

Appendix 6-A Additional soils information

A.1 Notes

Terminology generally follows McDonald et al. (1990) and Isbell (1996) but sodicity is rated as per Northcote and Skene (1972) and erodibility is based on Gray and Macnish (1985) with their assessments of K factor after Wischmeir and Smith (1978) rated as:

- 0.15 to 0.25 — low
- 0.25 to 0.35 — moderate
- >0.35 — high

Where K factors are not available, estimates of erodibility are qualitative, based on expert appraisals of soil physical and chemical properties against comparable soils for which K factors are available. Also, it should be noted that K factors apply only to the surface soil and that deeper subsoils are frequently highly erodible.

Dispersion assessments (Baker and Eldershaw, 1993) are based on measurements of R1 rated as:

- <0.6 — low
- 0.6 to 0.8 — medium
- >0.8 — high

Where R1 measurements are not available, estimates of dispersion are qualitative, based on expert appraisals of soil physical and chemical properties against comparable soils for which dispersion assessments are available.

A.2 Dam site and storage area

A.2.1 Dominant soils

Information has been drawn from the following:

- observations made and analyses undertaken during this study;
- Shields (1997)
- Forster (1985)
- Sweeney (1968)
- Gray and Macnish (1985)

These references may be consulted for additional information including the results of soil analyses.

Eucalypt streambeds — Black and Grey Rudosols (layered clay loams and clays)

| | |
|-------------------------|--------------------------------|
| Parent material: | Alluvium |
| Surface rock and stone: | None |
| Profile permeability: | Slowly to moderately permeable |
| Drainage: | Poorly to moderately drained |
| Erodibility: | Moderate |

Profile:

0.0 – 0.3 m Dark grey to black sandy clay loam to light medium clay
Weak blocky to massive structure
Firm to hard setting surface
Generally non-sodic
Dispersion rating low to medium
pH 6.5 to 7.5
Clear or abrupt change to:

0.3 – 1.5 m Layered brown sandy clay loam to light medium clay

Note. Soil properties in this group are highly variable because of variations in depositional environments

Eucalypt floodplains and levees — Brown and Grey Dermosols and Chromosols

Parent material: Alluvium

Surface rock and stone: None

Profile permeability: Moderately permeable

Drainage: Moderately well drained

Erodibility: Moderate

Profile:

0.0 – 0.3 m Brown to grey or black sandy loam to fine sandy clay loam
Massive structure
Firm to hard setting surface
Non-sodic
Dispersion rating low to medium
pH 6.5 to 7.0
Gradual or occasionally clear change to:

0.3 – 1.0 m Brown or gray sandy clay loam to light medium clay
Moderate to strong blocky structure
Generally non-sodic
Dispersion rating medium
pH 6.5 to 8.0
Diffuse change to:

1.0 – 1.5 m Layered brown sandy clay loam to light clay

Note 1. Soil properties in this group are quite variable because of variations in depositional environments and probably variations in age of the landscapes

Eucalypt floodplains — Grey and Black Vertosols

Parent material: Alluvium

Surface rock and stone: None

Profile permeability: Slowly permeable

Drainage: Imperfectly drained to moderately well drained

Erodibility: Moderate

| | |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Profile: | |
| 0.0 – 0.1 m | <p>Grey to black medium-heavy clay Medium to coarse granular structure Self-mulching and cracking Generally non-sodic Dispersion rating low to medium pH 6.5 to 7.5 Gradual change to:</p> |
| 0.1 – 0.5 m | <p>Grey to black or occasionally brown medium heavy clay Moderate to strong fine blocky structure Generally non-sodic Dispersion rating low to medium pH 7.0 to 8.0 Diffuse change to:</p> |
| 0.5 – 1.0 m | <p>Grey to black or occasionally brown heavy clay Coarse blocky or lenticular structure Sodic or occasionally strongly sodic Dispersion rating medium to high pH 7.5 to 8.5 Diffuse change to</p> |
| 1.0 to 1.5 m | <p>Brown to grey or black medium heavy clay Coarse blocky to massive structure Sodic or occasionally strongly sodic Dispersion rating medium to high pH 7.5 to 8.5</p> |

Eucalypt floodplains — Yellow and Grey Sodosols

| | |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Parent material: | Alluvium |
| Surface rock and stone: | None |
| Profile permeability: | Slowly permeable |
| Drainage: | Imperfectly drained |
| Erodibility: | High |
| Profile: | |
| 0.0 – 0.2 m | <p>Grey to black sandy loam to fine sandy clay loam, bleached at base Massive structure Hard setting surface Non-sodic Dispersion rating low to medium pH 5.5 to 7.0 Abrupt change to:</p> |
| 0.2 – 0.8 m | <p>Yellowish brown to grey and occasionally brown, occasionally mottled, light medium clay to medium heavy clay Strong coarse prismatic or columnar structure</p> |

| | |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | Sodic to strongly sodic Dispersion rating medium to high pH 7.5 to 9.0 Gradual change to: |
| 0.8 – 1.0 m | Yellowish brown to grey and occasionally brown light medium clay to medium heavy clay Moderate coarse blocky structure Strongly sodic Dispersion rating high pH 8.0 to 9.0 Gradual change to: |
| 1.0 to 1.5 m | Brown to grey or yellowish brown light clay to light medium clay Medium blocky to massive structure Strongly sodic Dispersion rating high pH 8.0 to 8.5 |

Brigalow uplands — Grey and Brown Vertosols and Dermosols

| | |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Parent material: | Weathered sediments |
| Surface rock and stone: | 0 to 20% (usually 0 to 2%) |
| Profile permeability: | Slowly to moderately permeable |
| Drainage: | Moderately well drained |
| Erodibility: | Moderate |
| Profile: | |
| 0.0 – 0.1 m | Grey to dark brown light-medium clay to medium-heavy clay Medium to coarse granular structure Self-mulching and cracking Generally non-sodic Dispersion rating low to medium pH 7.0 to 8.5 Gradual change to: |
| 0.1 – 0.5 m | Grey to black or occasionally brown medium heavy clay Moderate to strong fine blocky structure Non-sodic to sodic Dispersion rating medium to high pH 7.0 to 8.0 Diffuse change to: |
| 0.5 – 1.0 m | Grey to brown medium-heavy clay Coarse blocky or lenticular structure Strongly sodic Dispersion rating high pH 7.5 to 8.5 Diffuse change to |

1.0 to 1.5 m Weathered sediments

Softwood Scrub Uplands — Grey and Brown Dermosols and Vertosols

Parent material: Weathered sediments

Surface rock and stone: 0 to 20% (usually 0 to 2%)

Profile permeability: Moderately permeable

Drainage: Moderately well drained

Erodibility: Low

Profile:

0.0 – 0.1 m Grey to dark brown clay loam to light clay or light-medium clay
Medium to coarse granular structure
Generally non-sodic
Dispersion rating low
pH 7.0 to 8.5

Gradual change to:

0.1 – 0.5 m Grey to dark brown or occasionally black medium to medium heavy clay
Moderate to strong fine blocky structure
Non-sodic to sodic
Dispersion rating medium to high
pH 7.0 to 8.0

Diffuse change to:

0.5 – 1.0 m Grey to brown medium-heavy clay
Moderate coarse blocky structure
Strongly sodic
Dispersion rating high
pH 7.5 to 8.5

Diffuse change to

1.0 to 1.5 m Weathered sediments

Eucalypt highlands — Yellow and Grey Sodosols

Parent material: Weathered sediments

Surface rock and stone: 0 to 30% (usually 0 to 5%)

Profile permeability: Slowly permeable

Drainage: Imperfectly drained to moderately well drained

Erodibility: High

Profile:

0.0 – 0.3 m Grey to brown loamy sand to sandy clay loam, bleached at base
Massive structure
Hard setting surface
Non-sodic
Dispersion rating medium
pH 5.5 to 6.0

Abrupt change to:

| | |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0.3 – 0.7 m | Yellowish brown to grey and occasionally brown, occasionally mottled, light medium clay to medium heavy clay Strong coarse prismatic or columnar structure Sodic to strongly sodic Dispersion rating high pH 7.5 to 8.5 Gradual change to: |
| 0.7 to 1.5 m | Weathered sediments |

Softwood scrub highlands — Grey and Brown Dermosols and Vertosols

| | |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Parent material: | Weathered sediments |
| Surface rock and stone: | 0 to 30% (usually 0 to 10%) |
| Profile permeability: | Moderately permeable |
| Drainage: | Moderately well drained |
| Erodibility: | Low |
| Profile: | |
| 0.0 – 0.1 m | Grey to dark brown clay loam to light clay or occasionally light-medium clay Weak to moderate fine granular structure Non-sodic Dispersion rating low pH 7.0 to 8.0 Gradual change to: |
| 0.1 – 0.2 m | Grey to brown or occasionally black light clay to light-medium clay Moderate to strong fine blocky structure Non-sodic Dispersion rating low to medium pH 7.0 to 8.0 |
| Diffuse change to: | |
| 0.2 – 0.7 m | Grey to brown light-medium clay Fine blocky structure Non-sodic or occasionally sodic Dispersion rating medium to high pH 7.5 to 8.5 Diffuse change to |
| 0.7 to 1.5 m | Weathered sediments |

