Landscape unit	Landform element	Soil type	Major distinguishing attributes	Great soil group	PPF	Predominant natural vegetation
Miscellaneous alluvial landforms (A) Burdekin River alluvial landform	Levee	6Ucc	0.05 - 0.50m dark to brown sand to fine sandy loam A1 horizon over grey, brown or yellow A12 or A2 horizon to 0.50 - 1.10 over acid to neutral brown to yellow sand to sandy clay loam A3 or B horizon to 1.5+m	No suitable group, affinities with siliceous sands - earthy sands	Uc5.21 Uc5.11 Uc5.23 Uc4.22	Open woodland to open forest of poplar gum, carbeen, grey bloodwood and Burdekin plum with broad leaf tea-tree, cocky apple, pandanus, prickly pine and quinine bush associated with Tussock grassland of giant spear grass, black spear grass and brown sorghum with golden beard grass and blue grasses associated
		6Uma	0.15 - 0.40m dark to brown sandy loam to clay loam A horizon over acid to neutral brown sandy loam to clay loam B horizon to 0.80 - 1.10m over brown sandy loam to sandy clay loam D horizon to 1.5+m	No suitable group, affinities with yellow earth	Um5.52 Gn2.22 Gn2.41 Uc5.22	Woodland to low open woodland of carbeen, poplar gum and grey bloodwood with batswing coral tree, cocky apple, Burdekin plum and Leichhardt tree associated with Tussock grassland of black spear grass, giant spear grass, and brown sorghum
		6Gnd	0.15 - 0.30m grey to brown sandy loam to clay loam A1 horizon over brown to yellow-brown fine sandy loam to clay loam A2 or A3 horizon to 0.50 - 1.20m over neutral brown to yellow clay loam to light clay B horizon to 1.5+m	No suitable group, affinities with yellow podzolic soil	Gn3.75 Gn3.72 Gn3.22	Woodland to open woodland of carbeen, cabbage gum and poplar gum with red and grey bloodwood and cocky apple associated with Tussock grassland of black spear grass, giant spear grass and brown sorghum
		6Dbc	0.10 - 0.20m dark to brown fine sandy loam to fine sandy clay loam A1 horizon over frequently bleached A2 horizon to 0.20 - 0.40m over neutral brown medium clay B horizon to 0.90 - 1.5+m over brown to grey sandy loam to light medium clay D horizon	No suitable group, affinities with brown podzolic soil	Db1.32 Db1.22	Woodland to low woodland of poplar gum, grey bloodwood and carbeen with cocky apple associated with Tussock grassland of black spear grass, giant spear grass, brown sorghum and kangaroo grass
		6Dbf	0.05 - 0.25m dark to brown sandy loam to loam fine sandy A1 horizon over yellow-brown to grey fine sandy loam to fine sandy clay loam A2 or A3 horizon to 0.20 - 0.40m over neutral brown to yellow-brown fine sandy clay to medium clay B horizon to 0.80 - 1.40m over sandy clay loam to fine sandy clay D horizon to 1.5+m	Brown podzolic soil	Db1.22 Db1.12 Dy2.12	Open woodland to woodland of poplar gum, grey and red bloodwood, carbeen and grey Ironbark with cocky apple associated with Tussock grassland of blue grasses, black spear grass and giant spear grass with golden beard grass associated

Table 1 (Cont'd)

Landscape unit	Landform element	Soil type	Major distinguishing attributes	Great soil group	PPF	Predominant natural vegetation
Miscellaneous alluvial landforms A. Burdekin River alluvial landforms	Backplain	6Umb2	0.20 - 0.30m dark to grey loam fine sandy to fine sandy clay loam A horizon over acid to neutral dark to yellow-brown clay loam to light clay B horizon to 0.55 - 0.75m over neutral brown to grey fine sandy clay loam to medium clay D horizons to 1.50+m	No suitable group	Um5.52 Um6.31 Gn3.91	Woodland of poplar gum, grey bloodwood and carbeen with cocky apple associated with Tussock grassland of brown sorghum, black spear grass and giant spear grass
		6Ugc	Hard setting surface over brown-mottled dark to grey light clay A1 horizon to 0.10 - 0.20m over bleached A2 horizon to 0.15 - 0.30m over alkaline grey medium clay B horizon to 0.75 - 1.5+m over grey to brown light clay D horizon to 1.5+m	(Bleached) grey clay No suitable group	Ug2 Ug3.2 Uf3	Low open woodland to low woodland of cabbage gum, poplar gum and carbeen with cocky apple associated with Tussock grassland of blue grasses, kangaroo grass and black spear grass
		6Gna	0.20 - 0.40m dark clay loam A horizon over neutral brown to dark light to medium clay B horizon to 0.90 - 1.20m over brown sandy clay loam to sandy clay D horizon to 1.5+m	No suitable group, affinities with prairie soil	Gn3.22 Gn3.92 Gn3.42 Dd1.12	Low open woodland to low woodland of carbeen, cabbage gum, poplar gum and grey bloodwood with coral tree, Leichhardt tree and cocky apple associated with Tussock grassland of giant spear grass, black spear grass and brown sorghum
		6Gne	0.15 - 0.35m dark to grey clay loam A1 horizon over bleached A2 horizon to 0.25 - 0.50m over alkaline dark to grey light clay B horizon to 1.5+m	No suitable group	Gn3.49 Gn3.03 Gn3.06	Low open woodland to open woodland of poplar gum and cabbage gum with grey bloodwood and cocky apple associated with Tussock grassland of black spear grass and giant spear grass with blady grass and brown sorghum associated
		6Dbb	0.10 - 0.25m dark to brown loam to clay loam A1 horizon over bleached A2 horizon to 0.30 - 0.40m over alkaline grey to brown or dark medium clay B horizon to 1.00 - 1.20m over brown to yellow-brown light to light medium clay D horizon to 1.5+m	Solodic soil	Dy2.43 Dy2.33 Db1.33 Dd1.33	Low open woodland to low woodland of poplar gum, cabbage gum, carbeen and grey bloodwood with cocky apple associated with Tussock grassland of black spear grass, giant spear grass and brown sorghum
Miscellaneous alluvial landforms B. Creek and relict alluvial landforms	Prior streams	6Uca	0.10 - 0.30m dark coarse sand to sandy loam A horizon over acid to neutral brown coarse sand to sandy loam to 0.80 - 1.00m over mottled sand D horizon to 1.5+m	No suitable group affinities with earthy sands - siliceous sands	Uc5.11 Uc5.21	Low open to low woodland of pandanus, broad leaf tea-tree and grey bloodwood with cocky apple and poplar gum associated with Tussock grassland of giant spear grass and black spear grass

Table 1 (Cont'd)

Landscape unit	Landform element	Soil type	Major distinguishing attributes	Great soil group	PPF	Predominant natural vegetation
Miscellaneous alluvial landforms B. Creek and relict alluvial landforms	Levees	6Uga	Hard setting to weakly self mulching surface over dark light to light medium clay to 0.05 - 0.20m over alkaline dark to grey medium clay to 1.00 - 1.50+m over grey sandy clay to medium clay D horizon to 1.5+m	Black earth-grey clay	Ug5.17 Ug5.16 Ug5.2	Open woodland to woodland of poplar gum, cabbage gum and grey bloodwood with carbeen and red bloodwood associated with Tussock grassland of black spear grass and blue grasses
		6Drc	0.10 - 0.20m dark to grey loam to clay loam A1 horizon over bleached A2 horizon to 0.20 - 0.50m over alkaline yellow-mottled red to brown medium to heavy clay B horizon to 1.00 - 1.35m over red-brown sandy clay to medium clay D horizon to 1.5+m	Solodic-solodized solonetz	Dr3.33 Dr3.43	Open woodland to woodland of grey bloodwood and poplar gum with carbeen, cabbage gum, cocky apple and beefwood associated with Tussock grassland of black spear grass, blue grasses and giant spear grass with kangaroo grass associated
		6Dbe	0.05 - 0.15m brown-mottled dark to brown fine sandy loam to fine sandy clay loam A1 horizon over bleached A2 horizon to 0.10 - 0.20m over neutral to alkaline yellow-mottled brown medium to heavy clay B horizon to 0.55 - 0.70m over brown to yellow-brown loamy sand to light medium clay D horizons to 1.5+m	Red-brown earth	Db2.33 Db2.43 Db2.32	Open woodland to open forest of poplar gum, carbeen and red and grey bloodwood with beefwood and cocky apple associated. Occasionally open forest of tea-tree with Tussock grassland of blue grasses, black spear grass and golden beard grass
		6Dbh	0.05 - 0.15m grey to brown loam to clay loam A1 horizon over bleached A2 horizon to 0.10 - 0.25m over alkaline brown light to medium clay B horizon to 0.60 - 1.00m over brown clay loam to medium clay D horizon to 1.5+m	Solodic-solodized solonetz	Db1.43 Db1.33	Low open woodland to low woodland of beefwood, false sandalwood and carbeen with cabbage gum and grey Ironbark associated or Tall open shrubland of beefwood occurs with Open tussock grassland of purple top Rhodes grass and blue grasses
Floodouts, fans and levees		6Ufa	0.10 - 0.30m brown to dark sandy clay to light clay A horizon over alkaline dark medium clay B horizon to 1.5+m	No suitable group, affinities with chernozem	Uf6.32	Low open woodland of carbeen, poplar gum and cabbage gum with beefwood and cocky apple associated with Tussock grassland of Rhodes grasses, black spear grass and blue grasses

Table 1 (Cont'd)

Landscape unit	Landform element	Soil type	Major distinguishing attributes	Great soil group	PFF	Predominant natural vegetation	
Miscellaneous alluvial landforms B. Creek and relict alluvial landforms	Floodouts, fans and levees	6Ufd	0.15 - 0.45m dark light to light medium clay A horizon over acid to neutral dark to brown light to light medium clay B horizon to 0.70 - 1.5m over brown to yellow sand to loamy sand D horizon to 1.5+m	Prairie soil	Uf6.32 Uf6.31	Open woodland of poplar gum, grey bloodwood and carbeen with cocky apple associated with Tussock grassland of blue grasses and black spear grass	
		6Ufe	0.05 - 0.30m brown-mottled dark to grey light to medium clay A horizon over acid to alkaline grey to brown sand D1 horizon to 0.30 - 0.70m over neutral to alkaline sand to clay D horizons to 1.5+m	Alluvial soil	Uf6.22 Uf6.23	Open woodland to woodland of poplar gum, cabbage gum and tea-tree spp. with parkinsonia associated with Tussock grassland of blue grasses and black spear grass with brown sorghum associated	
			6Dba	0.10 - 0.20m dark to brown sandy loam to sandy clay loam A1 horizon over bleached A2 horizon to 0.15 - 0.30m over alkaline brown medium clay B horizon to 1.5+m	Solodic-solodized solonetz	Db1.43 Db1.33	Low open to low woodland of carbeen, grey bloodwood and cabbage gum with poplar gum, whitewood, beefwood and mimosa associated with Tussock grassland of black spear grass, blue grasses and Rhodes grasses
			6Dyb	0.15 - 0.30m dark to brown sandy loam A1 horizon over bleached A2 horizon to 0.30 - 0.60m over neutral yellow-mottled yellow-brown sandy clay to medium clay B horizon to 1.5+m	Soloth-solodic soil	Dy3.32 Dy3.42	Open woodland of poplar gum and grey bloodwood with carbeen, cocky apple and cabbage gum associated with Tussock grassland of black spear grass, blue grasses and giant spear grass
			6Dye	0.20 - 0.40m dark to brown loamy sand to sandy loam A1 horizon over bleached A2 horizon to 0.30 - 0.80m over alkaline yellow-mottled grey to yellow-brown medium clay B horizon to 1.5+m	Solodic-solodized solonetz	Dy3.43 Dy3.33	Open woodland to low open woodland of poplar gum, grey bloodwood and tea-tree spp. with beefwood and cabbage gum associated with Tussock grassland of black spear grass and giant spear grass
			6Dyf	0.10 - 0.25m grey to dark loam to clay loam A1 horizon over bleached A2 horizon to 0.25 - 0.50m over alkaline brown-mottled yellow-brown to brown medium clay B horizon to 1.20 - 1.50+m over brown light to light medium clay D horizon to 1.5+m	Solodic-solodized solonetz	Dy3.43 Dy3.33 Db2.43	Woodland to low woodland of poplar gum and grey bloodwood with cocky apple associated with Tussock grassland of black spear grass, giant spear grass and kangaroo grass

Table 1 (Cont'd)

