RETURN TO CONTENTS PAGE

5. Topography, geology and soils

5. Topography, geology and soils

This chapter describes the existing environment, potential impacts and mitigation measures related to topography, geology and soils within the proposed Jilalan Rail Yard project area. The assessment has been based on a review of previous soil and land studies, geotechnical information and field investigations.

5.1 Methodology

The topography, geology, soil types, geomorphology and landform patterns within the project area were investigated through review of aerial photographs and maps, existing studies within and adjacent to the project area and completing a site inspection of the project area during May and June 2007. Observations recorded during the site inspection were described in accordance with McDonald *et al* 1990.

Previous studies associated with topography, geology and soils issues within and surrounding the project area included:

- Jilalan Station Yard Upgrade and Bypass Line – Stage 1 Expansion Preliminary Planning and Engineering Report (Connell Hatch 2007a)
- Preliminary Geotechnical Investigation Jilalan Station Bypass for Queensland Rail (Connell Hatch 2007b)
- Plane Creek Sugar Cane Land Suitability Study (Wills and Baker 1988)

No further sampling or analysis was undertaken to assess potential soil contaminant status or identify the presence/absence of Acid Sulfate Soils (ASS) for this EIS. Further investigations will be undertaken during detailed design when the nature, scale and extent of disturbance within the project area have been quantified.

5.2 Description of environmental values

5.2.1 Topography and landform

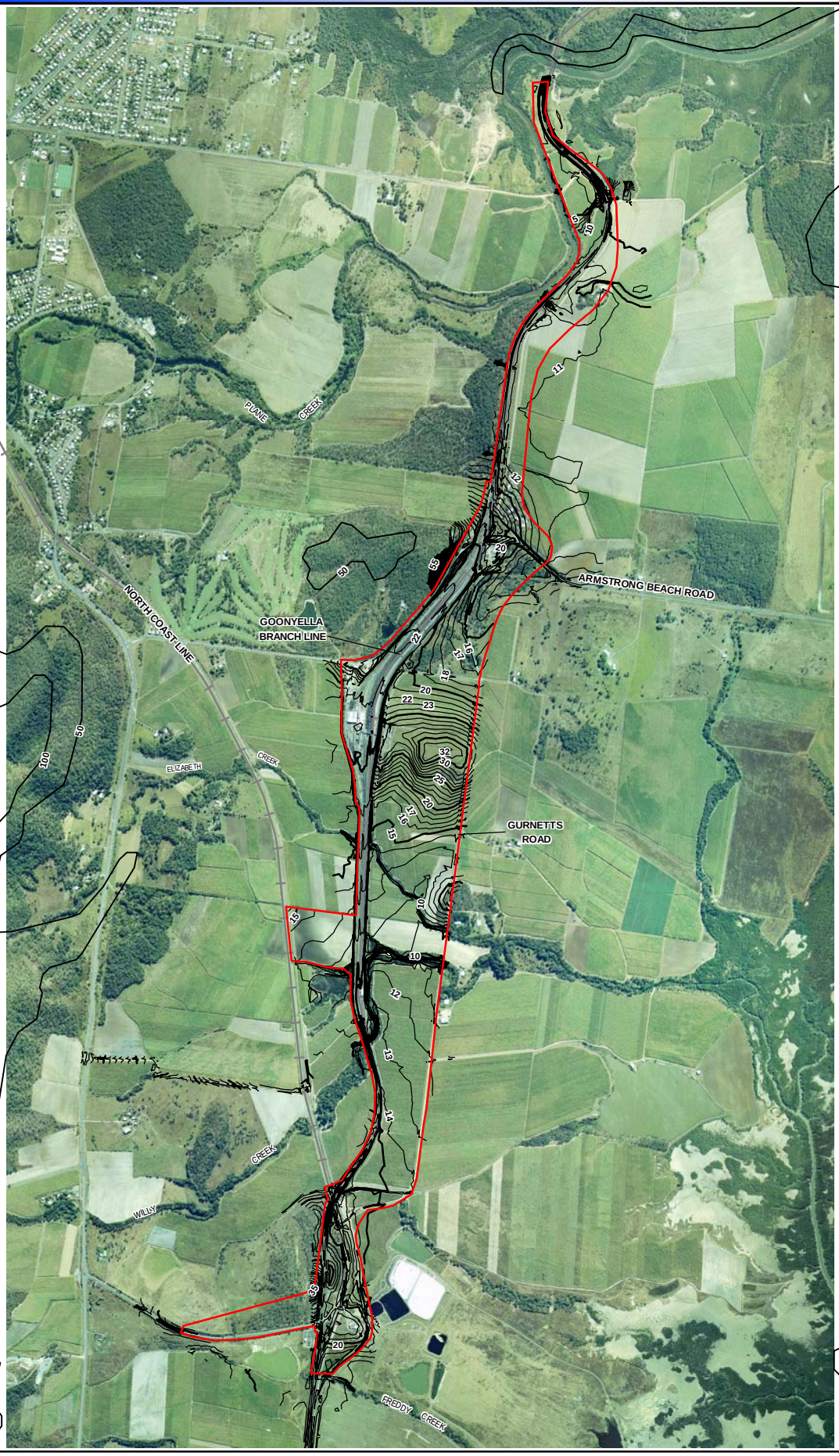
Topography within and surrounding the project area is dominated by a level to gently undulating plain, which is intercepted by a convergent, integrated tributary network of drainage lines and isolated hillcrests of rolling hills and low rises with gently inclined to steep slopes. Topographical elevations within the project area range from <5 m Australian Height Datum (AHD) within the drainage lines and channels to approximately 35 m AHD where the project alignment intercepts the adjoining hillslopes (refer Figure 5.1).

The dominant landform patterns within the area surrounding the project area are characterised as a gently undulating alluvial plain containing a number of isolated rolling hills and rolling low rises located between a series of steep mountains to the west and the level plain associated with the estuary downstream to the east, which discharges into Sarina Inlet and Llewellyn Bay (refer Figure 5.2).

Land use within and surrounding the project area is dominated by the production of sugar cane with some minor grazing and urban and industrial land.

During the site inspection a number of landform survey observation locations were identified and described. Landform survey observation locations are indicated on Figure 5.2 and the characteristics and descriptions of the area are summarised in Table 5.1.

Jilalan Rail Yard Upgrade Project



V:\Projects\Qld_Rail\HR5001\GIS\Workspaces\Jilalan_15.wor By: SLG Date: 05/09/07 Version 3

N

0 1000 (m)

Scale 1:20 000 (m) (@ A3 size)

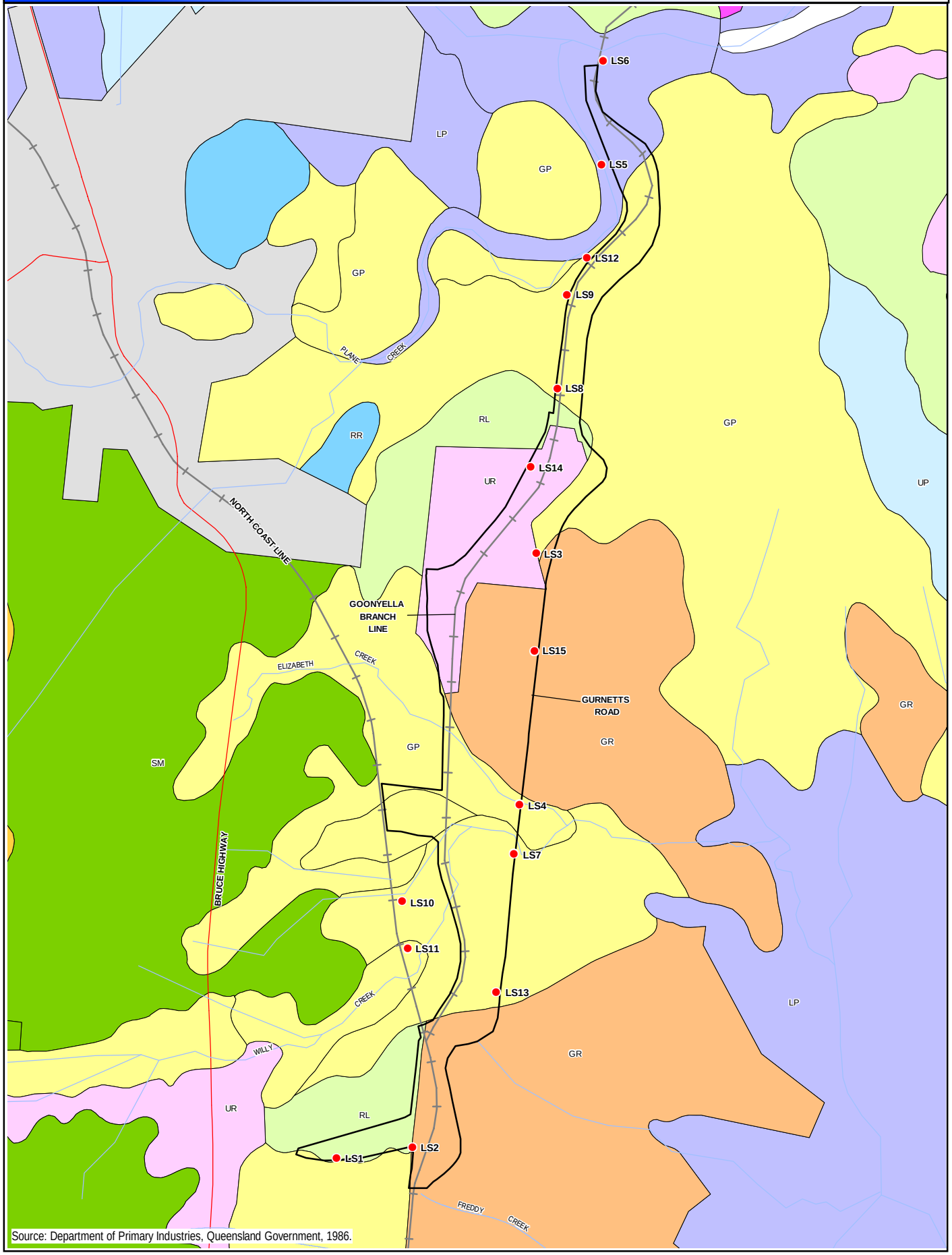
LEGEND

- Project Area
- Rail
- Contour (m)

TOPOGRAPHY

FIGURE 5.1

Jilalan Rail Yard Upgrade Project



Source: Department of Primary Industries, Queensland Government, 1986.

