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New Hope Coal Australia

Report for Preliminary Mine Closure Study - New Oakleigh

Hydrogeological Desktop Assessment

June 2012

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1. Introduction

1.1 Background

New Hope Group (NHG) owns and operates a number of open cut mining operations in southeast (SE) Queensland. Two of these operations, New Oakleigh and Chuwar, are currently undergoing Detailed Rehabilitation Planning and Mine Closure Planning, which includes a number of technical studies that provide input into this process including:

- Materials Characterisation;
- Geotechnical Study;
- Contaminated Land Assessment; and
- Groundwater Study.

This report presents the Hydrogeological Desktop Assessment for the **New Oakleigh** site and relates to characterisation of the existing groundwater environment with a view to identification, assessment and management of potential long term post-closure impacts on the groundwater environment.

1.2 Scope of Work

This hydrogeological desktop assessment includes the following scope of works:

- Collation and review of hydrogeological information from NHG and the public domain for the mine site and surrounding region;
- Site inspection by a GHD Hydrogeologist to assess and discuss groundwater conditions with relevant NHG personnel;
- Development of a history of mining operations for the site;
- Characterisation of aquifer types, extents, hydraulic properties and groundwater flow systems;
- Undertake preliminary groundwater inflow estimates using analytical modelling techniques; and
- Develop a hydrogeological field program to identify priority areas for further hydrogeological assessment and monitoring of long-term potential hydrogeological impacts to the surrounding hydrological environment.

This Report is subject to, and must be read in conjunction with, the limitations set out in Section 13 and the assumptions and qualifications contained throughout the Report and additionally, the Preliminary Site Contamination Assessment report being prepared concurrently by GHD.

2. Legislative Framework

2.1 Groundwater

This section describes the current legislative framework and requirements for the vicinity of New Oakleigh in relation to groundwater management. Much of the content in this section has been adapted from recent Environmental Impact Statement (EIS) studies undertaken throughout Queensland.

2.1.1 Legislative Requirements

The Department of Environment and Resource Management (DERM) is responsible for the management of Queensland's groundwater resources, its protection and sustainable use.

Groundwater in Queensland for the purposes of supply is administrated through Groundwater Management Areas (GMAs). A number of these regulated groundwater areas have been established to protect this natural resource.

Water Act 2000

The *Water Act* 2000 provides the legislative basis for the allocation and sustainable management of Queensland's water resources. The *Water Act* 2000 provides a framework under which catchment based Water Resource Plans (WRPs) are developed in Queensland. The WRPs are then activated through Resource Operations Plans (ROPs).

A WRP provides a framework for sustainable management of water resources in the plan area including establishment of Groundwater Management Areas (GMAs). WRPs also define the availability of water and define water licensing and development permit requirements. A ROP details how the water resources will be managed to implement the strategies and objectives as set out in the WRP.

In Queensland, regulated groundwater areas, which is a general term used to include declared artesian and sub artesian groundwater management areas, which have been established by the Queensland Government to protect groundwater resources. The water resources in these regulated groundwater areas are subject to management and are either established through a WRP, a Local Water Management Policy or as defined by Schedule 11 of the Water Regulation 2002.

In order to take water from a regulated groundwater area for certain purposes, authorisation (such as a licence or development permit) is required. These purposes are defined under a WRP, Local Water Management Policy or by the Water Regulation 2002.

Water Regulation 2002

The Water Regulation 2002 is subordinate to the *Water Act* 2000 and defines sub artesian groundwater declared areas, i.e. regulated groundwater areas. It also details the purpose of use (such as stock / domestic use) that do not require authorisation to take water and, by omission, those purposes that do require authorisation. New Oakleigh is not located within a sub artesian groundwater declared area.

2.1.2 Groundwater Management

As discussed previously, regulated groundwater areas (such as GMAs) are areas within which groundwater resources are managed and which require authorisations to take water (subject to purpose of use). The GMAs / declared sub artesian areas etc. are further split into Groundwater Management Units (GMUs) and Unincorporated Areas (UAs). A GMU is a hydraulically connected groundwater system and the resource is actively managed. UAs incorporate all other groundwater resources that are not part of GMUs and which have no requirements for allocations of groundwater abstraction for livestock or domestic use. There is typically little data on rates of groundwater abstractions or on sustainable yields of aquifers for UAs.

New Oakleigh is situated within the Warrill-Bremer alluvial GMA, which lies within the Moreton Basin. Groundwaters in this GMA are managed under the *Water Resource (Moreton) Plan* 2007 and limitations in the taking of groundwater are restricted to stock or domestic purposes, salinity management purposes, or, under a water entitlement / permit.

2.1.3 Environmental Protection (Water) Policy 2009

The Environmental Protection (Water) Policy 2009 (EPP (Water) applies to all water in Queensland and provides a framework for defining the environmental value of water and guidelines for water quality. The policy aims to protect water to the designated environmental value, as stipulated under the *Environmental Protection Act 1994* (EP Act).

Environmental values (EVs) of specific waters to be protected or enhanced are defined in schedule 1 of the EPP (Water). The Bremer River and all its tributaries are specifically defined in schedule 1 of the EPP (Water). Waters in this catchment are therefore managed under the 2009 EPP (Water) publication *"Bremer River environmental values and water quality objectives – Basin 143 (part) including all tributaries of the Bremer River"*.

2.2 Surface Water

DERM operates a network of gauging stations to primarily fulfil legislative requirements of the Water Act 2000; that is, to regularly measure and keep publicly available records of volume and quality of water in Queensland.

The network assesses the State's water resource availability by providing data for hydrologic analysis, operation and management activities to ensure sustainable management of the resource.

2.3 Climate

The Australian Government Bureau of Meteorology (BoM) is one of the major water resource data collection agencies in Australia. BoM has a significant role in providing rainfall and general climate data for water resource purposes.

There are several BoM climate stations situated in the vicinity of Rosewood township. The locations of the weather stations are discussed in Section 5.1.

3. Review of Existing Data

3.1 Climate

Patched-point datasets (PPD) were purchased from the Queensland Natural Resource Management (NRM) SILO data store. This time series data (which has been in-filled by SILO for each record period) was requested for Rosewood Walloon Road (040184) climate station. Other data used in this assessment was downloaded directly from the BoM.

3.2 Surface Water

Relevant surface hydrology data was obtained from DERM's online water monitoring data portal.

3.3 Groundwater

Data has been obtained and reviewed from the sources outlined below:

- DERM Groundwater Database;
- NHG provided groundwater level data from the New Oakleigh mine, which includes limited groundwater level, quality and yield data; and
- The following previous investigation reports:

  AGE Consultants Pty Ltd (2009) New Oakleigh Mine – North Pit Seepage, Task 1 Data Review
  This report assesses the source and mechanisms controlling surface seepage identified subsequent to mine closure. Suitable options to manage seepage are proposed and the existing environment, stratigraphy and groundwater systems are also discussed.

  GeoConsult Pty Ltd (2009) New Hope Coal – New Oakleigh TSIM (Thiel Surface Impedance Method) Geophysical Survey Report. Prepared For New Hope Coal Australia. November 2009
  This report discusses a Thiel Surface Impedance Method (TSIM) survey undertaken near the New Oakleigh Mine. The survey was undertaken to map surface impedance variations within the area and to assist in defining geophysical anomalies which may be associated with sub□surface geological changes. Of particular interest were two water seeps within the survey area. The report describes the findings of the surveys and the procedures used to assess and interpret the data collected.

  SKM (2009) New Hope Coal Infrastructure Decommissioning Report: Jeebropilly and New Oakleigh Mines. July 2009
  This report provides a desktop assessment addressing the removal of mine site infrastructure at the Jeebropilly and New Oakleigh mines. The report provides an environmental assessment as well as contaminated land and waste assessment as well as cost estimates for proposed works.

  Golder Associates (2007) Preliminary Environmental Assessment under LRAP for Closed Landfill at Rosewood, Queensland. September 2007
  This report describes a subsurface investigation and preliminary environmental assessment of a closed landfill situated at 94 Oakleigh Colliery Road, approximately 3 km north of Rosewood township. Contamination was identified and characterised, and potential health and environmental risks were assessed, with recommendations for remediation works provided.

Douglas Partners (2004) Groundwater Study, New Oakleigh Coal Mine, Rosewood. Prepared for New Hope Coal Australia Ltd. August 2004

This report describes the results of a groundwater study carried out on the New Oakleigh Coal Mine to meet legislative conditions issued with the granting of a new mining lease, ML50175.

The study assessed the aquifers and groundwater quality in the vicinity of the mine and comprised the review of existing groundwater data, drilling and installation of monitoring bores, installation of data loggers to monitor groundwater levels, groundwater sampling and monitoring of groundwater quality.

Golder Associates (2001) Oakleigh Coal Project Geotechnical Evaluation. September 2001

This report discusses a geotechnical study undertaken in relation to ongoing mining operations for the Oakleigh Coal project. In particular, potential geotechnical impacts of mining on the nearby historic railway line are assessed.

4. Site History

4.1 Site Location

New Oakleigh mine is situated on either side of the Rosewood – Marburg Road on the northern outskirts of Rosewood township, approximately 65 km west of Brisbane in SE Queensland (Figure 1). The vicinity of New Oakleigh is situated within the Bremer Basin, at an elevation in the order of 200 m Australian Height Datum (AHD).

The New Oakleigh site consists of 7 mining leases covering a total surface area of 410 hectares (ha) within a total project area of approximately 1,000 ha. The cadastral information for the site shows that the area leased for mining by NHG comprises 99 individual land parcels.

4.1.1 Title Search and Land Ownership Information

The New Oakleigh site is comprised of 99 individual land parcels, as detailed below in Table 1.

Table 1 Site Identification

Site Location:	Rosewood – Marburg Road, Rosewood, Queensland, 4340
Real Property Descriptions:	The site is comprised of 99 land parcels, and land information is summarised in Appendix A
Site Area:	995 hectares
Site Owner:	New Hope Coal Australia
Local Council:	Ipswich City Council
Parish	Walloon
County	Churchill
Mining Leases (ML):	4568, 4584, 4675, 4683, 4698, 4699, and 50175
Minerals Development Licences (MDL):	351, and 357

4.2 Mine Development History

The New Oakleigh mine has a long operational mining history of over 90 years, with both underground and surface workings at the site. Surface mining has occurred in three areas across the site: on the eastern side of the site are two areas known as the North Pit, the Normanton Pit; and on the western side of the Rosewood – Marburg Road is the West pit. The New Oakleigh Mine Information Sheet (dated 17 September 2004) provided by NHG was utilised to prepare the following summary of the New Oakleigh mining operations:

- The site was historically an underground coal mine which commenced operation in approximately 1920 as Perry's Knob Colliery and changed its name to Oakleigh Colliery around 1929;
- Oakleigh was continuously worked by underground means until November 1997;
- Oakleigh Colliery first commenced open cut operations in 1973 at the southeast corner of ML4584 and progressed in a generally northerly direction; this area is known as the North Pit;
- Normanton Collieries also started an open cut, the Normanton Pit, in the south eastern side of the site (ML4568 and ML4675) in 1973 and operated until approximately 1981. Mining of the Normanton Pit recommenced in June 1997 and continued until December 1999 when coal reserves could no longer be worked economically;
- New Oakleigh Coal Pty Ltd, a subsidiary of New Hope Coal Australia, acquired the New Oakleigh Mine in December 1999;
- In 2000, New Oakleigh Coal Pty Ltd resumed mining the North Pit for short time until the remaining available reserves were mined out; and
- The open cut mining of the West Pit (on ML4698) commenced in May 2000 with initial box cut operations and coal mining in September 2000.

Mining lease report search records for the area covering the New Oakleigh site from the Queensland Mines and Energy (now known as Department of Employment, Economic Development and Innovation) were obtained for seven mining leases (ML) and two mineral development licences (MDL) as summarised in

Table 2 and detailed within the Preliminary Site Contamination Assessment report provided within Appendix A.

The publicly available records show that mining leases have been held for the land parcels comprising the New Oakleigh site since 1951. The two oldest mining lease reports include:

- ML4568 – issued to Leonard George Boughen on 30 March 1951 which incorporates the vicinity of the Normanton Pit; and
- ML4584 – issued to George Henry Rule on 10 April 1951 in the mining area of the North Pit. The mining lease for the area of the current West Pit was issued to Oakleigh Colliery Pty Ltd on 9 July 1982. This mining lease record was the earliest registered to Oakleigh Colleries Pty Ltd, with an approved date of 5 October 1978.

The site was historically used as an open cut coal mine consisting of a surface mining area and two mine pits contained within five mining leases (4659, 4662, 4660, 4667 and 4668), however at present, only one lease remains granted (4660). Mining leases were issued for the site between 1977 and 1980.

Table 2 **Mining Lease and Mineral Development Licence Information**

Lease ID	Name of Lease	Status	Commencement Date	Expiry Date	Area (ha)	Mine Pit
ML50175	Oakleigh West	Current	01/10/1993	30/09/2013	85.45	West
ML4698	Oakleigh West	Granted - Renewal Lodged	01/12/1986	30/11/2007	189.3	West
ML4584	Oakleigh No.5	Granted - Renewal Lodged	01/04/1984	31/03/2005	161.6	North
ML4683	Oakleigh No.5	Granted - Renewal Lodged	01/03/1986	28/02/2007	173.46	North
ML4699	Oakleigh East	Granted - Renewal Lodged	01/09/1984	31/08/2005	129.75	North
ML4668	No Name	Granted - Renewal Lodged	01/04/2006	31/03/2011	192	Normanton
ML4675	Oakleigh No.4	Granted - Renewal Lodged	01/11/2002	31/10/2007	63.47	Normanton
MDL351	Malabar	Granted - Renewal Lodged	01/03/2004	28/02/2009	251.30	North of North Pit
MDL357	Kunkala	Granted - Renewal Lodged	01/09/2005	31/08/2010	1274.29	Surrounding West Pit

Prior to New Hope purchasing the New Oakleigh site, numerous underground workings operated in the area and a variety of infrastructure from that period remains onsite. Information regarding the historic underground workings at New Oakleigh remains unknown; that is, the depths of mining, dimensions of tunnels, potential in-fill of worked sections and details regarding the extent of the tunnel network are not known. New Hope commented that the underground workings are "*extensive*" and provided mine plan drawings. However, the information provided by New Hope to GHD of the underground workings could not be used in this assessment, owing to the lack of geo-referencing.

A coal handling and preparation plant operated at New Oakleigh from the late 1970s until approximately 2004 and is understood to have been decommissioned in 2005.

At the time of reporting, only the West Pit was operational and both the North Pit and Normanton Pit were currently under rehabilitation. A currently decommissioned railway line encircles the north western portion of the site and intersects the eastern portion of site. On the eastern side of the site, a landfill is situated at 94 Oakleigh Colliery Road. The landfill is closed and no longer accepts wastes; however, it currently operates as a waste transfer station by Ipswich City Council (ICC). This landfill was not considered in this assessment.

A detailed mine plan is provided as Figure 2.

5. Site Characteristics

5.1 Climate

The New Oakleigh mine region exhibits a subtropical climate with warm wet summers and cool dry winters.

5.1.1 Weather Stations

Based on a review of data sourced from the BoM, five climate stations containing current data were identified within 15 km of Rosewood township (Figure 3). These identified climate stations are located radially around Rosewood township and include Rosewood Walloon Rd (040184), Tallegalla Alert (040503), Amberley TM (040816), Amberley AMO (040004) and Grandchester Symes (040091). Climate data from these sites is similar at most of these stations, however climate data was obtained for Rosewood Walloon Rd (040184) climate station from the Bureau of Meteorology (BoM) SILO dataset, based on the station's proximity to the New Oakleigh site and long historical (and current) climate records. Rosewood Walloon Rd climate station data is discussed in the following sections.

5.1.2 Temperature

Mean monthly temperature data for Rosewood Walloon Rd (040184) climate station is presented in Table 3. Mean maximum temperatures range from 27.9°C to 31.3°C in the summer months (October to March) and 20.9°C to 27.1°C in the winter months (April to September). Mean minimum temperatures range from 13.1°C to 19.3°C in summer and 5.7°C to 13.8°C in winter.

Table 3 Mean Monthly Temperatures (degrees Celsius)

Weather Station		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rosewood Walloon Rd (040184)	Min	19.0	19.1	17.4	13.8	10.0	7.2	5.7	6.4	9.4	13.1	16.0	18.2
	Max	31.0	30.6	29.4	27.1	24.0	21.3	20.9	22.5	25.5	27.9	29.8	31.1

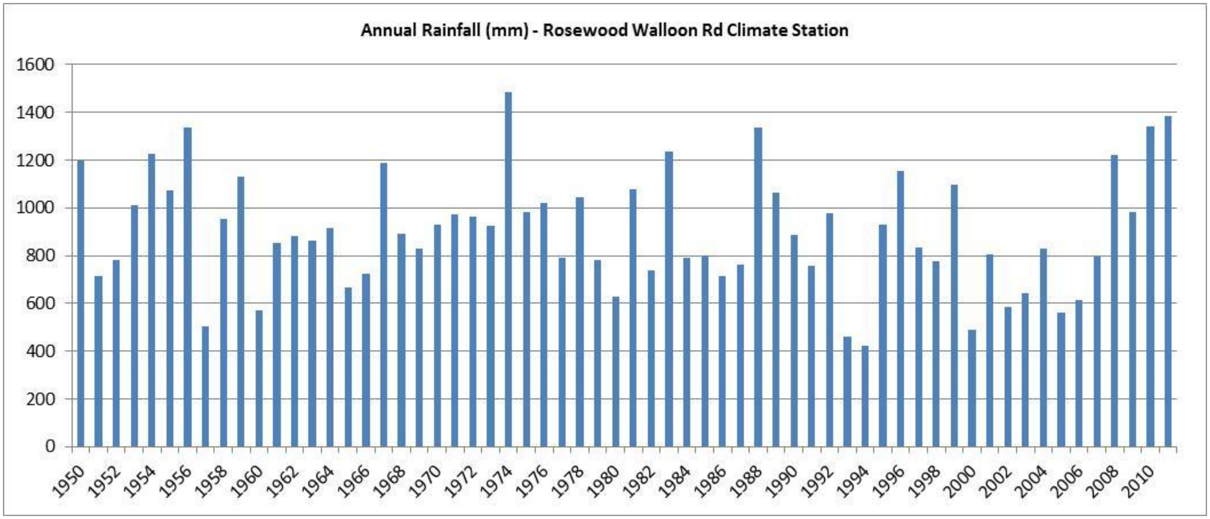
5.1.3 Rainfall

Chart 1 shows a graph of historic annual rainfall from the Rosewood Walloon Rd (040184) climate station. The following rainfall statistics have been obtained from this location:

- Average annual rainfall of 864 mm has been recorded at this location during the period 1900 to 2011;
- 62% of rainfall occurs during the 'wet season' between November and March inclusive; the wettest months being December, January and February (mean monthly rainfalls around 120 mm;
- The highest annual rainfall (1482.5 mm) occurred in 1974, whilst the lowest annual rainfall (424.4 mm) occurred in 1994; and
- The lowest rainfall occurs during winter and early spring with the driest months being August (mean rainfall of 30 mm), September (mean rainfall of 37 mm), July (mean rainfall of 38 mm) and June (mean rainfall of 47 mm).

Rainfall is mainly infrequent and heavy, primarily caused by monsoon conditions extending from the north in summer.

Chart 1 Annual Rainfall



5.1.4 Evaporation

Potential evaporation in the Rosewood region is on average two times greater than precipitation, which averages around 1,700 mm/year.

5.2 Topography and Regional Geomorphology

The vicinity of the New Oakleigh mine site exhibits steep relief with an overall southerly slope (Figure 4). To the north and northeast of the North Pit, a ridge with a topographic high of approximately 200 m AHD dominates the surface and slopes down to elevations of approximately 50 m AHD within the town of Rosewood and along the Bremer River.

5.3 Surrounding Land Uses

Land uses of properties immediately surrounding the site are detailed in Table 4. A detailed inspection of adjacent sites was not carried out as part of this assessment.

Table 4 Surrounding Land Uses

Direction	Land Use
North	Primarily farmland and grazing land north of Cochranes Road, and north west of Rosewood – Marburg Road, as well as small pockets of remnant bushland.
East	Large areas of remnant bushland directly to the east of the site, and a number of partially cleared rural properties located south east of the site off Karrabin – Rosewood Road.
South	The township of Rosewood is located to the south of the site and extends south of the Rosewood – Laidley Road. To the south west of the site is an area of grazing land bordered by Rosewood in the east and the Rosewood – Laidley Road in the south.
West	Agricultural land runs along the western boundary with properties of grazing and cropping with residential properties and scattered remnant bushland west of the site.

5.4 Surface Hydrology

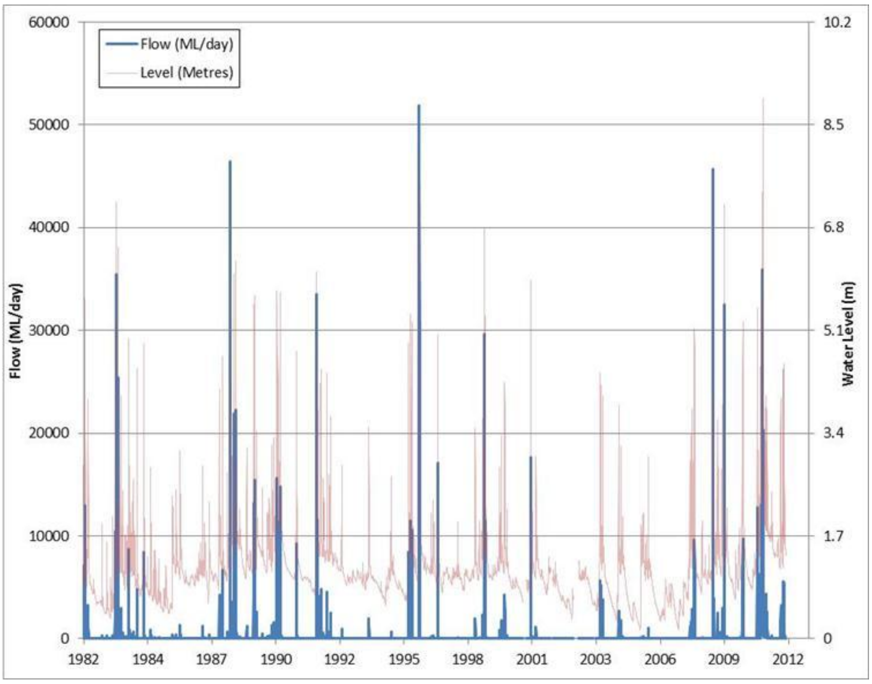
New Oakleigh lies within the Moreton Basin, which drains the area east of Toowoomba to Moreton Bay (west to east) and the upper reaches of the Brisbane River to the vicinity north of the New South Wales border (north to south). The basin's northern limit is at the source of the Brisbane River, and outlets through a number of rivers and streams, primarily via the Brisbane River downstream of Brisbane to the Coral Sea.

The New Oakleigh site is situated within the Bremer catchment, which is the southernmost catchment within the wider Moreton Basin. The Bremer River and Warrill Creek are significant surface water features within the Bremer catchment. The Bremer River sources below Mount Fraser at an elevation of 132 m Australian Height Datum (AHD). Warrill Creek confluences with the Bremer River upstream of Ipswich, whilst the Bremer River confluences with the Brisbane River downstream of Ipswich at an elevation of 3.7 m AHD.

Ephemeral gullies drain stormwater runoff from the mine site into Western Creek, which joins the Bremer River about 1 km south of Rosewood (Douglas Partners, 2004). New Oakleigh is situated to the north of Rosewood township, approximately 6 km north of the Bremer River. Chart 2 shows historic river level and flow data for the Bremer River @ Walloon (station 143107A) (approximately 10 km east of New Oakleigh). The data shows that the river flows throughout the year, with occasional flood events peaking flows and levels temporarily.

BoM data shows that the reduced level (RL) of the ground zero gauge on the Bremer River @ Walloon TM (540081) is 16.4 m AHD, and that average water levels are considered to be around 3 m at this location. This shows a Reduced Water Level (RWL) of around 13 m AHD for the Bremer River @ Walloon. ***This BoM data has not been verified however shows that RWLs at both rivers are low, that is less than 13 m AHD.***

Chart 2 Bremer River @ Walloon – river level and flow



Source: *data obtained from DERM website: http://watermonitoring.derm.qld.gov.au/*

Site history information provided by Mr Drysdale (NHG) suggested that surface expressions of groundwater, i.e. springs, were noticed to occur during mining operations: "*apparently originally there were salt springs on the hill, with reeds growing, and that the springs flowed down the hill".* Additionally, some surface seepage has also been identified at the site.

5.4.1 Mine Pit Water Hydrology

Water Levels

Historical mine pit water level data, i.e. within ponds and mine voids, was not provided or identified otherwise for use in this assessment.

GHD's site inspection and NHG comments indicated that:

- The Normanton Pit does not contain surface water and has partially been in-filled with spoil material. Some groundwater inflow was identified in the southern portion of the Normanton Pit, primarily related to coal seam intersection;
- The North Pit contains water within two areas; the former in-pit tailings pond and the in-pit spoil area. The source of the water has been inferred to be both groundwater and pooled surface water, since the pits contained water even during dry periods. Water seepage at the ground surface has been identified immediately northeast and northwest of the North Pit. This seepage is currently being assessed through a Seepage Study being undertaken by SKM; and
- The West Pit contains some surface water assumed by NHG to be related to the intersection of historic underground workings. Portions of the West Pit have partially been in-filled with spoil material. Pit water is pumped irregularly to other surface water storages at the site, primarily for use in dust suppression.

Water Quality

NHG has previously sampled and analysed surface water contained within the tailings dam pond, as well as identified seepage of water to the ground surface at the mine. Stiff Diagram analysis of water quality data suggested that the source of the seepage water was either the tailings dam within the pit, or discharged water from a coal seam aquifer (AGE, 2009).

6. Regional Geology

This section outlines the geology of the New Oakleigh mine region, including depositional history, stratigraphy and coal seam details. Much of the following section has been adapted from previous studies of the region.

6.1 Structural Geology

Previous studies have described this portion of Moreton Basin as being subject to earth movements that folded existing sedimentary sequences in the geological past (Cameron, 1970). A shallow synclinal structure was the result and pitches gently towards the south.

Several northwest trending faults have previously been identified by NHG, two of which intersect the West Pit (Douglas Partners, 2004). This source reveals that one of these structures extends to the northwest from the northern low wall side of the West Pit and strikes the western creek alignment, whilst the other structure extends west from the northwest batter of the pit.

Anecdotal evidence obtained by Douglas Partners (2004) suggested that groundwater inflows were experienced in the West Pit, however details regarding the potential origin of flows, i.e. from the fault itself or from the coal seam aquifers, were not clear. Anecdotal evidence also revealed that groundwater levels were maintained below the floor of the open pit by way of an extraction bore situated adjacent to the fault.

6.2 Regional Geology

The regional geology comprises Mesozoic sediments (including coal measures) underlying Cainozoic (Tertiary and Quaternary) volcanics and sediments. The geology is described below from oldest to youngest.

The New Oakleigh mine is situated within southeast Queensland's Moreton Basin, which contains sediments of Late Triassic to Middle Jurassic age (AGE, 2009). The Geological Survey of Queensland's 1:100,000 series Ipswich Sheet shows the vicinity of the mine to be underlain by the Jurassic Walloon Coal Measures, which comprise several thin coal seams interlayered with shale, siltstone and sandstone. NHG information indicates that the coal seams mined at New Oakleigh dip towards the south.

The Ipswich 1:250,000 geological map (GSQ, 1973) indicates that Tertiary formations (primarily basalt) outcrop locally in the eastern half of the New Oakleigh mine and further towards the northwest. Some occurrence of basalt has previously been identified within the mine site, with thicknesses of up to 6 m (AGE, 2009).

Some Quaternary alluvial sediments associated with the Bremer River floodplain overlie the coal measures near New Oakleigh, and in the southeast portion of the site. These alluvial sediments comprise undifferentiated floodplain and stranded river terrace deposits, i.e. above the floodplain, of sand, silt, gravel and clay (Douglas Partners, 2004). Alluvial deposition is more irregular and discontinuous along smaller drainage lines and tributaries of the Bremer River. AGE (2009) identified that that the nearest notable occurrence of alluvial sediments to the New Oakleigh mine was associated with Black Snake Creek, situated approximately 1 km north of the mine site.

Figure 5 shows the regional outcrop geology in the New Oakleigh mine region.

6.3 Stratigraphy

The stratigraphy in the vicinity of New Oakleigh is summarised in Table 5 from youngest to oldest.

Table 5 Stratigraphy of New Oakleigh

Age	Unit	Description	Indicative Thickness
Quaternary		Soils and alluvial sediments	Approx. 1 m thick
Tertiary	Basalt	Basalt, rhyolite, trachyte	< 6 m thick*
Mesozoic			
Late Triassic to Middle Jurassic	Walloon Coal Measures	Shale, siltstone, sandstone, coal, mudstone and limestone. Coal seams intersected at depths ranging from 15 m to 178 m bgl* Weathered to 21 m*	Thickness unknown
Palaeozoic			
Devonian to Carboniferous	Neranleigh – Fernvale Beds. These units unconformably underlie the Jurassic Ipswich Coal Measures**	Mudstone, shale, arenite, chert, jasper, metavolcanics, conglomerate	unknown

Source: * *Information obtained from (AGE, 2009)*

*** Generic information obtained from Geoscience Australia*

Note: bgl = below ground level

7. Regional Hydrogeology

The groundwater regime at New Oakleigh has been interpreted from other investigations undertaken at the New Oakleigh mine and the wider region, as well as through public domain data held by the Queensland Government. This section should be revisited following completion of site investigations.

7.1 Regional Aquifers

In general terms, the coal seams are often more permeable (and release larger quantities of groundwater) than their host sandstone and siltstones. Coal seams within the Mesozoic formations are considered the main aquifers within the otherwise lower permeability units. NHG (2002) has previously indicated that groundwater yields from exploration bores and active mining pits has been very low or nil, with no significant groundwater resources encountered through mining operations.

7.1.1 Palaeozoic Formations

Palaeozoic basement rocks comprising mudstone, shale, arenite, metavolcanics and conglomerate occur regionally and outcrop approximately 12 km east of the New Oakleigh site. The extent of these rocks to occur beneath the site remains unknown, but based on regional knowledge, are likely to be at great depth (>400 m bgl).

If present, groundwater within these units is likely to flow through secondary porosity, and is likely to be structurally controlled.

7.1.2 Mesozoic Formations

Groundwater within the Mesozoic formations is likely to exhibit flow through secondary porosity, i.e., flow occurring though structural features such as faults, joints and fissures and other discontinuities within the rock mass. A lesser component of flow may occur through primary porosity, e.g. interstices of coarser grained indurated sediments.

Within the Mesozoic Walloon Coal Measures of the Moreton Basin, groundwater can be categorised into two hydrogeologically distinct units, as stipulated previously by AGE (2009);

- Low permeability sedimentary sequences of sandstone, shale and siltstones that comprise the majority of the Walloon Coal Measures formation; and
- Moderate permeability coal seams, which at New Oakleigh, can be considered semi-confined within the sedimentary sequences described above. Regionally, these coal seams also occur as confined aquifers at locations that are remote from outcrop / subcrop. The coal seams represent the major water bearing strata within the Walloon Coal Measures.

Mining operations at New Oakleigh showed that groundwater intersections generally occurred within the first, i.e. shallowest, or second coal seam within the Walloon Coal Measures, at depths ranging from 14 m to 24 m bgl.

7.1.3 Tertiary Basalt

Groundwater within the Tertiary basalt is likely to exhibit the bulk of its flow through secondary porosity. That is, flow occurring though structural features in the basalt such as joints and fractures. Some primary porosity flow through vesicles may also occur where present.

The Ipswich 1:250,000 geological map (GSQ, 1973) maps the Tertiary basalt outcrops to the north of the New Oakleigh mine. Previous exploration investigations within the New Oakleigh mine identified up to 6 m thickness of basalt. Given the likely limited lateral extent and vertical thickness of this unit in the vicinity of the mine (AGE, 2009) it is unlikely that Tertiary Basalts would comprise a significant aquifer near the mine.

7.1.4 Quaternary Alluvials

The extent of Quaternary Alluvial deposit occurrence at the New Oakleigh mine site is considered minor based on broad scale mapping (GSQ, 1973), but remains largely unknown at a local scale. Where they do occur, these deposits would form localised inter-granular aquifers associated with flood plain deposits derived from active drainage channels, i.e. Bremer River deposits. Groundwater flow in alluvial systems predominantly occurs through pore spaces (primary porosity) within unconsolidated sediments.

7.1.5 Anthropogenic Aquifers

Anthropogenic or *ex-situ* sources of soil and/or rock materials such as spoil heaps and in-filled mine voids may contain significant volumes of water within storage. Large spoil heaps stockpiled above the natural surface may act as localised perched aquifers, whereas a mine void may locally increase groundwater recharge and create mounding or storage within the surrounding host geology.

The unconsolidated, loose, nature of stockpiles, spoil heaps and overburden dumps would permit some percolation, storage and transmission of water. These features would be highly localised (compared to regional aquifer systems), variable and highly dependent on the extent, depth and composition of fill materials, as well as the depth of weathering and extent of fracturing within adjacent materials.

7.2 Borehole Locations and Depth

7.2.1 GWDB Bores

The DERM Groundwater Database (GWDB) stores all Queensland groundwater resource information including, water level, water quality, construction, pump and flow test, elevation, location, strata, stratigraphy and aquifer details, bore condition, casing and wire line.

A search of the GWDB database identified approximately 160 bores within an approximated 20 km radius of the New Oakleigh mine. These bores are evenly distributed in all directions of the New Oakleigh mine, particularly to the south within locations of Quaternary Alluvial outcrop (adjacent to the Bremer River and Warrill Creek). Based on the 77 bores containing depth information, these bores were drilled to depths ranging from 4.5 m to 147 m, averaging as 31 m bgl. Approximately 65% of the 106 identified bores containing bore use information are existing water supply bores drilled pre-1991 to develop the Bremer River Alluvium. Most other bores are used for (sub-artesian) groundwater monitoring.

7.2.2 New Oakleigh Site Bores

Based on information provided by New Hope, 17 bores are known to exist within the New Oakleigh mine site (Figure 2). The location details and depths for these bores were provided by NHG and are shown in Table 6, however no information on lithology or screen intervals are available. Some of these bores are also referred to by name as well as bore ID (e.g. Blake's Road bore, Perrin's Road bore and Kelly's bore). None of the 17 bores were identified during the initial site inspection by GHD. Twelve of the bores are located outside of the New Oakleigh site boundary to the south and south west and it is understood that the other five bores are located on tenanted properties.

In addition to these bores, the SKM seepage study (on-going at the time of reporting) has thus far included the drilling and installation of ten groundwater monitoring bores (Table 7). Bore construction details or formations monitored remain unknown for these bores. It is understood that the SKM seepage study will conclude subsequent to issue of this report, and as such, the outcomes of which cannot be incorporated into this assessment.

The coordinate projection for the locations in Table 6 and Table 7 is Australian Map Grid 1984 (AMG84) and datum is Australian Geodetic Datum 1984 (AGD84).

Table 6 Existing Bores at New Oakleigh

Bore ID	Easting (AMG AGD84)	Northing (AMG AGD84)	Elevation (m AHD)	Bore Depth (m)
8315P (Blakes Road Bore)	460038.1	6944393	126.64	119
8337WB	458522.3	6943786	71.16	36
8341WB	459375.9	6944495	103.31	30
8340WB	459203	6944285	127.01	102
8342P	458690.7	6943666	78.32	46.5
8344WB	457977.3	6942990	53.56	19
8345WB (Kellys Bore)	457449.3	6944255	66.97	37
8346WB	458396	6943753	64.84	24
8348P	457452.9	6944256	66.73	30
8343P	458401	6943754	64.66	36
8347P	458526.6	6943787	71.51	48
8372WB	457986.8	6942992	53.13	18
8373P	458181.5	6943018	54.62	26.4
8374P	458218.2	6943369	58.65	18
8377P	455559.1	6943637	75.05	12.5
8378P	457861.1	6942819	51.09	18
8401P	457274.1	6943321	60.59	34

Source: *data provided to GHD by Mr. Ross Bennett (New Hope)*

Table 7 SKM Seepage Bores at New Oakleigh

Bore ID	Easting (AMG AGD84)	Northing (AMG AGD84)
Bore 1	459051.857	6946308.223
Bore 2	459024.802	6946227.488
Bore 3	458988.162	6946049.531
Bore 4	459398.82	6946436.222
Bore 5	458747.857	6945085.296
Bore 6	458812.391	6945166.682
Bore 7	459381.983	6946514.466
Bore 8	459165.458	6946425.567
Bore 9	459331.885	6946576.954
Bore 10	458972.506	6946332.039

Source: *data provided to GHD by Mr. Ross Bennett (New Hope)*

7.3 Potential Yields

7.3.1 Palaeozoic Formations

Available groundwater flow rate data from the GWDB is presented as Figure 7. The data provides yield measurements for bores in the vicinity that develop various geological formations. Data was not identified from bores monitoring the regionally identified Palaeozoic rocks in the New Oakleigh region. Groundwater yields for this formation were identified in the Chuwar region however, where yields ranged from 0.3 L/sec to 1.2 L/sec, averaging around 0.6 L/sec.

This data should be considered indicative, since it was recorded through various methods primarily during drilling and exploration works undertaken in the vicinity. The bores may not necessarily have been designed and constructed as high yielding production bores.

7.3.2 Mesozoic Formations

Pumping information was provided for six bores at New Oakleigh, including Blake's Road, Marburg Road, Perrin's Road, Kelly's bore, bore 8373 and bore 8374. A summary of the findings is presented below, noting that GHD has not undertaken any quality control checks on the data:

- **Blake's Road bore (8315P)**: 6,830 kL pumped between April 2003 and October 2004. Groundwater level generally stable, with variations (both rising and falling) of less than 0.85 m;
- **Marburg Road (8171WB)**: nearly 30,000 kL pumped between May 2003 and May 2004. Groundwater level generally rising, with variations (both rising and falling) of up to 3.6 m;
- **Perrin's Road bore and Kelly's bore (8345WB)**: unknown quantity pumped from both bores. Groundwater level fluctuating, with declines of up to 6.6 m and rises of up to 4.8 m in both bores;

- **Bore 8373**: unknown quantity pumped. Groundwater level generally stable, with variations (both rising and falling) of less than 0.35 m; and
- **Bore 8374**: unknown quantity pumped. Groundwater level generally stable, with rises of up to 0.29 m and falls of less than 0.55 m.

Queensland Water Resources Commission (1987) regional groundwater resource mapping depicts groundwater availability and characteristics across Queensland. Near the New Oakleigh mine, the map documents the groundwater potential within the Walloon coal measures as being limited, with bore yields typically less than 5 L/sec. Airlift tests undertaken during exploration drilling at New Oakleigh indicate that actual groundwater yield from the coal measures at the mine site are generally lower, ranging from 0.6 L/sec to 0.9 L/sec (Douglas Partners, 2004).

Available groundwater flow rate data from the DERM Groundwater Database (GWDB) is presented as Figure 7. The data provides yield measurements for bores in the vicinity that develop various geological formations. Data collected from bores monitoring the Walloon Coal Measures shows groundwater yields ranging from 0.15 L/sec to 1.9 L/sec, averaging around 0.5 L/sec. Data collected from bores monitoring Jurassic Sandstone (Marburg Sandstone, Gatton Sandstone and Koukandowie Formation sandstone) show groundwater yields ranging from 0.05 L/sec to 1 L/sec, averaging around 0.3 L/sec. This data should be considered indicative, since it was recorded through various methods primarily during drilling and exploration works undertaken in the vicinity.

7.3.3 Tertiary Basalt

Previous hydrogeological investigations at New Oakleigh (including those identified in Section 3.3) did not highlight the Tertiary Basalt as a significant hydrogeological unit. If saturated, groundwater within the Tertiary basalt would likely exhibit flow through secondary porosity. That is, flow occurring though features in the basalt such as joints, fractures, and vesicles.

Groundwater flow rate data for the Tertiary Basalt was not identified from the GWDB for the New Oakleigh region, potentially reflecting the limited extent and/or available storage of these flows. Data obtained from GWDB bores monitoring the Tertiary basalt (Booval Group) in the Chuwar region identified groundwater yields ranging from 0.2 L/sec to 5.6 L/sec, averaging around 2.1 L/sec. Lower flows of up to 0.5 L/sec were identified within Tertiary sediments in the Chuwar region.

7.3.4 Quaternary Alluvium

Queensland Water Resources Commission (1987) indicates potential for groundwater within the unconsolidated alluvial sediments in the Rosewood township region, with bore yields ranging from 5 L/sec to 15 L/sec (Douglas Partners, 2004).

Yield measurements identified from the GWDB showed bores in the vicinity that develop the Western Creek, Woolshed Creek and Bremer River Alluvium (Figure 7). Data collected from these bores showed groundwater yield ranging from 0.06 L/sec to 12.6 L/sec, averaging around 3.7 L/sec. The nearest identified bore to the New Oakleigh site (bore 138174), situated adjacent to the site on Rosewood-Laidley Road (Figure 7), showed a yield of 8 L/sec within Bremer River alluvium.

7.3.5 Anthropogenic Aquifers

Permeability and potential yields associated with these anthropogenic aquifers have not been identified to date.

7.4 Groundwater Levels and Flow

The groundwater level and flow conditions at the New Oakleigh mine are poorly understood. Inferences have been made primarily from regional data.

Groundwater elevation contours (Figure 8) have been developed from RWL data recorded within the GWDB (DERM, 2010), to develop an understanding of potential groundwater flow directions and gradients. Groundwater data was obtained between June to October 2010, from bores within 20 km of the mine site. Since the groundwater elevation contours are not aquifer specific, this data is considered indicative only.

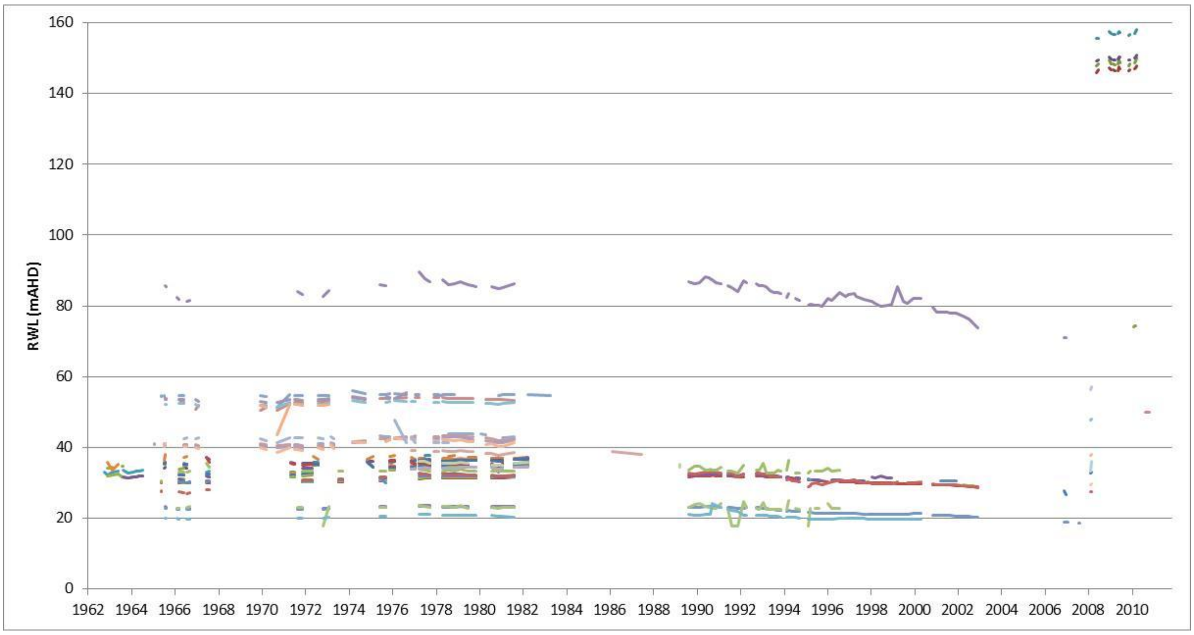
The regional groundwater flow direction is inferred to be south-southeasterly in the New Oakleigh mine region, i.e. north of the Bremer River. South of the Bremer River, groundwater is inferred to flow northwesterly. At locations adjacent to the Bremer River, groundwater is likely to flow in a predominantly easterly direction, consistent with the downstream movement of water in the river. These observations are consistent with groundwater level data from the New Oakleigh mine site (Figure 8), which indicate a hydraulic gradient ranging from 0.009 to 0.014, becoming flatter towards the southeast, as groundwater approaches the Bremer River.

Local groundwater flow systems at the New Oakleigh mine are likely to be influenced by the historic underground mine voids that exist beneath the site. These voids are likely to comprise local groundwater sinks, as discussed further in Section 7.8.

7.5 Groundwater Level Trends

Chart 3 presents a bore hydrograph from Queensland GWDB bores containing groundwater elevation data. Bores that contain time series data show stable to slightly increasing groundwater levels between 1970 and 1982, following which, there is a gap in data collection until 1989. From this date, collection of water level data was limited to a few monitoring bores, which generally show declining groundwater levels from 1989 to 2010. It should be noted that information relating to monitored geological formation was not provided within the GWDB for most of these bores and as such, groundwater level trends specific to geological formations cannot be appreciated. Based on shallow bore depths (predominantly less than 20 m bgl), it is inferred that most of these bores develop the Bremer Alluvium.

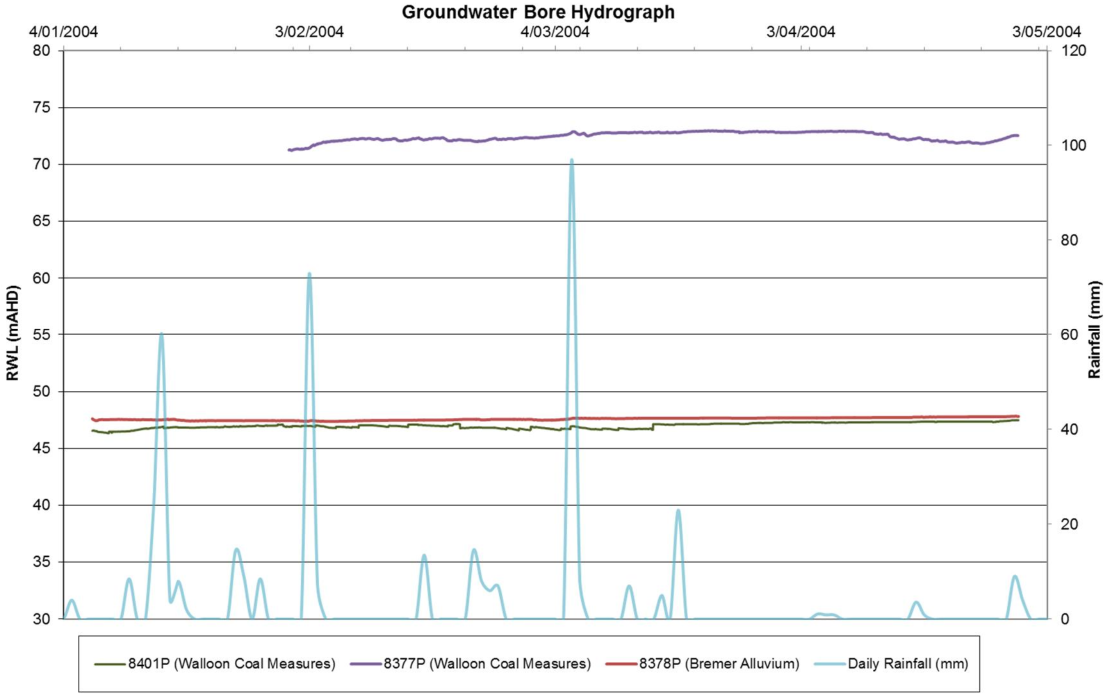
Chart 3 Groundwater Bore Hydrograph – GWDB data



Groundwater level monitoring data provided by NHG from the New Oakleigh mine is shown as Chart 4, with groundwater level data collected every 20 minutes during the period January to May 2004. Groundwater level trends in each of the three monitored bores (8401P, 8377P and 8378P) were generally stable throughout this period, despite significant rainfall in early February and early March 2004. Bore 8377P showed a minor increase following significant rainfall. Two of these bores monitor the Walloon Coal Measures (8401P and 8377P), whilst one bore (8378P) monitors the Bremer Alluvium. This data shows RWLs to range from 45 m to 75 m AHD.

