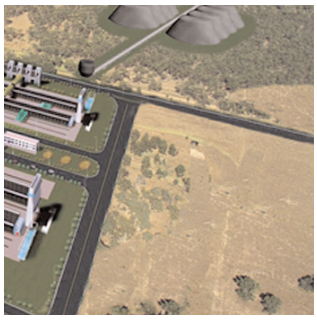
3 Land Characteristics





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3.1 Topography and Geomorphology

3.1.1 Project Site

The terrain characteristics of the area to be developed for the Queensland Coke and Power Plant Project (the Project) and related infrastructure have been assessed in terms of landform and topography (surface form and slope) and geomorphology. The method of assessment is provided fully in Section 3.2 below.

The proposed layout of the project development area and the general site topography are shown in Figure 3.1. Areas of topographical significance include Flagstaff Hill and Neerkol and Quarry Creeks.

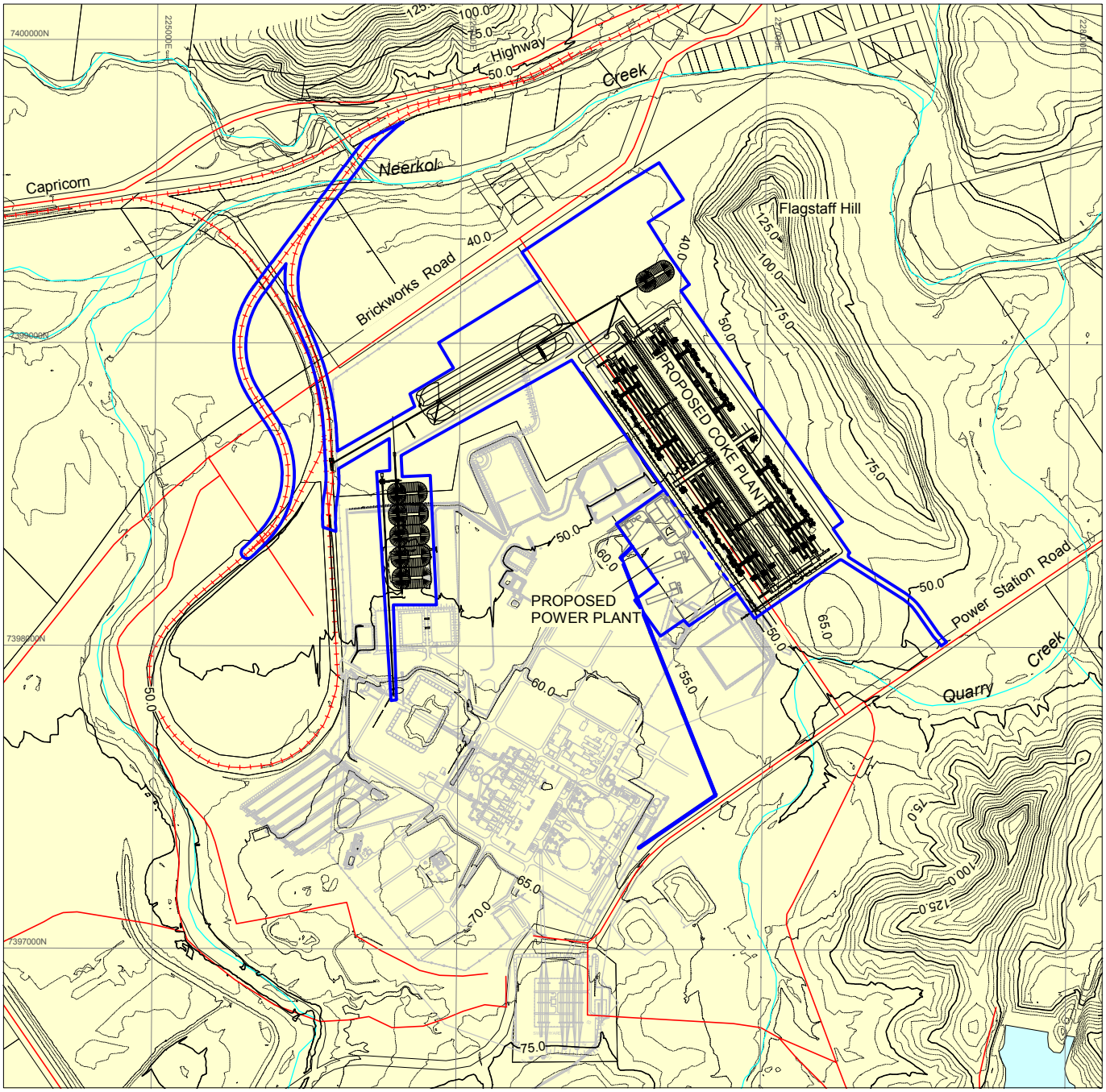
With the exception of some areas which have been modified by cutting and/or filling operations associated with the prior AMC project, the terrain within the site comprises near level to gently inclined intermediate and higher stream terraces and backplains, with overall surface slopes <2%, and locally stepped alluvial terraces associated with Quaternary (Qa) alluvial deposits adjacent to Neerkol Creek in the northern and western sectors of the site, with a minor occurrence in the south eastern sector of the site where adjacent to Quarry Creek.

Undulating lands with low broadly rounded rises with marginal slopes and gently inclined footslopes mostly in the range 2-5% occur as erosional plains developed on the Stanwell Coal Measures (Ks) geological formation in the central-southern sector of the site. Gently to moderately inclined erosional and lower colluvial slopes, and broadly rounded dissection slope interfluves with slopes in the range (5-15%), occur on the lower slope flanks of the steep north/north-west – south/south-east trending Precipice Sandstone (Jp) strike ridge located immediately adjacent to the eastern site boundary (Flagstaff Hill). The linear strike ridge comprises steep planar mid slopes (25-50%) rising to very steep (>50%) to locally sub-vertical rocky escarpment slopes which occur discontinuously below the narrow rocky ridge crest.

3.1.2 Fisherman's Landing Facility

A product stockpile/loading facility is to be developed at Fisherman's Landing to receive the product railed from the project site and load it for shipping to overseas markets. The stockpile area at Fisherman's Landing will be located on existing reclaimed (engineered filled) land constructed over Holocene coastal marine/estuarine sediments (Qm).

A train unloader and conveyor system is also proposed to transport the product to the stockpile area from the existing railway. In the railway loop area, the terrain comprises gently inclined and undulating lands with overall slopes in an easterly direction of approximately 1-2% towards the east, with residual soils (Qr) developed on colluvial deposits and lateritised sediments. A narrow drainage flat and broadly depressional drainageway with overall surface slopes,<1%, occur adjacent to the eastern embankment of the railway loop, which separates the residual soil plains from the marine flats and reclaimed lands to the east.



LEGEND

- Proposed Development Footprint
- Proposed Coke and Power Plant
- Existing Stanwell Power Station
- Property Boundaries
- 50 Topographic Contour 25m (mAHD)
- Topographic Contour 5m (mAHD)
- Creek
- Road
- Railway

N

0 250m 500m

Scale 1:20 000 (A4)

Horizontal Datum GDA94 Zone 56

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ENVIRONMENTAL IMPACT STATEMENT

TOPOGRAPHY AND PROJECT LAYOUT

Drawn: LL	Approved: J.McD	Date: 06-01-06	Figure: **3.1** Rev:C
Job No: **42625626**	File No: 42625626-g-005c.wor		**A4**

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3.2 Geology and Soils

Summary

Project Site

Areas of topographical significance include Flagstaff Hill and Neerkol and Quarry Creeks. Ten terrain units were identified in the project area. Geological regimes present comprise Quaternary alluvium, Early Cretaceous Stanwell Coal Measures and Jurassic Precipice Sandstone.

Useable topsoil resources are mainly confined to the surficial (A) horizon materials (about 0.2 m thick) and locally in the upper part of the subsurface (B1) horizons (about 0.4-0.5 m thick), which contain seed-stock, micro-organisms and nutrients necessary for plant growth. Topsoil will be stripped separately and either used directly on rehabilitating areas or stockpiled for later use in site rehabilitation. Stockpiles (construction to a maximum height of approximately 3 m) will be located in areas that are outside the project disturbance area and away from drainage lines. Sediment controls will be installed downstream of the stockpiles to collect any washed sediment. If the stockpile is to be retained for a period of more than 6 months, it will be deep ripped and sown with local grass seed-stock and legumes in order to maintain the biological integrity of the soil.

Approximately 24.5% of the project site has been assessed as having a high erosion potential rating, with 23.5% rated moderate to high, 15% as moderate and the remaining 37% of the area rated as low or low to moderate erosion potential. Approximately 41% of the area comprises soils that have slightly to moderately dispersive soil layers, 10% of the area has soils with moderately dispersive soil layers, only about 2% of the area comprises highly dispersive soils. The balance of the site (47%) consists of soils that are either non-dispersive or contain only very slightly dispersive soil layers. Implementation of drainage and erosion control measures will assist in minimising the erosion potential due to the occurrence of dispersive soils. The ground surface elevations, together with the geological regimes and the generally well-drained nature of the project site, are not conducive to the formation or occurrence of Acid Sulphate Soils (ASS) within the site.

The project site is spread over a small geographical area and is located a good distance from the recorded recurrent earthquake activity in the region. The intensities of earthquakes likely to occur range from V to VI on the Modified Mercalli Intensity Scale. The design of project structures to Australian Standard AS1170.4 will comply with the minimum criteria considered necessary for the protection of life.

Fisherman's Landing

Four terrain mapping units were identified in the Fisherman's Landing area. Geological regimes present include Quaternary Holocene Estuarine/Marine Unconsolidated Sediments (Qhe/m) and Quaternary Residual Soils and Colluvium (Qrs). Soils associated with the Quaternary Marine Deposits (Qm) comprise mainly uniform fine-textured or gradational medium to fine-textured soils (Soil Type 7), which generally have a surface crust and dark grey brown or dark brown and pale grey mottled saline clays or silty clay subsoils. Under natural undisturbed conditions, these Holocene estuarine/marine sediments

provide an environment for the occurrence of acid sulphate soils (ASS), particularly where the elevation of the natural surface lies below about 3 to 5 m AHD. Soil Type 7 in terrain unit Qm17 was considered unsuitable for use as a topsoil resource.

The soils associated with the Quaternary Residual Soil/Colluvial Deposits (Qr) comprise uniform or gradational medium-textured soils (Soil Type 4), which are gravelly in parts and tend to become less gravelly and somewhat finer-textured (more clayey) downslope. On the lower less well-drained sectors of the terrain unit, the soils comprise siliceous or ferruginous gravelly silty to loamy surface duplex soils (Soil Type 5) with bleached sub-surface (A2) soil horizons and diffusely mottled and usually dispersive clayey subsoils. The soil Type 4-5 were considered to be marginal for use as a topsoil resource to a depth of between 0.15 to 0.3 m.

3.2.1 Description of Environmental Values

The terrain of the area to be developed for the Project has been assessed in terms of geology, landform and topography (surface form and slope) and soil types. Topography and geomorphology is discussed in Section 3.1 above.

Method of Assessment

Terrain mapping has been carried out primarily from interpretation of aerial photographs with reference to existing geological, topographical, and soils information, and the background data sources discussed below. This was followed by a site reconnaissance survey and soil sampling operations, all of which have provided the basis for identifying 'Terrain Units' which occur within the proposed project area.

As mapped, a terrain unit comprises a single or recurring area of land that is considered to have a unique combination of physical attributes in terms of bedrock, surface slope and form, and soil/substrate conditions. Accordingly, engineering and environmental characteristics determined at one location may be extrapolated to other occurrences of the same terrain unit.

Data Sources

The following data were used for the description and assessment of the physical environment of the project area:

- Colour aerial photography – Department of Natural Resources and Mines (2004a), Series QAPC6121 flown 9-07-2004, Run 6/149-150, at a nominal scale 1:37,500;
- Project area topographic base map, 1:20,000 scale with 1m contour interval, produced by Sedgman Pty Ltd, 11/02/2005;
- Sunmap Australia 1:250,000 Geological Series Queensland, Rockhampton Sheet SF 55-1;
- Soils and Land Suitability of the Gavial-Gracemere Area (DNRQ 990146), by J.L. McClurg (1984); and

- Baseline reports from the Australian Magnesium Project Draft Environmental Impact Statement (EIS), Section 9 - Environmental Effects, (Terrain and Soils), prepared for Australian Magnesium Corporation (AMC) by Dames & Moore (1999).

Field Investigations

Field investigations were carried out to confirm the terrain mapping. In addition to the 23 locations sampled as part of the EIS for the AMC project (Dames & Moore, 1999), a further 13 sites were investigated within the general area of interest for the Project. Soil profiles were assessed from backhoe pits excavated to a maximum depth of 1.5 m, or to weathered rock, whichever was shallower. At each sampling location, terrain characteristics and soil types were described generally in accordance with the guidelines of the "Australian Soil and Land Survey Field Handbook" (McDonald *et al.*, 1990). Site details and soil descriptions are included in Appendix D.1.

Existing Environment

Terrain Units

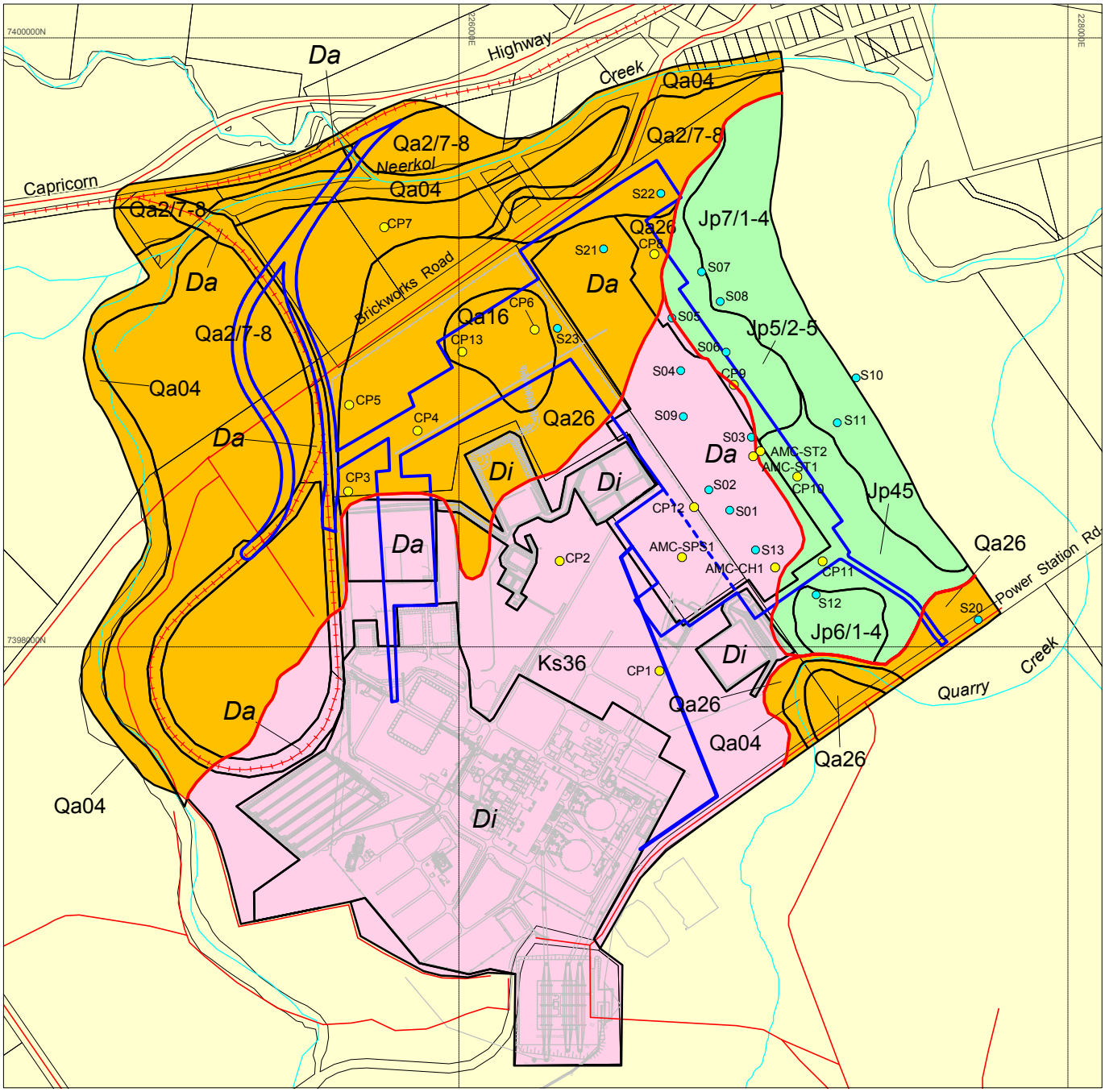
As discussed above, the identification of terrain units provides a basis for the description of the physical environment, and as mapped, they serve to show the occurrence and distribution of geological, landform units and soil types which occur within the mapped area.

Project Site

Ten terrain units identified within the project site are coloured on the basis of geological regime in which they occur and are shown on Figures 3.2a. Figure 3.2b comprises a Key to the Description of the Terrain Mapping Units. More detailed descriptions of the terrain units together with an assessment of engineering/environmental attributes considered important for project development, are included in Appendix D.2**.**

Fisherman's Landing

Using the methodology outlined above, four terrain mapping units were identified in the Fisherman's Landing area (URS, 2003). These include gently inclined undulating residual soil plains identified as terrain unit Qr2(4-5) together with drainage flats and a broadly depressional drainageway (Qr15), which occur within the railway loop area. The railway embankment is situated immediately to the west of the main access road which was located along the transition between terrain unit Qr15 and the marine supratidal flats (Qm17) upon which the reclaimed land (terrain unit D) wharf facilities area has been constructed.



LEGEND

CP1 ○ QCE Site Sampling Locations (2005)

S01 ○ AMC Site Investigation Locations (1998)

Geological Regime Boundary

Qa16 Terrain Unit Boundary

Proposed Development Footprint

Existing Stanwell Power Station

Creek

Road

Railway

0 500m 1000m

Scale 1:20 000 (A4)

Horizontal Datum GDA94 Zone 55

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NOTE:
This Figure 3.2a must be viewed with Figure 3.2b (Terrain Units Identification Key)

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ENVIRONMENTAL IMPACT STATEMENT

TERRAIN UNITS AND SITE SAMPLING LOCATIONS

Drawn: LL	Approved: JMcD	Date: 06-01-06	Figure: **3.2a**	Rev:C
Job No: **42625626**	File No: 42625626-g-007c.wor			**A4**

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GEOLOGICAL REGIME		LANDFORM – TERRAIN TYPE		SOILS	
Symbol	Formation and Lithology	Type	Surface Form and Slope	Type	Soil Types
Qa	Alluvium on water courses, terraces and floodplains.	0	Channel floors, banks and active levees of major streams and waterways with high, steep, and locally benched bank slopes and low floodprone terraces.	0	Rock outcrop and skeletal soils.
Ks	Lower Cretaceous Stanwell Coal Measures – mudstone, arenite, claystone.	1	Alluvial drainage flats and broadly depressioral backplains, generally poorly drained; slopes generally <1%.	1	Skeletal, rocky or gravelly soils (>60% gravel) with sand, silt or clayey matrix.
Jp	Jurassic Precipice Sandstone – cross-bedded, white to brown fine to coarse-grained pebbly quartzose sandstone, arenite, some white to yellowish brown laminated siltstone.	2	Flat to gently inclined erosional plains or gently undulating alluvial plains, floodplains and higher stream terraces, with slopes generally <2%;occasionally to periodically floodprone in lower-lying areas	2	Sand soils; uniform profile; includes stratified alluvial soils; (Ucl-4).
		3	Undulating plain and gently rolling to broadly rounded rises with gently inclined planar to concave intervening depressional areas, slopes mostly in the range 2- 5%	3	Coarse to medium-textured soils; uniform or gradational profiles; predominantly sandy texture; (Uc4-5, Uml-3).
		4	Undulating plain, and rolling rises with slopes mostly in the range 5-10%	4	Medium-textured often gravelly soils with uniform or weakly gradational profiles of predominantly loamy texture; (Um4-7, Gn1-2).
		5	Gently to moderately inclined intermediate to lower hill and ridge slopes dissection slope interfluves with slopes variable mostly in the range 5-15%	5	Sandy, silty or loamy surface duplex or gradational soils with strongly acidic to neutral sandy, silty or light to medium clay subsoil (B) horizons, (Gn2, Dy4-5).
		6	Isolated low hills and rises and low hilly lands with slpopes up to 25%;	6	Fine sandy, silty or loamy surface duplex soils with alkaline and mostly sodic medium to heavy clay or sandy clay, subsoil (B) horizons. (Db1-Dy3).
		7	Steep hilly lands with mostly short steep irregular planar hill and ridge slopes; slopes typically 25 to 50%;.	7	Fine-textured, uniform (non-cracking) clay soils with medium to heavy clay surficial (A) horizons over heavy structured clay subsoils - incipient cracking clays, (Uf5-6).
		8	Steep to very steep ridges and high hilly lands; with slopes typically>50% with local subvertical rocky bluffs and escarpment slopes	8	Fine-textured uniform, (cracking) clay soils of high plasticity locally with thin weak self-mulching surficial soil horizons (Ug5-6).
		Da	Land disturbed or modified by cutting and/or filling operations.		
			EXAMPLE: Terrain Unit Qa26 Qa (GEOLOGY) 2 (LANDFORM) 6 (SOIL TYPE)		**NOTE:** Dual Symbols for soil type, eg. (7-8) indicates that both material types or intergrades between the two soil types may occur within the mapping unit.

Notes:- (1) - Soil Group Name (Stace et.al. 1968; (2) - Principle Profile Form (Northcote 1971): (3) - Engineering Soil Class (AS 1764-1990); (4) - Australian Soil Classification (Isbell, 1996).

NOTE:
This Figure 3.2b must be viewed with Figure 3.2a (Terrain Units and Site Sampling Locations)

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ENVIRONMENTAL IMPACT STATEMENT

Job No: 42625626 | Drawn: LL | Approved: JMcD | Date: 06-01-06 | File No: 42625626-g-007c.wor

TERRAIN UNITS IDENTIFICATION KEY

Figure: 3.2b

A4 | Rev:C

Site Geology

Project Site

The geology of the general project area has recently been revised by the Geological Survey of Queensland (GSQ, 2004) as shown on the 1:100,000 Mount Morgan and Ridgelands Map Sheets - 8950 and 8951 respectively. The geological regimes that occur within the project area include:

- Quaternary alluvium (Qa), comprising clay, silt, sand and gravel beds. These sediments occur on the floodplain of Neerkol Creek which drains the north-western sector of the site. Quaternary alluvium also occurs in the floodplain of Quarry Creek, which passes through the far south-eastern sector of the site;

- Early Cretaceous Stanwell Coal Measures (Ks), comprising mudstone, arenite, claystone and coal. This regime constitutes the bedrock in the central and southern sector of the site. The strata dip to the south-west at low to steep angles as a consequence of regional folding. Weathering in these rocks usually extends to depths of 8 to 10 m; and

- Jurassic Precipice Sandstone (Jp), comprising white to brown poorly sorted, thick-bedded and cross-bedded fine to coarse-grained pebbly quartzose sandstone, arenite and minor white to yellowish brown laminated siltstone. The prominent north-south trending ridge-line and bounding slopes along the eastern boundary of the site comprise this geological regime.

