

# Marine Plain

## Karumba



Queensland  
Wetlands Program

### Study Area

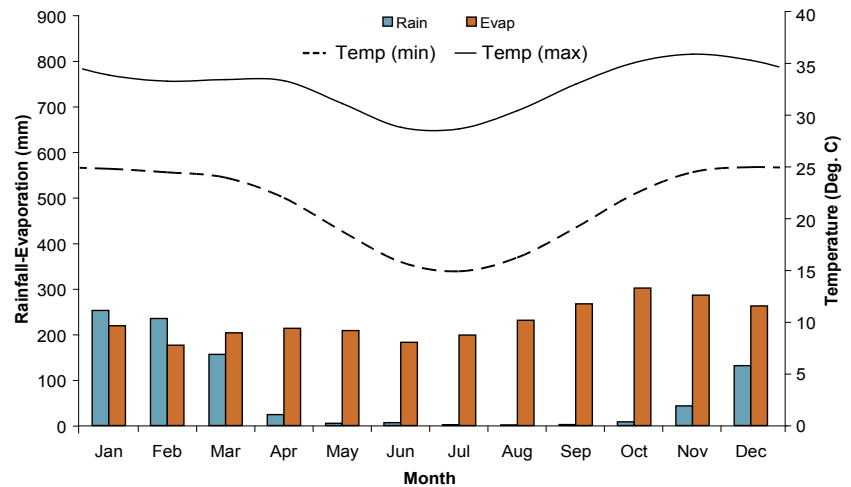
The Karumba marine plain transect is located approximately 20 km west of Karumba, Northern Queensland.

This area is a complex of landform elements consisting of dunes, foredunes, beach ridges, beaches, swales, tidal flats, intertidal flats, estuaries, tidal creeks, stream channels, stream beds, gullies, drainage depressions, swamps, lakes and oxbow<sup>1</sup>.

The transect runs for approximately 8 km grading from a scalded marine plain to a older beach ridge complex. This wetland is an example of a seasonally inundated relict marine plain in the Gulf Plains Bioregion.



### Climate<sup>2</sup>



The study area is situated within a tropical/equatorial climatic region with a distinct wet and dry season. Evaporation exceeds rainfall in the majority of months. The average annual rainfall for the area is 866 mm.

<b>Landform and Inundation</b>	Salt pans, tidal flats and alluvial marine plains Infrequent tidal inundation and seasonal freshwater inundation from overland flow
<b>Soils<sup>3</sup></b>	Vertosols and Kandosols
<b>Vegetation<sup>4</sup></b>	Infrequently inundated clay plains and low samphire rises (RE 2.1.4) Blue grass ( <i>Dichanthium</i> spp.) and browntop ( <i>Eulalia aurea</i> ) grassland on plains of cracking clays (RE 2.3.4) Grassland on low plains adjacent to estuarine zone (RE 2.3.1) Secondary dunes and swales (RE 2.2.2)
<b>Geology<sup>5</sup></b>	Coastal alluvium Salt pan deposits Beach ridge deposits Wyaaba beds: clayey quartzite sand sandstone, granular conglomerate sandy in places, interbedded sandy claystone
<b>Disturbance</b>	No effective disturbance except grazing by hoofed animals



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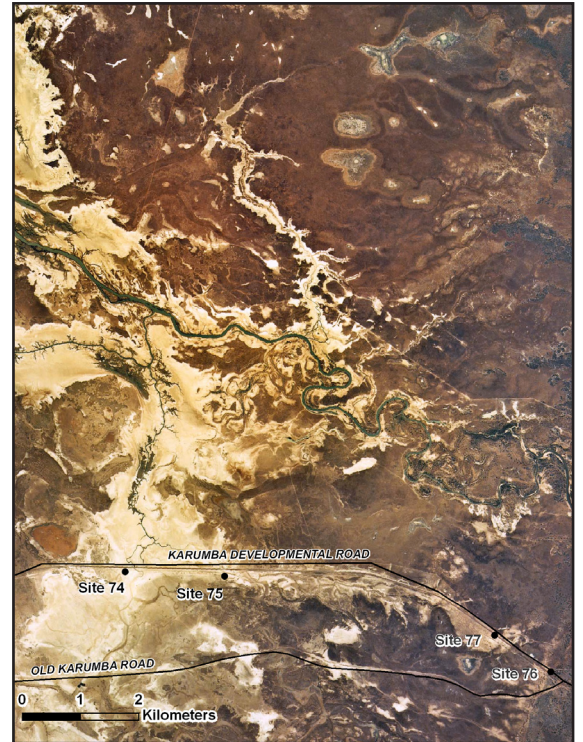