V:\Projects\Qld_Rail\HR5001\GIS\Workspaces\Jilalan_18.wor By: SLG Date: 05/09/07 Version 3

LEGEND

Landform

- LP - Level Plain
- GP - Gently Undulating Plain
- GR - Gently Undulating Rises
- UP - Undulating Plain
- UR - Undulating Rises
- RR - Rolling Rises
- RL - Rolling Low Rises
- RH - Rolling Hills
- SH - Steep Hills
- SM - Steep Mountains
- No Data

- Land Survey Site
- Project Area
- Rail
- Watercourse
- Major Road

N

0 1000 (m)

Scale 1:20 000 (m) (@ A3 size)

LANDFORMS AND SITE OBSERVATIONS

FIGURE 5.2

Table 5.1 Landform survey locations

Location	Landform elements and topographical relief	Observations and descriptions
Land Survey Site 1 (LS1) 	Gently to moderately inclined hillslope of a rolling low hill (RL) within a gently undulating plain (GP)	Observation site LS1 was located at the south western extent of the project area along Oonooie Road • Land use was a mix of grazing and sugar cane production • Moderately inclined, waning lower slope • Active erosion processes included gravity and overland flow forming downslope channelling • Area was heavily grassed and overgrown in patches with weeds and exotic species • Widely spaced stream channels developed through erosion with gravity driven convergent tributaries
Land Survey Site 2 (LS2) 	Moderately inclined hillslope of a rolling low hill (RL) surrounded by a gently undulating plain (GP)	Observation site LS2 was located immediately west of the level crossing of Oonooie Road at the southern extent of the project area • Land use was a mix of grazing and sugar cane production with an Ergon Energy substation facility on the southern side of Oonooie Road and the CSR Ethanol Distillery, Oonooie Facility site located immediately to the east of the level crossing • The North Coast Line and the Goonyella Branch Line intercepted the site in a north-south direction • Moderately inclined, waning lower slope • Active erosion processes included gravity and overland flow • Area was heavily grassed and overgrown in patches with weeds and exotic species • Widely spaced stream channels developed through erosion with gravity driven convergent tributaries • Outcrop of weathered sandstone with broken cobbly surface and some surface gravel
Land Survey Site (LS3) 	Very gently inclined hillslope at the interface of a gently undulating plain (GP) and gently undulating rises (GR)	Observation site LS3 was located on Gurnetts Road immediately north of the turnoff to the Jilalan Station at Soto Road • Land use was a mix of grazing and sugar cane production with a small patch of open woodland • Very gently inclined maximal lower slope • Active erosion processes included gravity driven channel formation from overland flow • Widely spaced convergent stream channels present in the surrounding area • Swamp area of open *Melaleuca* spp. woodland on the eastern side of Gurnetts Road

Location	Landform elements and topographical relief	Observations and descriptions
Land Survey Site 4 (LS4) 	Open depression at the base of a moderately inclined simple slope downstream of the rail yard to an open depression adjacent to a level to very gently inclined flat within a gently undulating plain (GP)	Observation site LS4 was located along the stream channel of Elizabeth Creek between the Goonyella Branch Line and Gurnetts Road • Surrounding land use was a mix of grazing and sugar cane production • Riparian vegetation was relatively dense with a mix of native, exotic and weed species • Culverts direct stream flow beneath Gurnetts Road • Active erosion processes included gravity driven scouring from overland flow towards the stream channel (refer Chapter 7) • Widely spaced convergent stream channels are the dominant drainage feature of the surrounding area
Land Survey Site 5 (LS5) 	Open depression adjacent to level to gently inclined flat within a level plain (LP) and bounded to the west by a gently undulating plain (GP)	Observation site LS5 was located immediately west of the project area at the Smyths Road crossing of Plane Creek • Riparian vegetation along both banks of the stream channel were dominated by dense stands of marine plants (refer Chapter 6) • Land use within the surrounding area was dominated by sugar cane production • Culverts and floodway direct stream flow beneath Smyths Road • Exposed soil profile along the eastern bank indicated an A horizon comprising of light brown sandy clay over a B horizon of yellow brown sandy clay overlying marine mud • Active erosion processes included gravity driven scouring from overland flow and tidal influences (refer Chapter 7)
Land Survey Site 6 (LS6) 	Open depression adjacent to level to very gently inclined flat within a level plain (LP)	Observation site LS6 was located north of the project area where the Goonyella Branch Line crosses Plane Creek • Riparian vegetation along both banks of the stream channel were dominated by dense stands of marine plants (refer Chapter 6) • Active erosion processes included gravity driven scouring and aggradation and sediment deposition within the base of the stream channel resulting from overland flow and tidal inundation processes (refer Chapter 7)

Location	Landform elements and topographical relief	Observations and descriptions
Land Survey Site 7 (LS7) 	Open depression at the base of a moderately inclined simple slope downstream of the rail corridor to an open depression adjacent to a level to very gently inclined flat within a gently undulating plain (GP)	Observation site LS7 was located along the stream channel of Willy Creek between the Goonyella Branch Line and Gurnetts Road • Riparian vegetation was relatively dense with a mix of native, exotic and weed species and the surrounding land use was a mix of grazing and sugar cane production • Culverts direct stream flow beneath Gurnetts Road • Active erosion processes included gravity driven scouring from overland flow to the stream channel (refer Chapter 7) • Widely spaced convergent stream channels are the dominant drainage feature of the surrounding area
Land Survey Site 8 (LS8) 	Level to gently inclined plain on the western side of the rail corridor within a gently undulating plain (GP)	Observation site LS8 was located within the relatively level plain on the western side of the Goonyella Branch Line rail corridor adjacent to Plane Creek • The vegetation comprised open woodland with dense mixed undergrowth of native, weed and exotic species and the surrounding land use is predominantly grazing on unimproved pasture • Culverts direct overland flow from east to west beneath the rail corridor • Active erosion of exposed soils along drainage lines and overland flow paths • Widely spaced unidirectional drainage lines intercept the plain and direct runoff to Plane Creek
Land Survey Site 9 (LS9) 	Open depression at the base of a maximal lower slope downstream of the rail corridor within a gently undulating plain (GP)	Observation site LS9 was located within the gently undulating plain between the western side of the Goonyella Branch Line rail corridor and Plane Creek • The vegetation was dominated by relatively open woodland with mid-dense to dense undergrowth of small shrubs and grasses with a mix of native, exotic and weed species and surrounding land use is predominantly grazing on unimproved pasture • Culverts direct channelised overland flow towards Plane Creek • Active erosion of exposed surface and subsurface soils resulting in significant gully and tunnel erosion within drainage lines and overland flow channels • Widely spaced unidirectional drainage lines direct runoff to Plane Creek

Location	Landform elements and topographical relief	Observations and descriptions
Land Survey Site 10 (LS10) 	Level to gently inclined plain on the western side of the Goonyella Branch Line adjacent to the open depression of a tributary of Willy Creek within a gently undulating plain (GP)	Observation site LS10 was located within the gently undulating plain adjacent to tributaries of Willy Creek upstream of the Goonyella Branch Line, but downstream of the North Coast Line and the CSR tramway lines • The vegetation within this area is dominated by cleared areas utilised for cane farming with a mix of native, exotic and weed species associated with the riparian areas adjacent to a tributary of Willy Creek and the nearby wetland • Active erosion of exposed soils on slopes, which has resulted in minor channelling and sheet erosion, but soils in relatively flat areas appear stable • Drainage lines and flow paths form a convergent channel network directing overland flow to Willy creek
Land Survey Site 11 (LS11) 	Open depression within a flat of a gently undulating plain (GP)	Observation site LS11 was located along Willy Creek upstream of the Goonyella Branch Line and is surrounded by a gently undulating plain • Riparian vegetation was relatively dense with a mix of native, exotic and weed species and the surrounding land use was dominated by sugar cane production • Active erosion of exposed soils on slopes • Channel is part of a convergent tributary network of Willy Creek
Land Survey Site 12 (LS12) 	Level to gently inclined gently undulating plain (GP) adjacent to Plane Creek	Observation site LS12 was located within the gently undulating plain between the western side of the Goonyella Branch Line and the Plane Creek channel • The vegetation was dominated by relatively open woodland with a mix of native, exotic and weed species and surrounding land use is predominantly grazing on unimproved pasture • Culverts direct channelised overland flow beneath the rail corridor towards Plane Creek • Active erosion of exposed surface and subsurface soils resulting in significant gully and tunnel erosion within drainage lines and overland flow channels • Widely spaced unidirectional drainage lines direct runoff to Plane Creek

Location	Landform elements and topographical relief	Observations and descriptions
Land Survey Site 13 (LS13) 	Relatively level to very gently inclined gently undulating plain (GP)	Observation site LS13 was located adjacent to Gurnetts Road, south of Willy Creek on the eastern side of the rail corridor • The vegetation within this area is dominated by cleared areas utilised for cane farming with a mix of native, exotic and weed species associated with the riparian areas • Surface soils appear relatively stable • Drainage lines and overland flow paths tend to form widely spaced convergent channel network
Land Survey Site 14 (LS14) 	Gently to moderately inclined lower simple slope of a rolling low rise (RL) adjacent to urban/industrial land	Observation site LS14 was located adjacent to Armstrong Beach Road on the western side of the Jilalan rail corridor • The vegetation was dominated by relatively open woodland with a mix of native, exotic and weed species and surrounding land use is predominantly grazing on unimproved pasture and urban/industrial development associated with the Jilalan Rail Yard and corridor • Active erosion on exposed soils
Land Survey Site 15 (LS15) 	Very gently to gently inclined gently undulating rise (GR)	Observation site LS15 was located adjacent to Gurnetts Road on the eastern side of the rail corridor • The vegetation within this area is dominated by cleared areas utilised for cane farming with a mix of native, exotic and weed species associated with the riparian areas • Surface soils appear relatively stable • Drainage lines and overland flow paths tend to form widely spaced convergent channel networks associated with Elizabeth Creek

5.2.2 Geology and geomorphology

A review of the Geology of Mackay 1:250,000 Map Sheet (Jensen 1972) indicated that the northern portion of the project area and extending eastwards is underlain by the sedimentary and volcanic units of the Devonian – Carboniferous age Campwyn Beds. The area south of the Jilalan Rail Yard is underlain by the volcanic units of the Permian age Carmila Beds, consisting of conglomerate, greywacke, tuff, acid volcanics and shale. The two dominant geological units were shown to be separated by the Sarina Fault, which runs on a northwest – southeast direction beneath the project area in the vicinity of the Jilalan Rail Yard.

A preliminary geotechnical investigation as part of the preliminary design and rail yard upgrade of Jilalan Rail Yard, was undertaken by Connell Hatch in 2007 (Connell Hatch 2007b).

During the investigation a further review of the regional geology detailed in the Queensland Government Natural Resources and Mines 1:100,000 Geological Series map indicated that the site is underlain by Mountain View Volcanics, which comprises a heterogenous assemblage of andesitic to rhyolytic lava flows and volcaniclastic rocks (including ignimbrite, breccia, conglomerate and sandstone). The Carmila Beds are comprised of volcanolithic conglomerate and minor sandstone and Quaternary Alluvium, which comprises clay, sand silt and gravel. The map also indicated that the project area is intercepted by the Sarina Fault, which cuts across the site in the vicinity of the Armstrong Beach Road and Goonyella Branch Line underpass (Connell Hatch 2007b).

The Mountain View Volcanics intercept the central portion of the project area between the area north of Armstrong Beach Road and Elizabeth Creek. The Quaternary Alluvium sediments are associated with the tidal areas of Plane Creek.