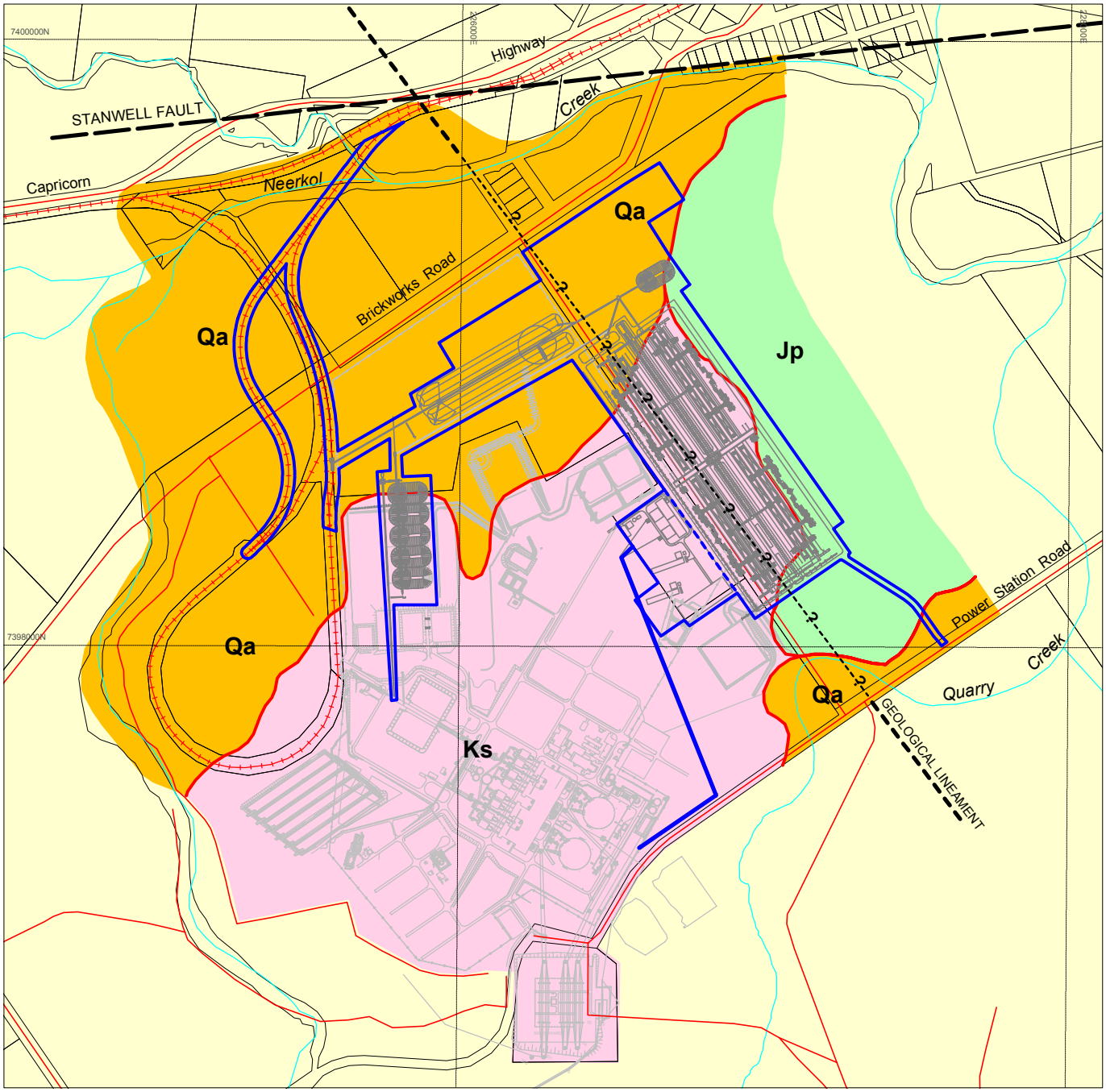
The occurrence of the geological regimes within the general area of interest is shown in Figure 3.3. As shown on the Sunmap Australia 1:250,000 Geological Series Queensland, Rockhampton Sheet, the Stanwell Fault is located approximately along the alignment of the Capricorn Highway immediately north of Neerkol Creek. A prominent geological lineament intersecting that fault-line has also been identified, which appears to pass through the centre of the project site. The approximate locations of these geological features are shown on Figure 3.3.

Fisherman's Landing

The geological regimes that occur in the Fisherman's Landing area include:

- Quaternary Holocene Estuarine/Marine Unconsolidated Sediments (Qhe/m), comprising mud, sandy mud, muddy sand and minor gravel in estuarine channels and banks, supra-tidal flats and fringing coastal grasslands. This geological regime occurs adjacent to, and to the east of, the existing railway loop and the access road, and underlies the reclaimed wharf facilities development area that will accommodate the coke stockpiles and conveyor assembly.

- Quaternary Residual Soils and Colluvium (Qrs), comprising sand, silt and gravelly residual soils with estuarine mud along the coastal margins. This geological regime underlies the existing railway loop embankment and the western end of the proposed train unloader and conveyor system.



LEGEND

- Geological Regime Boundary
- Stanwell Fault (Approximate Position)
- Geological Lineament (Approximate Position)
- Geological Lineament Inferred Location (Obscured by prior site earth works)
- **Qa** Alluvium on water courses, terraces and floodplains.
- **Ks** Lower Cretaceous Stanwell Coal Measures - mudstone, arenite, claystone.
- **Jp** Jurassic Precipice Sandstone - cross-bedded, white to brown fine to coarse-grained pebbly quartzose sandstone, arenite, some white to yellowish brown laminated siltstone.
- Proposed Development Footprint
- Proposed Coke and Power Plant
- Existing Stanwell Power Station
- Property Boundaries
- Creek
- Road
- Railway

0 500m 1000m

Scale 1:20 000 (A4)

Horizontal Datum GDA94 Zone 56

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SITE GEOLOGY

Drawn: LL	Approved: JMcD	Date: 06-01-06	Figure: **3.3**	Rev:C
Job No: **42625626**	File No: 42625626-g-006c.wor			**A4**

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Seismic Activity

Queensland is seismically active with the highest hazard region lying along the populated eastern coast and near offshore regions. Most Australian earthquakes occur in the crustal layers of the region and in the north-east of Australia the average earthquake focal depth has been determined to be 10 km (± 0.5 km). The largest earthquakes recorded in Queensland occurred offshore of Gladstone in 1918 (Richter Magnitude (ML) 6.3) and near Gayndah in 1935 (ML 6.1). Structural damage to buildings was reported in the Rockhampton region during the Gladstone earthquake and in the Rockhampton area, the earthquake was determined to have a Modified Mercalli Intensity of VI (denotes how strongly an earthquake affects a specific place and ranges between I and XII). Modified Mercalli Intensities of VII and VIII, which are capable of causing serious damage, were also noted on Quaternary floodplain alluvium in the Rockhampton area.

In Queensland, earthquakes with the potential to cause serious damage or fatalities (ML >5) have occurred on average about every 5 years during the last century, with several near misses to the State's large population centres. A high level of seismic activity runs through a belt just inland of Bundaberg spanning downwards from Gladstone through Gayndah and beyond. The recorded earthquake activity in the region is concentrated principally in two areas, namely the offshore Capricorn Group of islands and a zone extending from north of Biloela to near Monto (Anon, 1990 and McCue *et. al.*, 1993). In addition, several isolated earthquake epicentres have been recorded throughout the region.

The most recent, moderate sized earthquake within the broader region of the project site struck about 40 km from Bundaberg in 1985 and had a ML of 3.1. The closest recorded earthquake event to the Stanwell site has been a ML 4 earthquake on 7 March 1922, with epicentre located approximately 30 km north-east of the site.

The project site is spread over a small geographical area and is located a good distance from the recorded recurrent earthquake activity in the region. The intensities of earthquakes likely to occur at the project site range from V to VI on the Modified Mercalli Intensity Scale (Gaull *et. al.*, 1990). The directly observable effects of earthquakes of these intensities are (Doyle, 1995):

- Modified Mercalli Intensity V - Felt outdoors, direction estimated, sleeping people awakened, liquids disturbed and some spilled, small unstable objects displaced or upset, doors swing/close/open, shutters, and pictures move, pendulum clocks stop/start/change rate.

- Modified Mercalli Intensity VI - Felt by all, many people frightened and run outdoors, persons walk unsteadily, windows/dishes/glassware broken, ornaments/books etc fall off shelves, pictures fall off walls, furniture moved or overturned, weak plaster and masonry cracked, small bells ring (church, school), trees, bushes shaken visibly or heard to rustle.

The design of structures to Australian Standard AS1170.4:1993 complies with the minimum criteria considered necessary for the protection of life, by minimising the likelihood of collapse of structures. In terms of engineering design, the stated purposes of designing structures for earthquake loads in accordance with Australian Standard AS1170.4:1993 are:

- Minimise the risk of loss of life from structure collapse or damage in the event of an earthquake;
- Improve the expected performance of structures; and
- Improve the capability of structures that are essential to post-earthquake recovery to function during and after an earthquake and to minimise the risk of damage to hazardous facilities.

The structures at the project site will be designed in accordance with the standard. The 'design earthquake' specifications to be complied with are discussed in Section 15 – Health and Safety.

Soils

Project Site

From the 13 additional locations investigated, a total of 50 soil samples (typically 4 representative samples from each hole) were obtained for soil characterisation, indicative testing, and for soil profile classification purposes. Indicative (in-house) testing was carried out on all 50 soil samples collected. This involved testing of pH (1:5 H_2O), Electrical Conductivity (EC 1:5 H_2O) and Dispersion Class Rating (Emerson and Seedsmans, 1981). Soil colour, texture and structure were determined for all samples by field methods described by McDonald *et. al.*, (1990).

For this investigation, no soil samples were submitted for laboratory chemical analyses, as the main soil types within the site were comprehensively analysed during the previous AMC EIS studies (Dames & Moore, 1999). Results of the indicative testing are presented in Appendix D.4. The soil sampling locations investigated as part of the AMC site studies, together with those sampled during the current site investigation are shown in Figure 3.2a.

The soils that occur in the project area are related to the geological formations and geomorphological situations in which they have developed. The Key to the Identification of Terrain Units (Figure 3.2b) includes a generic grouping of the main soils types (Types 1 to 8) that occur within the project area, which in general are characterised by increasingly finer (more clayey) texture and higher plasticity, with increasing soil type number. Wherever possible, soil profiles have been classified in terms of the:

- A Handbook of Australian Soils (Stace *et. al.*, 1968);
- Principal Profile Form (PPF) (Northcote, 1974);
- The Australian Soil Classification (ASC) (Isbell, 1996); and
- Australian Standard AS 1726:1993.

Descriptions of soil types identified at each of the soil sampling locations (CP1-13) are included in Appendix D.1. The soil types associated with individual terrain units are described in Appendix D.2. The occurrence of soils within the project area identified on a terrain unit basis is shown in Figure 3.2a. A summary of the main soil types that occur within the project area are as follows (Table 3.2.1):

- Soil Type 1 (shallow rocky soils) occur in association with Soil Type 4 (shallow to medium deep gravelly loams) and comprise mostly shallow lithosols, on the steep middle to upper slopes of the sandstone ridges and hills in terrain units Jp7(1-4) and Jp6(1-4) respectively.

- Soil Type 2 comprise shallow uniform coarse-textured sand soils over weathered rock, and locally occur in association with medium deep thick sandy surface acidic yellow mottled duplex soils (Type 5) which are transitional to the weathered sandstone rock substrate in terrain units Jp4(2-5) and Jp5(2-5).

- Soil Type 3 (earthy sands) and Type 4 (medium-textured loamy soils) comprise alluvial deposits along Neerkol and Quarry Creeks in the channel floors, on the lower flood terraces, stream banks and levees. Loamy surface duplex soils with medium to heavy sodic clay subsoils (soil class 6) and dark-coloured uniform (cracking) clays (soil class 8) occur on the alluvial backplains and higher alluvial terraces.

- Soil Type 5 comprises thick sandy surface duplex soils mostly with a bleached subsurface (A2) horizon and acidic coarsely mottled yellow-brown red and grey sandy medium clay subsoils, locally with a ferruginous gravelly subsoil horizon transitional to the underlying weathered sandstone bedrock. These soils are transitional between, or occur in association with, soil Type 2 in terrain units Jp4(2-5) and Jp5(2-5), on the lower slope flanks and lower dissection slope interfluves of the high strike ridge; and associated low sandstone hills along the eastern boundary of the site.

- Soil Type 6 comprises mainly thin loamy surface duplex soils, locally with bleached or sporadically bleached (A2) subsoil horizons over brown or yellow brown mainly heavy usually sodic alkaline clay subsoils. These soils occur on the undulating plains and gently inclined slopes of the Stanwell Coal Measures (Ks) geological regime in terrain unit Ks36, and on the near flat to gently undulating alluvial plains in terrain units Qa26 and Qa16.

- Soil Types 7 and 8 occur in association on the alluvial plains and terraces along Neerkol Creek. Soil Type 7 comprises uniform dark-coloured (non-cracking) clay soils with a thin crusty weak self-mulching surface soil with no obvious surface cracking evident. The immediate subsurface (B) horizon is well structured to a depth of about 0.4-0.5 m, becoming more massive in the deeper subsoil. These soils have been termed ‘incipient cracking clay soils” as they have close similarities to the dark-coloured (cracking) clay soils (Soil Type 8) which have a thin self-mulching surface soil with a weak surface crust and strongly structured, and strongly alkaline, usually sodic heavy clay subsoils. As mapped these soils occur in a complex association in terrain unit Qa2(7-8).

Fisherman’s Landing

Soils data reviewed includes that relating to a proposed pipeline alignment in the vicinity of Fisherman’s Landing (URS, 2003). The data indicates that the soils associated with the Quaternary Marine Deposits (Qm) comprise mainly uniform fine-textured or gradational medium to fine-textured soils (Soil Type 7), which generally have a surface crust and dark grey brown or dark brown and pale grey mottled saline clays or silty clay subsoils. They occur on marine flats and mangrove flats associated with tidal inlets, on

tidal salt flats with samphire, or on low-lying plains with saltwater couch grassland along the landward margins of the marine deposits. Under natural undisturbed conditions, these Holocene estuarine/marine sediments which are subject to tidal influence, provide an environment for the occurrence of acid sulphate soils (ASS), particularly where the elevation of the natural surface lies below about 3 to 5 m AHD.

The soils associated with the Quaternary Residual Soil/Colluvial Deposits (Qr) tend to vary depending on the topographic position in the soil landscape. They comprise uniform or gradational medium-textured soils (Soil Type 4), which are gravelly in parts and tend to become less gravelly and somewhat finer-textured (more clayey) downslope. The surface soils comprise dark brown slightly acidic gravelly sandy loam to clay loam, and grade to gravelly sandy clay loam or light clayey subsoils which may contain dispersive soil layers with depth. On the lower less well-drained sectors of the terrain unit, the soils comprise siliceous or ferruginous gravelly silty to loamy surface duplex soils (Soil Type 5) with bleached sub-surface (A2) soil horizons and diffusely mottled and usually dispersive clayey subsoils.

Soil Properties

A total of 30 site locations have been investigated within the general project area. Seventeen of these sites were previously investigated as part of the AMC project studies (Dames & Moore, 1999). Samples from seven of those sites were submitted for detailed chemical analyses, the results of which are included in Appendix D.3. These results, together with the results of the indicative testing carried out on the samples obtained from the additional 13 sites sampled as part of the current investigation (Appendix D.4), have been used as the basis for the assessment of engineering/environmental attributes discussed in Section 3.2.2 below.

Topsoil Resources

Based on the findings of the site reconnaissance soil survey, together with the results of the indicative and laboratory testing available, an assessment of topsoil suitability for rehabilitation of lands that will be disturbed by the project development/construction process has been undertaken. Together with field observations of soil surface condition, soil texture and structure, Appendix D.4 provides the basis used to evaluate topsoil suitability for rehabilitation in terms of the physical and chemical properties of the soils purposes. The criteria and parameters used for the assessment are included in Appendix D.4 and indicative topsoil stripping depths of suitable (S) material have been determined. Appendix D.4 also provides an assessment of materials that are considered to be marginal (M) for use as topsoil material, but would have acceptable properties for the use as subsoil resources, if required.

Project Site

Useable topsoil resources are mainly confined to the surficial (A) horizon materials and locally in the upper part of the subsurface (B1) horizons, which contain seed-stock, micro-organisms and nutrients necessary for plant growth. Soil microbial activity, organic matter content and other parameters affecting soil fertility, tend to decrease with depth.

Table 3.2.1 Soil Types in the Project Site Area

Soil Type	Soil Description	Soil Classification			
		Aust. Soil[1] Group	P.P.F.[2]	U.S.C.[3]	A.S.S[4]
1	Skeletal, rocky or gravelly soils (>60% rock cobbles and weathered rock gravel) with sand, silt or clayey matrix	Skeletal Soils	NSG	GW, GP, GM-GC	Very Gravelly Paralithic Leptic Rudosols
2	Uniform sand or gravelly sand soils underlain by weathered rock	Lithosols	Uc2 12 Uc4.13	SP, SM, SM-SP	Stratic Rudosols
3	Earthy sands – sandy earth soils, moderate shallow coarse to medium-textured soils	Earthy Sands	Uc5.21	SM-SC, SP-SC, SC	Paralithic Leptic Tenosols
4	Uniform or gradational, medium-textured sandy loam or loamy alluvial soils, or gravelly loam residual soils	Alluvial Soils or Lithosols	Uc6.13, Um5.52, K-Um4.3	GM-GC	Chernic Leptic Tenosols or Gravelly Paralithic Orthic Tenosols
5	Sandy surface texture contrast (duplex) soils with strongly acidic to neutral to clay subsoils	Yellow Podzolic Soils	Dy5.81, Dy4.61, Gn2.11	SM-SP/SC-CL, SM-SP/GC-CL	Mottled-Ferric Yellow-Brown Kurosols
6	Silty to loamy surface texture contrast (duplex) soils with alkaline, sodic medium to heavy clay subsoils	Solodic Soils	Db1.13 Db1.33-1.43 Dy3.33	SM or CL-ML/CL- CH or CH	Subnatric-Mesonatric Brown Sodosols
7	Uniform or weakly gradational (Non-cracking) clay soils	Dark Grey (Non-Cracking) Clays	Uf5.11-.12, Uf6.11-.12	CL-CH or CH/CH	Vertic Subnatric or Meso-natric Black Dermosols
8	Uniform dark grey-brown (cracking) clay soils	Grey-Brown (Cracking) Clays	Ug5.15	CH/CH	Endocalcareous Self-mulching Black Vertosols

Notes: [1] Common Soil Group Name (Stace *et. al*., 1968)
[2] Principal Profile Form (Northcote, 1971)
[3] Engineering Soil Class (AS 1764:1990)
[4] The Australian Soil Classification (Isbell, 1996)

In terms of acceptable soil properties and extent of occurrence, the most suitable sources of topsoil resources occur in terrain units with soil Types 6, 7 and 8 and to a lesser extent the alluvial soil Type 4 and Type 5 or combinations thereof. The surficial (A) soil horizons of these soil types are typically about 0.2 m thick and usually comprise the most suitable material resources in terms of soil physical and chemical properties. The subsoil (B1) horizons that occur within the zone to depths of about 0.4-0.5 m (bgl), are usually of lesser quality in terms of soil nutrient levels but may be useable, particularly if blended in part with the surficial (A) soil horizons. However in the main these (B1) materials are unsuitable for use alone as topsoil, due to locally elevated levels of alkalinity, salinity, sodicity and other adverse soil attributes such as excessively coarse soil structure, very strong (tough) dry consistence or dispersive characteristics.

The occurrences of terrain units with soil Types 1 and the loamy residual soil Type 4 may contain high amounts of gravelly scree or weathered rock lag gravel, typically only about 0.3-0.4m thick and underlain by weathered rock. These material types are of limited extent within terrain units Jp6(1-4) and Jp7(1-4) and as such, they are considered to be unsuitable or marginal for topsoil use.

Soil occurrences within terrain unit Jp5(2-5), with soil Types 2 and possibly Type 3, are considered to be marginal for use as topsoil due to the predominantly coarse sandy texture, stoniness and low water storage capacity. However the surficial (0.2 m) which contain organic matter and seed-stock may be worth recovering for use as top-dressing materials.

Fisherman's Landing

Based on reviewed soil data in the Fisherman's Landing area (URS, 2003), soil Type 7 in terrain unit Qm17 was considered unsuitable for use as a topsoil resource due to the thin but crusty and saline nature of the surficial soil layer, as well as the possible local occurrence of strongly acidic actual ASS materials.

The soil Type 4-5 association in terrain unit Qr2(4-5) comprise locally gravelly sandy to loamy surficial soils underlain by locally heavily leached often bleached or pale-coloured sub-surface (A2) horizons which in turn may be underlain by somewhat dispersive clay loam or clayey subsoils. The quality of the surficial soil horizons was considered to be marginal for use as a topsoil resource to a depth of between 0.15 to 0.3 m. The soils present on the reclaimed land areas designated "D" are of unknown origin and are likely to be quite variable and of little use as a topsoil resource.

3.2.2 Potential Impacts and Mitigation Measures

Topsoil Management

As part of the sites earthworks, topsoil will be stripped separately either used directly on rehabilitating areas or stockpiled for later use in site rehabilitation. With the exception of some minor rocky areas along the eastern and southern boundaries of the site, the surface horizons (0.2-0.3 m) in most other areas to be disturbed have been assessed as being suitable for use in site rehabilitation. However, variability occurs within the soil types of each of the terrain units. Consequently, monitoring of soil type variability will be undertaken during the construction phases of the Project to ensure that the objective of maximum quantity, quality and management of useable topsoil resources is recovered.

Stripping

Prior to the commencement of stripping, areas will be cleared of vegetation where required. Earthmoving plant operators will be trained and/or supervised to ensure that stripping operations are conducted in accordance with stripping plans and *in situ* soil conditions. This will ensure that all suitable topsoil material resources are salvaged and that the quality of the stripped topsoil is not reduced through contamination with unsuitable soils. Care will be taken during stripping, stockpiling, and respreading to ensure that structural degradation of the soil is avoided and that excessive compaction does not occur during stockpiling.

Stockpiling

Where possible, topsoil material will be respread directly from stripped areas onto areas being rehabilitated. Where this is not possible, topsoil shall be stored in stockpiles. Topsoil material stockpiles will be located in areas that are outside the project disturbance area and away from drainage lines. Drainage from higher areas will be diverted around stockpiles to prevent erosion. Sediment controls will be installed downstream of the stockpiles to collect any washed sediment.

Stockpiles will be formed in low mounds of minimum height (approximately 3 m maximum) and maximum surface area, consistent with the storage area available. If the stockpile is to be retained for a period of more than 6 months, the stockpile will be deep ripped and sown with local grass seed-stock and legumes in order to maintain the biological integrity of the soil. Topsoil stockpiles will be clearly sign-posted for easy identification and to avoid any inadvertent losses. Vegetation growth on stockpiles will be closely monitored for weeds, which, when found will be controlled and/or eradicated. Records of topsoil stockpile history, ongoing management and usage details will be maintained on site, including GPS location, date stripped, origin, soil type, pre-stripping disturbance characteristics, post-stockpiling seeding, weed management, use location, use dates and spreading details.

Soil Erosion

The objective of erosion management is to minimise water and wind generated sediment entrainment and off site release. Project construction activities will involve clearing and earthworks activities that are likely to disturb significant areas of land for considerable periods of time. The extent of the environmental impact likely to result from such activities has been rated on a terrain unit basis as low (L), medium (M) or high (H). The basis of the assessment of erosion potential is provided in Appendix D.5.

Existing and Potential Soil Erosion

Project Site

Based on interpretation of the aerial photography (DNRM, 2004a), together with general observations made during the reconnaissance field survey, existing accelerated soil erosion does not appear to be a major problem within the project area as a whole. However, some occurrences of sheet and gully erosion are evident locally within the site. These highly erosion prone areas occur mainly on the slopes adjacent to and along the drainage lines in terrain unit Qa04, within and on the lower parts of dissection slope interfluves in terrain units Ks36 and on the steep ridge slopes in terrain unit Jp7(1-4) along the north eastern site boundary.

Other areas that have been rated as having moderate to high erosion potential occur in terrain units Jp6(1-4), where clearing of vegetation is likely to give rise to significant sheet and/or rill erosion, and on the slopes adjacent to drainage lines within terrain unit Qa2(7-8). Other areas have been rated as having either moderate or low to moderate erosion potential due to the nature of the surface soils and/or generally near flat or very gentle surface slopes. However, as many of these areas have soil profiles that include dispersive soil layers, the impact of erosion in these areas will depend on the nature and extent of the earthworks required.

For the site area as a whole, based on the assessment of erosion potential provided in Appendix D.5, approximately 24.5% of the area has been assessed as having a high erosion potential rating, with 23.5% rated moderate to high, 15% as moderate and the remaining 37% of the area rated as low or low to moderate erosion potential. Erosion control measures, outlined below, will be undertaken as necessary to minimise the potential effects of erosion.

Fisherman's Landing

In the Fisherman's Landing area, the overall erosion potential of the natural (undisturbed) land surface is rated as low, tending to moderate where adjacent to drainage lines or in excavations where exposure of dispersive soil layers may give rise to rill and/or gully erosion. On the reclaimed land areas the erosion potential is rated low due to compaction of the imported fill material and drainage control measures in place to control surface runoff. Accordingly with respect to the construction of the train unloader, conveyor system and coke stockpile facilities, adherence to the erosion control measures outlined below will ensure that environmental impacts resulting from erosion are minimal.