Landscape unit	Landform element	Soil type	Major distinguishing attributes	Great soil group	PPF	Predominant natural vegetation
Miscellaneous alluvial landforms B. Creek and relict alluvial landforms	Floodouts, fans and levees	6Dyg	0.05 - 0.10m grey to brown or dark loam to clay loam A1 horizon over bleached A2 horizon to 0.10 - 0.20m over alkaline brown-mottled grey to yellow medium to heavy clay B horizon to 0.70 - 1.20m over yellow-brown to grey fine sandy clay loam to light medium clay D horizon to 1.5+m	Solodic-solodized solonetz	Dy3.43 Dy3.33	Low open to open woodland of carbeen, cabbage gum, poplar gum, beefwood and false sandalwood with grey bloodwood and cocky apple associated with Open tussock grassland of black spear grass and purple top Rhodes grass
		6Dyh	0.15 - 0.30m dark to brown sand to sandy loam A1 horizon over bleached A2 horizon to 0.20 - 0.50m over alkaline yellow-mottled grey medium clay B horizon to 1.5+m	Solodic-solodized solonetz	Dy3.43 Dy3.33	Low open to open woodland of poplar gum, cabbage gum, carbeen and beefwood with grey bloodwood, false sandalwood, dead finish, chinee apple and cocky apple associated with Tussock grassland of black spear grass and love grass with blue grasses and purple top Rhodes grass associated
		6Dyj	0.05 - 0.20m dark to grey sandy loam to clay loam A horizon bleached throughout or near base over grey medium to heavy clay B horizon to 1.00 - 1.50m over grey to yellow-brown sandy loam to medium clay D horizon to 1.5+m, strongly alkaline at and below 0.30m	Solodic-solodized solonetz	Dy2.43 Dy2.33	Low open to open woodland of poplar gum, cabbage gum and beefwood with false sandalwood, carbeen, grey bloodwood and corkwood associated with Open tussock grassland of blue grasses, giant spear grass, black spear grass and purple top Rhodes grass
		6Ddb	0.15 - 0.30m dark to grey coarse sand to sandy loam A1 horizon over bleached A2 horizon to 0.25 - 0.50m over alkaline grey to dark medium to heavy clay to 1.5+m	Solodic soil	Dy2.43 Dd1.33	Low open woodland of poplar gum, carbeen, cabbage gum and beefwood with grey bloodwood and cocky apple associated with Tussock grassland of blue grasses and black spear grass
Closed depressions		6Dda	0.10 - 0.15m dark to brown clay loam A1 horizon over bleached A2 horizon to 0.15 - 0.25m over alkaline dark medium clay B horizon to 0.70 - 1.10m over grey to dark clay loam to light medium clay D horizon to 1.5+m	Solodic-solodized solonetz	Dd1.43 Dd1.33	Low open woodland to open woodland of poplar gum, carbeen, cabbage gum and beefwood with grey bloodwood associated with Tussock grassland of black spear grass, blue grasses and Rhodes grasses

Table 2 Ratings\* for salinity, sodicity and nutrients in sampled soil types, Leichhardt Downs Section, Burdekin River Irrigation Area

Soil type	Soil salinity	Sodicity		Extractable phosphorus		Extractable potassium	Copper	Zinc	Manganese	Total nitrogen	Organic carbon	Total sulphur
		0.2-0.3m	0.8-0.9m	Acid	Bicarbonate							
1Uga	v. low	non-sodic	sodic	low	v. low	high	medium	medium	medium	low	medium	medium
1Ugd	v. low	non-sodic	sodic	v. low	v. low	low	medium	low	medium	low	low	-
1Ugf	medium	sodic	strongly sodic	v. low	v. low	medium	medium	low	high	low	low	low
1Dyc	high	strongly sodic	strongly sodic	v. low	v. low	low	medium	low	medium	low	low	low
1Dda	low	strongly sodic	strongly sodic	v. low	v. low	medium	medium	low	high	low	low	low
2Uga	v. low	non-sodic	sodic	v. low	v. low	low	medium	medium	medium	low	low	-
2Ugc	v. low	non-sodic	sodic	v. low	v. low	high	-	-	-	low	low	low
2Ugd	v. low	non-sodic	sodic	medium	low	high	medium	medium	medium	low	medium	medium
2Ugh	v. low	non-sodic	sodic	low	low	high	medium	low	medium	low	low	low
2Dbb	low	strongly sodic	strongly sodic	v. low	low	high	-	-	-	low	-	medium
2Dba	medium	strongly sodic	strongly sodic	low	medium	medium	-	-	-	low	low	low
2Dya	medium	strongly sodic	strongly sodic	v. low	v. low	medium	medium	low	medium	medium	low	low
2Dyb	medium	strongly sodic	strongly sodic	low	low	medium	medium	low	medium	medium	low	low
3Uga	v. low	non-sodic	sodic	low	v. low	high	-	-	-	low	low	low
3Uga8	v. low	non-sodic	sodic	low	v. low	high	medium	medium	medium	low	low	low
3Ugd	v. low	non-sodic	sodic	low	v. low	high	-	-	-	v. low	low	low
5Uga	v. low	non-sodic	non-sodic	medium	low	medium	medium	low	medium	low	low	low
5Ugb	v. low	non-sodic	non-sodic	v. low	v. low	medium	medium	low	medium	low	low	medium
5Ugc	medium	sodic	strongly sodic	v. low	v. low	low	medium	low	high	low	low	low
5Dra	v. low	non-sodic	non-sodic	low	low	medium	medium	medium	high	low	low	low
5Dya	v. low	non-sodic	non-sodic	medium	low	medium	-	-	-	low	low	low
5Dyb	v. low	non-sodic	sodic	medium	low	medium	-	-	-	low	low	low
5Dyc	high	strongly sodic	strongly sodic	low	v. low	medium	medium	v. low	medium	low	low	low
5Dyf	high	sodic	strongly sodic	v. low	v. low	low	medium	v. low	medium	v. low	v. low	low
6Dbb	v. low	non-sodic	sodic	high	medium	high	medium	medium	high	medium	medium	medium
6Dbh	medium	strongly sodic	strongly sodic	low	low	high	medium	medium	medium	low	low	low

Note: \* Soil salinity rating as weighted average root-zone salinity to 0.9 m from predicted EC<sub>se</sub> values after Shaw et al. (1986). Sodicity ratings after Northcote and Skene (1972). Other ratings after Bruce and Rayment (1982).

#### 4. MAPPING UNITS

Mapping units were named after the major soil type found in each unit. Individual map units delineated on the map were called unique map areas (UMAs) and each given a number.

Simple UMAs were named after the dominant soil type when it occupied more than 70% of the area. Complex areas where soil types could not be separated at the 1:25 000 scale were mapped as compound UMAs. Compound UMAs were named after the two most commonly occurring soil types, with the one that occupied the largest area being named first.

#### 5. LAND SUITABILITY EVALUATION

Each UMA was allocated a separate land suitability class for sugar-cane, grain crops, small crops, mangos and rice.

The land suitability classification contains five classes based on an increasing limitation to crop growth, increasing requirement for water use efficiency to achieve satisfactory crop establishment and growth, increasing requirement for modifications to existing land in preparation for irrigation, and increasing degradation hazard.

The five classes are:

1. Land suitable for irrigation with no or minor limitations.
2. Land suitable for irrigation with slight limitations.
3. Land suitable for irrigation with moderate limitations.
4. Land currently unsuitable for irrigation.
5. Land unsuitable for irrigation.

The classes are defined in more detail in Appendix 1.

Sixteen limiting factors involving both soil and land attributes considered important for crop growth and irrigation management were used as the basis for determining land suitability. Subclasses, usually from 2 to 5, were allocated to each limiting factor depending on the degree of severity of the limitation.

The maximum subclass of one or more limiting factors was used to determine the class for a particular UMA. Where a number of limiting factors had the same subclass, appraisal of the effects of interactions between these factors was considered in order to determine whether this land should be downgraded to the next class.

Two classifications were used, one for rice, the other for crop groups other than rice. The classification for crop groups other than rice was developed primarily for determining the suitability of land for grain crops. To allocate a separate suitability class for the other crop groups (that is sugar-cane, small crops and mangos), the effects of the subclasses of the limiting factors on the growth and management of each of the respective crop groups were considered.



The classifications used to determine land suitability are shown in Appendix 2.

Table 3 lists subclasses of the limiting factors and land suitability classes for the soil types for each crop group.

Limiting factors as well as the range of subclasses assigned to a simple UMA may vary from that of the soil type depending on minor soil types within the UMA or variations due to soil and land attributes not normally associated with the soil type. Limiting factors of the two major soil types as well as the minor soil types were considered when allocating a suitability class to a complex UMA.

Land suitability classes specific to the UMAs of the study area as well as their respective areas are listed in Table 4.

Soil types with similar land suitability classes, soil and land limitations and management requirements were grouped into agricultural management units. Table 5 lists the agricultural management units with their land suitability classes, soil and land limitations; and outlines important management considerations.

## 6. GUIDELINES FOR DEVELOPMENT

A number of important planning strategies need to be followed in the resubdivision and farm design stage of irrigation development to enable economic crop production to be sustained on subsequent farms and ensure long-term stability of land resources. Measures to decrease the effects of potential degradation must be undertaken in the development of an area for irrigation. The distribution of soils and the suitability of land on individual farms must also be considered during subdivisional planning to ensure farms are economically viable.

Degradation hazards of concern on Leichhardt Downs Section include:

- salinisation, including both regional (rise in groundwater with subsequent salinisation on a regional level) and toposequence salinisation (rise in groundwater with subsequent salinisation on lower slopes of intake areas);
- erosion; and
- flooding.

Farm subdivisional considerations include:

- complex soil distribution; and
- use of class 4 and 5 lands.

Table 3 Subclasses of limiting factors and land suitability classes for sugar-cane, grain crops, small crops, mangoes and rice for soil types of Leichhardt Downs Section, Burdekin River Irrigation Area

Soil type	Subclasses of limiting factors for crops other than rice															Land suitability classes				Subclasses of limiting factors for rice						Land suitability Rice	
	d	pb	ps	pd	pt	sa	so	t	n	r	g	w	e	f	i	o	Sugar cane	Grain crops	Small crops	Mangoes	t	g	f	p	sa		pd
1Uga, 1Ugd 1Ugc, 1Ugf			3				3*		2		2	3			2-3	2	3	4	4	2-3	2						2-3
1Uge			3	3			3	2	2		2			2		3	3	4	4	5	2			2			5
1Dya		4	3-4			3	3-4	2	2					2		3	4	4	5	2-4							2-4
1Dyb		3-4	3-4			3	4	2	2					2		3	4	4	5	2-4				5			5
1Dyc, 1Dda		3-4	3-4			3	3-4	2	2					2		3	4	4	5	2-4							2-4
1Dba		3-4	3-4				4	2	2					2		3	4	4	5	2-4							2-4
2Uga			3				3*		2					2-3		2	3	4	4					2			2
2Ugb			3						2		2	3		3		2	3	4	4		2	2	2				2
2Ugd, 2Ugg, 2Ugc			3						2		2	3		2-3		2	3	4	4		2		2				2
2Uge			3				3*		2		2	3		2-3		2	3	4	4		2		2				2
2Ugh			3				3		2		2	3		2-3		2	3	4	4		2		2				2
2Dyc		3	3				3		2		2	3		2-3		2	3	5	4		2	2			2		2
2Dba, 2Ddb		4	4				4		2							4	5	5	5	2					2		2
2Dbb, 2Dyb		3	3				3	3-4	2					2		2	3	4	4	2-3					2		2-3
2Dya		4	3-4				3	3-4	2					2		3	4	5	4	2							2
2Dbc, 2Dbd		2	3				3	2	2					2		2	3	3	3	2-3				3			3

Table 3 (Cont'd)

Soil type	Subclasses of limiting factors for crops other than rice															Land suitability classes				Subclasses of limiting factors for rice						Land suitability Rice		
	d	pb	ps	pd	pt	sa	so	t	n	r	g	w	e	f	i	o	Sugar cane	Grain crops	Small crops	Mangoes	t	g	f	p	sa		pd	
2Dbe		3	3						2								2	3	4	4	2							2
3Uga, 3Uga8 3Ugk			3				3*	2		2	3		3				2	3	4	4			2	2	2			2
3Ugd, 3Uge			3					2		2	3		3				2	3	4	4			2	2	2			2
3Ugf			2					2					3				2	3	3	4					2	2		2
4Ucc			3	4	4			3	3				2		4		4	4	4	3	5				5			5
4Dyg		2-3	3				3*	2-3	3				3				4	4	4	4	5				5			5
4Dba		2-3	3				3-4	2-3	3				3				4	4	4	4	5				5			5
4Dyh		2-3	3				4	2	2-3				3				4	4	4	5	5				5			5
5Uga	2		3	**				2-3					3				2	3	4	4	5				5			5
5Ugb	2		3	**			3*	3					3				2	3	4	4	5				5			5
5Dra, 5Dya	2		3	**			3	2				3		3			3	3	2	1	5				5			5
5Dyb			3					3	2				3				3	3	3	2	5				5			5
5Dyc		2-3	3-4				3-4	2	2				2-3		4		4	4	4	4	5				5			5
5Dyd		4	4				4	2	2				2		4		4	4	4	4	4-5				5			5
5Dyf - 5Ugc	2	2-3	3	3			3	2-3	2				3				3	3	4	4	5				5			5
6Ucc			3	4	3-4			2	2						4		3	4	3	2	3				5			5
6Uma, 6Umb, 6Gnd			2					2									2	2	2	2	3				5			5

ERRATA Table 3. The subclasses of limiting factors for crops other than rice for soil type 5 Dra 5 Dya are 2 for d, 3 for ps, 3 for t, 2 for n, 3 for e, and 3 for i.