Eucalypt highlands — Red Kandosols

| | |
|-------------------------|---------------------------------------------------------|
| Parent material: | Deeply weathered sediments on residual plateau surfaces |
| Surface rock and stone: | Occasionally 10 to 20% fine ironstone gravel |
| Profile permeability: | Highly permeable |
| Drainage: | Well drained |

| | |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Erodibility: | High |
| Profile: | |
| 0.0 – 0.1 m | <p>Reddish brown sandy loam to sandy clay loam or occasionally sandy clay</p> <p>Massive to very fine granular structure</p> <p>Non-sodic</p> <p>Dispersion rating low</p> <p>pH 5.5 to 6.5</p> <p>Gradual change to:</p> |
| 0.1 – 1.2 m | <p>Red or dark red sandy clay to light-medium clay</p> <p>Massive to weak very fine granular to blocky structure</p> <p>Non-sodic</p> <p>Dispersion rating low to medium</p> <p>pH 5.0 to 6.0</p> <p>Diffuse change to:</p> |
| 1.2 – 1.5 m | Weathered ferruginised sediments |

Eucalypt highlands — Rudosols and Tenosols

| | |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Parent material: | Weathered sediments |
| Surface rock and stone: | 0 to 40% (usually 5 to 20% coarse gravel to cobble) |
| Profile permeability: | Highly permeable |
| Drainage: | Rapidly drained |
| Erodibility: | High |
| Profile: | |
| 0.0 – 0.2 m | <p>Brown to reddish brown sandy loam to sandy clay loam</p> <p>Massive structure</p> <p>Non-sodic</p> <p>Dispersion rating low</p> <p>pH 5.5 to 6.5</p> <p>Gradual change to:</p> |
| Below 0.2 m | <p>50 to 70% coarse gravel or cobble surrounded by brown to reddish brown sandy loam to sandy clay loam</p> <p>Massive to weak very fine granular to blocky structure</p> <p>Non-sodic</p> <p>Dispersion rating low to medium</p> <p>pH 5.0 to 6.0</p> |

Eucalypt and white cypress highlands — Brown Sodosols, Chromosols and Tenosols

| | |
|-------------------------|-----------------------------------------------------|
| Parent material: | Weathered sediments |
| Surface rock and stone: | 0 to 30% (usually 5 to 15% coarse gravel to cobble) |
| Profile permeability: | Moderately to highly permeable |
| Drainage: | Well drained |
| Erodibility: | High |

Profile:

| | |
|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0.0 – 0.1 m | Brown to reddish brown sandy loam to sandy clay loam occasionally bleached at base Massive structure Non-sodic Dispersion rating low to medium pH 5.5 to 6.5 Clear change to: |
| 0.1 – 0.3 m | Brown to reddish brown light medium clay to medium heavy clay Moderate coarse blocky structure Non-sodic to sodic Dispersion rating medium to high pH 5.0 to 6.0 Gradual change to: |
| 0.3 – 0.6 m | Grey brown medium clay Moderate coarse blocky structure Sodic to strongly sodic Dispersion rating medium to high pH 5.5 to 6.5 Diffuse change to |
| Below 0.6 m | Weathered sediments |

A.2.2 Sampled soils

Site 1 Eucalypt highlands — Rudosols and Tenosols

Location: 56J 209890 m E, 7180620 m N
 Landform element: Hillslope (8% slope)
 Landform pattern: Rolling low hills
 Permeability: Highly permeable
 Drainage: Well drained
 Surface coarse fragments: 30% rounded coarse gravel
 Substrate lithology: Sandstone and/or conglomerate
 Australian Soil Classification: Paralithic Tenosol

Profile morphology

| Horizon | Depth | Morphology |
|---------|------------|---------------------------------------------------------------------------------------------------------------------|
| A11 | 0 to 0.1 m | Brown (7.5YR4/2) light sandy clay loam, 30% coarse gravel, firm surface, massive structure, field pH 7.2. Clear to: |
| A12 | 0.1 m – | As above but coarse gravel increasing and impossible to dig with auger, spade or mattock |

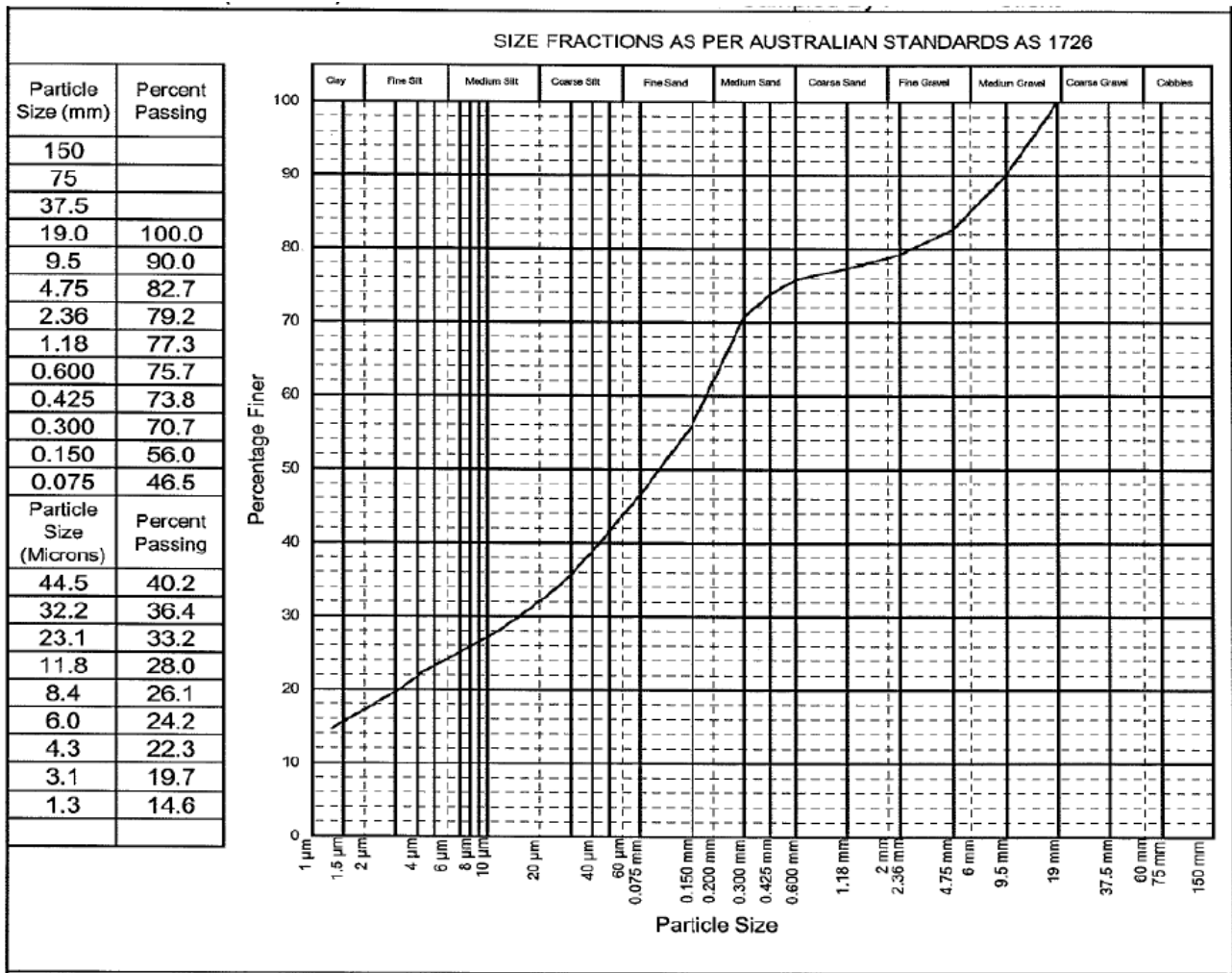
Analysis results

| Depth (m) | Moisture content (%) | pH | Electrical conductivity (BS/cm) | Chloride (mg/kg) | Acid Extractable K (mg/kg) | Nitrite +nitrate as N (mg/kg) | Total Kjeldah I N (mg/kg) | Acid ext. P (mg/ kg) | Bicarbonat e ext. P (mg/kg) |
|-----------|----------------------|-----|---------------------------------|------------------|----------------------------|-------------------------------|---------------------------|----------------------|-----------------------------|
| 0-0.1 | 4.0 | 7.5 | 40 | 30 | 400 | 1.7 | 1,740 | 5 | 11 |

| Depth (m) | Exch. Ca (meq/100g) | Exch. Mg (meq/100g) | Exch. K (meq/100g) | Exch. Na (meq/100g) | CEC (meq/100g) | Exch. Al (meq/100g) | ESP | Ca/Mg |
|-----------|---------------------|---------------------|--------------------|---------------------|----------------|---------------------|-----|-------|
| 0-0.1 | 5.5 | 3.3 | 0.7 | 0.1 | 9.7 | <0.1 | 1.2 | 1.7 |

| Depth (m) | Percent gravel (>2 mm) | Percent sand (2 mm - .06 mm) | Percent silt (0.06 mm – 0.002 mm) | Percent clay (<0.002 mm) |
|-----------|------------------------|------------------------------|-----------------------------------|--------------------------|
| 0-0.1 | 21 | 35 | 27 | 17 |