Erosion Control Measures

Site water management strategies consider the potential for off site impacts resulting from erosion through the management of water on site. Section 5 – Water Resources discusses waste management and the proposed site water flow regime.

Erosion on construction sites cannot be eliminated completely, but the following erosion control measures based on the Engineering Guidelines "Soil Erosion and Sediment Control – Engineering Guidelines for Queensland Construction Sites" (Institution of Engineers Australia (IEAust), Queensland Division, 1996) will be undertaken to reduce erosion from disturbed areas:

- Limiting the area disturbed and clearing progressively, immediately prior to the commencement of construction activities;
- Safeguarding the surface layer by stripping and stockpiling topsoil prior to construction;
- Controlling runoff and sediment loss from the site using appropriate short-term erosion control measures such as silt fences, hay bales, diversion mounds, etc;
- Using temporary soil diversion mounds to control runoff within, and to divert water away from, the construction site where practicable;
- Minimising the period that the bare soil is left exposed to erosion; and
- Using appropriately designed sediment traps to minimise off-site effects of erosion.

The control of erosion and sediment movement within and from the site will be necessary both during the construction stage and subsequently during the operating life of the facility. Where access is required for temporary (construction) use only, disturbed areas will be lightly ripped, restored to a stable condition and revegetated as soon as practicable following the completion of construction. Particular attention will be

paid to those areas which may contain dispersive soils. Measures to manage erosion are outlined in the Environmental Management Plan for the site and include an erosion monitoring program.

Acid Sulphate Soils

Acid Sulphate Soil (ASS) environments are those that include soil horizons or layers of sediment that contain unoxidised sulphides, or very strongly acidic soil horizons that have formed from oxidation of sulphides when the materials have been exposed to oxidising conditions due to excavation, or from lowering of the local groundwater table. They mostly occur on coastal lowlands such as mangrove tidal flats, salt marshes, in some lowland seasonal or permanent swamplands, or other coastal sedimentary environments with a surface elevation below 5 m AHD.

Project Site

The general ground surface elevation within the proposed project site varies from about 30 m AHD on the alluvial flats associated with Neerkol Creek, to about 60 m AHD in the central-eastern development sector of the site. These ground surface elevations, together with the geological regimes identified, and the generally well-drained nature of the site, are not conducive to the formation or occurrence of ASS within the site.

Fisherman's Landing

The stockpile area at Fisherman's Landing will be located on existing reclaimed land constructed over Holocene coastal marine/estuarine sediments that are likely to contain some potential ASS zones at depth below the base level of the engineered reclamation. Construction of the stockpile facility is therefore unlikely to disturb or expose any *in situ* buried existing or potential ASS sediments.

A conveyor system is also proposed to transport the product from the existing railway load-out facility to the stockpile area. As shown on the 1:100,000 Gladstone geological map sheet, the conveyor facility will be constructed partly on reclaimed land (discussed above) and partly on (non-ASS) residual deposits (Qrs) underlain by Tertiary Rundle Formation sediments (Tr) in the railway load-out area. Whilst the engineering design and type of the foundation system proposed for the conveyor facility have yet to be finalised, it is unlikely that construction of the facility will result in exposure and/or disturbance of ASS materials.

Environmental Effects

An assessment of some engineering and environmental attributes is included as part of the description of terrain units in Appendix D.2, to assist planning of earthworks and to help minimise potential environmental impacts that may arise from site construction activities.

Problem Soils

Problem soils relate primarily to the occurrence of highly reactive (cracking) clay soils which exhibit substantial shrinkage and swelling characteristics due to wetting and drying cycles, which may result in

damage to structures and foundations due to differential ground movements. These (R3) soils occur in soil Type 8 in terrain unit Qa2(7-8) and to a lesser extent in (R1) soil Types 6 and 7 in terrain units Qa16, Qa26 and in association with Type 8 soils in Qa2(7-8). The basis for the assessment of reactive soils is included in Appendix D.2.

Soil Salinity

Saline soils are those soils having significant levels of soluble salts within the soil profile. With changing hydrologic conditions, e.g. rising water-table following removal of trees from the site, soluble salts may move upwards in the profile into the higher and surficial soil horizons, with consequent impact on existing or re-vegetated areas. Increased potential for corrosion of steel and/or concrete products may also occur.

Soil salinity ratings for soils in each of the terrain units identified have been determined from indicative and laboratory test results based on electrical conductivity (EC) testing, the results of which are included in Appendix D.2. The criteria used to assess the potential effects of soil salinity are also included in Appendix D.2. The terrain units that include soils with medium to high or high salinity levels, locally in the shallow (B1) horizon but mainly in the deeper subsoil (B2 or B-C) soil horizons, include Qa16, Qa2(7-8) and Ks36.

Sodicity

Sodicity is the level of exchangeable sodium in the soil and is determined using the Exchangeable Sodium Percentage (ESP) which is the amount of exchangeable sodium expressed as a percentage of the Effective Cation Exchange Capacity (ECEC). General ratings for sodicity established by Northcote and Skene (1972) are provided in Appendix D.4. Sodic soils tend to exhibit the following problems:

- Severe surface crusting;
- Likely dispersion on wetting;
- Very low infiltration and hydraulic conductivity;
- Very hard dense subsoils;
- High susceptibility to severe gully erosion; and
- High susceptibility to tunnel erosion.

Based on laboratory testing previously undertaken for the AMC project site, 11 of 25 samples tested from within the project area were either sodic, strongly sodic, or very strongly sodic, in places in the upper B1 horizon, but mainly in the middle to lower B2 and B-C horizons. These sodic soils occur mainly in terrain units Qa16, Qa2(7-8) and Ks36.

Drainage Condition

Surface and subsurface drainage conditions have been assessed in Appendix D.2. The basis for the assessment of site drainage conditions, that is, whether well or excessively well-drained or if subject to flooding, surface water ponding and/or seasonally perched groundwater conditions, is provided in Appendix D.2. Terrain units susceptible to regular or periodic flooding or adverse drainage status include terrain units Qa04, the lower-lying parts of Qa26 and Qa2(7-8) and Qa16.

Soil Dispersion

Soils may be prone to dispersion when exposed and subjected to the ingress of water. The level of dispersion is related to the soil texture and the physical and chemical nature of the various soil horizons. In particular, high levels of exchangeable sodium (sodicity) can predispose soil layers to dispersion. Dispersive soils in particular, may be prone to severe sheet and gully erosion when exposed in cuttings or in excavations and when in contact with percolating groundwater or surface water runoff.

Indicative dispersion testing was carried out for all of the samples collected during the field reconnaissance survey, the results which are included in Appendix D.4. The testing procedure has been adapted from a method developed by Emerson and Seedsman (1981), and provides input to the assessment of erosion potential and effects when soils are subject to disturbance due to earthworks. Excluding the sandy and rocky soils, the majority of soil types that occur within the site may contain dispersive soil layers, in particular in terrain units which include soil Types 6, 7 and 8.

Based on the ratings for soil dispersion provided in Appendix D.2, approximately 41% of the area comprises soils that have slightly to moderately dispersive soil layers, 10% of the area has soils with moderately dispersive soil layers, only about 2% of the area (terrain unit Qa16) comprises highly dispersive soils, while the balance of the site (47%) consists of soils that are either non-dispersive or contain only very slightly dispersive soil layers. Adherence to drainage and erosion control measures discussed above will assist in minimising the erosion potential due to the occurrence of dispersive soils.

Excavation Conditions

The likelihood of encountering shallow occurrences of strong rock requiring rock breaking equipment or blasting for removal is provided in Appendix D.2 for each terrain unit. The basis for the assessment of excavation conditions is also included in Appendix D.2.

Soil Permeability

To provide an assessment of the suitability of the substrate materials as foundation soils for the construction of possible future waste water storage/treatment ponds, *in situ* soil permeability assessments are included together with the basis for the assessment in Appendix D.2. The estimates are based on visual classification of soil type together the results of indicative *in situ* permeability (standard infiltration) tests conducted at five sites investigated for the AMC project site (Dames & Moore, 1999).

3.3 Land Contamination

Summary

None of the Lots which either form part of the project area or are adjacent to the project area are listed on the Environmental Protection Agency's Contaminated Land Register. Lot 1/RP886588 is included on the Environmental Protection Agency's Environmental Management Register (EMR) as a notifiable activity for "Chemical Storage (other than petroleum products or oil)". This EMR entry was linked with the original single lot for the SPS, which was then sub-divided into the current land parcels. Therefore, none of the lots on which the Project is to be sited are affected by this entry.

The existence of several settlement ponds adjacent to the site on the SPS lots could be regarded as a potential source of contamination that may impact the project site.

3.3.1 Description of Environmental Values

This section summarises the results of a preliminary Stage 1 contaminated land assessment that was carried out over the project site. The aim of the assessment was to identify any land on the project site that had been contaminated by past uses. Full details of the assessment are provided in Appendix E. This section of the EIS also addresses the risk of future contamination, potential impacts, and mitigation measures designed to reduce and/or eliminate that risk where possible.

Environmental Protection Agency Registers

The project site comprises a number of land parcels (Table 3.3.1, below and Figure 3.4, presented in Section 3.4.1). Table 3.3.1 presents the results of searches of the Queensland Environmental Protection Agency's (EPA) Environmental Management Register (EMR) and the Contaminated Land Register (CLR) for the lots in question, as well as surrounding land parcels. The EMR, pursuant to section 374 of the *Environmental Protection Act 1994*, records land that has been used for a notifiable activity (i.e. a land use that may cause land contamination) as well as land that has been shown through investigation to be impacted by a hazardous contaminant. The CLR records land that, due to the presence of significant contamination, requires remediation to reduce health or environmental risk to acceptable levels.

Table 3.3.1 Description of Lots and Results of Register Searches

Lot Description	Proposed Works/Area	Owner	EMR	CLR
1/SP140242	Coke Plant area.	Stanwell Corporation Ltd.	Not Included	Not Included
1/SP140243	Coke stockpiles.	Stanwell Corporation Ltd.	Included	Not Included
44/SP140243	Coal stockpiles, and area adjacent to the south and west of the Project.	Stanwell Corporation Ltd.	Included	Not Included
214/P4047	Area adjacent to north of coke stockpile.	MacKay	Not Included	Not Included
218/P4047	Area adjacent to north of coke stockpile.	MacKay	Not Included	Not Included
2/RP614973	Area adjacent to north of coke stockpile.	Goldsworthy	Not Included	Not Included
1/RP886588	Area south-west of proposed Coke Plant.	Queensland Electricity Transmission Corporation	Included	Not Included

None of the Lots which either form part of the project area or are adjacent to the project area are listed on the CLR. Lots 1/SP140243 and 44/SP140243 are included on the EMR as a notifiable activity for "Chemical Storage (other than petroleum products or oil)". It is understood from discussions with the EPA that this refers to quantities of caustic soda (NaOH) and sulphuric acid (H_2SO_4), which are used in relation to the operation of SPS. SPS confirmed that these products were stored within SPS's chemical store. Lot 1/RP886588 is also included on the EMR as a notifiable activity for "Chemical Storage (other than petroleum products or oil)". The EPA confirmed that the EMR entry for this Lot was linked with the original single Lot for the SPS, which was then sub-divided into the current land parcels. Therefore, none of the Lots on which the Project is to be sited are affected by this entry.

Site History

The majority of the project site was historically used for grazing and agriculture (western half of Lot 1/SP140242 and the south-eastern corner of Lot 1/SP140243). In addition, parts of the site have been used as a schoolyard (northern end of Lot 1/SP140242), for storage and maintenance of construction plant (south-western corner of Lot 1/SP140242) and cleared and levelled for the former AMC foundation work (a portion of Lots 1/SP140242 and 1/SP140243).

The area proposed for the coal and coke stockpiles (Lot 1/SP140243 and an area in the north-western corner of Lot 44/SP140243) were also historically used for grazing. In the last few decades, a number of ponds including sludge ponds and dams were built on the site, some of which have been filled in with fill material. The northern portion of Lot 1/SP140243 is undeveloped and covered in bushland. The section of Lot 44/SP140243 that is proposed for the coal stockpile has been cleared, although when this occurred is unknown.

To the north of the project area, Lots 218/P4047 and 214/P4047 are indicated to be residential properties from the entries in the Historical Title database. Most of the infrastructure, including sewage plant belonging to SPS is located on Lot 44/SP140243. The eastern half of Lot 1/SP140242, adjacent to the

east of the project site and the land to the south of the site is bushland. Appendix E provides full details on the history of the project site.

Site Inspection

The Project site was inspected on 4 April 2005. Past land uses over the Lots identified as being within the project site or adjacent to the project site do not appear to have resulted in soil contamination on a large scale. Full detail of the site inspection is provided in Appendix E and potentially contaminated areas are briefly discussed below.

The area in the west of Lot 44/SP140243 where the coal stockpiles are to be located appears to have been raised approximately 3 to 5 m above the surrounding area in places, which suggests that fill material may have been used across the area to increase the elevation. It is understood that this material was excavated from the settlement ponds to the south.

The area adjacent to the south of the proposed coal stockpiles contained two coal stockpile settlement ponds which are believed to service the existing coal stockpile that belongs to SPS further to the south. It is expected that these ponds would naturally overflow in the area to the north, however, no record of these ponds overflowing was found. Several evaporation ponds were located on the eastern margin of Lot 44/SP140243, adjacent to the western boundary of the Project. These comprise part of the sewage treatment plant which services SPS. Once evaporated, sludge from these ponds is used for landscaping purposes on the SPS site, although this has been restricted to generally around the office/reception areas.

An area in the centre of the proposed project footprint contains much of the equipment and chemicals (cement aid) that were brought on to site for the former AMC development. Former foundation slabs from the AMC development are present across this area, on which have been stored equipment, several drums of fuel and several drums of cement aid. In addition, a small diesel tank had been kept on a skid in this area. Interviews with former AMC personnel revealed that an environmental management system was in place for the preparation work for the AMC project and that any spills that occurred were cleaned up promptly and detailed records kept.

To the north of this area, a small zone that was previously the construction workers mess area was present. This area is also known to contain buried cesspits/septic tanks. On the southern-most area of the project site, in an area where a large steel frame to support a building had been erected, additional drums of cement aid were noted to be stored on grated troughs. An area adjacent to the western margin of the project site on Lot 1/SP140242 was noted to be collecting runoff from a mound of fill/cleared land material. Two settlement ponds are present to the north of the former mess area and form a likely receptor for all surface runoff in this area.

Soil Testing

Four soil samples were collected from various locations across the site (Figure 3.2a) and tested for metals, organochlorine and organophosphorus pesticides, and selected organic compounds, including polynuclear aromatic hydrocarbons and petroleum hydrocarbons.

Sample AMC-ST1 was collected from soil at the location of a former diesel tank. Sample AMC-ST2 was collected from a hydrocarbon stained patch of soil nearby. Both samples were located in the area where most equipment has been stored from the former AMC development. Sample AMC-CH1 was collected from adjacent to stored drums of cement aid in the south of the former AMC development site, while sample AMC-SPS1 was collected from the western boundary of the former AMC site. Results of selected chemical analyses are presented in Tables 3.3.2 and 3.3.3 with full results in Appendix E.

Table 3.3.2 Laboratory Results for Metals

Metals (mg/kg)					
Parameter	**Criteria**	**Sample Number**			
		AMC-SPS1	**AMC-ST1**	**AMC-CH1**	**AMC-ST2**
Arsenic	20	6	6	6	5
Cadmium	3	<1	<1	<1	<1
Chromium	50	19	5	14	4
Copper	60	17	19	13	15
Lead	300	11	9	8	7
Nickel	60	9	7	8	6
Zinc	200	25	142	32	55
Mercury	1	<0.1	<0.1	<0.1	<0.1

Table 3.3.3 Laboratory Results for Total Petroleum Hydrocarbons (TPH)

Total Petroleum Hydrocarbons (TPH) (mg/kg)					
Parameter	**Criteria**	**Sample Number**			
		AMC-SPS1	**AMC-ST1**	**AMC-CH1**	**AMC-ST2**
C_6-C_9 Fraction	100	<2	<2	<2	<2
C_{10}-C_{14} Fraction	100	130	240	470	<50
C_{15}-C_{28} Fraction	1000	<100	3260	7270	<100
C_{28}-C_{36} Fraction	1000	<100	6060	450	<100

The other parameters that were analysed for included organochlorine pesticides, organophosphorus pesticides, polynuclear aromatic hydrocarbons and BTEX. The analysis showed no levels of these compounds in the soil above laboratory detection levels (Appendix E).

Metals Analyses

Results of the metal analyses have been compared to criteria for environmental investigation thresholds, as set out in the "Draft Guidelines for the Assessment and Management of Contaminated Land in

Queensland" (Queensland Department of Environment, 1998). All of the results were below the environmental investigation thresholds.

Organics Analyses

Samples AMC-ST1 and AMC-CH1 indicated elevated levels of TPH, which were higher than the environmental threshold identified by the guidelines (Queensland Department of Environment, 1998). These samples were collected from areas that were suspected to have been impacted by spills historically from either fuel tanks or chemical stores. The high TPH values would correlate with a spill of diesel or fuel oil, however, it appears from a visual examination of the site surface that any spill was localised. Results from the other samples collected were all below the relevant environmental investigation thresholds.

3.3.2 Potential Impacts and Mitigation Measures

The objectives of contamination management include the further assessment and management of known or unknown potential existing contaminated sites, and the minimisation and management of any potential contamination that may result from the Project. Potential construction and operational contamination sources/areas and potential impacts include the following:

- Coal stockpiles – potential for polluted runoff to contaminate land, surface water and groundwater;
- Diesel fuel storage tank(s) - potential for spills and hardstand runoff to contaminate land, surface water and groundwater;
- Oil and lubricants used in plant and vehicles - potential for spills and hardstand runoff to contaminate land, surface water and groundwater;
- Workshop areas - potential for hardstand runoff containing pollutants to contaminate land, surface water and groundwater;
- Chemical stores - potential for spills/leaks to contaminate land, surface water and groundwater;
- Waste disposal/storage areas – potential for spills/leaks and polluted hardstand runoff to contaminate land, surface water and groundwater; and
- Potentially contaminated fill – potential to contaminate ground if imported and used during construction works and potential to contaminate other soil, surface water and groundwater if excavated from site and inappropriately stored, removed or disposed of.

Mitigation and Management Measures

Based on the site inspection, a number of measures require to be implemented to manage any existing land contamination. During the construction phase, an investigation of the areas around the spills

identified above will be carried out. The existence of several settlement ponds adjacent to the site on the SPS lots could be regarded as a potential source of contamination that may impact the project site.

In terms of contamination resulting from the construction or operations of the Project, the aim is to have no spills or releases of contaminants to the environment. Detailed mitigation and management measures are provided in Section 16 - Environmental Management Plan. General measures that will be adopted include the following:

- When excavating, any existing potentially contaminated fill material and naturally occurring soils will be segregated and fill material will be analysed prior to removal from site. If contaminated soil is to be removed from site, the EPA regulations for waste transport and disposal will be followed. Any fill material to be imported for use during construction works shall be clean;
- Coal stockpiles, workshop areas, chemical stores, fuel tanks and waste disposal/storage areas will be located on hardstand or compacted soil. Contaminated runoff from these areas will be collected and remediated or disposed of in an approved manner;
- Relevant Australian Standards (e.g. for the storage and handling of flammable and combustible liquids and dangerous goods) will be complied with, and all chemical and fuel storage areas and other hardstand where potential contaminants are used will be bunded;
- Where possible, hazardous chemicals and materials will be replaced with less harmful alternatives. Material Safety Data Sheets (MSDSs) for chemicals used or brought onto sites will be kept in a central register on site and at the area of use and be readily available to workers at all times;
- Spills will be cleaned up immediately. For significant chemical or fuel spills, the Site Emergency Response Plan will be followed and the EPA and Fitzroy Shire Council notified as soon as possible;
- Detailed records will be kept of any activities or incidents that have the potential to result in land contamination. Records will be kept on an inventory that contains information on storage location, personnel training and disposal procedures for all chemicals, fuel and other potential contaminants used on site. Records will be maintained by the Environmental Representative and reviewed regularly. Regular inspections of containers, bund integrity, valves and storage and handling areas will be carried out; and
- All staff will be trained as part of their site induction in appropriate handling, storage and containment practices for chemicals, fuel and other potential contaminants as relevant.

3.4 Land Use and Tenure

Summary

The real property description of the project site is Lot 1/SP140242 and Lots 1 and 44/SP140243, County of Livingstone, Parish of Stanwell. These lots are held in freehold ownership by SCL. The rail spur re-

alignment is proposed to run through SCL-owned Lot 2/RP801218, privately owned freehold Lot 214/P4047 to the immediate north of the project site, and across the edge of Lot 161/LN2211 (unallocated State land) and Lot 2/RP614973 (privately owned freehold land), before merging with the existing east-west rail line. The Fisherman's Landing site is predominantly freehold (Lots 502/SP144781 and 102/SP 108926) with a small amount of leasehold (Lot 503/SP144788) leased to the Central Queensland Port Authority (CQPA).

The predominant land use in the Fitzroy Shire is agriculture. The project site within the SEP was significantly cleared for the former AMC project. The industrial area associated with SPS and railway loop infrastructure represent the dominant land use in the immediate area surrounding the site, with the timbered Flagstaff Hill and Stanwell Nature Refuge to the immediate east and south respectively. Approximately 1 km north of the project site is the village of Stanwell which comprises approximately 40 dwellings. A number of rural residences occur in the vicinity of the project site, particularly to the north (approximately 500 m) and west/south-west (approximately 1.3 km). There are no private dwellings in the close vicinity of the Fisherman's Landing wharf site, with the nearest residence being located approximately 1.8 km away. The Fisherman's Landing facility will be established on reclaimed land between the Cement Australia and Comalco wharves, and on disturbed land associated with the Cement Australia rail loop.

The SEP is designated under the Fitzroy Shire Planning Scheme, Gracemere-Stanwell Zone as Special Industry Precinct I (Fitzroy Shire Council, 2005), and is recognised as a major regional opportunity for large scale industry which has synergy with the SPS and potential to utilise the rail spur and other existing infrastructure. The Fisherman's Landing Wharf development is compatible with the Local Authority and Port Authority development plans for the locality and the Port of Gladstone.

The project site at Stanwell is within the boundaries of the registered Darumbal Native Title Claim QC97/21 and the Fisherman's Landing area is subject the Port Curtis Coral Coast Native Title Claim QC01/29. However, the land required for the Project is freehold and that required for the wharf facility is freehold and leasehold. Therefore, native title should not be an issue for the Coke and Power Plant infrastructure. The land required for the rail spur comprises both freehold and state land. Depending on the final route of the rail spur, native title may have to be dealt with by the provider of the rail infrastructure.

In terms of agricultural capability, the land proposed to be affected by the Project comprises approximately 26 ha (12.7%) of Class B land (Limited crop land). The Class B land is primarily that owned by SCL and not currently being used for agriculture. However, some of this land (that on private freehold Lot 214/P4047) is being used for cropping. Approximately 23.5 ha (17.8%) of Class C land (Pasture land) and 56.8 ha (19.7%) of Class D land (Non-agricultural land) is likely to be affected. None of this land is currently used for agricultural purposes.

The project footprint has been designed to fit as closely as possible into the area previously cleared under the AMC project and as closely as possible to the existing SPS to reduce potential impact. The Project will impose limited constraints on the future use of land in the Stanwell area. The post-operation land use cannot be definitively determined as this stage, however, since the Project will be developed in an

industrial area (SEP) it is likely that the hardstand would remain to allow for future development should the project infrastructure eventually be removed. The area to be developed at Fisherman's Landing is located within an existing port facility. Constraints on the future use of this area as a result of the Project will restrict the use of the area targeted for the coke handling facilities for other industries, although the development is in line with the intended use of the port facility.

3.4.1 Description of Environmental Values

Land Tenure

The project site is located in the Stanwell Energy Park (SEP) which occupies an approximate area of 3,800 hectares (ha) and is owned by Stanwell Corporation Ltd (SCL). The proposed site currently comprises land adjacent to the Stanwell Power Station (SPS). The real property description of the project site is Lot 1/SP140242 and Lots 1 and 44/SP140243, County of Livingstone, Parish of Stanwell. These lots are held in freehold ownership by SCL and cover a total area of approximately 1,411 ha. The Power Plant will be located on Lot 44/SP140243 and the Coke Plant and stockpile areas will occupy parts of Lot 1/SP140242 and Lots 1 and 44/SP140243 (Figure 3.4).