Table 3 (Cont'd)

Soil type	Subclasses of limiting factors for crop other than rice																Land suitability classes				Subclasses of limiting factors for rice					Land suitability	
	d	pb	ps	pd	pt	sa	so	t	n	r	g	w	e	f	l	o	Sugar cane	Grain crops	Small crops	Mangoes	+	g	f	p	sa	pd	Rice
6Dbc, 6Dbf	2	2					2										2	2	2	2	3		5				5
6Ugc			3				2				3		3				2	3	4	4			2	2		4	4
6Gna			3				2	2					2				2	3	2	2	4		5				5
6Gne			2				2	2					2				2	3	2	2	4		5				5
6Dbb	2	3					3*	2									2	3	3	3	2-3		5				5
6Uca			3	4	4		2	2							4		4	5	4	3	5		5				5
6Uga			2				3	2					3	4			3	4	4	4	5		5				5
6Drc	2	3						2									2	3	3	2	2		4				4
6Dbe	3	3					2										2	3	3	3	5		5				5
6Dbh	3	4				4	2	2					2				4	4	4	5	5		5				5
6Ufa, 6Ufd, 6Ufe			3	4			2				3	2	4				5	5	5	3	5		5				5
6Dba	2-3	3				3	2						2				2	3	3	3	4		3				4
6Dyb	2	3	4	2			2	2									3	4	4	3	3		5				5
6Dye			3	4	2		2	2					2				3	4	4	3	5		5				5
6Dyf	2	3					2	2									3	4	3	3	5		5				5
6Dyg	3	3				3	2	2					2				3	4	4	4	4		4				5
6Dyh	2	3	4			3	2	2					2				3	4	4	4	5		3		4		5

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Table 3 (Cont'd)

Soil type	Subclasses of limiting factors for crops other than rice															Land suitability classes				Subclasses of limiting factors for rice						Land suitability Rice	
	d	pb	ps	pd	pt	sa	so	t	n	r	g	w	e	f	l	o	Sugar cane	Grain crops	Small crops	Mangoes	t	g	f	p	sa		pd
6Dyj		3	4	3			4	2	2					2	3		4	4	4	4	5			5			5
6Ddb		2	3	3			3	2	2					2			3	4	3	3	3			5			5
6Dda		3	3	4			3	2	2						3		3	4	3	3	3			5			5

\* Some soil types do not have a sodicity rating as defined in the land suitability classification.

\*\* These soil types sometimes have a pd subclass of 4 depending on the presence of other soil types with markedly different permeabilities.

Table 4 - Land suitability classes for unique map areas, Leichhardt Downs Section, Burdekin River Irrigation Area.

UMA No.	UMA name	Area ha	Land suit.					UMA No.	UMA name	Area ha	Land suit.					
			C	G	S	M	R	*			C	G	S	M	R	
1	6UmaE	4.5	5	5	5	3	5		59	1Ugd	6.0	3	3	4	4	3
2	4R	2.7	5	5	5	5	5		60	1Ugc	2.7	2	3	4	4	4
3	4DygE	6.0	5	5	5	5	5		61	1Ugd	3.8	3	3	4	4	4
4	2Uge	7.1	2	3	4	4	2		62	5Dyd	5.1	4	4	4	4	5
5	4Dyg4	5.8	3	4	5	4	5		64	2Dbb	17.2	2	4	4	4	2
6	6Dyh3	1.8	3	4	4	4	5		65	2Dyc	23.3	2	3	5	4	2
7	6Dbb	6.5	2	3	2	2	5		66	2Ugg	8.2	2	3	4	4	2
8	6DyhE	1.7	5	5	5	5	5		67	2Ugc	17.0	2	3	4	4	2
9	2Dbb	18.0	3	3	4	4	5		68	4Dyh	43.2	4	4	4	4	5
10	2Dbd	12.1	3	4	4	5	4		69	4Dba	4.4	4	4	4	4	5
11	4UccR	41.5	5	5	5	5	5		70	3Uga	15.3	2	3	4	4	2
12	2Sp	13.6	5	5	5	5	5		71	6Dyj	4.9	4	4	4	5	5
13	1Ugd	5.8	2	3	4	4	2		72	6Dyh	1.3	3	4	4	4	5
14	4Ucc1	8.4	5	5	5	5	5		73	2Ddb	3.5	4	4	5	5	4
15	4Dyg4	7.4	3	4	4	5	5		74	6Dyj	1.0	4	4	4	4	5
16	4Dygr	1.3	4	4	4	4	5		75	1Dda	111.1	3	4	4	5	4
17	4Dyh	15.8	4	4	4	4	5		76	4Dyh	12.2	4	4	4	4	5
18	4Dyh3	5.8	4	4	4	4	5		77	6Dyf	15.0	3	4	3	3	5
19	2Ugc	14.1	3	4	5	4	3		78	6Dye	15.8	5	5	5	4	5
20	2Ugc	13.3	3	4	4	4	3		79	6Dyf	2.7	3	4	3	3	5
21	6Dbb	1.4	2	3	4	4	5		80	4Dyg	18.8	3	4	4	4	5
22	6Dbb	1.5	2	3	4	4	5		81	6Dyg	10.8	3	4	4	4	5
23	6Dbb	13.1	2	3	2	2	5		82	6Dda	0.8	2	3	3	3	4
24	6Sp	0.9	5	5	5	5	5		83	4Dyh3	0.5	4	4	4	4	5
25	2Ugc	17.9	3	4	5	5	3		84	2Dyc	9.6	3	4	5	4	3
26	2Ugc	1.2	4	4	5	5	3		85	6Dyg	12.0	3	4	4	4	5
27	2Dya	5.3	3	4	5	4	3		86	6Ufd	7.1	5	5	5	3	5
29	6Dyb1	4.2	4	4	5	4	5		87	1Uga	72.3	2	3	5	4	3
30	4Dyh3	7.6	4	4	4	4	5		88	1Dyc	14.3	3	4	4	5	4
31	2Ugc	17.1	2	3	4	4	3		89	6Dba	6.1	3	4	4	3	4
32	2Dbd	2.5	3	4	4	4	3		90	1Dda	1.6	3	4	4	5	5
33	6Dbb3	8.5	3	3	3	3	5		91	6Ufa	8.6	5	5	5	3	5
34	2Uge	31.0	3	4	4	4	3		92	1Ugd	24.0	2	3	4	4	4
35	2Ugc	5.6	2	3	4	4	3		93	1Dyc	11.0	3	4	4	5	4
36	2Uga	4.7	2	3	4	4	3		94	6Dda	6.4	3	4	4	3	5
37	1Ugd	45.6	3	3	4	4	3		95	1Dda	1.8	3	4	4	5	4
38	1Uga	38.9	2	3	4	4	3		96	1Ugc	9.9	2	3	4	4	4
39	5Dyd	13.8	4	4	4	4	5		97	5Dya	1.6	3	3	2	1	5
41	5Dya	4.1	3	3	2	1	5		98	2Dyb	87.0	2	3	4	4	3
42	5Dra	44.1	3	3	2	1	5		99	1Dyc	28.2	3	4	4	5	4
43	5Dyf	9.3	3	4	4	4	5		100	1Dda	4.1	4	4	4	5	4
45	1Dya	9.4	4	4	5	5	5		101	1Dyc	5.0	4	4	4	5	5
46	1Ugf	2.3	3	3	4	4	5		102	1Dyc	4.7	4	4	4	5	5
48	5Dyc	8.6	4	4	4	4	5		103	1Uge	5.9	3	3	4	4	5
49	1Dba	2.7	4	4	4	5	4		104	5Dyb	4.6	3	4	3	2	5
50	5Dyc1	5.9	4	4	4	4	5		105	5Dyc	1.5	4	4	4	4	5
51	5Dyd	6.9	4	4	4	4	5		106	1Ugd	6.6	2	3	4	4	5
52	1Uga	37.3	2	3	4	4	3		107	1Uga	42.7	2	3	4	4	4
53	1Dyc	18.8	4	4	4	5	3		108	1Dyc	14.2	3	4	4	5	5
54	1Ugd	26.4	3	3	4	4	3		109	1Uge	6.8	3	3	4	4	5
55	5Uga	2.3	3	3	4	4	5		110	5Dyc	0.5	4	4	4	4	5
56	1Ugf	1.6	3	4	4	4	3		111	1Dyc	0.8	3	4	4	5	4
57	3Uga	463.2	2	3	4	4	2		112	1Dyc	11.3	3	4	4	5	5
58	5Dyc	3.9	4	4	4	4	5		113	1Ugd	7.0	2	3	5	4	4

\* C- Sugar-cane G- Grain crops S- Small crops M- Mangoes R- Rice

Table 4 (Continued)