Particle size distribution (0-0.1 m)



Site 2 Eucalypt and white cypress highlands — Brown Sodosols, Chromosols and Tenosols

Location: 56J 209870 m E, 7180690 m N
 Landform element: Hillslope (3% slope)
 Landform pattern: Rolling low hills
 Permeability: Moderately permeable
 Drainage: Imperfectly drained
 Surface coarse fragments: Variable – 0 to 30% rounded coarse gravel
 Substrate lithology: Sandstone
 Australian Soil Classification: Subnatric Brown Sodosol

Profile morphology

| Horizon | Depth | Morphology |
|---------|---------------|------------------------------------------------------------------------------------------------------------------------------------------|
| A1 | 0 to 0.05 m | Brown (7.5YR4/3) sandy clay loam, firm surface, massive structure, field pH 7.0. Clear to: |
| A2 | 0.05 to 0.1 m | As above but sporadic bleach. Abrupt to: |
| B21 | 0.1 to 0.3 m | Brown (7.5YR4/4) medium heavy clay, moderate blocky structure, field pH 7.3. Gradual to: |
| B22 | 0.3 to 0.6 m | Greyish brown (10YR5/2) medium heavy clay, weak blocky structure, field pH 7.5. Gradual to: |
| BC | 0.6 to 0.7 m | Light greyish brown (10YR6/2) sandy clay (increasing amounts of sand and weathered sandstone fragments), massive structure, field pH 7.5 |

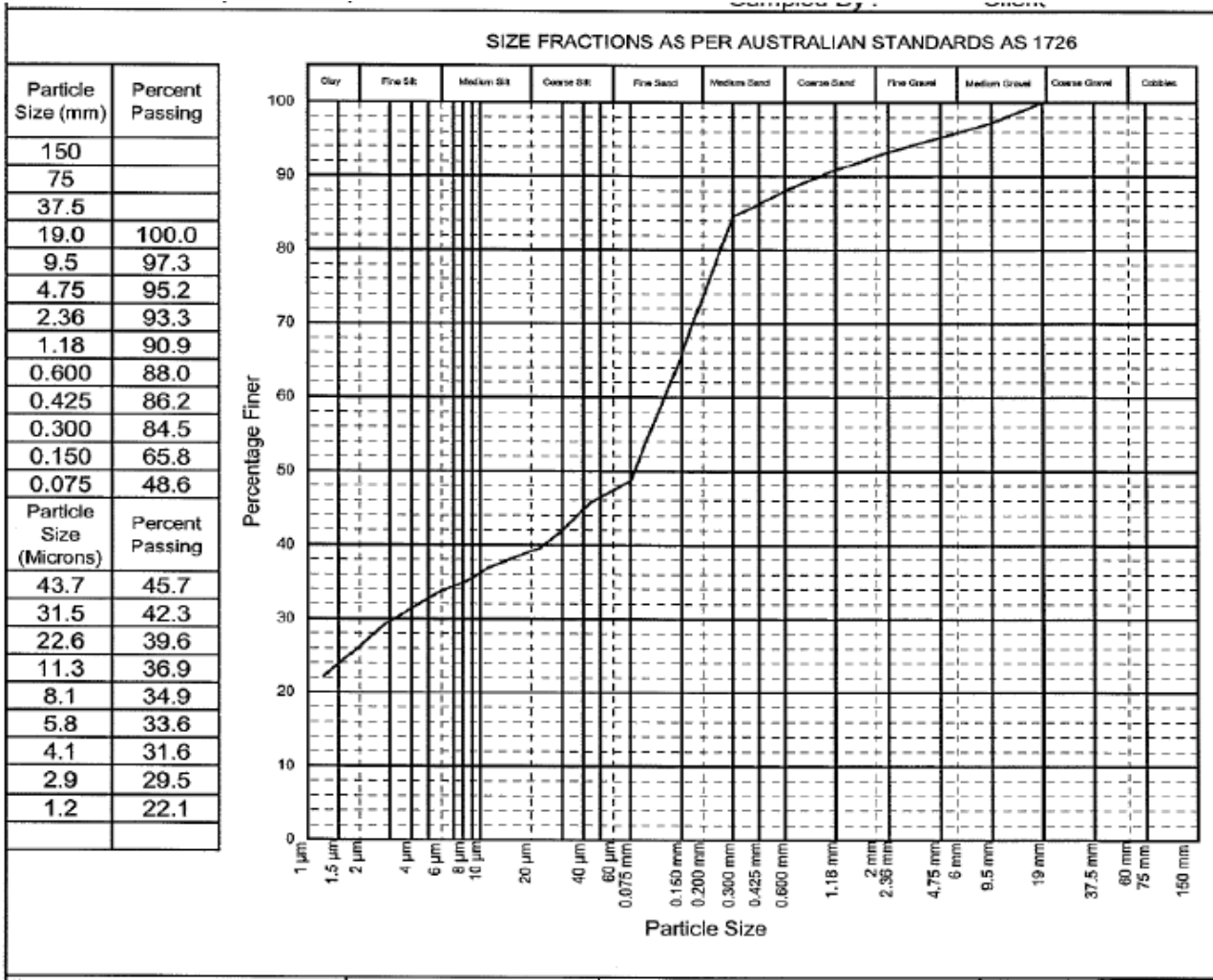
Analysis results

| Depth (m) | Moisture content (%) | pH | Electrical conductivity (BS/cm) | Chloride (mg/kg) | Acid Extractable K (mg/kg) | Nitrite + nitrate as N (mg/kg) | Total Kjeldahl N (mg/kg) | Acid ext. P (mg/kg) | Bicarbonate ext. P (mg/kg) |
|-----------|----------------------|-----|---------------------------------|------------------|----------------------------|--------------------------------|--------------------------|---------------------|----------------------------|
| 0-0.05 | 3.2 | 6.9 | 28 | 50 | 200 | 1.0 | 900 | 2 | 3 |
| 0.2-0.3 | 16.6 | 7.6 | 193 | 460 | | | | | |
| 0.5-0.6 | 15.5 | 7.8 | 466 | 920 | | | | | |
| 0.6-0.7 | 12.7 | 7.9 | 455 | 750 | | | | | |

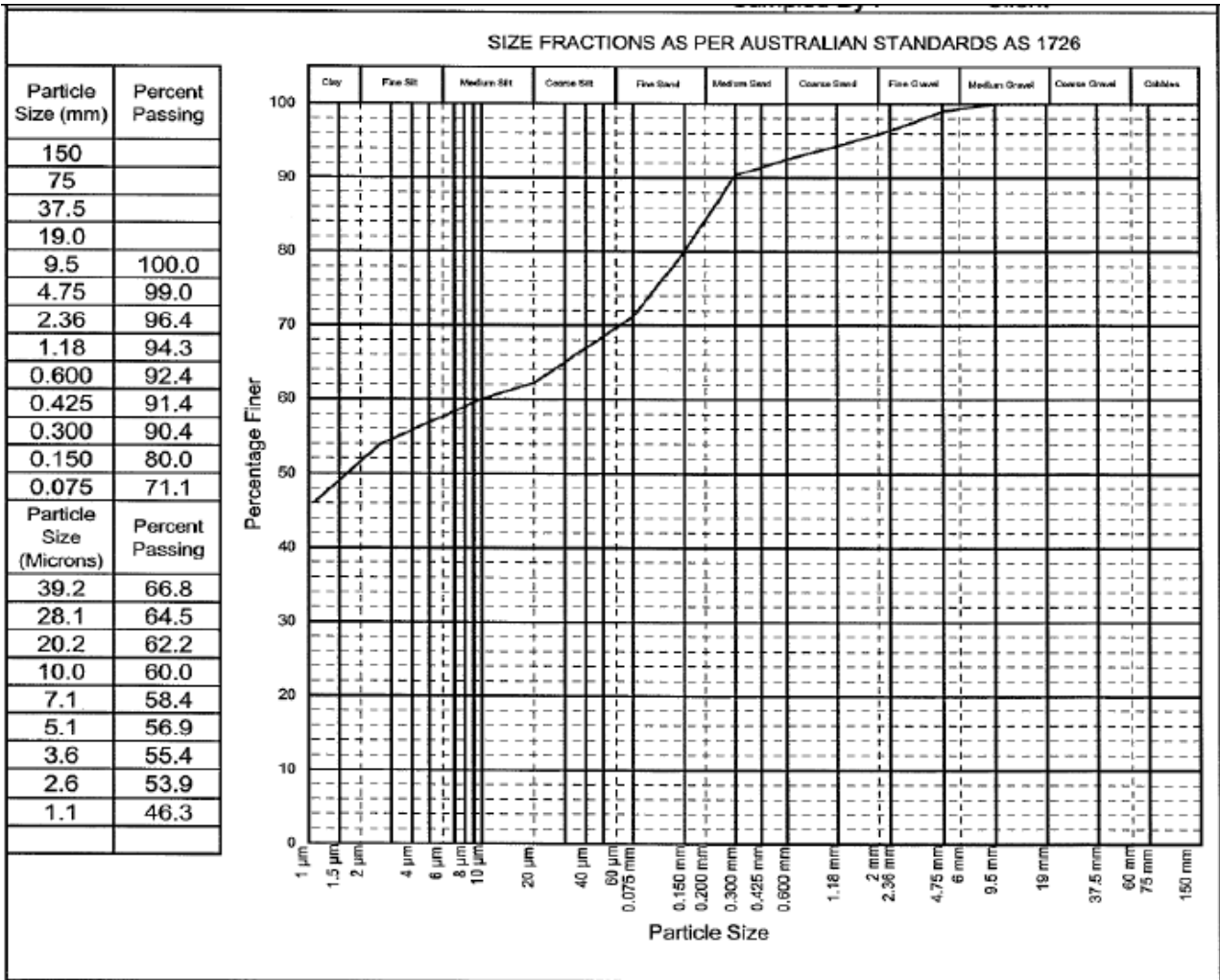
| Depth (m) | Exch. Ca (meq/100g) | Exch. Mg (meq/100g) | Exch. K (meq/100g) | Exch. Na (meq/100g) | CEC (meq/100g) | Exch. Al (meq/100g) | ESP | Ca/Mg |
|-----------|---------------------|---------------------|--------------------|---------------------|----------------|---------------------|------|-------|
| 0-0.05 | 4.1 | 6.1 | 0.7 | 0.4 | 11.3 | <0.1 | 3.9 | 0.7 |
| 0.2-0.3 | 4.6 | 17.1 | 0.7 | 3.2 | 25.6 | <0.1 | 12.5 | 0.3 |
| 0.5-0.6 | 4.6 | 18.7 | 0.7 | 4.9 | 28.9 | <0.1 | 16.9 | 0.2 |
| 0.6-0.7 | 4.5 | 17.9 | 0.7 | 4.7 | 27.8 | <0.1 | 17 | 0.2 |