Site history interviews undertaken by GHD identified that the Blake's Road bore, which develops the historic '*Glenco*' underground workings, was last measured for SWL in 2010, and showed a groundwater level of 102 m bgl.

Chart 4 Groundwater Bore Hydrograph – New Oakleigh Monitoring Data



Note: *Rainfall data obtained from BoM SILO service.*

7.6 Aquifer Hydraulic Parameters

Site specific or regional groundwater permeability data was not identified for any of the geological formations inferred to occur at or near the New Oakleigh site. The Mesozoic aquifer system (coal measures and host rocks) are considered most relevant to the analysis. It is inferred that the low permeability sedimentary sequences exhibit permeabilities in the order of 0.01 m/day to 0.001 m/day. The coal seams are inferred to show permeabilities in the order of 0.001 m/day to 0.1 m/day. These ranges have been adopted as preliminary estimates in the analytical modelling undertaken in Section 9.

These estimates are based on our understanding of potential permeability ranges of equivalent formations found elsewhere in Queensland; GHD provides no warranty in the accuracy of these estimates or that these estimates reflect site conditions at or near New Oakleigh. Site specific investigations are required to determine aquifer hydraulic parameters.

7.7 Recharge

7.7.1 Palaeozoic Formations

Palaeozoic Formations consisting largely of mudstone, shale and arenite outcrop approximately 13 km northeast of the New Oakleigh site. The majority of groundwater recharge to these rocks (at this location) is likely to occur through 'direct' infiltration of rainfall and percolation through residual soils, fractures and joints to either deeper zones within these rocks, or adjacent units, primarily during significant rainfall events.

7.7.2 Mesozoic formations

The Walloon Coal Measures subcrop below Quaternary sediments at the New Oakleigh site at depths of 15 m to 178 m bgl. The majority of groundwater recharge to the Mesozoic sediments is likely to occur from downward leakage of water from overlying units where in hydraulic connection.

Fractures induced in the Mesozoic formations through historic mining may also provide additional pathways for recharge of waters to the formation and underlying / adjacent units.

7.7.3 Tertiary Basalt

At outcrop locations in the western portion of the site (Figure 5), the Tertiary basalt aquifer is likely to be recharged through direct rainfall recharge, whilst basalt at depth is likely to be recharged by way of throughflow from adjacent formations or downward leakage from overlying formations, or, if an upwards pressure gradient exists, upward leakage from the underlying Mesozoic sediments.

The thickness and subsurface extent of Tertiary Basalts at the site remains uncertain.

7.7.4 Quaternary Sediments

Quaternary alluvial sediments associated with the Bremer River are primarily present along the Bremer River floodplain. Recharge to these sediments is likely to occur through infiltration of direct rainfall or associated flood events, which may inundate the Bremer River and its floodplain.

7.8 Discharge

Groundwater discharge processes and mechanisms remain largely unknown at this stage.

Anthropogenic aquifers such as spoil stockpiles, surface mine voids are likely to discharge water locally to adjacent or underlying formations or depending on pore pressures, to the ground surface by way of seepage or spring flow. Groundwater seepage has been identified at the ground surface in the vicinity north of the North Pit, where previously filled tailings pits are possibly discharging water further north outside of the mine site.

It is reasonable to infer that groundwater within the Quaternary sediments discharges to underlying Tertiary units (where present) and to underlying Mesozoic formations. Some groundwater within the Quaternary sediments is also likely to migrate down topographic slope towards the surface waters associated with the Bremer River.

It should be noted that little is known at this stage with regards to vertical flow regimes. It is possible that water within the Mesozoic formations is subject to upwards pressure gradients, resulting in discharge to overlying sediments. However, connectivity between the largely permeable coal seams and the relatively impermeable sedimentary rocks within this formation is likely to be low.

The voids of historic underground mine workings within the Walloon Coal Measures are likely to represent areas of groundwater sinks, that is, groundwater adjacent to and overlying these voids would discharge at these voids. Given the significant extent of the underground mine footprint (suggested by NHG), the extent of influence these historic workings have on local groundwater flow systems is likely to be significant.

7.9 Groundwater Quality

Available groundwater quality data from GWDB bores located within 20 km of New Oakleigh is presented within Figure 9. Chart 5 shows available time series data for 66 GWDB bores. These figures show that laboratory analytical data obtained from previously drilled boreholes in the vicinity primarily show a median total dissolved solids (TDS) value of <2,500 mg/L TDS, however can range from fresh (217 mg/L TDS) to saline (<16,000 mg/L TDS). Field chemistry data obtained from the same boreholes show data that correlates well with these laboratory results.

It is considered likely that the majority of the [fresh] water qualities were obtained from the shallow Bremer Alluvium, rather than the deeper Walloon Coal Measures, which would typically exhibit lower (more saline) groundwater quality. Figure 9 shows that most bores near the New Oakleigh mine exhibit brackish groundwater quality up to 3,500 mg/L TDS. The two nearest groundwater bores to the site show salinities around 7,500 mg/L TDS at depths of 60 m (monitoring mudstone) and 70 m bgl (monitoring sandstone).

The Groundwater Resources of Queensland Map shows that within the Walloon Coal Measures, water quality is brackish to saline for most stock use (TDS ranging from 1,500 mg/L to 5,000 mg/L). Water quality within the alluvial sediments has been considered fresh within the State map, with TDS ranging from 500 mg/L to 1,500 mg/L.

Groundwater pH data obtained from these bores shows average conditions to be near neutral (7.7 pH units), with conditions ranging from near neutral (6.6 pH units) to alkaline (9.5 pH units).

Chart 5 Groundwater Quality – GWDB Bore Data

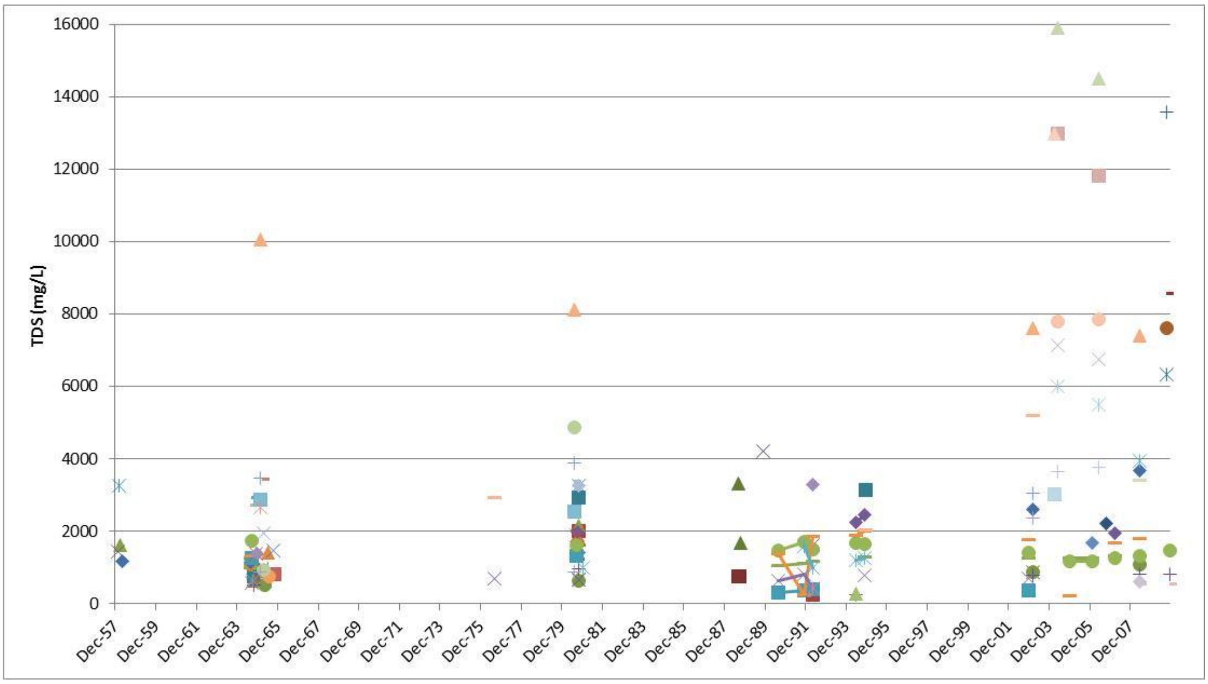
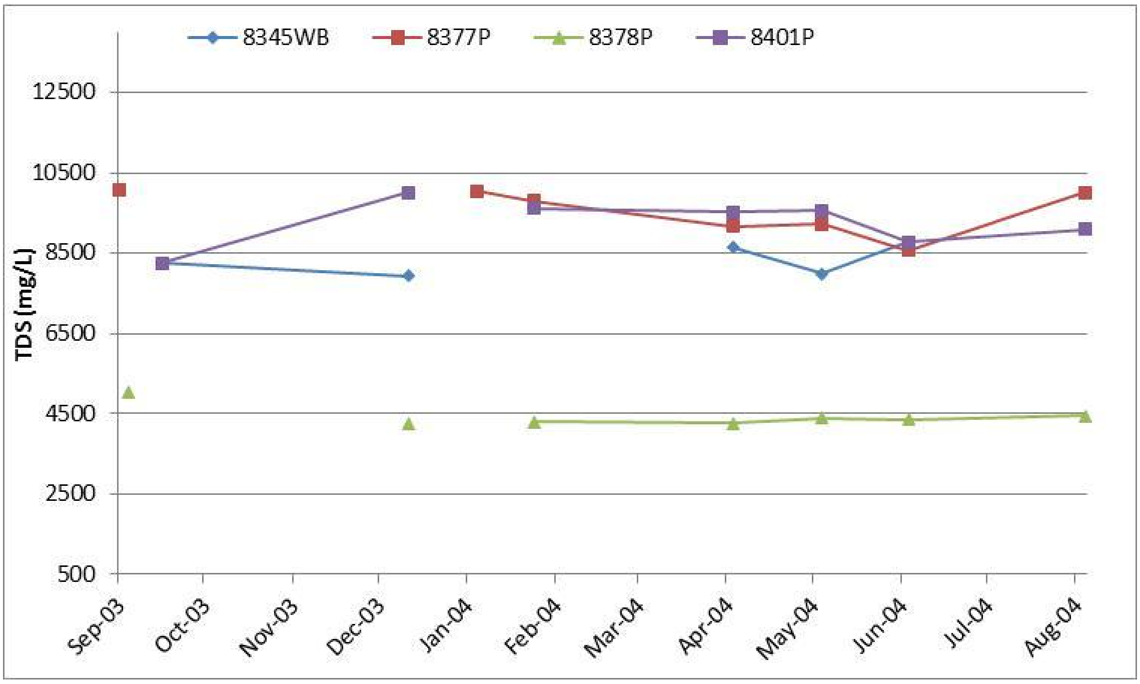


Chart 6 shows limited groundwater salinity data obtained from four monitoring bores at the New Oakleigh mine between September 2003 and August 2004. Groundwater quality ranged from brackish (4,200 mg/L TDS) at bore 8378P to saline (8,000 mg/L to 10,000 mg/L TDS) at bores 8345WB, 8377P and 8401P. Groundwater pH conditions at these bores was near-neutral throughout this period, with values ranging from 6.2 to 7.6 pH units.

Site specific groundwater quality data obtained from NHG (2002) monitoring, indicates groundwater within the Walloon Coal Measures to be brackish to saline, with electrical conductivity (EC) values ranging from 5,000 µS/cm to 7,000 µS/cm (3,200 mg/L to 4,500 mg/L TDS).

Chart 6 Groundwater Quality – New Oakleigh Bore Data



7.10 Groundwater Use

Groundwater in the vicinity of Rosewood is currently used by the New Oakleigh mining operation and possibly, by a number of private users that do not require registration with DERM. The following provides a summary of existing groundwater extraction in the vicinity.

7.10.1 New Oakleigh Mine

It is understood that the coal handling and preparation plant was decommissioned in 2005 and that little or no groundwater has been extracted since this time.

Previous investigations and anecdotal information (Douglas Partners, 2004) identified that the mine extracted groundwater from three bores within old underground mine workings to supplement the wash plant demand. These bores include bore 8315P (located on Blakes Road), bore 8171WB (Rosewood-Marburg Road) and bore 8373P (near Perrins Lane). Anecdotal evidence suggested that the bores pumped dry within a day and took up to two days to recover. Groundwater was also extracted from a fractured rock aquifer within the Walloon Coal Measures at bore 8345WB (known as 'Kelly's bore'). This bore is situated adjacent to bore 8345P and was abstracted for dust suppression at the mine. Pooled surface water at the West Pit (which is probably connected to water within underground mine workings) is used for dust suppression at the site.

Historic data suggests that bore 8171WB extracted approximately 29 Megalitres (ML) between May 2003 and May 2004. The Blake's Road bore extracted a total volume of 5 ML between August 2003 and May 2004. Groundwater level monitoring at both of these bores showed no significant variation in groundwater levels during extraction (Douglas Partners, 2004), which is somewhat contrary to the aforementioned anecdotal evidence provided in the same study. Groundwater bores developing historic underground mine workings are likely to have large available storage when considering the comparatively small volumes of water extracted.

7.10.2 Existing Domestic Users

Since the entire Moreton Basin vicinity is not within a Proclaimed Groundwater Area under the *Water Resources Act* 1989 and the *Water Act* 2000, bores drilled in the district do not require a licence, permit or registration with DERM.

A search of the DERM groundwater database (GWDB) identified information on 105 existing groundwater bores within 20 km of the New Oakleigh mine (Figure 6). General comments regarding these bores include:

- 16 bores which were drilled and installed for groundwater monitoring of sub artesian groundwater, i.e. observation / investigation purposes. These bores are listed below, with inferred geological unit monitored based lithological logs where provided within the GWDB. Aquifer test data was not provided for these bores:
  - bores monitoring sandstone: 14310194, 14310195, 14310256, 14310096 and 14310091;
  - bores monitoring mudstone: 14310190, 14310189, 14310193 and 14310191;
  - bores monitoring shale: 14320874, 14320875, 14310080, 14310086 and 14310262; and
  - formation monitored not specified: 14310255 and 14300126.
- 17 drilled for water resource investigations bores including those listed below. The GWDB does not contain installation details or aquifer test details for these bores:
  - bores monitoring sandstone: 138286, 138287, 14310096, 14310091, 138259, 138261 and 14310261;
  - bores monitoring shale: 14320874, 14320875, 14310256, 14310086 and 14310262;
  - bores monitoring clay: 138257, 138260 and 138262; and
  - formation monitored not specified: 14310255 and 14310080.
- 56 existing bores drilled for water supply purposes, which primarily monitor the Bremer River and Western Creek Alluvium (these show yields ranging from 0.1 L/sec to 12.6 L/sec, averaging 4.3 L/sec) as well as Jurassic sandstones and the Walloon Coal Measures (these show yields ranging from 0.3 L/sec to 2 L/sec, averaging 0.5 L/sec).

8. Conceptual Hydrogeological Model

A conceptual hydrogeological model is a generalised description of a complex groundwater flow system that describes the behaviour of the groundwater system and its interactions between aquifers and with surface water within a catchment. A conceptual model requires compilation of detailed information on the geology, water quality, recharge, surface water, groundwater levels, hydraulic parameters and groundwater usage. The key elements in a conceptual model are defining the extents and hydraulic properties of the aquifers and aquitards and understanding the groundwater flow directions, groundwater recharge and discharge processes.

A conceptual hydrogeological model has been developed based on the largely inferred distribution of the various geological formations, aquifer testing and groundwater monitoring. The model is a tool through which detailed technical concepts can be summarised in a relatively non-technical way. The model should be reviewed and revised as site specific data becomes available.

Based on the information and assumptions outlined above, a conceptual groundwater model has been developed for the currently operating site and is presented as Figure 10. The schematic comprises a section through the site, showing the interpreted geological units, aquifers and groundwater flow. Significant elements of the conceptual model are outlined below, from shallowest (youngest) to deepest (oldest).

8.1 Surficial Flow

The Bremer River and associated tributaries lie at the ground surface a few kilometres south of New Oakleigh. The Bremer River contains surface water year-round and as such, river alluvium is likely to be fully saturated.

Groundwater has the potential to contribute inflows, i.e. baseflow, to the river, based on the steep topography and higher groundwater head at the mine site compared with river water levels. However, the component of surface water (following significant rainfalls) that could percolate downwards and contribute to groundwater recharge remains uncertain at this stage.

At the New Oakleigh site, surface water runoff, i.e. primarily from rainfall, is likely to flow from areas of higher elevation towards the open-pits, i.e. the West, North and Normanton pits. The West pit generally contains some water, the source of which is likely to include both groundwater inflow and rainfall runoff. The dominance of either mechanism remains unknown at this stage. The Normanton pit on the other hand, does not contain any water, and the North pit contains some water within the historic tailings pond and the spoil area.

Cross-sections A-A’ and B-B’ (Figure 10) both show a potential surface water (and potentially groundwater) divide along the northern site boundary based on topographic data. This suggests local flow components in the northern extent of the site boundary, i.e. the northern portions of both the West and North Pits, to flow in a northerly direction. This inference concurs with identified seepage at the ground surface on the northern slopes of the watershed divide near the North Pit.

8.2 Groundwater Flow Systems

Available data suggests the following interpretations of groundwater flow systems at the New Oakleigh mine:

- Anthropogenic aquifers of limited extent – comprising spoil stockpiles and open and partially in-filled mine voids at the ground surface. Mine voids are not technically aquifers, but comprise storages which may be connected and artificially recharge to host rocks within which the void is formed;
- Anthropogenic 'aquifers' of significant extent – comprising open underground mine voids. These mine voids may have collapsed partially and although are not technically aquifers, they potentially comprise significant groundwater storages which may be connected to surface waters (or rapidly recharged by surface water / run-off), and that may subsequently artificially recharge to host rocks within which the void is formed;
- Shallow Quaternary Alluvial aquifer – moderate permeability and high quality unconfined aquifer, with extent generally laterally restricted to the limits of the Bremer River floodplain; and
- Semi-confined to confined fractured rock aquifer – groundwater is largely contained and transmitted within the permeable Mesozoic coal seams, but may also occur in fractures / fissures of the less permeable Mesozoic rocks and Tertiary rocks (where present).

Saturated soil stockpiles (and potentially in-filled mine voids) are unlikely to be compacted, and as such, may show moderate permeability that may locally provide storage or transmit water to adjacent or underlying formations. The stockpiles (and in-filled voids which may receive preferential recharge) may have localised groundwater mounds where they are saturated, and groundwater seepage may occur at the ground surface along their margins.

Quaternary age flood plain deposits of the Bremer River represent aquifers that rely on rainfall events for recharge via rainfall-runoff, or significant flooding events to become saturated through river flow. Much of the pre-Quaternary land surface has been deeply incised by stream action over geologic time.

Regionally, tertiary volcanism resulted in deposition of basalt over several eruption periods / phases. The basalts form the higher topography in the eastern half of the site. Tertiary basalts are likely to be limited in lateral continuity and if present, recharge via direct rainfall recharge or downward percolation of water where overlain by Quaternary sediments. It is unknown whether basalts in the vicinity of New Oakleigh are saturated but if so, movement of groundwater within the basalt is likely to be controlled by compartmentalised fractures and vesicular intervals.

Beneath the Quaternary sediments in the region, the Mesozoic formations probably receive groundwater recharge from these overlying units, with water sourced from significant rainfalls. At deeper locations, recharge probably occurs through diffuse rainfall recharge or through flow, by way of downward percolation of water from the overlying Quaternary material or Tertiary material if present. Water movement in the Mesozoic rocks is probably structurally controlled, whereby water moves primarily through major fracture systems and within the more permeable coal seams (relative to the host rocks). Limited hydraulic connection may exist between the coal seams and the adjacent rocks of the Walloon Coal Measures, however this, and the impact of modified permeabilities (refer to Section 8.2.1) remain largely unknown.

Northwest trending faults have been mapped at the mine (these are not shown in Figure 10), and their influence on groundwater flow is not understood.

8.2.1 Modified Groundwater Flow Systems

Three open cut pits (the West, North and Normanton pits) have been identified at the ground surface at the New Oakleigh site, only one of which (West Pit) represents an operational mining area. The potential exists for these pits to represent local groundwater sinks at the site, particularly at the West and North pits, which show pooled surface water (possibly due to some groundwater discharge) throughout the year.

Site history information provided by Mr Cochran and Mr Drysdale (NHG) indicated that NHG worked the North Pit for about 12 months after purchasing the site, ceasing in 2001 primarily due to water management issues. Local influences on groundwater systems posed by the surface pits remain largely unknown, but are likely to vary hydrostratigraphically and temporally.

The surface pits essentially create a direct conduit for surface water to migrate into the Walloon Coal Measures, specifically the coal seams. It is assumed that the base of the mine voids is deeper than the regional groundwater table and that they have been filled to some extent by groundwater, with some contribution by rainfall. It is suspected that the mine workings have resulted in artificial enhancement of the permeability (and connectivity) of the fractured (Mesozoic rock) aquifer. Groundwater entering the mine works has ultimately flowed into the open pits, where the pits are suspected as intersecting the mine workings. This appears to be the case at the West Pit, where mine personnel suggested that the base of the pit intersects the historic underground workings.

The dimensions of these surface pits and their wider footprints (which incorporate in-filled portions of the pits) remain unknown. GHD calculations, estimated through using NHG provided GIS layers of the three pits, and analysis undertaken using ArcGIS proprietary software package, shows that approximate surface areas of the West, North and Normanton pit footprints are in the order of 1 km^2, 1.5 km^2 and 0.5 km^2 respectively.

Additional water stored within these pits or uncompacted fill / spoil at the surface has probably increased pore pressures in these shallow soils, resulting in surface seepage of water to the north of the North Pit. Depending on water quality, this surface seepage has the potential to cause salinity management issues as the seepage water evaporates.

The locations, dimensions, integrity and extent (both lateral and vertical) of the historic underground mine workings at New Oakleigh remain largely unknown. Underground mine workings have been identified at depths of 51 m and 75 m within the New Oakleigh mine, within the eastern portion of the pit high wall (AGE, 2009). These significant underground voids, some of which may have been backfilled or have since collapsed, also represent groundwater sinks / conduits whereby surface water and groundwater within the Walloon Coal Measures (specifically the coal seams) may accumulate. Site history information provided by Mr Cochran and Mr Drysdale (NHG) suggested that "*the Glenco [underground] workings were always wet*" and a submersible pump worked continuously to manage accumulated water. The extent of impact (either horizontal or vertical) to groundwater flow systems remains unknown and will require site-specific data to assess.

The vertical extent of groundwater influence at the mine (as a result of the excavated voids) is unknown since the depth of historic underground mining remains unknown. NHG considers it likely that three or four levels of underground mining historically took place at New Oakleigh. Adjacent groundwater is likely to [locally] flow towards these underground voids, which represent [local] groundwater sinks.

8.3 Summary

The current conceptual hydrogeological model is largely based on inferences and limited site specific data. It is assumed that the various open pits and underground mine workings at New Oakleigh are interacting with a combination of both groundwater and surface water. The historical mine works may have artificially modified both groundwater flow and storage capacity locally. The interaction caused by the mine workings may also influence local hydraulic gradients and groundwater quality. With time, this ‘water’ may migrate with the regional groundwater flow direction towards potential receptors, which have not been conclusively identified, but are likely to include receiving waterways and ecosystems, such as those found down-gradient in the Bremer River floodplain, but also groundwater users of this resource.

There is currently a lack of site specific groundwater information (e.g. quality, potentiometry) to assess the risk of impacts arising from the closure of the mine. The potential impacts of these data gaps on mine site rehabilitation are discussed in Section 10.

9. Analytical Hydrogeological Model

To provide an initial understanding of the potential inflows into the existing mine excavation, simple analytical approximations have been undertaken. These provide a simple means of estimating steady state or long term average inflows to a mine pit, based on assumed aquifer parameters typical for the geological formations present.

It should be noted that the applicability of any analytical solution depends on the extent to which the 'real' situation under consideration is consistent with the assumptions used to derive the mathematical equations.

9.1 Inflows to Surface Pits

9.1.1 Marinelli & Niccoli (2000) Solution

Marinelli and Niccoli (2000) present steady-state analytical solutions for estimating the groundwater inflow rate to a mine pit containing a pit lake of finite depth.

Background to solution

The solutions take into account:

- The effect of decreased saturated thickness near the pit walls;
- Distributed recharge to the water table; and
- Upward flow through the pit bottom.

The approximation is defined by Marinelli and Niccoli (2000) as:

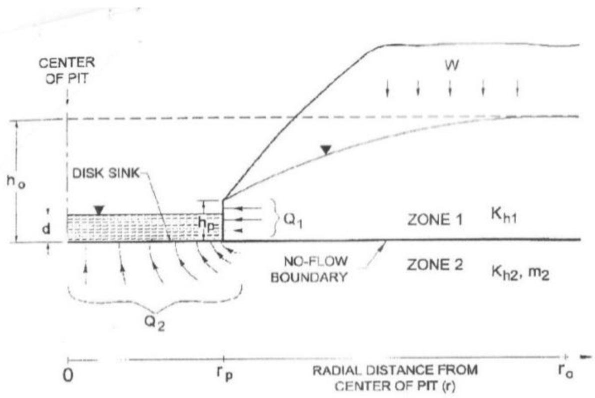


Figure 2. Pit inflow analytical model.

$$\boxed{Q_1 = W\pi(r_o^2 - r_p^2)}$$

$$\boxed{Q_2 = 4r_o\left(\frac{K_{h2}}{m_2}\right)(h_o - d)}$$

$$\boxed{m_2 = \sqrt{\frac{K_{h2}}{K_{v2}}}}$$

$$\boxed{h_o = \sqrt{h_p^2 + \frac{W}{K_{h1}}\left[r_o^2 \ln\left(\frac{r_o}{r_p}\right) - \frac{(r_o^2 - r_p^2)}{2}\right]}}$$

Where:

- r_p = Effective Pit Radius;
- h_o = Initial Saturated Thickness (measured);
- h_p = Saturated Thickness above base Zone 1;

- d = Depth of pit lake;
- W = Distributed Recharge Flux;
- K_{h1} = Hydraulic Conductivity (horizontal) Zone 1;
- K_{h2} = Hydraulic Conductivity (horizontal) Zone 2;
- K_{v2} = Hydraulic Conductivity (vertical) Zone 2; and
- r_o = Radius of Influence.

Assumptions and Limitations

General

Some basic assumptions of these analytical approximations include:

- Lowering the water table decreases the saturated thickness of earth materials providing pit inflow;
- Significant inflow occurs through the pit bottom relative to seepage from the pit walls;
- There is no impermeable boundary at depth and the rock formation below the pit is semi-infinite; and
- Steady-state flow conditions exist near the mine pit.

Zone 1

- Pit walls are approximated as right circular;
- Groundwater flow is horizontal, i.e. the Dupuit - Forcheimer approximation is valid;
- Static water table is approximately horizontal;
- Uniformly distributed recharge across the site as a result of surface infiltration; and
- Groundwater flow into the pit is axially symmetric.

Zone 2

- Head is initially uniform throughout zone 2. Initial head in zone 2 = initial water table in zone 1;
- Disk sink has constant head equal to pit lake water level. If pit dewatered, head = elevation of pit base;
- Flow to disk sink is 3-dimensional and axially symmetric; and
- Materials are anisotropic.

Inflow Estimates

West and North Pits

The following inputs were used in the iterative assessment of potential groundwater inflows:

- r_p = 564 m;
- h_o = 70 m (i.e. SWL = 20 m bgl);
- h_p = 60 m;
- d = 50 m (assumed depth of void);
- W = 2.74×10^{-08} m/sec (i.e. average rainfall of 864 mm/year);
- K_{h1} = 1.16×10^{-07} m/sec (i.e. higher permeability within coal units intersecting the void);

- K_{h2} = 1.16 x 10^{-08} m/sec (i.e. lower permeability within non-coal units at base of void);
- K_{v2} = 1.16 x 10^{-09} m/sec (i.e. typically Kh = 10 x Kv);
- r_o = 570 m (radius of influence); and
- Dimensions of pits at the ground surface (including footprint): 1,000 m x 1,000 m = 1,000,000 m^2.

These input parameters represent estimated conditions at both the West and North pits (Table 8), owing to their similar surface areas and similar assumed average depths.

Table 8 Marinelli & Niccoli (2000) Inflow Estimation – West & North Pits

Hydraulic Conductivity (m/day) for K_{h1} / K_{h2}	Estimated Inflows (L/sec)	Estimated Inflows (m^3/day)	Comments
0.01 / 0.001	**0.7**	**58**	Average K for non-coal and coal measures respectively
0.1 / 0.01	1.4	122	Above average K for non-coal measures
0.1 / 0.1	9	765	Higher than average K for coal and non-coal measures
1.0 / 0.1	9	764	High K for coal and non-coal measures
1.0 / 1.0	83	7,200	High K for coal and non-coal measures
5.0 / 2.0	166	14,300	Very high K for coal and non-coal measures

Note: Radii of Influence = generally around 570 m

Normanton Pit

The same inputs were used as per the iterative assessment of potential groundwater inflows undertaken on the West and North pits, with the following exceptions:

- r_p = 400 m;
- h_o = 60 m;
- h_p = 50 m;
- d = 30 m (assumed depth of void);
- r_o = greater than 470 m (radius of influence); and
- Normanton Pit dimensions at the ground surface (including footprint): 1,200 m x 400 m = approximately 500,000 m^2.

These input parameters represent estimated conditions at the Normanton pit (Table 9).

Table 9 Marinelli & Niccoli (2000) Inflow Estimation – Normanton Pit

Hydraulic Conductivity (m/day) for K_{h1} / K_{h2}	Estimated Inflows (L/sec)	Estimated Inflows (m^3/day)	Comments
0.01 / 0.001	5.4	469	Average K for non-coal and coal measures respectively
0.1 / 0.01	14	1,200	Above average K for non-coal measures
0.1 / 0.1	27	2,300	Higher than average K for coal and non-coal measures
1.0 / 0.1	24	2,100	High K for coal and non-coal measures
1.0 / 1.0	133	11,500	High K for coal and non-coal measures
5.0 / 2.0	248	21,400	Very high K for coal and non-coal measures

Note: Radii of Influence = generally around 570 m

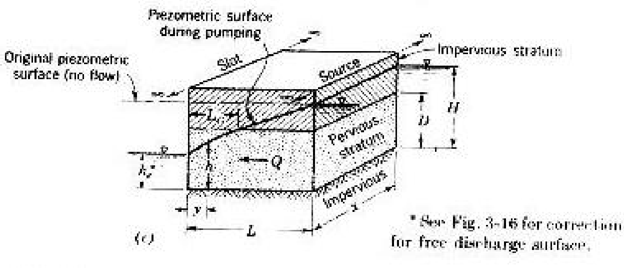
9.2 Inflows to Underground Workings

9.2.1 Mansur & Kaufmann (1962) Solution

The Mansur & Kaufmann (1962) analytical approximation has been used to estimate the potential inflows into a long wall mining excavation. This approximation is based upon Darcian principles and a number of general assumptions, and should be reviewed when site specific information becomes available for the New Oakleigh mine.

Background to solution

This solution is used for combined artesian – gravity inflow, i.e. where the water level in the coal seam is lowered to within the coal seam (as opposed to only its top). The approximation is defined by Mansur & Kaufmann (1962) as:



$$Q = \frac{kx}{2L}(2DH - D^2 - h_e^2)$$

Where:

Q = inflow per unit length;

K = permeability of the pervious stratum in the direction of flow;

D = Thickness of pervious stratum;

H = Hydraulic head at distance L from the free discharge surface; and

h_e = Height of the free discharge surface in the slot.

Assumptions and Limitations

Some basic assumptions of this analytical approximation include:

- The coal seams behave as a confined aquifer;
- Flow to the tunnel face is linear;
- Tunnel length is 100 m;
- Headwall and footwall materials are impermeable, i.e. flow occurs through the coal seam only;
- The coal has a hydraulic conductivity of 0.01 m/day;
- Groundwater level of 50 m;
- The coal seam has a thickness of 4 m and has a maximum depth of 150 m; and
- The radius of influence is 500 m based on approximations made using the Marinelli & Niccoli (2000) solution, i.e. using a rectangular 'pit' with dimensions 1 km x 1 km.

Inflow Estimates

Based on the solution limitations and aforementioned inputs, a summary of the inflow estimation has been provided in Table 10. Based on an average hydraulic conductivity (k) of 0.01 m/day and a radius influence of 500 m, a preliminary inflow estimate of around 0.045 L/sec per 100 m of tunnel is approximated.

Table 10 Preliminary Inflow Estimation (L/sec) per 100 m of Tunnel

Radius of Influence (m)	Coal Seam Hydraulic Conductivity (m/day)				
	0.001	0.010	0.100	1.000	5.000
250	0.00	0.04	0.44	4.36	21.81
500	0.00	**0.045**	0.45	4.50	22.48
1500	0.00	0.05	0.46	4.58	22.92
2500	0.00	0.05	0.46	4.60	23.01

9.3 Conclusions and Summary

The analytical solutions used to develop preliminary estimates of groundwater inflows to the West and North surface pits at the New Oakleigh site suggested that groundwater inflow rates to each pit is in the order of 0.7 L/sec (or 58 m^3/day), whilst the Normanton pits showed groundwater inflow rates of around 5.4 L/sec (or 469 m^3/day), based on estimated average hydrological parameters and estimated pit dimensions / saturation levels.

The analytical solution used to develop preliminary estimates of groundwater inflows to the underground workings at the New Oakleigh site suggested that groundwater inflow rates to the tunnel are in the order of 0.045 L/sec per 100 m of tunnel (or 3.9 m^3/day / 100 m of tunnel), based on estimated average hydrological parameters.

The findings of this high level review should be revisited when site specific hydrological information and data become available, including more accurate estimates of surface void dimensions and catchment size for each of the voids, as well as dimensions / extent of the underground workings. This will help to develop a better understanding of water balances.

10. Groundwater Considerations for Site Rehabilitation

It is understood that NHG proposes to eventually rehabilitate the site. The nature and timing of this rehabilitation is not known. The site could potentially be rehabilitated for numerous purposes such as:

- Land rezoned and developed for residential housing;
- Land rezoned and developed for recreation;
- Land revegetated and returned to native habitat; or
- A mixture of the above.

Whilst the final land use is not known, a brief discussion on some of the identified groundwater related issues has been documented in this section for discussion purposes. The objective of the discussion is to determine a framework for the additional assessment works that may be required by regulatory agencies to be undertaken as part of the rehabilitation works / environmental approvals. Some of the broad groundwater issues that may need to be considered are summarised in Table 11.

There is currently insufficient hydrogeological understanding to assess the risk, i.e. likelihood and consequence of these potential impacts to groundwater. To address these data gaps, further investigations have been recommended, however the level of investigation should be commensurate with the proposed rehabilitation. At a minimum, characterisation of site groundwater quality and potentiometry is required.

Table 11 Potential Groundwater Issues and Actions

Groundwater Issue	Details to address	Works Required	Potential Activities
Has groundwater been contaminated by mining activities?	Is the groundwater polluted? Could groundwater or pit water be used in the future or as part of rehabilitation works?	Characterisation of background groundwater quality	Commence periodic monitoring of pit water (where present) and groundwater quality to develop baseline data[1 2 3] Establish additional groundwater monitoring installations to close current data gaps and facilitate the understanding of groundwater systems. Bores should provide a good spatial coverage of the site, targeting several identified hydrogeological units
	What are the receiving environments and potential sensitive receptors?	Characterisation of groundwater potentiometry and flow directions Confirmation of groundwater beneficial uses	Commence periodic monitoring of pit water and groundwater level to develop baseline data*
	What is the fate and transport of this contamination?	Determinations of aquifer hydraulic parameters Transient groundwater quality	At a minimum, hydraulic conductivity tests should be undertaken on all existing bores. Obtain aquifer parameters through pumping tests conducted on large diameter pumping bores. Develop a numerical groundwater model if required.
Has historic and current mining operations impacted groundwater conditions?	Is groundwater interacting with the surface pits?	Transient water level behavior (groundwater monitoring) Assess potential preferential flow paths for water movement associated with seepage	Identify stratigraphic details of the pits. Review historic exploration bore data. Assess the pit hydro-dynamics / water balance. Assess hydrochemistry, flow regimes, potential contamination, potential sources of pit waters, connectivity of groundwater and surface water.

[1] In accordance with the ANZECC (2000) and NEPM (1999) guidelines.

[2] Suggested suite of analytical parameters: pH, TDS, Major cations, Major anions and Minor anions; heavy metals screen; total petroleum hydrocarbons (TPH), benzene, toluene, ethyl-benzene and xylenes (BTEX) and Polycyclic Aromatic Hydrocarbons (PAHs); organophosphate pesticides (OPP), organochlorine pesticides (OCP) and triazine herbicides, stable oxygen isotopes.

[3] Quality control (QC) samples should also be collected during each sampling event.

Groundwater Issue	Details to address	Works Required	Potential Activities
		Assess risks to the environment in relation to potential pit water seepage	
	What would be the long term water quality of the pits?	Site drainage and pit water balance Chemistry / nutrient balances	Identify the source of water in the pits (where present) Develop management (disposal, on-going use) strategies for extracted pit water (if rehabilitation options require void water extraction)
	Groundwater considerations	Assessment of the potential for long term water table rise, and salinity impacts on built structures Assessment of acid mine drainage	Will potential groundwater inflow to the voids influence rehabilitation options?
Are the historic underground workings impacting natural groundwater systems?	Is groundwater interacting with the surface pits?	Transient water level behavior (groundwater monitoring Assess potential preferential flow paths for water movement associated with seepage Assess risks to the environment in relation to potential pit water seepage	Identify stratigraphic details of the pits and underground workings. Review historic exploration bore data. Assess the pit – underground void hydro-dynamics / water balance. Assess hydrochemistry, flow regimes, potential contamination, potential sources of pit waters, connectivity of groundwater and surface water.
	Is groundwater within the underground workings contaminated?	Characterisation of background groundwater quality Assessment of acid mine drainage	Commence periodic monitoring of pit water and underground void water to develop baseline data Establish additional groundwater monitoring installations to facilitate the understanding of groundwater systems.
Seepage at the ground surface	What are the mechanisms controlling water seepage at the ground surface, identified at the site?	Incorporate recommendations of the SKM seepage study to site management and understanding of groundwater systems. Sample and analyse seepage water to identify potential sources.	Monitor installed seepage wells periodically.

11. Conclusions

11.1 Surface Water

At the New Oakleigh site, surface water runoff, i.e. primarily from rainfall, is likely to flow from areas of higher elevation towards the three open-pit voids, i.e. the West, North and Normanton Pits. The West Pit generally contains some water, the source of which is likely to include rainfall runoff but primarily groundwater inflow, given its year-round presence. Similarly, the North Pit contains water from historic tailings ponds.

New Oakleigh lies within the Moreton Basin and is within 3 km north of the Bremer River, which shows stream flow year-round. Groundwater has the potential to contribute inflows, based on the steep topography and higher groundwater head at the mine site compared with river water levels.

Springs have been identified by site personnel during mining operations and surface water seepage has also been identified to the north of the North Pit, the details of which will be assessed in a separate study.

Details relating to rainfall, surface runoff and potential groundwater recharge remain largely unknown.

11.2 Groundwater

A conceptual model of groundwater systems in the vicinity of the site has been developed, largely through assumptions and inferences made in relation to hydrostratigraphy, aquifer properties and groundwater flow systems. These inferences were largely based on published geological studies and limited data provided for the New Oakleigh site.

The current understanding of groundwater systems involves direct recharge to surficial Quaternary sediments and outcropping rocks of the Mesozoic Walloon Coal Measures and the Tertiary volcanics. Some downward migration of infiltrated groundwater is anticipated from these units to deeper systems within the Mesozoic formations. Recharge and discharge processes are largely assumed at this stage and would depend primarily on the location of compartmentalised fracture systems, as well as historically mined locations, which have modified natural flow systems.

Locally at the New Oakleigh site, groundwater is inferred to flow in a general south-easterly direction, however the impact of the surface pits or the historic underground workings to function as groundwater sinks remains unknown. Construction details of historic groundwater bores at the site suggests that the historic underground workings contain groundwater. The locations, dimensions, integrity and extent of the historic underground mine workings remain largely unknown.

Analytical techniques were applied to estimate the groundwater inflow into both the mine voids and the underground workings at New Oakleigh. Whilst a number of broad assumptions were made regarding the analytical inputs, groundwater inflows to each of the surface pits were estimated to range from 0.7 L/sec to 5.5 L/sec, whilst groundwater inflow rates to the underground workings are in the order of 0.045 L/sec per 100 m of tunnel. Owing to the assumptions made, these inflow assessments are considered preliminary only.

11.3 Groundwater Issues and Site Redevelopment

There is insufficient site specific data to draw any firm conclusions regarding the potential groundwater risks to site rehabilitation or redevelopment. Fundamental groundwater information such as groundwater quality and potentiometry needs to be characterised as a priority before such management decisions can be made.

12. Recommendations

As discussed in Section 10, the level of investigations and assessment for the New Oakleigh site need to be consistent with the site rehabilitation and development plans. The following recommendations are proposed to inform rehabilitation planning in relation to groundwater and are based on the findings to date and on the assumption that North Pit, Normanton Pit and West Pit will ultimately be backfilled. The recommendations are structured so that the outcomes can be used to facilitate further targeted assessment and investigation, if necessary.

12.1 Hydrogeological Assessment

Limited existing groundwater level and quality data have been identified for the New Oakleigh site. Consequently it has not been possible to estimate post rehabilitation groundwater levels or the likely quality (including the presence or absence of contaminants) of groundwater inflows to the former mine workings during rehabilitation. Preliminary estimates of the rate of inflow of groundwater to the pits and to underground workings are included in Section 9. However, if more certainty around inflows is required it is recommended that estimations are also made using alternative methods.

Further work is therefore recommended for the following reasons:

- To estimate post rehabilitation groundwater levels within and in the vicinity of the mine workings;
- To confirm the likely quality of groundwater inflows to any mine workings to be dewatered during the rehabilitation, as disposal of any groundwater will need to be appropriately managed;
- To refine the preliminary estimates of groundwater inflow rates to mine workings if more certainty is required; and
- To inform the development of a Groundwater Management Plan for rehabilitation, if required, including identification of suitable disposal options for any extracted groundwater.

The recommended priority tasks for completion post mine closure but before commencement of rehabilitation are outlined below.

12.1.1 Groundwater Levels

It is understood that ten groundwater monitoring bores have recently been installed by SKM, eight of which are in the vicinity of North Pit. In order to inform rehabilitation planning for North Pit, on the assumption that the void water will need to be extracted prior to backfilling, review of the data collected by SKM is recommended. It is likely, although has not been confirmed by monitoring at this stage, that the void water in North Pit includes a component of groundwater. The geological and hydrogeological data should therefore be reviewed to form an opinion on whether or not groundwater inflows to the workings should be anticipated during dewatering and to provide an estimate of post rehabilitation groundwater levels.

West Pit is currently operational and it is likely that a component of the water pumped from the pit is groundwater, although in the absence of monitoring bores this has not been confirmed. Groundwater levels post operational mining and post rehabilitation are likely to rise in comparison to current levels.

No standing water was observed in Normanton Pit at the time of the GHD site visit however groundwater levels may be close to ground surface in natural ground and/or perched within any in-pit spoil. Given that only one groundwater level has been identified nearby, for Blakes Road Bore (8315P) which is understood to be installed in underground workings, this may not be representative of the conditions in the vicinity of Normanton Pit.

To confirm groundwater levels in the vicinity of West Pit and Normanton Pit and hence evaluate the potential for groundwater inflows, and to provide information to estimate post rehabilitation groundwater levels the following is recommended:

- Install a minimum of one monitoring bore to confirm the groundwater level in natural ground and one bore to confirm the groundwater level in any in-pit spoil at Normanton Pit;
- Install a minimum of three monitoring bores around West Pit to confirm groundwater levels in natural ground and one bore within existing in-pit spoil; and
- Survey and measure groundwater levels in the new monitoring bores, SKM bores and any other on site bores that can be located, to confirm groundwater levels.

12.1.2 Groundwater Quality

The groundwater quality monitoring data identified for the site as part of this study does not include any analysis for potential contaminants. Review of any new groundwater quality data provided by recent SKM work and sampling of any other groundwater monitoring bores at the site (existing and proposed new bores) is therefore recommended post closure to:

- Confirm post mine closure groundwater quality;
- Identify potential groundwater contamination issues; and
- Confirm the potential for inflow of any contaminants to voids during rehabilitation.

Groundwater quality data will also assist with identifying suitable management and / or disposal strategies for groundwater that may be drawn into the various mine workings during rehabilitation.

A single sample of groundwater should be collected from each available bore on the site, including the SKM bores and any new bores installed in the vicinity of West Pit and Normanton Pit (refer to Section 12.1.1). The samples should be analysed initially for a comprehensive suite of parameters including:

- pH, TDS, major cations (calcium, magnesium, sodium and potassium), major anions (chloride, sulphate, carbonate and bicarbonate) and minor anions (nitrate, nitrite, fluoride, reactive phosphorous);
- Dissolved metals screen (as a minimum aluminium, arsenic, cadmium, chromium, copper, iron, lead, nickel, zinc and mercury); and
- Total petroleum hydrocarbons (TPH), benzene, toluene, ethyl benzene, xylene (BTEX) and polycyclic aromatic hydrocarbons (PAHs).

If groundwater contamination is identified then further sampling and other work may be necessary.

12.1.3 Groundwater Inflow Estimation

In the absence of detailed hydrogeological testwork or information on groundwater inflow rates during operation of the mine, any estimates of maximum inflow to fully dewatered pits during rehabilitation will be subject to a high degree of uncertainty. Preliminary inflow estimates to North Pit (0.7 L/s (58 m^3/day) and to West Pit (0.7 L/s (58 m^3/day), excluding potential inflows from underground workings, have been calculated (refer to Section 9) using an analytical model. However, actual inflows could be significantly lower or higher than these initial estimates since a range of simplifying assumptions are inherent in the calculations and they are based on little or no actual data for the site. These estimates could be improved through the collection of detailed site specific information from hydraulic testwork. However, the best guide to groundwater inflow to dewatered voids would be experience gained from dewatering the voids during mine operations.

It is unlikely that any actual data are available on groundwater inflow rates to the various non-operational mine workings, but anecdotal information on sump and pump sizes, pump run hours, seasonal fluctuations etc. may be available from the operators.

In the absence of any information from the mine operators and/or further hydrogeological investigations then additional insight on potential groundwater inflow rates to North Pit could be obtained from field trials (i.e. temporarily installing a pump and recording the rate of water level decline for a given pumping rate). It should be noted, however, that on its own this method would tend to under-estimate groundwater inflows since groundwater inflows will tend to increase as the water level in the void declines. Hence, the maximum inflow will only be achieved at the final dewatered condition. Where the field trial approach is adopted it is therefore recommended that the field trial results be used to 'calibrate' the analytical calculations summarised in Section 9. This combined approach should provide an inflow estimate suitable for use in the development of a groundwater management plan.