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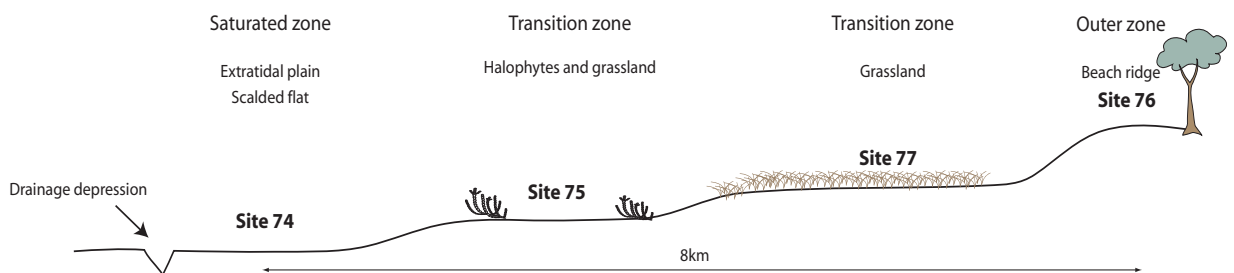
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## Location

GDA94 • MGA Coordinates : 503400 E, 8072305 N, Zone 54 • Lat/Long : -17.43515 S, 141.03201 E



## Landscape Diagram



## Summary of Field Observations

- Bare extratidal flat and high salt concentration indicative of an evaporative profile and little or no leaching in the saturated zone
- pH and field tests confirm the presence of acid sulfate materials within the saturated zone (Figure 1)
- Faint and distinct mottling within 0.3 m of soil surface and at depth indicate water fluctuation throughout all profiles, this is common in a seasonally saturated landscape
- Ferruginous root channel linings are a good indication of the wetland boundary and correspond to presence of vegetation growth out of the scalded area (Figure 2)
- High soil chroma values in the saturated zone correlates to lack of vegetation and source of organic materials for anaerobic microbes, with no energy source available for these microbes no reduction occurs regardless of the duration of saturation
- Soil organic carbon increase moving out of the wetland, this corresponds to the increase in vegetation growth from the scalded area

## Soil Profiles

Site 74 - Scalded flat



Mottled profile and positive peroxide test for acid sulfate soils all positive wetland soil indicators  
Scalded salt flat with EC decreasing down profile suggests an evaporative system  
Lack of vegetation correlates to low organic carbon levels, higher matrix chroma colours and no ferruginous root channel linings

**A11** 0.02 m  
**A12** 0.3 m  
**B1** 0.4 m  
**B21** 0.7 m  
**B22** 0.9 m  
**B23** 1.0 m



Site 75 - Halophytes and grassland



Mottles, ferruginous root channel linings, positive peroxide test for acid sulfate soils and low matrix chroma colours all positive indicators of periodic inundation

EC levels similar through profile suggesting less of an evaporative profile and possible leaching of salts

**A11** 0.03 m  
**A12** 0.2 m  
**B21** 0.6 m  
**B22** 0.8 m  
**B23** 1.0 m



Site 77 - Grassland



Mottles, ferruginous root channel linings and low chroma values all positive indicators of wetland soils  
Profile is alkaline with no presence of sulfidic materials  
EC is greater at depth suggesting a leached profile  
This site may be inundated seasonally but probably is dry for most of the year

**A1** 0.04 m  
**B21** 0.2 m  
**B22k** 0.6 m  
**B23** 1.0 m



Site 76 - Beach ridge



Mottles and ferromanganiferous nodules present

Higher chroma values and position in landscape suggest that this site is not seasonally inundated