| Depth (m) | Percent gravel (>2 mm) | Percent sand (2 mm - .06 mm) | Percent silt (0.06 mm – 0.002 mm) | Percent clay (<0.002 mm) |
|-----------|------------------------|------------------------------|-----------------------------------|--------------------------|
| 0-0.1 | 7 | 46 | 21 | 26 |
| 0.2-0.3 | 4 | 26 | 19 | 51 |
| 0.5-0.6 | 11 | 23 | 17 | 49 |
| 0.6-0.7 | 0 | 29 | 24 | 47 |

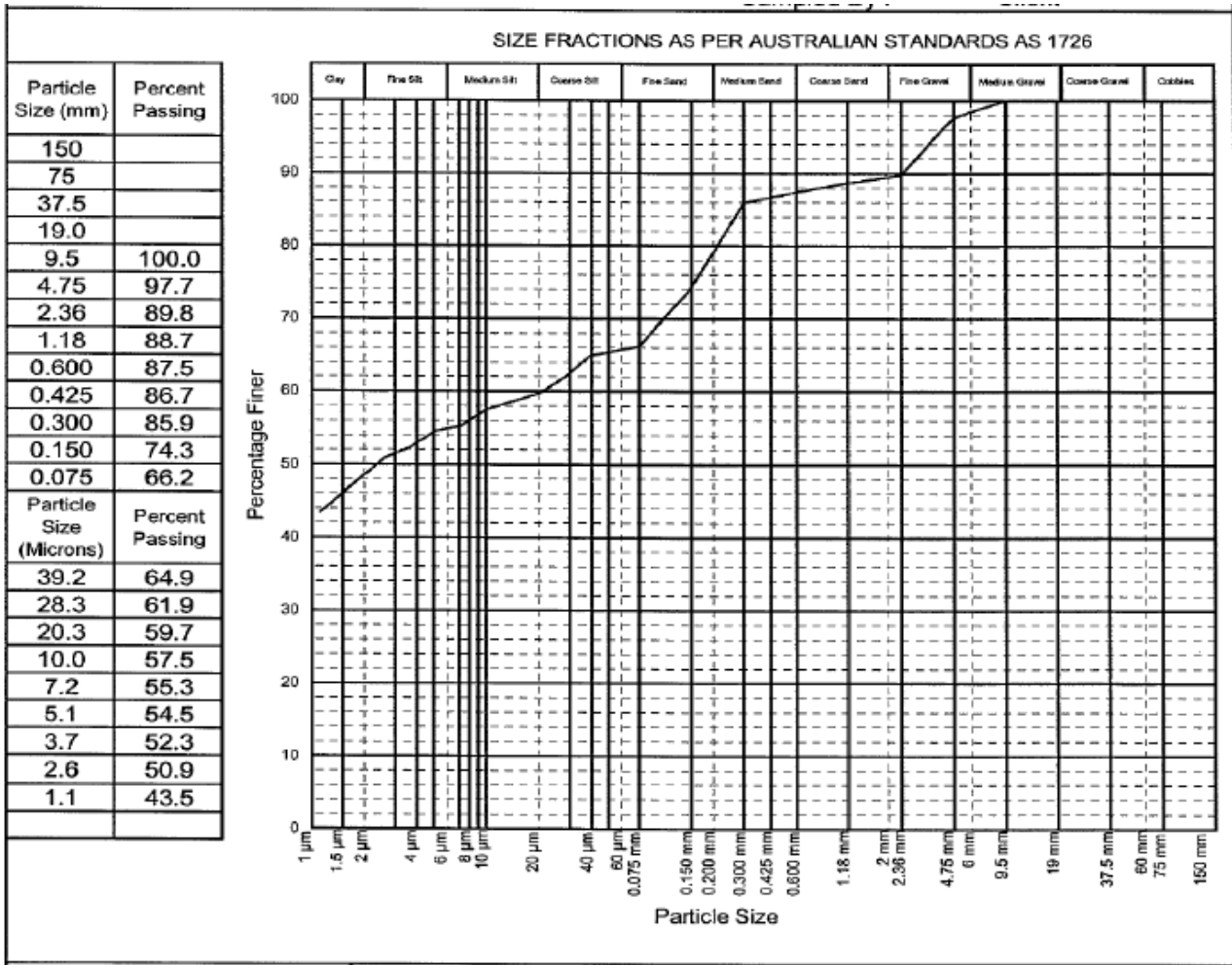
Particle size distribution (0-0.05 m)



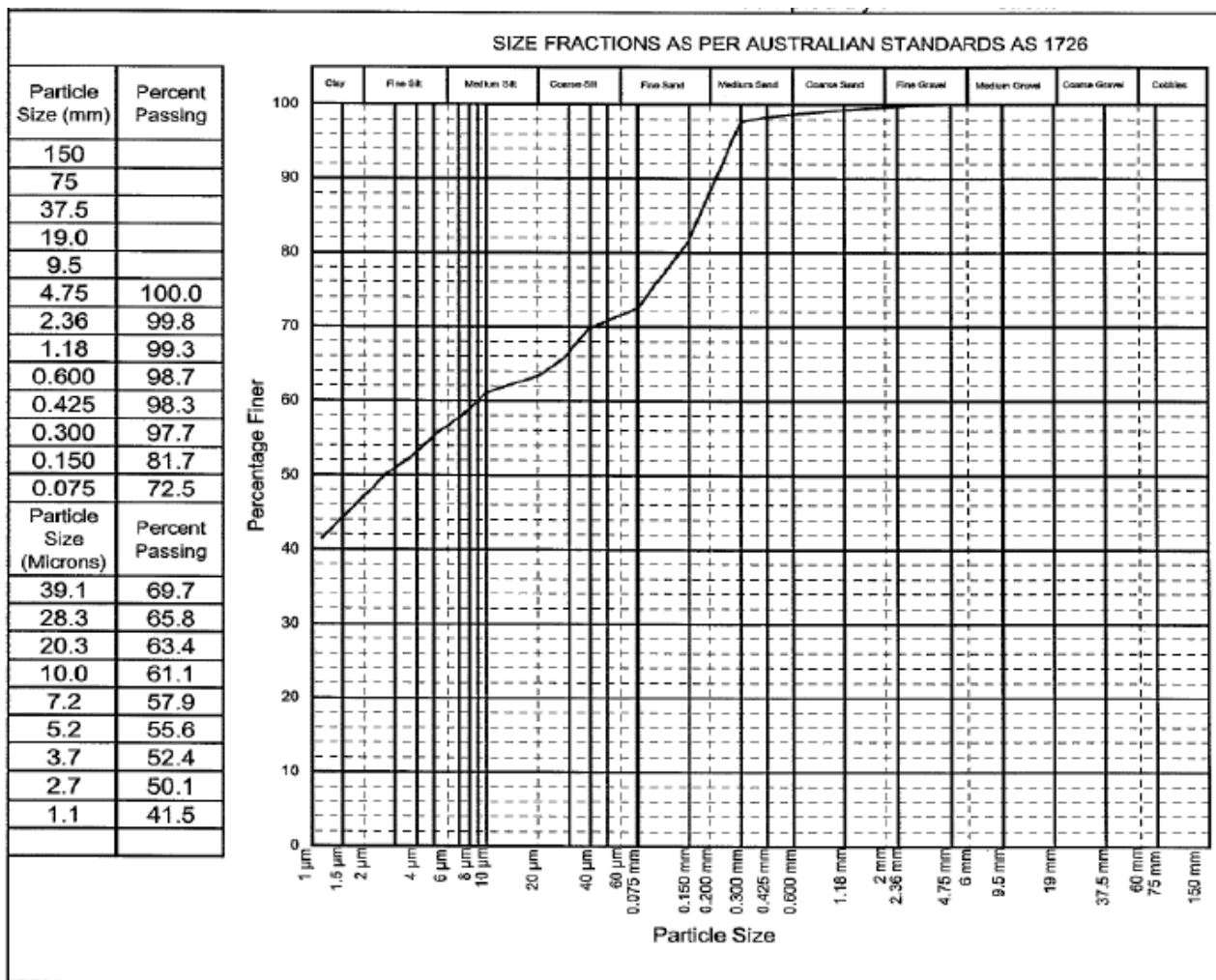
Particle size distribution (0.2-0.3 m)