Findings of the preliminary geotechnical investigation (Connell Hatch 2007b) and preliminary engineering assessment (Connell Hatch 2007a) for site geology are summarised as follows:

- Lower than expected seismic velocities were recorded.
- Low seismic velocities for the volcanic and sandstone materials underlying the project area may give an incorrect impression of rippability of rock material due to the nature of the weathering process for these materials (ie exfoliation weathering may result in hard boulders (corestones) remaining within the profile).
- Trafficking problems were not encountered during the investigation, however areas of active earthworks exposing sandy/silty clays, sandy silts, clayey gravels, clayey/silty sands may experience trafficking problems during construction works, particularly after periods of rainfall
- Settlement behaviour of materials under load are likely to be variable across the project area with elastic settlement predominantly occurring in granular material and consolidation settlement occurring in cohesive material
- Ground improvement measures are likely to be required in areas where embankments are proposed to be constructed over low strength soils

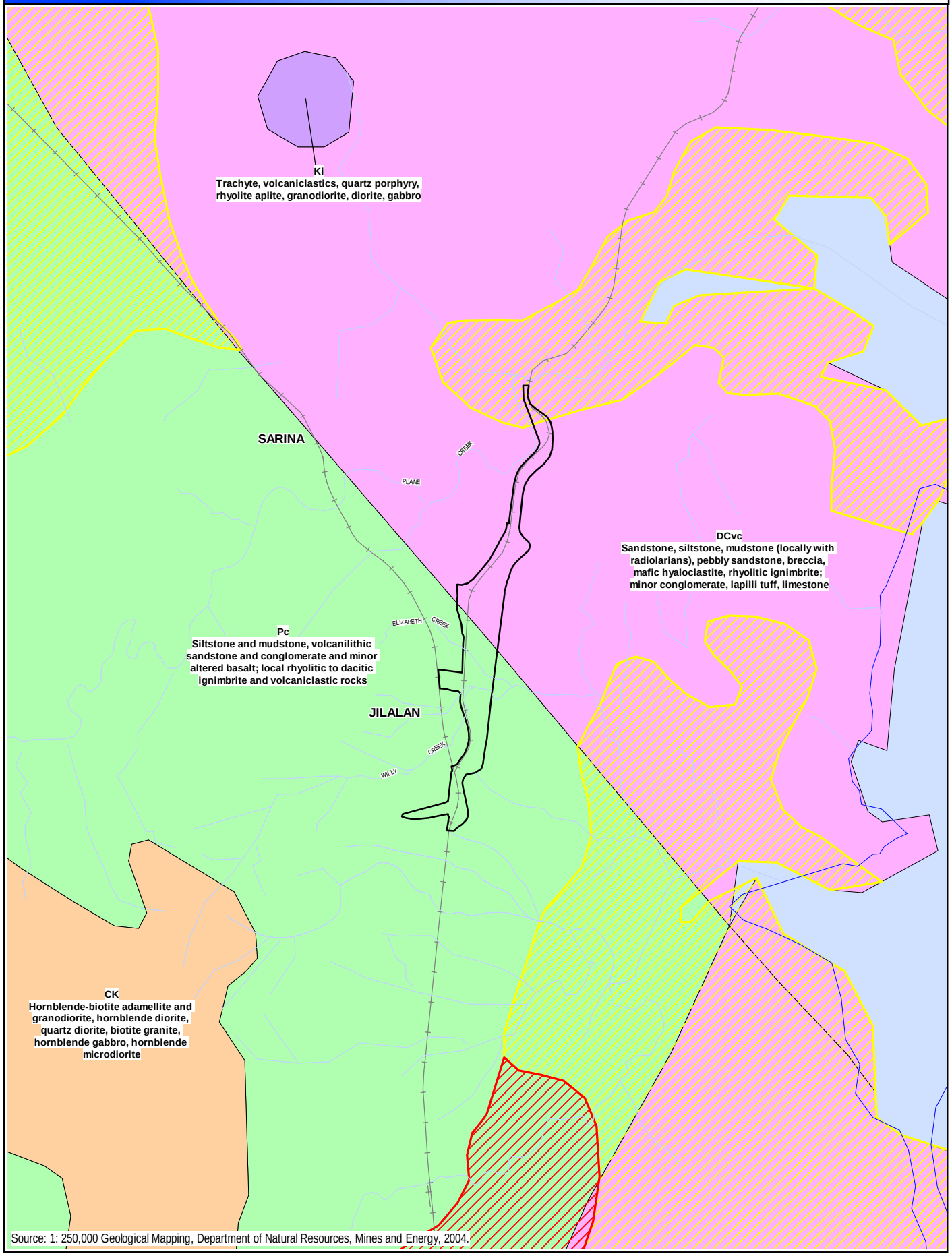
Figure 5.3 illustrates the location of the project area in relation to the underlying dominant geological features. It indicates that the Quaternary Alluvium overlies both the Campwyn Volcanics and the Carmila Beds and is associated with the alluvial plains and surface drainage features intercepting and surrounding the project area.

5.2.3 Soils

Findings of the preliminary geotechnical investigation (Connell Hatch 2007b) and preliminary engineering assessment (Connell Hatch 2007a) for site soils are summarised as follows:

- Sandy/silty clays, sandy silts, clayey gravels and clayey/silty sands present in surface soils are vulnerable to trafficability problems arising from vegetation clearing activities.
- At the time of the preliminary investigations the onsite material was generally considered to be suitable for reuse onsite as bulk embankment fill material, but likely to be unsuitable for use as outer verge material.
- At the time of the preliminary investigations the onsite material was identified as unsuitable for reuse as top course (600 mm) material.
- Subgrade assessment results indicated the presence of expansive clay material, which generally has a high swell potential. These material characteristics are likely to effect embankment and pavement design specifications.
- Potentially compressible soils were encountered at a number of locations associated with alluvium deposited in former creek bed channels, especially in the vicinity of Plane Creek. These characteristics have the potential to result in significant variable settlement depending on the nature of disturbance within areas containing these soils.
- Fill and ballast material were encountered in areas associated with constructed road and rail infrastructure.

Jilalan Rail Yard Upgrade Project



Source: 1: 250,000 Geological Mapping, Department of Natural Resources, Mines and Energy, 2004.

V:\Projects\Qld_Rail\HR5003\GIS\Workspaces\Jilalan_07.wor By: SLG Date: 05/09/07 Version 3

LEGEND

Geological Unit

- CK - Urannah Igneous Complex
- DCvc - Campwyn Volcanics
- Ki - Ki-BBG
- Pc - Carmila Beds

Deeply Weathered Rock

- Alluvium, mainly clay, silt, sand and gravel
- Soil, alluvium, gravel, scree, 'billy', sand, duricrust

- Project Area
- Water
- Rail

N

0 2500 (m)

Scale 1:50 000 (m) (@ A3 size)

REGIONAL GEOLOGY

FIGURE 5.3

Results of the Emerson Class tests completed during the preliminary geotechnical investigation indicated that the soils encountered within the project area ranged from medium to very high potential risk of dispersion. Consequently soils may be vulnerable to dispersion and erosion under low velocity or volume surface flows (Connell Hatch 2007b).

Soil types within and surrounding the project area have been characterised and mapped (Wills and Baker 1988) as part of the Plane Creek Sugar Cane Land Suitability Study. Soil types intercepted and directly adjoining the project area are illustrated in Figure 5.4 and summarised in Table 5.2.

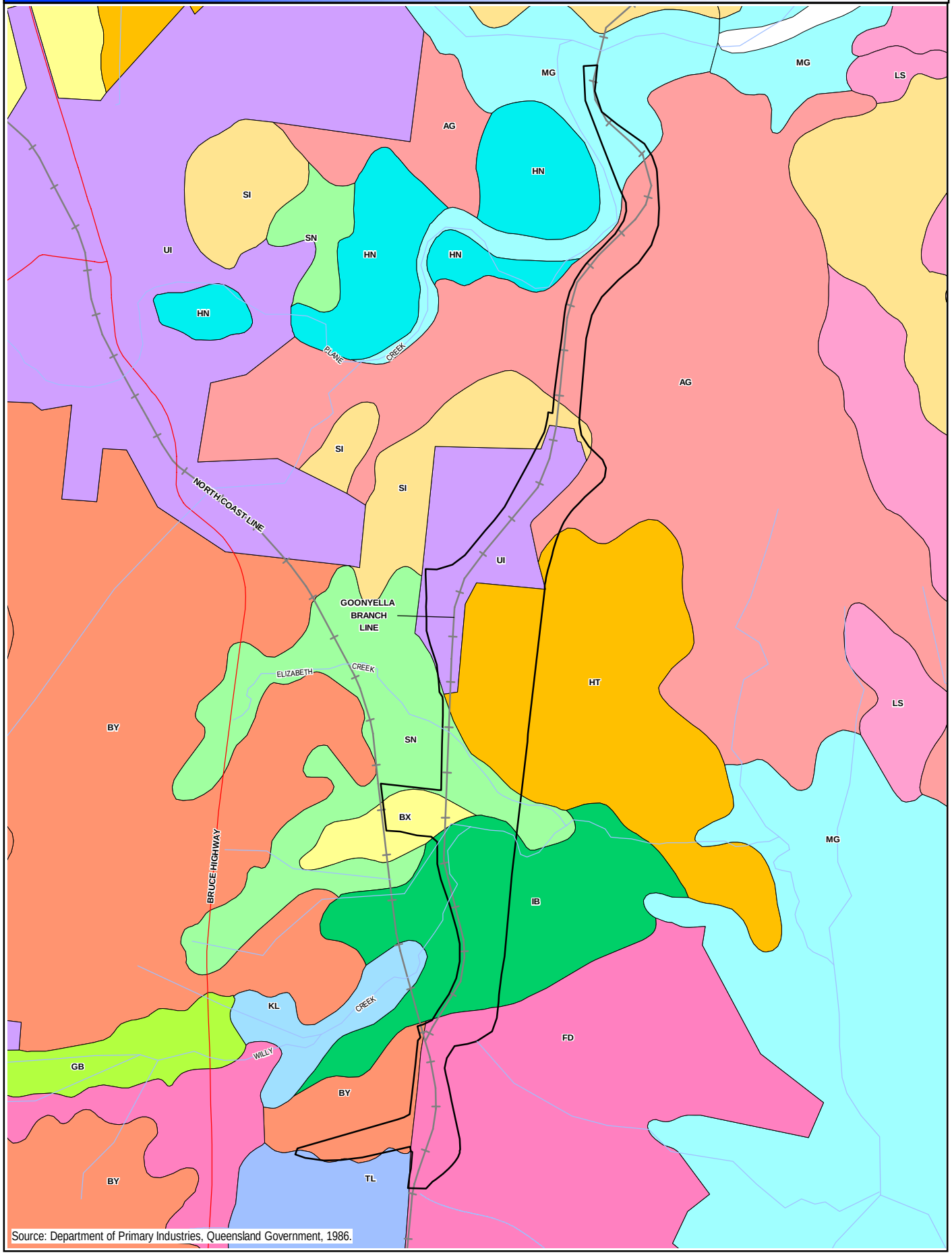
Table 5.2 Soil types within the project area