UMA No.	UMA name	Area ha	Land suit. C G S M R	UMA No.	UMA name	Area ha	Land suit. C G S M R
114	1Dyc	0.6	3 4 4 5 5	172	6Dbf	5.2	3 4 3 3 5
115	2Ugg	12.1	2 3 4 4 2	173	6Dyh	4.1	3 4 4 3 5
116	1Ugf	3.4	2 3 5 4 4	174	6Uca	15.1	4 5 4 3 5
117	2Dyb	77.0	2 3 4 4 2	175	6Dda	12.6	3 4 3 3 5
118	2Dya	50.4	3 4 5 4 3	176	6Dbf2	2.7	3 4 3 3 5
119	2Ugc	14.2	3 4 5 4 3	177	6Dda	2.5	3 4 3 3 5
120	2Uge	74.2	2 3 4 4 2	178	6Dda	7.2	3 4 3 3 5
121	6Dyg	10.7	3 4 4 4 5	179	6Dyh	10.5	3 4 4 3 5
122	2Dbe	9.3	2 4 4 4 3	180	6Dda	2.6	3 4 3 3 5
123	2Ugd	20.8	2 3 4 4 2	181	6Dyb2	20.7	4 4 4 3 5
124	2Ugc	11.8	3 4 5 4 2	182	6Ucc	0.6	4 5 4 3 5
125	2Ugg	118.1	2 3 4 4 2	183	6Dda	2.2	3 4 3 3 5
126	2Ugh	28.8	2 3 4 4 2	184	6Dyg	4.8	3 4 4 4 5
127	2Dbb	11.9	2 3 4 4 5	185	6Dbf2	3.0	4 5 3 3 5
128	2Dya	12.7	3 4 5 4 2	186	6Uca	6.4	4 5 4 3 5
129	2Dyb	2.6	3 4 4 4 3	187	6Dda	1.7	3 4 3 3 5
130	2Dyb	16.9	2 3 4 4 3	188	6Dyb	4.9	3 4 4 3 5
131	2Dya	33.6	3 4 5 4 2	189	6Dyh	3.0	3 4 4 3 5
132	2Ugd	6.1	2 3 5 4 3	190	6Dda	1.1	3 4 3 3 5
133	2Ugg	44.7	2 3 4 4 2	191	1Dda	5.3	3 4 4 5 5
134	1Ugc	14.2	3 4 4 5 3	192	6Dyh2	17.8	3 4 4 3 5
135	1Ugd	10.6	2 3 4 4 3	193	1Dda	6.4	3 4 4 5 5
137	5Dyd	2.1	4 4 4 4 5	194	6Ddb	1.8	3 4 3 4 5
138	5Dyc	26.6	4 4 4 4 5	195	6Uca	6.2	4 5 4 3 5
139	1Dyc	94.0	3 4 4 5 4	196	6Dyh2	6.8	4 4 4 3 5
140	1Dyb	9.8	3 4 4 5 5	197	6Dda	3.0	3 4 4 4 5
141	1Dya	23.6	3 4 4 5 4	198	6Dyb	1.3	4 4 4 3 5
142	5Dyd	5.4	4 4 4 4 5	199	1Uga	23.9	2 3 4 4 4
143	1Dda	12.9	3 4 4 5 5	200	5Dya	4.8	3 3 2 1 5
144	5Dyc	0.6	4 4 4 4 5	201	5Dra	9.1	3 3 3 1 5
145	1Dyc	2.4	3 4 4 5 3	202	6Dda	4.4	3 4 3 3 5
146	1Ugf	67.7	2 3 4 4 4	203	1Ugc	10.8	2 3 4 4 4
147	1Uga	12.1	2 3 4 4 4	204	3Uga	21.2	2 3 4 4 2
148	1Dda	0.7	3 4 4 5 4	205	3Uga8	51.8	2 3 4 4 2
149	1Dda	31.3	3 4 4 5 4	206	1Uga	19.3	2 3 4 4 2
150	1Ugd	7.9	2 3 4 4 5	207	1Dyc	5.6	4 4 4 5 4
151	1Uge	3.9	3 4 4 4 5	208	5DyaR	3.2	5 5 5 3 5
152	1Dda	8.4	3 4 4 5 5	209	3Uga8	49.7	2 3 4 4 2
153	1Ugd	2.1	2 4 4 4 4	210	5Dyb	1.6	4 4 4 3 5
154	1Ugc	3.7	2 3 4 4 4	213	3UgdE	45.2	5 5 5 5 5
155	1Dyc	12.1	3 4 4 5 4	214	1Ugd	2.9	2 3 5 4 2
156	5Dyd	6.4	4 4 4 4 5	215	6Dda	0.4	3 4 3 3 5
157	1Dyc	15.8	3 4 4 5 5	216	3Uge	93.8	2 3 4 4 2
158	5Dyd	1.0	4 4 4 4 5	217	6Gnd2	2.7	4 4 4 3 5
159	1Ugc	3.9	3 4 4 5 5	218	5Dyc	1.8	4 4 4 4 5
160	5Dyc	2.7	4 4 4 4 5	219	6Dye	16.6	3 4 4 3 5
161	1Uga	21.3	2 3 4 4 2	220	6Uca	8.5	4 5 4 3 5
162	3Uga	34.9	2 3 4 4 2	221	6Ddb	37.6	3 4 3 4 5
163	6Dbf2	20.1	3 4 2 2 5	222	5R	1.6	5 5 5 5 5
164	6Ddb	1.5	3 4 3 4 5	223	6Ddb	14.5	3 4 3 4 5
165	6Uca	1.2	4 5 4 3 5	224	6Uca	9.0	4 5 4 3 5
166	6Dda	2.6	3 4 3 3 5	225	6Dyh	8.3	3 4 4 3 5
167	6Dda	7.0	3 3 3 3 5	226	5Dyd	2.5	4 4 4 4 5
168	1Dda	11.0	3 4 4 5 5	227	2Ugh	4.5	2 3 4 4 2
169	6Uca	2.9	5 5 5 5 5	228	3Ugd	72.4	2 3 4 4 2
170	6Uca	1.5	5 5 5 5 5	229	2Ugc	7.5	2 3 4 4 2
171	6Dda	2.0	3 4 3 3 5	230	2Uge	11.0	2 3 4 4 2

Table 4 (Continued)

UMA No.	UMA name	Area ha	Land suit.					UMA No.	UMA name	Area ha	Land suit.				
			C	G	S	M	R				C	G	S	M	R
231	2Uga	3.4	2	3	4	4	2	290	5UgaE	6.1	5	5	5	5	5
232	2Ugc 2Dya	24.1	3	4	5	4	2	291	5Uga	1.9	3	4	5	4	5
233	2Dbb	52.8	2	3	4	4	5	292	5Dya	8.3	3	3	3	1	5
234	6Drc	7.3	2	3	3	2	5	293	5Dra	9.6	3	3	2	1	5
235	2Ugc	5.2	3	4	5	4	2	294	5Dya	63.4	3	3	2	1	5
236	2Dyb 2Uge	41.6	3	4	4	4	3	295	5Dra	72.0	3	3	2	1	5
237	2Ugh	14.5	2	3	4	4	2	296	5Dyc	9.1	4	4	4	4	5
238	2Uga	49.5	2	3	4	4	2	297	5Dya	3.4	3	3	2	1	5
239	2UgaE	17.3	5	5	5	5	5	298	5Dyd	2.5	4	4	4	4	5
240	6Dbb	96.4	4	4	4	5	5	299	5R	3.1	5	5	5	5	5
241	2Dyc	18.2	2	3	5	4	4	300	5R E	10.9	5	5	5	5	5
242	2Dyb	11.2	2	3	4	4	2	301	2Dba	11.0	4	5	5	5	5
243	2Dya	19.7	3	4	5	4	2	302	2Uga	16.3	2	3	4	4	2
244	2Uge	13.3	2	3	4	4	2	303	2Dyb	109.5	3	4	4	4	4
245	6Dba	47.7	2	3	3	3	4	304	2Dya	2.8	3	4	5	4	4
246	2Ugg	20.8	2	3	4	4	2	305	2Dya	19.6	3	4	5	4	2
247	6Gne	1.0	4	4	3	3	5	306	2Ugh	37.0	2	3	4	4	2
248	6Ufe	28.6	5	5	5	3	5	307	2DybE	71.3	5	5	5	5	5
249	6Ufe 6Dyh	5.9	5	5	5	4	5	308	2Dyb	2.5	3	4	4	4	5
250	6Dda2	0.6	3	4	4	3	5	309	2Dya	2.2	3	4	5	4	4
251	1Uga	2.5	3	4	4	4	4	310	2Dyb	1.7	2	3	4	4	2
252	6Dye	3.3	4	4	4	3	5	311	2Dyb 2Uge	12.0	2	3	4	4	2
253	6Uma2	36.1	2	2	2	2	5	312	2Ugg	14.1	2	3	4	4	3
254	2Dbc	34.6	2	3	2	3	3	313	2Ugg	7.4	2	3	4	4	2
255	2Dbd	15.4	2	3	3	3	5	314	2Uga	3.5	2	3	4	4	2
256	2Dyb	11.4	2	3	4	4	5	315	2DybE	4.3	5	5	5	5	5
257	2Uge	7.1	2	3	4	4	3	316	2Ugd 2Dba	6.0	3	4	5	5	3
258	2Dyc	8.7	3	3	5	4	3	317	2Dba	1.2	4	5	5	5	3
259	2Dyb	11.5	2	3	4	4	2	318	2DbeE	0.7	5	5	5	5	5
260	2Dya	22.8	3	4	5	4	2	319	2Dbe	0.6	5	5	5	5	5
261	2Dyb	7.4	2	3	4	4	2	320	6Drc	6.1	2	3	3	2	5
262	2DbbE	6.8	5	5	5	5	5	321	6DrcE	0.5	5	5	5	5	5
263	2Ugd	6.9	2	3	5	4	2	322	6UgaE	0.9	5	5	5	5	5
264	2Dyb	32.5	2	3	4	4	2	323	6UgaE	0.7	5	5	5	5	5
265	2Dba	1.0	4	5	5	5	2	324	2Dyb	30.9	2	3	4	4	2
266	6Drc	3.0	2	3	3	2	4	325	6Drc	2.1	2	3	3	2	4
267	6Drc	1.1	2	3	3	2	4	326	2Dbb	10.1	2	3	4	4	5
268	2Dba	0.8	4	5	5	5	2	327	2Uge	13.3	3	4	5	4	5
269	2DbbE	0.7	5	5	5	5	5	328	2Ugb	3.3	2	3	4	4	2
270	2DbbE	1.1	5	5	5	5	5	329	2UgbE	2.1	5	5	5	5	5
271	2DyaE	6.1	5	5	5	5	5	330	2Ugg	13.2	2	3	4	4	2
274	2Dya	1.6	5	5	5	5	4	331	2Ugb	17.2	2	3	4	4	2
275	2Dyb	4.2	3	4	5	4	5	332	3Ugd	7.7	2	3	4	4	2
276	6Drc	0.7	2	3	3	2	5	333	2Dyc	1.3	2	3	5	4	2
277	2Dba	1.1	4	5	5	5	2	334	2Dbc	2.3	3	3	4	4	3
278	2Ugd 2Dba	0.7	4	5	5	5	2	335	2Dyb	1.5	2	3	4	4	2
279	2Dba	0.5	4	5	5	5	2	336	2Uge	1.2	2	3	4	4	2
280	2Dba	3.0	4	5	5	5	2	337	2Dyc 2Ugg	4.4	3	4	5	4	3
281	2UggE 2DycE	4.3	5	5	5	5	5	338	2UgbE	6.5	5	5	5	5	5
282	2Ugg	8.0	3	4	4	4	3	339	2Ugb	1.7	2	3	5	4	3
283	2DbbE	1.4	5	5	5	5	5	340	5Dyb	13.8	3	3	3	2	5
284	2Dya	0.7	5	5	5	5	5	341	5Dra	187.8	3	3	2	1	5
285	2Dya	13.0	3	4	5	4	5	342	5Dya	10.5	3	3	2	1	5
286	2Ugd	0.8	2	3	5	4	2	343	5Dyb 5Dyc	15.2	4	4	4	4	5
287	2Dba 2Dya	22.2	4	5	5	5	4	344	6Ddb	0.5	3	4	3	4	5
288	5DraR	3.8	5	5	5	5	5	345	6Drc	5.9	2	3	3	2	5
289	2Dyb	4.5	2	3	4	4	2	346	1Ugd 1Dyc	10.1	3	4	4	5	3



Table 4 (Continued)