Particle size distribution (0.5-0.6 m)



Particle size distribution (0.6-0.7 m)



Site 3 Eucalypt uplands — Yellow and Grey Sodosols

Location: 56J 209880 m E, 7180160 m N
 Landform element: Hillslope (3% slope)
 Landform pattern: Undulating low hills
 Permeability: Slowly permeable
 Drainage: Poorly drained
 Surface coarse fragments: Variable – 0 to 10% subrounded stone and occasional rock outcrop
 Substrate lithology: Sandstone
 Australian Soil Classification: Mottled Subnatric Yellow Sodosol

Profile morphology

| Horizon | Depth | Morphology |
|---------|----------------|---------------------------------------------------------------------------------------------------------------------------------|
| A1 | 0 to 0.15 m | Dark grey (10YR4/1) sandy loam, firm surface, massive structure, field pH 6.5. Clear to: |
| A2 | 0.15 to 0.25 m | As above but conspicuous bleach. Abrupt to: |
| B21 | 0.25 to 0.6 m | Brownish yellow (10YR6/6), 20% grey mottle, medium clay, strong prismatic structure, field pH 6.0. Gradual to: |
| BC | 0.6 to 0.7 m | Light greyish brown (10YR6/2) sandy clay (increasing amounts of weathered sandstone fragments), massive structure, field pH 5.9 |
| C | .7 m – | Grey sandstone with siltstone layers |

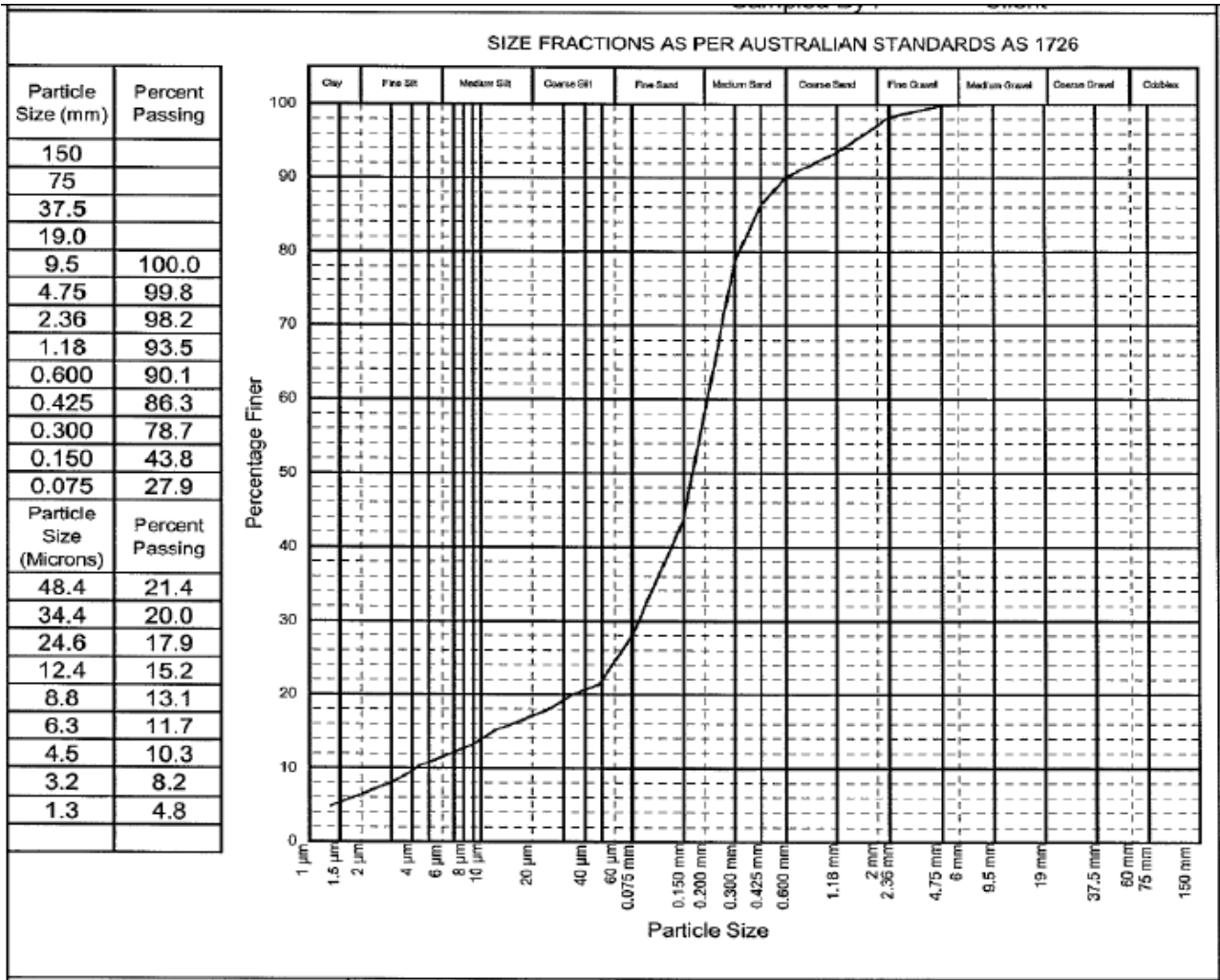
Analysis results

| Depth (m) | Moisture content (%) | pH | Electrical conductivity (BS/cm) | Chloride (mg/kg) | Acid Extractable K (mg/kg) | Nitrite + nitrate as N (mg/kg) | Total Kjeldahl N (mg/kg) | Acid ext. P (mg/kg) | Bicarbonate ext. P (mg/kg) |
|-----------|----------------------|-----|---------------------------------|------------------|----------------------------|--------------------------------|--------------------------|---------------------|----------------------------|
| 0-0.1 | 2.9 | 6.4 | 27 | 60 | 200 | 9.4 | 580 | 2 | 3 |
| 0.3-0.4 | 3.4 | 6.7 | 52 | 160 | | | | | |
| 0.5-0.6 | 9.3 | 5.7 | 71 | 80 | | | | | |