West Pit is currently operational and therefore records of pit water extraction should be kept, to enable estimates of groundwater inflow rates to be made. The discharge flow rate (calculated as a daily rate, for example) for each pump should be recorded. Records of daily rainfall totals should also be kept so that inflows from surface water can be estimated and accounted for in the discharge flow rate.

No standing water was observed in Normanton Pit at the time of the GHD site visit and, unless groundwater level data (refer to Section 12.1.1) indicate otherwise, this suggests that groundwater inflow to this pit limited. Nonetheless, if excavation is anticipated as part of rehabilitation or proposed future land use then the potential for groundwater inflows to occur should be considered.

12.1.4 Analysis and Reporting

Upon completion of any additional hydrogeological assessments outline above a technical report should be prepared to detail the outcomes, review the understanding of the hydrological systems at the site and the conceptual model and provide recommendations for any further work to inform the future rehabilitation and development of the New Oakleigh site.

12.2 Future Contamination Assessment and Management Strategies

If contamination is identified at the site, an optimised surface water and groundwater monitoring program should be developed at that stage. Such a program would detail the proposed monitoring locations in terms of monitoring frequency, duration and analytical requirements. Additional assessment activities that may be included in assessing potential contamination issues include the periodical collection of groundwater and surface water level measurements for analysis of temporal trends, installation of additional bores, and assessing site specific aquifer parameters through hydraulic conductivity (slug) or pumping tests.

A longer-term periodic monitoring program should be considered for implementation if site conditions, particularly those related to potential contamination, require further understanding to satisfy remediation goals, rehabilitation requirements and ultimately, land use change.

12.3 Other Suggested Activities

It is understood that site rehabilitation may include dewatering of former pits and backfilling. Confirmation of the geometry of each void prior to rehabilitation is recommended. This would assist with a more accurate estimation of the volume of void water and in the calculation of potential fill volumes required for backfilling. If in-pit survey, obtained around the time of the cessation of mining, is not available then a bathymetric survey could be undertaken to confirm pit bed profiles where required.

13. Limitations

This **Preliminary Mine Closure Study – New Oakleigh, Hydrogeological Desktop Assessment** report ("Report"):

1. *has been prepared by **GHD Pty Ltd** ("GHD") for **New Hope Group**;*
2. *may only be used and relied on by **New Hope Group**;*
3. *must not be copied to, used by, or relied on by any person other than **New Hope Group** without the prior written consent of GHD;*
4. *may only be used for the purpose of developing a preliminary understanding of the existing groundwater environment for the **New Oakleigh** site and proposing additional works to further that understanding (and must not be used for any other purpose).*

*GHD and its servants, employees and officers otherwise expressly disclaim responsibility to any person other than **New Hope Group** arising from or in connection with this Report.*

To the maximum extent permitted by law, all implied warranties and conditions in relation to the services provided by GHD and the Report are excluded unless they are expressly stated to apply in this Report.

The services undertaken by GHD in connection with preparing this Report:

- *were limited to those specifically detailed in section 1.2;*
- *did not include GHD undertaking any testing.*

The opinions, conclusions and any recommendations in this Report are based on assumptions made by GHD when undertaking services and preparing the Report ("Assumptions"), including (but not limited to):

- *It should be noted, that in gathering information for the study, GHD relied on verbal information and previous assessments supplied by the **New Hope Group** and on visual inspections of the site, which may not have been independently verified.*
- *Where laboratory tests and/or similar work have been performed and recorded by others the data is included and used in the form provided by others. The responsibility for the accuracy of such data remains with the issuing authority, not with GHD.*
- *Where site specific hydrogeological or geological data / information was not available, GHD has, where necessary, made interpretations based on the available data which was provided to GHD by New Hope. The responsibility for the accuracy of such data remains with the issuing authority, not with GHD.*
- *Information provided in the reports listed in section 1.2.2 has been referenced in the preparation of this report, however this information has not been independently verified.*

GHD expressly disclaims responsibility for any error in, or omission from, this Report arising from or in connection with any of the Assumptions being incorrect.

Subject to the paragraphs in this section of the Report, the opinions, conclusions and any recommendations in this Report are based on conditions encountered and information reviewed at the time of preparation and may be relied on until additional site specific information or data is obtained, after which, GHD expressly disclaims responsibility for any error in, or omission from, this Report arising from or in connection with those opinions, conclusions and any recommendations.

*GHD has prepared this Report on the basis of information provided by **New Hope Group**, **BoM and DERM** as well as information derived from previous investigations at the site, which GHD has not independently verified or checked beyond the agreed scope of work.*

GHD does not accept liability in connection with such unverified Information, including (but not limited to) errors and omissions in the Report which were caused by errors or omissions in that information.

The opinions, conclusions and any recommendations in this Report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

Investigations undertaken in respect of this Report are constrained by the particular site conditions, such as the location of buildings, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this Report.

Site conditions (including any the presence of hazardous substances and/or site contamination) may change after the date of this Report. GHD does not accept responsibility:

- *arising from, or in connection with, any change to the site conditions; and*
- *to update this Report if the site conditions change.*

*If **New Hope Group** wishes to provide this Report to a third party recipient to use and rely upon, then GHD's prior written consent will be required. Before this Report is released to the third party recipient, the third party recipient will be required to execute a GHD prepared deed poll under which the recipient agrees:*

- *to acknowledge that the basis on which this Report may be relied upon is consistent with the principles in this section of the Report; and*
- *to the maximum extent permitted by law, GHD shall not have, and the recipient forever releases GHD from, any liability to the recipient for loss or damage howsoever in connection with, arising from or in respect of this Report whether such liability arises in contract, tort (including negligence).*

14. Glossary of Terms

Aquifer: A geological formation, group of formations or part of a formation, which contains sufficient saturated permeable material to allow useful extraction by a pumping well.

Alluvial: Pertaining to, or composed of, alluvium or other deposits from streams and rivers.

Alluvium: A general term for unconsolidated material deposited during recent geological time by a stream or other body of running water. Typically forms a sorted or semi-sorted sediment in stream beds, floodplains, deltas or as fan at the base of a mountain slope.

Aquitard: A geological formation, group of formations or bed which is saturated but does not allow water to flow freely to a pumping well. However, aquitards may transmit appreciable amounts of water between adjacent aquifers.

Aquiclude: A geological formation, group of formations or part of a formation through which virtually no water moves.

Artesian: Pertaining to a confined aquifer in which the head level is above the surface of the ground.

Bedrock: A general term for rock, usually solid, that underlies soil or other unconsolidated material.

Capillary Fringe: The zone above the saturated zone where capillary action can draw groundwater above the water table.

Catchment: The land area that drains into a stream, river, lake, estuary, or coastal zone.

Confined Aquifer: An aquifer which is isolated from the atmosphere by an impermeable layer. Pressure in confined aquifers is generally greater than atmospheric pressure.

Contaminant: A substance, element, or compound that, if added to an aquifer, has an adverse effect on the quality of water in that aquifer.

Corrosion: The act or process of dissolving or wearing away a material.

Desalination: To remove salt and other chemicals from seawater or saline water.

Discharge: Any process by which water is removed from an aquifer. Includes water that flows to a surface feature, such as a spring, river or wetland, as well as water which flows to an adjacent aquifer.

Drawdown: The change in groundwater head level that can be attributed to the operation of a pumping well.

Ecosystem: A system that is made up of a community of animals, plants, and bacteria and its interrelated physical and chemical environment.

Electrical Conductivity: The ability of a material to conduct electricity under an applied voltage. This is used to estimate the Total Dissolved Solids in a water sample.

Erosion: The process or group of processes whereby solids in the natural environment are relocated by moving water, glacial ice or wind.

Evaporation: The process by which liquid water becomes gaseous, or the volume lost from a body of water due to this process.

Evapotranspiration: Pertains to water lost to the atmosphere via evaporation and transpiration of plants.

Extrusive Rock: Igneous rocks formed from magma that flows out on the Earth's surface. These rocks cool rapidly, producing a fine crystalline structure.

Fault: A fracture or zone of fractures in a geological layer along which there has been displacement of the sides relative to one another.

Groundwater: Water occurring naturally below ground level or water pumped, diverted and released into a well for storage underground.

Groundwater Dependent Ecosystem: An ecosystem that is partially or wholly reliant on groundwater for its survival. This can include terrestrial, subsurface and marine ecosystems.

Hardness: A measure of the mineral content of water, primarily calcium and magnesium ions. 'Hard' water causes an insoluble residue to form when water is used with soap.

Hydraulic Conductivity: The volume of water that can flow through a given area of aquifer material under a given hydraulic head measured in $m^3/day/m^2$ (m/day) and usually assigned the symbol K.

Hydrostratigraphy: The identification and distinction of hydrogeological units based on their hydraulic properties.

Igneous Rock: Rocks that solidified from molten material, that is, from magma.

Intrusive Rock: Igneous rocks formed from magma injected beneath the Earth's surface. Generally these rocks have large crystals caused by slow cooling.

Metamorphic Rock: Any rock derived from pre-existing rocks by mineralogical, chemical, and/or structural changes, in response to marked changes in temperature, pressure, shearing stress, and chemical environment.

Permeability: The property or capacity of a porous rock, soil or sediment for transmitting a fluid; it is a measurement of the relative ease of fluid flow within a material.

pH: A measure of the acidity or alkalinity of a solution. Neutral solutions have a value of 7, this value increases for alkaline solutions and decreases for acidic solutions.

Porosity: The percentage of the bulk volume of a soil or rock that is occupied by interstices, whether isolated or connected.

Pumping Test: A test that is conducted to determine aquifer or well characteristics.

Recharge: The process of adding water, or the amount of water added, to the volume of water stored in an aquifer.

Sedimentary Rock: Rocks resulting from the consolidation of loose sediments that has accumulated in layers.

Specific Capacity: The rate of extraction from a pumping well per unit of drawdown, expressed in $m^3/day/m$. The value will typically change with the duration of pumping.

Standing Water Level: The level of water in a well or bore that is not being affected by pumping of groundwater.

Stratigraphy: The study of rock layers and layering, especially of their distribution, deposition and age.

Surface Water: Any water that collects as a surface feature, including rivers, streams, lakes, wetlands and the ocean.

Sustainable Yield: The groundwater extraction regime, measured over a specified planning timeframe that allows acceptable levels of stress on the system while still protecting the higher value uses associated with the total resource.

Total Dissolved Solids: The total mass of all solids dissolved in a water sample, measured in mg/L.

Transmissivity: The rate at which water is transmitted through a unit width of an aquifer under a unit hydraulic gradient.

Unconfined Aquifer: An aquifer which has the upper surface exposed to the atmosphere.

Vadose Zone: The subsurface zone between ground level and the saturated zone, that is, the water table.

Water Table: The surface between the Vadose zone and the saturated zone of unconfined groundwater. This can also be defined as the surface at which groundwater pressure is equal to atmospheric pressure.

Water Quality: The physical, chemical and biological characteristics of water, frequently used by reference to a set of standards against which compliance can be assessed.

Wetland: An area of land whose soil is saturated with moisture either permanently or seasonally. Such areas may also be covered partially or completely by shallow pools of water. Wetlands include swamps, marshes, and bogs, among others.

Yield: The rate at which water can be extracted from a pumping well, typically measured in L/sec or ML/sec.

15. References

Australia and New Zealand Environment and Conservation Council and the Agricultural and Resource Management Council of Australia and New Zealand (ANZECC/ARMCANZ) (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*.

Cameron, J.B. (1970) *The Rosewood-Walloon Coalfield*. Publication No. 344, Geological Survey of Queensland. Queensland Department of Mines.

Douglas Partners (2004) *Groundwater Study, New Oakleigh Coal Mine, Rosewood*. Report prepared for New Hope Coal Australia Ltd., August 2004.

Geological Survey of Queensland (GSQ) (1973) *Ipswich 1:250,000 Geological Sheet*. SG 56-14. Queensland Department of Mines.

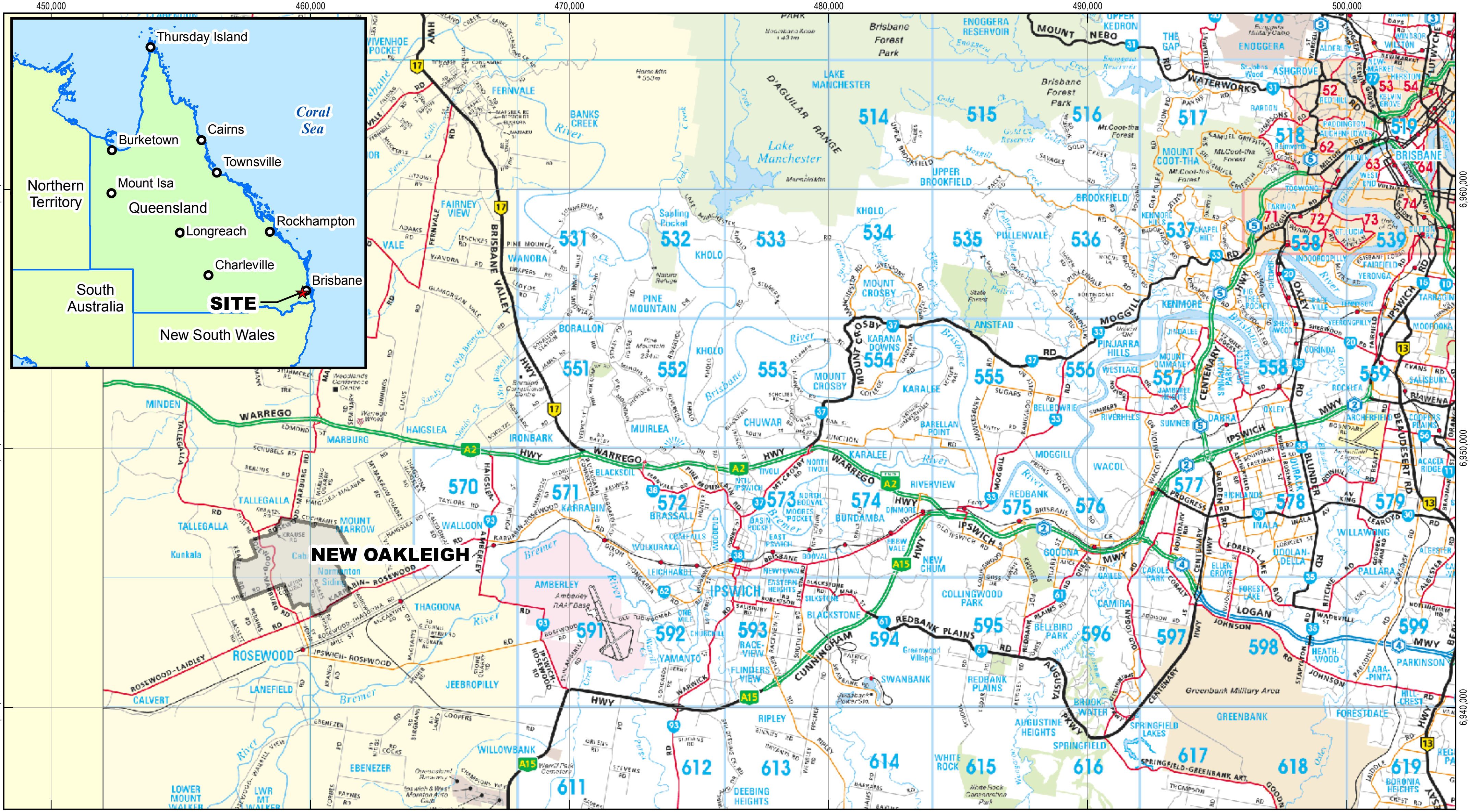
National Environment Protection Council (1999) N*ational Environment Protection (Assessment of Site Contamination) Measure*, December 1999.

New Hope Coal Australia Ltd (2002) E*MOS: Environmental Management Overview Strategy New Oakleigh Coal Mine ML4568, 4584, 4683, 4698, 4699, and MLA50175*. April 2002.

Queensland Water Resources Commission (1987) *Groundwater resources of Queensland* [map], 1:2,500,000 scale, Queensland Department of Mines.

Water Resource (Moreton) Plan 2007. Reprint No. 1D, 24 November 2011. Office of the Queensland Parliamentary Counsel.

16. Figures



1:200,000 (at A4)

0 2 4 6 8

Kilometers

Map Projection: Universal Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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Hydrological Desktop Assessment,
New Oakleigh Mine Site, Rosewood, Queensland, 4340.

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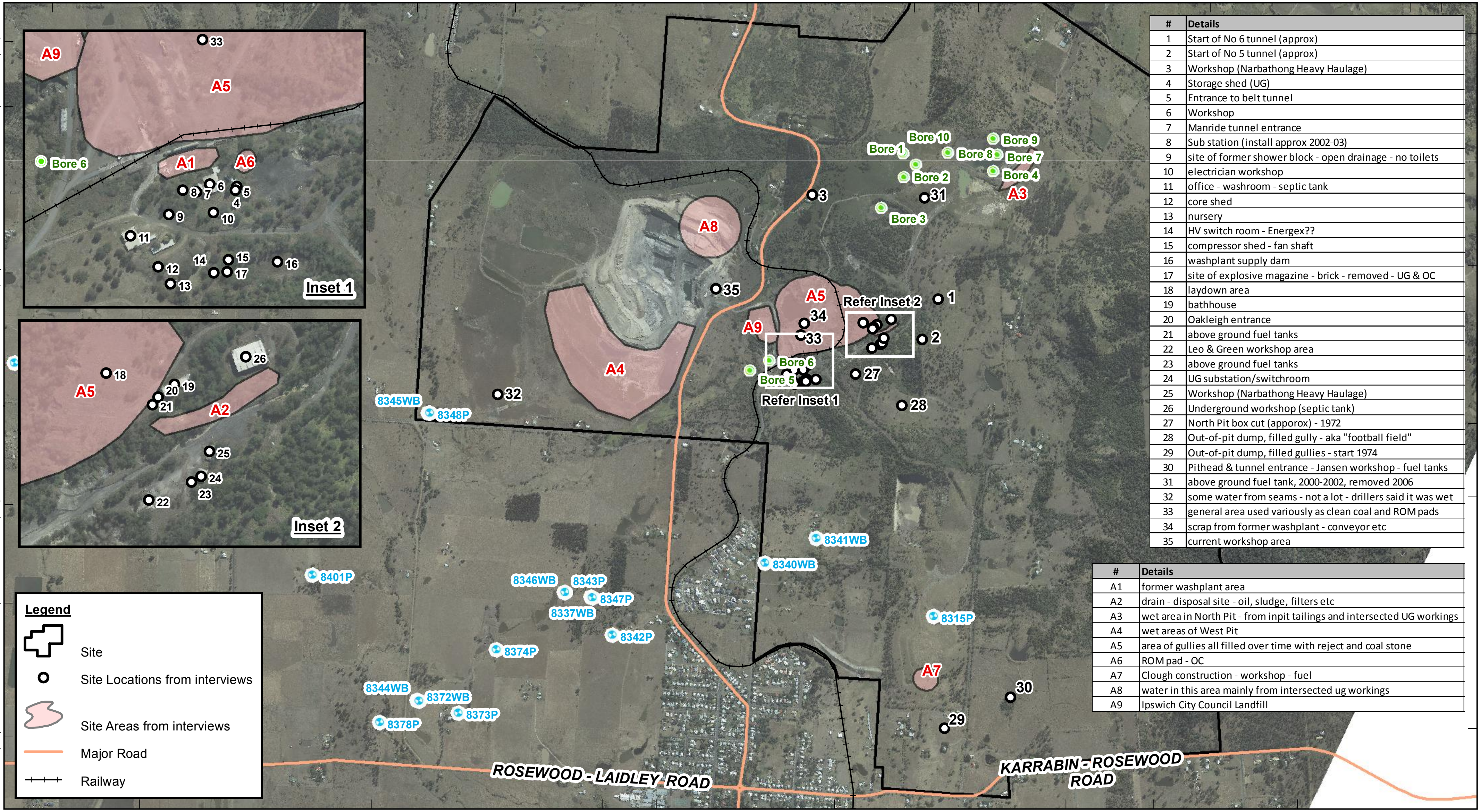
Site Location Plan

Figure 1

G:\41\24703\GIS\Maps\PDFs_MXDs\41-24703-17_oakleighLocality02_revA.mxd

Level 4, 201 Charlotte St Brisbane QLD 4000 T 61 7 3316 3000 F 61 7 3316 3333 E bnemail@ghd.com W www.ghd.com

Data source: DERM: cadastre, 2007 & 100k geology, 2007; Geoscience Australia , road and rail, 2007. Created by: jvc



#	Details
1	Start of No 6 tunnel (approx)
2	Start of No 5 tunnel (approx)
3	Workshop (Narbathong Heavy Haulage)
4	Storage shed (UG)
5	Entrance to belt tunnel
6	Workshop
7	Manride tunnel entrance
8	Sub station (install approx 2002-03)
9	site of former shower block - open drainage - no toilets
10	electrician workshop
11	office - washroom - septic tank
12	core shed
13	nursery
14	HV switch room - Energex??
15	compressor shed - fan shaft
16	washplant supply dam
17	site of explosive magazine - brick - removed - UG & OC
18	laydown area
19	bathhouse
20	Oakleigh entrance
21	above ground fuel tanks
22	Leo & Green workshop area
23	above ground fuel tanks
24	UG substation/switchroom
25	Workshop (Narbathong Heavy Haulage)
26	Underground workshop (septic tank)
27	North Pit box cut (approx) - 1972
28	Out-of-pit dump, filled gully - aka "football field"
29	Out-of-pit dump, filled gullies - start 1974
30	Pithead & tunnel entrance - Jansen workshop - fuel tanks
31	above ground fuel tank, 2000-2002, removed 2006
32	some water from seams - not a lot - drillers said it was wet
33	general area used variously as clean coal and ROM pads
34	scrap from former washplant - conveyor etc
35	current workshop area

#	Details
A1	former washplant area
A2	drain - disposal site - oil, sludge, filters etc
A3	wet area in North Pit - from inpit tailings and intersected UG workings
A4	wet areas of West Pit
A5	area of gullies all filled over time with reject and coal stone
A6	ROM pad - OC
A7	Clough construction - workshop - fuel
A8	water in this area mainly from intersected ug workings
A9	Ipswich City Council Landfill

1:25,000 (at A4)

0 200 400 600 800 1,000

Meters

Map Projection: Universal Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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Hydrological Desktop Assessment,
New Oakleigh Mine Site, Rosewood, Queensland, 4340.

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Date | 13 Feb 2012

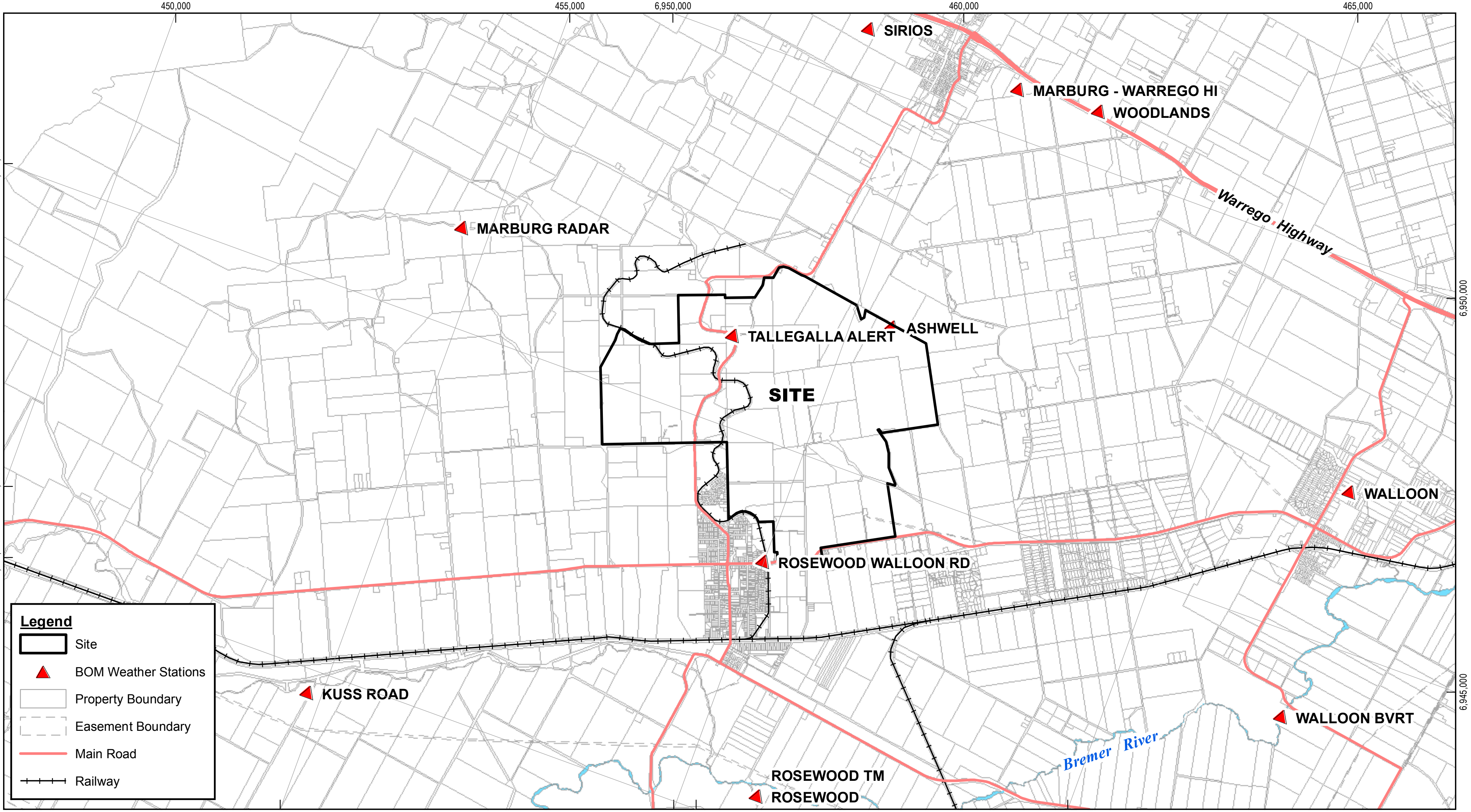
New Oakleigh Mine Plan

Figure 2

G:\41\24703\GIS\Maps\PDFs_MXDs\41-24703-43_oakleighFeatures02_revA.mxd

Level 4, 201 Charlotte St Brisbane QLD 4000 T 61 7 3316 3000 F 61 7 3316 3333 E bnemail@ghd.com W www.ghd.com

Data source: DERM: cadastre, 2007; Brisways: street maps, 2007; Geoscience Australia: road, 2009. Created by: jvc



1:70,000 (at A4)

0 0.5 1 1.5 2 2.5 3

Kilometers

Map Projection: Universal Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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Revision	A
Date	09 Feb 2012

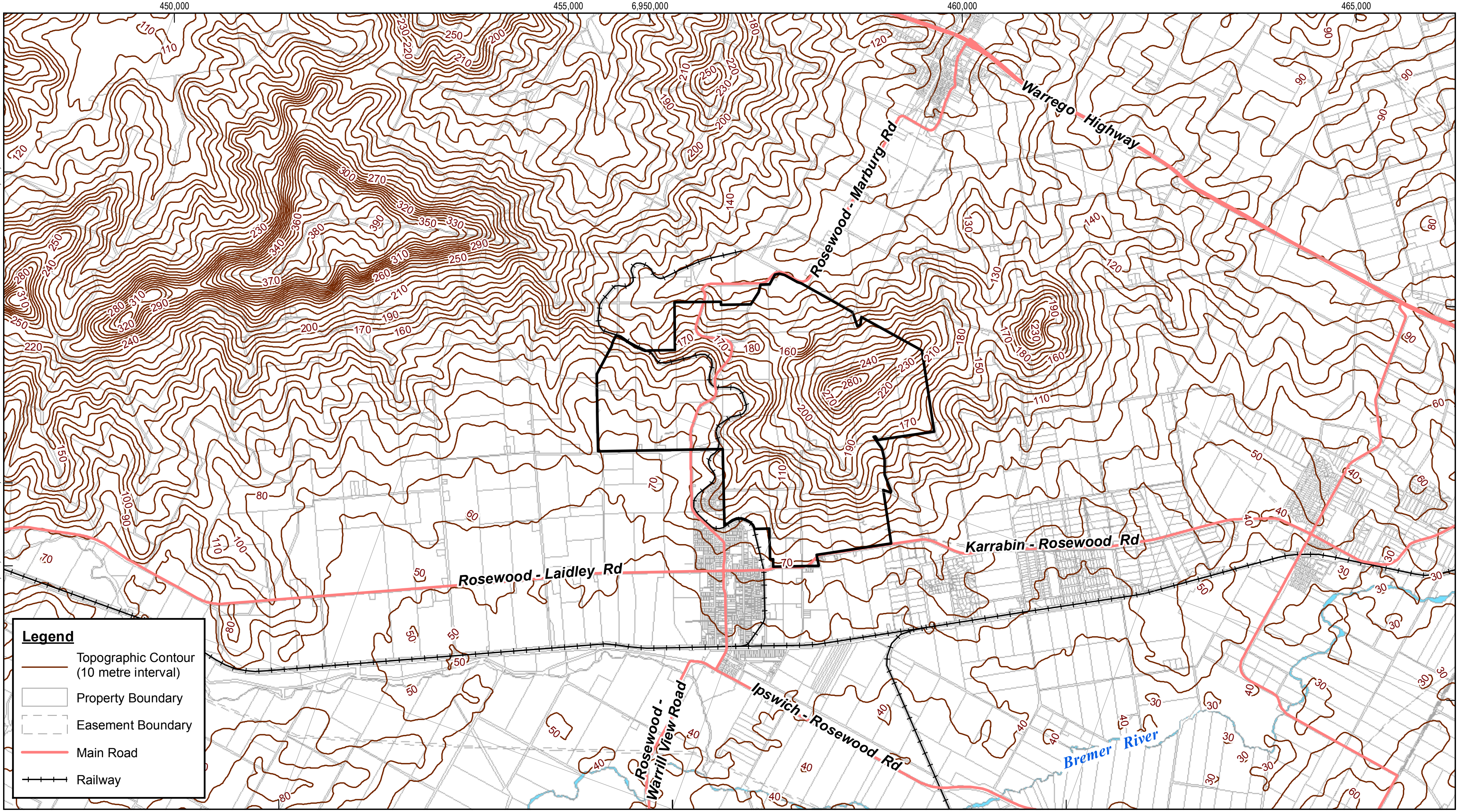
Climate Stations

Figure 3

G:\41\24703\GIS\Maps\PDFs_MXDs\41-24703-25_oakleighClimateStns_revA.mxd

Level 4, 201 Charlotte St Brisbane QLD 4000 T 61 7 3316 3000 F 61 7 3316 3333 E bnemail@ghd.com W www.ghd.com

Data source: DERM: cadastre, 2007 IQATLAS: topography, 2007; Geoscience Australia , road and rail, 2007. Created by: jvc



1:70,000 (at A4)

0 0.5 1 1.5 2 2.5 3

Kilometers

Horizontal Datum: GDA 1994
Grid: GCS GDA 1994

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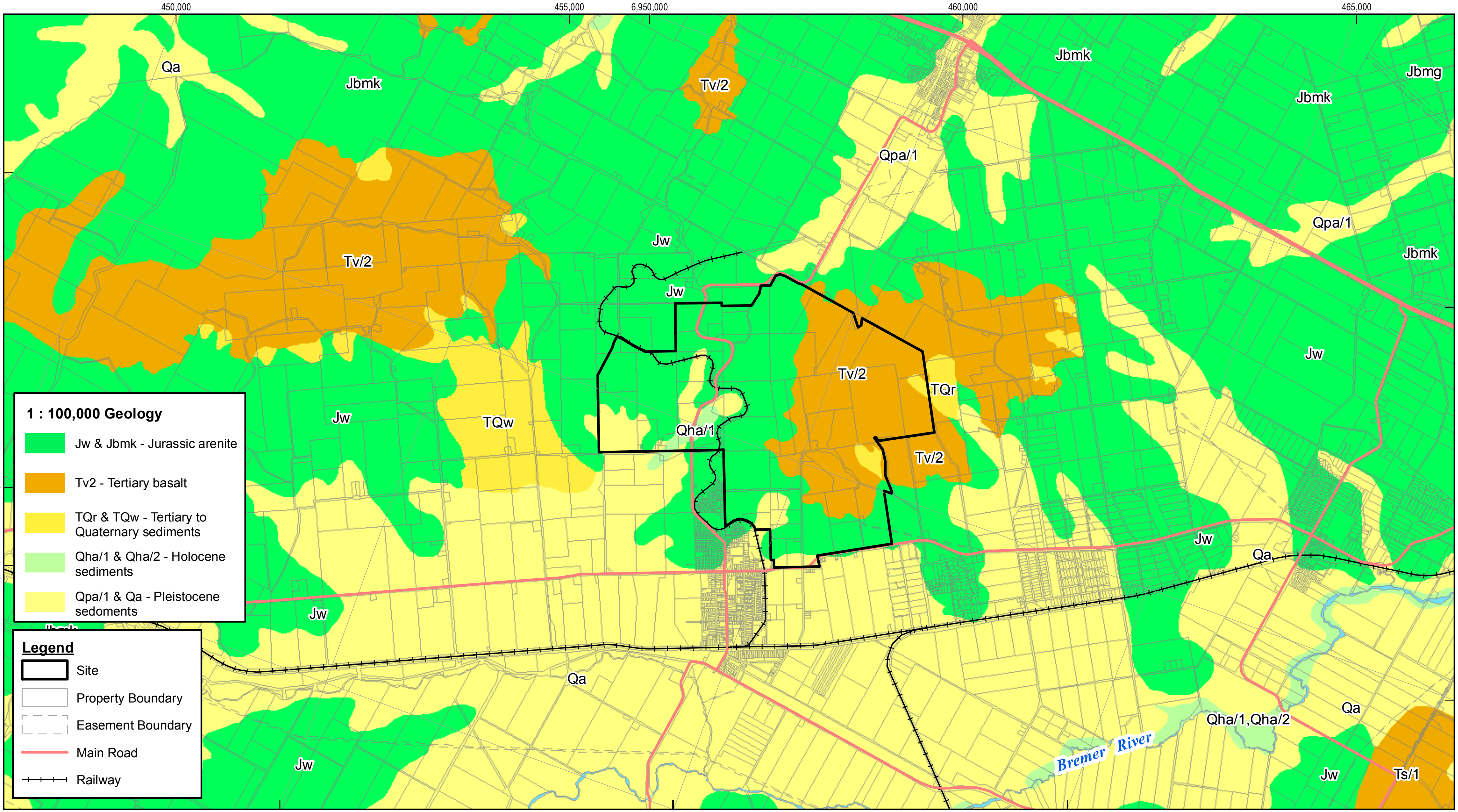
Topographic Plan

Figure 4

G:\41\24703\GIS\Maps\PDFs_MXDs\41-24703-19_oakleighTopo02_revA.mxd

Level 4, 201 Charlotte St Brisbane QLD 4000 T 61 7 3316 3000 F 61 7 3316 3333 E bnemail@ghd.com W www.ghd.com

Data source: DERM: cadastre, 2007 IQATLAS: topography, 2007; Geoscience Australia , road and rail, 2007. Created by: jvc



1:70,000 (at A4)

0 0.5 1 1.5 2 2.5 3

Kilometers

Map Projection: Universal Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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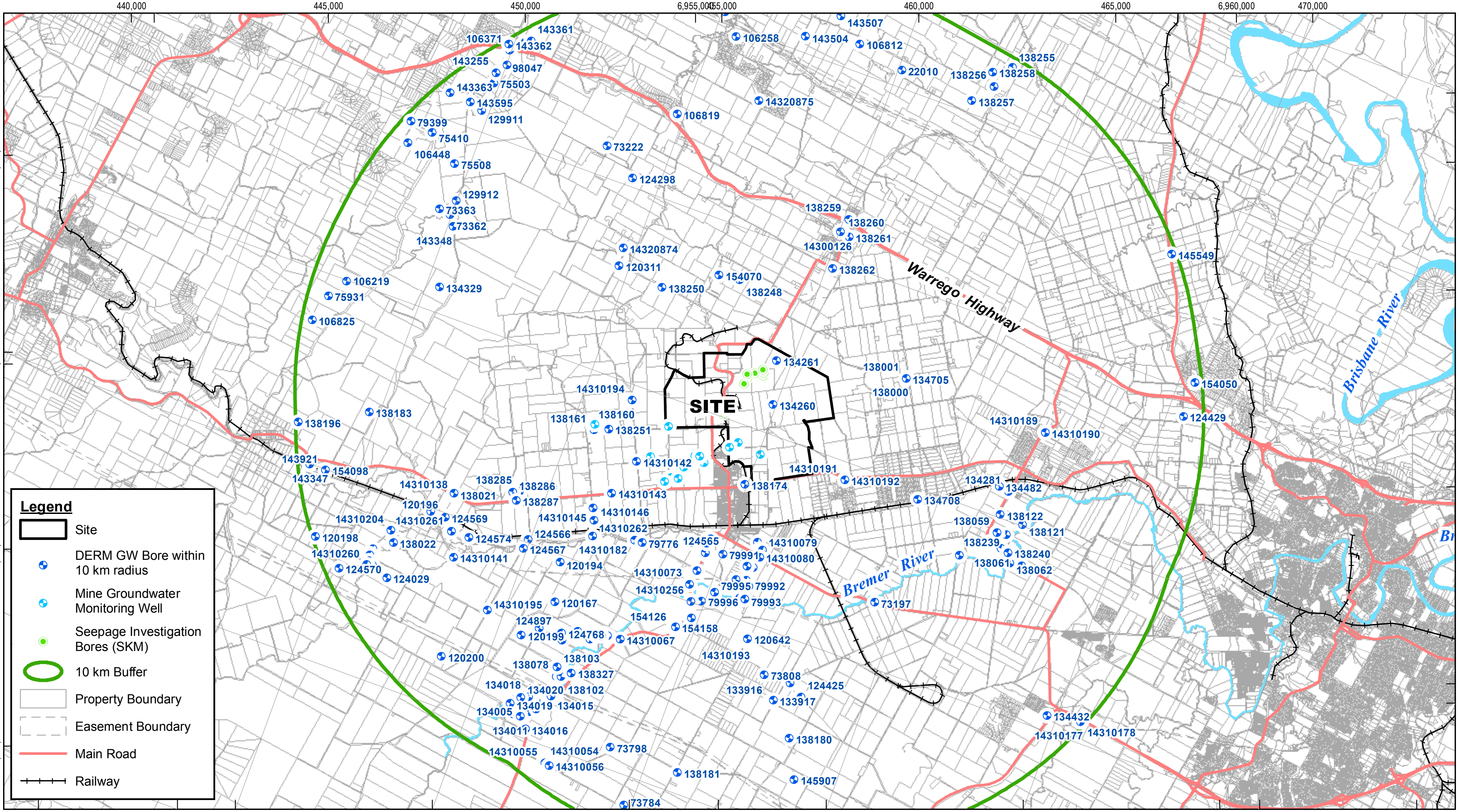
Regional Geology

Figure 5

G:\41\24703\GIS\Maps\PDFs_MXDs\41-24703-21_oakleighGeology02_revA.mxd

Level 4, 201 Charlotte St Brisbane QLD 4000 T 61 7 3316 3000 F 61 7 3316 3333 E bnemail@ghd.com W www.ghd.com

Data source: DERM: cadastre, 2007 IQATLAS: topography, 2007; Geoscience Australia , road and rail, 2007. Created by: jvc



1:140,000 (at A4)

0 1 2 3 4 5 6

Kilometers

Map Projection: Universal Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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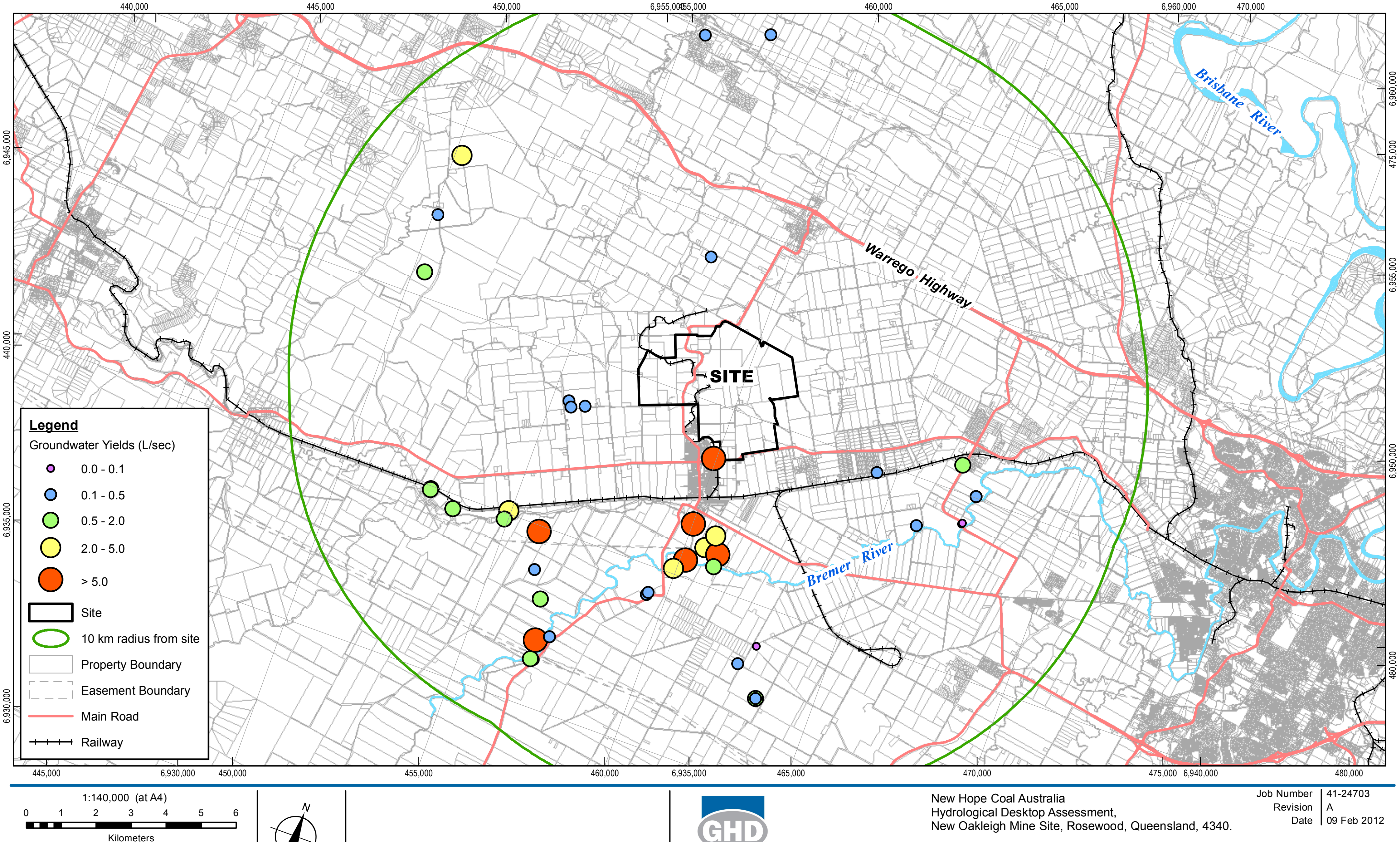
Borehole Location Plan

Figure 6

G:\41\24703\GIS\Maps\PDFs_MXDs\41-24703-23_oakleighBoreLocs_revA.mxd

Level 4, 201 Charlotte St Brisbane QLD 4000 T 61 7 3316 3000 F 61 7 3316 3333 E bnemail@ghd.com W www.ghd.com

Data source: DERM: cadastre, 2007 IQATLAS: topography, 2007; Geoscience Australia , road and rail, 2007. Created by: jvc



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Groundwater Yields

Figure 7

G:\41\24703\GIS\Maps\PDFs_MXDs\41-24703-31_oakleighYield_revA.mxd

Level 4, 201 Charlotte St Brisbane QLD 4000 T 61 7 3316 3000 F 61 7 3316 3333 E bnemail@ghd.com W www.ghd.com

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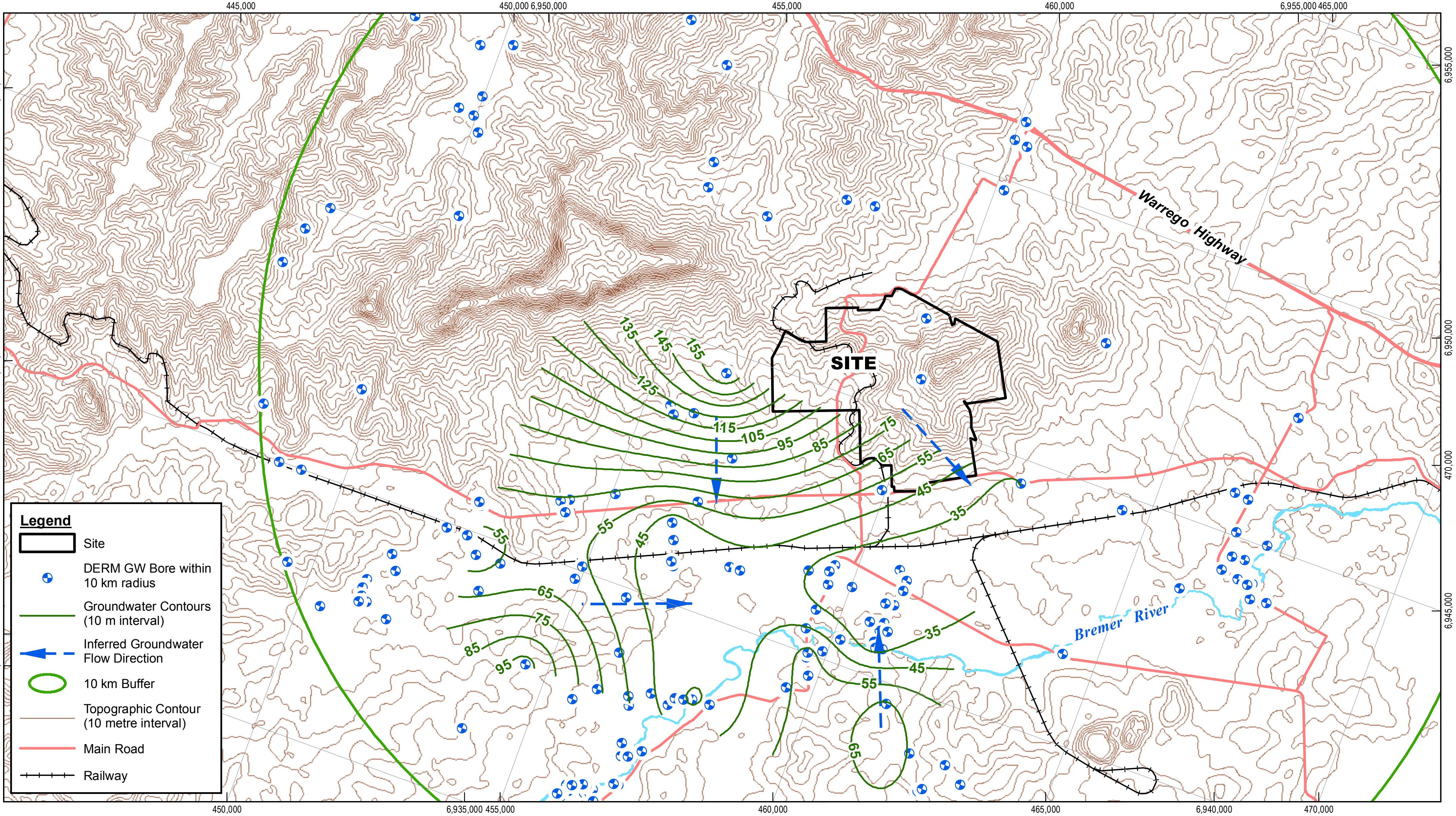