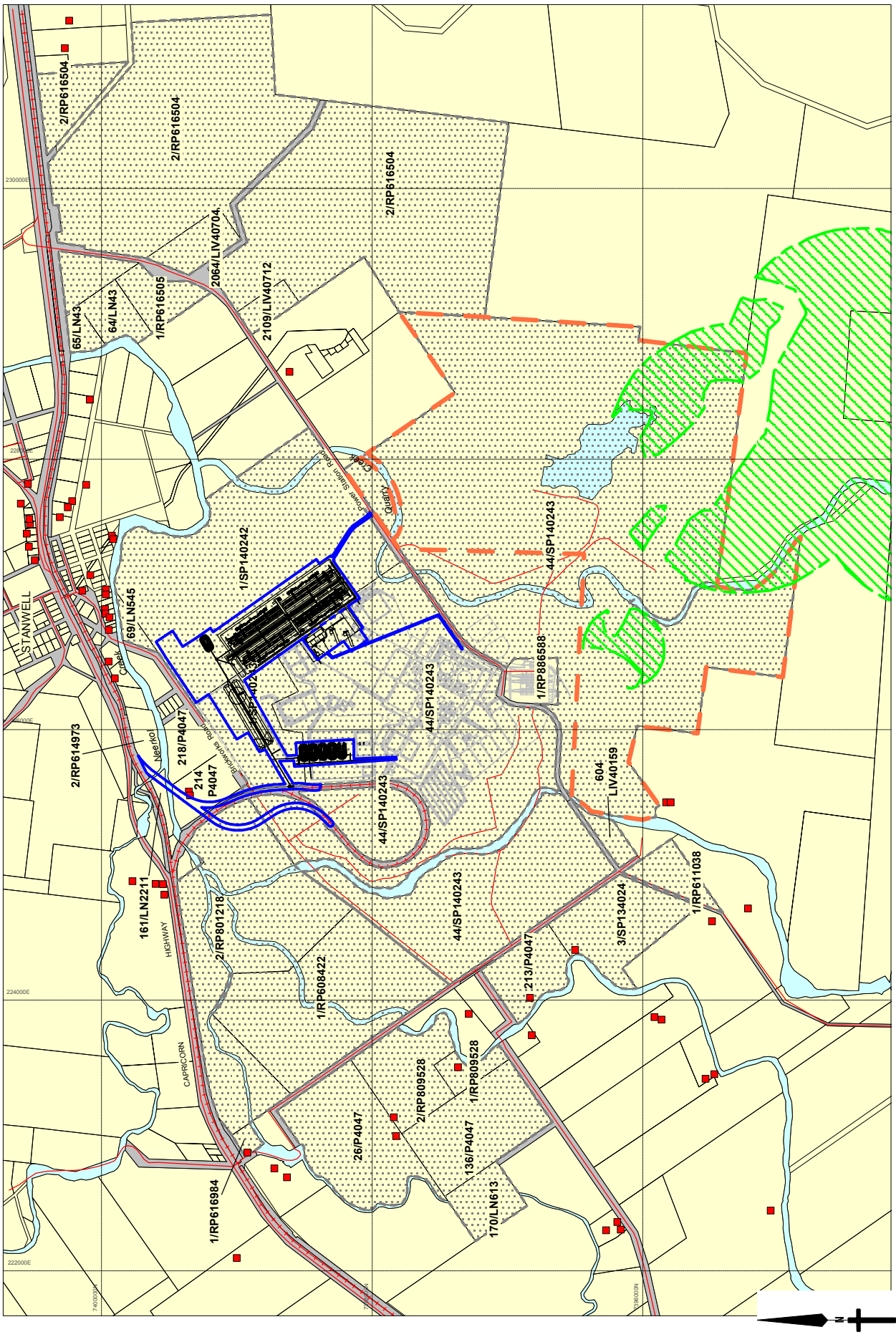
Historically, Lots 38 to 43 and 45/LIV4086, and Lot 2/RP886592 were combined to form Lot 1/SP140242. A lot previously described as 2/RP886592 has been divided into Lots 1 and 44/SP140243. The adjacent SPS occupies Lots 1 and 44/SP140243 and a small portion of Lot 2/RP801218, and covers an area of approximately 1,200 ha (Department of Natural Resources and Mines, 2005).

Most of the land surrounding the project area is freehold land owned by SCL. However, the land to the immediate north of the site is privately owned. The potential rail spur, which will be the responsibility of the rail infrastructure provider, runs through Lot 214/P4047 (privately owned freehold land) to the north of the project site between Brickworks Road and the Capricorn Highway. In addition, the rail spur will cross the edge of Lot 161/Crown Plan LN2211 (unallocated State land) and Lot 2/RP614973 (privately owned freehold land) before merging with the existing rail line (Department of Natural Resources and Mines, 2005).

The Fisherman's Landing Wharf site near Gladstone is predominantly freehold with a small amount of leasehold held by the Central Queensland Port Authority (CQPA). At this site it is proposed that a train unloader facility will occupy a small section of land described as Lot 101/SP108924, County of Deas Thompson, Parish of Targinie, owned by Cement Australia. A conveyor system, product stockpiles and stacker/reclaimer are proposed to be located to the west of the unloader facility on Lot 502/SP144781. The proposed berth for loading of coke product for shipping to overseas markets is Berth No. 3, located within Lot 503/SP144788 and between Berth No. 4 used by Cement Australia and Berth No. 2 designated for use by Comalco (Department of Natural Resources and Mines, 2005) (Figure 3.5).

Land Use

The predominant land use in the Fitzroy Shire is agriculture, primarily grazing (Cooperative Research Centre for Coastal Zone Estuary and Waterway Management, 2003). Like much of Fitzroy Shire, the



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**LAND TENURE AT STANWELL
AND SENSITIVE ENVIRONMENTAL AREAS**

Drawn: VH	Approved: JMcD	Date: 06-01-06	Figure: **3.4**
Job No: **42625626**	File No: 42625626-g-015d.wor		Rev: D
			A4

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Job No: 42625626 | Drawn: VH | Approved: JMcD | Date: 06-01-06 | File No: 42625626-g-019b.wor

Figure: 3.5

A4 | Rev: B

LAND TENURE AND PROJECT INFRASTRUCTURE AT FISHERMAN'S LANDING

312000E
314000E
7368000N
7366000N
2/RP608978
104 SP155862
102/SP108926
1/RP614356
137/FTY1831
101/SP108924
1/MPH35335
57/CP902700
1/RP614039
11/SP108408
1/SP144433
30/SP103898
31/SP103898
33/SP103898
32/SP103897
35/SP103899
502 SP144781
502/SP144781
500/SP120901
106/DS699
503/SP144788
BERTH NO. 5 BULK LIQUIDS BERTH
BERTH NO. 4 CEMENT AUSTRALIA
BERTH NO. 3 PROPOSED QCE
BERTH NO. 2 COMALCO
BERTH NO. 1 PROPOSED COMALCO
STACKER/RECLAIMER
SAMPLE STATION
SETTLEMENT/EVAPORATION POND
BREEZE SCREEN
BREEZE BIN
COKE STOCKPILES
POP-UP TRIPPER STATION
COMALCO
CONVEYOR
TRAIN UNLOADER
RAIL LOOP
CEMENT AUSTRALIA
CEMENT AUSTRALIA
PORT CURTIS
N
0 200 400m
Scale
Horizontal Datum GDA94 Zone 56

LEGEND

Property Boundaries | Railway | Road / Rail | 33/SP103898 Lot and Plan Numbers

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majority of flat to gently sloping land surrounding the SEP and Stanwell has been cleared and developed for grazing and other agricultural pursuits, including irrigated cropping (Fitzroy Basin Association, 2004a). Natural bushland has been cleared or modified in much of this area, with native vegetation remaining on the more steeply sloped areas occurring to the north-west and south-east of the site.

The majority of the lower lying areas within the SEP have also historically been selectively cleared and developed for grazing and other purposes. Sandstone quarrying occurs in the area with some gravel quarrying having occurred in the past. Development of the more elevated portion of the SEP at Flagstaff Hill has been restricted by steep topography and the presence of vine thicket vegetation. This area is currently retained in a predominantly natural condition. The existing land use in the area surrounding the project site is shown in Figures 3.6 and 3.7.

The specific areas proposed for the Project within the SEP (Lot 1/SP140242 and Lots 1 and 44/SP140243) were significantly cleared for the former AMC project (Dames & Moore, 1999). It is intended that the Project will be located to the north-east of, and in close proximity to, the existing SPS SPS between Brickworks Road and Power Station Road. The industrial area associated with the SPS and railway loop infrastructure represent the dominant land use in the immediate area surrounding the site. The Stanwell Nature Refuge occupies an area to the immediate south of the project site, and this remains in an undeveloped condition (Department of Natural Resources and Mines, 2004a).

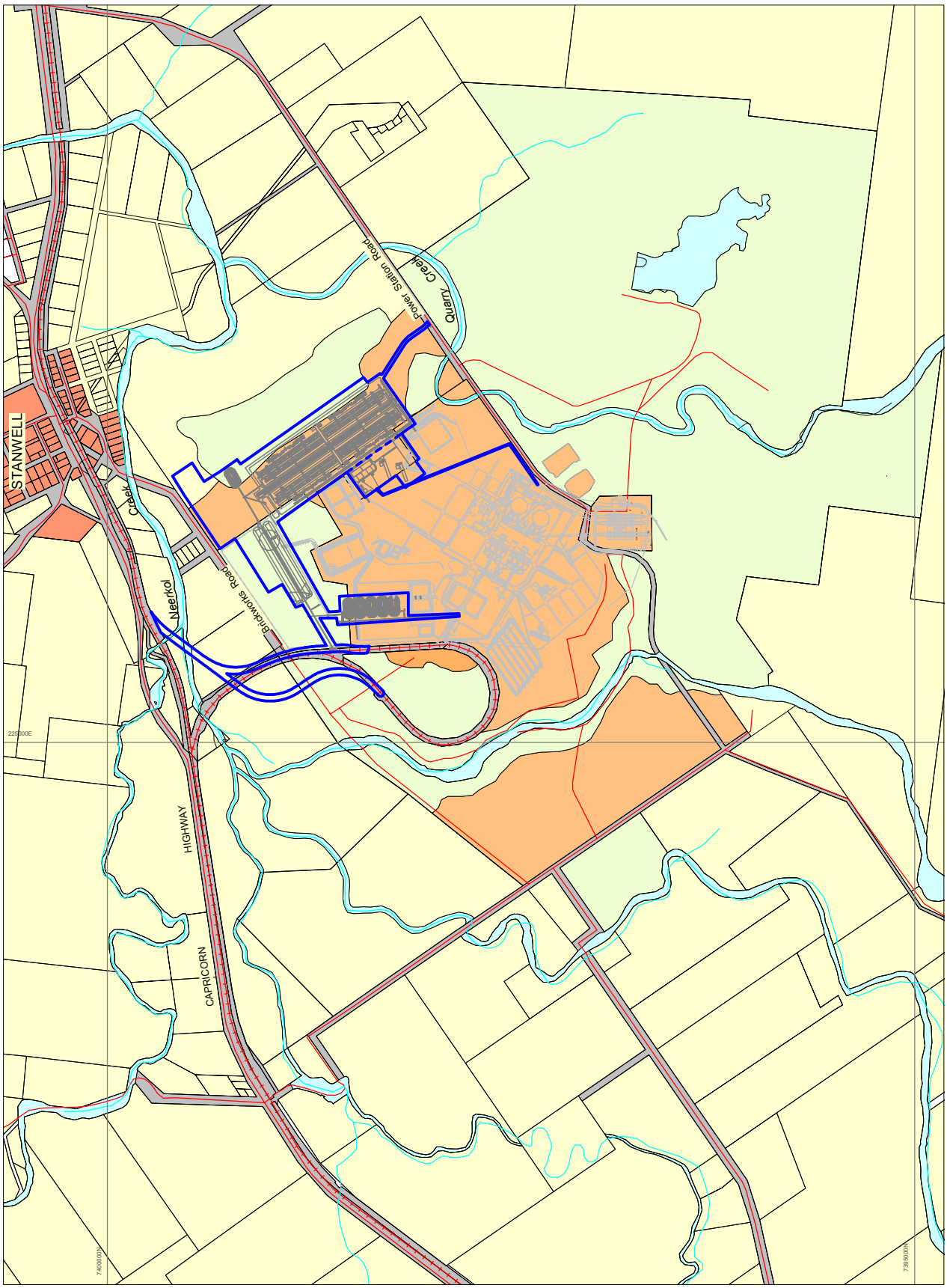
As discussed above, the majority of the Project (approximately 59 ha) will be situated on land previously cleared for the AMC project (Dames & Moore, 1999; Department of Natural Resources and Mines, 2004a). To the immediate east of this area is vegetated land abutting Flagstaff Hill. Approximately 6.10 ha of woodland and 6.07 ha of grassland in this area will be required to allow for the full footprint of the Project. This area will also require approximately 5 ha of *Eucalyptus crebra* woodland/open woodland to be removed. Section 6 - Nature Conservation provides further details of the vegetation to be impacted.

Areas for coal and coke loading and unloading associated with the Project will be located in the vicinity of the existing rail loop and coal unloading facilities on Lots 1 and 44/SP140243. Approximately 19.12 ha of the woodland on Lot 1/SP140243 will require to be cleared for the coke stockpile areas. The southern coal stockpile area will be located primarily on cleared land currently used by the SPS to the immediate east of the rail loop.

To the immediate north of the SEP, the land is used for agriculture and includes rural residences. The rail spur construction will result in the loss of approximately 10.47 ha, including modified pastoral grassland currently used for agriculture and riparian habitat along Neerkol Creek, to the north of Lot 214/P4047. Assessment of the impact of the rail spur will be undertaken by the rail infrastructure providers.

Approximately 1 km further north of the project site is the village of Stanwell. The village consists of approximately 40 dwellings and associated facilities which are centred along the Capricorn Highway and associated railway line. Facilities in Stanwell include a community hall, primary school, shop, sporting club and showground.

The proposed port site at Fisherman's Landing is to be a new multi-user wharf export facility established on reclaimed land between the Cement Australia and Comalco wharves, and on disturbed land associated



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LAND USE

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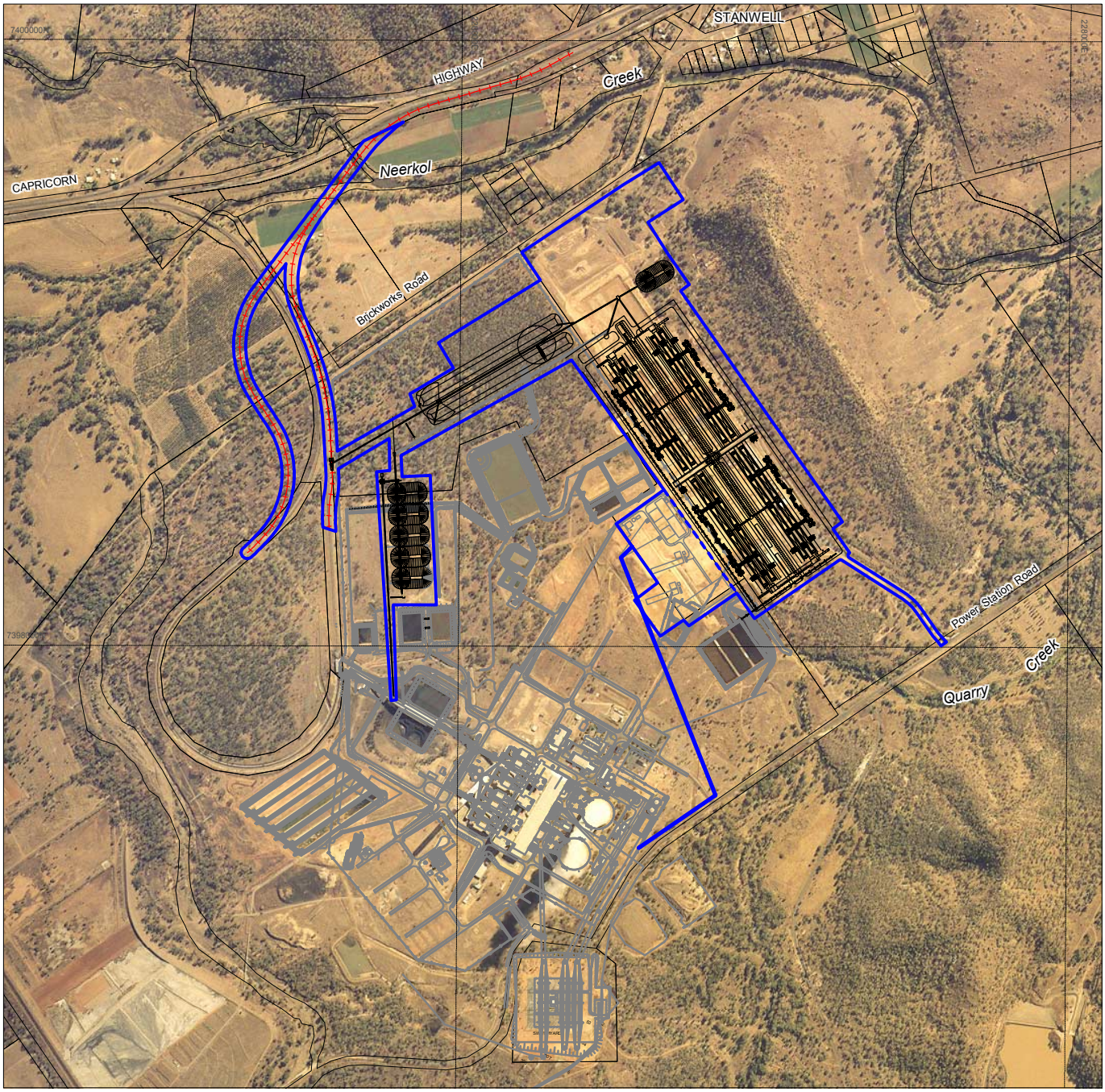
Job No: **42625626**	File No: 42625626-g-011d.wor		Rev: D **A4**



LEGEND

- Proposed Development Footprint
- Proposed Coke and Power Plant
- Existing Stanwell Power Station
- Cadastral Boundaries
- Proposed Railway

N

0 250m 500m

Scale 1:20 000 (A4)

Horizontal Datum GDA94 Zone 56

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QUEENSLAND COKE AND POWER PLANT PROJECT ENVIRONMENTAL IMPACT STATEMENT

AERIAL PHOTO SHOWING LAND USES AND PROJECT FOOTPRINT

Drawn: LL	Approved: JMcD	Date: 06-01-06	Figure: **3.7**	Rev:C
Job No: **42625626**	File No: 42625626-g-012c.wor			**A4**

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with the Cement Australia rail loop. The area of land surrounding the proposed wharf is proposed to continue to be developed as part of the Port of Gladstone.

Location of Dwellings

As discussed above, the village of Stanwell is located approximately 1 km to the north of the SEP. The village consists of approximately 40 dwellings and associated facilities which are centred along the Capricorn Highway and associated railway line, with the density of dwellings becoming increasingly dispersed with distance from the village centre.

Several structures, comprising two houses and two sheds, line Brickworks Road along the northern boundary of the project site. Historically, these properties have been associated with more intensive agricultural uses on alluvial areas adjacent to Neerkol Creek. These structures are unoccupied and are situated on freehold land owned by SCL which forms part of the SEP.

A rural dwelling in close vicinity to the proposed rail spur is situated on Lot 214/P4047. This property is currently occupied on a tenancy basis. As the location proposed for the rail spur will have some impact on this property, the rail infrastructure provider and the proponents will address these impacts with the landowner during the development approvals process for the rail spur. The nearest residences to the Project are indicated in Figure 3.4.

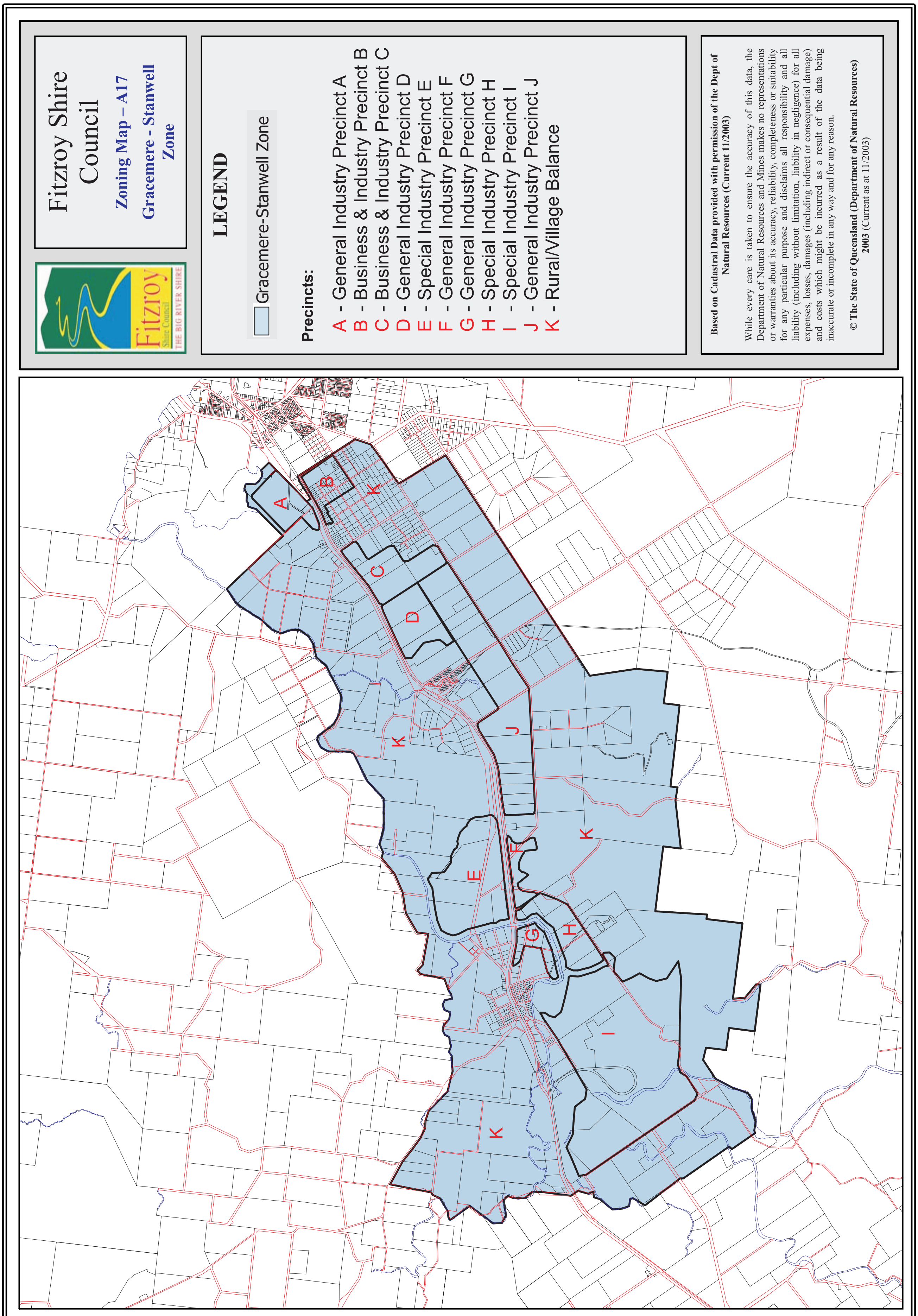
There are two dwellings located approximately 1.8 km and 2.3 km to the south of the proposed rail unloading facility at Fisherman's Landing, along Fisherman's road. The operations associated with the Project are minor in comparison to existing activities undertaken at the Fisherman's landing site and additional impacts arising from project activities are not expected to be significant.

Land Classification and Zoning

The relevant local planning instrument governing the development of the project site is the Fitzroy Shire Planning Scheme which took affect on 5 December 2005 (Fitzroy Shire Council, 2005). The planning scheme complies with the requirements of the *Integrated Planning Act 1997*.