**A1** 0.1 m  
**A2e** 0.35 m  
**B1** 0.5 m  
**B2** 0.7 m



## Soil Indicators Present (within 0.3 m of surface)

Indicator <sup>6</sup>	Site 74	Site 75
Organic materials and organic carbon (OC)*	No organic materials OC: 0.21%	No organic materials OC: 0.29%
Matrix colour	Brown	Greyish brown
Chroma (thickness of layer)**	Not present	Present (0.3 m)
Mottles and Segregations	Few <5 mm distinct orange mottles Few 5-15 mm faint grey mottles Few <5 mm faint orange mottles	Common 5-15 mm distinct orange mottles Common <5 mm faint orange mottles Few <5 mm faint grey mottles
Depth to groundwater	Not present	Not present
Ferruginous root channel and pore linings	Not present	Present
pH* <sup>7</sup>	Slightly acid	Very strongly acid
Texture	Fine sandy medium clay and medium heavy clay	Fine sandy medium clay to medium heavy clay
Acid sulfate material	Present	Present
Electrical Conductivity (EC) <sup>7</sup>	Highly saline	Moderately saline
Indicator <sup>6</sup>	Site 76	Site 77
Organic materials and organic carbon (OC)*	No organic materials OC: 1.23%	No organic materials OC: 0.61%
Matrix colour	Brown	Greyish brown to dark grey
Chroma (thickness of layer)**	Present (0.3 m)	Present (0.3 m)
Mottles and Segregations	Common <5 mm faint orange mottles Few 2-6 mm ferromanganiferous nodules	Few <5 mm faint brown mottles Very few <5 mm faint orange mottles Few 2-6 mm calcareous nodules
Depth to groundwater	Not present	Not present
Ferruginous root channel and pore linings	Not present	Present
pH* <sup>7</sup>	Strongly acid	Neutral
Texture	Loamy sand to sandy loam	Medium clay to medium heavy clay
Acid sulfate material	Not present	Not present
Electrical Conductivity (EC) <sup>7</sup>	Non saline	Non saline

\*Organic carbon % (Dumas method) and pH taken from surface (0-0.1 m)

\*\*Chroma value is less than or equal to 2



Figure 1. A strong reaction from a hydrogen peroxide field test for sulfidic materials

The reaction between the oxygen from the hydrogen peroxide and soil pyrites can be volatile, the larger the reaction the more soil pyrites present



Figure 2. Ferruginous root channel linings provide reliable evidence of plant growth in a saturated environment, where the root has pushed oxygen into the saturated soil forming a coating of ferric iron around the root channel

Soil Morphology

Site 74			Classification			Australian Soil Classification			Salic, Crustry, Aquic Vertosol		
			Landform Element			Landform Element			Drainage depression		
			Morphological Type			Morphological Type			Flat		
Horizon	Depth (m)	Boundary	Texture	Colour	Mottles	Coarse Fragments	Structure	Segregations	Consistence		
A11	0 to .02	-	fine sandy medium clay	brown (10YR53)	few (2-10%) fine (<5 mm) distinct orange mottles	none	strong 10-20 mm platy	none	very firm dry		
A12	.02 to .3	-	medium heavy clay	brown (10YR43)	few (2-10%) medium (5-15 mm) faint grey mottles, few (2-10%) fine (<5 mm) faint orange mottles	none	moderate 10-20 mm angular blocky	none	very firm moderately moist		
B1	.3 to .4	-	medium heavy clay	brown (10YR53)	common (10-20%) medium (5-15 mm) distinct orange mottles, few (2-10%) fine (<5 mm) distinct red mottles	none	moderate 10-20 mm lenticular	none	strong moderately moist		
B21	.4 to .7	-	light medium clay	greyish brown (2.5Y52)	common (10-20%) fine (<5 mm) prominent yellow mottles, common (10-20%) medium (5-15 mm) prominent red mottles	none	massive	none	firm moist		
B22	.7 to .9	-	light medium clay	grey (2.5Y61)	many (20-50%) medium (5-15 mm) mottles	none	massive	none	weak wet		
B23	.9 to 1	-	light medium clay	light brownish grey (10YR62)	few (2-10%) medium (5-15 mm) distinct orange mottles	none	massive	none	very weak wet		