UMA No.	UMA name	Area ha	Land suit.					UMA No.	UMA name	Area ha	Land suit.				
			C	G	S	M	R				C	G	S	M	R
347	6Gnd	68.2	3	4	3	2	5	404	3Ugk	27.9	2	3	4	4	3
348	5Dyb3	6.8	4	4	4	3	5	405	5Dyc	13.1	4	4	4	4	5
349	5Dyc3	6.7	4	4	4	4	5	406	5Dyd	3.1	4	4	4	4	5
350	5Dyc	1.6	4	4	4	4	5	407	1Ugd	9.1	2	3	4	4	2
351	1Ugc	2.5	2	3	4	4	5	408	3Uga8	9.7	2	3	4	4	3
352	3Uge	10.5	2	3	4	4	2	409	5Dyb	0.9	4	4	4	3	5
353	2Ugg	28.1	2	3	4	4	2	410	5Dyc	13.5	4	4	4	4	5
354	2Ugh	40.6	2	3	4	4	2	411	5Dra	19.9	3	4	4	3	5
355	2Uge	21.0	2	3	4	4	2	412	5Uga	54.0	2	3	4	4	5
356	6Dbh	25.1	4	4	4	5	5	413	5Dra	1.2	3	4	4	4	5
357	2Dbb	3.8	3	4	4	4	4	414	5Dra	0.5	3	4	4	4	5
358	2DbbE	2.3	5	5	5	5	5	415	5Ugb	3.3	3	4	4	4	5
359	5Dyc	1.3	4	4	4	4	5	416	5Dra	1.2	3	4	4	4	5
360	5Dra	2.2	3	4	4	3	5	417	5Dra	2.2	3	4	4	4	5
361	5Dya	7.8	3	3	2	1	5	418	5Ugb	2.8	3	4	4	4	5
362	5Dyc	37.9	4	4	4	4	5	419	5Ugb	5.1	3	4	4	4	5
363	2Ddb	1.2	4	5	5	5	4	420	5Dyf	6.2	3	3	4	4	5
364	2Uga	2.9	3	3	4	4	4	421	5Ugb	2.4	3	4	4	4	5
365	2Dba	5.4	5	5	5	5	4	422	5Dyf	1.7	3	4	4	4	5
366	2Dba	1.4	5	5	5	5	4	423	5Uga	25.9	3	4	4	4	5
367	2DdbE	2.4	5	5	5	5	5	424	5Dyf	5.8	3	3	4	4	5
368	6Dbh2	2.3	5	5	5	5	5	425	5Dyc	5.3	4	4	4	4	5
369	2Ugg	3.9	3	3	4	4	4	426	5Ugb	1.7	3	4	4	4	5
370	2Ugg	1.2	4	4	4	4	4	427	5Dra	21.8	3	3	2	1	5
371	5Dyd	0.9	4	4	4	4	5	428	5Dyc	4.2	4	4	4	4	5
372	6Dyg	1.4	5	5	5	5	5	429	5Dyb	1.5	4	4	4	4	5
373	2Ugh	1.4	3	4	5	5	3	430	5Dyc	0.8	4	4	4	4	5
374	2Ugh	0.7	3	4	5	5	3	431	5Ugb	8.5	3	4	4	4	5
375	6Uga	10.4	3	4	4	4	5	432	5Uga	2.7	3	4	4	4	5
376	6Dyg	2.4	3	4	4	4	5	433	5Dyc	2.9	4	4	4	4	5
377	2Dya	6.8	3	4	5	4	2	434	5Uga	15.7	2	3	4	4	5
378	2Ugh	3.1	2	3	4	4	2	435	5Dra	20.6	3	3	2	1	5
379	2Dbb	6.7	3	3	4	4	5	436	5Dyc	1.6	4	4	4	4	5
380	5Dyc	35.4	4	4	4	4	5	437	5Ugb	2.0	2	3	4	4	5
381	5Dra	179.5	3	3	2	1	5	438	5Dra	1.1	3	4	3	3	5
382	1Ugf	2.0	2	3	5	5	5	439	3Ugd	20.8	4	4	5	5	3
383	2UgeE	2.7	5	5	5	5	5	440	3Ugf	29.1	2	3	3	4	3
384	2Uge	4.6	2	3	5	4	3	441	1Uga	3.4	3	3	4	4	3
385	2Dyb	12.4	2	3	4	4	2	442	1Ugc	2.4	2	3	4	4	3
386	1UgaE	13.4	5	5	5	5	5	443	1Ugc	2.9	2	3	4	4	2
387	2Ugg	29.4	2	3	4	4	2	444	1Dyc	16.8	4	4	4	5	3
388	6UmaE	24.6	5	5	5	5	5	446	5Dya	5.9	3	3	2	1	5
389	1Uga	11.2	3	4	5	4	3	447	5Ugb	0.9	2	3	4	4	5
390	5Dyb	8.0	3	3	3	2	5	448	5Dyb	4.4	3	3	3	2	5
391	5Dyb	20.6	4	4	4	3	5	449	5Dyc	5.1	4	4	4	4	5
392	5Uga	12.4	3	4	4	4	5	450	5Dra	5.3	3	3	2	1	5
393	5Dra	5.8	3	4	3	2	5	451	5Dyc	6.8	4	4	4	4	5
394	5Uga	3.7	3	4	4	4	5	452	5Dra	12.4	3	3	2	1	5
395	5Dra	94.1	3	3	2	1	5	453	5Dyc	10.5	4	4	4	4	5
396	1Ugd	173.8	2	3	4	4	3	454	5Dyc	4.0	4	4	4	4	5
397	6DbeE	4.2	5	5	5	5	5	455	5Dyc	1.8	4	4	4	4	5
398	2Uge	1.7	2	3	4	4	3	456	5Dyf	3.0	3	3	4	4	5
399	5Dyc	4.3	4	4	4	4	5	457	5Dra	6.0	3	3	2	1	5
400	2DdbE	2.0	5	5	5	5	5	458	6Dbc	4.4	3	3	2	2	5
401	2DybE	0.7	5	5	5	5	5	459	5Dyf	39.9	3	3	4	4	5
402	2Uga	2.1	2	3	4	4	3	460	5Dra	2.9	3	4	4	3	5
403	5Uga	1.0	3	4	4	4	5	461	5Uga	6.7	3	4	4	4	5

Table 4 (Continued)

UMA No.	UMA name	Area ha	Land suit. C G S M R	UMA No.	UMA name	Area ha	Land suit. C G S M R
462	5Dra	4.3	3 4 3 2 5	519	5Dyb	2.1	3 3 3 2 5
463	5Uga	3.7	3 4 4 4 5	520	5Dyc	12.9	4 4 4 4 5
464	5Dyc	4.5	4 4 4 4 5	521	1Ugf	3.2	3 3 4 4 5
465	5Dra	2.2	3 4 3 2 5	522	5Uga	2.4	3 4 4 4 5
466	5Ugb	1.4	3 4 4 4 5	523	5Uga	2.5	3 4 4 4 5
467	5Uga	0.8	3 4 4 4 5	524	5Dyc	2.3	4 4 4 4 5
468	5Dyc	1.2	4 4 4 4 5	525	5Uga	1.0	4 4 4 4 5
469	1Uga	6.6	3 3 4 4 3	526	5Uga	6.4	3 4 4 4 5
470	1Ugd	1.7	3 3 4 4 3	527	5Dra	0.5	3 3 4 4 5
471	1DycE	2.3	5 5 5 5 5	528	5Dyc	4.5	4 4 4 4 5
472	1UgcE	2.8	5 5 5 5 5	529	5Dra	23.4	3 3 2 1 5
473	1Dyc	1.1	4 4 4 5 3	530	5Uga	1.0	3 4 4 4 5
474	1Ugc	9.4	4 4 4 5 3	531	1Ugd	8.5	3 4 4 5 4
475	5Dyc	14.0	4 4 4 4 5	532	5Dyc	8.0	4 4 4 4 5
476	5Dyb	16.9	3 3 3 2 5	533	5Dyc	2.8	4 4 4 4 5
477	1Dyc	3.5	3 4 4 5 2	534	5Dyc	2.0	4 4 4 4 5
478	1UgfE	6.8	5 5 5 5 5	535	5Uga	10.5	3 4 4 4 5
479	1Dyc	10.7	3 4 4 5 3	536	5Uga	3.9	3 4 4 4 5
480	5Dra	9.5	3 3 2 2 5	537	5Uga	20.7	2 3 4 4 5
481	5Dyc	3.2	4 4 4 4 5	538	5Dra	49.0	3 3 2 1 5
482	5Dra	22.6	3 3 2 1 5	539	5Dra	10.5	3 4 4 3 5
483	5Dra	44.2	2 3 2 1 5	540	5Uga	8.0	3 4 4 4 5
484	5Dya	1.8	3 3 2 1 5	541	5Dra	3.1	3 4 4 4 5
485	5Dra	7.5	3 3 3 2 5	542	5Uga	1.6	3 4 4 4 5
486	5Dyc	2.7	4 4 4 4 5	543	5Dyc	8.3	4 4 4 4 5
487	5Dyb	3.2	3 4 4 4 5	544	5Dra	2.8	3 4 3 3 5
488	5Dra	15.3	3 3 3 2 5	545	5Dra	1.3	3 4 4 3 5
489	5Dya	10.6	3 3 3 2 5	546	5Dra	21.7	3 4 3 2 5
490	5Dra	2.9	3 4 3 3 5	547	5Ugb	20.6	2 3 4 4 5
491	5Dyc	2.8	4 4 4 4 5	548	5Dyc	8.5	4 4 4 4 5
492	1Dyc	3.4	3 4 4 5 3	549	5Dyc	3.1	4 4 4 4 5
493	2Uge	6.3	2 3 4 4 5	550	5Ugb	6.1	2 3 4 4 5
494	1Dyc	24.3	3 4 4 5 4	551	5Dyc	7.4	4 4 4 4 5
495	1Ugf	4.4	2 3 4 4 3	552	1Uga	5.7	3 4 4 4 5
496	5Dyb	14.4	3 3 3 2 5	553	5Uga	3.3	4 4 4 4 5
497	5Uga	0.9	3 4 4 4 5	554	5Dra	6.0	3 4 4 4 5
498	5Dra	0.6	3 4 3 2 5	555	5Uga	11.7	3 4 4 4 5
499	5Uga	6.0	3 4 4 4 5	556	5Uga	3.4	3 4 4 4 5
500	5Dyc	1.7	4 4 4 4 5	557	5Dyc	1.4	4 4 4 4 5
501	5Dra	1.0	4 4 3 3 5	558	1Ugd	11.6	2 3 4 4 3
502	5Dra	0.5	4 4 4 4 5	559	1Ugf	145.1	2 3 4 4 2
503	5Uga	4.0	3 4 4 4 5	560	1Dyc	9.4	4 4 4 5 2
504	5Dyc	4.9	4 4 4 4 5	561	1Dyc	4.9	4 4 4 5 2
505	5Dra	47.3	3 3 2 1 5	562	5Dyc	4.3	4 4 4 4 5
506	5Dyc	4.9	4 4 4 4 5	563	1Dyc	27.4	4 4 4 5 4
507	5Dyb	3.0	4 4 4 3 5	564	5Uga	31.7	2 3 4 4 5
508	5Dyc	3.9	4 4 4 4 5	565	5Uga	3.2	3 4 4 4 5
509	1Dyc	3.0	3 4 4 5 3	566	5Dra	2.5	3 4 3 3 5
510	1Dyc	2.9	3 4 4 5 3	567	5Uga	9.0	3 4 4 4 5
511	1Dyc	0.6	3 4 4 5 3	568	1Dyc	12.9	3 4 4 5 4
512	1Dyc	8.0	3 4 4 5 4	569	5Dra	3.3	3 4 3 3 5
513	5Dyc	26.4	4 4 4 4 5	570	1Ugd	2.4	2 3 4 4 4
514	5Dra	1.3	4 4 4 4 5	571	5Uga	9.3	3 4 4 4 5
515	5Dyb	2.9	4 4 4 3 5	572	5Dra	1.0	3 4 3 3 5
516	5Dyc	2.7	4 4 4 4 5	573	5DraR	3.1	5 5 5 5 5
517	5Uga	2.2	4 4 4 4 5	574	5Dyb	2.0	4 4 4 4 5
518	5Dyc	6.2	4 4 4 4 5	575	5Dyc	2.2	4 4 4 4 5

Table 4 (Continued)