1:100,000 (at A4)

0 1 2 3 4

Kilometers

Map Projection: Universal Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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Groundwater Elevation Contours

Figure 8

G:\41\24703\GIS\Maps\PDFs_MXDs\41-24703-27_oakleighGWkont_revA.mxd

Level 4, 201 Charlotte St Brisbane QLD 4000 T 61 7 3316 3000 F 61 7 3316 3333 E bnemail@ghd.com W www.ghd.com

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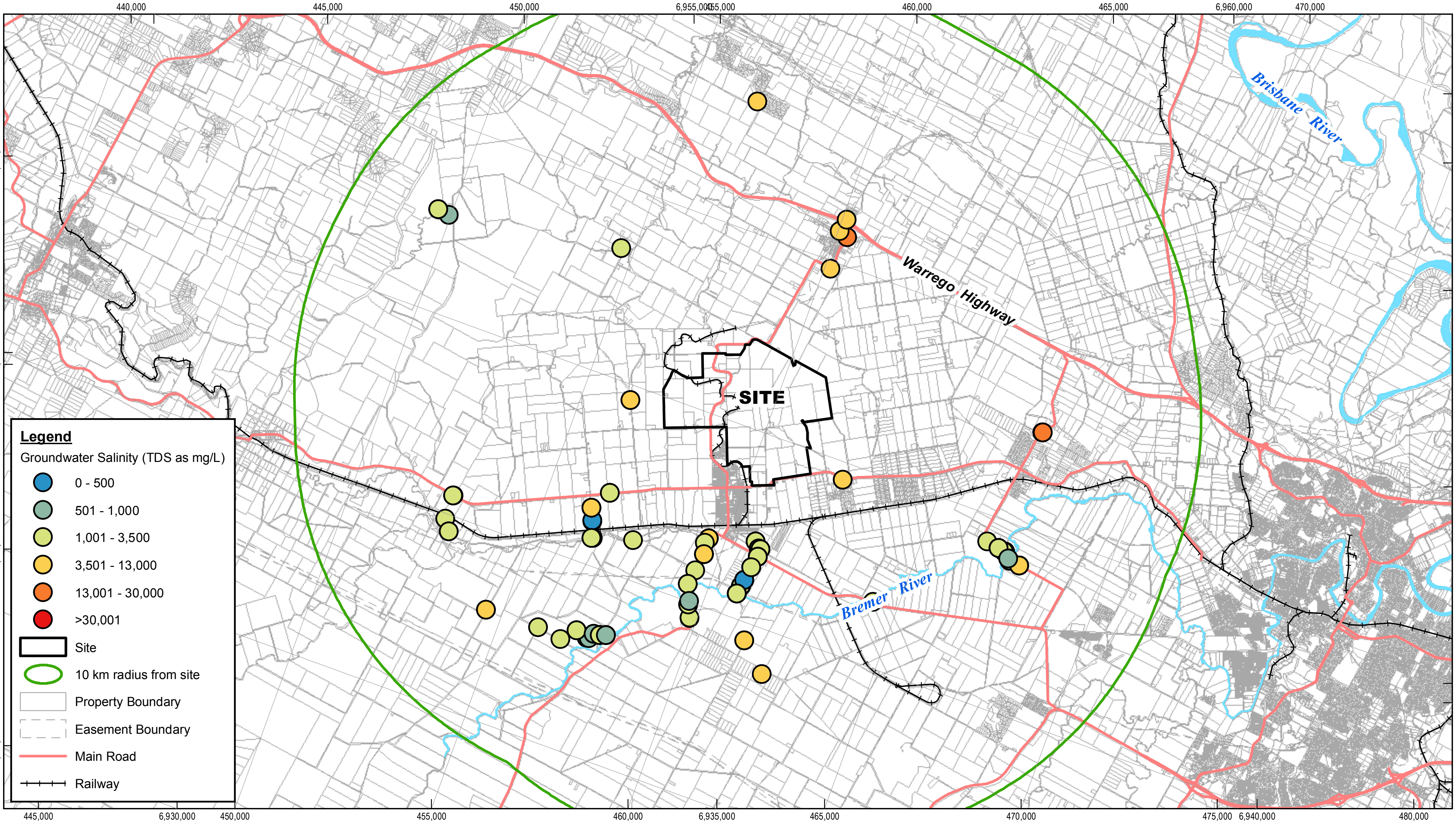

1:140,000 (at A4)

0 1 2 3 4 5 6

Kilometers

Map Projection: Universal Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

New Hope Coal Australia
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Groundwater Salinity

Figure 9

G:\41\24703\GIS\Maps\PDFs_MXDs\41-24703-29_oakleighSalinity_revA.mxd

Level 4, 201 Charlotte St Brisbane QLD 4000 T 61 7 3316 3000 F 61 7 3316 3333 E bnemail@ghd.com W www.ghd.com

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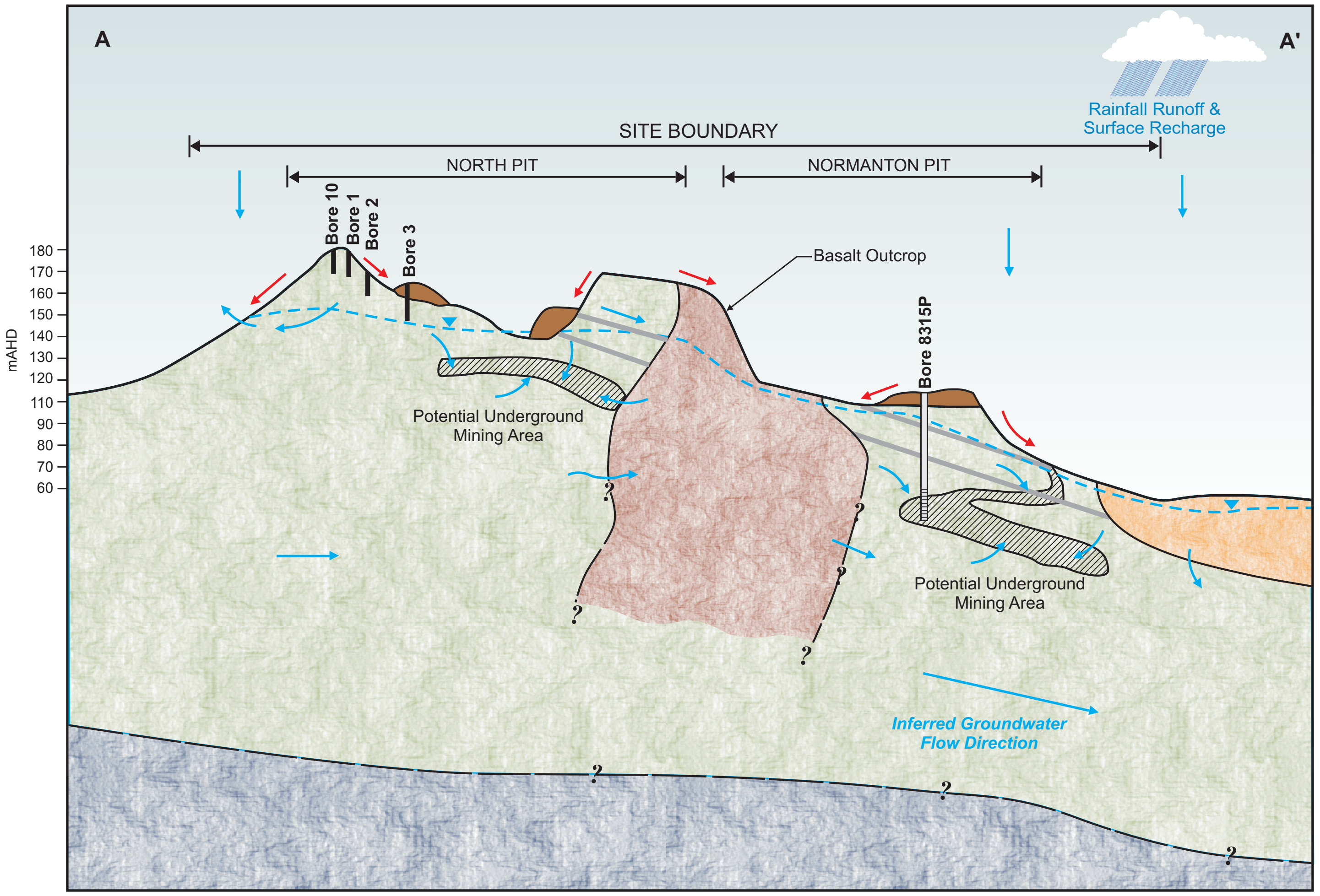

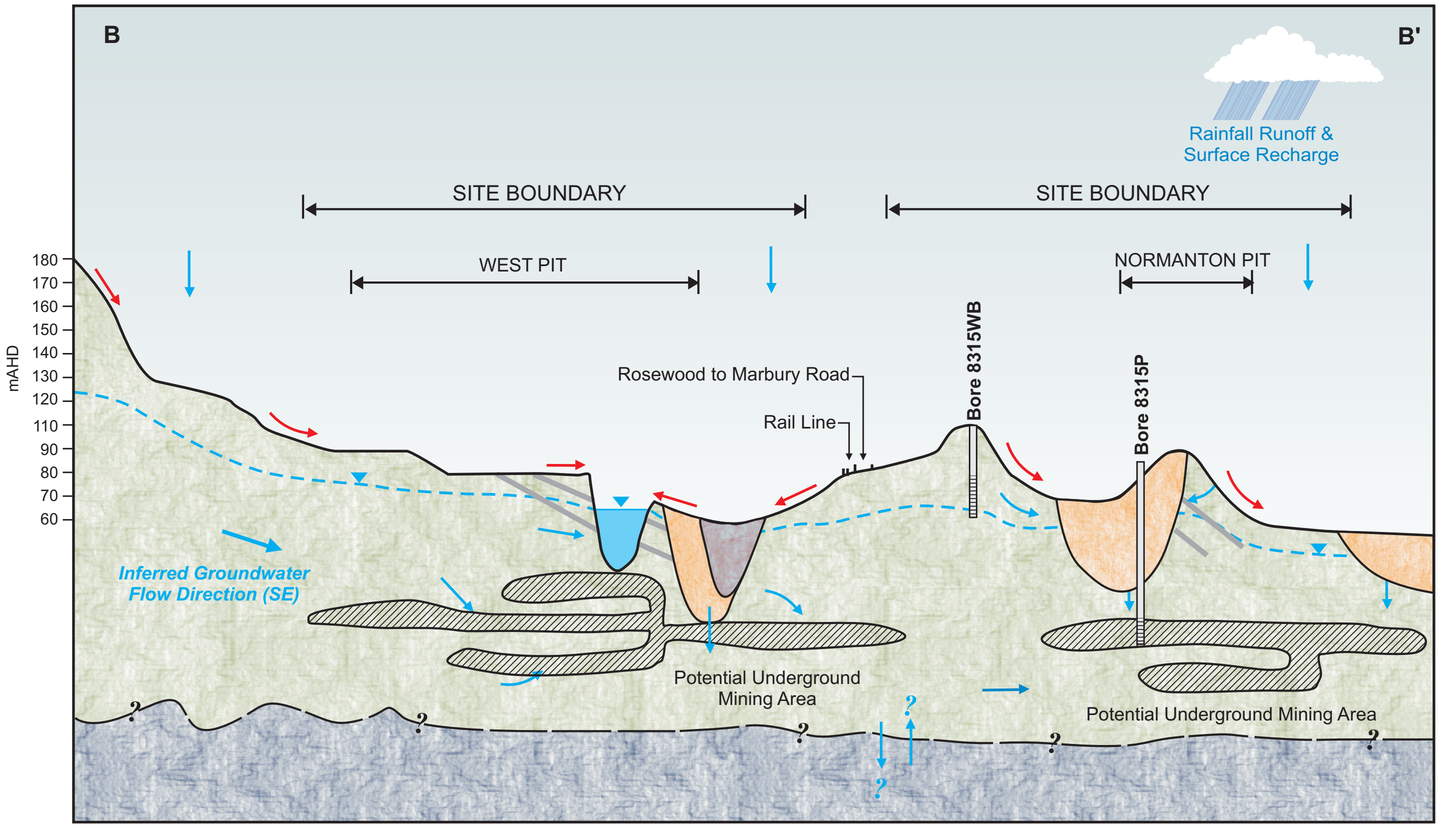

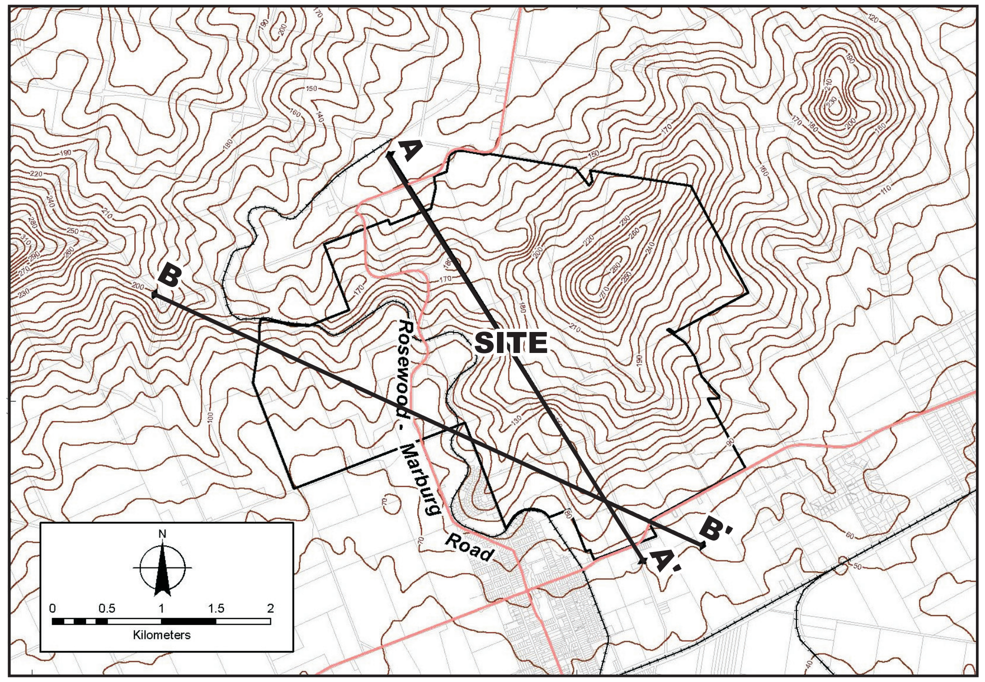

LEGEND

- QUATERNARY (HOLOCENE) SEDIMENTS
- QUATERNARY (PLEISTOCENE) SEDIMENTS
- TERTIARY BASALT
- MESOZOIC (JURASSIC) ARENITE (WALLOON COAL MEASURES)
- PALAOZOIC BASEMENT (NERANLEIGH-FERNDALE BEDS) (Mudstone, shale, metavolcanics)
- Spoil Fill
- Coal Seams
- Potential Groundwater Movement
- Inferred Surface Water Runoff
- Inferred Water Table Elevation

41-27403_LTN_03.cdr

NOT TO SCALE

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New Hope Coal Australia
Preliminary Mine Closure Study - New Oakleigh
Hydrogeological Desktop Assessment

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Revision	A
Date	9 FEB 2012

Conceptual Site Model

Figure 10

8/180 Lonsdale St Melbourne VIC 3000 Australia T 61 3 8687 8000 F 61 3 8687 8111 E melmail@ghd.com.au W www.ghd.com.au

Appendix A

GHD Preliminary Site Contamination Assessment

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New Hope Coal Australia

Report for Preliminary Mine Closure Study - New Oakleigh

Desktop Site Contamination Assessment

June 2012

INFRASTRUCTURE | MINING & INDUSTRY | DEFENCE | PROPERTY & BUILDINGS | ENVIRONMENT

Contents

Table Index

Appendices

1. Introduction

GHD Pty Ltd (GHD) was commissioned by New Hope Group (New Hope) to undertake a preliminary Site Contamination Assessment (SCA) for the New Oakleigh Mine located on Rosewood – Marburg Road, on the northern outskirts of Rosewood, Queensland (QLD), 4340, hereafter referred to as "the site, New Oakleigh mine site, or New Oakleigh". A site locality plan is presented as **Figure 1, Appendix A.**

1.1 Background

New Hope owns and operates a number of open cut mining operations in south east (SE) Queensland. Two of these operations, New Oakleigh and Chuwar, are currently undergoing Detailed Rehabilitation Planning and Mine Closure Planning, which includes a number of technical studies that provide input into this process including:

- Materials Characterisation;
- Geotechnical Study;
- Contaminated Land Assessment; and
- Groundwater Study.

This report presents the Preliminary SCA for the New Oakleigh site and relates to the assessment of potential for contamination resulting from previous and / or current operations based on the information available at the time of the assessment, with the objective of the identification, assessment and management of potential long term post-closure impacts on the environment.

1.2 Objectives

The primary objectives of the preliminary SCA was to: assess the potential for contamination to be present onsite resulting from previous and / or current operations, identify potential contaminants, and identify areas onsite where contamination may be present based on the information available at the time of the assessment.

The following report documents the findings of this preliminary SCA, which refers to the legislative requirements for contamination assessment in Queensland as defined in the:

- *Draft Guidelines for the Assessment and Management of Contaminated Land in Qld*, Former Queensland Department of Environment (DoE), May 1998 (Draft Guidelines); and
- Guidelines issued under Schedule B of the *National Environmental Protection (Assessment of Site Contamination) Measure* (NEPM), National Environmental Protection Council, December 1999.

This preliminary SCA was based on an information review including a desktop assessment, review of client provided information, site inspection observations, and site history interviews.

No intrusive soil or groundwater investigations were undertaken on the site during this preliminary SCA.

The objectives of the preliminary site contamination assessment were to:

- Assess the potential for past and current land uses to have caused contamination on the site;
- Assess the range, location and potential for contaminants to be present;

- Undertake a site visit to identify visible effects of contamination;
- Assess the potential for groundwater contamination via a desktop study and consider the requirement for an intrusive groundwater investigation; and
- Prepare a report on the work undertaken, outcomes of the work undertaken, and significance of results as well as any recommendations for further work that may be required to assist mine remediation and closure planning at the site.

This Report is subject to, and must be read in conjunction with, the limitations set out in Section 11 and the assumptions and qualifications contained throughout the Report and additionally, the Hydrogeological Desktop Assessment report being prepared concurrently by GHD.

1.3 Scope of Works

The following scope of works was completed:

1.3.1 Desktop Site History Assessment

A site history review was conducted for this preliminary SCA, and included:

- Review of publicly available mining records to ascertain extent and duration of mining operations;
- Review of historical aerial photography to ascertain historical locations of buildings and other related site infrastructure;
- Site inspection documenting site features; inspecting for signs of contamination; preparing a photographic log for the site (**Appendix B**); and confirming features documented in the desktop review;
- Review of geologic maps to provide background information relating to soil types and geology; and
- Review of regional groundwater conditions and the potential for groundwater contamination. The groundwater review was conducted to establish potential for contamination based on depth to groundwater, beneficial uses of regional and local groundwater and current groundwater quality. This assessment included a review of geological and hydrogeological maps of the area and registered groundwater bores; and published documentation and previous investigations in the area.

Review of current and historical title deeds to determine past users of the site, and a search of the Department of Environment and Heritage Protection's (EHP) Environmental Management Register (EMR) / Contaminated Land Register (CLR) database was not completed as initial review of the site found that there is at least 99 individual land parcels comprising the site. GHD informed New Hope, and it was determined that this information could be ascertained during future studies.

1.3.2 Review of Information and Previous Reports

New Hope provided information to GHD detailing the history, operations, and infrastructure related to the site. Previous assessment reports were provided to GHD by New Hope for review, including where relevant, technical data, and report findings. The five previous assessment reports reviewed to develop an appreciation of current knowledge of the site included:

- *Oakleigh Coal Project Geotechnical Evaluation, Golder Associates Pty Ltd, September 2001;*
- *Groundwater Study for New Oakleigh Coal Mine Rosewood, Douglas Partners Pty Ltd, August 2004;*

- *New Oakleigh Mine Information Sheet, Deanne Wayne, 17 September 2004;*
- *New Oakleigh Mine North Pit Seepage, Task 1 Data Review, Australasian Groundwater and Environmental (AGE) Consultants Pty Ltd, 4 March 2009; and*
- *New Hope Coal, Infrastructure Decommissioning Report, Jeebropilly and New Oakleigh Mines, Sinclair Knight Merz (SKM), 6 July 2009.*

Although the old landfill site currently operated by Ipswich City Council (ICC) as a waste transfer station is excluded from the site, and this assessment, the following report was provided to GHD by New Hope as background information to the former landfill site: *Preliminary Environmental Assessment under LRAP (Landfill Remediation Action Program) for closed landfill at Rosewood QLD, Golder Associates Pty Ltd, September 2007.*

1.3.3 Site History Interviews

Mr Ross Bennett, Senior Environmental Project Officer of New Hope arranged for GHD to conduct a site history interview with five past and present New Hope employees as persons with knowledge of site operations. Information obtained during the site history interview is a key part of preparing a comprehensive site history to identify past and present potentially contaminating activities.

2. Site Information

2.1 Site Location and Summary

The site is located on both the eastern and western sides of Rosewood – Marburg Road on the northern outskirts of the township of Rosewood, QLD, 4340 as shown on **Figure 1, Appendix A**.

The site consists of seven current mining leases covering a total surface area of 410 hectares (ha) within a total project area of 995 ha. The cadastral information for the site shows that the area leased for mining by the New Hope comprises 99 individual land parcels. **Figure 2, Appendix A** shows the mining lease (ML) areas and land property details for the site. Two additional mineral development licence (MDL) areas surrounding the site are registered to New Hope as illustrated in **Figure 3, Appendix A**. Site details are summarised in **Table 1**.

Prior to New Hope purchasing the site numerous underground workings operated in the area and a variety of infrastructure from that period remains onsite. Underground operations on the site commenced in approximately 1920 and were worked until 1997. Open cut operations across the site have been conducted in three pit areas: the West Pit located on the western side; the North Pit is situated in the northern portion on the eastern side; and the Normanton Pit in the south eastern corner. Open cut mining operations occurred at the North Pit from 1973 to approximately 2001; in the Normanton Pit commencing in 1973 until approximately 1981 and recommenced from 1997 to 1999; and West Pit works from 2000 until present day (2012). At the time of this preliminary SCA, only the West Pit was operational and both the North Pit and Normanton Pit were under rehabilitation.

A now decommissioned railway line circles the north western side of the site and intersects the eastern side of site. On the eastern side of the site an old closed landfill is situated at 94 Oakleigh Colliery Road and is operated as a waste transfer station by Ipswich City Council (ICC).

Table 1 Site Identification

Site Location:	Rosewood – Marburg Road, Rosewood, QLD, 4340
Real Property Description:	The site is comprised of 99 land parcels, and land information is summarised in Table 2
Site Area:	995 hectares
Site Owner:	New Hope Group
Local Council:	Ipswich City Council
Parish:	Walloon
County:	Churchill
Mining Leases (ML):	4568, 4584, 4675, 4683, 4698, 4699, and 50175
Mineral Development Licences (MDL):	351, and 357

2.2 Site Details and Land Information

The land comprising the mining leases for the site includes 99 individual land parcels, as detailed below in **Table 2**.

However it should be noted that New Hope does not have surface rights to all of the land within these mining lease boundaries, as such there are areas where there has been no mining related surface disturbance or associated activities.

Typically a contaminated land site history review would include obtaining the available current and historical titles for each land parcel to ascertain previous ownership and occupation of the site. However due to the number of land parcels comprising the site detailed land information searches have not been conducted during this preliminary SCA (as requested by New Hope).

Table 2 Land Information Summary

Lot	Plan	Notes
ML4568		
1	RP35741	Portion of land in lease area
1	RP173139	
1	RP163205	
1	RP131849	
2	RP35742	Portion of land in lease area
2	RP173139	
3	SP193367	
4	RP131849	
4	SP193367	
5	RP131849	
7	RP888388	
1	RP117036	
40	RP219993	
46	RP816006	
336	CH31265	
337	RP888388	

ML4584		
1	RP129879	
1	CC2421	Vertically above Lot 4 RP219991
1	RP152485	Located along creek boundary
1	RP815460	Located along creek boundary
1	RP35741	Portion of land in lease area and vertically above Lot 41 RP219994
1	RP35706	
1	RP162096	
1	RP35720	
2	RP35728	Located along creek boundary
2	RP70803	
2	RP35742	Portion of land in lease area
3	CC2422	
3	CC628	
3	RP35720	Vertically above Lot 103 RP35720
4	RP219991	Vertically below Lot 1 CC2421
5	RP220231	
11	RP35730	
24	CP827306	Located along creek boundary
26	CP827306	Located along creek boundary
27	SP103139	Located along creek boundary
28	SP827078	Located along creek boundary
28	SP103139	Located along creek boundary
29	SP103139	Located along creek boundary
41	RP219994	Vertically below Lot 1 RP35741
46	RP900073	
103	RP35720	Vertically below Lot 3 RP35720
608	CC3056	

ML4675		
1	SP107663	
1	SP165090	
2	SP107663	
2	SP165090	
ML4683		
1	RP35895	
1	RP35716	
2	CC2737	
2	RP35716	
7	SP160438	
526	CH31539	
537	SP160438	
615	CH31736	
ML4698		
1	RP893629	
1	RP35744	
1	RP112647	
1	RP112278	Portion of land in lease area
1	CC2372	
1	RP202576	Located along creek boundary
2	RP35724	Vertically above Lot 12 RP35724
2	CC2260	
2	RP35778	
2	RP113254	
2	RP202576	
2	RP35849	Located along creek boundary
4	RP893629	
3	RP35849	
3	RP35777	
12	RP35724	Vertically below Lot 12 RP35724

29	CP827087	Located along creek boundary
30	CP827087	Located along creek boundary
51	SP211926	
52	SP211926	Portion of land in lease area
674	CH31976	
ML4699		
2	RP35707	
2	RP839880	
3	RP839880	
36	RP213735	
39	RP213735	
451	CH31411	
ML50175		
1	RP151350	
1	RP203566	
2	RP35748	
2	RP213689	
3	RP804740	
3	RP200369	
3	RP35867	
5	RP893629	
9	RP35934	
22	RP904565	
23	RP904565	
Outside Mining Lease Area		
1	RP35778	North of site
1	RP213663	South east corner
4	SP200477	South east corner
5	SP200477	South east corner
282	C876	In the broad vicinity of ML4698
616	CH312527	In the broad vicinity of ML4568

2.3 Mining Operations

The New Oakleigh mine has a long mining history of over 90 years operation, with both underground and surface workings at the site. Surface mining has occurred in three areas across the site: on the eastern side of the site are two areas known as the North Pit, the Normanton Pit; and on the western side of the Rosewood – Marburg Road is the West Pit.

The New Oakleigh Mine Information Sheet (dated 17 September 2004) provided by New Hope was utilised to prepare the following summary of the New Oakleigh mining operations:

- *"The site was historically an underground coal mine which commenced operation in approximately 1920 as Perry's Knob Colliery and changed its name to Oakleigh Colliery around 1929;*
- *Oakleigh was continuously worked by underground means until November 1997;*
- *Oakleigh Colliery first commenced open cut operations in 1973 at the southeast corner of ML4584 and progressed in a generally northerly direction; this area is known as the North Pit;*
- *Normanton Collieries started as an open cut, the Normanton Pit, in the south eastern side of the site (ML4568 and ML4675) in 1973 and operated until approximately 1981. Mining of the Normanton Pit recommenced in June 1997 and continued until December 1999 when coal reserves could no longer be worked economically;*
- *New Oakleigh Coal Pty Ltd, a subsidiary of New Hope Coal Australia, acquired the New Oakleigh Mine in December 1999;*
- *In 2000, New Oakleigh Coal Pty Ltd resumed mining the North Pit for a short time until the remaining available reserves were mined out; and*
- *The open cut mining of the West Pit (on ML4698) commenced in May 2000 with initial box cut operations and coal mining in September 2000".*

Mining lease report search records for the area covering the site from Queensland Mines and Energy (now known as Department of Employment, Economic Development and Innovation) were obtained for the seven mining leases (ML) and two mineral development licences (MDL) as detailed below in **Table 3** and attached in **Appendix C**.

The publicly available records show that mining leases have been held for the land parcels comprising the New Oakleigh site since 1951. The two oldest mining lease reports are for: ML4568 issued to Leonard George Boughen on 30 March 1951 which incorporates the vicinity of the Normanton Pit, and ML4584 issued to George Henry Rule on 10 April 1951 in the mining area of the North Pit. The North Pit mining lease record for ML4584 was the earliest registered to Oakleigh Colleries Pty Ltd with an approved date of 5 October 1978. The mining lease for the area of the current West Pit was issued to Oakleigh Colliery Pty Ltd on 9 July 1982.

Figure 2 in **Appendix A** shows the configuration of areas registered to New Hope under ML or MDL. The West Pit is covered by ML4698 and ML50175; the North Pit areas are ML4584, ML4683, and ML4699. Mining leases ML4568 and ML4675 comprise the Normanton Pit. **Figure 3, Appendix A** shows the ML and MDL covering the site and surrounding areas.

Table 3 Mining Lease and Mineral Development Licence Information

Lease ID	Name of Lease	Status	Commencement Date	Expiry Date	Area (ha)	Mine Pit
ML50175	Oakleigh West	Current	01/10/1993	30/09/2013	85.45	West
ML4698	Oakleigh West	Granted - Renewal Lodged	01/12/1986	30/11/2007	189.3	West
ML4584	Oakleigh No.5	Granted - Renewal Lodged	01/04/1984	31/03/2005	161.6	North
ML4683	Oakleigh No.5	Granted - Renewal Lodged	01/03/1986	28/02/2007	173.46	North
ML4699	Oakleigh East	Granted - Renewal Lodged	01/09/1984	31/08/2005	129.75	North
ML4568	No Name	Granted - Renewal Lodged	01/04/2006	31/03/2011	192	Normanton
ML4675	Oakleigh No.4	Granted - Renewal Lodged	01/11/2002	31/10/2007	63.47	Normanton
MDL351	Malabar	Granted - Renewal Lodged	01/03/2004	28/02/2009	251.30	North of North Pit
MDL357	Kunkala	Granted - Renewal Lodged	01/09/2005	31/08/2010	1274.29	Surrounding West Pit

2.4 Surrounding Land Uses

Land uses of properties immediately surrounding the site are described in **Table 4**.

Table 4 Surrounding Land Uses

Direction	Land Use
North	Primarily farmland and grazing land north of Cochranes Road, and north west of Rosewood – Marburg Road, as well as small pockets of remnant bushland.
East	Large areas of remnant bushland directly to the east of the site, and a number of partially cleared rural properties located south east of the site off Karrabin – Rosewood Road.
South	The township of Rosewood is located to the south of the site and extends south of the Rosewood – Laidley Road. To the south west of the site is an area of grazing land bordered by Rosewood in the east and the Rosewood – Laidley Road in the south.
West	Agricultural land runs along the western boundary consisting of grazing and cropping with residential properties and scattered remnant bushland west of site.

2.5 Environmental Management and Contaminated Land Registers

The Department of Environment and Heritage Protection (EHP) administers the Environmental Management Register (EMR) and Contaminated Land Register (CLR), which identifies land that has been or is being used for a notifiable activity for which the EHP has been notified. A notifiable activity has been deemed by EHP to be an activity that has the potential to cause land contamination. Under the *Environmental Protection Act 1994*, landowners must inform the department that land has been or is being used for a notifiable activity.

A search of the QLD EHP EMR and CLR databases was not conducted for the site, as the New Oakleigh site is comprised of 99 land parcels. An EMR search is typically conducted for each allotment to verify if each property is listed on the EMR or CLR, or not. A standard search fee, payable to EHP, applies to each individual allotment.

The SKM '*New Hope Coal Infrastructure Decommissioning Report – Jeebropilly and New Oakleigh Mines, July 2009*' report states in section 4.4.2 "*the New Oakleigh site has two properties listed on the EMR, these include the fuel farm and the disused underground fuel tank for the notifiable activity of Petroleum Product or Oil Storage*". However the SKM report (2009) does not detail the land parcel details for the two properties listed on the EMR and the EMR / CLR search results are not included in the appendices of the report.

2.6 Topography

The vicinity of the site exhibits steep relief with an overall southerly slope. To the north and north east of the North Pit, a ridge with a topographic height of approximately 200 m Australian Height Datum (AHD) dominates the surface and slopes south down to elevations of approximately 50 m AHD within the town of Rosewood and along the Bremer River.

2.7 Hydrogeological Assessment

A *Report for Preliminary Mine Closure Study – New Oakleigh Project, Hydrogeological Desktop Assessment,* GHD, June 2012 (Document Number: 41/24703/205525) characterises the existing groundwater environment, and identifies assessment and monitoring requirements to assist with the management of potential long term post-closure impacts on the groundwater environment.

The desktop hydrogeological assessment report involved the following scope of works:

- Collation and review of hydrogeological information from New Hope and the public domain for the mine site and surrounding region;
- Site inspection by a GHD Hydrogeologist to assess and discuss groundwater conditions with relevant New Hope personnel;
- Characterisation of aquifer types, extents, hydraulic properties and groundwater flow systems;
- Undertake preliminary groundwater inflow estimates using analytical modelling techniques; and
- Develop a hydrogeological field program to identify priority areas for further hydrogeological assessment and monitoring of long-term potential hydrogeological impacts to the surrounding hydrological environment.

Extracts of the geology, hydrology, and hydrogeology have been summarised and / or extracted from the hydrogeological desktop assessment report (GHD, 2012).

2.8 Geology

The site is situated within south east Queensland's Moreton Basin, which contains sediments of Late Triassic to Middle Jurassic age (AGE, 2009). The *Geological Survey of Queensland's 1:100,000 series Ipswich Sheet* shows the mine site to be predominately underlain by Walloon Coal Measures, which comprise of several thin coal seams interlayered with shale, siltstone and sandstone.

Tertiary basalts outcrop locally to the north of the New Oakleigh mine however some occurrence of basalt has previously been identified within the mine site, with thicknesses of up to 6 metres (AGE, 2009). Floodplain and river terrace alluvium deposits associated with the Bremer River floodplain comprising of clay, silt, sand and gravel encroach into the site from the south along former drainage lines and tributaries, overlying coal measures in the area. Isolated pockets of colluvium pediment slope wash, clay scree and soil are present along the site's eastern boundary. AGE (2009) identified that that the nearest notable occurrence of alluvial sediments to the New Oakleigh mine was associated with Black Snake Creek, situated approximately one kilometre (km) north of the mine site.

Geology classifications are shown on the regional geology plan attached in **Figure 4, Appendix A**, and was sourced from the DERM, 2007. Resolution of the dataset is 1:100,000, therefore, the boundaries between the individual units may only be accurate to approximately 100 m.

2.9 Surface Hydrology

New Oakleigh lies within the Moreton Basin, which drains the area east of Toowoomba to Moreton Bay (west to east) and the upper reaches of the Brisbane River to the vicinity north of the New South Wales border (north to south). The basin's northern limit is at the source of the Brisbane River, and outlets through a number of rivers and streams, primarily via the Brisbane River downstream of Brisbane to the Coral Sea.

The site is situated within the Bremer catchment, which is the southernmost catchment within the wider Moreton Basin. The Bremer River and Warrill Creek are significant surface water features within the Bremer catchment. The Bremer River sources below Mount Fraser at an elevation of 132 m AHD. The Warrill Creek confluences with the Bremer River upstream of Ipswich, whilst the Bremer River confluences with the Brisbane River downstream of Ipswich at an elevation of 3.7 m AHD.

Ephemeral gullies drain stormwater runoff from the site into Western Creek, which joins the Bremer River about 1 km south of Rosewood (Douglas Partners, 2004). The site is situated to the north of Rosewood township, approximately 6 km north of the Bremer River. In the GHD Hydrogeology Report (May, 2012), *Chart 2* shows the historic river level and flow data for the Bremer River at Walloon. Hydrology data shows that typically the river flows throughout the year, with occasional flood events peaking flows and levels temporarily.

The ground zero gauge on the Bremer River is 16.4 m AHD, and the average water levels are considered to be around 3 m at the zero gauge location. The non-verified Bureau of Meterology data shows that the reduced water levels at both rivers are low at less than 13 m AHD.

2.10 Regional Hydrogeology

The groundwater regime at New Oakleigh has been interpreted from other investigations undertaken at the site and the wider region, as well as through public domain data held by the Queensland government. This section should be revisited following completion of site investigations.

2.10.1 Regional Aquifers

In general terms, the coal seams are often more permeable (and release larger quantities of groundwater) than their host sandstone and siltstones. Coal seams within the Mesozoic formations are considered the main aquifers within the otherwise lower permeability units. New Hope (2002) has previously indicated that groundwater yields from exploration bores and active mining pits has been very low or nil, with no significant groundwater resources encountered through mining operations.

Palaeozoic Formations

Palaeozoic basement rocks comprising mudstone, shale, arenite, metavolcanics and conglomerate occur regionally and outcrop approximately 12 km east of the site. The extent of these rocks to occur beneath the site remains unknown, but based on regional knowledge, are likely to be at great depth >400 metres below ground level (m bgl). If present, groundwater within these units is likely to flow through secondary porosity, and is likely to be structurally controlled.

Mesozoic Formations

Groundwater within the Mesozoic formations is likely to exhibit flow through secondary porosity, i.e., flow occurring though structural features such as faults, joints and fissures and other discontinuities within the rockmass. A lesser component of flow may occur through primary porosity, e.g. interstices of coarser grained indurated sediments.

Within the Mesozoic Walloon Coal Measures of the Moreton Basin, groundwater can be categorised into two hydrogeologically distinct units, as stipulated previously by AGE (2009):

- Low permeability sedimentary sequences of sandstone, shale and siltstones that comprise the majority of the Walloon Coal Measures formation; and
- Moderate permeability coal seams, which at New Oakleigh, can be considered semi-confined within the sedimentary sequences described above. Regionally, these coal seams also occur as confined aquifers at locations that are remote from outcrop / subcrop. The coal seams represent the major water bearing strata within the Walloon Coal Measures.

Mining operations at New Oakleigh showed that groundwater intersections generally occurred within the first, i.e. shallowest, or second coal seam within the Walloon Coal Measures was encountered, at depths ranging from 14 m to 24 metres below ground level (m bgl).

Tertiary Basalt

Groundwater within the Tertiary basalt is likely to exhibit the bulk of its flow through secondary porosity. That is, flow occurring though structural features in the basalt such as joints and fractures. Some primary porosity flow through vesicles may also occur where present.

The Ipswich 1:250,000 geological map (GSQ, 1973) maps the Tertiary basalt outcrops to the north of the New Oakleigh mine. Previous exploration investigations within the New Oakleigh mine identified up to 6 m thickness of basalt. Given the likely limited lateral extent and vertical thickness of this unit in the vicinity of the mine (AGE, 2009), it is unlikely that Tertiary Basalts would comprise a significant aquifer near the mine.

Quaternary Alluvials

The extent of Quaternary Alluvial deposit occurrence at the New Oakleigh mine site is considered minor based on broad scale mapping (GSQ, 1973), but remains largely unknown at a local scale. Where they do occur, these deposits would form localised inter-granular aquifers associated with floodplain deposits derived from active drainage channels, i.e. Bremer River deposits. Groundwater flow in alluvial systems predominantly occurs through pore spaces (primary porosity) within unconsolidated sediments.

Anthropogenic Aquifers

Anthropogenic or *ex-situ* sources of soil and/or rock materials such as spoil heaps and in-filled mine voids may contain significant volumes of water within storage. Large spoil heaps stockpiled above the natural surface may act as localised perched aquifers, whereas a mine void may locally increase groundwater recharge and create mounding or storage within the surrounding host geology.

The unconsolidated, loose, nature of stock piles, spoil heaps and overburden dumps would permit some percolation, storage and transmission of water. These features would be highly localised (compared to regional aquifer systems), variable and highly dependent on the extent, depth and composition of fill materials, as well as the depth of weathering and extent of fracturing within adjacent materials.

2.11 Groundwater Monitoring Data

2.11.1 Local Groundwater

The EHP Groundwater Database (GWDB) stores Queensland groundwater resource information including, water level, water quality, construction, pump and flow test, elevation, location, strata, stratigraphy and aquifer details, bore condition, casing and wire line.

A search of the GWDB database identified approximately 160 bores within an approximated 20 km radius of the site. These bores are evenly distributed in all directions of the site, particularly to the south within locations of Quaternary Alluvial outcrop (adjacent to the Bremer River and Warrill Creek). Based on the 77 bores containing depth information, these bores were drilled to depths ranging from 4.5 m to 147 m bgl, averaging as 31 m bgl. Approximately 65% of the 106 identified bores containing bore use information are existing water supply bores drilled pre-1991 to develop the Bremer River Alluvium. Most other bores are used for (sub-artesian) groundwater monitoring.

2.11.2 New Oakleigh Site Bores

Based on information provided by New Hope, 17 bores are known to exist within the New Oakleigh mine site. The construction and location details for these bores were provided by New Hope and are shown in **Table 5**. Some of these bores are also referred to by name as well as bore ID (e.g. Blake's Road bore, Perrin's Road bore and Kelly's bore).

Table 5 Existing Bores at New Oakleigh

	Australian Map Grid (AMG)			
Bore ID	Easting	Northing	Elevation (m AHD)	Bore Depth (mbgl)
8315P	460038.1	6944393	126.64	119
8337WB	458522.3	6943786	71.16	36
8341WB	459375.9	6944495	103.31	30
8340WB	459203	6944285	127.01	102
8342P	458690.7	6943666	78.32	46.5
8344WB	457977.3	6942990	53.56	19
8345WB	457449.3	6944255	66.97	37
8346WB	458396	6943753	64.84	24
8348P	457452.9	6944256	66.73	30
8343P	458401	6943754	64.66	36
8347P	458526.6	6943787	71.51	48
8372WB	457986.8	6942992	53.13	18
8373P	458181.5	6943018	54.62	26.4
8374P	458218.2	6943369	58.65	18
8377P	455559.1	6943637	75.05	12.5
8378P	457861.1	6942819	51.09	18
8401P	457274.1	6943321	60.59	34

Source: *Data provided to GHD by Mr. Ross Bennett (New Hope). Data not verified by GHD.*

In addition to the existing New Oakleigh bores, the SKM seepage study (on-going at the time of reporting) has thus far included the drilling and installation of ten groundwater monitoring bores (**Table 6**). Bore construction details or formations monitored remain unknown for these bores. It is understood that the SKM seepage study will conclude subsequent to issue of this report, and as such, the outcomes of which cannot be incorporated in this assessment.

Table 6 SKM Seepage Bores at New Oakleigh

Bore ID	Easting	Northing
Bore 1	459051.857	6946308.223
Bore 2	459024.802	6946227.488
Bore 3	458988.162	6946049.531
Bore 4	459398.82	6946436.222
Bore 5	458747.857	6945085.296
Bore 6	458812.391	6945166.682
Bore 7	459381.983	6946514.466
Bore 8	459165.458	6946425.567
Bore 9	459331.885	6946576.954
Bore 10	458972.506	6946332.039

Source: *Data provided to GHD by Mr. Ross Bennett (New Hope). Data not verified by GHD, and datum to be confirmed.*

3. Site History

A review of historical information is conducted as part of a site contamination assessment to assess previous site use. The scope of a site history review typically includes the following components:

- Current and Historical Title Searches; and
- Historical aerial photography.

3.1 Current and Historical Title Searches

The site comprises approximately 99 individual land parcels, as detailed previously in **Table 2**.

Typically a contaminated land site history review would include obtaining the available current and historical titles for each land parcel to ascertain previous ownership and occupation of the site. However due to the number of land parcels comprising the site detailed land information searches have not been conducted during this preliminary SCA (as requested by New Hope).

3.2 Aerial Photography Review (1958 – 2011)

Historical usage of the site was deduced from a review of available aerial photographs from the EHP. The following photographs cover the site over a 53 year period from 1958 to 2011 (attached in **Figures A – J, Appendix D** and summarised in Table 7*)*.

Table 7 Historical Aerial Photography Review

YEAR: 1958	TITLE: Figure A – Historical Aerial Photography – 1959
FILM #: QAP890 **RUN #:** 4 **FRAME #:** 15 **SCALE:** 1:25,000 **HEIGHT:** 3,810 m **FORMAT:** Black & White	**North Pit and Former Coal Handling and Plant Preparation (CHPP) Area** The 1958 aerial photograph shows the majority of the site as cleared farmland with associated buildings scattered across the area. There is no surface disturbance evidence of mining activities relating to the North Pit. A railway line through the area roughly following the alignment of Rosewood – Marburg Road intersects the site. A small conveyer belt and associated buildings are present along the rail line in the CHPP area. Oakleigh Colliery Road is evident, connecting the CHPP area with Urry Road, which runs along the sites southern boundary. **West Pit Area** The 1958 aerial photograph shows the majority of the site as cleared farmland with associated buildings scattered across the area. A small cluster of buildings are present in the current heavy vehicle workshop area. Rosewood-Marburg Road is visible running through the area in a north to south direction. **Normanton Pit Area** The 1958 aerial photograph shows the majority of the site as cleared farmland with associated buildings scattered across the area. Upper John Street and Blakes Road are present entering the area from the south and are linked by an access road. **Surrounding Area** The 1958 aerial photograph shows the surrounding land appears as predominately cleared farmland with residential development having occurred at Rosewood located south of the site at the intersection of Walloon Road and John Street.
YEAR: 1970	**TITLE: Figure B – Historical Aerial Photography – 1970**
FILM #: QAP2147 **RUN #:** 4 **FRAME #:** 066 **SCALE:** 1:25,000 **HEIGHT:** 3,773 m **FORMAT:** Black & White	**North Pit and Former CHPP Area** The 1970 aerial photograph shows an expansion of the CHPP area since 1958 with additional stockpiles present. There is no evidence of mining activities relating to the North Pit. **West Pit Area** The 1970 aerial photograph shows no significant changes from the 1958 aerial photograph with the area still observed to be farmland and no evidence of mining activities. **Normanton Pit Area** The 1970 aerial photograph shows no significant changes in the area from the 1958 aerial photograph with the area comprised of farmland and no mining activities evident. **Surrounding Area** The 1970 aerial photograph shows the surrounding area has been further cleared for farmland and additional development has occurred to the south of the site at Rosewood since 1958.

YEAR: 1978	TITLE: Figure C – Historical Aerial Photography – 1978
FILM #: QAP3605 **RUN #:** 3 **FRAME #:** 3291 **SCALE:** 1:25,000 **HEIGHT:** 3,800 m **FORMAT:** Colour	**North Pit and Former CHPP Area** The 1978 aerial photograph shows that a significant expansion of the CHPP area has occurred since 1970 with an increased number of stockpiles surrounding the now extended conveyer belt. Mining activities for the North Pit open cut mine have commenced east of the CHPP area, with a large excavation area visible and an exposed rock face present. A number of access roads are present linking the excavation area with the former CHPP area. **West Pit Area** The 1978 aerial photograph shows a number of stockpiles situated behind the small cluster of buildings adjacent the workshop area; however there is no evidence of mining. **Normanton Pit Area** The 1978 aerial photograph shows mining activities for the Normanton Pit open cut mine have occurred between Upper John Street and Blakes Road, with the area cleared and disturbed earth evident. Deeper excavations have occurred on the southern side of the access road linking Upper John Street with Blakes Road. A small building is present at the southern end of the disturbed area. **Surrounding Area** The 1978 aerial photograph shows the area surrounding the site has been further cleared for farmland and additional development has occurred south at Rosewood since 1970.
YEAR: 1982	**TITLE: Figure D – Historical Aerial Photography – 1982**
FILM #: QAP4019 **RUN #:** 3 **FRAME #:** 103 **SCALE:** 1:25,000 **HEIGHT:** 3,850 m **FORMAT:** Colour	**North Pit and Former CHPP Area** The 1982 aerial photograph shows that further expansion of the CHPP area has occurred since 1978, with additional stockpiles present. Two small buildings are evident along the access road linking the CHPP area with the North Pit coal mine. Expansion of the North Pit coal mine has occurred since 1978 with the area of excavation expanding further north. **West Pit Area** The 1970 aerial photograph shows no significant changes from the 1958 aerial with the area still visible as farmland and no evidence of mining activities. **Normanton Pit Area** The 1982 aerial photograph shows deeper mining operations have occurred on the northern side of the access road. The mine pit is observed to contain liquid. The extent of earth disturbance shown in the 1978 aerial photograph has diminished. The small building shown in the 1978 aerial photograph is no longer present. **Surrounding Area** The 1982 aerial photograph shows the surrounding area has been further cleared for farmland and additional development has occurred since 1978 at Rosewood.