Site 75			Classification			Australian Soil Classification			Salic, Crustry, Aquic Vertosol		
			Landform Element			Landform Element			Plain		
			Morphological Type			Morphological Type			Flat		
Horizon	Depth (m)	Boundary	Texture	Colour	Mottles	Coarse Fragments	Structure	Segregations	Consistence		
A11	0 to .03	-	fine sandy medium clay	dark greyish brown (10YR42)	common (10-20%) medium (5-15 mm) distinct orange mottles	none	strong 10-20 mm platy	common (10-20%) medium (2-6 mm) ferruginous root linings	very firm dry		
A12	.03 to .2	-	medium clay	dark greyish brown (10YR42)	common (10-20%) fine (<5 mm) faint orange mottles, few (2-10%) fine (<5 mm) faint grey mottles	none	moderate 10-20 mm angular blocky	few (2-10%) medium (2-6 mm) ferruginous root linings	very firm moderately moist		
B21	.2 to .6	-	medium heavy clay	dark greyish brown (10YR42)	few (2-10%) fine (<5 mm) distinct orange mottles, few (2-10%) fine (<5 mm) faint grey mottles	none	moderate 10-20 mm lenticular	none	very firm moderately moist		
B22	.6 to .8	-	medium clay	greyish brown (2.5Y52)	common (10-20%) medium (5-15 mm) distinct orange mottles	none	massive	none	very firm moist		
B23	.8 to 1	-	medium clay	greyish brown (10YR52)	many (20-50%) medium (5-15 mm) distinct orange mottles, common (10-20%) medium (5-15 mm) distinct red mottles	none	massive	few (2-10%) fine (<2 mm) ferruginous soft segregations	firm moist		

Site 76		Classification			Australian Soil Classification				Bleached, Mesotrophic, Brown Dermosol		
		Landform Element			Beach Ridge						
		Morphological Type			Rise						
Horizon	Depth (m)	Boundary	Texture	Colour	Mottles	Coarse Fragments	Structure	Segregations	Consistence		
A1	0 to .1	clear to	sandy loam	dark brown (7.5YR32)	none	none	massive	none	firm dry		
B2e	.1 to .35	gradual to	loamy sand	brown (7.5YR42)	common (10-20%) fine (<5 mm) faint orange mottles	none	massive	few (2-10%) medium (2-6 mm) ferromanganiferous nodules	weak moderately moist		
B1	.35 to .5	clear to	clay loam, sandy	brown (10YR53)	common (10-20%) fine (<5 mm) faint orange mottles, few (2-10%) fine (<5 mm) faint grey mottles	none	massive	very few (<2%) fine (<2 mm) ferromanganiferous nodules	firm dry		
B2	.5 to .7	-	sandy light medium clay	yellowish brown (10YR54)	many (20-50%) fine (<5 mm) faint grey mottles, common (10-20%) medium (5-15 mm) distinct orange mottles	none	weak 5-10 mm subangular blocky	none	strong dry		
Site 77		Classification			Australian Soil Classification				Epicalcareous-Epihypersodic, Crusty, Grey Vertosol		
		Landform Element			Plain						
		Morphological Type			Flat						
Horizon	Depth (m)	Boundary	Texture	Colour	Mottles	Coarse Fragments	Structure	Segregations	Consistence		
A1	0 to .04	clear to	medium clay	greyish brown (2.5Y52)	none	none	moderate 10-20 mm angular blocky, moderate 5-10 mm angular blocky	few (2-10%) fine (<2 mm) ferruginous root linings	very firm dry		
B21	.04 to .2	clear to	medium heavy clay	very dark grey (5Y31)	few (2-10%) fine (<5 mm) faint brown mottles	none	moderate 5-10 mm angular blocky	few (2-10%) fine (<2 mm) ferruginous root linings	very firm moderately moist		
B22k	.2 to .6	diffuse to	medium heavy clay	dark grey (5Y41)	very few (<2%) fine (<5 mm) faint orange mottles	none	moderate 5-10 mm angular blocky	few (2-10%) medium (2-6 mm) calcareous nodules	very firm moderately moist		
B23	.6 to 1		medium heavy clay	olive grey (5Y42)	none	none	moderate 5-10 mm angular blocky	none	very firm moist		