Mapping unit	Mapping symbol	Great soil group of dominant soil	Major characteristics of dominant soil	Slope
Mangroves and saltmarsh	Mg	N/A	N/A	N/A
Hannan	Hn	Alluvial soil	Acid, brown, uniform (tending gradational) sandy to fine sandy soil	0-2%
Alligator	Ag	Solodic-solodized solonetz to grey clay	Silty, alkaline, bleached, mottled, grey-yellow duplex soil with layers of ironstone nodules	0-2%
Samourgassi	Si	Lithosol	Shallow, stony, acid, brown lithosol to gradational soil	6-20%
Urban and industrial	Ur	N/A	N/A	N/A
Hector	Ht	Prairie soil	Gravely, neutral, mottled, brown duplex to gradational soil	3-12%
Sarina	Sn	Solodic-solodized solonetz	Alkaline, bleached, mottled, grey-brown duplex soil	0-3%
Bell	Bx	Black earth	Alkaline, self-mulching, black cracking clay, gleyed at depth	0-1%
Ilbilbie	Ib	Soloth	Acid, bleached, mottled, light grey duplex soil with discontinuous hard pan	0-1%
Karloo	Kl	Solodic-solodized solonetz	Alkaline, bleached, mottled grey – brown duplex soil	0-1%
Breen	By	Lithosol, no suitable group	Shallow, stony, acid, light brown sandy clay loam	2-16%
Tedlands	Tl	Soloth to solodic-solodized solonetz	Acid to neutral, bleached, mottled, grey-yellow duplex soil	0-1%

Table Notes:
N/A Not Available
(Source: Wills and Baker 1988)

Results and observations of soil physical and chemical properties were recorded during the Plane Creek Sugar Cane Land Suitability Study (Wills and Baker 1988) indicated that soils surrounding the project area generally comprised profiles deeper than 1.2 m below ground level (bgl).

Jilalan Rail Yard Upgrade Project



V:\Projects\Qld_Rail\HR5001\GIS\Workspaces\Jilalan_17.wor By: SLG Date: 05/09/07 Version 3

N

0 1000 (m)

Scale 1:20 000 (m) (@ A3 size)

LEGEND

Soil Type

- AG - Alligator
- BX - Bell
- BY - Breen
- CV - Cliftonville
- FD - Freddy
- GB - Gillinbin
- HN - Hannan
- HT - Hector
- IB - Ilbilbie
- KL - Karloo
- LS - Louisa
- SI - Samourgrassi
- SN - Sarina
- TL - Tedlands
- MG - Mangroves and Saltmarsh
- UI/UN - Urban and Industrial

- Watercourse
- Major Road
- Rail
- Project Area

SOILS

FIGURE 5.4

Laboratory analysis for soil quality and agricultural suitability were also undertaken as part of the study (Wills and Baker 1988). Analysis of the data presented in the study was completed for the purposes of providing quantitative information relating to the chemical and physical properties of soils surrounding the project area as part of this EIS. The results of the data analysis are summarised in Table 5.3.

Table 5.3 Soil chemical and physical properties

Parameter	Mean	Mode	Maximum	Minimum
pH[1]	6.6	5.9	9.9	5.1
Electrical Conductivity (μS/m) [1]	0.10	0.03	2.30	0.01
Cation Exchange Capacity (meq/100g) [1]	15	16	42	1
Calcium (meq/100g) [1]	6.64	11.00	39.00	0.10
Magnesium (meq/100g) [1]	4.8	1.1	20.0	0.3
Sodium (meq/100g) [1]	1.41	0.10	29.00	0.06
Potassium (meq/100g) [1]	0.16	0.12	0.97	0.02
Sodium Absorption Ratio (SAR)[2]				
0.1m bgl	0.83	N/A	2.69	0.11
0.3m bgl	1.86	N/A	28.03	0.19
0.6m bgl	3.39	N/A	55.50	0.20
0.9m bgl	5.75	N/A	97.66	0.29
1.2m bgl	8.49	N/A	123.66	0.35
Exchangeable Sodium Percentage (ESP) [2]				
0.1m bgl	3.52	N/A	11.00	0.56
0.3m bgl	6.86	N/A	66.25	0.56
0.6m bgl	9.08	N/A	80.00	0.56
0.8-0.9m bgl	12.15	N/A	95.65	0.90
1.1-1.2m bgl	15.13	N/A	96.67	1.53
Total Dissolved Salts (TDS) [2]				
0.1m bgl	0.04	N/A	0.10	0.01
0.3m bgl	0.02	N/A	0.10	0.01
0.6m bgl	0.03	N/A	0.19	0.01
0.8-0.9m bgl	0.08	N/A	1.22	0.01
1.1-1.2m bgl	0.16	N/A	1.47	0.01

Table Notes:
[1] Wills and Baker 1988
[2] Calculated from data in Wills and Baker 1988
N/A Not Applicable

Data analysis results indicated that overall soils surrounding the project area are non-saline, highly sodic soils with slightly acidic surface soils. Results also indicated that soil sodicity and alkalinity increase with depth through the profile. While soils were generally not considered to be dispersive or affected by salt there were some localised highly dispersive and salt-affected soil profiles identified during the study (Wills and Baker 1988) and the risk of soil dispersivity and salinity increase with depth.

Slope classes were mapped during the Plane Creek Sugar Cane Land Suitability Study (Wills and Baker 1988). The modal slope classes identified within and surrounding the project area are illustrated in Figure 5.5.

The modal slope class is defined as the most common class of slope occurring in a landform pattern (McDonald *et al* 1990) and is adopted as a standardised measure of slope steepness for the calculation of soil loss.

Slope analysis results indicated that slopes are relatively level within the northern portion of the project area, north of Armstrong Beach Road, with gently to moderately inclined slopes in the vicinity of the Jilalan Rail Yard and on the western side of the project area in the vicinity of the Armstrong Beach Road alignment. Slopes are very gently inclined through the central portion of the project area south of the rail yard and in the vicinity of Elizabeth Creek. Slopes in the vicinity of Willy Creek and its tributary network are relatively level, with slopes at the southern extent of the project area becoming very gently inclined in the vicinity of the Freddy Creek catchment and the CSR Ethanol Distillery, Oonooie Facility site, to gently inclined within the southwest corner of the project area near Oonooie Road. Steeper slope occurs in areas directly adjacent to the project area on the northwest side of the Armstrong Beach Road underpass bridge and ton the northwest side of the Oonooie Road level crossing. These steeper slopes are associated with the isolated rolling low hills and rises at these locations.

Slope length and steepness are key factors influencing soil erosion. An assessment of erosion was completed as part of the study undertaken by Wills and Baker (1988). Erosion observations relating to the impacts of water erosion processes were recorded during the study and were mapped. The erosion assessment observations within and surrounding the project area are illustrated on Figure 5.6.

The erosion assessment results within and surrounding the project area indicated that, at the time of the study, the state of erosion included:

- Areas where no water erosion was apparent within the level plain of Plane Creek.
- Areas where sheet erosion was the only active process that was apparent, which was recorded within the gently undulating plain adjacent to Plane Creek.
- Areas of moderate sheet and rill erosion associated with the gently undulating plain between Elizabeth and Willy Creeks intercepting the central southern portion of the project area.
- Areas of severe sheet and rill erosion associated with the upper reaches of Elizabeth and Willy Creeks.
- Areas of slight sheet, rill and gully erosion associated with the gently undulating rises in both the central eastern portion and south eastern portion of the project area extending eastwards towards the estuary.
- Areas of moderate sheet, rill and gully erosion associated with the rolling low rises north of Armstrong Beach Road and on the western side of the North Coast Line along Oonooie Road.

Based on the data observations from the Plane Creek Sugar Cane Land Suitability Study (Wills and Baker 1988) and the observations recorded in the field for each Land Survey observation site a soils risk assessment and map have been prepared. The soils risk assessment summary is provided in Table 5.4 and is illustrated in Figure 5.7.

Table 5.4 Soil risk assessment summary

Land Survey observation site	Landform pattern[1]	Soil type[1]	Slope class[1]	Erosion assessment[1]	Degradation risk
LS1	Rolling low rise	Breen	Gently inclined (GE)	Moderate sheet, rill and gully erosion	High
LS2	Rolling low rise	Breen	Gently inclined (GE)	Moderate sheet, rill and gully erosion	High

Land Survey observation site	Landform pattern[1]	Soil type[1]	Slope class[1]	Erosion assessment[1]	Degradation risk
LS3	Gently undulating plain	Alligator	Gently inclined (GE)	Sheet erosion only	High
LS4	Gently undulating plain	Sarina	Very gently inclined (VG)	Severe sheet and rill erosion	High
LS5	Level plain	Mangroves and saltmarsh	Level (LE)	No water erosion	Moderate
LS6	Level plain	Mangroves and saltmarsh	Level (LE)	No water erosion	Moderate
LS7	Gently undulating plain	Ilbilbie	Level (LE)	Moderate sheet and rill erosion	Moderate
LS8	Gently undulating plain	Alligator	Level (LE)	Sheet erosion only	High
LS9	Gently undulating plain	Alligator	Level (LE)	Sheet erosion only	High
LS10	Gently undulating plain	Ilbilbie	Level (LE)	Moderate sheet and rill erosion	Moderate
LS11	Gently undulating plain	Karloo	Very gently inclined (VG)	Severe sheet and rill erosion	High
LS12	Gently undulating plain	Alligator	Level (LE)	Sheet erosion only	High
LS13	Gently undulating plain	Ilbilbie	Level (LE)	Moderate sheet and rill erosion	Moderate
LS14	Rolling low rise	Samourgassi	Moderately inclined (MO)	Moderate sheet, rill and gully erosion	High
LS15	Gently undulating rise	Hector	Very gently inclined (VG)	Slight sheet, rill and gully erosion	Low