YEAR: 1987	TITLE: Figure E – Historical Aerial Photography – 1987
FILM #: QAP4617 **RUN #:** 3 **FRAME #:** 075 **SCALE:** 1:25,000 **HEIGHT:** 4,060 m **FORMAT:** Colour	**North Pit and Former CHPP Area** The 1987 aerial photograph shows that additional stockpiling has occurred at the CHPP area. A number of new buildings are visible along the access road linking the CHPP area with the North Pit coal mine. Mining operations for the North Pit open cut mine have expanded to the west and east with a benched rock face evident along the areas northern wall. An access road has been constructed linking the North Pit with Rosewood - Marburg Road. Former mined areas to the south, appear to have been filled, re-profiled and re-vegetated. **West Pit Area** The 1987 aerial photograph shows no significant changes from the 1982 aerial photograph with the area remaining as farmland and no evidence of mining activities. **Normanton Pit Area** The 1987 aerial photograph shows the Normanton Pit open cut mine to be abandoned with no evidence of new mining operations since 1982. Vegetation now covers the majority of the formally disturbed area. **Surrounding Area** The 1987 aerial photograph shows additional development has occurred to the south of the site at Rosewood since 1978 and the surrounding area has been further cleared for farmland.
YEAR: 1990	**TITLE: Figure F – Historical Aerial Photography – 1990**
FILM #: QAP4658 **RUN #:** 3E **FRAME #:** 172 **SCALE:** 1:25,000 **HEIGHT:** 4,130 m **FORMAT:** Colour	**North Pit and Former CHPP Area** The 1990 aerial photograph shows that mining operations for the North Pit open cut mine have expanded to the east with further evidence of excavation visible. **West Pit Area** The 1990 aerial photograph shows no significant changes from the 1987 aerial photograph with no evidence of mining activities and the area predominantly farmland. **Normanton Pit Area** The 1990 aerial photograph shows no obvious changes from the 1987 image, except that the now abandoned mine pit contains liquid. **Surrounding Area** The 1990 aerial photograph shows the surrounding area has been further cleared for farmland and additional development has occurred to the south of the site at Rosewood since 1987.

YEAR: 1993	TITLE: Figure G – Historical Aerial Photography – 1993
FILM #: QAP4658 **RUN #:** 4 **FRAME #:** 98 & 99 **SCALE:** 1:25,000 **HEIGHT:** 4,130 m **FORMAT:** Colour	**North Pit and Former CHPP Area** The 1993 aerial photography indicates that mining operations have been significantly scaled back since 1990 with fewer stockpiles present in the CHPP area and the southern portion of the North Pit coal mine having been filled, re-profiled and re-vegetated. **West Pit Area** The 1993 aerial photograph shows no significant changes from the 1990 aerial photograph with the area still appearing as farmland and no evidence of mining activities. **Normanton Pit Area** The 1993 aerial photograph shows no significant changes to the 1990 aerial photograph with the abandoned mine pit no longer full of liquid. **Surrounding Area** The 1993 aerial photograph shows the surrounding area has been further cleared for farmland and additional development has occurred to the south of the site at Rosewood since 1990.

YEAR: 1997	TITLE: Figure H – Historical Aerial Photography – 1997
FILM #: QAP5582 **RUN #:** 2 **FRAME #:** 026 **SCALE:** 1:37,500 **HEIGHT:** 6,500 m **FORMAT:** Colour	**North Pit and Former CHPP Area** The 1997 aerial photography shows the North Pit coal mine has been further filled, re-profiled and re-vegetated since 1993 with liquid present at the base of the pit. A well-defined dirt access road is evident linking the CHPP area with the Normanton Pit. **West Pit Area** The 1997 aerial photograph shows no significant changes from the 1993 aerial photograph with the area still appearing as farmland and no evidence of mining activities. **Normanton Pit Area** The 1997 aerial photography shows significant earth disturbance resulting from mining activities has occurred once again across the Normanton Pit coal mine area. **Surrounding Area** The 1997 aerial photograph shows the surrounding area has been further cleared for farmland and additional development has occurred to the south of the site at Rosewood since 1993.

YEAR: 2002	TITLE: Figure I – Historical Aerial Photography – 2002
FILM #: QAP5933 **RUN #:** 4 **FRAME #:** 007 **SCALE:** 1:25,000 **HEIGHT:** 4,130 m **FORMAT:** Colour	**North Pit and Former CHPP Area** The 2002 aerial photograph shows that further excavation activities have occurred in the north eastern corner of the North Pit coal mine and the remainder of the former mine area has been filled, re-profiled and re-vegetated since 1997. The mine pit located in the north eastern corner is full of liquid. A body of liquid is evident in the CHPP area surrounded by the remaining stockpiles. **West Pit Area** The 2002 aerial photography shows that mining activities for the West Pit coal mine have occurred since 1997 and that the previously identified cluster of small buildings adjacent the CHPP area have been replaced by new buildings for the Current Heavy Vehicle Workshop Area. **Normanton Pit Area** The 2002 aerial photograph shows evidence of earth disturbance resulting from mining activities remaining at the northern end of the Normanton Pit coal mine area. **Surrounding Area** The 2002 aerial photograph shows the surrounding area has been further cleared for farmland and additional development has occurred to the south of the site at Rosewood since 1997.
YEAR: 2011	**TITLE: Figure J – Google Earth Pro Imagery – 2011**
FILM #: NA **RUN #:** NA **FRAME #:** NA **SCALE:** NA **HEIGHT:** NA **FORMAT:** Colour	**North Pit and Former CHPP Area** The 2011 aerial photograph shows the stockpiles and associated infrastructure including the conveyer belt at the CHPP area are no longer present. The remaining mining activities in the north eastern corner of the North Pit coal mine appear to have ceased with the area having been further filled, re-profiled and re-vegetated and a new dam constructed. Evidence of earth disturbance from mining activities remains south of the dam. **West Pit Area** The mining activities for the West pit coal mine have moved further south since 2002, with the surrounding former mining areas filled, re-profiled and re-vegetated. **Normanton Pit Area** The 2011 aerial shows evidence of earth disturbance resulting from mining activities remaining at the northern end of the Normanton Pit coal mine area. **Surrounding Area** The 2011 aerial photograph shows the surrounding area has been further cleared for farmland and additional development has occurred to the south of the site at Rosewood since 2002.

Notes: NA = Not Available. Sources: DERM, 2011 and Google, 2011

4. Information Review

The following sub sections provide a summary with respect to site history and contaminated land information, points to note, conclusions, and recommendations extracted from previous assessment reports provided by New Hope to GHD for review and inclusion in this preliminary desktop assessment.

New Hope provided GHD with an information fact sheet for the New Oakleigh Mine, and the following four previous reports:

- *Oakleigh Coal Project Geotechnical Evaluation – Golder Associates Pty Ltd (September, 2001);*
- *Groundwater Study for New Oakleigh Coal Mine Rosewood – Douglas Partners (August, 2004);*
- *New Oakleigh Mine North Pit Seepage, Task 1 Data Review – Australasian Groundwater and Environmental (AGE) Consultants Pty Ltd (4 March 2009);* and
- *New Hope Coal Infrastructure Decommissioning Report – Jeebropilly and New Oakleigh Mines – SKM (July, 2009).*

4.1 New Oakleigh Mine Information Sheet – New Hope (September 2004)

The New Oakleigh mine has a long mining history of over 90 years operation, with both underground and surface workings at the site. Section 2.3 summarises information extracted from the New Oakleigh Mine Information Sheet (dated 17 September 2004 is included in **Appendix E**).

4.2 Oakleigh Coal Project Geotechnical Evaluation – Golder Associates Pty Ltd (September, 2001)

- *"Geotechnical studies in relation to the ongoing mining operations for the Oakleigh Coal project were undertaken, with particular reference to the potential geotechnical impact of mining on the nearby historic railway line.*
- *The coal measures at the Oakleigh site occur within the Marburg Formation of the Walloon Coal Measures. Mining is proposed to target the Butler, Cowell / Stewarts, Kathage, Wass and Haenke seams, with the lower most target seam (in 2001 at the time of reporting) being the Haenke 6 seam;*
- *Mining is currently in progress using truck and shovel methods and is proposed to progress north-westwards from the existing pit area, and then south-south-eastwards along the length of the western boundary of the lease area. The bedding dip is at very shallow angles, and mining advance is in the down-dip direction.*
- *Observations and assessments of failures in weathered ground in two areas the first failure was located in the north west of the pit area and observed on 10 January 2001; and the second failure in the north-western pit area in the form of tension cracking was observed by New Hope on 9 May 2001 and inspected by Golder on 10 May 2001. Remedial works were recommended and implemented comprising surface water drainage measures and construction of a free-draining buttress of blasted rock.*
- *Geotechnical drilling investigations were undertaken by Golder between March and April 2011 with six fully cored boreholes drilled by New Hope using HQ triple tube tungsten / diamond coring methods.*

The materials encountered in the boreholes drilled included residual sandy clays (extremely weathered mudstones and sandstones), mudstones, sandstones, coals, carbonaceous mudstones and weak bedding parallel materials (generally associated with coal seam roofs and / or floors).

- *Observations made during the geotechnical mapping in the pit and discussions with New Hope indicate that groundwater seepage from the pit walls has not been widespread to date and has generally been restricted to localised areas below the base of weathering.*
- *New Hope advised Golder that during excavation of two test holes in the pit floor early in May 2001, rapid inflows of groundwater were experienced, with the water level stabilising at approximately 61 metres relative level (m RL).*
- *In pit design to date, New Hope has employed the following design criteria: slopes in weathered overburden materials of approximately 45° inclination; no catch berm at the base of weathering; and unbenched, continuous slopes in fresh rock of approximately 65° inclination and in excess of 40 m height.*
- *Observations made during geotechnical mapping of the pit indicate that localised instability due to toppling and rockfall may occur, although this is generally on a small scale and does not affect overall wall stability.*
- *Golder considered it appropriate for New Hope to continue to excavate the unweathered coal measures strata to the current design angle of 65°, and accept that localised instability may arise where adversely oriented discontinuities are intersected.*
- *The stability of the walls in the south-eastern section of the final pit will likely be adversely affected by the presence of old working within the Butler, Cowell and Wass seams, all of which may be intersected or approached by the proposed mining. It was suggested by Golder that flatter overall batters may be required in this section of the mine dependent upon the condition of the rock mass about the old workings and their proximity to the proposed final pit walls.*
- *The existing pit walls below base of weathering have been excavated at angles approximately 65° to heights of up to 40m, and appear to be generally stable. It is considered appropriate that these design criteria continue to be employed in future pit wall development below the base of weathering to the proposed maximum depths of 60 m to 65 m. Flatter batters of around 50° should be considered adjacent to the old underground workings. This will need to be further assessed as mining continues into these areas.*
- *Golder recommended groundwater conditions encountered in the pit walls during mining should be closely and continuously monitored to verify the analytical assumption of essentially dry conditions. Golder further added that this will become increasingly important as mining progresses and the likelihood of groundwater being encountered increases".*

The Golder report (2001) Figures and Borehole Logs are extracted and included in **Appendix E**.

4.3 Groundwater Study for New Oakleigh Coal Mine Rosewood – Douglas Partners (August, 2004)

- *"The Groundwater study was conducted to address the requirements of groundwater conditions C2-1 to C2-4 of the new Environmental Authority M5637 issued with the granting of a new mining lease ML50175. A copy of the relevant information extracted from the Douglas Partners report is attached in **Appendix E**.*
- *The groundwater conditions comprised:*
  - *C2-1 states that a groundwater study must be undertaken of the existing groundwater regimes with the aim of proposing any necessary monitoring programs and contaminant limits;*
  - *C2-2 states that groundwater levels must be monitored and drawdowns in excess of 2 m per year, not resulting from the pumping of licensed bores, must be notified to the administering authority;*
  - *C2-3 states that the sampling of groundwater should comply with the Environmental Protection Authority's (EPA's) water quality sampling manual; and*
  - *C2-4 states that additional testing is to be carried out on Mrs Svennson's property to assess the impact of blasting on groundwater, and continue until the EPA is satisfied that blasting can have no impact to the aquifers on Mrs Svennson's property.*
- *The objective of the groundwater study was to investigate the aquifers and groundwater quality surrounding New Oakleigh to satisfy the four groundwater conditions as required by the EPA.*
- *The study comprised the review of existing groundwater data, drilling and installation of three new monitoring bores, installation of data loggers to monitor groundwater levels, groundwater sampling and monitoring of groundwater quality.*
- *Yield from exploration bores and active mining pits has been very low or nil, and no significant groundwater resource has been encountered by the mining operations. Also groundwater level data indicates a hydraulic gradient sloping from north to south reflecting the surface topography.*
- *The three new groundwater bores (8377P, 8378P, and 8401P) intersected groundwater at a depth range of 47 and 73 m RL.*
- *Groundwater quality measured returned results of neutral pH, brackish Electrical Conductivity, and a temperature range of 21.5 to 23.5 °C.*
- *Data logged by the vibrating wire piezometers installed in the new wells revealed hydrographs showing a response to rainfall and variations in groundwater level.*
- *Water samples were analysed for the major anions, major cations, and standard eight metals. The majority of the analytical results were less than both the Australian and New Zealand Environment Conservation Council (ANZECC) fresh water guideline for 90% ecosystem protection for lowland rivers, and the Australian Drinking Water Guideline (1996) livestock drinking water quality criterion. The exceptions to this data trend were water chemistry for copper, nickel and zinc with results for some bores greater than the ANZECC freshwater criteria but less than the Australian Drinking Water Guidelines criteria for livestock drinking water.*
- *Drilling completed across the mining area showed that the only usable groundwater resource was the old underground mine workings.*

- *Groundwater is extracted from four bores by the mine to supplement the requirements for the wash plant and for dust suppression. During dry times it is understood that the mine extracts groundwater from an additional three bores within old underground mine workings to supplement the demand of the wash plant. These bores were located on Blake's Road (bore 8315P), Rosewood – Marburg Road (bore 8171WB), and near Perrin's Lane on Bulow's property (bore 8373P).*
- *Three separate aquifers or groundwater regimes were identified within the mining lease areas of New Oakleigh Mine: Bremer River Alluvium aquifer, Walloon Coal Measures fractured rock (coal seam) aquifers, and Voids within the old mine workings.*
- *Fractured rock aquifers within the Walloon Coal Measures contain groundwater of poor quality, i.e. saline with a total dissolved solids (TDS) of approximately 9,500 mg/L which is not suitable for livestock or human consumption. Multiple aquifers that are not hydraulically connected may exist within the different coal seams and carbonaceous mudstone layers.*
- *Recommendations were provided by Douglas Partners that:*
  - *Monitoring of groundwater quality and levels within the bores (8378P, 8348P, and 8401P) be continued on a quarterly basis (every three months) to assess the seasonal variations in quality for at least two years to obtain reliable background data;*
  - *Monitoring should also be carried out on those bores used as a water source by the mine to supplement the demand of the wash plant; and*
  - *Once this background information has been obtained and assessed, then groundwater quality objectives (i.e. contaminant limits) for the mine site should be developed".*

Based on the limited monitoring data provided by New Hope to GHD it is assumed that the recommendations from the Douglas Partners 2004 Groundwater Study were not implemented, and as such the additional groundwater data for the site is not available.

4.4 New Oakleigh Mine North Pit Seepage, Task 1 Data Review – Australasian Groundwater and Environmental (AGE) Consultants Pty Ltd (4 March 2009)

- *"The Oakleigh North Pit operated until 2000 when it closed and the void backfilled with spoil and some tailings. Breakout of seepage was observed a short-time after in a gully located immediately adjacent to the downhill side of the pit, but within a rural residential property along the site's northern boundary.*
- *New Hope commissioned AGE to determine the source of this seepage, the mechanism by which it is occurring, and to identify suitable options (if necessary) that would be available to control the seepage. The AGE task 1 data review (2009) includes a review of the existing environment to develop an understanding of the geological stratigraphy of the area and how this controls the movement of groundwater in and around North Pit.*
- *The northern boundary of the site adjoins two rural residential properties referred to as the north-western property (Lot 2 on CC2737) and the north-eastern property (Lot 526 on CH31539). The low wall of the North Pit extends in a south-west to north-east direction, reportedly within 5 m of the northern boundary of the site. Subsequent to commencement of filling the void with spoil and tailing in 2000, breakout of seepage was observed in the gully located adjacent to the north-west end of the low wall crest alignment. The gully drains northwards through the north-western property which is down slope of the pit.*

- *Later around 2006, a second seepage area was reported within the gully located immediately downslope of the opposite north-eastern end of the low wall crest alignment. This second gully drains to the north-west across the north-eastern property into the north-western property. The location of the rural properties in relation to the North Pit is shown on AGE Drawing No. 1 in* **Appendix E***.*
- *Some rehabilitation of the tailings was completed in 2008 and included partial capping of the desiccated western portion of the tailings area. Around the same time these works were completed, a third seepage breakout was observed within the eastern gully near its confluence with the western gully.*
- *Seepage breakout areas are defined by dieback of the grass cover and desiccation salt crystals on the ground surface.*
- *A review of the drill hole data provided by New Hope identified a number of exploration / resource holes drilled in and around the North Pit, and to the north-west adjacent to the north-western property located to the north of the mine. The location of these exploration boreholes are shown in AGE (2009) Drawing No. 2, and data is summarised in AGE Table 1,* **Appendix E***. The AGE Table 1 summarises known depth of underground workings in this area range between 51.8 m to 75.0 m.*
- *New Hope has sampled surface water within the tailings dam pond (NP) and at 3 locations (BD1 to BD3) along the property creek alignment to determine the source for the seepage. AGE concluded that the water quality data is indicative of a similar water type suggesting the water source of the surface water seepage is either the tailings dam within the pit, or discharge from a coal seam aquifer.*
- *Information on groundwater levels is limited to a water supply bore located towards the northern end of the north-eastern property, this bore intersected water at 33.3 m when drilled in August 2007. In addition water is reportedly around 45 m (150 feet) within an underground mine air shaft located roughly in the centre of the same property.*
- *The coal seam aquifers are the prime water bearing strata within the study area, and provide the most likely opportunity for groundwater movement either into or out of the existing North Pit. However on a local scale minor perched aquifers can occur in areas of fill such as spoil heaps and the filled mine void.*
- *From the available data, AGE construed that there were three hydrogeological units present within the study area: a perched aquifer associated with backfilled spoil and tailings contained in the mine void footprint; a shallow perched aquifer within a higher permeability fractured regolith zone between the surficial soils and weathered bedrock; and a deeper semi-confined to confined aquifer contained within low to moderately permeable coal seams which are the prime water bearing strata within the study area.*
- *The perched aquifer associated with the North Pit spoil and tailings are likely to be fully saturated as indicated by the elevation of the ponded surface water within the mine void. Groundwater recharge to this aquifer would be from a combination of groundwater outflow from the mined coal seams intersected within the pit high wall, and surface water inflows from rain events. The extent of these features was presented conceptually in AGE Drawing No. 3,* **Appendix E***.*

4.5 New Hope Coal Infrastructure Decommissioning Report – Jeebropilly and New Oakleigh Mines – SKM (July, 2009)

GHD has extracted the components of this report relating specifically to the site:

- "*There is currently no quantitative data which can be used to verify the presence or extent of contamination and to what extent remediation will be required as part of mine closure. Remediation will likely involve combinations of on-site disposal, bio-remediation, on-site capping, and either off-site disposal to landfill or on-site disposal to a monocell for highly contaminated material".*
- *"Contaminated land may also be present in areas subject to previous mine workings and / or mine waste disposal, and rehabilitated areas. The need and extent of remediation in these areas will also need to be considered".*
- *"Key risks that were identified and will require further investigation included:*
  - *Management and remediation of co-disposal / tailing areas;*
  - *Management of settlement and landform stability in rehabilitated areas;*
  - *Shallow capping on some rehabilitated co-disposal areas may limit future land use;*
  - *Current land use classifications; and*
  - *Historical mine workings.*

  The above risks will require further investigation in subsequent planning for decommissioning of the New Oakleigh mine site".
- Section 3 of the SKM report (2009) outlines closure obligations such as legal requirements and the regulatory framework for rehabilitation and closure. A copy of the SKM report (2009) is included in **Appendix E**.
- Section 4 of the SKM report (2009) provides a "*preliminary appraisal of the potential contaminated land in association with key infrastructure areas at New Oakleigh identified in a meeting on 20 May 2009. The key contaminated land issues associated with infrastructure areas at the New Oakleigh mine site are:*
  - *Key industrial areas with potential for contaminated land including the former wash plant, workshops, fuel farm, and the land farm;*
  - *Other areas with potential for contaminated land include land in the vicinity of the railway corridor and ICC landfill, and areas subject to mining works, tailings dam, etc;*
  - *There is currently no contaminated land data to estimate the extent and cost of remediation required;*
  - *An urban residential landuse has been proposed for the New Oakleigh site. Contaminated land issues associated with the infrastructure areas may preclude the use of these for residential land. For example, if contamination is present, extensive and an unviable degree of remediation may be required to enable a residential landuse. This scenario may also be applicable to areas which have been subject to mining, mine waste disposal, and have been rehabilitated due to contaminated land issues (if present), subsidence issues, and potentially ground gas (e.g. from methane);*
  - *DERM closely scrutinises developments which propose to change a landuse from a low sensitivity (e.g. industrial or mining) to high sensitivity (e.g. residential). This is due to the potential health risks to future users of the land. Without extensive contaminated land data which demonstrates*

that the land which has been subject to mine related activities is suitable for a low density residential landuse (e.g. through remediation), it is considered likely that DERM will have significant concerns with such a change in landuse;

- *It is considered likely that properties will need to be removed from the EMR in order for a low density residential landuse to be developed. Depending on the extent of contamination, it may be uneconomically viable to remove properties from the EMR; and*
- *A more feasible landuse for areas subject to mine related activities is likely to be open space or recreational areas. These areas may require additional capping, and will depend on whether contamination is present and poses an unacceptable human health or environmental risk.*

- *The New Oakleigh mine has two properties which are listed on the EMR, these include: the fuel farm and the disused underground fuel tank for the notifiable activity 'Petroleum Product or Oil Storage'.*
- *At this stage specific characteristics of the post-closure land use options are not available and have been defined in general terms: New Oakleigh land use: The preferred land use options for New Hope are to decommission and rehabilitate the site to a standard suitable for residential land use with tenure transferred to a third party for residential development purposes.*
- *It is considered critical that a viable post-mining landuse be determined at an early stage, so that rehabilitation / remediation being undertaken now is appropriate to satisfy the future landuse".*

5. Site Inspection Information and Observations

5.1 Background Information

Based on discussions with Mr Ross Bennett, Senior Environmental Project Officer of New Hope during the site inspection on 15 November 2011 the following background information relating to the site was recorded:

- Mining activities commenced at New Oakleigh in the 1920's and continue today (15/11/2011). The site is split in two portions, east where activities have ceased and the west where mining operations continue.
- The West Pit is currently the only operational mining pit, and approximately 12-18 months of operations remain.
- The infrastructure on the site currently in use is the heavy vehicle workshop, the fuel farm, and the wash down area for the West Pit operations, located on the western side of the site.
- The site configuration of the eastern side of the site comprises of two previous open cuts known as the North Pit, and the Normanton Pit (furthest to the east).
- The residual void, tailings dam, and former Coal Handling and Preparation Plant (CHPP) site are located in the vicinity of the North Pit.
- Prior to New Hope ownership of the site the land was worked extensively during underground mining times, with old entrances and infrastructure remaining on the eastern side of the site. The underground era infrastructure is still present and includes a large workshop, sheds, and a lay down area near to the current day North Pit.
- The Normanton Pit is located on the far east of the site. Limited knowledge of the site infrastructure and operation of the mining area is known.
- New Hope purchased the New Oakleigh site in late 1999. Limited information and documented knowledge of the underground workings of the mine is known prior to New Hope's purchase of the site.
- Mr Bennett has little to no knowledge of the historic underground workings, however he understands that there are some historical files available for the underground workings in addition to a series of historical aerial photographs for the surface workings of the site.
- New Hope commissioned another consultant (SKM) to undertake a site assessment and develop an infrastructure removal plan for the New Oakleigh and another New Hope site (Jeebropilly) in 2009. The SKM report (provided by New Hope to GHD) contains a broad overview of the contaminated land assessment process as well as the regulatory requirements in Queensland. However the SKM report (2009) states that "*there is currently no quantitative data which can be used to verify the presence or extent of contamination, and to what extent remediation will be required as part of mine closure*".
- An old landfill is located on the eastern side of the site. This portion is excluded from the GHD assessment. It is worth noting, that disposal of waste to the landfill has ceased, the site is currently operated as a Waste Transfer Station by Ipswich City Council (ICC). SKM is currently undertaking an investigation of water seepage identified in some areas of and around the landfill.

- The groundwater study in progress by SKM is aiming to identify two areas of groundwater seepage onsite, install groundwater monitoring wells, identify the mechanism/s for seepage/s, and develop a conceptual model of the processes that are occurring at New Oakleigh.
- Limited environmental monitoring data is available for the New Oakleigh site, and the existing groundwater wells are located outside the site. The current Environmental Authority (EA) for the site has no requirements for groundwater monitoring on site, and there is currently no extraction of water on the site.
- GHD was informed by New Hope that a groundwater bore network does not exist for the site, and New Oakleigh groundwater bores for which historical data is available are no longer accessible. As such, during the site inspection on 15 November 2011 no groundwater bores were observed or identified.
- Mr Bennett said that "*Closure and Remediation Planning of the site has recently commenced, and the New Hope Group is in the conceptual stages of determining what the future use of the site may be, and what activities could occur on the site. The post mining plan is potential grazing, native self-sustaining systems, urban development, and / or a combination of land use types. The Department of Environment and Heritage Protection (EHP) Environmental Authority (EA) for the site does not include strict conditions specifically relating to landform, slope, etc; however re-negotiation will be required to surrender the EA for the mining site*".
- There are no known records of imported fill material being brought on to site over the years.
- For the North Pit there are two areas of tailings pits for the surface workings, one small and one large.
- For the Normanton Pit (further to the east), the mining area is stand alone with a fairly discrete pit. Some areas of the pit have been backfilled with spoil.
- Mr Bennett said that "*The West Pit is backfilled with overburden material, and there are no tailings in this area. The water storage dams primarily for water suppression and operational purposes, hold water and leak into the surrounding spoil. Water is intersected at the mine face with a small amount of water flowing into the West Pit, where it is captured in sumps and pumped to surrounding dams. However there is not enough water that New Hope have to pump it out regularly. Inflows have not been quantified*".
- Surface water samples have been collected irregularly onsite and there are surface water discharge limits in the New Oakleigh Environmental Authority (EA) for the South discharge point. Water quality data is limited to the parameters required by the EA (pH, Electrical Conductivity, and suspended solids). However the south discharge point is not active but rather an overflow discharge, and during times of rain the gully flows and stormwater / surface water drainage overflows. Some surface water quality records are available for the last five or six years.
- The site may or may not be on the EMR, as a large majority of the New Oakleigh operations pre-date the *Environmental Protection Act 1994*.
- Vegetation management across the site is minimal, and weed management is conducted by contractors a couple of times a year. The inactive areas of the site are grazed by cattle to reduce the risks of fire across the site.
- Mine blastings occur approximately twice a week by contractors, there is no onsite storage of explosives. Blasting has been occurring for at least the last two years at New Oakleigh.

- Mr Bennett said that "*there is no known in-pit burying of waste materials, i.e. fill materials and old tyres*".
- It is understood that a chemical Material Safety Data Sheets (MSDS) register for the site exists. The register includes volumes of fuels, solvents, and de-greasers. Mr Bennett did not know if the register extended to chemical usage records.

5.2 Site Inspection – 15 November 2011

GHD inspected the New Oakleigh site accompanied by Mr Ross Bennett, Senior Environmental Project Officer of New Hope on 15 November 2011, and a photographic log of site features and observations is attached in **Appendix B**.

The purpose of the site inspection was to assess current site conditions and activities, and to visually assess areas of potential environmental concern based on previous site activities and operations, and reports. The site inspection concentrated on identification of evidence that may be indicative of contaminated land, including:

- Condition and presence of site equipment and infrastructure relating to the site;
- Conditions of buildings, concrete and bitumen floors and roads relating to the site;
- Evidence or presence of chemical storage including chemical containers;
- Chemical odour;
- Disturbed or distressed vegetation;
- Disturbed, discoloured or stained soil;
- Bare soil patches;
- Presence of fill relating only to the site;
- Presence of stockpiled soil and waste materials; and
- Quality of surface water (if any).

GHD staff observed the following during the site inspection on 15 November 2011 at New Oakleigh:

- The site is located on the western and eastern sides of Rosewood – Marburg Road, with operational activities confined to the western side of the site. The New Hope office and car parking area is located adjacent and parallel to the road, and west of the buildings is the active mining area of the West Pit.
- Existing infrastructure is located in a number of areas on the eastern side of the site, with three era's of infrastructure remaining. Infrastructure was observed and identified from the underground era with surface buildings and linkages to the underground mining remnants; the buildings from the open cut era prior to New Hope's ownership of the site; and New Hope infrastructure from the last twenty years.
- Site access roads are constructed of dirt and / or gravel, tracks and / or roads.
- On the western side of the site the following infrastructure was observed: administration and demountable buildings; septic tanks for the toilets from the site office facilities; a fuel farm comprised of five above ground storage tanks containing diesel fuel; bunding and overflow systems; a designated mine truck re-fuelling area with trucks parked up and in the process of re-fuelling; a designated wash down area with drains and sediment traps as well as a high pressure water gun, air compressor, and

water tanks; waste storage and disposal areas including a large skip bin containing waste materials, stored tyres, metal material piles, wooden pallets, hoses and piping; and the heavy vehicle workshop and servicing area.

- The workshop and servicing area had several heavy vehicles parked up and undergoing maintenance and / or servicing including drilling rigs, piling rigs, trucks, an excavator, front end loaders, and water trucks. The equipment in and around the workshop area included a crane, hoist, forklift, elevated work platform, welding equipment, workshop machinery (pedestal drill, grinder, saw), battery charging area, gas cylinders, and chemical storage areas.
- Storage of chemicals such de-greasers, solvents, coolants, etc both in steel drums and intermediate bulk container (IBC) tanks were evident inside the workshop building as well as in designated areas surrounding the workshop building.
- Small stockpiles of stained soil were observed. Likely due to the practice of parking up and servicing and then stockpiling and / or land farming hydrocarbon impacted soils.
- On the eastern side of the site, infrastructure not related to the mining operations was observed including a waste transfer station (operated by ICC) at the entrance; a disused wheel wash infrastructure including poly water tank; and a historic railway line easement with two train carriages, a shipping container, and a loading hopper.
- A laydown area of approximately 100 m x 100 m in size at the entrance to the eastern side of the site was observed, with metal structures, piping, old pieces of equipment and machinery including a tractor and an excavator.
- The Oakleigh Coal Mines Administration Office buildings and car park area is located on the eastern side of the site between the footprints of the North Pit and Normanton Pit.
- Railway siding with fuel dispensing pipework and above ground fuel storage tanks is located on the eastern side of the site between the Normanton and North Pits, in the vicinity of the infrastructure from the underground operations.
- Infrastructure from the historic underground operations is present and includes sheds, concrete water tank, above ground storage fuel tank, laydown storage area, and approximately 20 old 44 gallon drums. Linoleum on top of concrete pads was observed indicating previous building constructions.
- Soil mounds, likely piles of waste materials or spoil, with re-established vegetation were observed in various areas across the eastern side of the site, and in particular in the vicinity of the electrical substation building.
- Decommissioned power lines which were used during the times of the underground operations.
- The electrical substation building contained an electrical system comprised of three transformers, ammeters, atop a concrete floor with floor drainage and collection sumps. The electrical plans and instructions for isolation points for the electrical system were displayed on the building wall, and the "Out of Service" tags were dated October 1998.
- Next to the electrical substation in a westerly direction, was an old wooden house building with three sections built as two rooms and a small garage and / or workshop area. Above ground piping leading to concrete water tanks was observed, with signage indicating the infrastructure was potentially a water supply for fire fighting.

- A workshop area on the east side of the site, believed to be the Operations Workshop, comprised of a large metal storage shed with cement floor in good condition with drainage grates. The contents of the workshop included a crane, electrical equipment, workshop machinery including drills, old belts from the coal washing plant, air and water pumps, compressors, machinery, metal and polypropylene pipes, spare parts and equipment storage area. Adjoining the large workshop area were a series of small rooms such as staff rooms, a kitchen and dining room, and toilet facilities with concrete floor and potential asbestos walls. Presence and evidence of various types of chemicals and fuels storage containers in the workshop area including fuel tanks, degreasing fluid, acrylic, enamel paints, solvents, mechanical fluids, etc; however a chemical and fuels inventory was not recorded during the site inspection.
- A collection of buildings constructed of timber and tin roofing make up the older workshops area. The entrance to the underground workings, as well as the cap lamp chamber, workshop, and garage building. The garage building had a corrugated roof, collapsing wooden floor, storage and workshop areas as well as a fire / storage area at the end.
- The Managers Office had a listing of phone numbers for the operations, as well as a Site Plan dated 9/11/1998 showing: the Old Store and Workshop, Electrical Shed, Operators Crib Shed, Bath House, two Parts Stores, Workshop, Tool Store, Drum Stand, Fire Depot, and Carpark.
- Two in-pit tailings dams were observed in the North Pit mining area. The larger tailing dam size is approximately 200 m x 200 m in area.
- Mr Bennett explained that the North Pit High Wall spoil was backfilled in the residual void, this area was observed.
- No surface water controls were observed in the area of the North Pit, and Mr Bennett commented that there were erosion problems in this area of the site.
- The seepage break out point to the north of the North Pit tailings dam was located. Also observed in this vicinity was a cattle storage area and a recently installed groundwater monitoring bore. Mr Bennett explained that the neighbour is a cattle farmer and that cattle are agisted in the vicinity of the North Pit mining area to assist vegetation management and suppress weeds.
- No obvious evidence of illegal dumping of refuse was observed in inspected areas across the site.
- Vegetation was observed to have re-established following the completion of mining activities.
- Stockpiles of spoil from mining activities were present in a number of areas across the site, and steep terrain with visible slipping / erosion was observed in some locations.
- No chemical odours were detected during the site inspection.

6. Site Interview

A component of a preliminary site contamination assessment is interviews with site personnel and persons that have been associated with the site. Often documents, records and information about site activities and practices do not exist; as such site history interviews are an effective way to gain additional information which can then verify other information sources.

The site history interview for the site was arranged by Mr Ross Bennett, Senior Environmental Project Officer of New Hope. The site history interview was attended by GHD staff Miss Renelle Watson, Senior Contaminated Land Scientist, and Miss Ruth Brown, Senior Hydrogeologist; with New Hope employees:

- Mr Ross Bennett, Senior Environmental Project Officer for New Hope. Mr Bennett has been an employee for 6 years, and is currently the project manager of the remediation and closure planning for two mine sites (Chuwar and New Oakleigh);
- Mr Peter Bevan started working for contractors Leo and Green in approximately 1980 as an Operator, and has been an employee of New Hope or as a Contractor to one of the previous site operators for 31 years. Mr Bevan was involved in the development of the nursery for rehabilitation planting in the early 1990's. Mr Bevan provided specific details of the North Pit relating to mining history and activities; components of the building structures and infrastructure during the operational period; as well as the locations of stockpiles and spoil piles on the site;
- Mr Ty Cochran started working as an Apprentice in 1993, and has been an employee for 18 years. Mr Cochran spent time as a Prep Plant Operator and also has intimate knowledge of the New Oakleigh site's underground workshop and wash plant areas. Mr Cochran's knowledge of the electrical systems and location of electrical infrastructure onsite will be an asset to New Hope in future rehabilitation works;
- Mr Murray Freeman has worked as either a Contractor to one of the previous companies (Jansen's, Klough's, Leo and Green, Narbethong Heavy Haulage) or as an employee of New Hope for 37 years since March 1974, and was originally employed by Jansen's to put the fire out in the Normanton Pit. He was employed by various contractors until he started working for the New Hope in September 1980. Mr Freeman's memories are substantial and detailed responses were provided by him in relation to the Normanton Pit operations and historic site activities. Mr Freeman provided confirmation that there was an offsite dump located further to the south during the working of the Normanton Pit in the late 1970's;
- Mr William (Bill) Drysdale commenced work in 1980 until 1996, and then returned to work for New Hope in 2001. Mr Drysdale explained that he worked on the number 5 tunnel, number 6 tunnel and the number 3 tunnel at New Oakleigh. Mr Drysdale worked as an underground miner '*on all the pits at some stage*' and as his career progressed became a deputy. Mr Drysdale provided quality information in relation to underground infrastructure as well as the open cut mining of the North Pit; and
- Mr Neil Loveday began his association with the New Hope sites in March 1979, working as a Contractor to one of the previous companies or as an employee of New Hope for 32 years until his retirement in June 2011. Mr Loveday worked as an Operator at the Chuwar, New Oakleigh, Jeebropilly, Amberley, Southern Cross, and New Chum sites throughout his career.

The following information in relation to the site was provided, discussed and verified by the past and present New Hope employees in attendance on Wednesday 14 December 2011:

- The New Oakleigh site was purchased by the New Hope Group in 1999; and
- The Rosewood – Marburg railway bridge got washed out in 1974.

Western side of New Oakleigh

- The current workshop area located on the western side was constructed in 2000, and is located in the area of the old 1950's wash plant. Previously located in this area was the entrance to the underground workings, three houses, a small workshop, and a timber shed.
- The old mining plant was constructed of timber and included a picking belt. Coal was placed in trucks and loaded to rail.
- Mr Loveday and Mr Drysdale provided information about the West Pit and said that "*water was not obvious and the underground workings dipped to the east – south-east. There was water in the old tunnels and the New Hope Group never touched the tunnels. Water was extracted from Bruce's (seam) to supply water for the wash plant. Water was pumped to a dam near to Rosewood Road via a 4-inch line. There was not a lot of water underground, water that was detected was associated with the seams, but the West Pit didn't make a lot of water. The West Pit bottom was straight and a Marburg pump was used 3 days a week to manage the water*".
- An interesting observation was shared "*during open cut mining of the West Pit a wooden well was found, pretty well in the middle of the site*".
- The fuel storage infrastructure on the site has always been above ground storage tanks (ASTs). The existing fuel farm area includes five ASTs, an oil water separator, and a land farm (hydrocarbon impacted soil treatment) area.

Eastern side of New Oakleigh

- Underground mining at New Oakleigh was by 12 – 14 member crews. Approximately 12 to 14 people would have worked in the workshop, and the bath house catered for approximately 30 people.
- Two tunnels exist on the eastern side of the site – one the belt tunnel entrance and the other the man riding tunnel (with wagons on a rope). A storage shed was constructed over the tunnel entrance.
- The original workshop and crib room for the underground workings were located on the eastern side of the site south east of the North Pit area.
- There was a surface laydown area for the underground operations for mining equipment and shuttle cars.
- There was a heavy vehicle workshop and lunch room, and the old shop was moved to there.
- The septic tanks from both the houses and the surface workshops associated with the underground mining were still intact when underground mining operations on the eastern side of the site ceased in approximately 2001.
- Mine spoil was dumped and stockpiled on site in many areas, and there were designated areas determined by wet weather accessibility where coal stone was dumped.

- Waste coal stone and rubbish was filled into the gully on the eastern side of the workshop, and assorted dumping has occurred in this area for at least 20 years. Mr Loveday and Mr Freeman confirmed that "*pre 1995 everything was filled down the gully but that for the last couple of years waste was removed from site by a contractor*".
- The workshop for the underground operations would likely have contained greases, oils, paints, cranes, and machine services but there was no fuel stored in this location. Mr Loveday explained that "*the machinery of the underground era was mostly electric / hydraulic and only small amounts of fuel would have been needed if any*".
- Recollections from the former New Hope employees were that any fuel infrastructure was above ground and that the tanks were connected to localised fuel dispensing bowsers, with no knowledge of extensive fuel lines or fuel pipework. Mr Bennett confirmed that "*There is an underground tank just east of the former CHPP area. Although little is known about the contents, age, size, or condition of the underground tank*".
- Located on the eastern side of the site between the North and Normanton Pits the electricity substation for the underground operations, aerial power lines and transformers were decommissioned in 1998. Mr Cochran recalled that "*the electrical infrastructure was decommissioned, he remembered it being done, there were records completed at the time, and Mr Rob Lewis was involved*". When asked to elaborate on the components of the electrical infrastructure Mr Cochran said that "*he did not know what the transformer fluids were, and he did not know about the conductors and transducers*".
- The underground workings were sealed in 1998. The New Hope employees recollected that the tunnels were decommissioned by near surface filling with dirt and sealing the entrance. Mr Drysdale recalled "*a bulk head collapse in the belt tunnel entrance*" and he also explained that "*the tunnels were sealed with concrete*". Mr Drysdale said "*Mr Stephen Rule the former underground surveyor would know more details about how the tunnels were decommissioned, and that Mr Stephen Rule lived locally in Marburg*".
- On the eastern side of the site, the existing electrical substation was installed in 2002 / 2003 and was constructed to upgrade power to supply the upgraded plant equipment. Timber components of the underground plant were also removed out of service at this time.
- The Electricians workshop was located to the north of the fan shaft, and only small amounts of chemicals if any were stored in this location.
- The CHPP area was constructed for onsite washing and processing of coal prior to load out via the railway line. The preparation plant ceased operation in 2005, and the underground workshop was still being used at this time. Mr Cochran and Mr Loveday explained they worked at the site when the washing ceased and were involved in removing the CHPP infrastructure.
- The New Hope employees explained the open cut mining technique of Run of Mine (ROM) coal from the North and Normanton Pits was mined via two belts, and the rejects went to the wash plants. Coal stored onsite was either clean coal or ROM coal. Trucks carted the rejects and they were levelled out as pads.
- Mr Bevan was asked about the Leo and Green era buildings and the activities that occurred at that time and he explained that "*he started working on the site in 1980 for Leo and Green on the middle section of the open cut North Pit. The Leo and Green workshop was utilised for servicing, oil changes, storage of spare parts and everything. There were AST fuel tanks but no bowsers, the tanks were*

connected via hoses. The toilets were septics". Mr Bevan elaborated that "*he worked with Mr Tommy Graham, and started the nursery and rehabilitation in the early 1990's. Small amounts of pesticides were used, and there was a car parking area but operations were pretty small*".

- Servicing of vehicles was done on a flat pad at the crest of the pit operations in the early 1980's, with any vehicle fluids allowed to drain onto the pad, and filters collected, stored and taken away.
- It was confirmed by the New Hope they knew that "*the crib rooms were constructed of asbestos sheeting, and it was for fire protection*".
- The New Hope employees stated that "*the New Hope Administration office buildings were constructed of concrete, had bathrooms with showers but no toilets, and drainage went down the gully. Some of the buildings (bath house) were condemned due to white ants in 2001 and were removed in 2002 / 2003"*. Other areas of interest in this vicinity were "*the car parking area, geologists shed, nursery, and the compressor shed / old fan shaft was located here as well*".
- The blasting magazine and explosives were removed, although during operations "*small amounts of jelly and sticks were stored onsite*" stated Mr Drysdale.
- A brief comment was made on two short points to the presence of an old dam but it was now siphoned, and a gantry but no additional information was recorded.
- New Hope employees were asked about the site's neighbours (relating to blasting and explosions) but the general consensus was "*there were no issues with noise or anything as it was only cattle grazing land to the south*". The New Hope employees also answered that to their knowledge the residents of Rosewood did not complain about the noise or operations of the mine.
- When asked to recall any fuel infrastructure on the eastern side of the site Mr Bevan and Mr Lovedale agreed that "*the New Hope fuel farm was ASTs storing diesel fuel for the machinery of the North Pit open cut, which operated from 2000 to about 2002. There were 2 ASTs which were re-filled by the tanker once or twice a week, and mine trucks were filled with diesel by hose. The tanks were removed a few years ago in either late 2005 or early 2006*".
- "*The North Pit was operating when New Hope bought the site, but the Normanton Pit mine operations had finished*" said Mr Freeman. "*New Hope worked the North Pit for only about 12 months and finished in 2001, and finished mining in this area because the water was too much*". Mr Drysdale elaborated in relation to the finalisation of the North Pit mining and said that "*they believed they had hit the old underground workings (Gunthorpe's layer and Rough Rig 5) and that water was coming at them from both sides. They were strip working in 50 metre strips, and had big pumps with 6 inch hosing. The pumps would work 24 hours a day 7 days a week, but if they had to turn them off over the weekend the water would be back again on Monday morning*".
- Discussion continued about the slurry dam and information provided by New Hope employees was that "*the water pumped out of the pit was used for the wash plant; water was pumped down to the dam behind the ROM pad for the wash plant; a fault intersected it so that's where they thought the water came from; and there was a borehole installed in the 1980's to lower the water level and it had a very large casing*". Mr Freeman said that "*material from the settling pond was known as slurry, and it was dug out, carted in trucks to the slurry dams, and dam construction was a continuous activity*".

- New Hope employees when asked about whether the mine pit was wet under normal operations it was stated that "*during the operation of the North Pit there was slow seepage and sometimes they noticed wet walls*".
- Mr Drysdale said that "*apparently originally there were salt springs on the hill, with reeds growing, and that the springs flowed down the hill. He referred to the Ian Gray fault, and said that he had seen pictures of where the stone drift through*".
- Detailed recollections were provided by Mr Freeman and Mr Bevan, their shared recollections included "*The North Pit originally commenced in 1972 with a box cut location, and they tunnelled in from the high wall and the North Pit workings were uphill. The North Pit spoil was backfilled in the gully in an area now known as the football field, and the level was lifted a couple of times over the years. There was a bit of water in the seams but not massive amounts of water just damp, and there was no recollection of pumps being used for water management. The Surveyor, Mr Norman Rule, used to come every 3 months".*
- Mr Freeman described the Normanton Pit operations "*There was a fire in 1974 in the original location of the underground workings and mining had to close down. The coal seam dipped to the south and was pretty much dry after the first 3 benches. Operations started in the south progressing westwards across Blake's Road then northwards, and the mining ceased in 1999 because of the lease boundary. There was an old wash plant on the western side of the Normanton Pit and also the Jansen's and Klough's workshop areas which contained scrap steel, ASTs containing diesel and some shipping containers*".
- Mr Loveday stated that "*12 to 18 months ago when he had last dipped the Blakes Road bore it was 102 m depth to water. He also said that the Blakes Road bore goes into the Glenco workings*".
- Information was provided by Mr Cochran and Mr Drysdale that "*the Glenco workings were always wet, and underground the submersible pump worked continuously, when they were pillaring the roof fell in the Normanton in the late 1980's early 1990's, water was up to their knees in no time, the floor of the Normanton was 120 – 130 m below ground surface as a rough depth, and it was a short drift*".
- Mr Freeman also stated that "*there was an out of pit dump for the Normanton Pit which was located to the south of the mining area*".