In the planning scheme, the project area is located within the Gracemere-Stanwell Zone, Special Industry Precinct I. Much of the land in the SEP is similarly zoned (Fitzroy Shire Council, 2005) (Figure 3.8). The overall outcomes planned for Special Industry Precinct I include large scale industrial uses of regional significance which have some synergy with the SPS and which may require larger separation distances to sensitive land uses. The development of the Project at the site would constitute a regionally significant industry and is considered to generally be consistent with future intentions for development in the area.

Most of the area surrounding Special Industry Precinct I is designated Rural/Village Balance Precinct K in the planning scheme and is predominantly used for cattle grazing. The township of Stanwell also falls within this zoning. The outcomes planned for this area include the maintenance of existing land uses including the integrity of Stanwell village and agricultural pursuits on larger lots (Fitzroy Shire Council, 2005). Apart from the development of the proposed rail spur which will be aligned through Lots



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TOWN PLANNING SCHEME ZONING (FITZROY SHIRE PLANNING SCHEME 2005)

Drawn: VH	Approved: JMcD	Date: 06-01-06	Figure: **3.8**	Rev. B
Job No.: **42625626**	File No. 42625626-g-016b.cdr			A4

214/P4047, 161/LN2211 and 2/RP614973, there will be no direct land use impacts from the Project on land zoned Rural/Village Precinct K.

To the south of the project site is an extensive wooded area gazetted as the Stanwell Nature Refuge. It occupies approximately 621 ha and is also zoned Rural/Village Balance Precinct K (Queensland Department of Environment, 1996; Fitzroy Shire Council, 2005) (Figures 3.6 and 3.8). There will be no direct land use impacts from the Project on this area.

Within the Fitzroy region, the "Central Queensland Strategy for Sustainability - 2004 and Beyond: (CQSS) (Fitzroy Basin Association, 2004) has recently been developed as part of the Central Queensland – A New Millennium joint initiative, bringing together governments at all levels and the community to create a framework to guide the future growth and development of the Central Queensland region. The CQSS is the regional plan for the management of the natural resources and environments of the river catchments of the Central Queensland region. Whilst the plan does not have the statutory backing of local government planning schemes, it seeks to protect the region's assets through addressing key pressures. The CQSS outlines a number of targets and indicators to be followed in managing individual components of the social and natural environment, to ensure development projects in the region are sustainable. This plan will be adopted where relevant in development of the Project.

As discussed above, the land at Fisherman's Landing wharf to be developed is on a small area of freehold land, owned by CQPA and Cement Australia, and leasehold, leased by the CQPA from the State.

Native Title Claims

The project site is within the boundaries of the registered Darumbal native title claim, lodged on 27 June 1997 (QC97/21). The claim is active and is currently in mediation. The area covered by the claim approximates 52,377 km^2, extending from the mouth of Raglan Creek to the Mount Morgan Range, along Tooloombah Creek and the Styx River to the outer extremity of the Great Barrier Reef. The claim falls in the boundaries of Banana, Broadsound, Fitzroy and Livingstone Shire Councils and Rockhampton City Council. The Gurang Land Council Aboriginal Corporation represents the Darumbal people (National Native Title Tribunal, 2005).

In addition, approximately 50 km north-west of the project area is the Darumbal native title claim, QC99/1. The area of this claim extends across the western boundary of Claim QC97/21 and does not impact on any of the proposed project site (National Native Title Tribunal, 2005).

Most of the Crown Land in the Fitzroy Shire region is under native title claim, however, the land required for the Coke and Power Plant infrastructure is freehold and therefore native title rights over the area have been extinguished pursuant to the *Native Title Act 1993.* Lot 161/LN2211, over which a portion of the rail spur may be developed, is Unallocated State Land on which native title may exist. Depending on the final route of the rail spur, native title may have to be dealt with by the provider of the rail infrastructure. The Fisherman's Landing Wharf area is subject the Port Curtis Coral Coast Native Title claim (QC01/29), however, the land required for the project infrastructure is freehold (Lot 502/SP144781 and Lot 102/SP108926) and State land leased to CQPA (Lot 503/SP144788), where native title has been extinguished or is inconsistent with the rights of the lessees.

Land with Special Purposes

There is no land with special purposes in the project area other than that zoned as Special Industry Precinct I discussed above.

Areas of Conservation Value and Marine Areas

Areas of conservation value and marine areas are discussed in Section 3.6 below.

Land Use Suitability

The assessment of land use suitability for the site of the proposed Project has indicated that, in terms of agricultural land capability, within the area that may be disturbed, some small areas along the proposed railway alignment are suitable for cropping. The remainder of the area is mainly suitable for grazing on improved or native pasture.

An assessment of the agricultural land capability of the area was conducted to provide a benchmark of existing/potential agricultural land use. As required by the Project Terms of Reference, in accordance with State Planning Policy 1/92 "Development and the Conservation of Agricultural Land", the assessment has been based on the four class system for defining Good Quality Agricultural Land as detailed in the "Planning Guidelines for the Identification of Good Quality Agricultural Land" (Department of Primary Industries (DPI) and Department of Housing and Local Government and Planning (DHLGP), 1993) as summarised below:

- *Class A*: Crop Land – land suitable for current and potential crops with limitations to production which range from nil to moderate levels;
- *Class B:* Limited Crop Land – land that is marginal for current and potential crops due to severe limitations, but is suitable for pastures. Engineering and/or agronomic improvements may be required before the land is considered suitable for sustainable cropping/cultivation;
- *Class C:* Pasture land – land suitable for improved or native pastures due to limitations which preclude continuous cultivation for crop production. Some areas may tolerate a short period of ground disturbance for pasture establishment; and
- *Class D*: Non-agricultural Land - land not suitable for agricultural uses due to extreme limitations. This may comprise undisturbed land with significant habitat, conservation and/or catchment values, or land that may be unsuitable because of very steep slopes, shallow soils, rock outcrop or poor drainage.

In order to determine the appropriate agricultural land class, terrain units identified within the project area have been evaluated for Land Suitability for dryland (rainfed) cropping. The soil and landform limitations criteria on which the land suitability classifications have been determined are based on the "Guidelines for Agricultural Land Evaluation in Queensland" published by the Department of Primary Industries (1990), modified to some extent by inclusion of criteria proposed by Schields and Williams (1991).

The system of classification is generally based on the identification of physical and chemical limiting factors or constraints applied to specific land uses by adopting the following format:

- *Class 1*: High quality land with few or very minor limitations for the intended land use;
- *Class 2*: Land with minor limitations for the intended land use;
- *Class 3*: Land with moderate limitations to sustaining the intended land use;
- *Class 4*: Marginal land requiring major inputs to sustain the intended land use; and
- *Class 5*: Unsuitable land due to extreme limitations for the intended land use.

For the terrain units identified within the project area (refer Section 3.2), the land suitability assessment for dryland cropping, from which the agricultural land capability classes have been assessed, are included in Appendix D.5. The agricultural land classes determined are shown in Figure 3.9.

Table 3.4.1 summarises the agricultural land capability of the land within the project area as a whole, as well as the respective areas of the agricultural land classes that may be affected within the proposed development footprint.

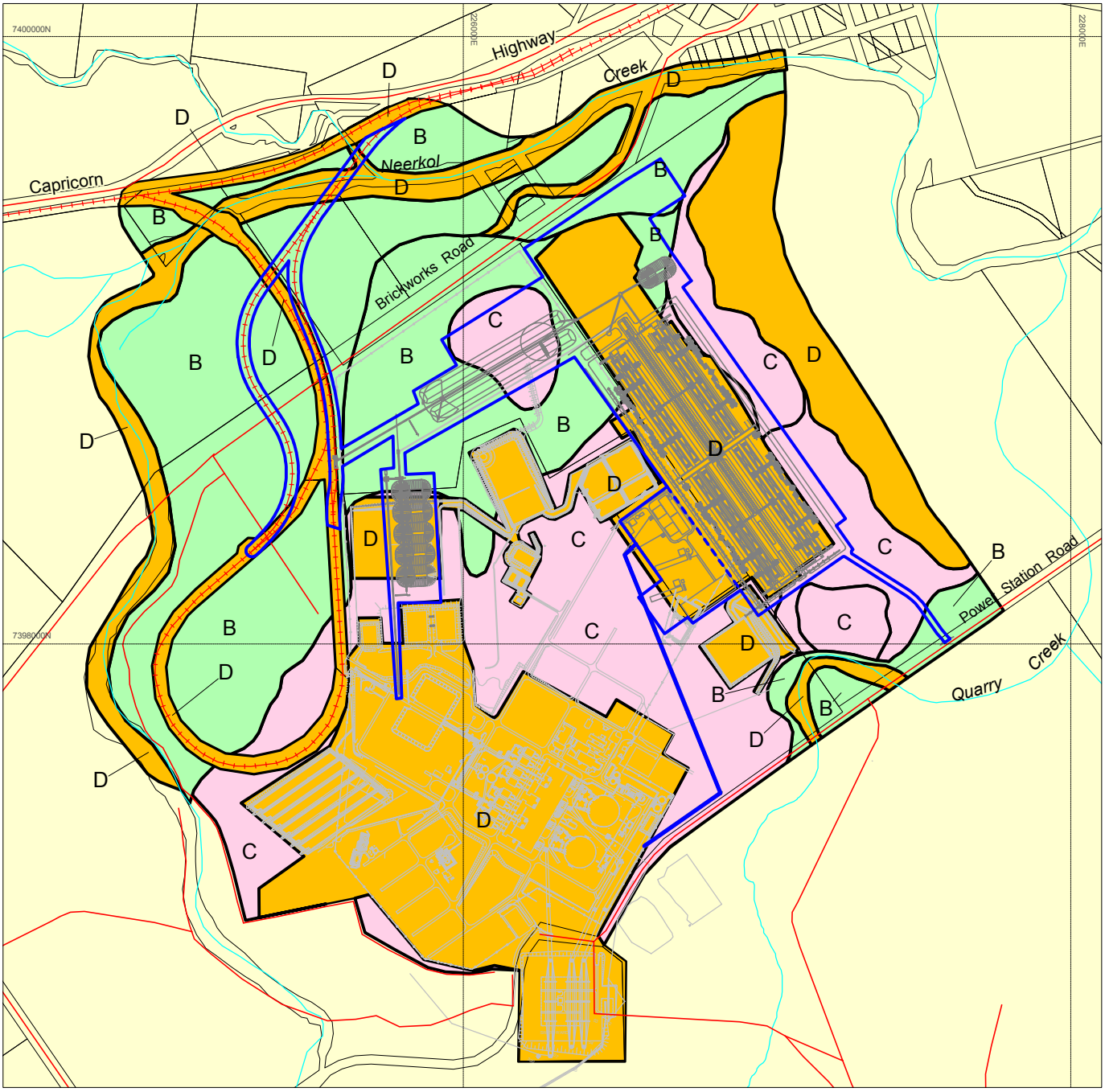
Table 3.4.1 Agricultural Land Class Affected by Project

Agricultural Land Class	Total Area of Agricultural Land Class (ha)	Area of Agricultural Land Class Affected by Project Footprint (ha)	Percentage of Agricultural Land Class Affected by Project Footprint (%)
Class A	Nil	Nil	Nil
Class B	205	26	12.7
Class C	132.5	23.5	17.8
Class D	288.5	56.8	19.7

The project area as mapped includes a total land area of 626 ha. Based on the cumulative areas of the terrain units described in Appendix D.2 and the corresponding agricultural land classes determined, a summary of the results of the land capability assessment is as follows:

- There is no Class A land within the project area as mapped;
- Class B land comprises approximately 205 ha (32.7%) of the project area;
- Class C land comprises approximately 132.5 ha (21.2%) of the project area; and
- Class D land comprises approximately 288.5 ha (46.1%) of the project area.

The land affected by the currently proposed project footprint comprises approximately 26 ha (12.7%) of the Class B land primarily along the proposed railway corridor and in the general vicinity of the western end of the coke stockpile and conveyor area. The Class B land is primarily that owned by SCL and not currently being used for agriculture. However, some of this land (that on Lot 214/P4047) is privately



LEGEND

A	Crop Land - land suitable for crops with nil to moderate levels of limitations.
B	Limited crop land - land that is marginal for crops due to severe limitations and suitable for pastures. Engineering and/or agronomic improvements may be required before the land is suitable for cropping.
C	Pasture land - land suitable only for improved or native pastures, continuous cultivation precluded, but some areas may tolerate short periods of ground disturbance for pasture establishment.
D	Non-agricultural land - land not suitable for agricultural uses due to extreme limitations including steep slopes, shallow rocky soils, poor drainage, water courses or existing industrial developments.

N

0 500m 1000m

Scale 1:20 000 (A4)

Horizontal Datum GDA94 Zone 56

Proposed Development Footprint
Proposed Coke and Power Plant
Existing Stanwell Power Station
Property Boundaries
Creek
Road
Railway

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AND POWER PLANT PROJECT
ENVIRONMENTAL IMPACT STATEMENT

AGRICULTURAL LAND CLASSES

Drawn: LL	Approved: JMcD	Date: 06-01-06	Figure: **3.9**
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owned and is being used for cropping. Elsewhere within the development footprint, there is approximately 23.5 ha (17.8%) of the Class C land and 56.8 ha (19.7%) of the Class D land likely to be affected. None of this land is currently used for agricultural purposes.

3.4.2 Potential Impacts and Mitigation Measures

In terms of land use, minimisation of the impacts of the Project on good quality agricultural land and native vegetation is the primary objective. Design of the Project aims to achieve this as discussed below. In addition, objectives to minimise and mitigate impact from the Project on land use values are detailed in the Environmental Management Plan.

Incompatible Land Uses

The Project is proposed to be constructed on land set aside for industrial development and the proposed land use is compatible with the land's zoning. However, the area to the immediate north of the project site is currently used for agriculture and zoned as Rural/Village Balance Precinct K. The proposed rail infrastructure associated with the Project is incompatible with the current land uses.

There is potential for air emissions from the Coke Plant and the SPS to impact on the Stanwell Nature Refuge and Essential Habitat Area to the south of the Project. The potential impacts are discussed further in Section 6 – Nature Conservation.

The Fisherman's Landing Wharf development is compatible with the Local Authority and Port Authority development plans for the locality and the Port of Gladstone.

Future Land Use Implications

The Project will impose limited constraints on the future use of land in the Stanwell area. The majority of the area proposed for the Project has been cleared for previously proposed industrial development. The area is recognised in the "Fitzroy Shire Planning Scheme" (Fitzroy Shire Council, 2005) as representing a significant regional opportunity for large scale industry and is considered to be generally consistent with future intentions for development in the area.

The total loss of approximately 8.45 ha of Class B land agricultural land as a direct result of the rail spur will have minimal, if any, broader future land use implications, considering the predominantly rural nature and extent of agricultural use of land in the region. However, the impact of severance of Lot 214/P4047 will result in 2.8 ha of land currently used for cropping in the north-west corner of the lot being isolated from the remainder of that lot. Approximately 2.1 ha of land currently used for agriculture on Lot 214/P4047 will be lost to the spur alignment. A small area of land (less than 1 ha) will also be lost from Lot 2/RP614973 (privately owned freehold land). Negotiations for provision of access to the severed land or acquisition of the land will be held between the rail infrastructure provider and the occupier, should the Project proceed.

The construction of the rail crossing at Neerkol Creek and tributary and the loss of approximately 0.74 ha of riparian vegetation will not impose significant constraints on any future land use, considering the size of the area to be impacted. The future availability of the rail infrastructure will however, increase the feasibility of future development in the SEP in accordance with the planning scheme.

The Project will not restrict the future use of parts of the SEP for industrial, conservation or agricultural purposes. The alignment of the Project to be as close to the SPS as possible will result in an extensive area to the east of the project site (including Flagstaff Hill) being available for use for habitat enhancement and/or grazing purposes.

The area to be developed for the Fisherman's Landing Wharf is located within an already existing port facility and in the vicinity of the existing Cement Australia rail loop. Constraints on the future use of this area as a result of the Project will restrict the use of the area targeted for the coke handling facilities for other industries although the development is in line with the intended use of the port facility.

Post-Operational Land Use

The post-operation land use of the project area cannot be definitively determined at this stage of the project planning. Since the Project will be developed in an industrial area, it is likely that the hardstand would remain to allow for future development should the project infrastructure eventually be removed. As mentioned above, it is also likely that the proposed rail infrastructure would also remain for future development. On cessation of use of the Project, the site would likely be classified as a contaminated site. This would limit the post-operation land use possibilities for the area. It is likely the Fisherman's Landing Wharf would continue to be used as such by commercial and industrial ventures in the future.

Mitigation Measures

The footprint of the Project has been designed to fit as closely as possible into the area previously cleared under the AMC project and as closely as possible to the existing SPS to reduce the length of services connections and conveyors. This indirectly has reduced the need to extend the Project to the east and has limited the potential impact on the surrounding vegetation, including that on the lower slopes of Flagstaff Hill. Similarly, the alignment of the rail spur aims to reduce the impact on the agricultural land on Lots 214 and 218/P4047, Lot 2/RP614973 and Neerkol Creek. The riparian ecosystem that will be disturbed by the construction of the rail spur is proposed to be restabilised and revegetated with local species. This component of the Project will be undertaken through the development approvals process for the rail spur.

3.5 Infrastructure

There are no reserves, road reserves railways or rail reserves covering the land to be affected by the Project. In addition, there are no easements on land that will be affected by the Project at either Fisherman's Landing or at the Stanwell site. Transport infrastructure is discussed in Section 3.12 of this EIS as are easements over land adjacent to the Project that will not be impacted. Figures 1.2 and 3.13 present the infrastructure to be constructed for the Project. The impact on environmental values of the project infrastructure is discussed in Sections 4 to 12 of this EIS.

3.6 Sensitive Environmental Areas

Summary

Project Site

The are no National Parks, Conservation Parks, State Forests or other reserves in the immediate vicinity of the project site. Locally, the gazetted Stanwell Nature Refuge lies to the south of the site in the designated Rural/Village Balance Precinct K (Fitzroy Shire Council, 2005). Approximately 1 km to the south of the site is an area of Essential Habitat for *Cycas megacarpa*, with a number of other protected species occurring in the area. The project site is not located within or near a Ramsar Wetland and is located approximately 15 km south-west of the Gracemere Lagoons.

Fisherman's Landing

There are a number of protected areas and national estates near Fisherman's Landing, including Mackay Capricorn National and Marine Parks, the Great Barrier Reef Marine Park and World Heritage Area, Joint Coastal Marine Park and Curtis Island National Park. Most of these areas are located well away from the port facility. Port Curtis (including Fisherman's Landing Wharf) lie outside the Joint Coastal Marine Park and the Great Barrier Reef Marine Park. However, all of the Port waters below mean low water mark lie within the Great Barrier Reef World Heritage Area. No construction within the Great Barrier Reef World Heritage Area will be undertaken as part of the Project. A number of Habitat Protection Zones are located near Port Curtis. In addition, Port Curtis is listed in the Directory of Important Wetlands in Australia and occupies an area of approximately 31,264 ha.

The activities at the wharf will be conducted in accordance with CQPA's Environmental Authority which authorises a number of activities conducted in accordance with conditions set by the Environmental Protection Agency, including stockpiling, loading or unloading goods in bulk at, and regulated waste transport from and to, Fisherman's Landing. It is anticipated that compliance with the conditions and implementation of surface water management and dust mitigation measures will result in minimal impact of the Project on the aquatic reserves, wetlands and declared fish habitat areas.

3.6.1 Protected Areas and National Estate

The are no National Parks, Conservation Parks, State Forests or other reserves in the immediate vicinity of the Project (Environmental Protection Agency (EPA) and Queensland Parks and Wildlife Service, (QPWS), 2005). The nearest State Forests and Reserves are Stuart Creek State Forest located approximately 10.5 km to the north-west of the SEP, State Forest No. 871 located approximately 11.5 km north-west of Stanwell (1,255 ha), State Forest No. 878 located approximately 27.5 km north-west of Stanwell (842 ha), Bouldercombe Gorge Resources Reserve located approximately 16 km south-east of the SEP and Bouldercombe State Forest located roughly 17 km to the east of the site. There will be no land characteristic impacts on any of these areas as a result of the Project.

Locally, the gazetted Stanwell Nature Refuge lies to the south of the project site in the Rural/Village Balance Precinct K zone designated under the Fitzroy Shire Planning Scheme (Fitzroy Shire Council, 2005). This refuge provides for conservation, visual amenity and buffering purposes. Also approximately 1 km to the south of the SEP is a wooded hilly area identified as Essential Habitat (Queensland Government, 2005) by the EPA for wildlife listed as endangered, vulnerable, near threatened or rare under the *Nature Conservation Act 1992*. The species identified as located in this wooded hilly area is *Cycas megacarpa* (EPA, 2005). A number of other protected species occur in the area surrounding the Project, including *Capparis humistrata, Eucalyptus raveretiana* and *Paradelma orientalis* (Section 6 - Nature Conservation). The Essential Habitat area extends approximately 5 km to the south of the SEP (Queensland Government, 2005) (Figure 3.4). The Gracemere Lagoons are located approximately 15 km north-east of Stanwell. The project will have no impact on this area.

There is potential for air emissions from the Coke Plant and the SPS to impact on the Stanwell Nature Refuge and Essential Habitat Area. A number of exceedances of the goals for sulphur dioxide (SO_2) and nitrogen dioxide (NO_2) specified in the *Environmental Protection (Air) Policy 1997* for biological integrity have been modelled under worst case conditions as occurring when the emissions from the Coke Plant and existing SPS are combined. Coke Plant emissions of SO_2 and NO_2, when considered independently of the SPS, do not exceed these goals. The potential impacts are discussed further in Section 6 – Nature Conservation.

In the region of the Fisherman's Landing port facility there are a number of protected areas and national estates including Mackay Capricorn National and Marine Parks, a number of State Forests, the Great Barrier Reef Marine Park and World Heritage Area, Joint Coastal Marine Park and Curtis Island National Park. With the exception of the Joint Coastal, Mackay Capricorn and Great Barrier Reef Marine Parks, all of these areas are located well away from the port facility and will not be impacted upon by the Project.

Port Curtis and Fisherman's Landing Wharf within Port Curtis, lie outside the Joint Coastal Marine Park and the Great Barrier Reef Marine Park. However, all of the Port waters below mean low water mark lie within the Great Barrier Reef World Heritage Area. No construction within the Great Barrier Reef World Heritage Area will be undertaken as part of the Project. However, much of the shipping transporting the coke product produced at Stanwell will traverse the Great Barrier Reef, although shipping will be along established channels. The impact of this additional shipping traffic is likely to be minor and incremental in nature and is not considered significant.

3.6.2 Wildlife Corridors and Wilderness Areas

The project site is located within a vegetated corridor associated with the hills in the Fitzroy Shire region. These hills retain much of their original open forest cover and provide an important north-south link, connecting State Forest No. 871 and No. 878 to the north with core habitat areas to the south of Stanwell (i.e., the Essential Habitat area discussed above) and south of Mt Morgan. They also connect numerous disjunct patches of closed forest (Figures 3.6 and 3.7). However, there are no State Wildlife Corridors in the project area. There will be no impact from the Project on designated wildlife corridors or wilderness areas.

3.6.3 Sites Subject to Treaty

The project site at SEP is not located within or near a Ramsar Wetland. However, the site is located in the Fitzroy River catchment which drains to the Pacific Ocean approximately 60 km south of the Corio Bay area and 100 km south of the Shoalwater Bay area. The Shoalwater and Corio Bay area is an internationally significant Ramsar site, number 792. Twenty-six known bird species protected by the Japan Australia Migratory Bird Agreement (JAMBA) and 27 known species listed under the China Australia Migratory Bird Agreement (CAMBA) visit the area (Fitzroy Basin Association, 2004a). The Project will not impact the Ramsar area. There are no other sites subject to treaty in the vicinity of the Project or Fisherman's Landing Wharf.