Table Note:
[1] Wills and Baker 1988

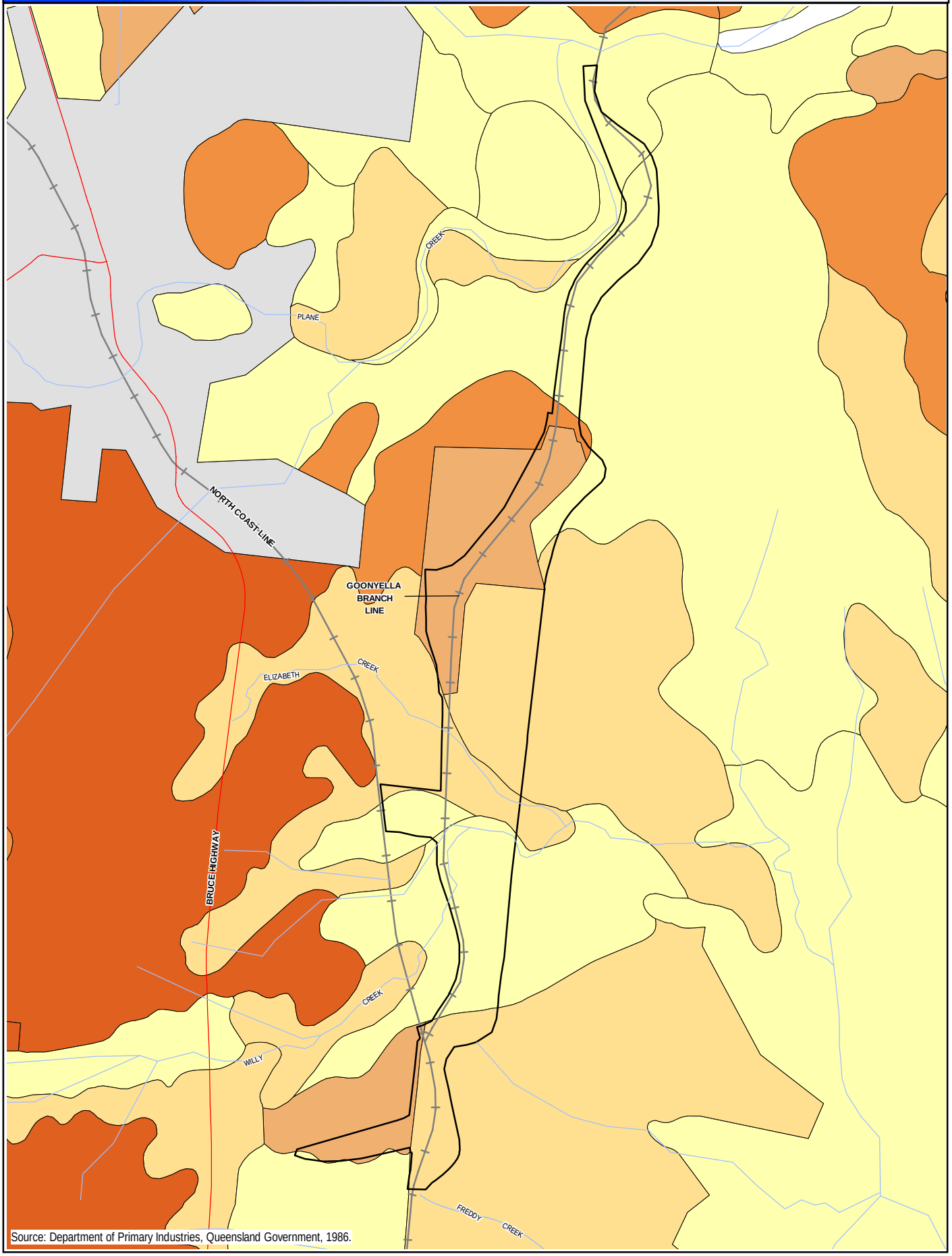
Discussions with DNRW representatives indicate that ASS have been identified during previous DNRW investigations within the Plane Creek floodplain and are therefore expected to underlie the northern portion of the project area in the vicinity of Smyths Road (pers comm. Peter Muller DNRW May 2007).

5.2.4 Good quality agricultural land

Wills and Baker (1988) completed a land suitability assessment as part of the Plane Creek Sugar Cane Land Suitability Study and mapped the land suitability classes. The land suitability classes within and surrounding the project area are summarised as:

- Class 5 – unsuitable uplands within the level plain of Plane Creek, the rolling low rises near Armstrong Beach Road and Oonooie Road.
- Class 3 – suitable with moderate limitations on the western side of Plane Creek at the northern end of the project area and through the central and southern portion of the project area extending from west to east across the gently undulating plains and gently undulating rises associated with the tributary network of Elizabeth, Willy and Freddy Creeks.
- Class 4 – marginally suitable with severe limitations extending west to east across the central northern portion of the project area in the vicinity of Armstrong Beach Road and the Jilalan Rail Yard and the Bell soils located between the tributary networks of Elizabeth and Willy Creeks on the western side of the project area.

Jilalan Rail Yard Upgrade Project



V:\Projects\Qld_Rail\HR5001\GIS\Workspaces\Jilalan_24.wor By: SLG Date: 06/09/07 Version 3

N

0 1000 (m)

Scale 1:20 000 (m) (@ A3 size)

LEGEND

Modal Slope

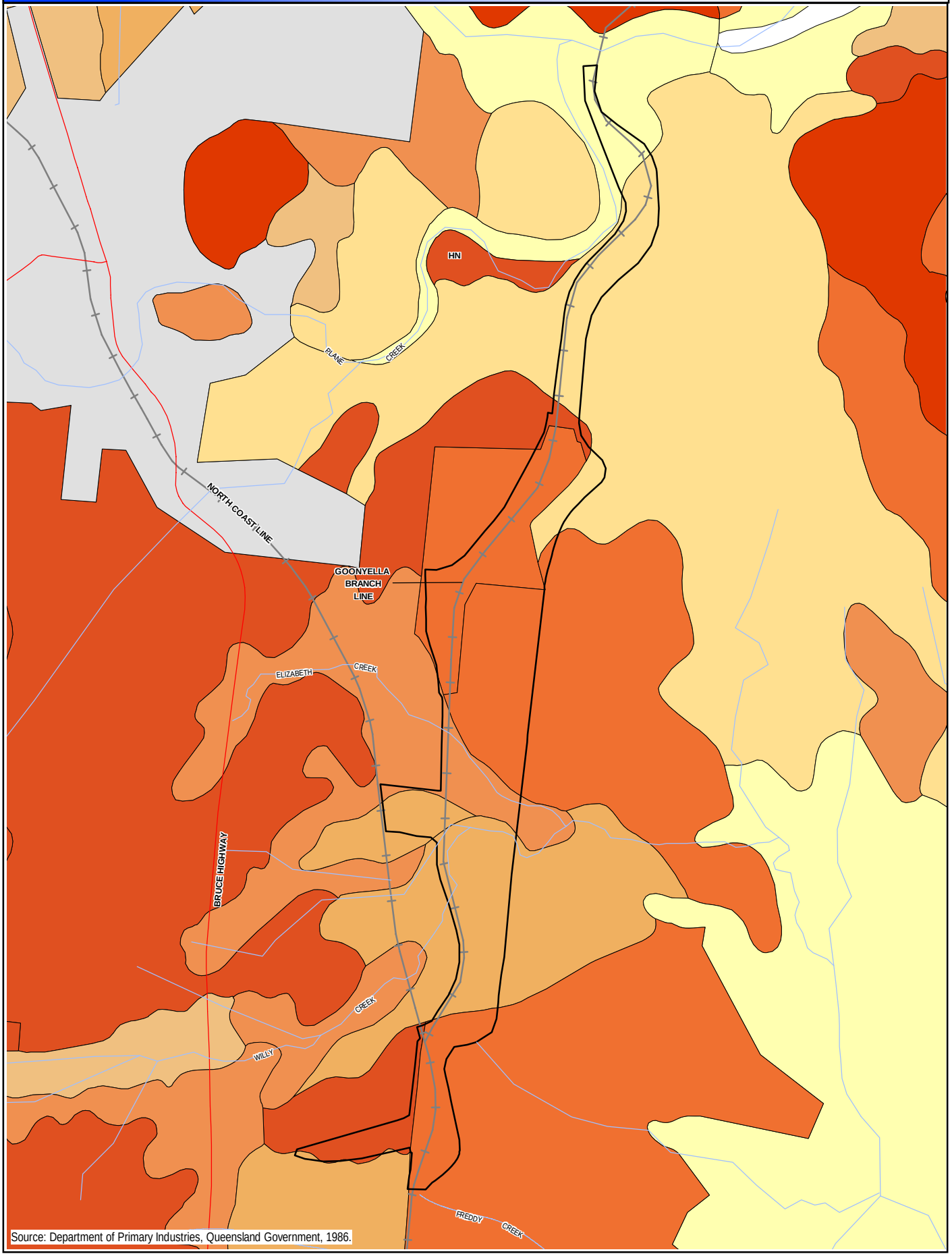
- ST - Steep
- MO - Moderately Inclined
- GE - Gently Inclined
- VG - Very Gently Inclined
- LE - Level
- No Data

- Project Area
- Major Road
- Rail
- Watercourse

SLOPE ANALYSIS

FIGURE 5.5

Jilalan Rail Yard Upgrade Project



V:\Projects\Qld_Rail\HR5001\GIS\Workspaces\Jilalan_25.wor By: SLG Date: 06/09/07 Version 3

N

0 1000 (m)

Scale 1:20 000 (m) (@ A3 size)

LEGEND

Erosion Assessment

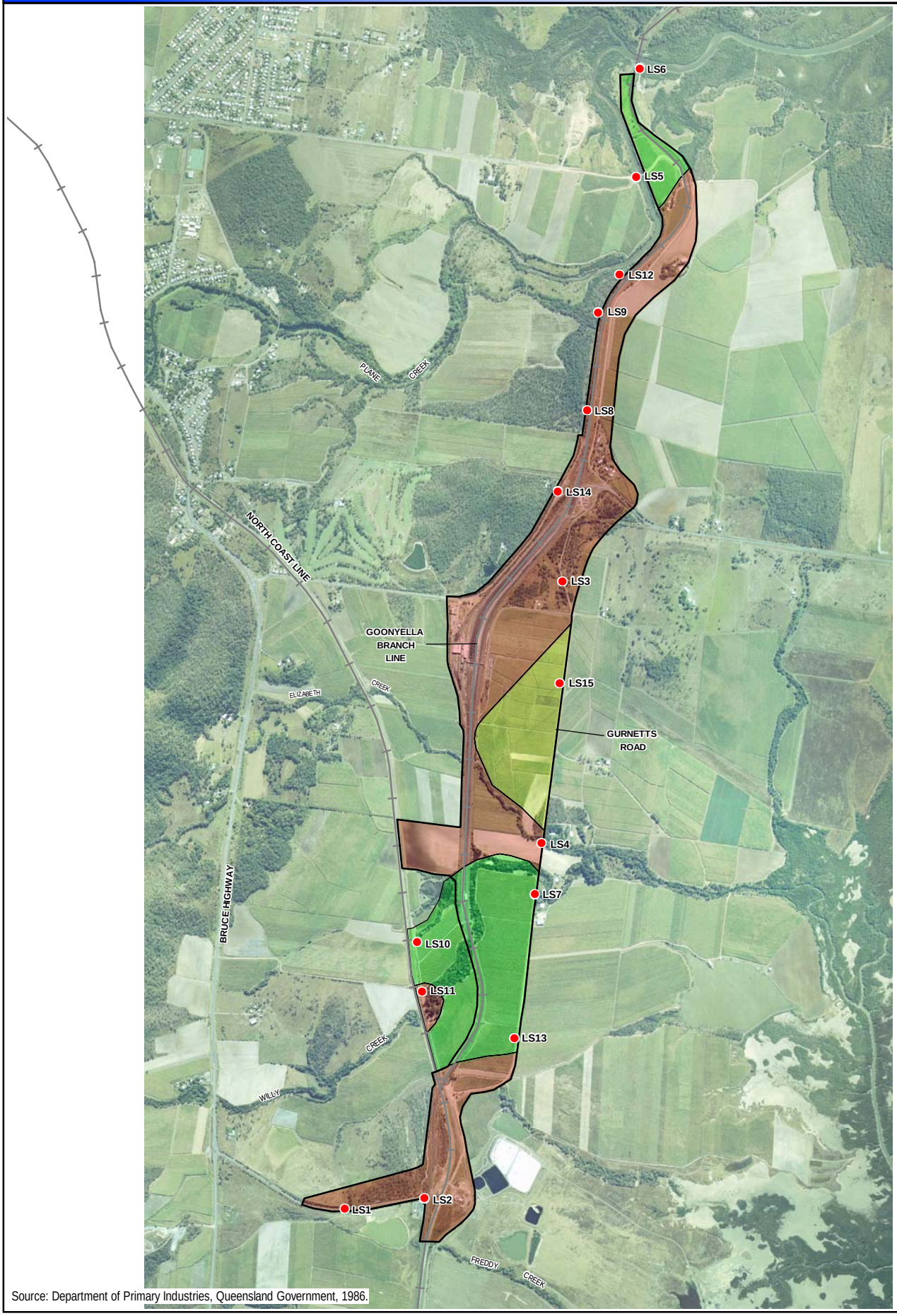
- Severe Sheet, Rill and Gully Erosion
- Moderate Sheet, Rill and Gully Erosion
- Slight Sheet, Rill and Gully Erosion
- Severe Sheet and Rill Erosion
- Moderate Sheet and Rill Erosion
- Slight Sheet and Rill Erosion
- Sheet Erosion Only
- No Water Erosion
- No Data