General site management

The New Hope employees said:

- The original owners of the site Mr Norman Rule and the mine surveyor Mr Stephen Rule may be able to provide more details about the underground workings and the tunnels;
- They did not recall any major chemical / fuel spills occurred on site;
- In their knowledge, there was no installation of underground storage tanks or associated infrastructure during the New Oakleigh mining operations. Mr Bennett confirmed that there was an underground tank just east of the former CHPP area, although little is known about the tank;
- To their knowledge, no environmental monitoring or investigations were conducted at the site during the operational mining period; and
- With the exception of the fire at the Normanton Pit, there was no memory of other fires during the operation of the site.

7. Areas of Potential Contamination

Table 8 outlines New Oakleigh areas of potential contamination, based on observations from the limited site inspection (15 November 2011) and evidence provided by New Hope employees during the site interview (14 December 2011).

For the following list of sites, additional information needs to be obtained (e.g. building plans or detailed inspections of building contents) to compile a detailed site register and risk assessment ranking. **Figure 5** (**Appendix A**) provides a visual representation of these areas.

The potential contaminants listed are indicative only, and are based on a general knowledge of the likely activities and substances used for the operations in each of these areas.

Table 8 New Oakleigh Areas of Potential Contamination

Site ID	Name & Location	Potential Contamination
1	Start of No. 6 tunnel	Potential localised surface storage of machinery, equipment or presence of infrastructure. Potential for storage and use of Total Petroleum Hydrocarbons (TPH), Benzene Toluene Ethylbenzene and Xylenes (BTEX), polyaromatic hydrocarbons (PAH), metals, volatile organic compounds (VOC), semi volatile organic compounds (SVOC), acids, caustic soda, chlorine, lime, solvents, processing reagents, herbicides, pesticides, and cyanide. Potential for soil and groundwater contamination.
2	Start of No. 5 tunnel	Potential localised surface storage of machinery, equipment or presence of infrastructure. Potential for storage and use of TPH, BTEX, PAH, metals, VOC, SVOC, acids, caustic soda, chlorine, lime, solvents, processing reagents, herbicides, pesticides, and cyanide. Potential for soil and groundwater contamination.
3	Workshop (Nartbathong Heavy Haulage)	Storage and use of TPH, BTEX, PAH, metals, VOC, SVOC, polychlorinated biphenyls (PCB), acids, degreasers, hydraulic oils, lubricants, coolants, caustic soda, chlorine, lime, solvents, processing reagents, herbicides, pesticides, insecticides, and cyanide. Potential localised surface storage of machinery, equipment or presence of infrastructure. Potential for soil and groundwater contamination.
4	Storage shed (UG)	Storage and use of TPH, BTEX, PAH, metals, VOC, SVOC, PCB, acids, degreasers, hydraulic oils, lubricants, coolants, caustic soda, chlorine, lime, solvents, processing reagents, herbicides, pesticides, insecticides, and cyanide. Disused equipment, spare machinery parts, oils, coolants, and associated chemicals.

Site ID	Name & Location	Potential Contamination
		Potential localised surface storage of machinery, equipment or presence of infrastructure. Potential for soil and groundwater contamination.
5	Entrance to belt tunnel	Potential localised surface storage of machinery, equipment or presence of infrastructure. Potential for storage and use of TPH, BTEX, PAH, metals, VOC, SVOC, PCB, acids, degreasers, hydraulic oils, lubricants, coolants, caustic soda, chlorine, lime, solvents, processing reagents, herbicides, pesticides, insecticides, and cyanide. Potential for soil and groundwater contamination.
6	Workshop	Storage and use of TPH, BTEX, PAH, metals, VOC, SVOC, PCB, acids, caustic soda, chlorine, lime, solvents, processing reagents, herbicides, pesticides, insecticides, cyanide, etc. Spills and /or accidental releases due to overflow from oil traps, servicing of mine machinery, equipment failure, leakage, inadequate handling, or storage and transport of chemicals. Potential localised surface storage of machinery, equipment or presence of infrastructure. Potential for soil and groundwater contamination.
7	Manride tunnel entrance	Potential localised surface storage of machinery, equipment or presence of infrastructure. Potential for storage and use of TPH, BTEX, PAH, metals, VOC, SVOC, PCB, acids, degreasers, hydraulic oils, lubricants, coolants, caustic soda, chlorine, lime, solvents, processing reagents, pesticides, insecticides, and cyanide. Potential for soil and groundwater contamination.
8	Sub station (2002-03)	Storage of electrical equipment, equipment failure or leakage, release of chemicals, lubricants, oils, etc. Potential localised surface storage of machinery, equipment or presence of infrastructure. Potential for storage and use of TPH, BTEX, PAH, metals, VOC, SVOC, PCB, acids, degreasers, hydraulic oils, lubricants, coolants, solvents, pesticides, and insecticides. Potential for soil and groundwater contamination.
9	Site of former shower block – open drainage – no toilets	Accumulation of detergents or industrial cleaners used to wash and de-contaminate during showering after mining shifts. Potential for storage and use of TPH, BTEX, PAH, metals, VOC, SVOC, PCB, acids, degreasers, hydraulic oils, lubricants, coolants, caustic soda, chlorine, lime, solvents, processing reagents, cleaning agents, nutrients, biological contaminants, herbicides, pesticides, insecticides, and cyanide. Potential for soil and groundwater contamination.

Site ID	Name & Location	Potential Contamination
10	Electrician workshop	Storage of electrical equipment, equipment failure or leakage, release of chemicals, lubricants, oils, etc. Spills and /or accidental releases due to overflow from oil traps, servicing of mine machinery, equipment failure, leakage, inadequate handling, or storage and transport of chemicals. Potential localised surface storage of machinery, equipment or presence of infrastructure. Potential for storage and use of TPH, BTEX, PAH, metals, VOC, SVOC, PCB, acids, degreasers, hydraulic oils, lubricants, coolants, caustic soda, chlorine, lime, solvents, processing reagents, herbicides, pesticides, insecticides, and cyanide. Potential for soil and groundwater contamination.
11	Oakleigh Coal Mines Administration Office buildings	Office buildings, staff facilities, and car parking area. Potential localised surface storage of machinery, equipment or presence of infrastructure. Potential for soil and groundwater contamination.
12	Core shed	Storage of equipment, equipment failure or leakage, release of chemicals, etc. Potential localised surface storage of machinery, equipment or presence of infrastructure. Potential for storage and use of TPH, BTEX, PAH, metals, VOC, SVOC, PCB, acids, degreasers, hydraulic oils, lubricants, coolants, caustic soda, chlorine, lime, solvents, processing chemicals and reagents, preserving agents, herbicides, pesticides, insecticides, and cyanide. Potential for soil and groundwater contamination.
13	Nursery	Storage of equipment, herbicides, pesticides, insecticides, etc. Potential localised surface storage of machinery, equipment or presence of infrastructure. Potential for storage and use of TPH, BTEX, PAH, metals, VOC, SVOC, PCB, acids, caustic soda, chlorine, lime, solvents, growth stimulating chemicals, preserving agents, herbicides, pesticides, insecticides, and cyanide. Potential for soil and groundwater contamination.
14	Heavy Vehicle switch room	Not inspected, and no information provided. Potential localised surface storage of machinery, equipment or presence of infrastructure. Potential for storage and use of TPH, BTEX, PAH, metals, VOC, SVOC, PCB, acids, pressurised gases, hydraulic oils, coolants, degreasers, solvents, preserving agents, and pesticides. Potential for soil and groundwater contamination.

Site ID	Name & Location	Potential Contamination
15	Compressor shed	Not inspected, and no information provided. Potential localised surface storage of machinery, equipment or presence of infrastructure. Potential for storage and use of TPH, BTEX, PAH, metals, VOC, SVOC, PCB, acids, pressurised gases, hydraulic oils, coolants, degreasers, solvents, preserving agents, and pesticides.
16	Washplant supply dam	Not inspected, and no information provided. Potential for storage and use of TPH, BTEX, PAH, metals, VOC, SVOC, acids, chlorine, lime, solvents, herbicides, pesticides, insecticides, and flocculants. Potential for soil and groundwater contamination.
17	Site of explosive magazine (removed)	Not inspected, and no information provided. Potential localised surface storage of machinery, equipment or presence of infrastructure. Potential for storage and use of TPH, BTEX, PAH dependant on blasting methods, Ammonium nitrate, detonators, nitrogen oxides (NO_x), ANFO (ammonium nitrate fuel oil) and AN (ammonium nitrate) emulsions / water gels, NO_2 nitrogen dioxide, NO nitric oxide, CO carbon monoxide, emulsion, primers, and accessories. Potential for soil and groundwater contamination.
18	Laydown area	Potential localised surface storage of machinery, equipment or presence of infrastructure. Storage of equipment, equipment failure or leakage, release of chemicals, lubricants, oils, etc. depending on the machinery, equipment, and infrastructure stored. Potential for storage and use of TPH, BTEX, PAH, Phenols, and metals. Potential for soil and groundwater contamination.
19	Bath house	Accumulation of detergents or industrial cleaners used to wash and de-contaminate during showering after work shifts. Septic tanks system – pathogens, nitrogen, nitrate, nitrite, chlorides, coliforms, phosphorus, and methane. Potential for storage and use of TPH, BTEX, PAH, metals, VOC, SVOC, PCB, acids, degreasers, hydraulic oils, lubricants, coolants, caustic soda, chlorine, bleaches, lime, solvents, processing reagents, cleaning agents, nutrients, biological contaminants, herbicides, pesticides, insecticides, and cyanide. Potential for soil and groundwater contamination.
20	Oakleigh tunnel entrance	Potential localised surface storage of machinery, equipment or presence of infrastructure. Potential for storage and use of TPH, BTEX, PAH, metals, VOC,

Site ID	Name & Location	Potential Contamination
		SVOC, PCB, acids, degreasers, hydraulic oils, lubricants, coolants, caustic soda, chlorine, lime, solvents, processing reagents, pesticides, insecticides, and cyanide. Potential for soil and groundwater contamination.
21	Above ground fuel storage tanks	Not inspected, and no information provided. Potential localised surface storage of machinery, equipment or presence of infrastructure. Potential for storage and use of TPH, BTEX, PAH, Phenols, and metals depending on the fuel type and volume of fuel stored. Potential for soil and groundwater contamination.
22	Leo & Green workshop area	Site interview evidence provided that these buildings were removed due to white ant infestation, and as such not all areas remain hence not able be inspected, and no information provided regarding building removal /s. Potential for storage and use of TPH, BTEX, PAH, metals, VOC, SVOC, PCB, acids, degreasers, hydraulic oils, lubricants, coolants, caustic soda, chlorine, lime, solvents, processing reagents, cleaning agents, nutrients, biological contaminants, herbicides, pesticides, insecticides, and cyanide. Spills and /or accidental releases due to overflow from oil traps, servicing of mine machinery, equipment failure, leakage, inadequate handling, or storage and transport of chemicals. Potential localised surface storage of machinery, equipment or presence of infrastructure. Potential for soil and groundwater contamination.
23	Above ground fuel storage tanks	Not inspected, and no information provided. Potential localised surface storage of machinery, equipment or presence of infrastructure. Potential for storage and use of TPH, BTEX, PAH, Phenols, and metals depending on the fuel type and volume of fuel stored. Potential for soil and groundwater contamination.
24	UG substation / switch room Also potential explosive magazine storage	Potential for sumps and pipe work to leak if not adequately maintained; and spills and/or accidental releases due to overflow from oil traps, equipment failure, inadequate handling, storage and transport. Potential localised surface storage of machinery, equipment or presence of infrastructure. PCBs, TPH, heavy metals. Potential for TPH, BTEX, PAH dependant on blasting methods, Ammonium nitrate, detonators, NO_x, ANFO (ammonium nitrate fuel oil) and AN (ammonium nitrate) emulsions / water gels, NO_2 nitrogen dioxide, NO nitric oxide, CO carbon monoxide, emulsion, primers, and

Site ID	Name & Location	Potential Contamination
		accessories. Potential for soil and groundwater contamination.
25	Workshop #2 (Narbathong Heavy Haulage)	Storage and use of TPH, BTEX, PAH, metals, VOC, SVOC, PCB, acids, caustic soda, chlorine, lime, solvents, degreasers, coolants, oils, paints, processing reagents, herbicides, pesticides, insecticides, and cyanide. Potential localised surface storage of machinery, equipment or presence of infrastructure. Spills and /or accidental releases due to overflow from oil traps, servicing of mine machinery, storage of machinery, equipment failure, leakage, inadequate handling, or storage and transport of chemicals. Potential for soil and groundwater contamination.
26	Workshop for underground mining operations	Localised surface storage of machinery, equipment and presence of infrastructure observed by GHD. Poor chemicals and hazardous materials storage observed. Potential for storage and use of TPH, BTEX, PAH, metals, VOC, SVOC, PCB, acids, caustic soda, chlorine, lime, solvents, processing reagents, degreasers, coolants, paints, oils, herbicides, pesticides, insecticides, and cyanide. Spills and /or accidental releases due to overflow from oil traps, servicing of mine machinery, equipment failure, leakage, inadequate handling, or storage and transport of chemicals. Potential for soil and groundwater contamination.
27	North Pit box cut	Not inspected, and no information provided. Localised surface storage of machinery, equipment or presence of infrastructure. Potential for soil and groundwater contamination.
28	Out of pit dump – aka "football field"	Not inspected, and no information provided. Benign or acid neutralising cover materials, saline or sodic clays and soils, and potentially acid forming waste rock. Potential for soil and groundwater contamination.
29	Out of pit dump – filled gullies	Not inspected, and no information provided. Benign or acid neutralising cover materials, saline or sodic clays and soils, and potentially acid forming waste rock. Potential for soil and groundwater contamination.
30	Pithead and tunnel entrance – Jansen workshop – fuel tanks	Not inspected, and no information provided. Potential localised surface storage of machinery, equipment or presence of infrastructure. Potential for soil and groundwater contamination.

Site ID	Name & Location	Potential Contamination
31	Above ground fuel storage tank	Not inspected, and no information provided. Potential localised surface storage of machinery, equipment or presence of infrastructure. Potential for storage and use of TPH, BTEX, PAH, Phenols, and metals depending on the fuel type and volume of fuel stored. Potential for soil and groundwater contamination.
32	Water from coal seams	Not inspected, and no information provided. Potential for groundwater contamination.
33	General storage area for clean coal and ROM pads	Not inspected, and no information provided. Potential localised surface storage of machinery, equipment or presence of infrastructure. Potential for soil and groundwater contamination.
34	Scrap metal from former wash plant	GHD observed components of the old conveyor, tractor, excavator, loading hopper, shipping container, etc. Potential localised surface storage of machinery, equipment or presence of infrastructure. Potential of TPH, BTEX, PAH, Phenols, and metals contamination depending on the machinery, equipment, and infrastructure stored. Potential for soil and groundwater contamination.
35	Current workshop area	Fuel farm (ASTs), refuelling area, and mine vehicle parking area. Vehicle workshop and servicing area outside workshop. Machinery and equipment inside workshop. Wash down bay area. Various chemical and hazardous materials storage areas. Potential for storage and use of TPH, BTEX, PAH, metals, VOC, SVOC, PCB, acids, caustic soda, chlorine, lime, solvents, processing reagents, degreasers, coolants, paints, oils, herbicides, pesticides, insecticides, and cyanide. Potential localised surface storage of machinery, equipment or presence of infrastructure. Potential for soil and groundwater contamination.

Areas identified from Site Interview with New Hope Employees		
A1	Former washplant area	Not inspected and limited information provided. Potential localised surface storage of machinery, equipment or presence of infrastructure. Potential for soil and groundwater contamination.
A2	Drain – disposal site	Not inspected and limited information provided. Oil, sludge, filters, etc Potential for soil and groundwater contamination.
A3	Wet area in North Pit	Not inspected and limited information provided. Inpit tailings and intersected underground workings. Potential for soil and groundwater contamination.
A4	Wet areas of West Pit	Not inspected and limited information provided. Potential for soil and groundwater contamination.
A5	Area of gully filling	Not inspected and limited information provided. Filled over time with reject and coal stone. Potential for soil and groundwater contamination.
A6	Run Of Mine (ROM) pad for open cut mining	Not inspected and limited information provided. Potential for soil and groundwater contamination.
A7	Workshop	Not inspected and limited information provided. Workshop area operated by Clough construction contractors during mining of the Normanton Pit. Storage and use of TPH, BTEX, PAH, metals, VOC, SVOC, PCBs, acids, caustic soda (sodium hydroxide), chlorine, lime, solvents and processing reagents, herbicides, pesticides, insecticides, cyanide, etc Potential localised surface storage of machinery, servicing of mine machinery, equipment failure, leakage, inadequate handling, or storage and transport of chemicals. Potential for soil and groundwater contamination.
A8	Water from intersection of underground workings	Not inspected and limited information provided. Potential for soil and groundwater contamination.
A9	Old landfill	Not inspected and limited information provided. Currently operated as a waste transfer station by Ipswich City Council. Potential localised surface storage of machinery, equipment or presence of infrastructure. Potential for soil and groundwater contamination. This area is currently outside the scope of the site assessment requested by New Hope.

8. Conclusions

The scope of the preliminary SCA was limited to; review of site information, site inspections, and site history assessment. Based on the findings of this assessment the following conclusions are made:

- The New Oakleigh site covers an area of approximately 1,000 ha. The current Australian Standard (AS4481.1-2205) for investigation and sampling of sites with potentially contaminated soil does not provide guidance on sites larger than five hectares. Rather, conventional practice is to subdivide the site into smaller areas for more effective assessment. Using the Australian Standard as a basis (AS4481.1-2005), the recommended sampling density is 11 sampling points per hectare to appropriately characterise potentially contaminated soil. GHD understands that undertaking intrusive investigations in accordance with the minimum number of sampling points in AS4481.1-2005 would be cost prohibitive and may not be justified without knowing the proposed rehabilitation / redevelopment plans for the site. At this stage, opportunistic sampling undertaken in conjunction with other investigations (e.g. geotechnical or groundwater well installation) is considered warranted.
- Potentially contaminated areas (as defined in **Table 8**) will require intrusive investigations to assess the nature and extent of potential and actual contamination, prior to the formation and progression of redevelopment / rehabilitation plans for the site.
- Review of historical aerial photography in addition to information obtained in the site interview facilitated by Mr Ross Bennett of New Hope on 14 December 2011 indicated that the potential for contamination could be extensive and largely grouped in 3 main areas related to the surface mining operations across the site. GHD suggests a prioritisation by New Hope (in cooperation with GHD) of the potentially contaminated areas identified for any future investigation works. The determination of future land use(s) in each area will assist with the prioritisation of intrusive investigations of potentially contaminated areas (as detailed in **Table 8**).
- Information relating to the historical and current mining methods (specifically underground operations), technology and mine processing operations, mining equipment, mine sequencing, CHPP outputs, rejects, tailings disposal, co-disposal, mine affected water, and characterisation of overburden materials would assist to target future contamination assessment.
- Due to the lack of detailed information in relation to the underground operations, the assessment to date has focused on surface activities and operations. Additional information will be required in relation to the underground operations to further assess, identify and delineate the nature and extent of potential and actual contamination.

9. Considerations and Recommendations

GHD provides New Hope with the following points for consideration and potential recommendations for the remediation planning works and future contaminated land assessments at the site:

- It is recommended New Hope investigate or confirm any planning and development conditions imposed by the Department of Environment and Heritage Protection or other regulatory agencies on remediation or rehabilitation of the site. Town planning advice should be sought to identify the legislative requirements under the *Sustainable Planning Act 2009* relating to redevelopment of New Oakleigh. This will assist New Hope to evaluate their options for the Rehabilitation Plan, as Master planning or conceptual designs for the New Oakleigh redevelopment will likely be required. A pre-lodgement meeting with EHP would be considered beneficial to ascertain information relating to the requirements for future assessments.
- As a priority, GHD recommend New Hope engage a licensed property conveyancer with previous mining experience to review existing property information; and conduct relevant searches needed for each of the 99 known land parcels 'owned' by New Hope or covered by a mining lease or mineral development licence. Future development applications will require inclusion of this information and as an example any site contamination assessments the following documents will be necessary:
  - Property details such as street address;
  - Current title searches;
  - Historical title searches back to Deed of Grant; and
  - Environmental Management Register / Contaminated Land Register search results.

  These land information searches will be required for any future planning or development applications. To ensure efficient use of New Hope budget GHD suggest this information should be consolidated and provided to Consultants for future packages of work.
- The New Oakleigh site is the oldest continuously operated coal mine in Queensland and as such was activated prior to the commencement of the *Environmental Protection Act 1994*, therefore the legislative requirements for aspects of the contaminated land assessment of the site are currently unclear. GHD suggests a review of the current EHP policies, and following EHP Guidelines and Technical Guidelines identify the assessment procedure for the site:
  - Rehabilitation requirements for mining projects;
  - Final and progressive rehabilitation reports and audit statements for level 1 mining lease projects;
  - Rehabilitation of Areas Containing Shafts, Boreholes or Audits;
  - Open Pit Rehabilitation;
  - Rehabilitation of Spontaneous Combustion Areas;
  - Rehabilitation of Land Subsidence Areas;
  - Geotechnical Slope Stability;
  - Erosion Control;
  - Growth Media Management;
  - Revegetation Methods;
  - Assessment of Revegetation;

- Housekeeping on Rehabilitated Areas;
- Minesite Decommissioning; and
- Estimation of Mine Rehabilitation Costs.

- A ground stability or geotechnical evaluation prior to intrusive investigation works is recommended to ensure potential issues relating to stability, and subsidence are assessed. There are potential high risk consequences associated with health and safety issues, explosive or noxious gases. New Hope liability, and New Hope operating procedures must take these risks into consideration. GHD suggests that these issues should be evaluated and any mitigation measures implemented prior to commencement of intrusive works.

- A dilapidation survey of the remaining buildings and infrastructure onsite is suggested prior to commencement of intrusive investigations. GHD observed collapsing structures (e.g. wooden floors and old tunnel entrances) during the site inspection on 15 November 2011. This is a potential health and safety consideration.

- Obtain copies of site plans and any other current or historic site plans to consolidate and document the information pertaining to infrastructure and buildings constructed across the site.

- A substantial amount of infrastructure remains on site from previous mining operations. GHD suggests a detailed audit of each remaining structure, with respect to contaminated land be completed. Where possible obtain existing building plans, to determine the building's purpose, and historic activities which have occurred in the vicinity of these buildings, with the dual purpose of developing an asset inventory to document existing content.

- A visual assessment and verification of all of the fuel storage tanks including above ground, underground, and associated infrastructure to identify any remaining infrastructure (such as vent pipes, or fuel lines); attempt to determine the contents, size, installation date / age, and condition of the tank; and assess if the tank has been de-commissioned. Furthermore as the tank and any associated infrastructure is no longer used, if not already done so, the UST should be decommissioned, and removed in accordance with the applicable legislative requirements and industry practices.

- During the GHD site inspection chemicals, fuels, oils, paints, solvents, degreasers, pesticides, other liquid wastes, and solid wastes were observed in numerous locations, including the four workshop areas on site. A waste inventory for the site should be prepared to determine a list of chemicals, volumes, condition of storage containers, and associated wastes (for example old containers, and contaminated personal protective equipment) generated to safely package waste materials for removal from site. Removal and disposal of the remaining onsite wastes by a licensed waste contractor will be required. Sampling of waste materials will be required to obtain necessary permissions and costings for licensed transport and disposal of waste materials.

- Supplementary information should be sought from ICC in relation to any historical flammable and combustible liquid licensing records which have been issued, or are current for the site. ICC records for the site may extend to information relating to building permits and construction details of on site infrastructure.

- Correlation of New Hope and EHP file records, in relation to any previous or current Environmental Authorities (EA's) for the site should be reviewed to obtain additional information relating to discharges from site and any environmental monitoring requirements, to satisfy any outstanding licence conditions and requirements.

- Review of previous, recently completed, or near completed other consultant reports from a contamination perspective namely relating to the materials characterisation, the recent groundwater bore installations by SKM, the seepage studies in progress, and surface water studies relating to the tailings dams. Review of data and other consultants reports should be undertaken as part of development of sampling and analysis plans and prior to commencement of intrusive soil and groundwater contamination assessments. Additional information and data from other reports, if available and suitable, may be able to be incorporated thereby potentially reducing the sampling requirements for future contamination assessments.
- Materials Characterisation Study completed for New Hope by Landloch consultancy may provide data relating to the physical properties and chemical composition of the mine spoil. Material characterisation data to evaluate the physical and chemical composition of soils and mine spoil could be utilised or direct additional sampling, with supplementary contaminant parameter analyses included in future assessments.
- Additional information in relation to site history is required, prior to commencement of any intrusive site contamination assessment works, to gain additional knowledge of the site. GHD suggests further site history interviews with the New Hope employees to verify and expand on the information provided on 14 December 2011, in particular:
  - Detailed review of available information and knowledge of the underground workings, particularly in relation to the lateral and vertical extent of mining. As well as knowledge of or information in relation to the reuse of materials to stabilise or backfill underground workings such as paste fill. The New Hope employees believed that the original owners of the site Mr Norman Rule and the mine surveyor Mr Stephen Rule may be able to provide more details about the underground workings and the tunnels;
  - Information should be sourced in relation to the decommissioning of the underground workings. Mr Drysdale said "*Mr Stephen Rule the former underground surveyor would know more details about how the tunnels were decommissioned, and that Mr Stephen Rule lived locally in Marburg*";
  - Additional information regarding the decommissioning of the electrical substation building and its electrical components should be sourced and verified by New Hope. Mr Cochran recalled that "*the electrical infrastructure was decommissioned, there were records completed at the time, and Mr Rob Lewis was involved*". When asked to elaborate on the components of the electrical infrastructure Mr Cochran said that "*he did not know what the transformer fluids were, and he did not know about the conductors and transducers*". It is recommended that New Hope review historical information;
  - The CHPP ceased operation in 2005, and the underground workshop was still being used at this time. Mr Cochran and Mr Loveday explained they worked at the site when the washing ceased and were involved in removing the CHPP infrastructure. Additional information should be obtained in relation to the CHPP decommissioning and removal to understand the methods for decommissioning, presence or absence of CHPP infrastructure and / or foundations, volume and nature of any of the chemicals or by-products, and waste management practices;
  - Detailed information or ground truthing of mine spoil dump and stockpile areas located across the site to assess the nature and extent of any actual or potential contamination;

- – Detailed information or ground truthing of the slurry dam /s areas to assess the nature and extent of any actual or potential contamination, as Mr Freeman said that "*material from the settling pond was known as slurry, and it was dug out carted in trucks to the slurry dams, and dam construction was a continuous activity*"; and
- – Gain access to existing groundwater bores, and verify the depth to groundwater recalled by Mr Loveday as he said that "*12 to 18 months ago when he had last dipped the Blakes Road bore it was 102 m depth to water*".

- GHD has worked with a geotechnical sub-consultant with extensive knowledge of underground coal mining in the general Ipswich area and surrounds. GHD can organise a review of information that the sub-consultant may have of underground coal mining in areas specific the New Oakleigh site on request.
- It is understood that a Materials Safety Data Sheet (MSDS) register exists for the site, including volumes of fuels, solvents, and de-greasers. The hazardous chemicals materials register for the site should be reviewed by a contaminated land scientist to establish volumes of chemicals stored, and / or used onsite.
- New Hope may also have historical information and / or records relating to the composition and consistency of mining process wastes, overburden, and spoil which could be utilised for future assessments. There are large areas of stockpiled material currently present onsite, and if the consistency and contamination status of this material be verified by other available data. It is possible to reduce future sampling density requirements should additional site data be available.
- The water quality, from a contamination perspective, of the tailings dams and surface drainage channels is currently unknown. The development of a surface water quality monitoring program to obtain sufficient data to assess any potential water quality and water contamination issues is recommended. Water quality data will be critical to assess if the tailings dam water and surface water can be discharged offsite, or can be potentially used for dust suppression during future site remediation works. Dependent on parameters water treatment prior to onsite use or potential offsite discharge may be required. Water quality assessment as a minimum will likely require potential water chemistry issues such as: turbidity, metals precipitation with disturbance and alteration of the water chemistry, potential for acid mine drainage, potential for sulfidic reactions, and potential for saline water chemistry due to evaporative processes in the tailings dams, etc, to be considered, mitigated and management planned accordingly.
- Opportunistic sampling of New Oakleigh groundwater, as part of the geotechnical and / or groundwater assessments, at various depths for analysis of a broader suite of contaminants should be conducted to assess future management options. Groundwater quality and quantity (yield) assessment to evaluate the potential for groundwater contamination on the site, as well as the potential for localised or regional groundwater contamination originating from the site.
- GHD propose a combined geotechnical, groundwater and contamination soil assessment, or opportunistic contamination sampling during the geotechnical and / or groundwater assessments, would provide contamination information without additional mobilisation and logistic costs to New Hope. It is considered likely that geotechnical issues may present greater constraints to redevelopment of the site, than any potential contamination issues identified to date based on existing data and interviews.

- Development of an asbestos register, or at a minimum an asbestos inspection to evaluate the remaining buildings and infrastructure for potential asbestos containing materials. Future demolition of buildings and structures containing asbestos will likely require asbestos management procedures, such as asbestos screening on fill materials, to be enacted due to the age of site buildings and GHD site inspection observations.
- The site is located in a waste levy zone area as defined by the *Waste Reduction and Recycling Act 2011*, therefore any removal and disposal of waste to landfill will likely attract a disposal levy fee. However provisions exist under the new *Waste Reduction and Recycling Act 2011* to make an application to EHP for approval of waste as a levy exempt waste. Prior to commencement of site remediation or rehabilitation activities the exemption avenues for ‘clean’ material, as well as additional material accumulated in the interim, should be explored prior to removal from site.
- Following the completion of the above (and when future land uses have been defined for certain areas) intrusive contamination investigations will be required in areas where the potential for contamination has been identified as a minimum. This will be required to assess the suitability of the area for the proposed land use from a contamination perspective and facilitate decisions on remedial requirements, management or removal from the EMR.

10. References

Australasian Groundwater and Environmental (AGE) Consultants Pty Ltd, 4 March 2009. New Oakleigh Mine North Pit Seepage, Task 1 Data Review.

Department of Environment and Resource Management (DERM) 2007, Ipswich Regional Geology Data Sheets (9442) Scale 1:100,000, Geoscience Australia.

Department of Environment and Resource Management (DERM) 2010, Queensland Groundwater Bore Database.

Douglas Partners Pty Ltd, August 2004. Groundwater Study for New Oakleigh Coal Mine Rosewood.

Deanne Wayne, 17 September 2004. New Oakleigh Mine Information Sheet.

GHD Pty Ltd, 26 September 2011. Proposal for Preliminary Closure Studies, New Hope Group New Oakleigh and Chuwar Projects.

GHD Pty Ltd, 13 June 2012. Report for Preliminary Mine Closure Study – New Oakleigh Project, Hydrogeological Desktop Assessment.

Golder Associates Pty Ltd, September 2001. Oakleigh Coal Project Geotechnical Evaluation.

National Environmental Protection Council. 1999. *National Environmental Protection (Assessment of Site Contamination) Measure (NEPM),* December 1999.

Queensland Environmental Protection Agency (DERM), 1998. *Draft Guidelines for the Assessment and Management of Contaminated Land in Queensland*, May 1998.

Queensland State Government – Mine Lease and Mineral Development Licence Records.

Sinclair Knight Merz (SKM), 6 July 2009. New Hope Coal, Infrastructure Decommissioning Report, Jeebropilly and New Oakleigh Mines.

Standards Australia, 2005. Australian Standard, *Guide to the investigation and sampling of sites with potentially contaminated soil. Part 1: Non-volatile and semi-volatile compounds*. AS4482.1 – 2005.

Standards Australia, 1999. *Guide to the investigation and sampling of sites with potentially contaminated soil. Part 2: Volatile compounds*. AS4482.2 – 1999.

11. Limitations

This **Preliminary Site Contamination Assessment Report** *("Report"):*

1. *has been prepared by* ***GHD Pty Ltd*** *("GHD") for* ***New Hope Group****;*
2. *may only be used and relied on by* ***New Hope Group****;*
3. *must not be copied to, used by, or relied on by any person other than* ***New Hope Group*** *without the prior written consent of GHD;*
4. *may only be used for the purpose of developing a preliminary understanding of the potential for contamination of land resulting from previous and or current site operations, probable contaminants and their locations for the* ***New Oakleigh*** *site and assessing the need for additional works to further that understanding (and must not be used for any other purpose).*

GHD and its servants, employees and officers otherwise expressly disclaim responsibility to any person other than ***New Hope Group*** *arising from or in connection with this Report.*

To the maximum extent permitted by law, all implied warranties and conditions in relation to the services provided by GHD and the Report are excluded unless they are expressly stated to apply in this Report.

The services undertaken by GHD in connection with preparing this Report:

- *were limited to those specifically detailed in section 1.2;*
- *presents the results of a desk-based site contamination assessment;*

It should be noted, that in gathering information for the study, GHD relied on verbal information and previous assessments supplied by the ***New Hope Group*** *and on visual inspections of the site, which may not have been independently verified.*

Where laboratory tests and / or similar work have been performed and recorded by others the data is included and used in the form provided by others. The responsibility for the accuracy of such data remains with the issuing authority, not with GHD.

Information provided in the reports listed in section 1.2.2 has been referenced in the preparation of this Report, however this information has not been independently verified.

GHD expressly disclaims responsibility for any error in, or omission from, this Report arising from or in connection with any of the Assumptions being incorrect.

Subject to the opinions, conclusions and any recommendations are based on conditions encountered and information reviewed at the time of preparation and may be relied on until additional site specific information or data is obtained, after which, GHD expressly disclaims responsibility for any error in, or omission from, this Report arising from or in connection with those opinions, conclusions and any recommendations.

GHD has prepared this Report on the basis of information provided by ***New Hope Group****,* ***Department of Environment and Heritage Protection, and Ipswich City Council,*** *as well as information derived from previous investigations at the site, which GHD has not independently verified or checked beyond the agreed scope of work.*

GHD does not accept liability in connection with such unverified Information, including (but not limited to) errors and omissions in the Report which were caused by errors or omissions in that information.

The opinions, conclusions and any recommendations in this Report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

Investigations undertaken in respect of this Report are constrained by the particular site conditions, such as the location of buildings, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this Report.

Site conditions (including the presence of hazardous substances and / or site contamination) may change after the date of this Report. GHD does not accept responsibility:

- *arising from, or in connection with, any change to the site conditions; and*
- *to update this Report if the site conditions change.*

An understanding of the site conditions depends on the integration of many pieces of information, some regional, some site specific, some structure-specific and some experienced based. Hence this report must be read in full and should not be altered, amended or abbreviated, issued in part or issued incomplete in any way without prior checking and approval by GHD. GHD accepts no responsibility for any circumstances that arise from the issue of the report that has been modified other than by GHD.

This report has been prepared with reference to the Draft Guidelines for the Assessment and Management of Contaminated Land in Queensland Department of Environment (1998).

This report presents the results of an environmental investigation prepared for the purpose of this commission. The data and advice provided herein relate only to the project described herein and must be reviewed by a competent engineer / scientist before being used for any other purpose. GHD accepts no responsibility for other use of the data.

The work conducted by GHD under this commission has been to the standard that would normally be expected of professional environmental consulting firm practising in this field in the State of Queensland. Although strenuous effort has been made to assess significant contamination required by the brief we cannot, however, guarantee that other issues outside of the scope of work undertaken by GHD do not remain.

If ***New Hope Group*** *wishes to provide this Report to a third party recipient to use and rely upon, then GHD's prior written consent will be required. Before this Report is released to the third party recipient, the third party recipient will be required to execute a GHD prepared deed poll under which the recipient agrees:*

- *to acknowledge that the basis on which this Report may be relied upon is consistent with the principles in this section of the Report; and*
- *to the maximum extent permitted by law, GHD shall not have, and the recipient forever releases GHD from, any liability to the recipient for loss or damage howsoever in connection with, arising from or in respect of this Report whether such liability arises in contract, tort (including negligence).*

Appendix A

Figures

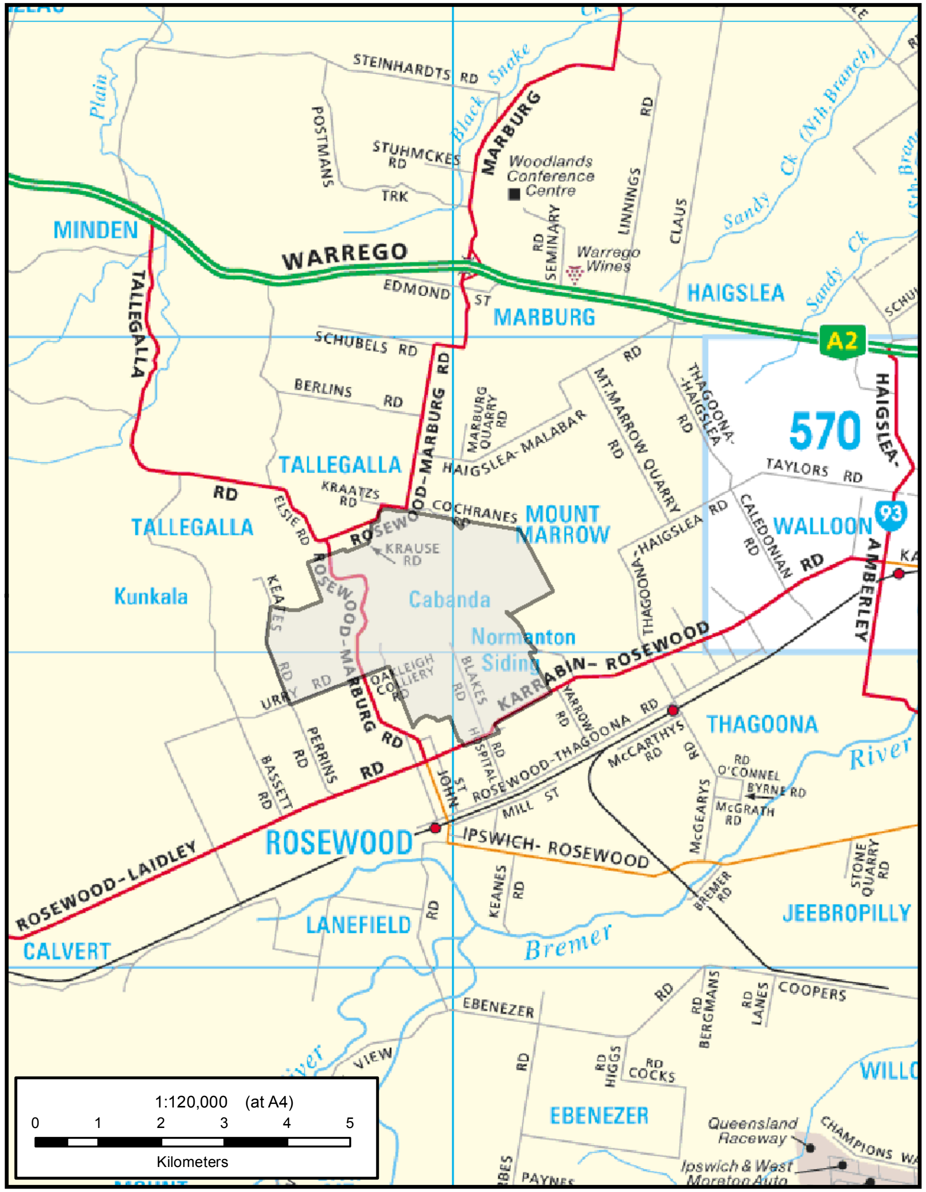
Site Locality

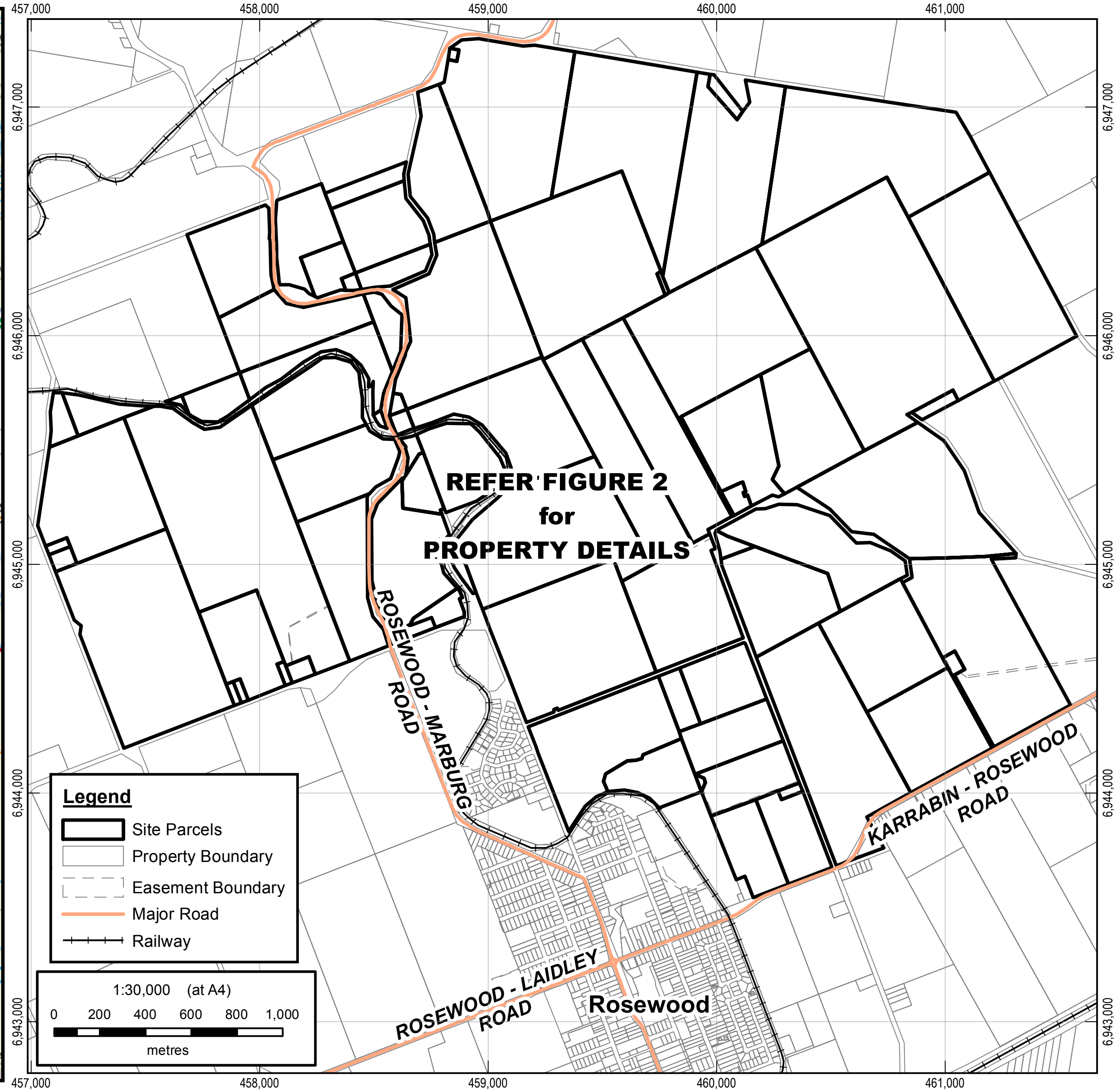
Property Details

Mining Operations

Local Geology and Hydrology

New Oakleigh Mine Plan





Map Projection: Universal Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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New Hope Coal Australia
Preliminary Site Contamination Assessment,
New Oakleigh Mine Site, Rosewood, Queensland, 4340.

Job Number	41-24703
Revision	A
Date	25 Jan 2012

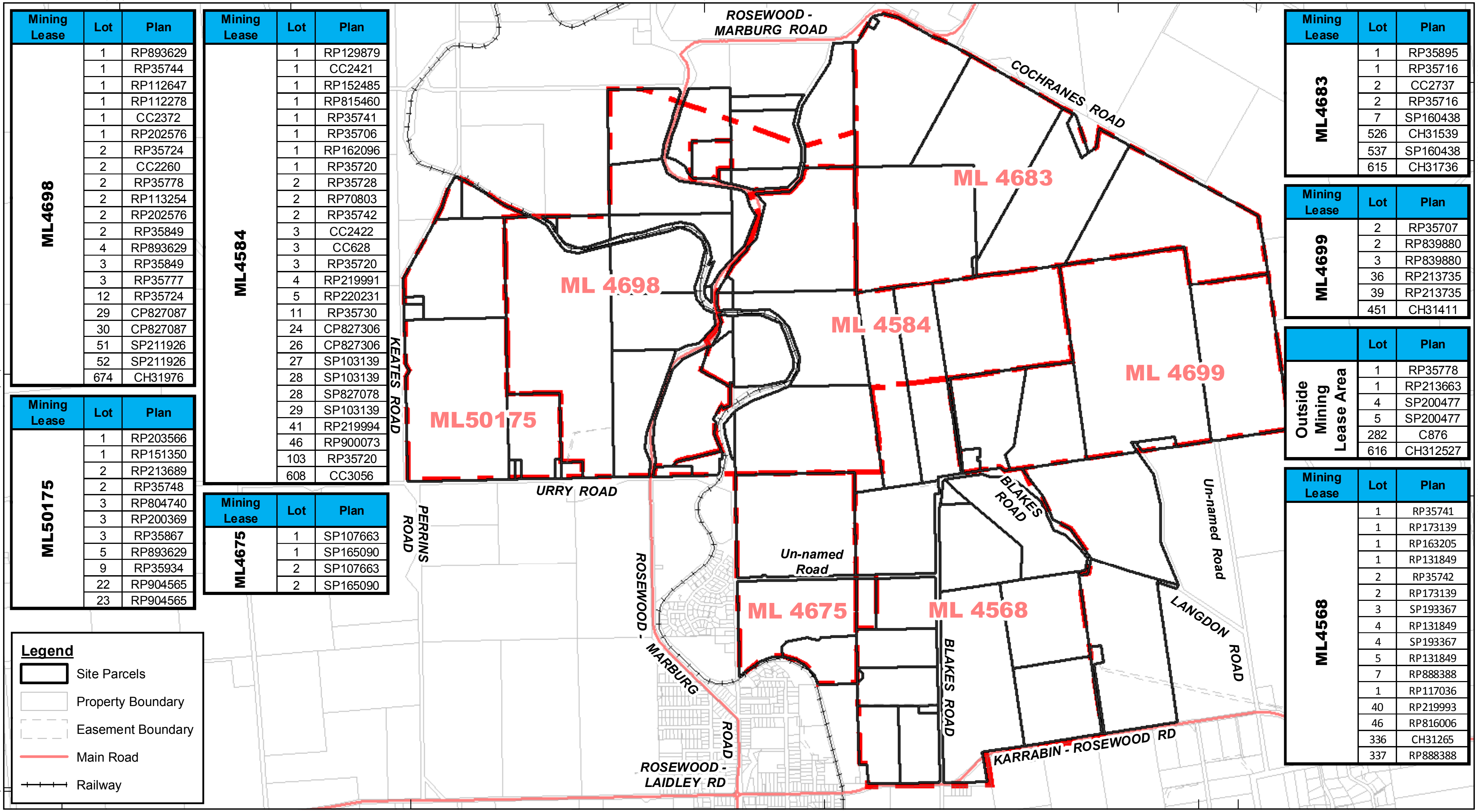
Site Locality

Figure 1

G:\41\24703\GIS\Maps\PDFs_MXDs\41-24703-12_oakleighLocality_revA.mxd

Level 4, 201 Charlotte St Brisbane QLD 4000 T 61 7 3316 3000 F 61 7 3316 3333 E bnemail@ghd.com W www.ghd.com

Data source: DERM: cadastre, 2007; Brisways: street maps, 2007; Geoscience Australia: road, 2009. Created by: jvc



Mining Lease	Lot	Plan
ML4698	1	RP893629
	1	RP35744
	1	RP112647
	1	RP112278
	1	CC2372
	1	RP202576
	2	RP35724
	2	CC2260
	2	RP35778
	2	RP113254
	2	RP202576
	2	RP35849
	4	RP893629
	3	RP35849
	3	RP35777
	12	RP35724
	29	CP827087
	30	CP827087
	51	SP211926
	52	SP211926
	674	CH31976

Mining Lease	Lot	Plan
ML50175	1	RP203566
	1	RP151350
	2	RP213689
	2	RP35748
	3	RP804740
	3	RP200369
	3	RP35867
	5	RP893629
	9	RP35934
	22	RP904565
	23	RP904565

Mining Lease	Lot	Plan
ML4584	1	RP129879
	1	CC2421
	1	RP152485
	1	RP815460
	1	RP35741
	1	RP35706
	1	RP162096
	1	RP35720
	2	RP35728
	2	RP70803
	2	RP35742
	3	CC2422
	3	CC628
	3	RP35720
	4	RP219991
	5	RP220231
	11	RP35730
	24	CP827306
	26	CP827306
	27	SP103139
	28	SP103139
	28	SP827078
	29	SP103139
	41	RP219994
	46	RP900073
	103	RP35720
	608	CC3056

Mining Lease	Lot	Plan
ML4675	1	SP107663
	1	SP165090
	2	SP107663
	2	SP165090

Mining Lease	Lot	Plan
ML4683	1	RP35895
	1	RP35716
	2	CC2737
	2	RP35716
	7	SP160438
	526	CH31539
	537	SP160438
	615	CH31736

Mining Lease	Lot	Plan
ML4699	2	RP35707
	2	RP839880
	3	RP839880
	36	RP213735
	39	RP213735
	451	CH31411

	Lot	Plan
Outside Mining Lease Area	1	RP35778
	1	RP213663
	4	SP200477
	5	SP200477
	282	C876
	616	CH312527

Mining Lease	Lot	Plan
ML4568	1	RP35741
	1	RP173139
	1	RP163205
	1	RP131849
	2	RP35742
	2	RP173139
	3	SP193367
	4	RP131849
	4	SP193367
	5	RP131849
	7	RP888388
	1	RP117036
	40	RP219993
	46	RP816006
	336	CH31265
	337	RP888388

1:27,000 (at A4)

0 200 400 600 800 1,000

metres

Map Projection: Universal Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

NOTE
This figure in indicative and the actual lot descriptions are not annotated due to the large number of parcels representing the site.