3.6.4 Aquatic Reserves and Declared Fish Habitat Areas

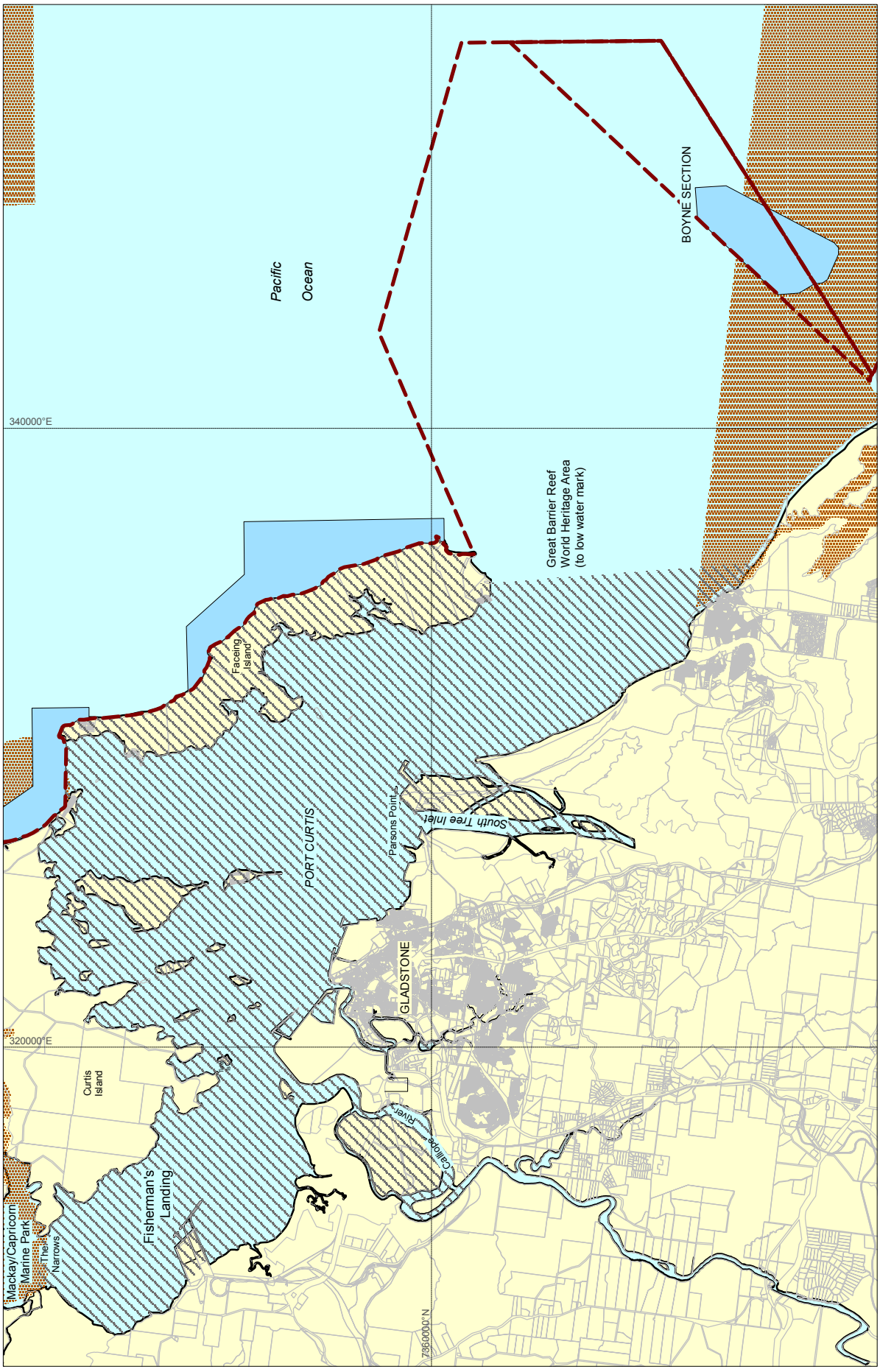
There are no declared Fish Habitat Areas (FHAs) in the vicinity of the proposed project site at Stanwell. The nearest FHAs to the project site are at Corio Bay at Yeppoon (north of Rockhampton) and Cawarral Creek near Emu Park (south-east of Rockhampton) (Department of Primary Industries and Fisheries, 2005).

There are no declared FHAs in the vicinity of the Fisherman's Landing Wharf (Department of Primary Industries and Fisheries, 2005). However, a number of Habitat Protection Zones (HPZ) are located near Port Curtis. These comprise the HPZ at Seal Rocks on the southern boundary of the Port Curtis shipping channel (approximately 20 km from Fisherman's Landing) and the HPZ on the eastern side of Facing Island (approximately 10 km from Fisherman's Landing).

In addition, there is a Species Conservation (Dugong Protection) Boundary to the immediate south of Port Curtis at Rodds Bay, approximately 20 km from the Fisherman's Landing Wharf (EPA and QPWS, 2005a). The Rodds Bay Dugong Sanctuary extends from Rodds Bay in the south to Curtis Island and Port Curtis in the north. The area has restricted fishing practices to ensure protection of dugongs in the area (Great Barrier Reef Marine Park Authority, 2005). It is anticipated that the Project will have no impact on these areas.

As discussed above, there are no Ramsar sites in the Gladstone region. However, Port Curtis is listed in the Directory of Important Wetlands in Australia (Environment Australia, 2001). The Port Curtis Wetland is defined as nationally important and occupies an area of approximately 31,264 ha. The Wetland extends over the entire area of Port Curtis, to the entrance of The Narrows (border of Mackay Capricorn Marine Park) (Figure 3.10). The area has been identified for its extensive range of marine wetlands, encompassing seagrass beds, mangrove forest and intertidal mudflats that provide habitat for a range of terrestrial and aquatic flora and fauna.

The activities at the wharf will be conducted in accordance with the Central Queensland Port Authority's (CQPA) Environmental Authority (EA). The EA authorises a number of activities conducted in accordance with conditions set by the EPA, including stockpiling, loading or unloading goods in bulk at, and regulated waste transport from and to, Fisherman's Landing.



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ENVIRONMENTAL IMPACT STATEMENT

**CONSERVATION AREAS
NEAR FISHERMAN'S LANDING**

Drawn: VH	Approved: JMcD	Date: 06-01-06	
Job No: **42625626**	File No: 42625626-g-017b.wor		

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It is anticipated that compliance with the EA conditions and implementation of the measures above will result in minimal impact of the Project on the aquatic reserves, wetlands and declared fish habitat areas.

3.6.5 Heritage/Historic Areas and Items

There are no National or Commonwealth Heritage Places listed in the Australian Heritage Database in the project area, either at Stanwell or at Fisherman's Landing (Department of the Environment and Heritage, 2005). While there are no listings with the Register of National Estate or State Heritage Register within the study area, the National Trust lists St Joseph's Orphanage at Neerkol, registration number RTN 1/143. In close proximity to the study area is Gracemere Homestead. This property is listed on the Register of National Estate, Queensland Heritage Register and National Trust. The National Trust also lists the Church in Stanwell, registration number FIT 3/1. The former Stanwell Railway Station, Central Railway Line, Stanwell, was once registered as a heritage place, however, it has been removed from the Register of the National Estate. A search of the Queensland Heritage Register revealed no results for registered heritage places in the vicinity of the Project or at the Fisherman's Landing wharf (EPA and QPWS, 2005b). No historic areas or items have been identified at the project site or at the wharf.

3.6.6 Areas of Cultural Significance

Areas of cultural significance for the Darumbal people in the project area will be identified through the cultural heritage management planning process under the *Aboriginal Cultural Heritage Act 2003* (ACHA) and are discussed in detail in Section 11 – Cultural Heritage. A Cultural Heritage Management Plan (CHMP), which will include a site survey to identify objects and areas of cultural significance, is currently being developed by the proponents and Darumbal people in accordance with the requirements of the ACHA. The development of the CHMP will also consider information from previous cultural heritage surveys undertaken within the proposed project area. The CHMP will provide the basis for the management of any Aboriginal cultural heritage issues, including areas of cultural significance, in the project area. The document will be an approved (by the Minister of Natural Resources and Mines) Management Agreement that develops procedures and protocols for cultural heritage management and engagement between the parties.

3.6.7 Occurrence of Declared Plants

At the SEP, a significant number of weeds were identified in previous surveys (Dames & Moore, 1999). Currently, nine weed species at the project site are identified as being of management concern (Section 6 – Nature Conservation). These are listed as pest species by the Department of Natural Resources and Mines under the Queensland *Land Protection (Pest and Stock Route Management) Act 2002*. The management of these weed species requires coordination and landowners are required to take reasonable steps to keep land free of declared Class 2 and Class 3 species.

Two of these weed species, Parthenium and Rubber vine, are also listed as Weeds of National Significance. This is a list of species developed by ANZECC (1997) which identifies weeds causing

significant environmental damage on a national scale. A weed control program will be implemented for the project site as an extension of the weed control program currently in place for the present commercial operations in the area. The distribution of declared weed species within mapped vegetation units is described in Section 6 - Nature Conservation.

There are no weed issues associated with the Fisherman's Landing site, as the wharf and stockpile area is to be built on reclaimed land.

3.6.8 Commonwealth National Environmentally Significant Matters

Under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), a number of national environmentally significant matters are listed. If the Project is likely to have a significant impact on these matters, it is to be assessed by the Commonwealth Department of the Environment and Heritage (DEH) and declared a 'controlled action'. The proponents referred the proposal to DEH for assessment in accordance with the relevant provisions of the EPBC Act (Queensland Coke & Energy Pty Ltd and Stanwell Corporation Ltd, 2005) and the Commonwealth Minister decided on 7 March 2005 that the proposal did not constitute a controlled action under the Act (Department of the Environment and Heritage, 2005b; Appendix C).

Therefore, the Project has been determined not to have a significant impact on any matters of national environmental significance. In addition, the Project and associated Fisherman's Landing Wharf activities are not related to any existing or proposed controlled activities, as defined by the EPBC Act, in respect of matters of national environmental significance. The national matters discussed in the Project's EPBC Act Referral (Queensland Coke & Energy Pty Ltd and Stanwell Corporation Ltd, 2005) are discussed below.

Project Site

The project site is not located within, or near to, a listed World Heritage area or within or near to a Ramsar Wetland.

There are 16 Threatened Species and 11 Migratory Species which were recorded within the EPBC Act Protected Matters Report (Department of the Environment and Heritage, 2005c) as likely to occur within the area of the Project. Given that the site is largely cleared and highly disturbed, there is not expected to be any significant impact on these species. The Project will have no impact on any Commonwealth Marine Area or Commonwealth Land.

Fisherman's Landing

As discussed above, Fisherman's Landing is at Port Curtis, which is within the Commonwealth Marine Area and Great Barrier Reef World Heritage Area. No construction within the Great Barrier Reef World Heritage Area will be undertaken as part of the Project, although additional shipping movements will be necessary. Much of the shipping will traverse the Great Barrier Reef. The impact of this additional shipping traffic is likely to be minor and incremental in nature and is not considered significant.

As discussed above, all environmentally relevant activities conducted at the wharf facility, including coke stockpiling and loading and unloading of bulk goods will be conducted in accordance with conditions set by the EPA in the CQPA Environmental Authority relevant to the Project.

There are no Ramsar wetlands within the area. Threatened marine species have been recorded from both within Port Curtis and seaward of Curtis and Facing Islands. The development will not impact directly on feeding or breeding habitat of these species. The limited terrestrial habitats present on the site are unlikely to support any threatened or vulnerable ecological communities. The terrestrial habitats present on the site are not known critical habitat for migratory species as protected by the EPBC Act although some may overfly the site. The site does not contain Commonwealth land, nor will any be indirectly impacted.

3.7 Visual Amenity and Scenic Values

Summary

The Project has been assessed as having a low to negligible potential visual impact on surrounding areas including Stanwell village and the Capricorn Highway. Views of the Project from surrounding areas are generally screened by existing trees, earth mounding and natural landforms. The Project would only be directly visible from Power Station Road at one location, which is near the entrance to the SPS. However, this view is partly screened by existing vegetation and landform. Power Station Road carries relatively low traffic flows and is mainly used for access to SPS and consequently a very low number of viewers would potentially see the Project.

The existing SPS is a large scale industrial complex in which the concrete cooling towers (120 m) and main stack (200 m) are visible above tree canopies from surrounding areas, including locations along the Capricorn Highway. The project structures will be substantially lower in height than those at the SPS, with the main vent stacks of the Coke Plant being 90 m, the proposed power plant turbine hall at 32 m and the cooling towers at 12 m. Upper portions of a number of the main stacks in the proposed Coke Plant would be visible from a limited number of locations along Capricorn Highway. The extent of these visible portions of stacks varies from about 15 m to 40 m. However, they will generally be visible above tree canopies and seen together with the upper 140 m portions of the SPS stack and upper 50 m of the associated cooling towers.

Proposed mitigation measures include roadside tree and shrub planting to provide additional visual screening to the project structures from the section of Power Station Road near the entrance to SPS. This planting will need to take account of the proposed 275 kV transmission line which will result in a large angle pylon to be constructed near the entrance to SPS. Lighting associated with the Project will be designed to avoid light spill on to Brickworks Road and to prevent direct views of lights on those portions of the stacks that may be visible from Capricorn Highway. Screen planting is proposed alongside the southern edge of Brickworks Road to block potential views of the coke stockpiles, including the emergency stockpile at the northern end of the Coke Plant.

3.7.1 Description of Environmental Values

This section of the EIS details the visual assessment process and the findings of that assessment. Given that the proposed development would involve construction of the Project alongside the SPS, the first step in the visual assessment was to determine and describe the existing development and the landscape context in which it is located. This provides a baseline against which the potential incremental impact of the Project was assessed. The visual assessment includes the proposed Coke Plant together with coal and coke stockpiles and conveyors and associated structures. It also includes the proposed Power Plant.

Visual Character of the Surrounding Landscape

The project site is located within a broad valley associated with Neerkol Creek which generally flows in an easterly direction parallel to the Capricorn Highway and railway. The valley is defined to the north and south by forest-covered hills, with a visually prominent tree-covered ridge along the eastern edge of the site (Flagstaff Hill).

The relatively flat areas associated with Neerkol Creek are partially cleared for grazing and cultivation with extensive stands of remnant trees along sections of the creek and road edges, as well as clumps of trees throughout the areas of agricultural land use. Mature trees, which are commonly about 20 m tall, are present throughout areas surrounding the site. Their vertical form contrasts with the horizontal ground surface to define broad open spaces in the landscape. These trees exert a strong influence on the visual character of the landscape surrounding the project site.

The visual character of the river flats associated with Neerkol Creek is dominated by the system of paddocks, which are generally covered by pasture grasses, contrasting with the vertical form of the extensive tree stands. Homesteads and agricultural buildings are distributed sparsely throughout the more fertile agricultural areas associated with the creek corridor.

Potential long-distance views are generally screened by the tree cover that commonly occurs alongside public roads and within the adjoining paddocks. Long distance views from the Capricorn Highway are generally confined to the upper portions of the tree-covered hills along the northern and southern edges of the valley. The upper portions of the main stack (200 m high) and cooling towers (120 m high) of the SPS are visible from some locations along the Capricorn Highway and railway line, but the extent of these glimpses is limited.

The SPS exerts a very strong influence on the visual character of the landscape in which is sits, including the section of Power Station Road along the southern edge. However, the extent of this visual prominence is limited by the extensive tree cover on surrounding areas as well as the major ridge located north-east of the SPS. High voltage transmission lines radiating from the SPS also have a strong influence on the visual character of the surrounding rural landscape, as they form an industrial element in the generally agricultural character of the landscape.

The only section of public road from which the SPS is visible is the section of Power Station Road immediately to the east. From Stanwell village and the Capricorn Highway, the SPS is generally not visible and only upper portions of the main stack and cooling towers are visible above the tree canopies.

The visual character of the landscape components discussed above is illustrated by the plates below. Figure 3.11 indicates the locations from where the photographs were taken.

Plate 3.1. View from Power Station Road towards the project site.

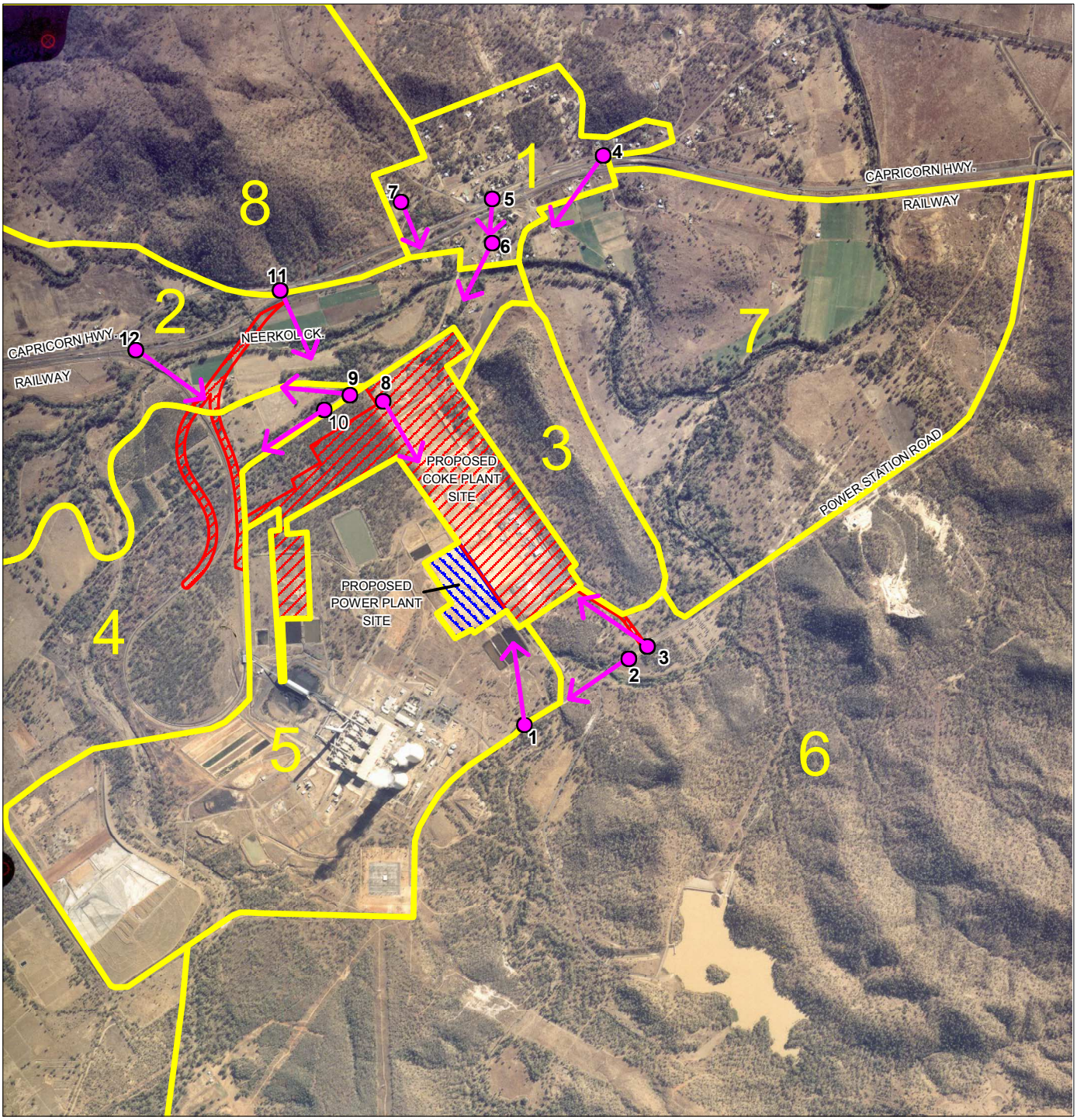
Plate 3.2. View along Power Station Road towards SPS with cooling towers visible.

Plate 3.3. Entrance to project site from Power Station Road with trees and landform blocking view.

Plate 3.4. Stanwell village (east) with prominent ridge located north-east of site.

Plate 3.5. View from Stanwell village shop with main

Plate 3.6. Residence adjoining Brickworks Road with



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Scale

LEGEND

- Landscape Unit Boundary
- Proposed Coke Plant Site
- Proposed Power Plant Site
- 1 Photo Location and Direction

LANDSCAPE UNITS:

1. Stanwell Village
2. Neerkol Ck. Corridor
3. Prominent Ridge (Flagstaff Hill)
4. Rural Land West of Site
5. Existing Stanwell Power Station
6. Forest Covered Hills
7. Rural Land North-East of Site
8. Forest Covered Hills North of Site

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QUEENSLAND COKE AND POWER PLANT PROJECT
ENVIRONMENTAL IMPACT STATEMENT

LANDSCAPE UNITS

Drawn: BH	Approved: JMcD	Date: 06-01-06	Figure: **3.11**	Rev:B
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stack of SPS visible above trees.

Plate 3.7. Stanwell School with glimpse of SPS cooling towers (120 m high) in right of photo.

Plate 3.9. Trees adjoining Brickworks Road.

Plate 3.11. View from Capricorn Highway across Neerkol Creek with top portions of SPS stack and cooling towers visible in right of photo.

trees blocking view towards site.

Plate 3.8. View across project site from north-west corner.

Plate 3.10. View along Brickworks Road on northern edge of site showing screening by trees.

Plate 3.12. View from Capricorn Highway along rail loop towards SPS with trees screening views of structures.

Landscape Units

In order to describe the visual character of the landscape in which the Project is proposed to be located, a series of Landscape Units have been identified and shown on Figure 3.11. These Units represent areas that are relatively consistent in terms of their combination of landform, vegetation and land use. This produces a distinctive visual character for each of the Landscape Units, which are described below in relation to the Project.

Landscape Unit 1 - Stanwell Village

Unit 1 is located on gently sloping south-oriented land north of Neerkol Creek, Capricorn Highway and railway at similar elevation as proposed Coke Plant. Extensive tree cover within the village limits long distance views from most locations. Views from the village towards the project site are generally blocked by the dense canopies of trees along Neerkol Creek as well as the tree-covered hill along the eastern edge of the site.

Landscape Unit 2 - Neerkol Creek Corridor

Landscape Unit 2 comprises a relatively flat and low elevation floodplain associated with Neerkol Creek. Extensive tree stands occur along the creek as well as along fence lines and in paddocks with mature trees generally 20 to 25 m tall. There are a limited number of residences in the vicinity of Stanwell village and along Brickworks Road. Views out of this landscape unit are generally screened by tree canopies with long-distance views limited to glimpses of tree-covered hills to north and south. Views towards the project site are generally blocked by tree canopies.

Landscape Unit 3 - Prominent Ridge East of the Site

Landscape Unit 3 comprises the steep-sided ridge (Flagstaff Hill) running along the eastern edge of the project site. The apparent height of the ridge is increased by the forest cover on it. No houses are located on the ridge or slopes and no public access is available to the top of the ridge. The ridge completely blocks views of the project site from areas to the east.

Landscape Unit 4 - Rural Land West of Site

Unit 4 consists of flat to gently undulating landform generally sloping towards the north-east. The predominant land use is agriculture with grazing the main activity. There area a relatively small number of homesteads within the landscape unit. Extensive stands of mature trees occur along roadsides and in clumps within paddocks that generally screen long distance views, including views towards the site.

Landscape Unit 5 - Stanwell Power Station

This Landscape Unit 5 comprises a landform that has been extensively modified by construction of water storage dams and ash disposal areas. A number of very large structures, include power generators, cooling towers (120 m high) and main stack (200 m high) are visually dominant from areas adjoining the SPS,

including the project site and a section of Power Station Road. Vegetation is limited to amenity planting with some tree planting around perimeter of the SPS.

Landscape Unit 6 – Forest-covered Hills South of Site

The moderately to strongly undulating landform comprising of a system of hills and valleys makes up Landscape Unit 6. The area is extensively covered by natural forest vegetation. No hoses or public lookouts are located in these hills which form the catchment of a major water storage dam that is located in the landscape unit.

Landscape Unit 7 - Rural Land East of Site

Landscape Unit 7 is generally low lying land associated with Neerkol Creek. Remnant vegetation present includes tall trees (20 to 25 m high) along the creek and in scattered clumps throughout the landscape, which is primarily agricultural in character. Views towards project site from this landscape unit are blocked by the visually prominent tree-covered ridge (Landscape Unit 3) located between this unit and the project site.

Landscape Unit 8 – Forest-covered Hills North-west of Site

This unit contains moderate to strongly undulating landform comprising of a system of hills and valleys. The landscape is extensively covered by natural forest vegetation that screens potential views from within the unit towards the project site. A limited number of rural residences area located throughout the unit.