## Soil Chemistry

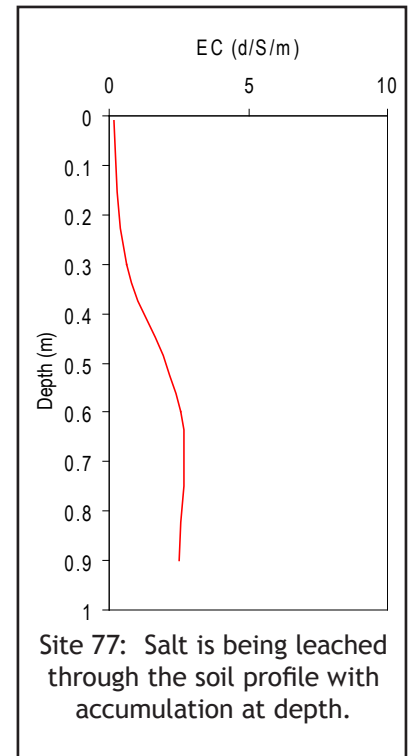
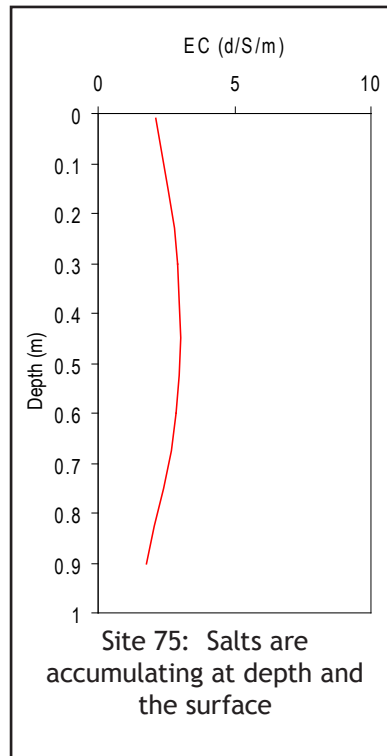
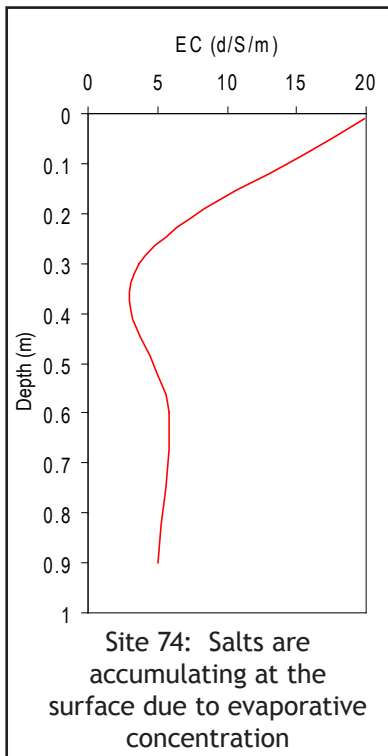
Site	Depth (m)	pH*	EC (dS/m)	Cl (mg/kg)	NO <sub>3</sub> -N (mg/kg)	TC%**	TN%**
74	0.00-0.10	6.4	12.3	19200	6	0.21	<0.03
	0.20-0.30	5.6	10.7	16600	6	0.18	<0.03
	0.40-0.50	4.9	12.7	21900	4	0.2	<0.03
75	0.00-0.10	4.5	4.91	6690	<1	0.29	0.04
	0.20-0.30	4.8	3.28	4380	<1	0.77	0.09
	0.40-0.50	4.6	3.66	4820	<1	0.31	0.04
76	0.00-0.10	5.3	0.03	21	2	1.23	0.08
	0.20-0.30	5.5	0.01	<20	1	0.13	<0.03
	0.40-0.50	5.7	0.01	<20	<1	0.17	<0.03
77	0.00-0.10	7		265	4	0.61	0.05
	0.20-0.30	8	0.69	901	2	0.47	0.04
	0.40-0.50	8.5	1.59	1950	<1	0.38	0.03

\*Aqueous 1:5

\*\*Total carbon and total nitrogen

### Electrical Conductivity

Electrical conductivity (EC) is a measure to describe the salinity, or the presence of soluble salts, of water, a soil water extract or suspension<sup>8</sup>. Moving along the transect from the saturated zone to the transition zone there is a distinct difference in EC profiles.



### References

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