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New Hope Coal Australia
Preliminary Site Contamination Assessment,
New Oakleigh Mine Site, Rosewood, Queensland, 4340.

Job Number 41-24703
Revision A
Date 12 Jun 2012

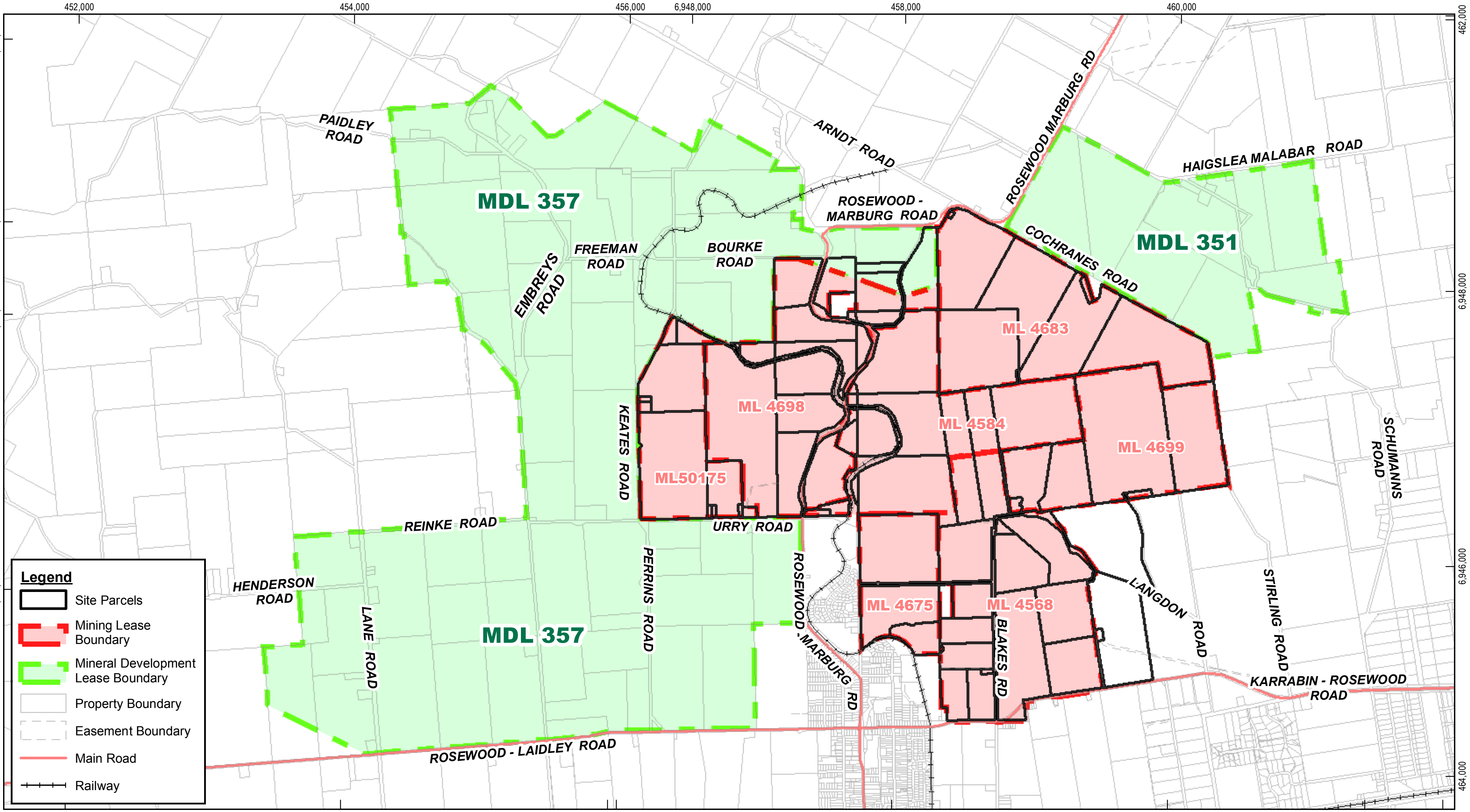
Property Details

Figure 2

G:\41\24703\GIS\Maps\PDFs_MXDs\41-24703-13_oakleighParcels_revA.mxd

Level 4, 201 Charlotte St Brisbane QLD 4000 T 61 7 3316 3000 F 61 7 3316 3333 E bnemail@ghd.com W www.ghd.com

Data source: DERM: cadastre, 2007 & 100k geology, 2007; Geoscience Australia , road and rail, 2007. Created by: jvc



Map Projection: Universal Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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New Hope Coal Australia
Preliminary Site Contamination Assessment,
New Oakleigh Mine Site, Rosewood, Queensland, 4340.

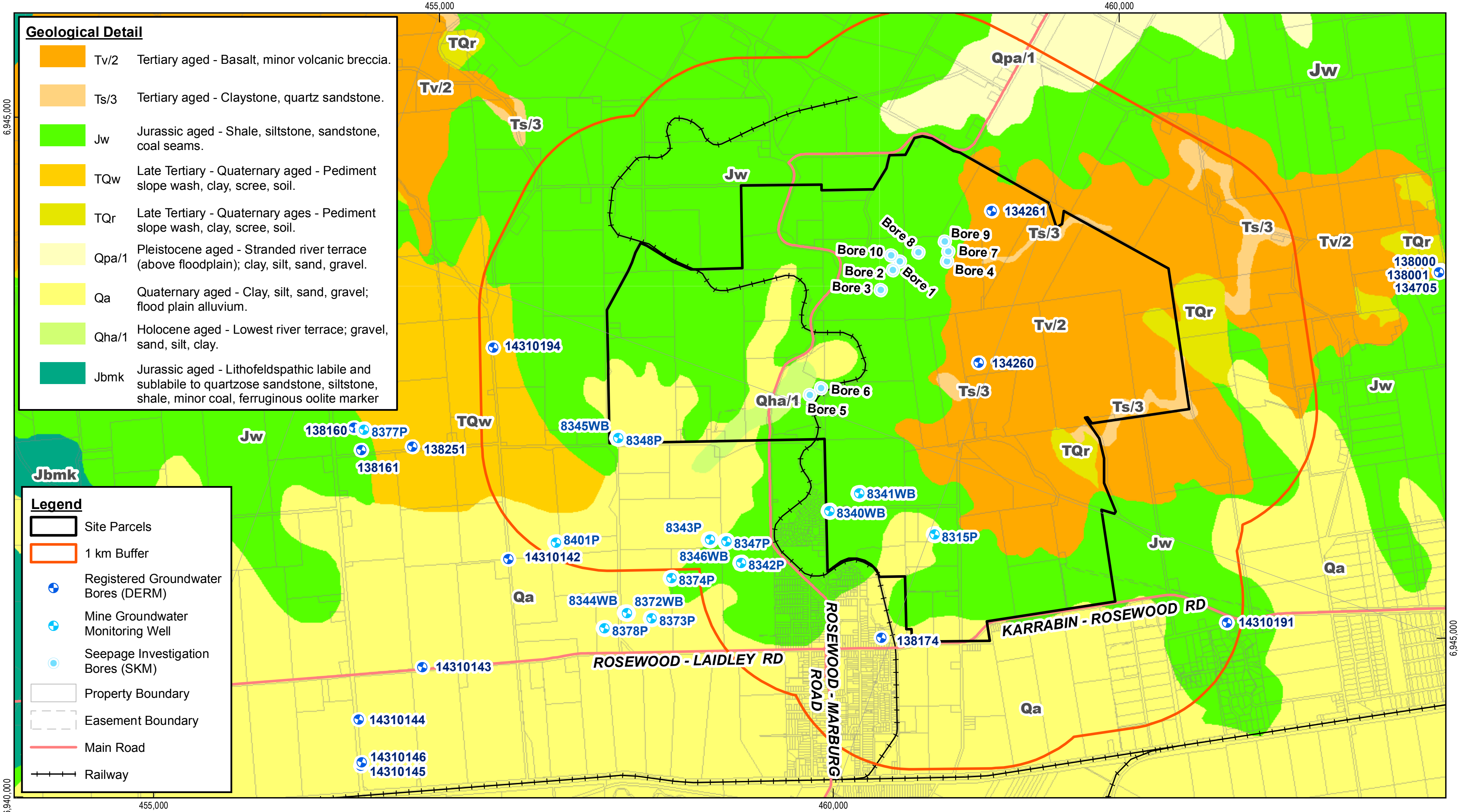
Job Number 41-24703
Revision A
Date 10 Feb 2012

Mining Operations for New Oakleigh — Figure 3

G:\41\24703\GIS\Maps\PDFs_MXDs\41-24703-14_MLs_MDLs_revA.mxd

Level 4, 201 Charlotte St Brisbane QLD 4000 T 61 7 3316 3000 F 61 7 3316 3333 E bnemail@ghd.com W www.ghd.com

Data source: DERM: cadastre, 2007 & 100k geology, 2007; Geoscience Australia , road and rail, 2007. Created by: jvc



1:40,000 (at A4)

0 500 1,000 1,500

metres

Map Projection: Universal Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD
CLIENTS | PEOPLE | PERFORMANCE

New Hope Coal Australia
Preliminary Site Contamination Assessment,
New Oakleigh Mine Site, Rosewood, Queensland, 4340.

Job Number	41-24703
Revision	A
Date	08 Feb 2012

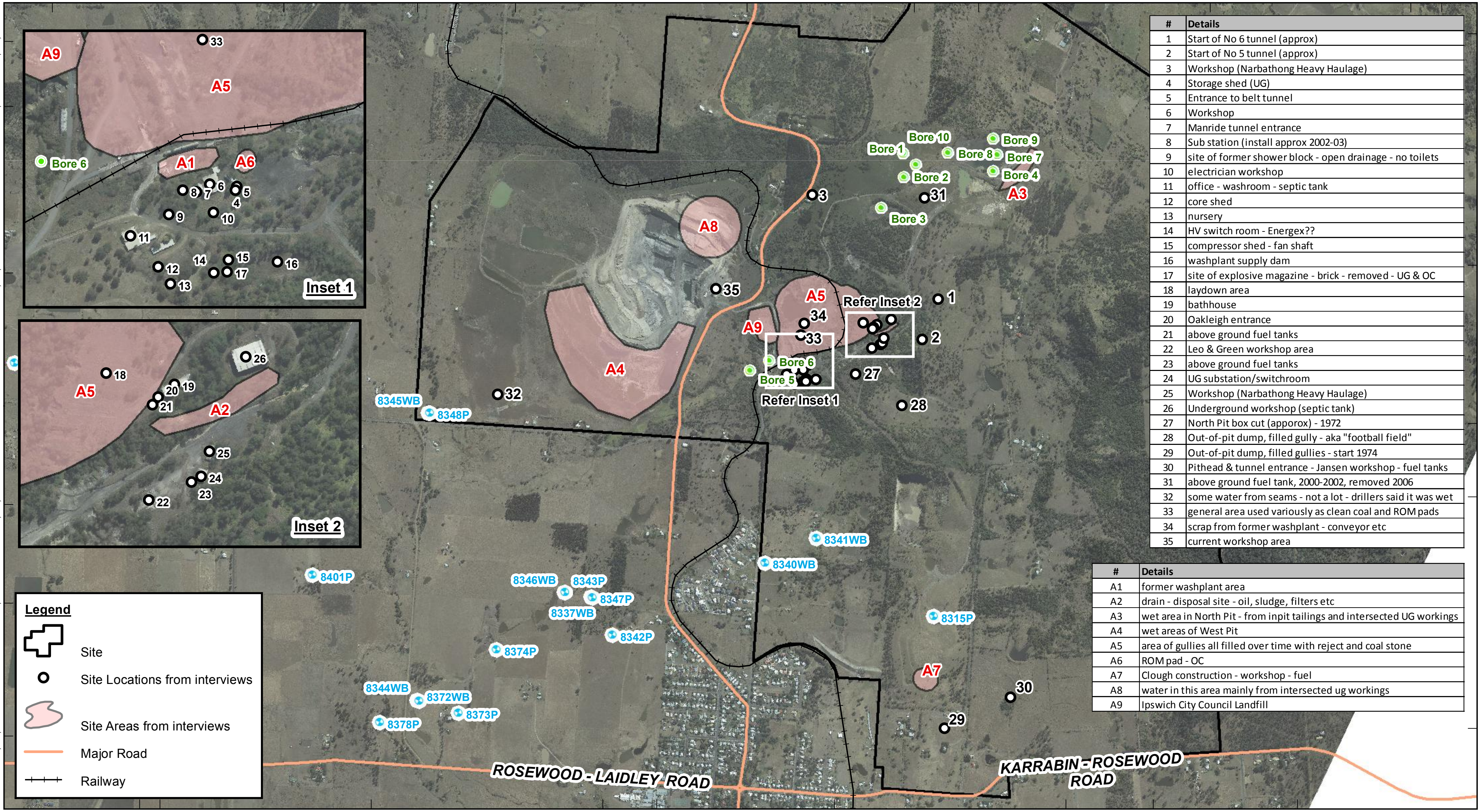
Local Geology and Hydrology

Figure 4

G:\41\24703\GIS\Maps\PDFs_MXDs\41-24703-15_oakleighGeology_revA.mxd

Level 4, 201 Charlotte St Brisbane QLD 4000 T 61 7 3316 3000 F 61 7 3316 3333 E bnemail@ghd.com W www.ghd.com

Data source: DERM: cadastre, 2007 & 100k geology, 2007; Geoscience Australia , road and rail, 2007. Created by: jvc



#	Details
1	Start of No 6 tunnel (approx)
2	Start of No 5 tunnel (approx)
3	Workshop (Narbathong Heavy Haulage)
4	Storage shed (UG)
5	Entrance to belt tunnel
6	Workshop
7	Manride tunnel entrance
8	Sub station (install approx 2002-03)
9	site of former shower block - open drainage - no toilets
10	electrician workshop
11	office - washroom - septic tank
12	core shed
13	nursery
14	HV switch room - Energex??
15	compressor shed - fan shaft
16	washplant supply dam
17	site of explosive magazine - brick - removed - UG & OC
18	laydown area
19	bathhouse
20	Oakleigh entrance
21	above ground fuel tanks
22	Leo & Green workshop area
23	above ground fuel tanks
24	UG substation/switchroom
25	Workshop (Narbathong Heavy Haulage)
26	Underground workshop (septic tank)
27	North Pit box cut (approx) - 1972
28	Out-of-pit dump, filled gully - aka "football field"
29	Out-of-pit dump, filled gullies - start 1974
30	Pithead & tunnel entrance - Jansen workshop - fuel tanks
31	above ground fuel tank, 2000-2002, removed 2006
32	some water from seams - not a lot - drillers said it was wet
33	general area used variously as clean coal and ROM pads
34	scrap from former washplant - conveyor etc
35	current workshop area

#	Details
A1	former washplant area
A2	drain - disposal site - oil, sludge, filters etc
A3	wet area in North Pit - from inpit tailings and intersected UG workings
A4	wet areas of West Pit
A5	area of gullies all filled over time with reject and coal stone
A6	ROM pad - OC
A7	Clough construction - workshop - fuel
A8	water in this area mainly from intersected ug workings
A9	Ipswich City Council Landfill

1:25,000 (at A4)

0 200 400 600 800 1,000

Meters

Map Projection: Universal Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

GHD
CLIENTS | PEOPLE | PERFORMANCE

New Hope Coal Australia
Preliminary Site Contamination Assessment,
New Oakleigh Mine Site, Rosewood, Queensland, 4340.

Job Number	41-24703
Revision	A
Date	13 Feb 2012

New Oakleigh Mine Plan

Figure 5

G:\41\24703\GIS\Maps\PDFs_MXDs\41-24703-42_oakleighFeatures_revA.mxd

Level 4, 201 Charlotte St Brisbane QLD 4000 T 61 7 3316 3000 F 61 7 3316 3333 E bnemail@ghd.com W www.ghd.com

Data source: DERM: cadastre, 2007; Brisways: street maps, 2007; Geoscience Australia: road, 2009. Created by: jvc

Appendix B

Photographic Log

Preliminary Site Contamination Assessment, New Oakleigh Site
15 November 2011 Site Inspection

Photograph 1 – Site entrance road showing machinery storage area (15/11/11).

Photograph 2 – View to the south with West Pit mining operations on the right of photo (15/11/11).

Photograph 3 – View west to the West Pit mining operations adjacent to the office and workshop buildings area (15/11/11).

Photograph 4 – Machinery stored at the site entrance, and coal material observed (15/11/11).

Photograph 5 – Demountable office buildings and staff facilities for West Pit operations (15/11/11).

Photograph 6 – Septic tank system for office and workshop buildings facilities (15/11/11).

Preliminary Site Contamination Assessment, New Oakleigh Site
15 November 2011 Site Inspection

Photograph 7 – West Pit fuel farm with 5 above ground storage tanks observed (15/11/11).

Photograph 8 – Zoomed in shot of fuel farm showing other fuel storage under roofing (15/11/11).

Photograph 9 – Truck refuelling area located directly west of the fuel farm area (15/11/11).

Photograph 10 – Wash down bay for with oil water separator and sediment trap (15/11/11).

Photograph 11 – Wash down bay area with sediment collection sump (15/11/11).

Photograph 12 – Wash down bay hardstand area with fine sediments observed on the surface (15/11/11).

Photograph 13 – View of wash bay water tank, and workshop building in the background (14/12/11).

Photograph 14 – Fuel drums stored on wooden pallets, and storage of materials near to the wash down bay area (15/11/11).

Photograph 15 – View to the east showing office buildings on the right and workshop building on the left of image (15/11/11).

Photograph 16 – Views across the site in a westerly direction to the West Pit (15/11/11).

Photograph 17 – View to the east of the workshop building showing heavy vehicles in for servicing and maintenance (15/11/11).

Photograph 18 – Area to the north of workshop building utilised for 'park up maintenance jobs' (15/11/11).

Photograph 19 – Zoomed in shot of the fuel storages in the fuel farm area, with views to the south of the site (15/11/11).

Photograph 20 – Designated gas cylinder storage area on the southern side of the workshop building (15/11/11).

Photograph 21 – View inside the heavy vehicle workshop (15/11/11).

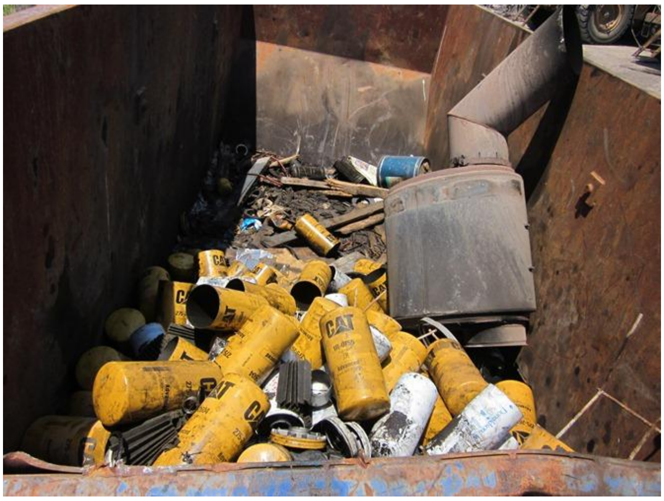
Photograph 22 – Small volumes of chemicals stored in proximity to the servicing area, observed relatively clean floors (15/11/11).

Preliminary Site Contamination Assessment, New Oakleigh Site
15 November 2011 Site Inspection

Photograph 23 – View of western end of workshop showing machinery and equipment (15/11/11).

Photograph 24 – Middle section of the workshop showing storage of small volumes of assorted chemicals (15/11/11).

Photograph 25 – Servicing of truck in progress, compacted earthen hardstand areas, and undercover parking for vehicles (15/11/11).



Photograph 26 – View of waste materials deposited in skip bin located near to the workshop building (15/11/11).

Photograph 27 – Battery charging area located to the south of the workshop building (15/11/11).

Photograph 28 – View south of the office car parking area (15/11/11).

Preliminary Site Contamination Assessment, New Oakleigh Site
15 November 2011 Site Inspection

Photograph 29 – West Pit infrastructure: workshop (right), refuelling area(at the back in the middle) and office buildings (left) (15/11/11).

Photograph 30 – View of the shed structures comprising the workshop building (15/11/11).

Photograph 31 – Eastern side of the site, view of disused wheel wash and coal loading hopper (15/11/11).

Photograph 32 – Storage of materials in the laydown area adjacent to the eastern site entrance (15/11/11).

Photograph 33 – Storage of disused metal structures (15/11/11).

Photograph 34 – Storage of disused metal structures previously used for coal loading (15/11/11).

Photograph 35 – View to the north showing the water body in the vicinity of the old coal handling and preparation plant (15/11/11).

Photograph 36 – View of soil mounds containing waste materials with re-established vegetation (15/11/11).

Photograph 37 – Old machinery no longer used is stored in the old laydown area on the eastern side of the site (15/11/11).

Photograph 38 – Old train carriages, coal loading hopper, and shipping containers located near the old railway line (15/11/11).

Photograph 39 – The Oakleigh Coal Mines Administration Office and car park located between the old North and Normanton Pits (15/11/11).

Photograph 40 – Site access road leading north from the Admin building to the north of the site.

Photograph 41 – Above ground fuel tanks and refuelling infrastructure adjacent to the access road north of the Admin building (15/11/11).

Photograph 42 – Electrical substation building and decommissioned power lines located east of the North Pit (15/11/11).

Photograph 43 – Old laydown area located near the old open cut buildings (15/11/11).

Photograph 44 – View north of the old open cut buildings showing the electrical substation, house, and garage / workshop area (15/11/11)

Photograph 45 – Old shipping container remains near old open cut buildings (15/11/11).

Photograph 46 – Old fuel storage drums located in the vicinity of the old open cut buildings (15/11/11).

Photograph 47 – Inside the old electrical substation building (15/11/11).

Photograph 48 – Old electrical equipment now decommissioned (15/11/11).

Photograph 49 – Electrical power mains for the previous underground tunnel workings (Oakleigh No. 3 and No. 5) (15/11/11).

Photograph 50 – Old garage / workshop area (15/11/11).

Photograph 51 – Old house, part of the old open cut buildings (15/11/11).

Photograph 52 – Inside the old house with walls constructed of potential asbestos containing materials (15/11/11).

Photograph 53 – Old concrete water tank located to the north of old open cut buildings (15/11/11).

Photograph 54 – View east from the road showing the old electrical substation building, old house, and garage / workshop area (15/11/11).

Photograph 55 – Small shed located at back of house, potentially was a garage / workshop area (15/11/11).

Photograph 56 – Sign at entrance of restricted area on eastern side of the site, reminding personnel of site procedures (15/11/11).

Photograph 57 – Road edges and drainage lines for surface water (15/11/11).

Photograph 58 – View of the site showing vegetation has established in a number of areas across the eastern side of site (15/11/11).

Photograph 59 – View from the far north eastern corner of the site across the tailings dam (15/11/11).

Photograph 60 – Zoomed in shot of the tailings dam (15/11/11).

Photograph 61 – View from the northern boundary of the site looking across to the North Pit high wall (15/11/11).

Photograph 62 – Stark differences observed in the grass cover near to the seepage site (15/11/11).

Photograph 63 – Overhead gantry crane in the large workshop building, known as the Operations workshop (15/11/11).

Photograph 64 – Operations workshop view from north to south (15/11/11).

Preliminary Site Contamination Assessment, New Oakleigh Site
15 November 2011 Site Inspection

Photograph 65 – South eastern section of the Operations workshop (15/11/11).

Photograph 66 – Equipment and fuel storage in the Operations workshop (15/11/11).

Photograph 67 – Operations workshop machinery (15/11/11).

Photograph 68 – Hydraulic hoist (15/11/11).

Photograph 69 – View of Operations workshop taken from south to north (15/11/11).

Photograph 70 – Typical construction of the series of rooms adjoining the Operations workshop (15/11/11).

Photograph 71 – Storage area for spare parts located in north west portion of Operations workshop (15/11/11).

Photograph 72 – Storage racks organised and labelled with the heavy vehicle machinery that the spare parts relate to (15/11/11).

Photograph 73 – Hardstand area on the eastern boundary of the Operations workshop (15/11/11).

Photograph 74 – View from eastern side of the Operations workshop with guttering and concrete water tank collecting rainwater (15/11/11).

Photograph 75 - Old building located south west of the Operations workshop (15/11/11).

Photograph 76 – Collection of buildings comprising the surface buildings from the underground mining operations (15/11/11).

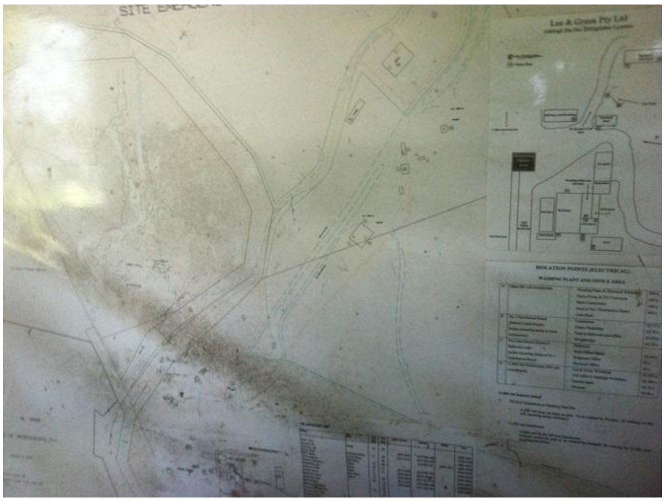
Photograph 77 – Garage / workshop building of the underground era (15/11/11).

Photograph 78 – Fire station building from the underground era (15/11/11).

Photograph 79 – Pipe work and hosing related to the fire fighting water supply onsite (15/11/11).

Photograph 80 – Contents of the underground workshop buildings (15/11/11).

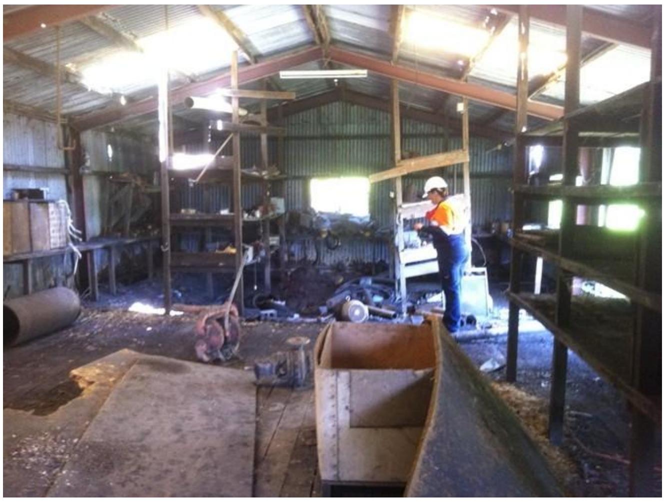
Photograph 81 – Old underground tunnel entrance (15/11/11).



Photograph 82 – Site Plans authored by Leo and Green Pty Ltd still hanging on the walls (15/11/11).

Photograph 83 – Office from underground operations located vertically above the tunnel entrance shaft (15/11/11).

Photograph 84 – Workshop for underground area constructed of corrugated sheeting (15/11/11).



Photograph 85 – Spare parts and storage shed from underground era, wooden floors collapsing (15/11/11).

Photograph 86 – Zoomed in shot of the Oakleigh Coal Mines Administration Office buildings (15/11/11).

Photograph 87 – Ipswich City Council waste transfer station atop the old landfill located near to Rosewood – Marburg Rodd (15/11/11)

Photograph 88 - Ipswich City Council waste transfer station gate house (15/11/11).

Appendix C

Mining Lease Information

Tenure Id: ML 4568

District: BRISBANE
Previous Id: ML327IPSW
Name of Lease: -
Status: GRANTED
Sub-Status: RENEWAL LODGED
Native Title Category: EXCLUSIVE LAND
Native Title Sub Category:

Pre-requisite Tenure Ids
-
Tenancy Type: Tenancy In Common

Principal Holder

NEW OAKLEIGH COAL PTY LTD
PO BOX 47
IPSWICH QLD
4305

Holder Names	Share %	Status	Deal In	Date Appv	Deal Out
NEW OAKLEIGH COAL PTY LTD	100.000000000000	Current	992093	25-NOV-1999	
SCM BRISBANE PTY LTD	100.000000000000	Former	975041	24-OCT-1997	992093
OAKLEIGH COLLIERY PTY LTD	100.000000000000	Former	3	18-SEP-1984	975041
BOUGHEN Leonard George	16.666700000000	Former	2	18-SEP-1984	3
TREWICK Alma Annie	16.666600000000	Former	2	18-SEP-1984	3
ALMA ANNIE TREWICK AS SOLE EXECUTRIX OF WILL OF SIDNEY LYLE TREWICK DECD	33.333400000000	Former	1	13-APR-1976	3
TREWICK Sidney Lyle	33.333400000000	Former	0	30-MAR-1951	1
BOUGHEN Leslie Arthur	33.333300000000	Former	0	30-MAR-1951	2
BOUGHEN Leonard George	33.333300000000	Former	0	30-MAR-1951	3

Marked Out Date and Time: 30-MAR-1951 07:00 AM
Lodged Date and Time: 30-MAR-1951 09:30 AM
Term Sought: 21 years
Certificate of Application Issued:

Situated Within at Date Lodged
-

Area: 192 Ha
Surface Area: 54.1364 Ha

Tenure Id: ML 4568

Local Authorities

IPSWICH

Minerals / Purpose

COAL

Locality

ROSEWOOD

Date of Grant: 20-MAR-1980

Act Granted Under: MINING ACT 1968-1986

Plan Number	Previous Plan Number	Volume	Folio
40689			
40689			
34655			

General Remarks

RENEWED FOR A TERM OF 5 YEARS.

Renewal Processes

Notice Issued: 13-APR-2010
Lodged: 30-SEP-2010
Approved: 11-MAR-2010

Term History

Commenced	Expiry	Years
01-APR-1980	31-MAR-1985	5
01-APR-1985	31-MAR-2006	21
01-APR-2006	31-MAR-2011	5

Background Tenures	Land Usage	Compensation Required	Finalised
LOT 1 ON RP117036 FREEHOLD	Mining	N	22-OCT-1997
ROAD RESERVE (UN-NAMED ROAD) (SA)	Mining	Y	25-NOV-1999
LOT 1 ON RP163205 FREEHOLD	Mining	N	22-OCT-1997
LOT 1 ON RP173139 FREEHOLD	Mining	N	22-OCT-1997
LOT 1 ON RP35741 FREEHOLD (SA)	Mining	Y	28-NOV-2000
LOT 103 ON RP35720 (BELOW DEPTH)	Mining	N	28-NOV-2000
LOT 2 ON RP173139 FREEHOLD	Mining	N	22-OCT-1997
LOT 2 ON RP208612 FREEHOLD	Mining	N	30-NOV-2000
LOT 2 ON RP35714 FREEHOLD (SA)	Mining	Y	25-NOV-1999
LOT 2 ON RP35742 FREEHOLD	Mining	N	22-OCT-1997
LOT 3 ON RP131849 FREEHOLD	Mining	Y	25-NOV-1999
LOT 3 ON RP35720 FREEHOLD	Mining	Y	28-NOV-2000

Tenure Id: ML 4568

LOT 336 ON CH31265 FREEHOLD	Mining	N	22-OCT-1997
LOT 337 ON RP888388 FREEHOLD	Mining	N	30-NOV-2000
LOT 4 ON RP131849 FREEHOLD (SA)	Mining	Y	25-NOV-1999
LOT 40 ON RP219993 (BELOW DEPTH)	Mining	N	22-OCT-1997
LOT 41 ON RP219994 (BELOW DEPTH)	Mining	N	28-NOV-2000
LOT 460 ON CH31460 FREEHOLD	Mining	N	22-OCT-1997
LOT 5 ON RP131849 FREEHOLD (SA)	Mining	Y	25-NOV-1999
LOT 7 ON RP888388 FREEHOLD	Mining	N	30-NOV-2000
ROAD RESERVE (BLAKES ROAD) (PART SA)	Mining	N	22-OCT-1997
ROAD RESERVE (KARRABIN-ROSEWOOD ROAD)	Mining	N	22-OCT-1997
LOT 1 ON RP131849 FREEHOLD	Mining	N	22-OCT-1997

Dealing Name	Dealing Number	Action Initiated	Expected Completion	Actual Completion
ADDITIONAL SURFACE AREA APPLN	0	28-JUL-1978	01-MAR-1990	29-JUN-1995
Remarks: LOT 5 ON RP 131849 AND LOT 2 ON RP 35714 BEING AN AREA OF 26.3264HA				
MORTGAGE OF INTEREST HELD	900098	16-JAN-1990	25-JAN-1990	10-AUG-1990
Remarks: Mortgage of OAKLEIGH COLLIERY PTY LTD interest to STANDARD CHARTERED BANK AUSTRALIA LIMITED				
MORTGAGE OF INTEREST HELD	935087	14-OCT-1993	26-OCT-1993	20-OCT-1993
Remarks: 100% MORTGAGED-MORTGAGEE NATIONAL AUSTRALIA BANK LIMITED C/-CLARKE AND KANN LAWYERS CML BUILDING POST OFFICE SQUARE BRISBANE QLD 4000				
RELEASE OF MORTGAGE	900098	20-OCT-1993	20-OCT-1993	20-OCT-1993
RELEASE OF MORTGAGE	935087	24-OCT-1997	24-OCT-1997	24-OCT-1997
ADDITIONAL SURFACE AREA APPLN	0	31-MAY-2000	31-JUL-2001	28-JUN-2001
Remarks: COMPLIES WITH MINERAL RESOURCES ACT 1989. AREA OF 11.51 HA. EA APPROVED 14/12/2000. TERM TO EXPIRE 31-MAR-2006.				
INITIAL DEVELOPMENT PLAN	1006505	13-FEB-2006	31-DEC-2007	22-APR-2009
Remarks: DEVELOPMENT PLAN LODGED BY NEW HOPE COLLIERIES FOR PROJECTS - NEW OAKLEIGH (PJ50063), NORTH IPSWICH/KHOLO (PJ50062), JEEBROPILLY (PJ50060). APPROVED FOR TERM OF 5 YEARS (1/1//2009 TO 30/09/2013).				
SPECIAL CONDITIONS	0	27-MAR-2006	22-MAY-2006	07-APR-2006
Remarks: CONDITIONS AS PROVIDED FOR IN THE MINERAL RESOURCES ACT AS AMENDED.				

Sub-Tenures

Tenure Type & Number	Date Lodged	Date Granted	Area

Tenure Id: ML 4584

District: BRISBANE
Previous Id: ML387IPSW
Name of Lease: OAKLEIGH NO.5
Status: GRANTED
Sub-Status: RENEWAL LODGED

Native Title Category: EXCLUSIVE LAND
Native Title Sub Category:

Pre-requisite Tenure Ids

-

Tenancy Type: Tenancy In Common

Principal Holder

NEW OAKLEIGH COAL PTY LTD
PO BOX 47
IPSWICH QLD
4305

Holder Names	*Share %*	*Status*	*Deal In*	*Date Appv*	*Deal Out*
NEW OAKLEIGH COAL PTY LTD	100.000000000000	Current	992003	29-OCT-1999	
SCM BRISBANE PTY LTD	100.000000000000	Former	975042	24-OCT-1997	992003
OAKLEIGH COLLIERY PTY LTD	100.000000000000	Former	1	05-OCT-1978	975042
RULE Robert Inglis	50.000000000000	Former	2	10-APR-1951	
RULE George Henry	50.000000000000	Former	1	10-APR-1951	
RULE Robert Inglis	50.000000000000	Former	0	10-APR-1951	1
RULE George Henry	50.000000000000	Former	0	10-APR-1951	1

Marked Out Date and Time: 10-APR-1951 07:00 AM
Lodged Date and Time: 10-APR-1951 03:00 PM
Term Sought: 21 years
Certificate of Application Issued: 10-APR-1951

Situated Within at Date Lodged

-

Area: 161.6 Ha
Surface Area: 115.46 Ha

Tenure Id: ML 4584

Local Authorities

IPSWICH

Minerals / Purpose

COAL

Locality

PAR WALOON CO CHURCHILL

Date of Grant: 08-MAR-1979

Act Granted Under: MINING ACT 1968-1986

Plan Number	Previous Plan Number	Volume	Folio
40690			
40690			

General Remarks

Renewal Processes

Notice Issued: 15-APR-2004
Lodged: 23-MAR-2005
Approved:

Term History

Commenced	Expiry	Years
01-APR-1979	31-MAR-1984	5
01-APR-1984	31-MAR-2005	21

Background Tenures	Land Usage	Compensation Required	Finalised
LOT 1 ON CC2421 FREEHOLD PAR WALLOON CO CHURCHILL	Mining	Y	28-NOV-2000
ROAD RESERVE (ROSEWOOD-MARBURG ROAD)	Mining	Y	08-MAR-2001
LOT 1 ON RP152485 FREEHOLD PAR WALLOON CO CHURCHILL	Mining	Y	28-NOV-2000
LOT 1 ON RP162096 FREEHOLD PAR WALLOON CO CHURCHILL	Mining	Y	28-NOV-2000
LOT 1 ON RP35706 FREEHOLD PAR WALLOON CO CHURCHILL	Mining	N	31-MAY-1985
LOT 1 ON RP35720 FREEHOLD PAR WALLOON CO CHURCHILL	Mining	Y	28-NOV-2000
LOT 1 ON RP35741 FREEHOLD PAR WALLOON CO CHURCHILL	Mining	Y	29-OCT-1999
LOT 1 ON RP70803 FREEHOLD PAR WALLOON CO CHURCHILL	Mining	N	31-MAY-1985
LOT 1 ON RP815460 FREEHOLD PAR WALLOON CO CHURCHILL	Mining	Y	28-NOV-2000
LOT 103 ON RP35720 FREEHOLD (BELOW DEPTH	Mining	N	22-OCT-1999

Tenure Id: ML 4584

LOT 2 ON RP35728 FREEHOLD (RAILWAY) PAR WALLOON CO CHURCHILL	Mining	Y	29-NOV-2000
LOT 2 ON RP35742 FREEHOLD PAR WALLOON CO CHURCHILL	Mining	N	31-MAY-1985
LOT 2 ON RP70803 FREEHOLD PAR WALLOON CO CHURCHILL	Mining	N	22-OCT-1997
LOT 24 ON CP827306 LANDS LEASE (RAILWAY) PAR WALLOON CO CHURCHILL	Mining	Y	29-NOV-2000
LOT 26 ON CP827306 LANDS LEASE (RAILWAY) PAR WALLOON CO CHURCHILL	Mining	Y	29-NOV-2000
LOT 27 ON CP827078 LANDS LEASE (RAILWAY) PAR WALLOON CO CHURCHILL	Mining	Y	29-NOV-2000
LOT 27 ON SP103139 FREEHOLD (RAILWAY) PAR WALLOON CO CHURCHILL	Mining	Y	29-NOV-2000
LOT 28 ON CP827078 LANDS LEASE (RAILWAY) PAR WALLOON CO CHURCHILL	Mining	Y	29-NOV-2000
LOT 28 ON SP103139 LANDS LEASE (RAILWAY) PAR WALLOON CO CHURCHILL	Mining	Y	29-NOV-2000
LOT 29 ON SP103139 FREEHOLD (RAILWAY) PAR WALLOON CO CHURCHILL	Mining	Y	29-NOV-2000
LOT 3 ON CC2422 FREEHOLD PAR WALLOON CO CHURCHILL	Mining	Y	28-NOV-2000
LOT 3 ON CC628 FREEHOLD PAR WALLOON CO CHURCHILL	Mining	Y	28-NOV-2000
LOT 3 ON RP35720 FREEHOLD PAR WALLOON CO CHURCHILL	Mining	Y	28-NOV-2000
LOT 31 ON RP234441 FREEHOLD (BELOW DEPTH PLAN) PAR WALLOON CO CHURCHILL	Mining	Y	28-NOV-2000
LOT 4 ON RP219991 FREEHOLD (BELOW DEPTH PLAN) PAR WALLOON CO CHURCHILL	Mining	Y	28-NOV-2000
LOT 41 ON RP219994 FREEHOLD (BELOW DEPTH PLAN) PAR WALLOON CO CHURCHILL	Mining	N	22-OCT-1997
LOT 46 ON RP900073 FREEHOLD PAR WALLOON CO CHURCHILL	Mining	Y	29-OCT-1999
LOT 5 ON RP219991 FREEHOLD (BELOW DEPTH PLAN) PAR WALLOON CO CHURCHILL	Mining	Y	28-NOV-2000
LOT 5 ON RP220231 FREEHOLD PAR WALLOON CO CHURCHILL	Mining	Y	29-OCT-1999
LOT 6 ON RP219990 FREEHOLD (BELOW DEPTH PLAN) PAR WALLOON CO CHURCHILL	Mining	Y	28-NOV-2000
LOT 608 ON CC3056 RAILWAY RESERVE R831 PAR WALLOON CO CHURCHILL	Mining	Y	16-MAY-2001
LOT 7 ON RP219990 FREEHOLD (BELOW DEPTH PLAN) PAR WALLOON CO CHURCHILL	Mining	Y	28-NOV-2000
ROAD RESERVE (OAKLEIGH COLLIERY ROAD)	Mining	Y	06-FEB-2001
LOT 1 ON RP129879 FREEHOLD PAR WALLOON CO CHURCHILL	Mining	Y	28-NOV-2000

Dealing Name	Dealing Number	Action Initiated	Expected Completion	Actual Completion

Tenure Id: ML 4584

Dealing Name	Dealing Number	Action Initiated	Expected Completion	Actual Completion
ADDITIONAL SURFACE AREA APPLN	0	26-JUN-1981	21-AUG-1985	04-JUL-1985
Remarks: AREA OF 32.40 HA.				
MORTGAGE OF INTEREST HELD	900098	16-JAN-1990	25-JAN-1990	10-AUG-1990
Remarks: Mortgage of OAKLEIGH COLLIERY PTY LTD interest to STANDARD CHARTERED BANK AUSTRALIA LIMITED				
MORTGAGE OF INTEREST HELD	935087	14-OCT-1993	26-OCT-1993	20-OCT-1993
Remarks: 100% MORTGAGED-MORTGAGEE NATIONAL AUSTRALIA BANK LIMITED C/-CLARKE AND KANN LAWYERS CML BUILDING POST OFFICE SQUARE BRISBANE QLD 4000				
RELEASE OF MORTGAGE	900098	20-OCT-1993	20-OCT-1993	20-OCT-1993
RELEASE OF MORTGAGE	935087	24-OCT-1997	24-OCT-1997	24-OCT-1997
ADDITIONAL SURFACE AREA APPLN	0	31-MAY-2000	30-JUL-2001	06-SEP-2001
Remarks: AREA OF 49.69 HA. COMPLIES WITH THE PROVISIONS OF THE MINERAL RESOURCES ACT. EPA CRITERIA ASSESSMENT COMPLETED 14-DEC-2000.				
INITIAL DEVELOPMENT PLAN	1006505	13-FEB-2006	31-DEC-2007	22-APR-2009
Remarks: DEVELOPMENT PLAN LODGED BY NEW HOPE COLLIERIES FOR PROJECTS - NEW OAKLEIGH (PJ50063), NORTH IPSWICH/KHOLO (PJ50062), JEEBROPILLY (PJ50060),				

Sub-Tenures

Tenure Type & Number	Date Lodged	Date Granted	Area

Tenure Id: ML 4675

District: BRISBANE
Previous Id: ML776IPSW
Name of Lease: OAKLEIGH 4
Status: GRANTED
Sub-Status: RENEWAL LODGED
Native Title Category: EXCLUSIVE LAND
Native Title Sub Category:

Pre-requisite Tenure Ids
PERMITS TO ENTER 94/79 & 95/79
Tenancy Type: Tenancy In Common

Principal Holder

NEW OAKLEIGH COAL PTY LTD
PO BOX 47
IPSWICH QLD
4305

Holder Names	Share %	Status	Deal In	Date Appv	Deal Out
NEW OAKLEIGH COAL PTY LTD	100.000000000000	Current	992001	29-OCT-1999	
SCM BRISBANE PTY LTD	100.000000000000	Former	975043	24-OCT-1997	992001
OAKLEIGH COLLIERY PTY LTD	100.000000000000	Former	0	01-NOV-1979	975043

Marked Out Date and Time: 01-NOV-1979 6:30 AM
Lodged Date and Time: 01-NOV-1979 2:45 PM
Term Sought: 21 years
Certificate of Application Issued: 04-AUG-1980

Situated Within at Date Lodged
AUTHORITY TO PROSPECT FOR COAL 220

Area: 63.47 Ha
Surface Area: 1.251 Ha

Local Authorities

IPSWICH

Minerals / Purpose

COAL

Locality

PAR WALLOON CO CHURCHILL

Date of Grant: 29-OCT-1981

Act Granted Under: MINING ACT 1968-1980

Tenure Id: ML 4675

Plan Number	Previous Plan Number	Volume	Folio

General Remarks

LEASE RENEWED FOR A TERM OF FIVE (5) YEARS.