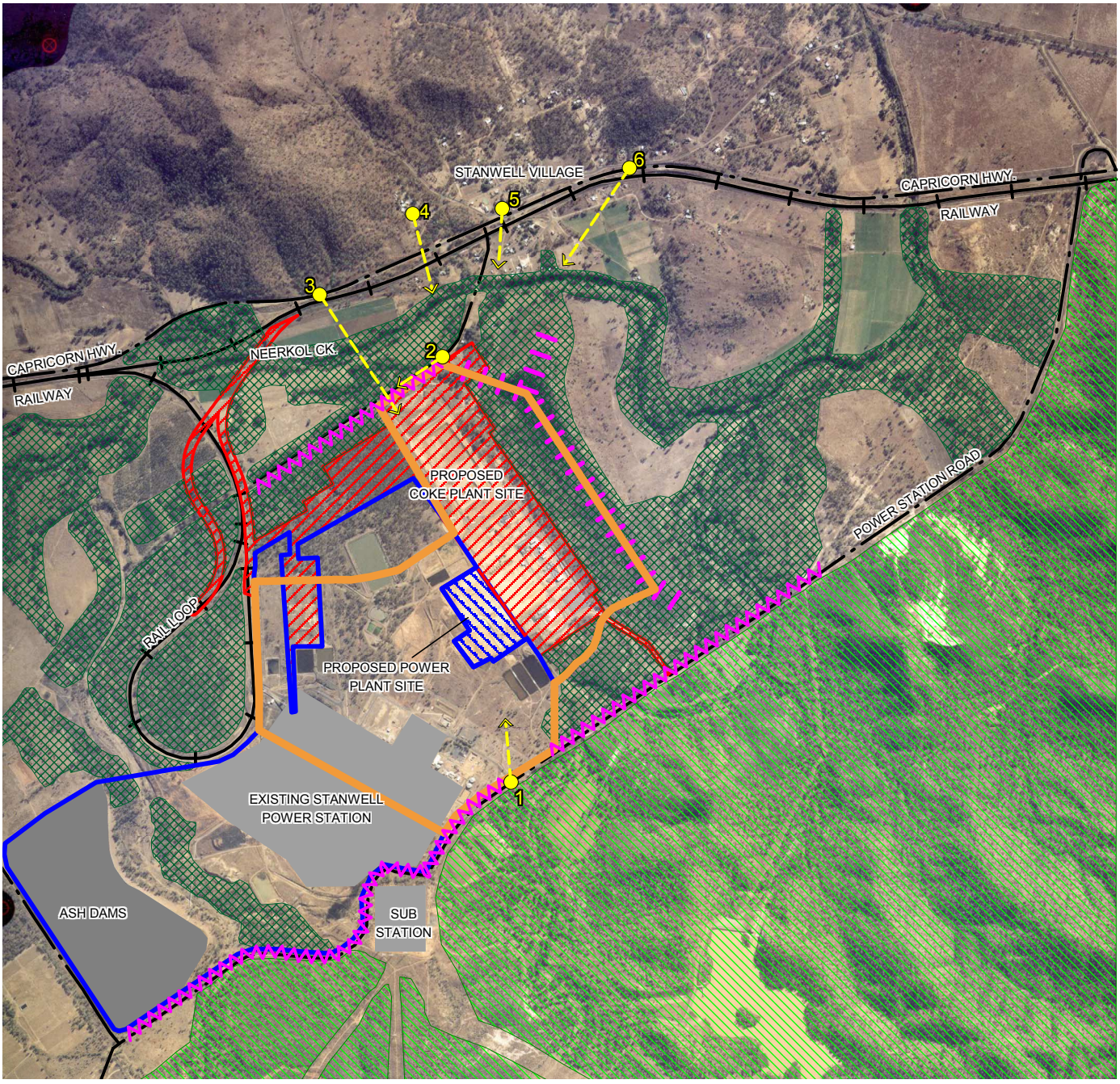
Visual Catchment of Site

The visual assessment involved:

- A detailed field inspection to determine the extent of visibility or visual catchment of the site; and
- Determination of the various situations from which the site could potentially be visible from surrounding areas.

The results of this visibility assessment are illustrated in Figure 3.12. The primary visual catchment of the project site is defined by the existing SPS to the west, a major ridge to the east (Flagstaff Hill), trees and earth mounding along the north with trees and low hill along the southern edge. Views of the site from public roads are limited to a short section of Power Station Road near the entrance to the SPS and a glimpse from Brickworks Road, which is an unsealed no-through local road with very low traffic flows.

The site is not visible from the Capricorn Highway, railway or Stanwell village, which are located to the north. However, the upper portions of the stack and cooling towers at the SPS are visible from these locations above the canopies of trees growing along Neerkol Creek. The site is not visible from any adjoining residences and there are no public lookouts in the surrounding area that could provide views of the site. The SPS is the only place of work from which the site is visible. These views are framed by structures associated with the SPS.



0 400 800m

Scale

LEGEND

- Primary Visual Catchment of Proposed Coke Plant
- Proposed Coke Plant Site
- Proposed Power Plant Site
- Existing Stanwell Power Station Infrastructure Area
- Screening Trees Providing Visual Sighting of Site from Capricorn Hwy, and Railway
- Forest Covered Hills Forming Skyline to Views from Capricorn Highway and Stanwell Village
- Potential Views from Public Roads Blocked Vegetation and Landforms
- Major Ridge Line Blocking Potential Views of Site
- View Situations and Direction 1

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ENVIRONMENTAL IMPACT STATEMENT

VISUAL ASSESSMENT

Drawn: BH	Approved: JMcD	Date: 06-01-06	Figure: **3.12**	Rev:B
Job No: **42625626**	File No: 42625626-g-022b.wor			**A4**

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View Situation Assessment

The visual assessment identified and mapped the various view situations from which the Project would be visible or the upper portions of structures could potentially be visible. These view situations are shown on Figure 3.12 and described in Table 3.7.1. In identifying the potential views, account was taken of current views to the upper portions of the SPS, which provides a reference against which the Project can be assessed in terms of potential visual impact. The assessment process carried out by URS in relation to potential views of the project structures from these view situations is described in detail in Section 3.7.2 below.

Table 3.7.1 View Situation Assessment

View Situation	Comment
1. Power Station Road (refer to photos 1 and 2)	• Potential views to the project site are generally blocked by roadside vegetation and landform. • Glimpses of the site are available from a section of road near entrance to SPS looking across area of grass and scattered trees with existing structures on site visible between trees. • Traffic using Power Station Road is primarily related to the SPS including staff, contractors and visitors. The road is also used by a small number of property owners located in the area west of the SPS.
2. Brickworks Rd. near western edge of site (refer to photo 10)	• Potential views into site from the section of road adjoining the northern edge of the site are blocked by earth mounding along the eastern portion of the boundary and be dense tree cover along the western portion of the road. • Views into the site are limited to a single location at the boundary fence gate at the western end of the earth mounding.
3. Capricorn Highway and railway line (refer to photos 11 and 12)	• Views of the project site from the Capricorn Highway and railway north of the site are blocked by stands of trees growing alongside the Highway and the Neerkol Creek corridor. • The top portions of SPS cooling towers and main stack are visible from some locations along the highway and railway but other structures are screened from view by trees.
4. Stanwell School (refer to photo 7)	• Views of the project site from the school are blocked by trees south of the school and adjoining the Capricorn Highway. • The top portions of the SPS cooling towers and main stack are visible above tree canopies.
5. Stanwell Village Shop (refer to photo 5)	• Views of the project site from the car park in front of the shop are blocked by trees adjoining the Capricorn Highway and railway. • The top portion of the SPS main stack is visible above tree canopies.
6. Stanwell Village (east) (refer to photo 4)	• Views of the project site from the public road in front of residences at the eastern end of Stanwell Village are blocked by trees along Neerkol Creek and the prominent tree-covered hill east of the site. • The top portion of the SPS main stack is visible above tree canopies.

3.7.2 Potential Impacts and Mitigation Measures

The potential visual impact of the Project, which will adjoin the existing SPS, would result primarily from the combination of two factors:

- The level of visibility or extent to which the proposed structures and stockpiles would be visible from surrounding areas; and
- The degree of visual contrast between the new structures and the landscape elements or existing SPS structures against which they would be seen from surrounding areas.

The potential visual impact at particular view situations will be strongly dependent on the level of visibility from that location, which in turn is dependent on a number of criteria which are defined in Table 3.7.2. The project structures that will potentially be visible are identified on Figure 3.13.

Visibility

Visibility is a measure of the extent to which particular components of the Project may be visible from surrounding areas, the relative number of viewers, the period of the view, view distance and context of the view.

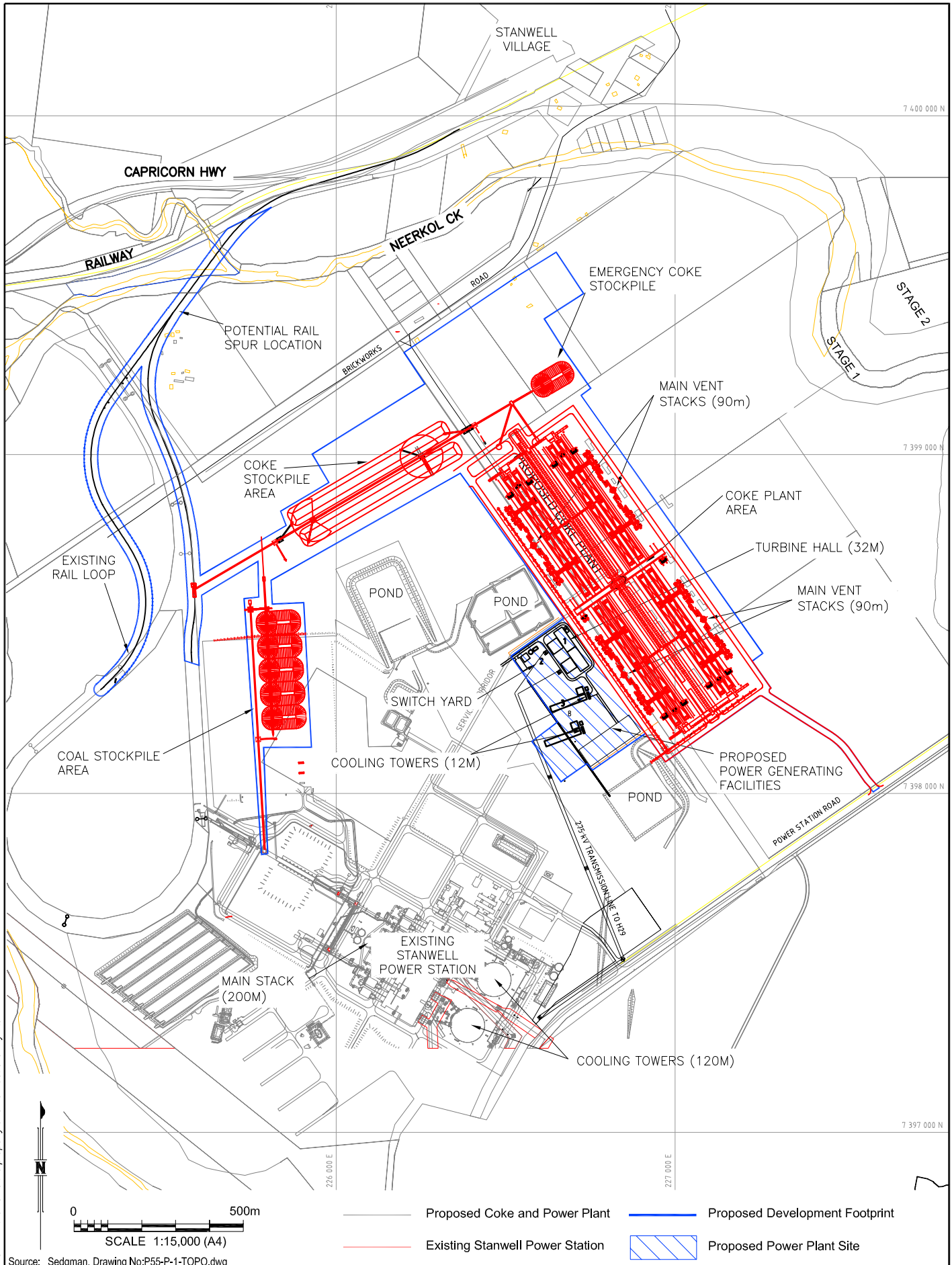
The underlying rationale for this component of the visual assessment is that, if a portion of the new plant is not visible from a particular area then the potential visual impact will be zero. Similarly, if the number of people who would potentially see the proposed plant is low, then the visual impact would be low compared to a situation in which a large number of people have the same view. Distance is a strong influence on potential visual impact because the proportion of the total view cone occupied by a structure decreases with distance. In addition the visual contrast between a structure and surrounding elements decreases due to atmospheric effects.

Visual Absorption Capacity

Visual absorption capacity is an estimation of the relative capacity of the existing landscape setting to visually absorb the new development without creating a significant change in visual character or producing a reduction in visual quality of the landscape. The capacity to absorb the new development is dependent on existing structures, vegetation cover and landform. The flat site of the Project, which is surrounded by stands of trees, has a high capacity to visually absorb the proposed development.

In addition the visual absorption capacity of the site is strongly influenced by the visual prominence of the existing SPS. The level of visual contrast between the Project and the existing SPS will be relatively low as they are similar in appearance. Consequently if parts of the Project are seen in the same view with parts of the SPS the visual contrast will be relatively low. However, if parts of the Coke Plant are viewed with a backdrop of natural landscape then the visual contrast and associated visual impact will be higher.

Also, atmospheric influences will tend to reduce the level of visual contrast between the new development and the adjoining SPS structures or landscape. The reduced visual contrast results in a reduced level of visual impact.



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ENVIRONMENTAL IMPACT STATEMENT

GENERAL SITE LAYOUT

Drawn: VH	Approved: JMcD	Date: 06-01-06	Figure: 3.13	Rev. C
Job No.: 42625626	File No.: 42625626-g-024c.dwg			A4

Proposed Coke and Power Plant Visibility

The project structures are described in Section 2 of this EIS. These new structures would be located alongside the SPS, resulting in a high degree of mutual screening of structures. The potential visual impact of the proposed new development from the key view situations identified in Section 3.3.2 has been identified and described in Table 3.7.2 below.

The levels of visibility resulting for the various combinations of criteria are presented in Table 3.7.3. The following categories of Period of View include; L=long, M=medium, S=short. The Levels of Visibility include; L=low, M=medium, H=high. Table 3.7.4 presents the results of the visibility assessment from the various potential view situations identified during the field inspection.

Table 3.7.2 View Situation Assessment Criteria

Criteria	Definition
Category of Viewer	
• Static	• House, picnic area or lookout point
• Dynamic	• Travelling along public road/railway
View Elevation	
• Above	• Higher elevation than proposed Project
• Level	• Level with proposed Project
• Below	• Lower elevation than proposed Project
Number of Viewers	
• High	• >10,000 people per day
• Moderate	• 1,000-10,000 people per day
• Low	• 100-1,000 people per day
• Very low	• <100 people per day
View Distance	
• Long	• >5km
• Medium	• 1-5km
• Short	• 200-1000m
• Very short	• <200m
Period of View	
• Long term	• >120 minutes
• Moderate term	• 1-120 minutes
• Short term	• <1minute

Table 3.7.3 Visibility Matrix

	Long Distance			Medium Distance			Short Distance			Very Short Distance		
Period of View	**L**	**M**	**S**	**L**	**M**	**S**	**L**	**M**	**S**	**L**	**M**	**S**
High Number of Viewers	M	L	L	H	M	M	H	H	M	H	H	H
Medium Number of Viewers	L	L	L	M	M	L	H	M	M	H	H	M
Low Number of Viewers	L	L	L	M	L	L	M	M	L	H	M	M

Table 3.7.4 Visibility of Project Site

View Situation	Approximate Distance to Site	Category of View	Approximate Period of View	Relative Number of Viewers	Level of Visibility	Visibility Rating
1. Power Station Road. near SPS entrance (Plate 3.13)	1 km	Motorists	Short-term	L	View across open land to project site with SPS visible in left of view.	M-L
2. Brickworks Road. along western edge of site (Plate 3.14)	10 m	Motorists	Short-term	Very Low	Glimpse into site at gateway, with upper portions of proposed Project potentially visible above perimeter earth mound.	L
3. Capricorn Highway. west of Stanwell village (Plate 3.15)	700 m	Motorists	Short-term	M	Ground surface of site not visible; tops of proposed structures may be visible above trees together with tops of SPS cooling towers and stack.	Nil - L
4. Stanwell School (Plate 3.16)	1 km	Teachers, students and parents	Short to moderate-term	L	Ground surface of site not visible; tops of proposed structures may be visible above trees together with tops of SPS cooling towers and stack.	Nil - L
5. Stanwell village shop (Plate 3.17)	800 m	Shop staff and shoppers	Short-term for shoppers and moderate-term for staff	M	Ground surface of site is not visible; tops of proposed structures may be visible above trees together with tops of SPS cooling towers and stack.	Nil - L
6. Eastern end of Stanwell village (Plate 3.18)	1.3 km	Residents and motorists	Moderate to long-term for residents and short-term for motorists	L	Ground surface of site not visible; tops of proposed structures may be visible above trees together with tops of SPS cooling towers and stack.	Nil - L

The level of visibility of the Project will generally be low. Direct views of the plant will be limited to a short section of Power Station Road near the entrance to the SPS. Other potential views will be confined to glimpses of the tops of the highest structures on the plant from a limited number of locations along the section of Capricorn Highway. Any portions of the Project that are visible will be viewed above the tree canopies together with the upper portions of the SPS cooling towers and main stack. The potential visual impact of the proposed new structures would therefore be low.

The cumulative visual impact of the visible portions of the proposed Project, which will generally be seen together with the upper portions of the existing SPS cooling towers and stack, is assessed as low to very low. The potential visibility of the proposed new structures is illustrated on the photographs that follow. The locations of the view situations from which these photos were taken are shown on Figure 3.12.

Plate 3.13. View Situation 1 - Power Station Road, near the entrance to SPS.

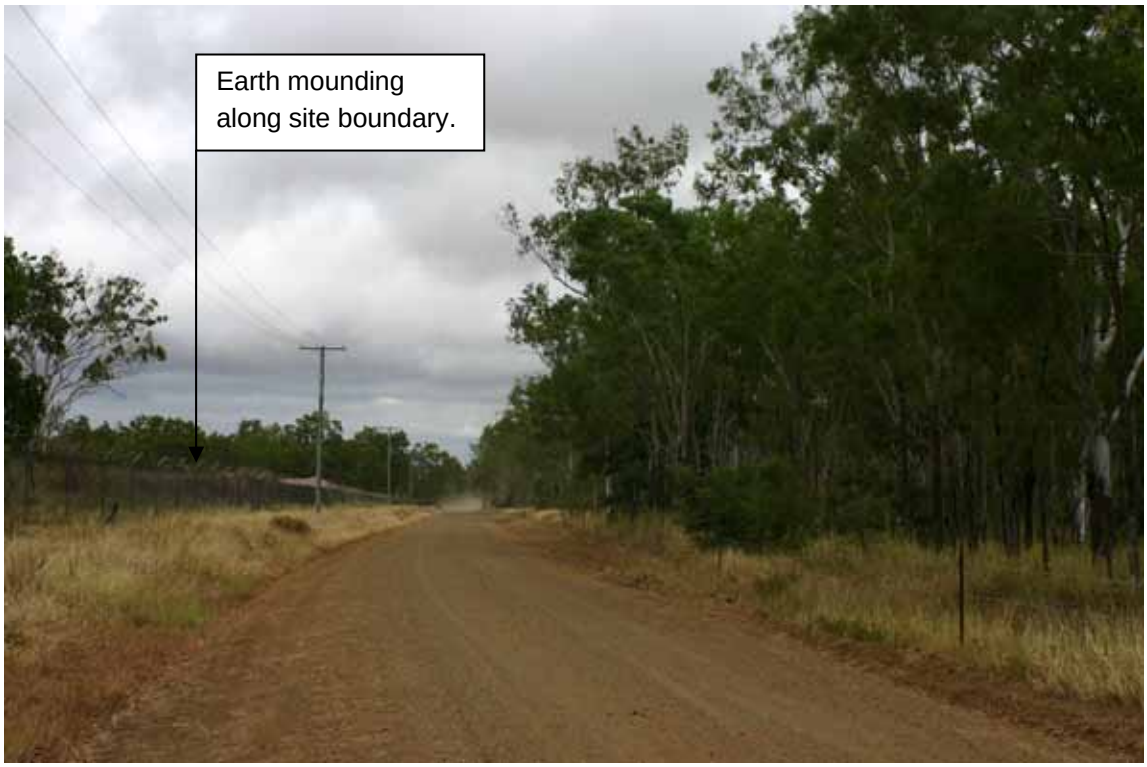


Plate 3.14. View Situation 2 - Brickworks Road, along the northern edge of site.

Plate 3.15. View Situation 3 - Capricorn Highway, west of Stanwell village.

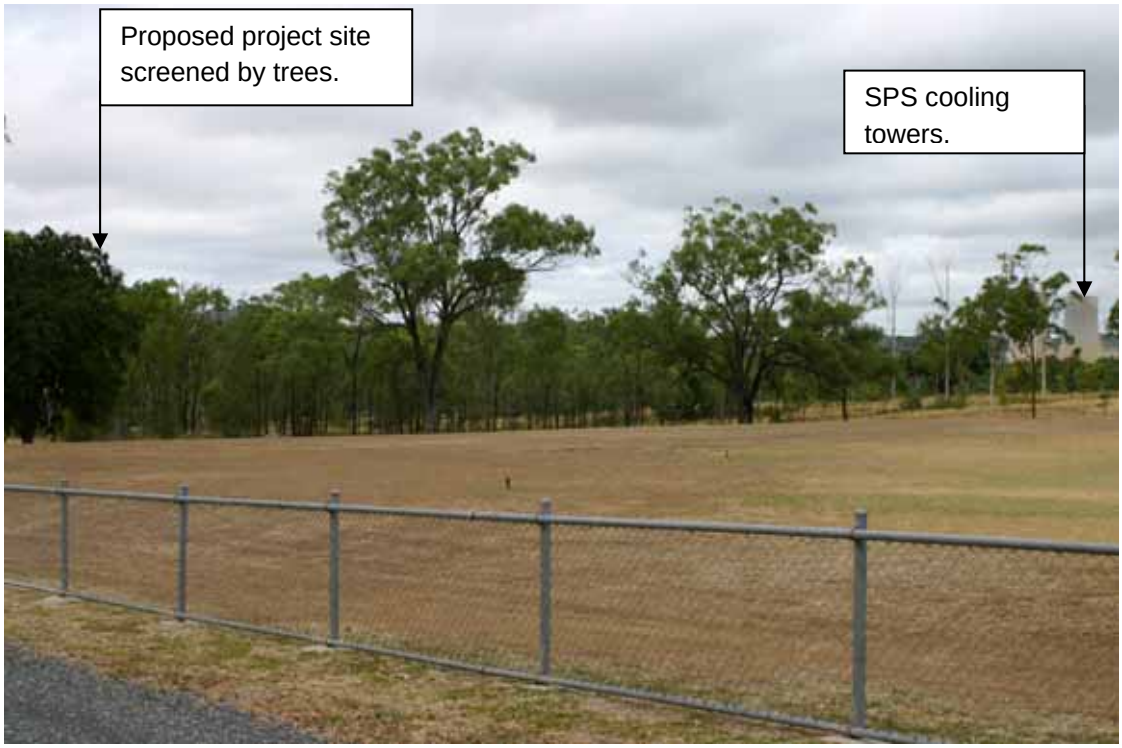


Plate 3.16. View Situation 4 - Stanwell School.