UMA No.	UMA name	Area ha	Land suit.					UMA No.	UMA name	Area ha	Land suit.					
			C	G	S	M	R				C	G	S	M	R	
576	1Uga	3.1	2	3	4	4	4	633	6Ufa	18.8	3	4	4	4	5	
577	6Uga	8.9	5	5	5	5	5	634	6Dbb	1.9	3	4	4	4	5	
578	2Dyb	62.9	2	3	4	4	5	635	5DycE	0.7	5	5	5	5	5	
579	5Dra	9.9	3	3	2	2	5	636	5DycE	1.7	5	5	5	5	5	
580	6Dyj	2.9	4	4	4	4	5	637	5Dyc	4.4	4	4	4	4	5	
581	1Uga	15.4	2	3	4	4	2	638	6UgaE	0.4	5	5	5	5	5	
582	1Ugc	10.6	2	3	4	4	2	639	6Uma	20.9	2	2	2	2	5	
583	5Dra	0.7	3	4	4	4	5	640	5Dya	13.9	3	3	2	1	5	
584	6Ufa	44.6	5	5	5	5	5	641	1Ugd	19.6	4	4	4	5	4	
585	6Dyg	5.5	3	4	4	4	5	642	6Ucc	15.0	3	4	3	2	5	
586	5Uga	1.9	3	4	4	4	5	643	6Dyg3	0.8	3	4	4	4	5	
587	6Dyj	6.4	4	4	4	4	5	644	6Umb2	2.0	4	4	4	4	5	
588	5Dyc	3.2	4	4	4	4	5	645	5R	2.4	5	5	5	5	5	
589	6Dyg	4.3	3	4	4	4	5	646	5Dra1	2.2	3	3	2	1	5	
590	1Ugc	1.2	4	4	4	4	5	647	5Dyc	2.5	4	4	4	4	5	
591	5Dyc	5.2	4	4	4	4	5	648	5Dyc5	3.1	5	5	5	5	5	
592	1Uga	6.3	3	3	4	4	4	649	5Dyc	9.3	4	4	4	4	5	
593	1Dyc	3.7	3	4	4	5	4	650	5Dyb	3.5	3	3	3	2	5	
594	1Dyc	1.2	4	4	5	5	5	651	5UgaR	0.4	5	5	5	5	5	
595	6Gna	1.2	4	4	4	4	5	652	5Uga	1.0	3	4	4	4	5	
596	1Dyc	2.3	4	4	5	5	5	653	5Uga	1.2	3	4	4	4	5	
597	5Dyb	1.1	4	4	4	4	5	654	5Uga	0.9	3	4	4	4	5	
598	6Dyj	7.5	4	4	4	4	5	655	5Uga	1.1	3	4	4	4	5	
599	1Uga	12.5	3	3	4	4	4	656	5Uga	1.7	3	4	4	4	5	
600	1Ugc	3.7	3	3	4	4	4	657	5Uga	0.9	3	4	4	4	5	
601	5Dra1	5R	3.7	5	5	5	5	658	5Dya	25.0	3	3	2	1	5	
602	5Dyc	1.4	5	5	5	5	5	659	6Dbb	27.0	2	3	3	3	5	
603	6Dda	9.1	3	3	3	3	5	660	5Dra	2.9	3	4	4	4	5	
604	1Dyc	1.6	3	4	4	5	4	661	5Uga	2.3	3	4	4	4	5	
605	5Uga	5.3	3	4	4	4	5	662	5Dya	38.2	3	3	2	1	5	
606	5DycE	1.8	5	5	5	5	5	663	5Dya	4.1	3	4	4	3	5	
607	5Dyc	2.0	4	4	4	4	5	664	5Dra	4.1	3	4	4	3	5	
608	5Uga	2.0	3	4	4	4	5	665	5Dyb	8.3	3	3	3	3	5	
609	5Dyc	9.7	4	4	4	4	5	666	5Dra	4.4	3	4	4	4	5	
610	1Ugc	0.4	4	4	4	4	5	667	5Dyb	3.7	3	3	3	3	5	
611	5Dyb	5Uga	1.9	4	4	4	5	668	5Ugb	0.7	3	4	4	4	5	
612	5Dra	0.9	4	4	3	3	5	669	5Dra	16.2	3	4	3	3	5	
613	5Dyc	5.0	4	4	4	4	5	670	2Dyb	3.1	3	3	4	4	3	
614	5Ugb	1.8	3	4	4	4	5	671	2DybE	1.9	5	5	5	5	5	
615	6Uma	255.9	2	2	2	1	5	672	5Dra	3.7	3	4	3	3	5	
616	1Dyc	2.1	3	4	4	5	3	673	5Dyc	1.3	4	4	4	4	5	
617	1Dyc	55.1	3	4	4	5	3	674	1Dyc	2.6	4	4	5	5	3	
618	5Dyb	6.0	3	4	3	3	5	675	1Dyc	1.4	3	4	4	5	3	
619	1Dyc	16.5	4	4	4	5	5	676	5Dra	3.2	3	4	3	2	5	
620	5Dyc	2.7	4	4	4	4	5	677	5Dyc	5.3	4	4	4	4	5	
621	1Ugc	2.8	3	3	4	4	2	678	5Dra3	4.9	3	4	4	4	5	
622	1Ugc	1.6	3	3	4	4	2	679	6Dbe	2.8	3	4	4	4	5	
623	1Dyc	5.3	3	4	4	5	4	680	1Dyc	4.7	3	4	4	5	5	
624	5Dyc	1.8	4	4	4	4	5	681	1Ugc	1.8	3	3	4	4	5	
625	5Dra	1.3	3	4	3	3	5	682	1Dyc	6.9	3	4	4	4	5	
626	5DycE	0.4	5	5	5	5	5	683	1UgcE	3.3	5	5	5	5	5	
627	6UgaE	2.0	5	5	5	5	5	684	6Gna	5.5	3	4	4	3	5	
628	1Dyc	0.7	3	4	4	5	2	685	5Dyc	7.8	4	4	4	4	5	
629	5Dyd	0.7	5	5	5	5	5	686	5Dyc	1.3	4	4	4	4	5	
630	1Dyc	1.1	5	5	5	5	5	687	5Dra	53.5	4	4	3	2	5	
631	6Dyg	5.8	5	5	5	5	5	688	5Dra1	5R	7.9	5	5	5	5	5
632	6UgaE	30.0	5	5	5	5	5	689	5Dyc1	5R	6.2	5	5	5	5	5



Table 5 Land suitability classes, soil and land limitations and management considerations for agricultural management units, Leichhardt Downs Section, Burdekin River Irrigation Area

Agricultural management units	Land suitability classes					Soil and land limitations		Management considerations
	Sugar cane	Grain crops	Small crops	Mangoes	Rice	Physical	Chemical*	
1Uga, 1Ugc, 1Ugd, 1Ugf	2	3	4	4	2-3	Gilgel to 0.30 m Waterlogging Flooding in some areas	Low general fertility with very low phosphorus levels Often strongly alkaline by 0.30 m Sodic to strongly sodic below 0.50 m Medium to high salt levels at 0.50 - 0.90 m.	Seedling emergence Wet season land preparation and harvesting Precision levelling required for adequate surface drainage Narrow range of optimum moisture for tillage operations. Uneven crop stand due to soil variability after levelling.
1Uge	3	3	4	4	5	Soil variability Linear gilgal Large pebbles and cobbles on surface of mounds Slope > 1% Susceptible to erosion	Low general fertility with very low phosphorus levels Mound often strongly alkaline by 0.30 m Strongly sodic at and below 0.50 - 0.60 m Medium to high salt levels at 0.50 - 0.90 m.	Seedling emergence Erosion control practices required Irrigation furrows may have to be positioned across the slope to decrease slope gradient Stone picking may be required in some areas for ease of tillage operations and harvesting of crops close to the soil surface. Uneven crop stand due to soil variability
1Dya, 1Dyc, 1Dda, 1Ddb	3	4	4	5	2-4	Shallow A horizon Surface crusting B horizon of very low permeability Low PANC** Soil variability Slope >0.5% in some areas Susceptible to erosion	Low general fertility with very low phosphorus levels Often strongly alkaline by 0.30 m Strongly sodic at and below 0.20 - 0.30 m High to very high salt levels at 0.50 - 0.60 m (Note, 1Dda may have only medium to high levels)	Seedling emergence Soil profile amendment required to increase PANC for crops other than rice Fertility problems associated with exposure of B horizon on levelling Uneven crop stand due to soil variability Irrigation furrows may have to be positioned across the slope to decrease slope gradient on higher slopes Dispersive B horizons Erosion control measures required on higher slopes High management inputs required.
1Dyb	3	4	4	5	5	Shallow A horizon Surface crusting Soil variability Slope >0.5% in some areas Susceptible to erosion D horizons coarser than light clay below 0.40 - 0.60 m Low PANC	Low general fertility with very low phosphorus levels Often strongly alkaline at 0.30 m Strongly sodic at and below 0.20 - 0.30 m Very high salt levels at 0.80 - 0.90 m	Seedling emergence Fertility problems associated with exposure of B horizon on levelling Uneven crop stand due to soil variability Unsuitable for rice growing due to rapid internal drainage below 0.40 - 0.60 m Irrigation furrows may have to be positioned across the slope to decrease slope gradient on higher slope Dispersive B horizon Erosion control measures required on higher slopes High management inputs required.

Table 5 (Cont'd)

Agricultural management units	Land suitability classes					Soil and land limitations		Management considerations
	Sugar cane	Grain crops	Small crops	Mangoes	Rice	Physical	Chemical*	
2Uga, 2Ugb	2	3	4	4	2	Low lying areas with low gradients Flooding	Low general fertility with very low phosphorus levels Sodic at and below 0.50 - 0.60 m. Low to medium salt levels at 0.80 - 0.90 m	Seedling emergence Precision levelling required for adequate surface drainage Wet season land preparation and harvesting Narrow range of optimum moisture for tillage operations.
2Ugc, 2Ugd, 2Uge	2	3	4	4	2	Low lying areas with low gradients Waterlogging Gligal to 0.30 m Flooding Surface crusting	Low general fertility Sodic at 0.50 - 0.60 m and usually strongly sodic by 1.10 - 1.20 m Medium salt levels at 0.80 - 0.90 m	Seedling emergence Precision levelling required for adequate surface drainage Wet season land preparation and harvesting Narrow range of optimum moisture for tillage operations Uneven crop stand due to soil variability after levelling.
2Ugg	2	3	4	4	2	Low lying areas with low gradients Waterlogging Gligal to 0.30 m Flooding	Low general fertility with very low phosphorus levels Sodic at and below 0.50 - 0.60 m Medium salt levels at 0.80 - 1.10 m	Seedling emergence Precision levelling required for adequate surface drainage Wet season land preparation and harvesting Narrow range of optimum moisture for tillage operations.
2Ugh	2	3	4	4	2	Low lying areas with low gradients Waterlogging Gligal to 0.30 m Flooding	Low general fertility with very low phosphorus levels Strongly alkaline by 0.30 m Sodic by 0.50 - 0.60 m and strongly sodic at and below 1.10 - 1.20 m Medium to high salt levels at 0.80 - 0.90 m.	Seedling emergence Fertility problems associated with exposure of strongly alkaline B horizons of mound after levelling Uneven crop stand due to levelling Precision levelling required for adequate surface drainage Wet season land preparation and harvesting Narrow range of optimum moisture for tillage operations.
2Dyc	2	3	5	4	2	Low lying areas with low gradients Waterlogging Gligal to 0.30 m Flooding Surface crusting	Low general fertility with very low phosphorus levels Sodic by 0.50 - 0.60 m and strongly sodic by 1.10 - 1.20 m Medium salt levels at 0.80 - 0.90 m	Seedling emergence Precision levelling required for adequate surface drainage Wet season land preparation and harvesting Uneven crop stand due to soil variability after levelling.

Table 5 (Cont'd)

Agricultural management units	Land suitability classes					Soil and land limitations		Management considerations
	Sugar cane	Grain crops	Small crops	Mangoes	Rice	Physical	Chemical*	
2Db <sub>a</sub>	4	5	5	5	2	Shallow A horizon Surface crusting B horizon of very low permeability Low PAWC*	Low general fertility with very low phosphorus levels Strongly alkaline by 0.30 m Strongly sodic at and below 0.20 - 0.30 m High salt levels at 0.50 - 0.60 m	Seedling emergence Soil profile amendment required to increase PAWC for crops other than rice Exposure of strongly sodic B horizon on levelling and cultivation Dispersive B horizons High management inputs required.
2Dy <sub>a</sub>	3	4	5	4	2	Shallow A horizon Surface crusting B horizon of very low permeability Low PAWC	Low general fertility with very low phosphorus levels Strongly sodic at and below 0.20 - 0.30 m High salt levels at 0.80 - 0.90 m	Seedling emergence Soil profile amendment required to increase PAWC for crops other than rice Exposure of strongly sodic B horizon on levelling and cultivation Uneven crop stand due to levelling Dispersive B horizons High management inputs required.
2Dy <sub>b</sub> , 2Db <sub>b</sub> , 2Db <sub>e</sub>	2	3	4	4	2-3	Surface crusting B horizon of very low permeability Low PAWC Flooding in some areas	Low general fertility with low to very low phosphorus levels Strongly sodic at and below 0.20 - 0.50 m (except for 2Db <sub>e</sub> ) Medium to very high salt levels at 0.50 - 0.60 m (Db <sub>e</sub> has only low salt levels)	Seedling emergence Soil profile amendment required to increase PAWC for crops other than rice Strongly sodic B horizon may be exposed on levelling and cultivation Dispersive B horizon Erosion control measures required in some areas.
2Db <sub>c</sub> , 2Db <sub>d</sub>	2	3	3	3	3	Surface crusting Flooding	Low general fertility with very low phosphorus levels May be strongly sodic at and below 0.50 - 0.60 m Low to high salt levels at 0.80 - 0.90 m	Seedling emergence Wet season land preparation and harvesting Erosion control measures required in some areas.
3Ug <sub>a</sub> , 3Ug <sub>a</sub> <sub>8</sub> , 3Ug <sub>d</sub> , 3Ug <sub>e</sub> , 3Ug <sub>k</sub>	2	3	4	4	2	Low lying areas with low gradients Waterlogging Flooding G1gal to 0.30 m	Low general fertility with low to very low phosphorus levels Strongly alkaline at 0.30 m in some areas (3Ug <sub>a</sub> , 3Ug <sub>a</sub> <sub>8</sub> , 3Ug <sub>k</sub> ) Sodic by 0.90 - 1.20 m Low to medium salt levels at 1.10 - 1.20 m.	Seedling emergence Precision levelling required for adequate surface drainage Wet season land preparation and harvesting Narrow range of optimum moisture for tillage operations Susceptible to secondary salinisation on edge of plains.
3Ug <sub>f</sub>	2	3	3	4	2	Low lying areas with low gradients Flooding	Strongly sodic at and below 0.80 - 0.90 m May have very high salt levels at 0.80 - 0.90 m.	Precision levelling required for adequate surface drainage Wet season land preparation and harvesting Narrow range of optimum moisture for tillage operations.