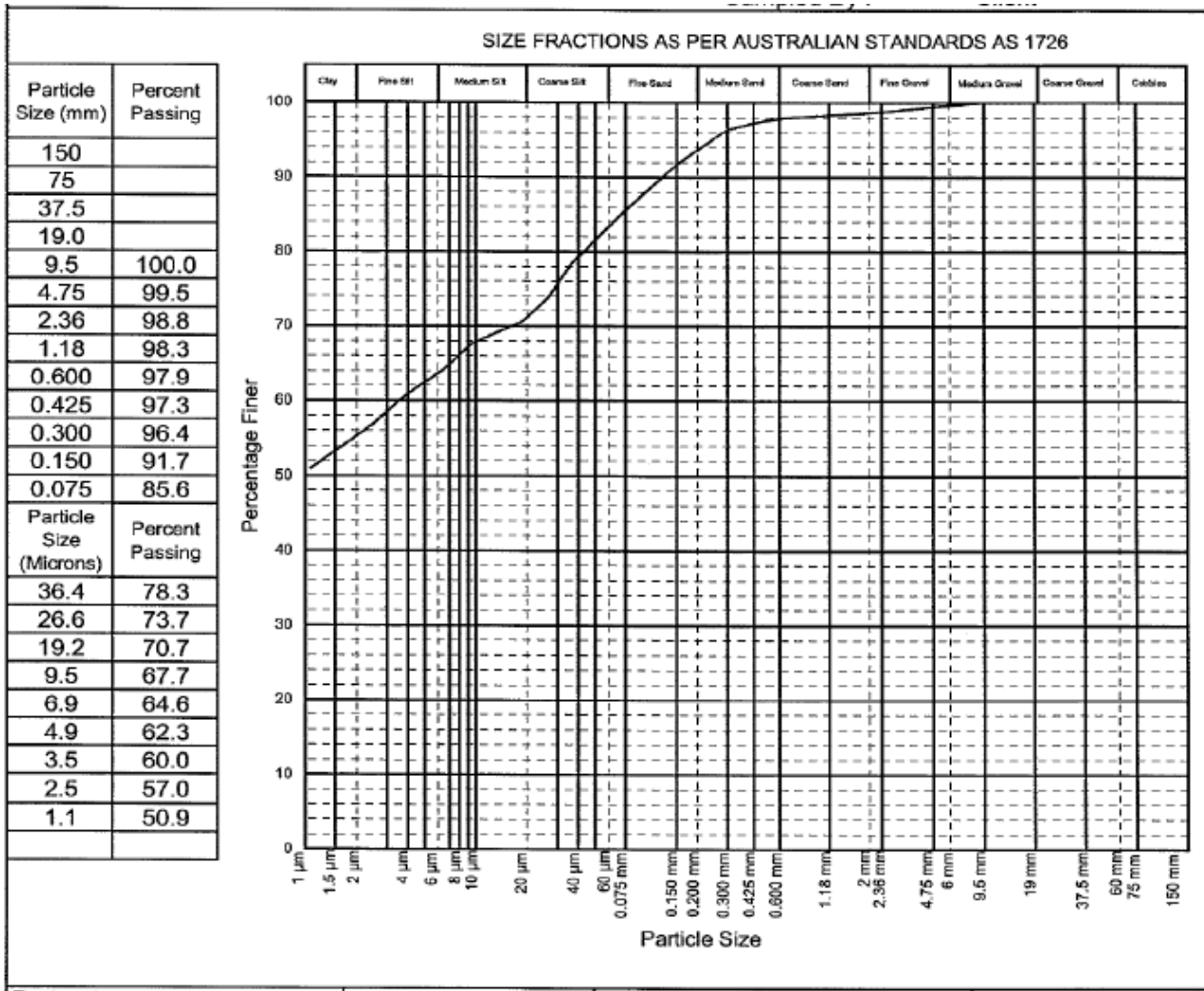
| Depth (m) | Exch. Ca (meq/100g) | Exch. Mg (meq/100g) | Exch. K (meq/100g) | Exch. Na (meq/100g) | CEC (meq/100g) | Exch. Al (meq/100g) | ESP | Ca/Mg |
|-----------|---------------------|---------------------|--------------------|---------------------|----------------|---------------------|------|-------|
| 0-0.1 | 2 | 1.2 | 0.6 | <0.1 | 3.9 | <0.1 | | 1.7 |
| 0.3-0.4 | 1.6 | 5.1 | 0.8 | 0.6 | 8.1 | <0.1 | 8 | 0.3 |
| 0.5-0.6 | 0.9 | 4.6 | 0.7 | 0.7 | 7 | <0.1 | 10.5 | 0.2 |

| Depth (m) | Percent gravel (>2 mm) | Percent sand (2 mm - .06 mm) | Percent silt (0.06 mm - 0.002 mm) | Percent clay (<0.002 mm) |
|-----------|------------------------|------------------------------|-----------------------------------|--------------------------|
| 0-0.1 | 3 | 72 | 18 | 7 |
| 0.3-0.4 | 1 | 16 | 28 | 55 |
| 0.5-0.6 | 7 | 11 | 36 | 46 |

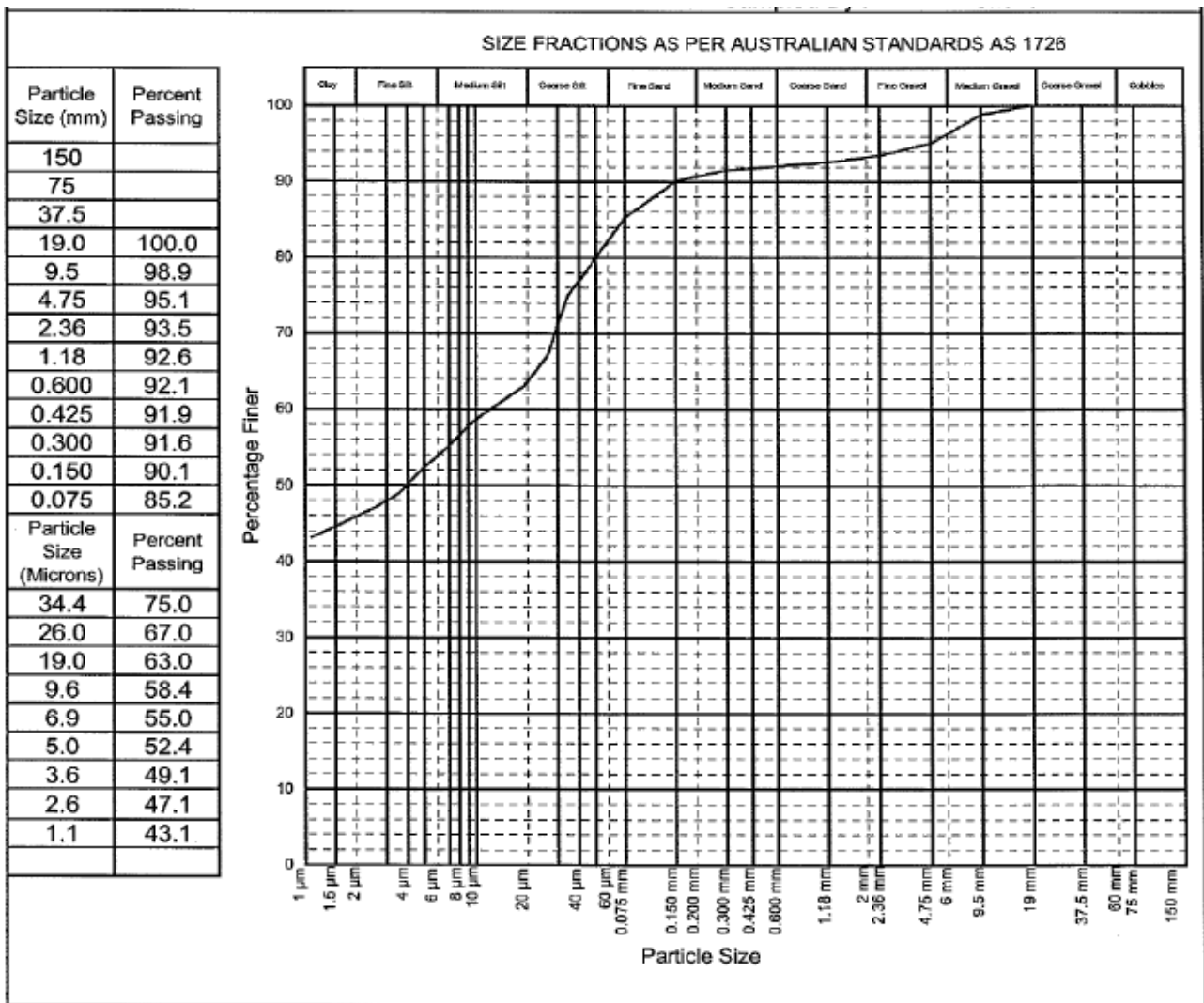
Particle size distribution (0-0.1 m)



Particle size distribution (0.3-0.4 m)



Particle size distribution (0.5-0.6 m)



A.3 Pipeline

A.3.1 Nathan Dam to Great Dividing Range

Descriptions and assessments of the dominant soils in the LRAs along the pipeline from Nathan Dam to the Great Dividing Range may be obtained from the preceding Sections A2.1 and A2.2 according to the following Table 6-9.

Information has been drawn from the following:

- observations made during this study;
- Forster (1985);
- Sweeney (1968); and
- Gray and Macnish (1985).

These references may be consulted for additional information including the results of soil analyses.

Table 6-1 Dominant soils in the LRAs along the pipeline between Nathan Dam and the Great Dividing Range

| LRA | Dominant soil | Associated soil descriptions from reservoir area and dam site |
|-------------------|-------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|
| 1 — Coolibah | Black and Grey Vertosols | Eucalypt floodplains — Grey and Black Vertosols |
| 3 — Juandah | Deep Sodosols | Eucalypt floodplains — Yellow and Grey Sodosols |
| 5 — Montana | Deep Sodosols | Eucalypt floodplains — Yellow and Grey Sodosols |
| 7 — Tara | Grey Vertosols | Eucalypt floodplains — Grey and Black Vertosols |
| 8 — Wandoan | Moderately deep Grey, Brown and Black Vertosols | Brigalow uplands — Grey and Brown Vertosols and Dermosols Softwood scrub uplands — Grey and Brown Dermosols and Vertosols |
| 10 — Hookswood | Moderately deep Red Kandosols | Eucalypt highlands — Red Kandosols |
| 11 — Duaringa | Shallow Tenosols, Kandosols and Rudosols | Eucalypt highlands — Rudosols and Tenosols |
| 13 — Mundell | Shallow Grey, Brown and Black Vertosols and Dermosols | Softwood scrub highlands — Grey and Brown Dermosols and Vertosols |
| 14 — Narran | Shallow Sodosols and Rudosols | Eucalypt uplands — Yellow and Grey Sodosols Eucalypt highlands — Rudosols and Tenosols |
| 15 — Glenhaughton | Shallow Sodosols and Kurosols | Eucalypt uplands — Yellow and Grey Sodosols |
| 15 — Nathan | Shallow Tenosols, Kandosols and Rudosols | Eucalypt highlands — Rudosols and Tenosols |

A.3.2 Great Dividing Range to Dalby

Information has been drawn from the following:

- observations made during this study;
- Forster, (1986);
- Harris et al., (1999) (Darling Downs Land Management Field Manual);
- Maher, J.M., (1998) (Central Darling Downs Land Resource Areas (map accompanying Harris et al. (1999)));
- Maher, J.M., (1996) (Understanding and Managing Soils in the Murilla, Tara and Chinchilla Shires – Murilla, Tara and Chinchilla Shires Field Manual); and
- Maher, J.M., (1995). (Murilla and Chinchilla Shires Land Resource Areas (map accompanying Maher, 1996)).
- These references may be consulted for additional information including the results of soil analyses.