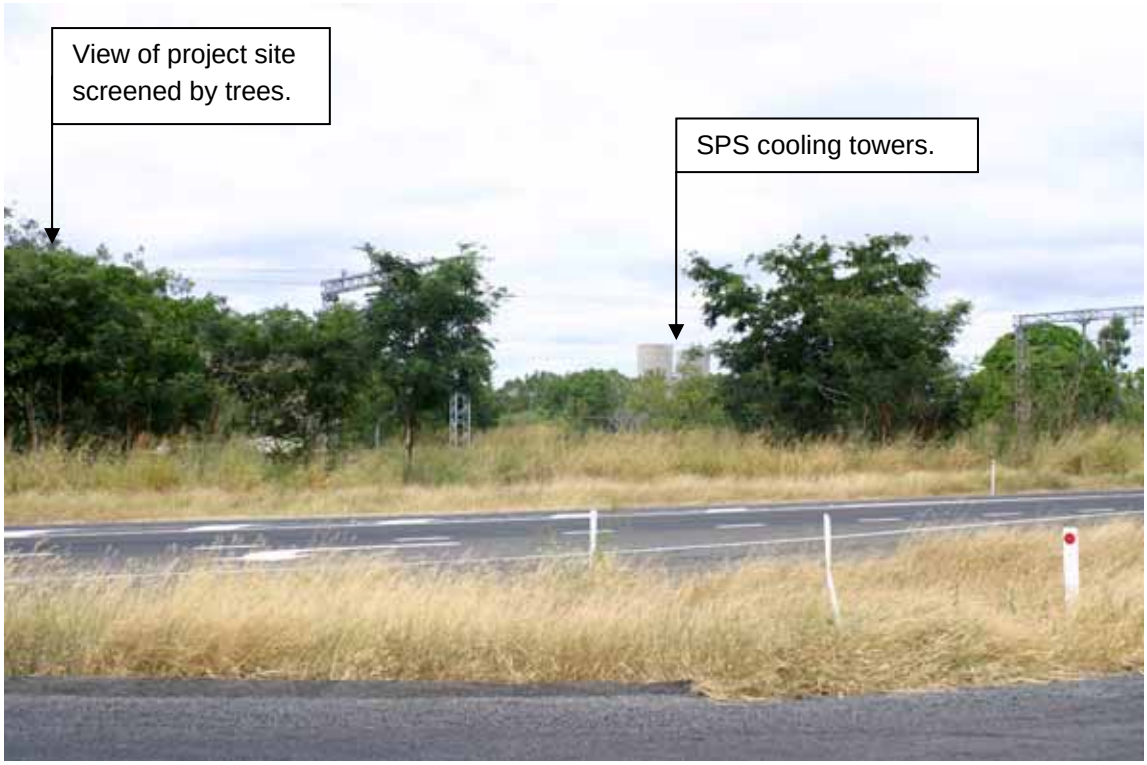


Plate 3.17. View Situation 5 - Stanwell village shop.

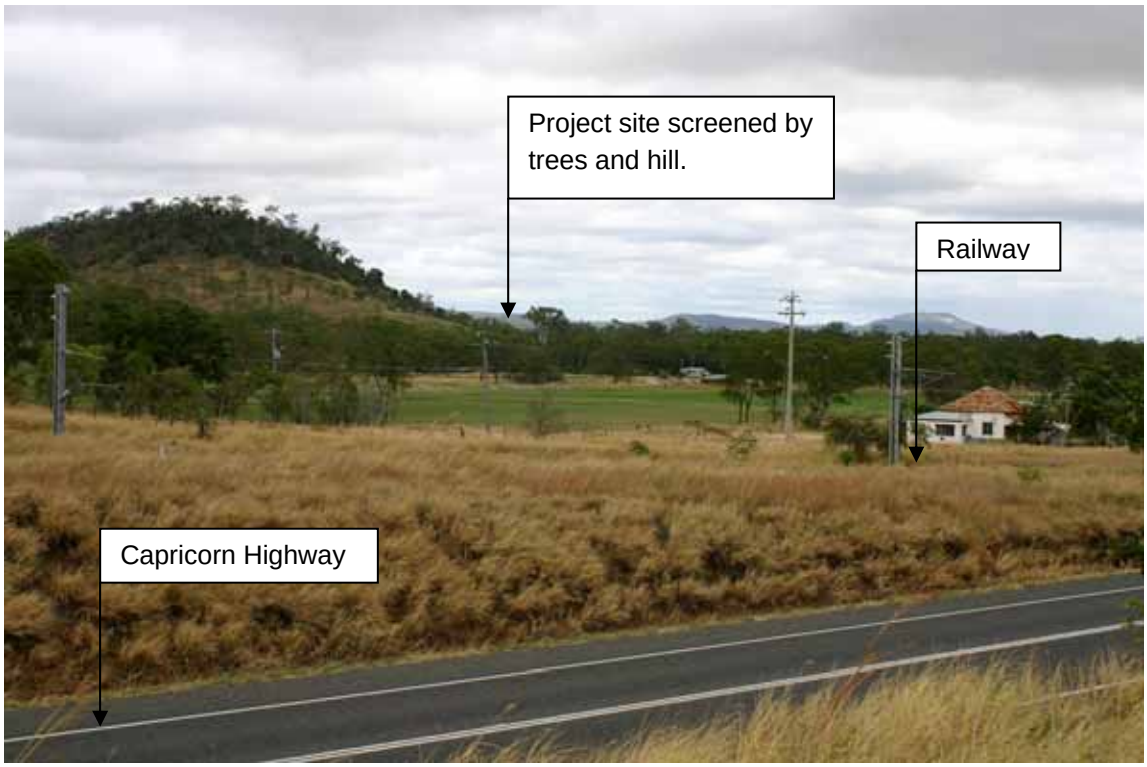


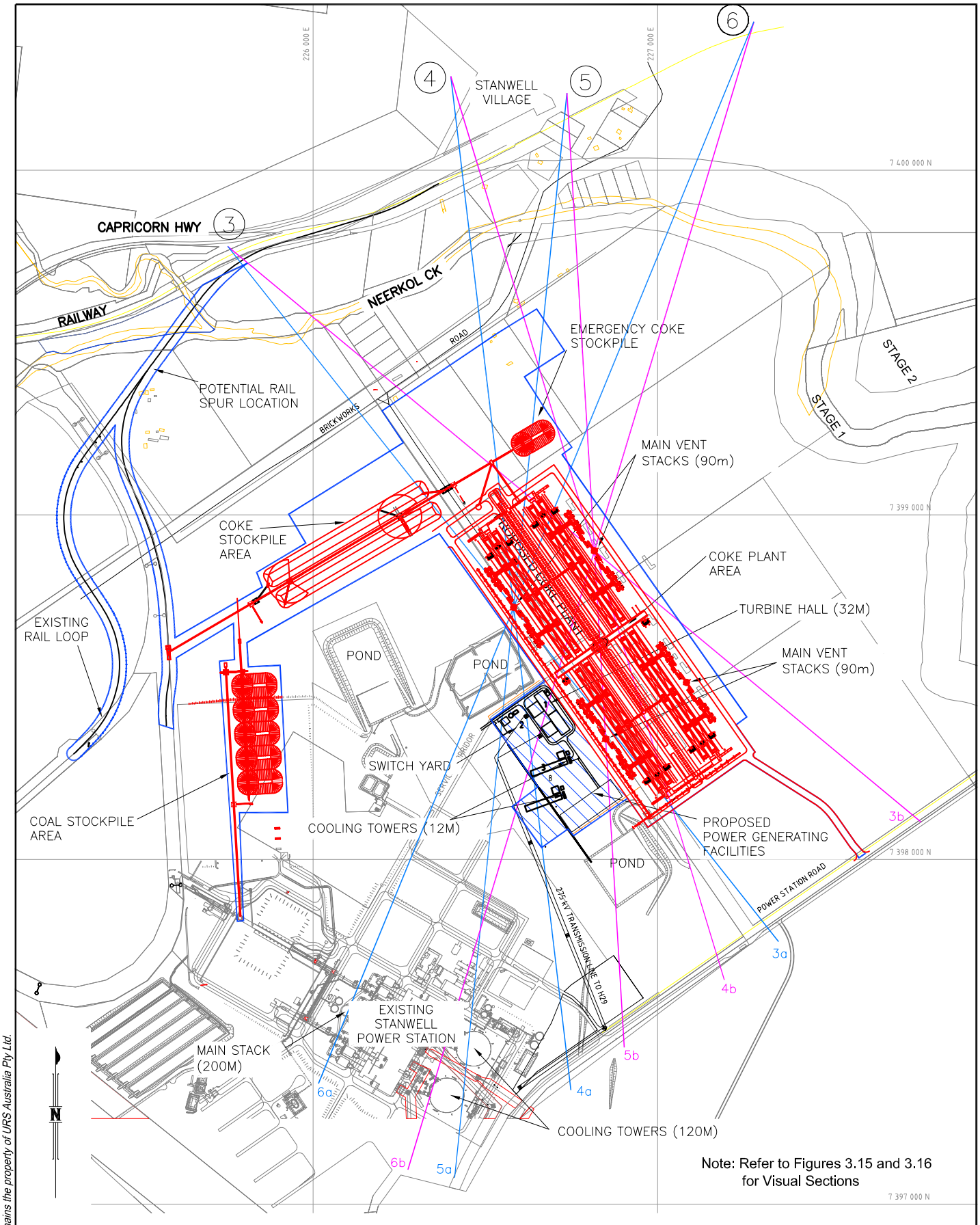
Plate 3.18. View Situation 6 - Stanwell village, eastern end.

Cross Sections

While the visibility assessment has indicated the site and the bulk of structures associated with the Project will be screened from potential views from the Capricorn Highway and Stanwell village, the upper portions of the main exhaust stacks, which will be 90 m high (above ground level), may be visible from some of the view situations. In order to check the extent to which the main exhaust stacks may be visible from various view situations, a series of cross sections have been prepared. The cross sections, the locations of which are shown on Figure 3.14, extend from the selected view situations through the main exhaust stacks located on the western and eastern edges of the Coke Plant, which are the closest to the Capricorn Highway. The extent of visibility is illustrated by the cross sections (Figures 3.15 and 3.16) and is described below.

View Situation 3 – Capricorn Highway

Approximately 40 m of the upper portion of the western stack would be visible above the trees, while 36 m of the eastern stack would be visible from this view situation. Stands of trees along Neerkol Creek screen the lower portions of the stacks. The visible portions of stacks would be seen with the upper portions of the main stack and cooling towers of the SPS. Potential views of other structures and stockpiles associated with the Project would be screened by trees.



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LOCATION OF VISUAL CROSS SECTIONS

Drawn: VH	Approved: JMcD	Date: 06-01-06	Figure: 3.14	Rev. C
Job No.: 42625626	File No.: 42625626-g-024c.dwg			A4

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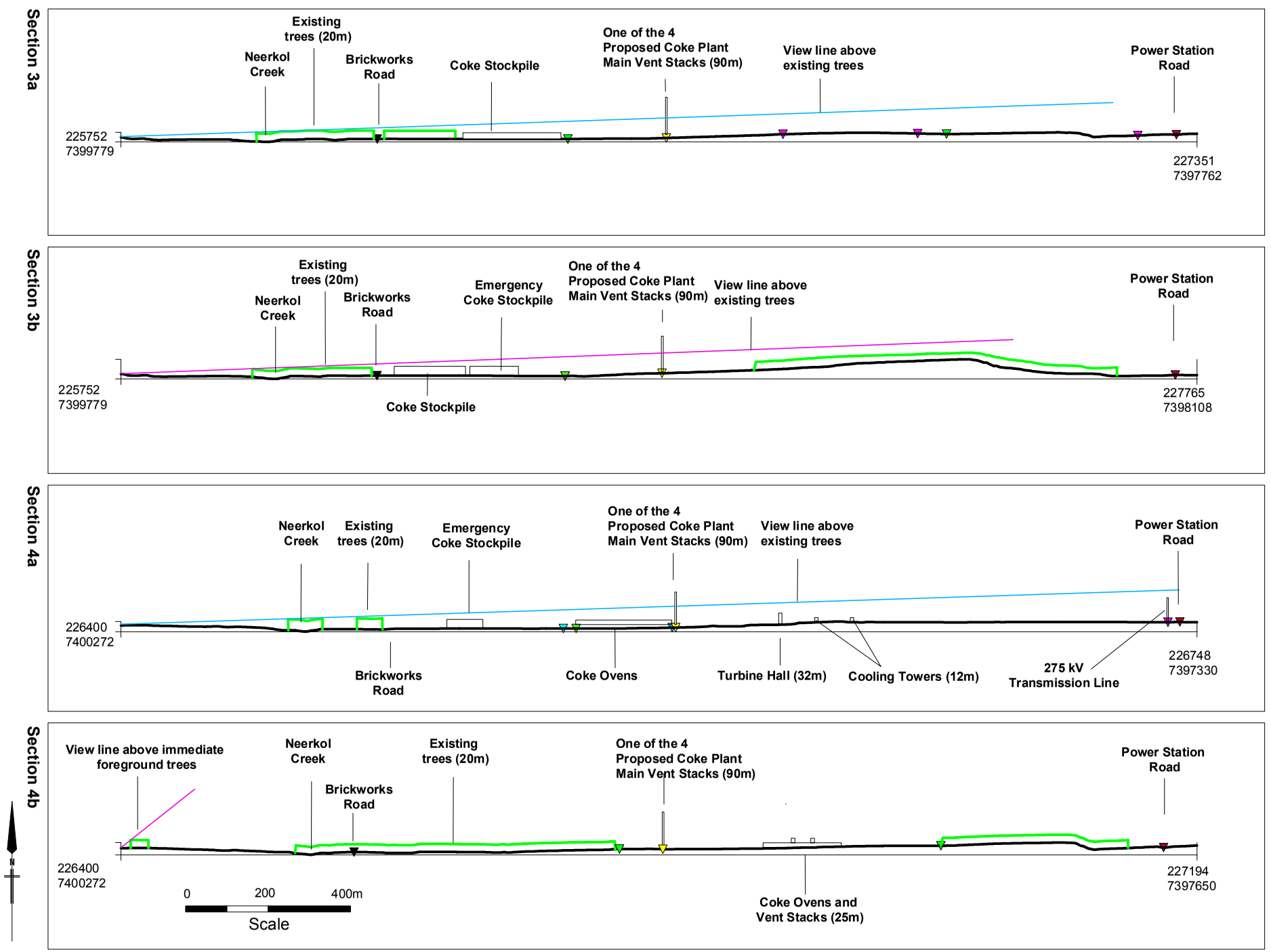
Job No: 42625626 | Drawn: BH | Approved: JMcD | Date: 06-01-06 | File No: 42625626-g-023d.wor

Figure: 3.15

VISUAL CROSS SECTIONS

A4 | Rev: D



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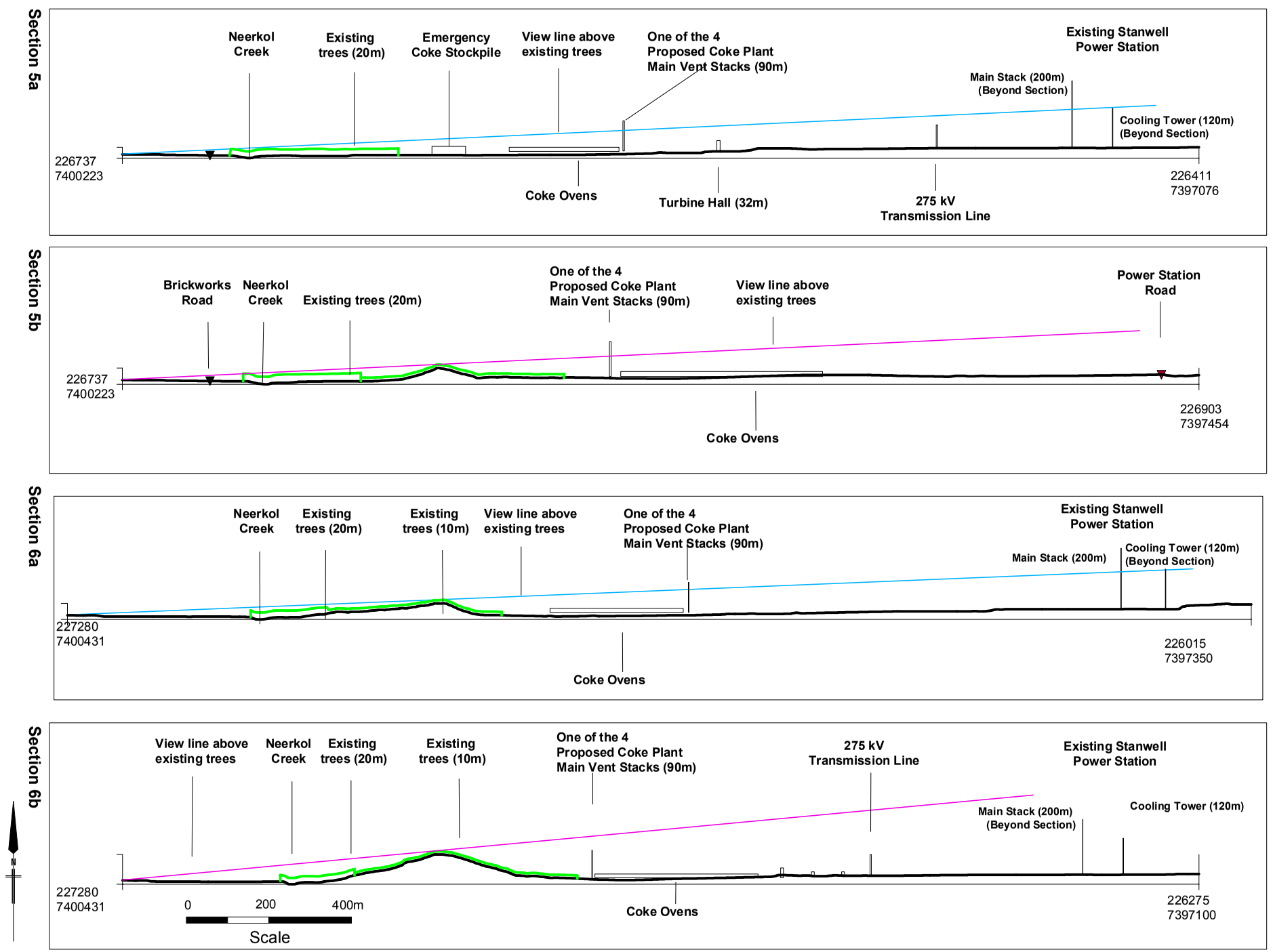
Job No: 4262626 | Drawn: BH | Approved: JMcD | Date: 06-01-06 | File No: 42625626-g-023d.wor

Figure: 3.16

VISUAL CROSS SECTIONS

A4 | Rev: D



View Situation 4 – Stanwell School

Potential views of most of the structures associated with the Project would be screened by existing trees as illustrated by cross sections 4a and 4b. However, as illustrated in cross section 4a, the top 30 m of the western stack of the Coke Plant would be visible above the tree canopies. It would be seen together with the upper portion of the existing SPS stack and cooling towers.

View Situation 5 – Stanwell Village

Potential views of the main exhaust stacks and other structures associated with the Project would generally be screened by existing trees as illustrated by cross sections 5a and 5b. However, the upper 30 m of the western stack and 20 m of the eastern stack of the Project would be visible above the tree canopies. They would be seen together with the upper 140 m of the main stack of the SPS as well as the top 50 m of the existing SPS cooling towers.

View Situation 6 – Stanwell Village (east)

Potential views of the main exhaust stacks and other structures associated with the Project would be screened from view by trees and the prominent hill along the eastern edge of the site. However, the upper 15 m of the western stack of the Project would be visible above the tree canopy. It would be seen together with the upper 20 m of the main stack of the SPS, although the cooling towers would be screened by landform and tree cover.

Visual Simulation

In order to illustrate the nature and extent of the predicted visual impact of the Project, a visual simulation was prepared to show the view from View Situation 1, which is located on Power Station Road near the entrance to the SPS. This is the only location accessible to the public that was identified by the visual assessment from which the coke ovens and other components of the Project would potentially be visible.

The simulation was prepared by taking a digital photograph of the view from View Situation 1 and superimposing a 3-D model of the Project on to the image. The form and scale of the plant was based on information provided by the client. Existing structures on site that are visible in the photograph were used as references in locating and scaling the proposed project structures.

Key aspects of the potential view illustrated by the visual simulation (Figure 3.17) are that:

- Existing trees partially screen views of the project structures and stockpiles, particularly potential views of the ground level components of the development;
- At a distance of approximately 1 km, the visible components of the Project would occupy a relatively small portion of the total view cone of motorists travelling along this section of Power Station Road;
- The view could be completely blocked if roadside planting of trees and shrubs was carried out; and

View situation before construction of Coke Plant and Power Plant.

View situation after construction of Coke Plant and Power Plant.

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VISUAL SIMULATION

Drawn: VH	Approved: JMcD	Date: 06-01-06	Figure: **3.17**	Rev. A
Job No.: **42625626**	File No. 42625626-g-044.cdr			A4

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- The tree-covered ridge east of the proposed Project (Flagstaff Hill) provides a backdrop to the visible portions of the Project, which avoids most of the coke plant structures from being seen against the skyline.

Lighting

There will be no requirements for flood lighting during the construction process, but low level lighting to allow safe access for personnel and some security lighting will be required during the winter months where daylight hours are limited. Such lighting would be installed on structures where necessary to provide lighting to adjoining outdoor areas. The potential visual impact of this lighting would be negligible due to the low level of lighting involved and the screening effect of existing trees and landform.

The highest point for permanent lighting in the operating plant will be located on storage bins and conveyor headframes. The cross sections indicate that potential views from the key viewing points to these structures will be screened by existing trees and landform. Stacks will require lighting when the plant is operating. All lighting will be designed to minimise light spill on to adjoining areas, including adjoining vegetation in order to avoid impacts on wildlife.

Mitigation Measures

While the overall potential visual impact of the Project has been assessed as low, the following mitigation measures will further restrict the potential impact to the absolute minimum. Roadside tree and shrub planting to provide additional visual screening to the project structures from the section of Power Station Road near the entrance to SPS (View Situation 1). This planting will need to take account of the proposed 275 kV transmission line which will result in a large angle pylon to be constructed near the entrance to SPS.

Lighting associated with the Project will be designed to avoid light spill on to Brickworks Road and to prevent direct views of lights on those portions of the stacks that may be visible from the Capricorn Highway. Screen planting is proposed alongside the southern edge of Brickworks Road to block potential views of the coke stockpiles, including the emergency stockpile at the northern end of the Coke Plant.

Conclusion

Overall, the Project would have a low to negligible visual impact on surrounding areas due to the combination of the following factors:

- Views of the Project from surrounding areas are generally screened by existing trees, earth mounding and natural landforms;

- The Project would only be directly visible from Power Station Road at one location, which is near the entrance to the SPS. However, even this view is partly screened by existing vegetation and landform;

- Power Station Road carries relatively low traffic flows and is mainly used for access to SPS and consequently a very low number of viewers would potentially see the Project;
- The existing SPS is a large scale industrial complex in which the concrete cooling towers (120 m) and main stack (200 m) are visible above tree canopies from surrounding areas, including locations along the Capricorn Highway;
- The project structures will be substantially lower in height than those at the SPS, with the main vent stacks of the Coke Plant being 90 m, the proposed power plant turbine hall at 32 m and the cooling towers at 12 m;
- Upper portions of a number of the main stacks in the proposed Coke Plant would be visible from a limited number of locations along Capricorn Highway. The extent of these visible portions of stacks varies from about 15 m to 40 m. However, they will generally be visible above tree canopies and seen together with the upper 140 m portions of the SPS stack and upper 50 m of the associated cooling towers;
- Proposed mitigation measures including roadside screen planting along the northern site boundary adjoining Brickworks Road and a short section adjoining Power Station Road would completely block potential views of the Project from these locations; and
- The Project has been assessed as having a low to negligible potential visual impact on surrounding areas including Stanwell village and the Capricorn Highway.

3.8 Decommissioning

The Project evaluation has been based on a life of 40 years, however, it is recognised that it is probable that the facility will remain in operation well beyond this period. The use of the site once the Project has been decommissioned has not yet been determined, however, numerous planning and environmental issues will be considered before a final decision is made. The process of preparing the decommissioning and rehabilitation plan will be extensive and relative to the applicable legislation at the time. Development of the decommissioning and rehabilitation plan will involve consultation with all relevant authorities responsible for the applicable legislation, and potential post-project land users. Decommissioning procedures at the project site will likely involve:

- The removal of equipment and structures which are of no further economic value;
- Decommissioning of the on-site rail network if required;
- Retention and possibly management of the project hardstand and water dams;
- Where necessary, site assessment to establish whether any decontamination work is required and performance of such work; and
- Re-contouring the site and landscaping.

It is likely that the project site and its associated infrastructure (including that at Fisherman's Landing) will be valuable either as a package or as individual elements to other industrial users. The proximity of the Stanwell site to the Port of Gladstone, in an area with developed social and physical infrastructure and considerable energy (Stanwell Power Station) and raw material resources, suggest that the most probable decommissioning activity will be the preparation of the site for alternative industrial uses.

Areas that can be revegetated or rehabilitated will be identified and appropriate post-project land use determined. Vegetation species used in the rehabilitation process will be selected from a range of native and local species, depending on their suitability and availability, and the post-project land use. A comprehensive Environmental Management Plan will be prepared, in consultation with the appropriate regulatory authorities, prior to the commencement of decommissioning activities.