- Project Area
- Major Road
- Rail
- Watercourse

EROSION ASSESSMENT

FIGURE 5.6

Jilalan Rail Yard Upgrade Project



Source: Department of Primary Industries, Queensland Government, 1986.

V:\Projects\Qld_Rail\HR5001\GIS\Workspaces\Jilalan_66.wor By: SLG Date: 10/09/07 Version 2

N

0 1000 (m)

Scale 1:20 000 (m) (@ A3 size)

LEGEND

Soil Degradation Risk

- High
- Moderate
- Low

- Land Survey Site
- Project Area
- Rail

SOIL DEGRADATION RISK

FIGURE 5.7

Results and observations recorded as part of the land suitability study indicated that the soils throughout the study area were generally characterised as:

- Profiles deeper than 1.2 m bgl.
- Non-saline soils with a small number of localised salt affected areas identified.
- Highly sodic subsoils with sodicity increasing with depth in the profile.
- Slightly acidic surface soils with alkalinity increasing with depth.
- Dispersive subsoils present.

The land suitability classes within and surrounding the project area are illustrated in Figure 5.8.

During the Preliminary Geotechnical Investigation (Connell Hatch 2007b), the depth of soils within the project area were observed to be relatively deep (>1 m bgl) in areas within the Plane Creek floodplain, north of Armstrong Beach Road and were dominated by silty sand and sandy clay material. At the southern end of the project area, soils were observed to be shallower in the vicinity of Oonooie Road and were dominated by silty sand material.

Soils through the central part of the project area between Armstrong Beach Road and Willy Creek consisted of variable depths and textures, with fill material and ballast observed in areas associated with constructed road and rail infrastructure.

5.2.5 Contaminated land

Title history summary

Title searches for each of the allotments were completed by DNRW in accordance with Connell Hatch's request lodged in August 2007. A summary of property descriptions is provided in Appendix G1. Historical titles show previous owners of each of the properties and are shown in Appendix G5.

Findings from the preliminary historical title summary indicate that the project area has been used predominantly for agricultural purposes for the production of sugar cane and some pastoral activities. The railway corridor has developed over a number of years with periodic expansions and upgrades of both the Goonyella Branch Line and the North Coast Line requiring access to and resumption of adjoining land.

Aerial photograph review

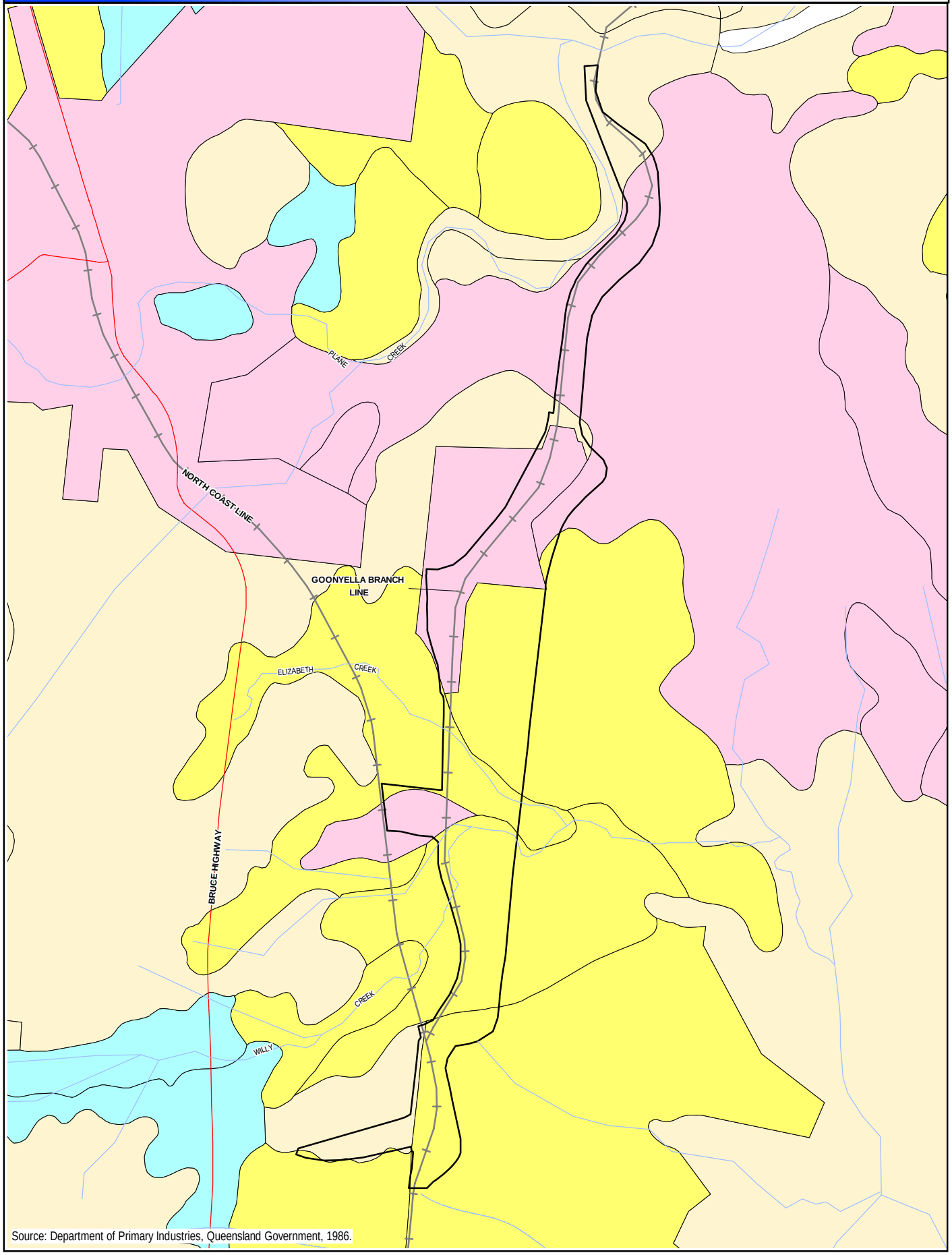
Historical aerial photographs were reviewed for the project area and a summary of findings is provided in Appendix G2.

Findings from the aerial photograph review indicated that the project area has been used primarily for agricultural purposes since the 1960s. Some changes have occurred to the area since that time, most of which have been the clearing and thinning of vegetation that was present in the 1960 images. Most of the cleared land has been converted for the purpose of sugar cane production and some grazing land. Of the area within and surrounding the project area, approximately 80% is currently sugar cane production and a further 10% currently remains vegetated.

The golf course located to the west of the project area was observed to have been expanded in the period between 1997 and 2004. There is also a dam or cleared and excavated land located to the east of the golf course, which currently holds water.

The area to the south and southeast of the project area has undergone significant change since the 1970s and now has numerous dams and other water storage areas within the CSR site located adjacent to planted sugar cane areas and other areas that have been cleared.

Jilalan Rail Yard Upgrade Project



Source: Department of Primary Industries, Queensland Government, 1986.

V:\Projects\Qld_Rail\HR5001\GIS\Workspaces\Jilalan_A3.wor By: SLG Date: 06/09/07 Version 3

N

0 1000 (m)

Scale 1:20 000 (m) (@ A3 size)

LEGEND

Land Suitability for Sugar Cane

- Class 2 - Suitable with Slight Limitations
- Class 3 - Suitable with Moderate Limitations
- Class 4 - Marginally Suitable with Severe Limitations
- Class 5 - Unsuitable Uplands

- Watercourse
- Major Road
- Rail
- Project Area

LAND SUITABILITY FOR SUGAR CANE

FIGURE 5.8

Areas of concern that have been identified during the aerial photograph review and may require further investigation include the wetland area between the Goonyella Branch Line and the North Coast Line, which is adjacent to the riparian vegetation of Willy Creek. There is also an industrial area located adjacent to the rail yard, which would be the site for storage of materials and other facilities associated with the rail yard.

The dams and water storage facilities situated within the CSR site located at the southeast of the project area have also been identified as an area of potential concern, as these storage facilities contain liquid effluent from the Plane Creek Sugar Mill. The liquid effluent is marketed by CSR Ethanol Distillery, Oonooie Facility as a liquid by-product fertiliser - Biodunder™. The MSDS documentation for this product indicates that there is likely to be high Biochemical Oxygen Demand (BOD) and low pH conditions within the storage facilities and there is a risk to the health of waterways and stormwater quality in the event of a spill of this material. Prior to the use of this material as liquid fertiliser, standard long term practice was to irrigate the surrounding land within the site, which may have resulted in nutrient and pH conditions within the site soils that may require the addition of soil conditioning treatment prior to the reuse of any soil disturbed within Lot 14 on RP806561. Further investigation of the environmental status of this site is required.

The water storage area on the eastern side of the golf course may also require further investigation as previous site activities were not able to be determined during the aerial photograph review. In the event that this water storage contains recycled water from the golf course, some water treatment may be required prior to the reuse of this water offsite or release due to decommissioning.

Lot 142 on CI4284 has been identified as currently being used as the Council Rubbish Tip. Due to the proximity of the site to Plane Creek and the project area further investigation of the operational and environmental status of this site will be required to assess the potential for existing contamination within, adjacent to and/or underlying this site in the event that this site is to be considered as a potential borrow area for construction materials.