Table 5 (Cont'd)

Agricultural management units	Land suitability classes					Soil and Land Limitations		Management considerations
	Sugar cane	Grain crops	Small crops	Mangoes	Rice	Physical	Chemical*	
4UccR	4	4	4	3	4	Surface crusting Large pebbles and cobble throughout profile Low PAWC Soil variability Slopes >1% Susceptible to erosion	Low general fertility with very low phosphorus levels.	Seedling emergence Erosion control measures required Flood irrigation unsuitable, spray or trickle irrigation recommended Downslope seepage may occur if excessive intake occurs upslope on these soils Stone picking required.
4Dyg, 4Dyh, 4Dba	4	4	4	4	5	Surface crusting B horizon of very low permeability Low PAWC Slopes usually >1% Susceptible to erosion	Low general fertility with very low phosphorus levels Strongly sodic at and below 0.30 - 0.60 m Medium to high salt levels at 0.50 - 0.60 m.	Seedling emergence Soil profile amendment required to increase PAWC Uneven crop stand due to soil variability Susceptible to secondary salinisation in some areas Erosion control measures required.
5Dra, 5Dya	3	3	2	1	5	Surface crusting Slopes >1% Susceptible to erosion Soil depth <1m Surface stone in some areas Permeable subsoils	Low general fertility with low to very low phosphorus levels.	Seedling emergence Spray or trickle irrigation recommended to decrease deep drainage losses and prevent secondary salinisation down slope Erosion control practices required Stone picking required in some areas for ease of tillage operations and harvesting of crops close to surface
5Dyb	3	3	3	2	5	Surface crusting Slopes >1% Susceptible to erosion Surface stone in some areas	Low general fertility with low phosphorus levels Sodic at and below 0.80 - 0.90 m.	Seedling emergence Erosion control practices required Non-saline seeps may develop if deep drainage losses are not prevented upslope Stone picking required in some areas.
5Dyc, 5Dyd	4	4	4	4	5	Surface crusting Susceptible to erosion B horizon of very low permeability Low PAWC	Low general fertility with low to very low phosphorus levels Strongly sodic at and below 0.20 - 0.50 m High to very high salt levels at 0.50 - 0.60 m	Seedling emergence Susceptible to secondary salinisation Soil profile amendment required to increase PAWC Erosion control practices required.
5Uga, 5Ugb	2	3	4	4	5	Slopes in some areas >1% Susceptible to erosion on higher slopes Soil depth <1m Soil variability, small areas often associated with 5Dra Surface stone in some areas	Low general fertility with low phosphorus levels.	Seedling emergence Erosion control practices required on higher slopes Small areas are often closely associated with soils of different management requirements. Stone picking required in some areas for ease of tillage operations and harvesting of crops close to the surface.



Table 5 (Cont'd)

Agricultural management units	Land suitability classes					Soil and land limitations		Management considerations
	Sugar cane	Grain crops	Small crops	Mangoes	Rice	Physical	Chemical*	
5Dyf-5Ugc	3	3	4	4	5	Soil variability Surface crusting Slopes often >1% B horizon of very low permeability Low PAWC of 5Dyf	Low general fertility with very low phosphorus levels Strongly sodic at and below 0.50 - 0.60 m Very high salt levels at 0.50 - 0.60 m	Seedling emergence Different soils within complex have different management requirements Erosion control practices required on higher slopes Profile amendment may be required to increase PAWC of 5Dyf.
6Ucc	3	4	3	2	5	Soil variability Low PAWC High infiltration rates Uneven slopes in some areas Flooding	Low general fertility with very low phosphorus levels.	Seedling emergence Frequent irrigation required, sprinkler or trickle irrigation recommended Erosion control measures required in some areas.
6Uma, 6Umb, 6Gnd, 6Dbc, 6Dbf	2	2	2	2	5	Surface crusting Irregular slopes in some areas		Seedling emergence Fairly frequent irrigations required.
6Gna, 6Gne	2	3	2	2	5	Surface crusting Low PAWC Slopes >0.5% in some areas		Seedling emergence Fairly frequent irrigations required Precision levelling required in some areas.
6Dbb, 6Dba	2	3	3	3	4	Surface crusting Slopes >0.5% in some areas Soil variability in some areas	Sodic at and below 0.50 - 0.60 m.	Seedling emergence Profile amendment may be required to increase PAWC in B horizon.
6Ugc	2	3	4	4	4	Waterlogging Flooding		Seedling emergence Wet season land preparation and harvesting Narrow range of optimum moisture for tillage operations.
6Uca	4	5	4	3	5	Soil variability Very low PAWC High infiltration rates	Low general fertility with very low phosphorus levels.	Seedling emergence Long narrow mapping units closely associated with soils of widely different management requirements Frequent irrigations required, sprinkler or trickle irrigation recommended Intake areas.
6Uga	3	4	4	4	5	Soil variability Irregular slopes Flooding Susceptible to erosive flooding		Wet season land preparation and harvesting Erosion control measures required Uneven crop stand due to soil variability Wet season flooding.

Table 5 (Cont'd)

Agricultural management units	Land suitability classes					Soil and land limitations		Management considerations
	Sugar cane	Grain crops	Small crops	Mangoes	Rice	Physical	Chemical*	
6Ufa, 6Ufd, 6Ufe	5	5	5	3	5	Flooding Soil variability Susceptible to erosive flooding Irregular slopes		Frequent wet season flooding Wet season land preparation and harvesting Range of soils within units have different management requirements Erosion control measures required Uneven crop stand due to soil variability.
6Drc	2	3	3	2	4	Surface crusting Low PANC Soil variability	Low general fertility with low phosphorus levels May be sodic at and below 0.90 - 1.20 m	Seedling emergence Some units closely associated with soils of different management requirements.
6Dbe	2	3	3	3	5	Surface crusting Low PANC Flooding		Seedling emergence Wet season land preparation and harvesting Erosion control measures required.
6Dbh	4	4	4	4	5	Surface crusting B horizon of very low permeability Low PANC	Low general fertility with low phosphorus levels Strongly sodic at and below 0.20 - 0.30 m High salt levels at 0.50 - 0.60 m	Seedling emergence Profile amendment required to increase PANC Exposure of strongly sodic B horizon on levelling and cultivation Dispersive B horizons.
6Dyb, 6Dye,	3	4	4	3	5	Soil variability Low PANC in A horizon	Low general fertility Medium salt levels by 0.90 - 1.20 m.	Seedling emergence Soils within units have different management requirements Uneven crop stand due to soil variability.
6Dyf	3	4	3	3	5	Soil variability Surface crusting Upper B horizon of low permeability	Low general fertility with very low phosphorus levels.	Seedling emergence Uneven crop stand due to soil variability.
6Dyh, 6Dyg	3	4	4	4	5	Soil variability Surface crusting Upper B horizons of low permeability Low PANC	Low general fertility May be strongly sodic at 0.20 - 0.30 m.	Seedling emergence Small areas closely associated with soils of widely different management requirements Strongly sodic B horizons may be exposed on levelling and cultivation Uneven crop stand due to soil variability.

Table 5 (Cont'd)

Agricultural management units	Land suitability classes					Soil and land limitations		Management considerations
	Sugar cane	Grain crops	Small crops	Mangoes	Rice	Physical	Chemical*	
6DyJ	4	4	4	4	5	Soil variability Flooding Low PAWC Susceptible to erosive flooding Surface crusting	Low general fertility with very low phosphorus levels Strongly sodic by 0.20 - 0.30 m High salt levels at 0.50 - 0.60 m.	Seedling emergence Soils within units have different management requirements Exposure of strongly sodic B horizons on levelling and cultivation Uneven crop stand due to soil variability. Frequent wet season flooding Erosion control measures required.
6Dda, 6Ddb	3	4	3	3	5	Soil variability Surface crusting	Low general fertility with very low phosphorus levels May be strongly sodic at and below 0.50 - 0.60 m High salt levels at 0.80 - 0.90 m.	Seedling emergence Small areas often closely associated with soils of widely different management requirements Uneven crop stand due to soil variability. Erosion control measures required in some areas.

\* Soil salinity rating as weighted average root-zone salinity to 0.9 m from predicted EC<sub>se</sub> values after Shaw et al. (1986).  
Sodicity ratings after Northcote and Skene (1972). Other ratings after Bruce and Rayment (1982).

\*\* Plant available water capacity.

Guidelines for irrigation development and farm subdivision are outlined below.

## 6.1 Degradation hazards

### 6.1.1 *Salinisation*

- Leakage from channels must be kept to an acceptable level to avoid deep drainage losses with subsequent rises in groundwater. Particular attention must be given to those parts of channels which are located in intake areas of landscape units 4 and 5 and prior stream areas of landscape unit 6.
- Discharge areas are potential areas of secondary salinisation and should be excluded from irrigable areas of farms.
- Provision must be made for the location of intercept drains immediately upslope of expected discharge areas; for example, on soil types 5Dyc or on lower slopes of landscape unit 1 at the interface with landscape unit 3.
- Farm boundaries should coincide with slope concavities or drainage ways wherever practical, as these areas are most at risk from rising groundwaters.

### 6.1.2 *Erosion*

- Creeks and major drainage depressions must be protected by adequate buffer zones and should be retained as drainage reserves and be adequately maintained.
- Any land, outside a reserve, which is degraded by gully erosion must be rehabilitated before inclusion within farms. Gullies must be filled with suitable soil, compacted, allowed to consolidate, and then be levelled.
- Within reserves, existing gullies migrating from creeks and drainage depressions must be stabilised to prevent further progression.
- Adequate provision must be made for sufficient land on farms, additional to the irrigable area, to accommodate internal farm roads, supply channels, drains and necessary erosion control works.

### 6.1.3 *Flooding*

- The drainage system of the developed area must be designed so that depth and length of inundation is minimised to reduce crop damage or loss.
- Roads, tram lines, water supply channels and drains must be located so that natural drainage is not impeded.

## 6.2 Farm subdivisional considerations

### 6.2.1 *Complex soil distribution*

- Areas with dyke rocks exposed on the surface associated with complex patterns of soils or salinisation hazard should be excluded from irrigable areas of farms.
- Where possible, large contiguous areas with complex patterns of managerially different soils, and which, with irrigation development, may adversely affect suitable lands downslope, should be excluded from farm design and set aside as reserves.

### 6.2.2 *Land suitability classes*

- All lands of classes 4 and 5 should be excluded from irrigable areas of farms.
- Farm boundaries within areas of suitable land (that is, classes 1, 2 and 3) should be located so that soils with similar management requirements can be grouped into relatively large areas.

## 7. FARM MANAGEMENT GUIDELINES

Suitable on-farm management strategies are also needed to ensure sustained economic crop production and assist in resource stability. Management considerations for the agricultural management units of the area have been given in Table 5. Some guidelines for farm management in regard to decreasing the incidence of salinisation and erosion are given below.

### 7.1 Salinisation

- Spray or trickle irrigation or special furrow irrigation techniques should be used on intake areas to minimise deep drainage losses to groundwater with subsequent secondary salinisation downslope.
- Precision levelling must be undertaken, especially on near-level landscapes, to ensure that surface drainage is not impeded so as to minimise accession to groundwater and subsequent regional salinisation.
- On-farm channels and drains must be appropriately designed and prepared so that drainage losses to groundwater are kept to a minimum.
- Only necessary clearing of vegetation on sloping lands must be undertaken. Increasing vegetation in non-irrigated areas is advisable.
- The construction of on-farm water storages is not advisable unless these storages are to be lined to reduce losses to groundwater.

## 7.2 Erosion

- All drainage ways must be grassed and adequately maintained.
- The gradient and length of irrigation furrows must be such that soil losses are kept to an acceptable level. On sloping lands, furrows may have to be angled across the maximum slope.
- Bare fallows should be avoided on sloping lands during the wet season.

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## 9. GLOSSARY

- landscape unit**      A natural unit of land in which a particular soil or association of soils is developed from a single rock type (consolidated or unconsolidated) or complex of rock types. The soils bear a constant relationship with a limited range of landform elements or native vegetation communities and there is a similar drainage net throughout the soil landscape. These relationships have developed as a result of interactions between climate, rock types and geomorphic history (adapted from Thompson and Moore 1984).
- soil type**            A three-dimensional soil body such that any profile within the body has a similar number and arrangement of major horizons whose attributes, primarily morphological, are within a defined range. All profiles within the soil type have similar parent materials (R. C. McDonald, personal communication).