Clay alluvial plains — LRAs 1a and 1b (Murilla, Tara and Chinchilla Shires) and Recent alluvial plains — LRAs 1A and 1B (Central Darling Downs)

Dominant soil — Condamine (Self-Mulching Black Vertosols)

| | |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Parent material: | Alluvium of mixed origin |
| Surface rock and stone: | None |
| Profile permeability: | Slowly permeable |
| Drainage: | Imperfectly drained |
| Erodibility: | Moderate Profile: |
| 0.0 – 0.05 m | Grey to black medium-heavy clay (occasional sand separation on surface after rain) Medium to coarse granular structure Self-mulching and cracking Non-sodic Low to medium dispersion rating pH 7.0 to 8.5 |
| 0.05 – 0.15 m | Clear change to: Grey to black medium heavy clay Well structured Generally non-sodic Low to medium dispersion rating pH 7.0 to 8.5 |
| 0.15 – 0.6 m | Clear change to: Black to greyish brown heavy clay Coarse blocky or lenticular structure Sodic or occasionally strongly sodic Medium dispersion rating pH 7.8 to 8.8 |
| 0.6 to 1.5 m | Gradual change to Brown to grey or black heavy clay Coarse lenticular structure Sodic or strongly sodic Medium dispersion rating pH 7.8 to 8.5 |

Clay alluvial plains — LRA 1c (Murilla, Tara and Chinchilla Shires) and Older alluvial plains — LRA 2B (Central Darling Downs)

Dominant soil — Cecilvale (Crusting Grey Vertosols)

| | |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| Parent material: | Alluvium of mixed origin (basalt and sandstone) |
| Surface rock and stone: | None |
| Profile permeability: | Very slowly permeable |
| Drainage: | Imperfectly drained |
| Erodibility: | Moderate |
| Profile: | |
| 0.0 – 0.10 m | Grey light clay to light medium clay Strong blocky structure Crusting and cracking Non-sodic Low to medium dispersion rating pH 7.0 to 8.0 |

| | |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0.10 – 0.6 m | <p>Clear change to: Grey medium clay Strong blocky structure Sodic to strongly sodic Medium to high dispersion rating pH 8.5 to 9.0</p> |
| 0.6 – 1.4 m | <p>Clear change to: Grey medium heavy clay Moderate blocky or lenticular structure Strongly sodic High dispersion rating pH 8.5 to 9.0</p> |
| 1.4 to 1.5 m | <p>Gradual change to Brown to grey fine sandy light clay to medium heavy clay Subangular blocky or lenticular structure Strongly sodic High dispersion rating pH 8.0 to 9.0</p> |

Poplar box flat plains — LRA 2b (Murilla, Tara and Chinchilla Shires) and 7a Ironbark / bull oak forests (Murilla, Tara and Chinchilla Shires)

Dominant soil — Braemar (Brown Sodosols)

| | |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Parent material: | Sandstone and/or alluvium derived from sandstone |
| Surface rock and stone: | None |
| Profile permeability: | Slowly permeable |
| Drainage: | Poorly drained |
| Erodibility: | Moderate to high |
| Profile: | |
| 0.0 – 0.15 m | <p>Grey-brown sandy loam Massive structure Sodic Low dispersion rating pH 5.0 to 6.0</p> |
| 0.15 – 0.30 m | <p>Clear change to: Light grey sandy loam, conspicuously bleached Massive structure Sodic Low dispersion rating pH 5.0 to 6.5</p> |
| 0.3 – 0.6 m | <p>Sharp change to: Brown, mottled, sandy clay Strong columnar structure</p> |

| | |
|--------------|--------------------------------------------------------------------|
| | Strongly sodic |
| | High dispersion rating |
| | pH 6.0 to 7.0 |
| | Clear change to |
| 0.6 to 1.5 m | Greyish brown, mottled, sandy clay (sandstone may occur below 1 m) |
| | Massive structure |
| | Strongly sodic |
| | High dispersion rating |
| | pH 5.0 to 6.0 |

Cypress pine sands — LRA 3a (Murilla, Tara and Chinchilla Shires)

Dominant soil — Chinchilla (Red Tenosols)

| | |
|-------------------------|---------------------------------|
| Parent material: | Sandy alluvium |
| Surface rock and stone: | None |
| Profile permeability: | Highly permeable |
| Drainage: | Rapidly drained |
| Erodibility: | Moderate |
| Profile: | |
| 0.0 – 0.3 m | Brown sandy loam |
| | Massive structure |
| | Non-sodic |
| | Low dispersion rating |
| | pH 6.5 to 7.5 |
| Clear change to: | |
| 0.30 – 0.80 m | Yellowish red clayey sand |
| | Massive structure |
| | Non-sodic |
| | Low dispersion rating |
| | pH 5.5 to 6.5 |
| | Diffuse change to: |
| 0.8 – 1.5 m | Red loamy sand |
| | Massive structure |
| | Non-sodic or occasionally sodic |
| | Low dispersion rating |
| | pH 5.0 to 6.0 |

Brigalow plains — LRA 4a (Murilla, Tara and Chinchilla Shires) and LRA 5A (Central Darling Downs)

Dominant soil — Kupunn (Shallowly gilgaied Grey and Brown Vertosols)

| | |
|-------------------------|----------|
| Parent material: | Alluvium |
| Surface rock and stone: | None |

| | |
|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Profile permeability: | Slowly permeable |
| Drainage: | Poorly drained |
| Erodibility: | Moderate |
| Profile: | |
| 0.0 – 0.1 m | Brown light clay to light medium clay Strong subangular blocky structure Self-mulching and cracking Non-sodic Low dispersion rating pH 6.5 to 8.0 |
| 0.10 – 0.50 m | Abrupt change to: Dark greyish brown medium clay to medium heavy clay Strong blocky structure Sodic Low to medium dispersion rating pH 7.5 to 9.0 |
| 0.5 – 0.8 m | Clear change to: Yellowish brown medium clay Moderate blocky structure Strongly sodic Medium to high dispersion rating pH 8.5 to 9.0 |
| 0.8 to 1.5 m | Gradual change to Brown to yellowish brown medium heavy clay Massive structure Strongly sodic High dispersion rating pH 5.5 to 9.5 |

Brigalow plains — LRA 4b (Murilla, Tara and Chinchilla Shires)

Dominant soil — Tara (Moderately to very deeply gilgaied Grey Vertosol)

| | |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Parent material: | Alluvium |
| Surface rock and stone: | None |
| Profile permeability: | Very slowly permeable |
| Drainage: | Poorly drained |
| Erodibility: | Moderate |
| Profile: | |
| 0.0 – 0.1 m | Dark grey light clay to light medium clay Moderate subangular blocky structure Self-mulching and cracking to hard setting and cracking surfaces Non-sodic Low dispersion rating pH 6.0 to 7.5 |
| 0.10 – 0.40 m | Clear change to: Grey medium clay to medium heavy clay Strong prismatic to blocky structure Sodic |

| | |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0.4 – 1.0 m | <p>Medium dispersion rating pH 8.0 to 9.0 Clear change to: Greyish brown medium clay to heavy clay Strong prismatic or lenticular structure Strongly sodic High dispersion rating pH 6.0 to 9.0</p> |
| 1.0 to 1.5 m | <p>Gradual change to Greyish brown medium clay Strong prismatic to blocky structure Strongly sodic High dispersion rating pH 4.5 to 8.0</p> |

Poplar box rises — LRA 8a (Murilla, Tara and Chinchilla Shires)

Dominant soil — Coalbar (Thin to moderately thick surfaced Brown and Grey Sodosols)

| | |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Parent material: | Alluvium derived predominantly from sandstone |
| Surface rock and stone: | None |
| Profile permeability: | Slowly permeable |
| Drainage: | Poorly drained |
| Erodibility: | High |
| Profile: | |
| 0.0 – 0.15 m | <p>Dark brown sandy loam to sandy clay loam Massive structure Hard setting surfaces Non-sodic Medium dispersion rating pH 6.0 to 7.0 Clear change to:</p> |
| 0.15 – 0.2 m | <p>Light brown sandy loam to sandy clay loam, conspicuously bleached Massive structure Non-sodic Medium dispersion rating pH 6.0 to 7.0 Abrupt change to:</p> |
| 0.2 – 0.8 m | <p>Brown medium clay Strong columnar structure Sodic to strongly sodic Medium to high dispersion rating pH 7.5 to 9.0 Gradual change to</p> |