EPA contaminated land search results

The Environmental Management Register (EMR) is a land use planning and management register. Land that has been or is being used for a notifiable activity (ie an activity that causes or is likely to cause contamination) and about which the EPA is notified, is recorded on the EMR. The EMR provides information on historic and current land use, including whether the land has been or is being used for a notifiable activity or has been contaminated by a hazardous contaminant. Sites recorded on the EMR are considered to pose a low risk to human health and the environment under the current land use.

The Contaminated Land Register (CLR) is a register of 'risk' sites, proven to contain contaminated soil material, which is causing or may cause serious environmental harm. Land is recorded on the CLR when scientific investigation shows it is contaminated and action needs to be taken to remediate or manage the land.

EPA EMR and CLR search results for each of the allotments within the project areas were completed by Connell Hatch in August 2007. Search results indicated that two property lots were included on the EMR, which are detailed as follows:

- Lot 13 on RP806561 is included on the EMR. The site has been subdivided from Lot 2 on RP736968 at Hutchings Road, Sarina, which has been subject to the Notifiable Activity – Chemical Storage (other than petroleum products or oil under item 29) – storing more than 10t of chemicals (other than compressed or liquefied gases) that are dangerous goods under the dangerous goods code. The site is not included on the CLR.
- Lot 101 on SP108584 is included on the EMR. The site has been subdivided from Lot 121 on CI3384, Armstrong Beach road, Plane Creek via Sarina, which has been subject to the Notifiable Activity – Railway Yards – operating a railway yard including goods handling yards, workshops and maintenance areas. The site is not included on the CLR.

Figure 5.9 shows the location of these two properties in relation to the project area.

EMR and CLR searches were not completed for property lots currently within the existing rail corridor and rail yard as it is likely that these lots are currently listed on the EMR due to the current land use activities.

A summary of the search results and property descriptions is provided in Appendix G3. Copies of the EMR and CLR search results for each of the properties and are shown in Appendix G4.

5.3 Potential construction impacts

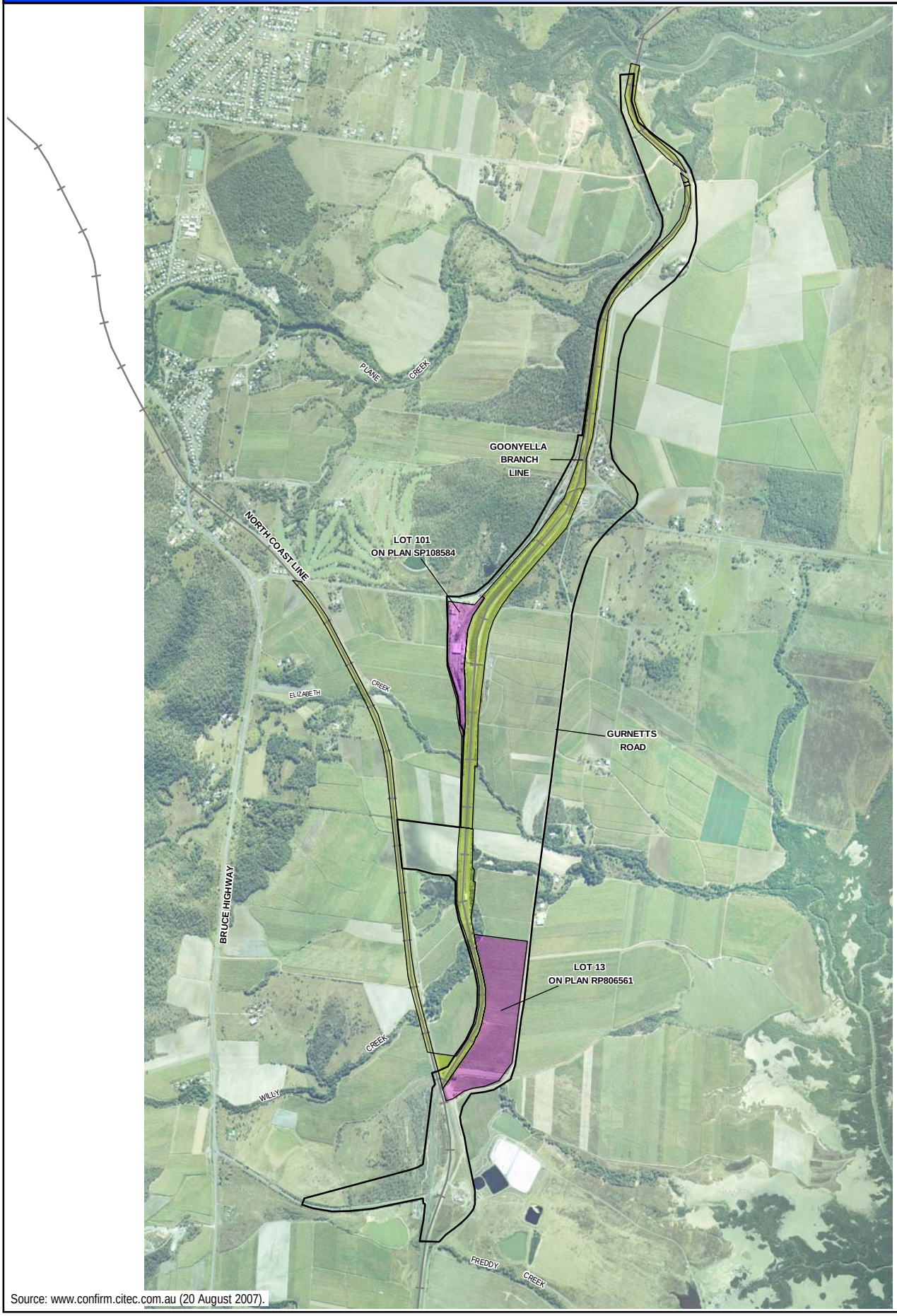
In summary, the JRYUP will incorporate the following activities that have the potential to impact on the topography, geology and/or soils within and surrounding the project area:

- Widening of the rail corridor on the eastern side of the existing rail yard and rail corridor infrastructure.
- Expansion of the existing Jilalan Rail Yard to incorporate additional wagon maintenance facilities, provisioning tracks and bypass tracks.
- Realignment of Gurnetts Road between Armstrong Beach Road and Soto Road.
- Upgrade of Gurnetts Road between Soto Road and Oonooie Road.
- Realignment of Smyths Road between the Smyths Road crossing of Plane Creek and Armstrong Beach Road.
- Construction of new Armstrong Beach Road Bridge and realignment of Armstrong Beach Road to the north of the existing bridge.
- Reconfiguration of the Armstrong Beach Road and Smyths Road intersection.
- Reconfiguration and relocation of Smyths Road and Gurnetts Road intersection to the east of the existing intersection.
- Construction of an underpass for Smyths Road beneath the rail corridor to connect with the Plane Creek crossing.
- Construction/upgrade of the Smyths Road/Plane Creek crossing.
- Realignment of the rail line near the Smyths Road crossing to reduce the curve.
- Construction of embankments and upgrade of trackside and surface drainage infrastructure.
- Realignment/diversion and filling options for Elizabeth Creek, Willy Creek and a number of unnamed drainage lines intercepting the project area.
- Construction of a turnout south of the wagon maintenance facilities adjacent to the Willy Creek wetland area.
- Construction of additional wagon maintenance workshop and provisioning sheds.
- Construction of an overpass and realignment for Oonooie Road to provide access to the CSR site.
- Protection, installation and upgrade of utility services.

The concept design for the JRYUP indicates that the majority of disturbance associated with construction of the Project will be associated with:

- Soil excavation
- Filling, realignment/diversion and works within creeks, drainage lines and wetland areas
- Vegetation clearing
- Construction of rail embankments
- Preparation of construction laydown areas and operational storage areas
- Installation of culverts and modification/construction of surface drainage infrastructure
- Construction of bridges and overpass/underpass
- Construction of workshop and provisioning sheds
- Installation of piles and pile caps for bridge structures
- Preloading of unconsolidated sediments within the Plane Creek floodplain

Jilalan Rail Yard Upgrade Project



Source: www.confirm.citec.com.au (20 August 2007).

V:\Projects\Qld_Rail\HR5001\GIS\Workspaces\Jilalan_67.wor By: SLG Date: 06/09/07 Version 2

N

0 1000 (m)

Scale 1:20 000 (m) (@ A3 size)

LEGEND

- EMR / CLR Listed Property
- Properties within Rail Corridor
- Project Area
- Rail

EMR AND CLR LISTED PROPERTIES

FIGURE 5.9

The potential impacts identified relating to topography, geology and soils from the construction of the JRYUP includes:

- Disturbance of dispersive, erosion prone surface and subsurface soils.
- Disturbance of ASS within the Plane Creek floodplain and channel.
- Loss of approximately 100 ha of Good Quality Agricultural Land (GQAL) from sugar cane production impacting on the operation feasibility of the Plane Creek Sugar Mill and the long term economic stability of local sugar cane production.
- Loss of fertile topsoil material.
- Uncontrolled settlement of unconsolidated subsurface material and weak soils/sediments.
- Increased risk of soil degradation and erosion in sensitive/erosion prone areas.
- Increased risk of soil salinity within the Plane Creek floodplain.
- Disruption of existing visual landscape and surface hydrology/hydraulic regimes due to the construction of engineered landforms and modification of existing landform features.
- Increased risk of soil contamination resulting from construction related activities and operation.
- Increased risk of soil erosion.
- Reduced visual amenity and soil and landform stability.
- Disturbance of ASS within the Plane Creek floodplain.
- Increased risk of soil erosion and degradation issues in the event that saline water extracted from Plane Creek is utilised as construction water for dust suppression and/or vehicle washdown activities.
- Increased risk of sedimentation and contamination of Sarina Inlet and Llewellyn Bay estuarine areas and riparian areas and aquatic ecology of Plane, Elizabeth, Willy and Freddy Creeks.
- Impacts to groundwater resources within and surrounding the project area through contamination and/or reduction in availability of groundwater resources due to dewatering.

5.4 Potential operational works

The potential impacts resulting from operation and maintenance of the Project include:

- Increased risk of long term soil erosion requiring long term maintenance measures.
- Reduced soil and landform stability and long term maintenance requirements.
- Long term impacts and maintenance of disturbed ASS resulting from works within and surrounding Plane Creek.
- Increased risk of sedimentation and contamination of Sarina Inlet and Llewellyn Bay estuarine areas and riparian areas and aquatic ecology of Plane, Elizabeth, Willy and Freddy Creeks.
- Impacts to groundwater resources within and surrounding the project area through contamination and/or reduction in availability of groundwater resources due to dewatering.