## 10. REFERENCES

- Baker, D. E., Rayment, G. E. and Reid, R. E. (1983), Predictive relationships between pH and sodicity in soils of tropical Queensland, *Communications in Soil Science and Plant Analysis* **14**:1063-73.
- Bruce, R. C. and Rayment, G. E. (1982), *Analytical methods and interpretations used by the Agricultural Chemistry Branch for soil and land use surveys*, Queensland Department of Primary Industries Bulletin QB82004.
- Gardner, E. A. and Coughlan, K. J. (1982), *Physical factors determining soil suitability for irrigation crop production in the Burdekin-Elliott River area*, Queensland Department of Primary Industries, Agricultural Chemistry Branch, Technical Report 20.
- Northcote, K. H. and Skene, D. J. M. (1972), Australian soils with saline and sodic properties, *CSIRO Australian Division of Soils, Soil Publication* 27.
- Northcote, K. H. (1979), *A factual key for the recognition of Australian soils*, 4th edition, Rellim Technical Publication, Glenside, South Australia.
- Shaw, R. J., Hughes, K. K., Dowling, A. J. and Thorburn, P. J. (1986), Principles of landscape, soil and water salinity - processes and management options. Part A in *Landscape soil and water salinity. Proceedings of the Burdekin regional salinity workshop, Ayr, April 1986*, Queensland Department of Primary Industries Publication QC86003.
- Thompson, W. P. (1977), *Soils of the Lower Burdekin River - Elliott River area North Queensland*, Queensland Department of Primary Industries, Agricultural Chemistry Branch, Technical Report 10.
- Thompson, C. H. T. and Moore, A. W. (1984), Studies in landscape dynamics in the Cooloola - Noosa River Area, Queensland. I. Introduction, general description and research approach, *CSIRO Australia Division of Soils Divisional Report* 73.

**APPENDIX 1**  
**IRRIGATION LAND SUITABILITY CLASSES, BURDEKIN RIVER IRRIGATION AREA**

- Class 1. Land suitable for crop production under irrigation with no or minor limitations.
- (a) It is highly productive requiring only fertiliser input.
  - (b) Land with attributes which allow greatest water application efficiency without the use of specialised irrigation management techniques.
  - (c) Land which requires no or minor land modification in preparation for irrigation.
  - (d) Potential erosion and salinity hazards are negligible under irrigation.
- Class 2. Land suitable for crop production under irrigation but with slight limitations to use in one or more of the following categories.
- (a) Land with some limitations to crop growth requiring amendment(s) to attain satisfactory productivity.
  - (b) Land with attributes which require the use of some specialised irrigation management techniques to achieve satisfactory water application efficiency, crop establishment and growth.
  - (c) Land which requires some land modifications, for example levelling, stone picking in preparation for irrigation.
  - (d) Simple conservation measures only are required to reduce soil loss to an acceptable level and potential secondary salinisation is not expected under irrigation.
- Class 3. Land suitable for crop production under irrigation but with moderate limitations to use in one or more of the following categories.
- (a) Land with moderate limitations to crop growth requiring rehabilitation or treatment to attain satisfactory productivity.
  - (b) Land with attributes such that there will be an even greater requirement to use specialised irrigation management techniques to achieve satisfactory water application efficiency, crop establishment and growth.
  - (c) Land which requires a moderate degree of land modification, for example levelling, stone picking in preparation for irrigation.



- (d) Land which requires graded banks as well as simple conservation measures to reduce soil loss to an acceptable level. Potential secondary salinisation is not expected to occur under irrigation.

Class 4. Land currently unsuitable for crop production under irrigation with such severe limitations that special agronomic, edaphic, economic and/or engineering studies are required to show it to be capable of sustained economic crop production.

- (a) Land on which crop growth under irrigation would be very poor without intensive reclamation measures.
- (b) Land with attributes, such that satisfactory water application efficiency, crop establishment and growth cannot be achieved with current irrigation management techniques.
- (c) Land which requires such a degree of land modification, for example, levelling, stone picking, drainage, in preparation for irrigation that it will not be economically feasible with current technology.
- (d) Land which cannot be used for continuous crop production under irrigation due to excessive soil loss even with conservation measures applied. The potential for secondary salinisation is high.

Class 5. Land which is not suitable for the long term production of crops under irrigation due to one or more of the following limitations.

- (a) Land whose limitations to crop growth cannot be corrected with existing technologies.
- (b) Land with such attributes that water application efficiency, crop establishment and growth cannot be achieved.
- (c) Land which cannot be prepared for irrigation use.
- (d) Land on which the level of soil conservation works required to reduce soil loss to an acceptable level would unduly hinder farming operations or land that is subject to regular damaging erosive flooding.

APPENDIX 2  
LAND SUITABILITY CLASSIFICATION, BURDEKIN RIVER IRRIGATION AREA

(a) Crops other than rice

Limiting factor	Nature and degree of limitation	Subclass
Soil depth	Refers to rock, pan or readily observable restriction which will affect root development and plant available water. Does not refer to effective rooting depth as suggested by salinity, sodicity, bulk density. .60 - 1.00m .45 - .60m .25 - .45m <.25m	d2 d3 d4 d5
Soil physical factors affecting plant growth and management.		
1. Depth to hard/slowly permeable subsols.	Hard subsols reduce water entry, available water capacity and restrict root development.  Depth to B horizon of duplex soils with dry extremely hard consistence. .20 - .40m .10 - .20m <.10m	pb2 pb3 pb4
2. Nature of surface soils.	Crop emergence is limited if soils have large aggregates at the surface or set too hard. (a) <u>Cracking clay soils</u> * Percentage of peds or fragments >5mm diameter on surface is: 25 - 45% >45% (b) <u>Other soils</u> Surface may set hard if overworked and there maybe difficulties in achieving satisfactory germination.  Surface soils set hard. Some difficulty in achieving satisfactory germination.  Surface soils set very hard; may seal on wetting, forming dense crusts on drying; very difficult to establish and maintain tilth and achieve satisfactory germination.	ps2 ps3  ps2 ps3 ps4
3. Distribution of soils.	Where two or more soils occur in a 300m traverse, (300m is regarded as minimum run length for furrow irrigation) and differ in depth or texture of the surface, and/or internal drainage characteristics such that even under good management, crop yields may differ markedly. Criteria are:  B horizon permeability is similar but A horizon depths differ by a factor of 1.5-2+ where A horizon depth of one soil is greater than .20m and/or A horizon field textures differ by > 2 field texture groups.++  B horizon permeabilities differ markedly and/or A horizon depths differ by a factor of >2 where A horizon depth of one soil is greater than 0.20m and/or A horizon on field textures differ by >2 texture groups.	pd3  pd4
4. Texture of surface soils	Method of irrigation is dependent on surface texture. Furrow irrigation is more difficult with deeper sands; spray irrigation becomes essential.  Surface textures of sands to sandy loams to depths of: .45 - .60m .60 - .90m >.90m	pt2 pt3 pt4
Salinity	Salts in the upper part of the soil affect crop growth.  Electrical conductivity of 1:5 suspension at 25°C is >1.0 dsm <sup>-1</sup> at .30 - .90m <.30m	sa3 sa4

\* Based on data reported in Gardner and Coughlan (1982)

+ Depth differences determined by multiplication

++ Northcote (1979)

## APPENDIX 2 (Continued)

Limiting factor	Nature of degree of limitation	Subclass
Sodicity	High sodicity causes soil dispersion, loss of pore space, restricted rooting depth and plant available water capacity.	
	EITHER	
	ESP at .20 - .30m	
	1s:	
	6 - 14%	so3
	>14%	so4
OR (where no ESP data)*	Field pH at .20 - .30m 1s:	
	(a) For cracking clays	
	8.0 - 9.5	so3
	>9.5	so4
	(b) For sodic soils and solodized-solonetz	
	6.5- 8.0	so3
>8.0	so4	
Topography	Slope influences water management, ease of development, layout, and erosion control. (Angled layout not considered)	
	Even slopes of	
	0.25 - 1.0%	t2
	1.0 - 2.0%	t3
	<0.03 or 2.0 - 6.0%	t4
>6.0%	t5	
Fertility	Fertility can be very low in some soils. This alters the economic basis of development.	
	From soil analyses described in Bruce and Rayment (1982), the following combination can be determined for plant nutrients:	
	1 - 2 nutrients are very low	n2
>2 nutrients are very low	n3	
Rockiness and stoniness	The presence of rocks on the surface and in surface soil affects cultivation and other cultural operations.	
	Some picking of cobbles for certain management requirements (e.g. harvesting soybeans).	r2
	Tillage restricted, picking of cobbles and stones required.	r3
	Tillage difficult, picking of cobbles and stones required.	r4
	Tillage impractical, stones and boulders too numerous to warrant removal or rockland.	r5
Microrelief	Uneven surfaces create the need for careful levelling. Costs increase with depth of levelling required. Soil chemical and physical problems with exposed subsoils are often associated.	
	Vertical interval of gully, or of other regular microrelief	
	.10 - .25m	g2
	.25 - .60m	g3
>.60m	g4	
Wetness	Areas which remain wet after rainfall, cannot be used until drainage has taken place. (Includes both internal (soil) and external (site) aspects of drainage).	
	Areas which are wet for some time; require levelling including some cut and fill.	w3
	Areas which are wet for many months after wet season; considerable filling, or special drainage, or other considerable reclamation necessary.	w4
	Areas which are wet for most of the year and are uneconomical to reclaim.	w5

\* Relationship from Baker, Rayment and Reid (1983)

## APPENDIX 2 (Continued)

Limiting factor	Nature and degree of limitation	Subclass
Water erosion	Soils susceptible to erosion need to be protected to maintain productivity.	
	Susceptible to erosion, control measures required are:	
	Simple practices, for example maintenance of cover.	e2
	Intensive practices, for example graded banks.	e3
	Pasture phase or permanent pasture.	e4
	Gully erosion so severe, that measures to rehabilitate these areas would be uneconomical.	e5
Flooding	Areas susceptible to flooding at critical stages of crop growth pose limitations to development because of yield reduction or total loss of crops.	
	Areas subjected to local flooding at different frequencies. Crop damage or losses may occur.	
	Frequency of flooding <1 in 10 years. Minor wet season crop losses or damage can be expected.	f2
	Frequency of flooding 1 in 5-10 years.	f3
	Frequency of flooding >1 in 5 years. Cropping during wet season months is not recommended due to frequency of flooding. Low lying areas adjacent to creeks and their outlets.	f4
	Areas subjected to erosive flooding.	f5
Intake or recharge attributes	Refers to intake areas where excessive amounts of irrigation and rain water losses to the groundwater can cause off-site seepage and salinisation.	
	Intake to groundwater is such that it can be minimized with:	
	Simple management and design.	12
	Special management and design e.g. use of sprinkler irrigation.	13
	Restricted cropping management and design e.g. trickle irrigation of deep rooted tree crops.	14
	Where accessions to groundwater are excessive and cannot be prevented.	15
Outflow or discharge attributes, susceptibility to rise in groundwater.	Areas which have a history of seepage or secondary salinisation or are suspected of same, will not be productive or will be very risky to develop. Lower slopes of the gently undulating rises are susceptible. Edges of the Burdekin River levee may also be susceptible.	
	Known/suspected secondary salinisation	04

APPENDIX 2 (Continued)  
 (b) Rice

Limiting factor	Nature and degree of limitation	Subclass
Topography	Simple slopes of .03 to 0.25% are regarded as the most suitable	
	0.03 to 0.25% complex slope	t2
	<0.03 or 0.25 to 0.5% simple or complex slope	t3
	0.5 to 0.75% simple slope	t4
	Any slope >.75% and/or complex slopes of 0.5 -0.75%	t5
Microrelief	Vertical interval of gllgal (m)	
	.10 to .25m	g2
	.25 to .60m	g3
	>.60m	g4
Flooding	Areas subject to local flooding more than 1 in 10 years but less often than 1 in 5 years.	f2
	Areas subject to local flooding more often than 1 in 5 years.	f3
	Areas subject to erosive flooding.	f5
Profile permeability	Duplex soils with A horizons of <0.20m, extremely hard upper B horizons and textures in the clay range from the base of the A horizons to >1.5m, and strongly alkaline (or with ESP>15) by 0.60m are considered the least permeable.	
	Cracking clay soils with alkaline soil reaction trend and/or ESP at some point in the profile >15 and texture in the clay range extending to >1.50m.	p2
	Duplex soils with A horizons >.20m deep, extremely hard upper B horizons and textures in the clay range from the base of the A horizon to >1.50m. Alkaline soil reaction trend and/or ESP at some point in the profile >15.	p3
	As for p3 but upper B horizon not extremely hard.	p4
	All uniform, duplex and gradational soils with acid and neutral soil reaction trends with ESP <15 throughout profile ad/or with some material with texture coarser than sandy clay between .40 and 1.50m.	p5
Soil salinity	Electrical conductivity of 1:5 extract at 25°C is greater than 1 ds m <sup>-1</sup> at:	
	.10 to .30m	sa4
	<.10m	sa5
Distribution of soil types	Distribution of soil types is such that when two or more soil types occur within a 300m traverse:	
	Soil types are of similar suitability for rice.	pd2
	Soil types are all suitable for rice but are of different suitabilities.	pd3
	One or more soil types is not suitable for rice.	pd4