0.8 to 1.5 m Pale brown light clay to brown light medium clay
Weak blocky structure
Strongly sodic
High dispersion rating
pH 8.0 to 9.0

Light forests — LRAs 9a and 9b (Murilla, Tara and Chinchilla Shires)

Dominant soil — Minnabilla (Stony Brown Rudosols)

Parent material: Sandstone
Surface rock and stone: Variable amounts of rock outcrop and surface stone
Profile permeability: Highly permeable
Drainage: Rapidly drained
Erodibility: Moderate
Profile:
0.0 – 0.10 m Dark brown sandy loam to sandy clay loam
Massive structure
Non-sodic
Low to medium dispersion rating
pH 5.0 to 6.0
Clear change to:
0.10 – 0.3 m Yellowish red sandy loam to sandy clay loam, many sandstone fragments
Massive structure
Non-sodic
Low to medium dispersion rating
pH 5.0 to 6.5
Abrupt change to:
0.3 – 1.5 m Weathered sandstone

Older alluvial plains — LRA 2A (Central Darling Downs)

Dominant soil — Waco (Self-mulching Black Vertosols)

Parent material: Alluvium of basaltic origin
Surface rock and stone: None
Profile permeability: Slowly permeable
Drainage: Imperfectly drained
Erodibility: Moderate
Profile:
0.0 – 0.15 m Black heavy clay
Strong granular structure
Self-mulching and cracking
Non-sodic

| | |
|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| | Low dispersion rating pH 7.5.0 to 8.5 |
| Clear change to: 0.15 – 0.9 m | Black heavy clay Strong lenticular structure Sodic to strongly sodic Medium dispersion rating pH 8.5 to 9.0 |
| 0.9 – 1.5 m | Clear change to: Greyish brown heavy clay Moderate lenticular structure Strongly sodic Medium dispersion rating pH 8.5 to 9.0 |

Alluvial plains – loamy Sodosols — LRA 3A (Central Darling Downs)

Dominant soil — Downfall (Moderately thick-surfaced Brown Sodosols)

| | |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Parent material: | Alluvium |
| Surface rock and stone: | None |
| Profile permeability: | Slowly permeable |
| Drainage: | Poorly drained |
| Erodibility: | Moderate to high |
| Profile: | |
| 0.0 – 0.15 m | Dark greyish brown fine sandy clay loam, bleached at base Massive structure Hard setting surface Non-sodic Medium dispersion rating pH 6.0 to 7.5 |
| 0.15 – 0.3 m | Abrupt change to: Mottled brown medium clay Strong columnar structure Sodic Medium dispersion rating pH 7.0 to 8.0 |
| 0.3 – 1.1 m | Clear change to: Olive brown to reddish brown medium clay to medium heavy clay Moderate blocky structure Strongly sodic High dispersion rating pH 8.5 to 9.0 Gradual change to |

1.1 – 1.5 m Greyish brown medium clay
Moderate blocky structure
Strongly sodic
High dispersion rating
pH 8.5 to 9.2

Alluvial plains – sandy Sodosols — LRA 4A (Central Darling Downs) and Poplar box Sodosols — LRA 9A (Central Darling Downs)

Dominant soil — Leyburn (Moderately thick-surfaced Brown Sodosols)

Parent material: Alluvium (may overlie sandstone at depth)
Surface rock and stone: None
Profile permeability: Very slowly permeable
Drainage: Poorly drained
Erodibility: Moderate to high
Profile:
0.0 – 0.05 m Dark yellowish brown fine sandy clay loam
Massive structure
Hard setting
Non-sodic
Medium dispersion rating
pH 6.0 to 7.5
Clear change to:
0.05 – 0.2 m Brown clay loam, conspicuously bleached
Massive structure
Non-sodic
Medium dispersion rating
pH 6.0 to 7.5
Abrupt change to:
0.2 – 0.6 m Yellowish brown medium clay
Moderate blocky or prismatic structure
Sodic to strongly sodic
Medium to high dispersion rating
pH 6.5 to 8.5
Gradual change to
0.6 – 1.5 m Yellowish brown medium clay
Massive structure
Strongly sodic
High dispersion rating
pH 8.5 to 9.2

Brigalow uplands — LRA 6A (Central Darling Downs)

Dominant soil — Moola (Shallow gilgaied Grey-Brown Vertosols)

Parent material: Fine-grained sandstone

| | |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Surface rock and stone: | 0 to 2% ironstone gravel |
| Profile permeability: | Slowly permeable |
| Drainage: | Imperfectly drained |
| Erodibility: | Moderate to high |
| Profile: | |
| 0.0 – 0.1 m | Brownish black fine sandy clay to light clay Moderate granular structure Self-mulching and cracking Non-sodic Low dispersion rating pH 8.0 to 8.7 Clear change to: |
| 0.1 – 0.2 m | Brownish black light clay to fine sandy light medium clay Moderate blocky structure Non-sodic Low to medium dispersion rating pH 8.0 to 8.7 Abrupt change to: |
| 0.2 – 0.6 m | Brownish black medium clay Moderate blocky structure Sodic to strongly sodic Medium to high dispersion rating pH 8.5 to 9.0 Gradual change to |
| 0.6 – 1.5 m | Yellowish brown medium clay Strong lenticular structure Strongly sodic High dispersion rating pH 5.2 to 8.5 |

Brigalow uplands — LRA 6D (Central Darling Downs)

Dominant soil — Calingunee (Gilgaied Black or Grey-Brown Vertosols)

| | |
|-------------------------|------------------------------------------------------------------------------------------------------|
| Parent material: | Fine-grained sandstone |
| Surface rock and stone: | 0 to 2% gravel |
| Profile permeability: | Slowly permeable |
| Drainage: | Imperfectly drained |
| Erodibility: | Moderate |
| Profile: | |
| 0.0 – 0.1 m | Brownish black medium clay Moderate granular structure Self-mulching and cracking Non-sodic |

| | |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0.1 – 0.2 m | <p>Low dispersion rating pH 7.0 to 7.5 Abrupt change to: Brownish black heavy clay Strong blocky structure Non-sodic Low to medium dispersion rating pH 7.5 to 8.5 Clear change to:</p> |
| 0.2 – 0.6 m | <p>Greyish brown medium heavy clay Strong lenticular structure Non-sodic to sodic Medium to high dispersion rating pH 6.5 to 8.5 Gradual change to</p> |
| 0.6 – 1.5 m | <p>Brown medium heavy clay Strong lenticular structure Strongly sodic High dispersion rating pH 5.2 to 8.5</p> |

Basaltic uplands — LRA 7A (Central Darling Downs)

Dominant soil — Craigmore (Linear gilgaied Black Vertosols)

| | |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Parent material: | Basalt |
| Surface rock and stone: | Usually stone free |
| Profile permeability: | Slowly permeable |
| Drainage: | Imperfectly drained |
| Erodibility: | Moderate |
| Profile: | |
| 0.0 – 0.05 m | <p>Brownish black medium clay Strong coarse to medium granular structure Self-mulching and cracking Non-sodic Low dispersion rating pH 7.5 to 9.0 Abrupt change to:</p> |
| 0.05 – 0.15 m | <p>Brownish black medium clay Strong subangular blocky structure Non-sodic Low dispersion rating pH 8.5 to 9.0 Clear change to:</p> |

| | |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| 0.15 – 0.6 m | Black medium heavy clay Strong blocky structure Non-sodic to sodic Low to medium dispersion rating pH 8.5 to 9.0 Gradual change to |
| 0.6 – 1.5 m | Brown to red-brown medium clay Strong lenticular structure Sodic Medium dispersion rating pH 8.5 to 9.0 |

Ironbark/bull oak Sodosols — LRA 10A (Central Darling Downs)

Dominant soil — Weranga (Thin-surfaced Yellow or Grey Sodosols)

| | |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Parent material: | Coarse-grained sandstone |
| Surface rock and stone: | Usually stone free |
| Profile permeability: | Very slowly permeable |
| Drainage: | Poorly drained |
| Erodibility: | High |
| Profile: | |
| 0.0 – 0.1 m | Brown sandy loam to sandy clay loam, conspicuously bleached at base Massive structure Non-sodic Moderate dispersion rating pH 6.0 to 7.0 Abrupt change to: |
| 0.1 – 0.5 m | Mottled yellowish brown sandy light medium clay to medium heavy clay Strong columnar structure Strongly sodic High dispersion rating pH 6.0 to 7.5 Clear change to: |
| 0.5 – 1.2 m | Pale brown to brown Sandy light medium clay to medium clay Massive to medium blocky structure Strongly sodic High dispersion rating pH 7.0 to 8.0 Note: may grade into weathered sandstone |

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