5.5 Mitigation measures

5.5.1 Design phase

The measures to be implemented during project design in order to mitigate the potential impacts of construction and operation of the project include:

- Minimise works associated with and impacts on creeks, surface drainage lines and wetland areas through design of embankments, filling, vegetation clearing, bridge and culvert structures.
- Protect creeks, drainage lines and wetland areas through design.
- Minimise project footprint and impacts to land currently under sugar cane production.
- The design process will require the input of a comprehensive level of information on the subsurface profile relating to strength, geotechnical and chemical properties of soils and site geology and the hydrogeological regime of the underlying groundwater system.

- Further detailed geotechnical investigations will be required to obtain information relating to detailed geotechnical stability assessments, bridge foundation designs, rail embankment designs and potential settlement of structures and fill embankments in order to suppress the aggressive, high swell nature of some areas of clay material within the project area.
- Detailed investigation of proposed borrow areas will be required to obtain information relating to the suitability and availability of construction materials from offsite sources.
- Scheduling of bulk earthworks and excavation and filling activities should be undertaken to ensure that these activities are minimised during adverse seasonal and climatic conditions (ie minimise active earthworks areas during the wet season – November to April).
- Detailed engineering design of the proposed rail infrastructure will need to be carried out in accordance with good engineering practice.
- Detailed investigation of areas of proposed disturbance within the rail yard, rail corridor and properties affected by the Project to adequately assess the environmental status of soils or subsurface materials (including groundwater resources) be disturbed during construction.
- An Acid Sulfate Soil investigation will need to be completed for the areas of proposed disturbance within the Plane Creek floodplain at the northern end of the project area.
- Further investigation and analysis of soil physical and chemical properties will be required in accordance with the Planning Guidelines for the Identification of Good Quality Agricultural Land for each mapped soil unit within the project area.
- Design of embankments and cut and fill areas associated with all aspects of rail infrastructure will be designed in accordance with the recommendations of the geotechnical investigations undertaken as part of the preliminary and detailed design stage of the project.
- Identify areas within the project area that will require ground improvement measures to be implemented prior to and during construction.
- Design retaining wall structures to accommodate some water pressure distribution in accordance with recommendations and findings of the geotechnical investigations that have been undertaken for the Project.

5.5.2 Construction phase

The measures to be implemented during construction in order to mitigate the potential impacts of the project include:

- Soil handling and management measures will be developed in the EMP and implemented prior to the commencement of construction. These measures will be incorporated into the Construction EMP and will include:
  - Acid sulfate soils
  - Erosion and sediment control
  - Topsoil management
  - Soil contamination protection and management
- A site rehabilitation/revegetation schedule and plan will be required to be developed and implemented progressively throughout construction in order to stabilise exposed erosion prone soils and subsoils as quickly as possible.
- Drainage and overland flow will need to be carefully managed and controlled so as not to impact on the stability of the rail embankments.
- All cut and fill procedures should be carried out in accordance with the relevant QR engineering standards and specifications, AS3798-1996 and all findings and recommendations detailed in the geotechnical investigations and reports completed during the preliminary and detailed design stages of the project.
- Prepare construction areas in accordance with recommendations and findings of the preliminary and detailed geotechnical investigations.
- Conduct excavation trials prior to commencement of bulk earthworks in order to confirm the type and size of equipment required to effectively and safely complete earthworks.
- Remove soft soils during preparatory earthworks to reduce risks associated with uncontrolled settlement of unconsolidated material under load.

5.5.3 Operational phase

The measures to be implemented during operation and maintenance in order to mitigate the potential impacts of the Project include:

- Periodic maintenance of surface drainage controls will be required.
- Periodic monitoring and maintenance of erosion prone, dispersive soils will be required in order to maintain stable surface soils, prevent accelerated erosion, remediate disturbed soils and protect vulnerable soils and sensitive areas in the receiving environment.

5.6 Conclusion

5.6.1 Topography and landforms

The dominant landform patterns within and surrounding the project area comprises a level to gently undulating plain, which is intercepted by a convergent, integrated network of drainage lines and isolated topographical features of rolling hills and rolling low rises. The project area is situated between a series of steep mountains to the west and the level plain associated with the coastal area of Sarina Inlet and Llewellyn Bay to the east.

The potential impacts to the existing topographical and landform features within the project area during construction are likely to be characterised as disruption of the existing visual landscape due to clearing of vegetation, the extension of engineered landforms in areas currently dominated by open level to gently undulating plains as well as the excavation, stockpiling and placement/relocation of surface and subsurface material and spoil.

5.6.2 Geology and geotechnical stability

The geology within and surrounding the project area was observed to be underlain by two dominant geological units, which are separated in the vicinity of the Jilalan Rail Yard by the Sarina Fault, which runs on a northwest – southeast direction beneath the project area. The northern portion of the project area and extending eastwards is underlain by the sedimentary and volcanic units of the Devonian – Carboniferous age Campwyn Beds. The area south of the Jilalan Rail Yard is underlain by the volcanic units of the Permian age Carmila Beds, consisting of conglomerate, greywacke, tuff, acid volcanics and shale.

Findings of the preliminary geotechnical investigation (Connell Hatch 2007b) and preliminary engineering assessment (Connell Hatch 2007a) for site geology are summarised as follows:

- Lower than expected seismic velocities were recorded.
- Low seismic velocities for the volcanic and sandstone materials underlying the project area may give an incorrect impression of rippability of rock material due to the nature of the weathering process for these materials (ie exfoliation weathering may result in hard boulders (corestones) remaining within the profile).
- Trafficking problems were not encountered during the investigation; however areas of active earthworks exposing sandy/silty clays, sandy silts, clayey gravels, clayey/silty sands may experience trafficking problems during construction works, particularly after periods of rainfall.
- Settlement behaviour of materials under load are likely to be variable across the project area with elastic settlement predominantly occurring in granular material and consolidation settlement occurring in cohesive material.
- Ground improvement measures are likely to be required in areas where embankments are proposed to be constructed over low strength soils.

Further detailed investigations are required for the assessment of the geotechnical conditions and constraints within the project area in order to adequately inform project design, particularly for embankments, batter slopes, structure foundations, site access points and construction material specifications.

5.6.3 Soils

Findings of the preliminary geotechnical investigation (Connell Hatch 2007b) for site soils are summarised as follows:

- Sandy/silty clays, sandy silts, clayey gravels and clayey/silty sands present in surface soils are vulnerable to trafficability problems arising from vegetation clearing activities.
- At the time of the preliminary investigations the onsite material was generally considered to be suitable for reuse onsite as bulk embankment fill material, but likely to be unsuitable for use as outer verge material.
- At the time of the preliminary investigations the onsite material was identified as unsuitable for reuse as top course (600 mm) material.
- Subgrade assessment results indicated the presence of expansive clay material, which generally has a high swell potential. These material characteristics are likely to effect embankment and pavement design specifications.
- Potentially compressible soils were encountered at a number of locations associated with alluvium deposited in former creek bed channels, especially in the vicinity of Plane Creek. These characteristics have the potential to result in significant variable settlement depending on the nature of disturbance within areas containing these soils.
- Fill and ballast material were encountered in areas associated with constructed road and rail infrastructure.

Results of the Emerson Class tests completed during the preliminary geotechnical investigation indicated that the soils encountered within the project area ranged from medium to very high potential risk of dispersion. Consequently soils may be vulnerable to dispersion and erosion under low velocity or volume surface flows (Connell Hatch 2007b).

Data analysis results indicated that overall soils surrounding the project area are non-saline, highly sodic soils with slightly acidic surface soils. Results also indicated that soil sodicity and alkalinity increase with depth through the profile. While soils were generally not considered to be dispersive or affected by salt there were some localised highly dispersive and salt-affected soil profiles identified during the study (Wills and Baker 1988) and the risk of soil dispersivity and salinity increase with depth.

The erosion assessment results within and surrounding the project area indicated that, at the time of the study, the state of erosion included:

- Areas where no water erosion was apparent within the level plain of Plane Creek.
- Areas where sheet erosion was the only active process that was apparent, which was recorded within the gently undulating plain adjacent to Plane Creek.
- Areas of moderate sheet and rill erosion associated with the gently undulating plain between Elizabeth and Willy Creeks intercepting the central southern portion of the project area.
- Areas of severe sheet and rill erosion associated with the upper reaches of Elizabeth and Willy Creeks.
- Areas of slight sheet, rill and gully erosion associated with the gently undulating rises in both the central eastern portion and south eastern portion of the project area extending eastwards towards the estuary.
- Areas of moderate sheet, rill and gully erosion associated with the rolling low rises north of Armstrong Beach Road and on the western side of the North Coast Line along Oonooie Road.

Discussions with DNRW representatives indicate that ASS have been identified during previous DNRW investigations within the Plane Creek floodplain and are therefore expected to underlie the northern portion of the project area in the vicinity of the Smyths Road crossing. Further investigations will be undertaken during the detailed design phase to assess the presence/absence and the nature and extent of ASS within this area. The findings of this investigation will assist in the development of a ASS mitigation measures that will ensure that ASS treatment requirements during construction are adequately identified.

5.6.4 Good quality agricultural land

Land use within the project area is dominated by the rail corridor for the Goonyella Branch Line and the Jilalan Rail Yard facilities and workshop. Land use in the area surrounding the project area is dominated by the production of sugar cane with some minor grazing and urban and industrial land.

Results and observations recorded as part of the land suitability study indicated that the soils throughout the study area were generally characterised as:

- Profiles deeper than 1.2 m bgl.
- Non-saline soils with a small number of localised salt affected areas identified.
- Highly sodic subsoils with sodicity increasing with depth in the profile.
- Slightly acidic surface soils with alkalinity increasing with depth.
- Dispersive subsoils present.

The findings of the Plane Creek Land Suitability Study (Wills and Baker 1988) indicated that GQAL is present within the project area and has been classified as:

- Class 3 – suitable with moderate limitations
- Class 4 – marginally suitable with severe limitations
- Class 5 – unsuitable uplands

A potential impact of the Project will be the loss of approximately 100 ha of GQAL currently under production for sugar cane.

Based on discussions with DNRW representatives further investigation and analysis of soil physical and chemical properties will be required in accordance with the Planning Guidelines for the Identification of Good Quality Agricultural Land (DPI/DHLGP 1993) for each mapped soil unit within the project area.

5.6.5 Contaminated land

Findings from the preliminary historical investigations for the project area indicate that the project area has been used predominantly for agricultural purposes since the 1960s. Some changes have occurred to the area since that time, most of which have been the clearing and thinning of vegetation for conversion for the purpose of sugar cane production and pastoral activities.

A number of areas of concern were identified, both within the project area and on adjoining land, through aerial photograph review, historical title searches and EPA EMR and CLR searches. These areas of concern were identified in relation to the potential for existing contamination to be present as a result of previous or current land use activities on all or part of the land parcel and will require further investigations to adequately assess the contaminant status of the properties prior to commencement of construction and site disturbance.

Locations that may be vulnerable to potential contamination as a result of project construction and/or operation were also identified and relate to areas that will be subject to material storage during construction and/or operation and areas within or adjacent to the integrated network of creek and drainage lines that intercept the project area, particularly riparian areas adjacent to and/or immediately downstream of proposed works and rail yard operations.