Renewal Processes

Notice Issued: 04-DEC-2006
Lodged: 28-SEP-2007
Approved:

Term History

Commenced	Expiry	Years
01-NOV-1981	31-OCT-2002	21
01-NOV-2002	31-OCT-2007	5

Background Tenures	Land Usage	Compensation Required	Finalised
LOT 1 ON SP140742 FREEHOLD PAR WALLOON CO CHURCHILL	Mining	N	13-NOV-2002
ROAD RESERVE (UNNAMED)	Mining	N	01-NOV-1979
LOT 2 ON SP140742 FREEHOLD PAR WALLOON CO CHURCHILL	Mining	N	13-NOV-2002
LOT 2 ON RP35719 FREEHOLD PAR WALLOON CO CHURCHILL	Mining	Y	22-MAR-2004

Dealing Name	Dealing Number	Action Initiated	Expected Completion	Actual Completion
MORTGAGE OF INTEREST HELD	900098	16-JAN-1990	25-JAN-1990	10-AUG-1990
Remarks: Mortgage of OAKLEIGH COLLIERY PTY LTD interest to STANDARD CHARTERED BANK AUSTRALIA LIMITED				
MORTGAGE OF INTEREST HELD	935087	14-OCT-1993	26-OCT-1993	20-OCT-1993
Remarks: 100% MORTGAGED-MORTGAGEE NATIONAL AUSTRALIA BANK LIMITED C/-CLARKE AND KANN LAWYERS CML BUILDING POST OFFICE SQUARE BRISBANE QLD 4000				
RELEASE OF MORTGAGE	900098	20-OCT-1993	20-OCT-1993	20-OCT-1993
RELEASE OF MORTGAGE	935087	24-OCT-1997	24-OCT-1997	24-OCT-1997
INITIAL DEVELOPMENT PLAN	1006505	13-FEB-2006	31-DEC-2007	22-APR-2009
Remarks: DEVELOPMENT PLAN LODGED BY NEW HOPE COLLIERIES FOR PROJECTS - NEW OAKLEIGH (PJ50063), NORTH IPSWICH/KHOLO (PJ50062), JEEBROPILLY (PJ50060),				
LATER DEVELOPMENT PLAN	0	10-OCT-2007	05-DEC-2007	22-APR-2009
Remarks: LATER DEVELOPMENT PLAN REQUESTED ON 10-10-07. WITH TAS 30-NOV-2008				

Sub-Tenures

Tenure Type & Number	Date Lodged	Date Granted	Area

Tenure Id: ML 4683

District: BRISBANE
Previous Id: ML787IPSW
Name of Lease: OAKLEIGH NO 5
Status: GRANTED
Sub-Status: RENEWAL LODGED

Native Title Category: EXCLUSIVE LAND
Native Title Sub Category:

Pre-requisite Tenure Ids

-

Tenancy Type: Tenancy In Common

Principal Holder

NEW OAKLEIGH COAL PTY LTD
PO BOX 47
IPSWICH QLD
4305

Holder Names	Share %	Status	Deal In	Date Appv	Deal Out
NEW OAKLEIGH COAL PTY LTD	100.000000000000	Current	992002	29-OCT-1999	
SCM BRISBANE PTY LTD	100.000000000000	Former	975044	24-OCT-1997	992002
OAKLEIGH COLLIERY PTY LTD	100.000000000000	Former	0	29-OCT-1980	975044

Marked Out Date and Time: 29-OCT-1980 07:00 AM
Lodged Date and Time: 29-OCT-1980 11:45 AM
Term Sought: 21 years
Certificate of Application Issued: 10-MAR-1981

Situated Within at Date Lodged

AP 220C

Area: 173.46 Ha
Surface Area: 37.479 Ha

Local Authorities

IPSWICH

Minerals / Purpose

COAL

Locality

PAR WALLOON CO CHURCHILL

Date of Grant: 27-FEB-1986

Act Granted Under: MINING ACT 1968-1983

Tenure Id: ML 4683

Plan Number	Previous Plan Number	Volume	Folio

General Remarks

Renewal Processes

Notice Issued: 01-MAR-2006
Lodged: 28-AUG-2006
Approved:

Term History

Commenced	Expiry	Years
01-MAR-1986	28-FEB-2007	21

Background Tenures

Background Tenures	Land Usage	Compensation Required	Finalised
LOT 1 ON RP35716 FREEHOLD	Mining	N	17-JUN-1982
LOT 1 ON RP35895 FREEHOLD	Mining	N	17-JUN-1982
LOT 2 ON CC2737 FREEHOLD	Mining	N	17-JUN-1982
LOT 7 ON SP160438 FREEHOLD	Mining	N	17-JUN-1982
LOT 526 ON CH31539 FREEHOLD	Mining	N	17-JUN-1982
LOT 537 ON SP160438 FREEHOLD	Mining	N	17-JUN-1982
LOT 615 ON CH31736 FREEHOLD	Mining	N	17-JUN-1982
LOT 2 ON RP35716 FREEHOLD (SA)	Mining	Y	29-OCT-1999

Dealing Name	Dealing Number	Action Initiated	Expected Completion	Actual Completion
MORTGAGE OF INTEREST HELD	900098	16-JAN-1990	25-JAN-1990	10-AUG-1990
Remarks: Mortgage of OAKLEIGH COLLIERY PTY LTD interest to STANDARD CHARTERED BANK AUSTRALIA LIMITED				
MORTGAGE OF INTEREST HELD	935087	14-OCT-1993	26-OCT-1993	20-OCT-1993
Remarks: 100% MORTGAGED-MORTGAGEE NATIONAL AUSTRALIA BANK LIMITED C/-CLARKE AND KANN LAWYERS CML BUILDING POST OFFICE SQUARE BRISBANE QLD 4000				
RELEASE OF MORTGAGE	900098	20-OCT-1993	20-OCT-1993	20-OCT-1993
RELEASE OF MORTGAGE	935087	24-OCT-1997	24-OCT-1997	24-OCT-1997
INITIAL DEVELOPMENT PLAN	1006505	13-FEB-2006	31-DEC-2007	22-APR-2009
Remarks: DEVELOPMENT PLAN LODGED BY NEW HOPE COLLIERIES FOR PROJECTS - NEW OAKLEIGH (PJ50063), NORTH IPSWICH/KHOLO (PJ50062), JEEBROPILLY (PJ50060),				

Sub-Tenures

Tenure Type & Number	Date Lodged	Date Granted	Area

Tenure Id: ML 4698

District: BRISBANE
Previous Id: ML856IPSW
Name of Lease: OAKLEIGH WEST
Status: GRANTED
Sub-Status: RENEWAL LODGED
Native Title Category: EXCLUSIVE LAND
Native Title Sub Category:

Pre-requisite Tenure Ids

-

Principal Holder

NEW OAKLEIGH COAL PTY LTD
PO BOX 47
IPSWICH QLD
4305

Holder Names	***Share %***	***Status***	***Deal In***	***Date Appv***	***Deal Out***
NEW OAKLEIGH COAL PTY LTD	100.000000000000	Current	992004	29-OCT-1999	
SCM BRISBANE PTY LTD	100.000000000000	Former	975045	24-OCT-1997	992004
OAKLEIGH COLLIERY PTY LTD	100.000000000000	Former	0	09-JUL-1982	975045

Marked Out Date and Time: 09-JUL-1982 07:00 AM
Lodged Date and Time: 09-JUL-1982 10:48 AM
Term Sought: 21 years
Certificate of Application Issued: 19-JUL-1984

Situated Within at Date Lodged

-

Area: 189.3 Ha
Surface Area: 117.64 Ha

Local Authorities

IPSWICH

Minerals / Purpose

COAL

Locality

PAR WALLOON CO CHURCHILL

Date of Grant: 27-NOV-1986

Act Granted Under: MINING ACT 1968-1986

Tenure Id: ML 4698

Plan Number	Previous Plan Number	Volume	Folio

General Remarks

ACCESS THROUGH ML 387 (IPSWICH) INITIALLY - SURFACE AREA OF 83.69 HECTARES GRANTED 19 AUGUST 1999.

Renewal Processes

Notice Issued: 04-DEC-2006
Lodged: 30-MAY-2007
Approved:

Term History

Commenced	Expiry	Years
01-DEC-1986	30-NOV-2007	21

Background Tenures	Land Usage	Compensation Required	Finalised
LOT 1 ON CC2372 FREEHOLD PAR WALLOON CO CHURCHILL	Mining	N	22-OCT-1997
UNNAMED ROAD RESERVE (ADJACENT CABANDA RAILWAY STATION)	Mining	Y	05-FEB-2001
LOT 1 ON RP112647 FREEHOLD PAR WALLOON CO CHURCHILL	Mining	Y	28-NOV-2000
LOT 1 ON RP202576 FREEHOLD PAR WALLOON CO CHURCHILL	Mining	Y	28-NOV-2000
LOT 1 ON RP35744 FREEHOLD PAR WALLOON CO CHURCHILL	Mining	N	22-OCT-1997
LOT 1 ON RP893629 FREEHOLD PAR WALLOON CO CHURCHILL	Mining	N	22-OCT-1997
LOT 12 ON RP35724 FREEHOLD PAR WALLOON CO CHURCHILL	Mining	Y	28-NOV-2000
LOT 2 ON CC2260 FREEHOLD PAR WALLOON CO CHURCHILL	Mining	Y	28-NOV-2000
LOT 2 ON RP113254 FREEHOLD PAR WALLOON CO CHURCHILL	Mining	N	22-OCT-1997
LOT 2 ON RP136368 FREEHOLD PAR WALLOON CO CHURCHILL	Mining	N	22-OCT-1997
LOT 2 ON RP202576 FREEHOLD PAR WALLOON CO CHURCHILL	Mining	N	22-OCT-1997
LOT 2 ON RP35724 FREEHOLD PAR WALLOON CO CHURCHILL	Mining	Y	28-NOV-2000
LOT 2 ON RP35744 FREEHOLD PAR WALLOON CO CHURCHILL	Mining	N	30-NOV-2000
LOT 2 ON RP35745 FREEHOLD PAR WALLOON CO CHURCHILL	Mining	N	30-NOV-2000
LOT 2 ON RP35778 FREEHOLD PAR WALLOON CO CHURCHILL	Mining	N	22-OCT-1997
LOT 2 ON RP35849 FREEHOLD PAR WALLOON CO CHURCHILL	Mining	N	30-NOV-2000
LOT 20 ON RP210772 FREEHOLD PAR WALLOON CO	Mining	Y	28-NOV-2000

Tenure Id: ML 4698

LOT 3 ON RP35777 FREEHOLD PAR WALLOON CO CHURCHILL	Mining	N	22-OCT-1997
LOT 3 ON RP35849 FREEHOLD PAR WALLOON CO CHURCHILL	Mining	Y	03-NOV-2000
LOT 4 ON RP893629 FREEHOLD PAR WALLOON CO CHURCHILL	Mining	Y	29-OCT-1999
LOT 674 ON CH31976 FREEHOLD PAR WALLOON CO CHURCHILL	Mining	N	22-OCT-1997
ROAD RESERVE (ROSEWOOD-MARBURG ROAD)	Mining	Y	08-MAR-2001
LOT 1 ON RP112278 FREEHOLD PAR WALLOON CO CHURCHILL	Mining	N	22-OCT-1997

Dealing Name	Dealing Number	Action Initiated	Expected Completion	Actual Completion
MORTGAGE OF INTEREST HELD	900098	16-JAN-1990	25-JAN-1990	10-AUG-1990
Remarks: Mortgage of OAKLEIGH COLLIERY PTY LTD interest to STANDARD CHARTERED BANK AUSTRALIA LIMITED				
MORTGAGE OF INTEREST HELD	935087	14-OCT-1993	26-OCT-1993	20-OCT-1993
Remarks: 100% MORTGAGED-MORTGAGEE NATIONAL AUSTRALIA BANK LIMITED C/-CLARKE AND KANN LAWYERS CML BUILDING POST OFFICE SQUARE BRISBANE QLD 4000				
RELEASE OF MORTGAGE	900098	20-OCT-1993	20-OCT-1993	20-OCT-1993
RELEASE OF MORTGAGE	935087	24-OCT-1997	24-OCT-1997	24-OCT-1997
ADDITIONAL SURFACE AREA APPLN	0	06-NOV-1998	05-FEB-1999	19-AUG-1999
Remarks: AREA OF 83.69 HA (EXCLUDING RESTRICTED LAND) GRANTED 19 AUGUST 1999.				
ADDITIONAL SURFACE AREA APPLN	0	31-MAY-2000	10-MAR-2001	30-NOV-2000
Remarks: AREA OF 13.95 HA GRANTED 30 NOVEMBER 2000.				
ADDITIONAL SURFACE AREA APPLN	0	31-MAY-2000	30-NOV-2001	08-NOV-2001
Remarks: AREA OF 20 HA.				
PARTIAL SURRENDER OF AREA	0	13-FEB-2001	10-APR-2001	21-AUG-2003
Remarks: CONDITIONAL SURRENDER OF PART OF MINING LEASE IN FAVOR OF MINING LEASE NUMBER 50175.				
INITIAL DEVELOPMENT PLAN	1006505	13-FEB-2006	31-DEC-2007	22-APR-2009
Remarks: DEVELOPMENT PLAN LODGED BY NEW HOPE COLLIERIES FOR PROJECTS - NEW OAKLEIGH (PJ50063), NORTH IPSWICH/KHOLO (PJ50062), JEEBROPILLY (PJ50060),				

Sub-Tenures

Tenure Type & Number	Date Lodged	Date Granted	Area

Tenure Id: ML 4699

District: BRISBANE
Previous Id: ML857IPSW
Name of Lease: OAKLEIGH EAST
Status: GRANTED
Sub-Status: RENEWAL LODGED
Native Title Category: EXCLUSIVE LAND
Native Title Sub Category:

Pre-requisite Tenure Ids

-

Tenancy Type: Tenancy In Common

Principal Holder

NEW OAKLEIGH COAL PTY LTD
PO BOX 47
IPSWICH QLD
4305

Holder Names	Share %	Status	Deal In	Date Appv	Deal Out
NEW OAKLEIGH COAL PTY LTD	100.000000000000	Current	992005	29-OCT-1999	
SCM BRISBANE PTY LTD	100.000000000000	Former	975046	24-OCT-1997	992005
OAKLEIGH COLLIERY PTY LTD	100.000000000000	Former	0	09-JUL-1982	975046

Marked Out Date and Time: 09-JUL-1982 08:00 AM
Lodged Date and Time: 09-JUL-1982 10:54 AM
Term Sought: 21 years
Certificate of Application Issued: 29-SEP-1983

Situated Within at Date Lodged

-

Area: 129.75 Ha
Surface Area: 0 Ha

Local Authorities

IPSWICH

Minerals / Purpose

COAL

Locality

ROSEWOOD

Date of Grant: 09-AUG-1984

Act Granted Under: MINING ACT 1968-1983

Tenure Id: ML 4699

Plan Number	Previous Plan Number	Volume	Folio

General Remarks

ACCESS THROUGH ML 4568

Renewal Processes

Notice Issued:
Lodged: 29-JUN-2005
Approved:

Term History

Commenced	Expiry	Years
01-SEP-1984	31-AUG-2005	21

Background Tenures	Land Usage	Compensation Required	Finalised
LOT 2 ON RP35707 FREEHOLD	Mining	N	22-OCT-1997
LOT 2 ON RP839880 FREEHOLD	Mining	N	22-OCT-1997
LOT 3 ON RP839880 FREEHOLD	Mining	N	22-OCT-1997
ROAD RESERVE (LANGDON ROAD)	Mining	N	22-OCT-1997
LOT 39 ON RP213735 FREEHOLD	Mining	N	22-OCT-1997
LOT 451 ON CH31411 FREEHOLD	Mining	N	22-OCT-1997
LOT 36 ON RP213735 FREEHOLD	Mining	N	22-OCT-1997

Dealing Name	Dealing Number	Action Initiated	Expected Completion	Actual Completion
MORTGAGE OF INTEREST HELD	900098	16-JAN-1990	25-JAN-1990	10-AUG-1990
Remarks: Mortgage of OAKLEIGH COLLIERY PTY LTD interest to STANDARD CHARTERED BANK AUSTRALIA LIMITED				
MORTGAGE OF INTEREST HELD	935087	14-OCT-1993	26-OCT-1993	20-OCT-1993
Remarks: 100% MORTGAGED-MORTGAGEE NATIONAL AUSTRALIA BANK LIMITED C/-CLARKE AND KANN LAWYERS CML BUILDING POST OFFICE SQUARE BRISBANE QLD 4000				
RELEASE OF MORTGAGE	900098	20-OCT-1993	20-OCT-1993	20-OCT-1993
RELEASE OF MORTGAGE	935087	24-OCT-1997	24-OCT-1997	24-OCT-1997
INITIAL DEVELOPMENT PLAN	1006505	13-FEB-2006	31-DEC-2007	22-APR-2009
Remarks: DEVELOPMENT PLAN LODGED BY NEW HOPE COLLIERIES FOR PROJECTS - NEW OAKLEIGH (PJ50063), NORTH IPSWICH/KHOLO (PJ50062), JEEBROPILLY (PJ50060),				

Sub-Tenures

Tenure Type & Number	Date Lodged	Date Granted	Area

Tenure Id: ML 50175

District: BRISBANE

Previous Id:

Name of Lease: OAKLEIGH WEST

Status: GRANTED

Sub-Status:

Native Title Category: EXCLUSIVE LAND

Native Title Sub Category:

Pre-requisite Tenure Ids

PP50596, PP50601, EPC 642

Tenancy Type: Tenancy In Common

Principal Holder

NEW OAKLEIGH COAL PTY LTD
17 LOWRY STREET
IPSWICH
QLD 4305

Holder Names	Share %	Status	Deal In	Date Appv	Deal Out
NEW OAKLEIGH COAL PTY LTD	100.000000000000	Current	0	13-FEB-2001	

Marked Out Date and Time: 08-FEB-2001 03:00 PM

Lodged Date and Time: 13-FEB-2001 02:30 PM

Term Sought: 10 years

Certificate of Application Issued: 13-FEB-2001

Situated Within at Date Lodged

Area: 85.45 Ha

Surface Area: 85.45 Ha

Local Authorities

IPSWICH

Minerals / Purpose

COAL

Locality

2 KILOMETRES NORTH WEST OF ROSEWOOD

Date of Grant: 21-AUG-2003

Act Granted Under: MINERAL RESOURCES ACT 1989

Tenure Id: ML 50175

Plan Number	Previous Plan Number	Volume	Folio

General Remarks

Renewal Processes

Notice Issued:
Lodged:
Approved:

Term History

Commenced	Expiry	Years
01-OCT-2003	30-SEP-2013	10

Background Tenures	Land Usage	Compensation Required	Finalised
LOT 1 ON RP151350 FREEHOLD PAR WALLOON CO CHURCHILL	Mining	Y	04-FEB-2003
LOT 1 ON RP203566 FREEHOLD PAR WALLOON CO CHURCHILL	Mining	Y	04-FEB-2003
LOT 2 ON RP213689 FREEHOLD PAR WALLOON CO CHURCHILL	Mining	Y	04-FEB-2003
LOT 2 ON RP35748 FREEHOLD PAR WALLOON CO CHURCHILL	Mining	Y	04-FEB-2003
LOT 22 ON RP904565 FREEHOLD PAR WALLOON CO CHURCHILL	Mining	Y	04-FEB-2003
LOT 9 ON RP35934 FREEHOLD PAR WALLOON CO CHURCHILL	Mining	Y	04-FEB-2003
LOT 3 ON RP200369 FREEHOLD PAR WALLOON CO CHURCHILL	Mining	Y	04-FEB-2003
LOT 3 ON RP35867 FREEHOLD PAR WALLOON CO CHURCHILL	Mining	Y	04-FEB-2003
LOT 3 ON RP804740 FREEHOLD PAR WALLOON CO CHURCHILL	Mining	Y	04-FEB-2003
LOT 5 ON RP893629 FREEHOLD PAR WALLOON CO CHURCHILL	Mining	Y	04-FEB-2003
LOT 23 ON RP904565 FREEHOLD PAR WALLOON CO CHURCHILL	Mining	Y	04-FEB-2003

Dealing Name	Dealing Number	Action Initiated	Expected Completion	Actual Completion
INITIAL DEVELOPMENT PLAN	1006505	13-FEB-2006	31-DEC-2007	22-APR-2009

Remarks: DEVELOPMENT PLAN LODGED BY NEW HOPE COLLIERIES FOR PROJECTS - NEW OAKLEIGH (PJ50063), NORTH IPSWICH/KHOLO (PJ50062), JEEBROPILLY (PJ50060), 20 DAYS LETTER SENT, 13/03/2009

Sub-Tenures

Tenure Type & Number	Date Lodged	Date Granted	Area

Tenure Id: MDL 351

District: BRISBANE
Previous Id:
Name of Licence: MALABAR
Status: GRANTED
Sub-Status: RENEWAL LODGED

Native Title Category: EXCLUSIVE LAND
Native Title Sub Category:

Pre-requisite Tenure Ids

MINISTERIAL APPROVAL GIVEN 14/8/03 FOR NO PRE-REQUISITE TENURE

Tenancy Type: Tenancy In Common

Principal Holder

NEW HOPE COLLIERIES PTY LTD
PO BOX 47

IPSWICH
QLD 4305

Holder Names	Share %	Status	Deal In	Date Appv	Deal Out
NEW HOPE COLLIERIES PTY LTD	100.000000000000	Current	0	15-AUG-2003	

Lodged Date and Time: 15-AUG-2003 03:00 PM
Term Sought: 5 years

Situated Within at Date Lodged

-

Area: 251.309 Ha
Plan Number:

Local Authorities

IPSWICH

Minerals / Purpose

COAL

Locality

200 KM WEST OF IPSWICH

Date of Grant: 06-FEB-2004
Act Granted Under: MINERAL RESOURCES ACT 1989

Date Certificated of Grant Issued: 25-FEB-2004

Tenure Id: MDL 351

Volume **Folio**

General Remarks

Renewal Processes

Notice Issued: 03-MAR-2008
Lodged: 25-FEB-2009
Approved:

Term History

Commenced	Expiry	Years
01-MAR-2004	28-FEB-2009	5

Background Tenures	Land Usage
LOT 1 ON CC1423 PAR WALLOON CO CHURCHILL	Development
ROAD RESERVE PAR WALLOON CO CHURCHILL	Development
LOT 1 ON RP35896 PAR WALLOON CO CHURCHILL	Development
LOT 1 ON RP73497 PAR WALLOON CO CHURCHILL	Development
LOT 1 ON RP80034 PAR WALLOON CO CHURCHILL	Development
LOT 1 ON RP99529 PAR WALLOON CO CHURCHILL	Development
LOT 12 ON RP880140 PAR WALLOON CO CHURCHILL	Development
LOT 2 ON CC2645 PAR WALLOON CO CHURCHILL	Development
LOT 2 ON RP223472 PAR WALLOON CO CHURCHILL	Development
LOT 2 ON RP35896 PAR WALLOON CO CHURCHILL	Development
LOT 3 ON RP880140 PAR WALLOON CO CHURCHILL	Development
LOT 4 ON RP35735 PAR WALLOON CO CHURCHILL	Development
LOT 4 ON RP35896 PAR WALLOON CO CHURCHILL	Development
LOT 4 ON RP857300 PAR WALLOON CO CHURCHILL	Development
LOT 456 ON RP857300 PAR WALLOON CO CHURCHILL	Development
LOT 456 ON RP880140 PAR WALLOON CO CHURCHILL	Development
LOT 593 ON CH31694 PAR WALLOON CO CHURCHILL	Development
LOT 603 ON CH31618 PAR WALLOON CO CHURCHILL	Development
ROAD LICENCE 3148 PAR WALLOON CO CHURCHILL	Development
LOT 1 ON RP120177 PAR WALLOON CO CHURCHILL	Development

Dealing Name	Dealing Number	Action Initiated	Expected Completion	Actual Completion
SPECIAL CONDITIONS	0	02-DEC-2003	30-DEC-2003	02-DEC-2003
Remarks: GENERAL WORK PROGRAM - STANDARD CONDITIONS				
SPECIAL CONDITIONS	0	25-FEB-2009	25-DEC-2009	

Tenure Id: MDL 351

Sub-Tenures

Tenure Type & Number	Date Lodged	Date Granted	Area

Tenure Id: MDL 357

District: BRISBANE
Previous Id:
Name of Licence: KUNKALA
Status: GRANTED
Sub-Status: RENEWAL LODGED

Native Title Category: EXCLUSIVE LAND
Native Title Sub Category:

Pre-requisite Tenure Ids
EPC642, EPC860, MDL350

Tenancy Type: Tenancy In Common

Principal Holder
NEW HOPE COLLIERIES PTY LTD
PO BOX 47
IPSWICH
QLD 4305

Holder Names	Share %	Status	Deal In	Date Appv	Deal Out
NEW OAKLEIGH COAL PTY LTD	50.000000000000	Current	0	07-MAY-2004	
NEW HOPE COLLIERIES PTY LTD	50.000000000000	Current	0	07-MAY-2004	

Lodged Date and Time: 07-MAY-2004 12:10 PM
Term Sought: 5 years

Situated Within at Date Lodged

Area: 1274.2938 Ha
Plan Number:

Local Authorities
IPSWICH

Minerals / Purpose
COAL

Locality
18 KILOMETRES WEST OF IPSWICH

Date of Grant: 25-AUG-2005
Act Granted Under: MINERAL RESOURCES ACT 1989

Tenure Id: MDL 357

Volume **Folio**

General Remarks

Renewal Processes

Notice Issued: 02-SEP-2009
Lodged: 18-MAY-2010
Approved:

Term History

Commenced	Expiry	Years
01-SEP-2005	31-AUG-2010	5

Background Tenures

REFER TO APPLICATION

Land Usage

Development

Dealing Name	Dealing Number	Action Initiated	Expected Completion	Actual Completion
SPECIAL CONDITIONS	0	15-AUG-2005	12-SEP-2005	15-AUG-2005
Remarks: INTENTION TO GRANT WITH ATTACHMENTS & SCHEDULE OF GENERAL EXCLUSIONS AND CONDITIONS VERSION 8 FORWARDED TO APPLICANT 15/08/05.				
SPECIAL CONDITIONS	0	25-AUG-2005	22-SEP-2005	25-AUG-2005
SPECIAL CONDITIONS	0	18-MAY-2010	15-OCT-2010	

Sub-Tenures

Tenure Type & Number	Date Lodged	Date Granted	Area

Appendix D

Historical Aerials

1:17,379 (at A3)

0 100 200 400 600 800 1,000

Metres

Map Projection: Universal Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD
CLIENTS | PEOPLE | PERFORMANCE

Film & Frame	Q890 / 15
Date	31/05/1959
Flying Ht	12,500' (3810m)
Photo Scale	1 : 25,000

New Hope Coal Australia
Hydrological Desktop Assessment,
New Oakleigh Mine Site, Rosewood, Queensland, 4340.

Job Number	41-24703
Revision	A
Date	30 Jan 2012

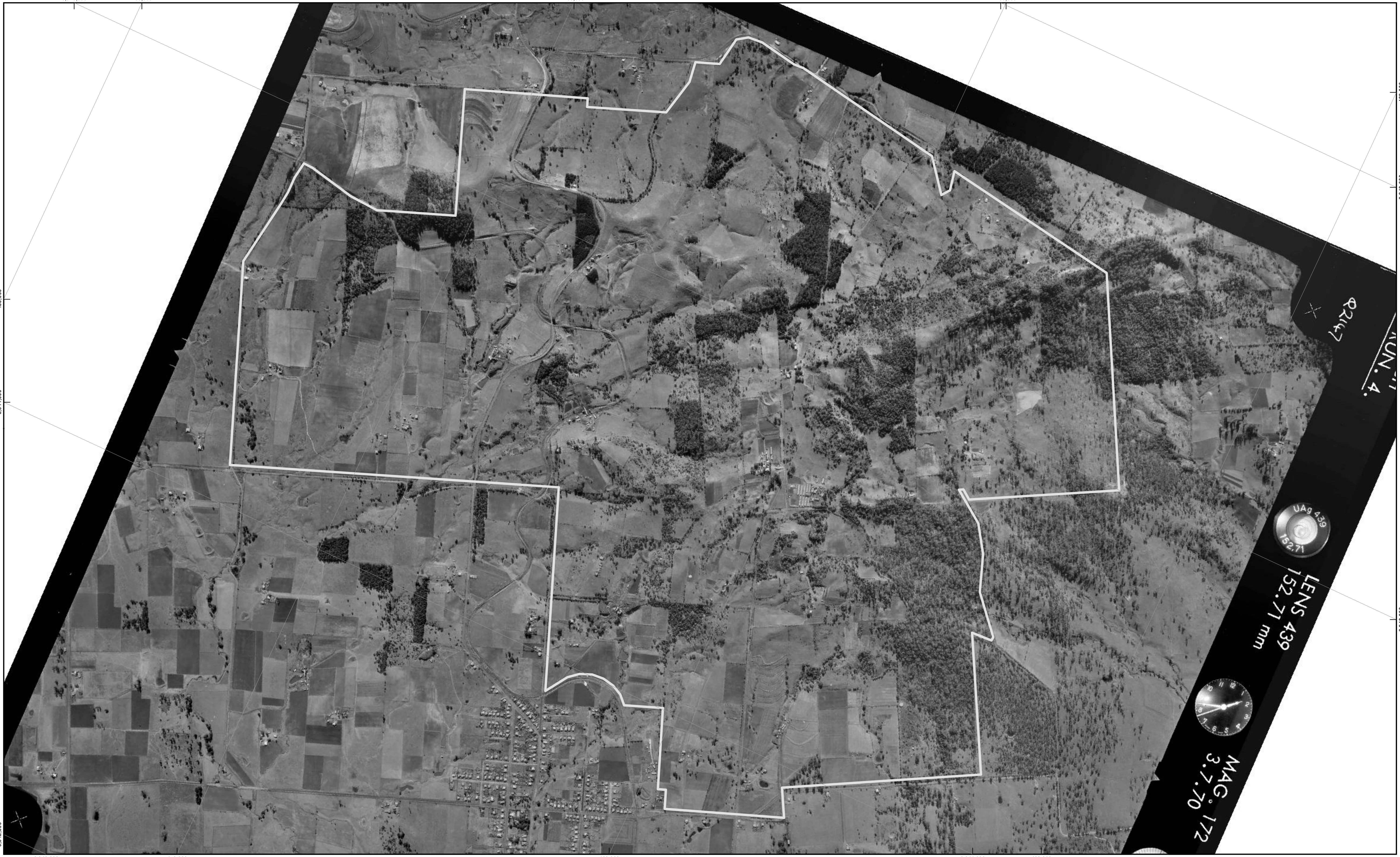
Historical Aerial - 1959

Figure A

G:\41\24703\GIS\Maps\PDFs_MXDs\41-24703-32_oakleighAerial1958_revA.mxd

Level 4, 201 Charlotte St Brisbane QLD 4000 T 61 7 3316 3000 F 61 7 3316 3333 E bnemail@ghd.com.au W www.ghd.com.au

Data source: DERM: cadastre, 2007 & Aerial Photography 1959. Created by: jvc



1:18,000 (at A3)

0 100 200 400 600 800 1,000

Metres

Map Projection: Universal Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

Film & Frame	Q2147 / 066
Date	3/07/1970
Flying Ht	12,380' (3773m)
Photo Scale	1 : 25,000

New Hope Coal Australia
Hydrological Desktop Assessment,
New Oakleigh Mine Site, Rosewood, Queensland, 4340.

Job Number 41-24703
Revision A
Date 30 Jan 2012

Historical Aerial - 1970

Figure B

Level 4, 201 Charlotte St Brisbane QLD 4000 T 61 7 3316 3000 F 61 7 3316 3333 E bnemail@ghd.com.au W www.ghd.com.au

G:\41\24703\GIS\Maps\PDFs_MXDs\41-24703-33_oakleighAerial1970_revA.mxd

Data source: DERM: cadastre, 2007 & Aerial Photography 1958. Created by: jvc

1:18,000 (at A3)

0 100 200 400 600 800 1,000

Metres

Map Projection: Universal Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

GHD
CLIENTS | PEOPLE | PERFORMANCE

Film & Frame	Q3605 / 3367
Date	21/08/1978
Flying Ht	3800m
Photo Scale	1 : 25,000

New Hope Coal Australia
Hydrological Desktop Assessment,
New Oakleigh Mine Site, Rosewood, Queensland, 4340.

Job Number	41-24703
Revision	A
Date	30 Jan 2012

Historical Aerial - 1978

Figure C

G:\41\24703\GIS\Maps\PDFs_MXDs\41-24703-34_oakleighAerial1978_revA.mxd

Level 4, 201 Charlotte St Brisbane QLD 4000 T 61 7 3316 3000 F 61 7 3316 3333 E bnemail@ghd.com.au W www.ghd.com.au

Data source: DERM: cadastre, 2007 & Aerial Photography 1978. Created by: jvc

1:18,000 (at A3)

0 100 200 400 600 800 1,000

Metres

Map Projection: Universal Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD
CLIENTS | PEOPLE | PERFORMANCE

Film & Frame	Q4019/138 & 139
Date	1/05/1982
Flying Ht	3950m
Photo Scale	1 : 25,000

New Hope Coal Australia
Hydrological Desktop Assessment,
New Oakleigh Mine Site, Rosewood, Queensland, 4340.

Job Number	41-24703
Revision	A
Date	30 Jan 2012

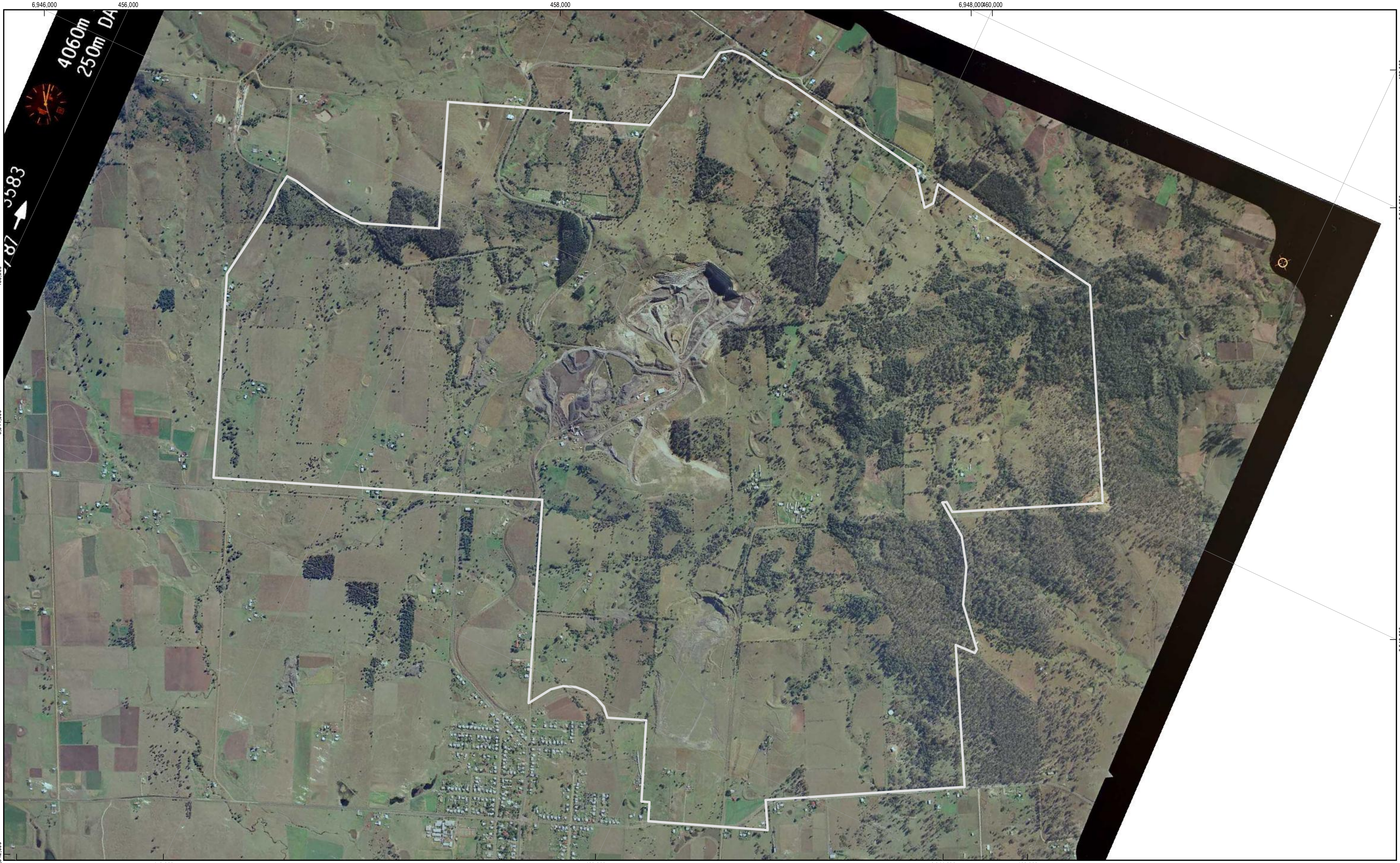
Historical Aerial - 1982

Figure D

Level 4, 201 Charlotte St Brisbane QLD 4000 T 61 7 3316 3000 F 61 7 3316 3333 E bnemail@ghd.com.au W www.ghd.com.au

G:\41\24703\GIS\Maps\PDFs_MXDs\41-24703-35_oakleighAerial1982_revA.mxd

Data source: DERM: cadastre, 2007 & Aerial Photography 1982. Created by: jvc



1:18,000 (at A3)

0 100 200 400 600 800 1,000

Metres

Map Projection: Universal Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

CLIENTS | PEOPLE | PERFORMANCE

Film & Frame	Qc4617 / 108
Date	26/06/1987
Flying Ht	4060m
Photo Scale	1 : 25,000

New Hope Coal Australia
Hydrological Desktop Assessment,
New Oakleigh Mine Site, Rosewood, Queensland, 4340.

Job Number 41-24703
Revision A
Date 30 Jan 2012

Historical Aerial - 1987

Figure E

G:\41\24703\GIS\Maps\PDFs_MXDs\41-24703-36_oakleighAerial1987_revA.mxd

Level 4, 201 Charlotte St Brisbane QLD 4000 T 61 7 3316 3000 F 61 7 3316 3333 E bnemail@ghd.com.au W www.ghd.com.au

Data source: DERM: cadastre, 2007 & Aerial Photography 1987. Created by: jvc

1:18,000 (at A3)

0 100 200 400 600 800 1,000

Metres

Map Projection: Universal Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

Film & Frame	Qc4856 / 061
Date	28/06/1990
Flying Ht	4130m
Photo Scale	1 : 25,000

GHD CLIENTS|PEOPLE|PERFORMANCE

New Hope Coal Australia
Hydrological Desktop Assessment,
New Oakleigh Mine Site, Rosewood, Queensland, 4340.

Job Number	41-24703
Revision	A
Date	30 Jan 2012

Historical Aerial - 1990

Figure F

G:\41\24703\GIS\Maps\PDFs_MXDs\41-24703-37_oakleighAerial1990_revA.mxd

Level 4, 201 Charlotte St Brisbane QLD 4000 T 61 7 3316 3000 F 61 7 3316 3333 E bnemail@ghd.com.au W www.ghd.com.au

Data source: DERM: cadastre, 2007 & Aerial Photography 1990. Created by: jvc

1:18,000 (at A3)

0 100 200 400 600 800 1,000

Metres

Map Projection: Universal Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

CLIENTS | PEOPLE | PERFORMANCE

Film & Frame	Qc4658/99 & 98
Date	9/08/1993
Flying Ht	4130m
Photo Scale	1 : 25,000

New Hope Coal Australia
Hydrological Desktop Assessment,
New Oakleigh Mine Site, Rosewood, Queensland, 4340.

Job Number 41-24703
Revision A
Date 30 Jan 2012

Historical Aerial - 1993

Figure G

G:\41\24703\GIS\Maps\PDFs_MXDs\41-24703-38_oakleighAerial1993_revA.mxd

Level 4, 201 Charlotte St Brisbane QLD 4000 T 61 7 3316 3000 F 61 7 3316 3333 E bnemail@ghd.com.au W www.ghd.com.au

Data source: DERM: cadastre, 2007 & Aerial Photography 1959. Created by: jvc

1:18,000 (at A3)

0 100 200 400 600 800 1,000

Metres

Map Projection: Universal Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD
CLIENTS | PEOPLE | PERFORMANCE

Film & Frame	QAP5582 / 026
Date	12/10/1997
Flying Ht	6,500m
Photo Scale	1 : 37,500

New Hope Coal Australia
Hydrological Desktop Assessment,
New Oakleigh Mine Site, Rosewood, Queensland, 4340.

Job Number 41-24703
Revision A
Date 08 Jun 2012

Historical Aerial - 1997

Figure H

Level 4, 201 Charlotte St Brisbane QLD 4000 T 61 7 3316 3000 F 61 7 3316 3333 E bnemail@ghd.com.au W www.ghd.com.au

G:\41\24703\GIS\Maps\PDFs_MXDs\41-24703-39_oakleighAerial1997_revA.mxd

Data source: DERM: cadastre, 2007 & Aerial Photography 1997. Created by: jvc

1:18,000 (at A3)

0 100 200 400 600 800 1,000

Metres

Map Projection: Universal Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

CLIENTS | PEOPLE | PERFORMANCE

Film & Frame	QAP6933 / 007
Date	11/03/2002
Flying Ht	4130m
Photo Scale	1 : 25,000

New Hope Coal Australia
Hydrological Desktop Assessment,
New Oakleigh Mine Site, Rosewood, Queensland, 4340.

Job Number	41-24703
Revision	A
Date	08 Jun 2012

Historical Aerial - 2002

Figure I

Level 4, 201 Charlotte St Brisbane QLD 4000 T 61 7 3316 3000 F 61 7 3316 3333 E bnemail@ghd.com.au W www.ghd.com.au

G:\41\24703\GIS\Maps\PDFs_MXDs\41-24703-40_oakleighAerial2002_revA.mxd

Data source: DERM: cadastre, 2007 & Aerial Photography 2002. Created by: jvc

1:18,000 (at A3)

0 100 200 400 600 800 1,000

Metres

Map Projection: Universal Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD
CLIENTS | PEOPLE | PERFORMANCE

New Hope Coal Australia
Hydrological Desktop Assessment,
New Oakleigh Mine Site, Rosewood, Queensland, 4340.

Job Number	41-24703
Revision	A
Date	08 Feb 2012

Historical Aerial Imagery - 2011

Figure J

Level 4, 201 Charlotte St Brisbane QLD 4000 T 61 7 3316 3000 F 61 7 3316 3333 E bnemail@ghd.com.au W www.ghd.com.au

G:\41\24703\GIS\Maps\PDFs_MXDs\41-24703-46_oakleighAerial2011_revA.mxd

Data source: DERM: cadastre, 2007. Client supplied data: aerial imagery 2011. Created by: jvc

Appendix E

Extracts from Previous Assessment Reports

New Oakleigh Mine - Information Sheet

Site History

Oakleigh is the oldest continuously operated coal mine in Queensland and is one of three remaining coal mines still operating in the Rosewood area of the West Moreton District. It commenced operation underground in approximately 1920 as Perry's Knob Colliery and changed its name to Oakleigh Colliery around 1929. Oakleigh was continuously worked by underground means until November 1997 when the underground mine was sealed as the remaining underground coal reserves could no longer be worked economically.

Oakleigh Colliery first commenced open cut operations in 1973 at the southeast corner of ML 4584 and progressed in a generally northern direction. This pit was developed to supplement underground operations and was known as the North Pit. The North Pit remained in operation until 1998.

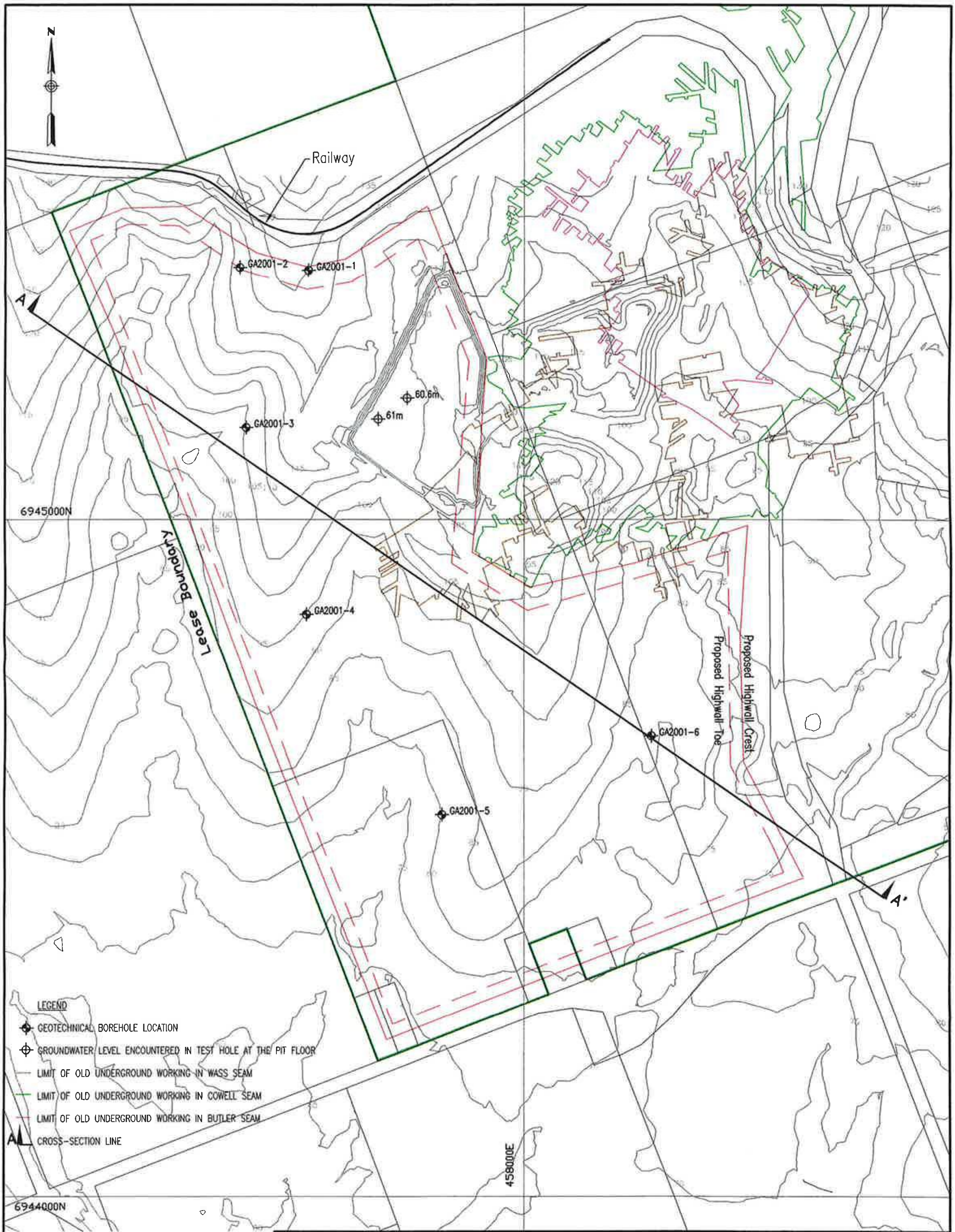
Normanton Collieries also started an open cut, the Normanton Pit, on the eastern side of Blake's Road in 1973. It was developed to supply coal to the now defunct power stations of Bulimba and Tennyson. Operations in the Normanton Pit moved westwards across Blake's Road and then northwards. The operation in this area ceased in about 1981.

In June 1997, mining recommenced at the Normanton Pit and continued until December 1999 when coal reserves could no longer be worked economically. The area is currently under rehabilitation. This operation was within 1 km of the town of Rosewood.

New Oakleigh Coal Pty Ltd, a subsidiary of New Hope Coal Australia, acquired the Mine in December 1999. In March 2000, New Oakleigh Coal Pty Ltd resumed mining in the North Pit. Coal mining in the North Pit ceased at the end of September 2000 when the remaining available coal reserves were mined out. This pit is now being used as an emplacement area for tailings and coarse reject disposal and will be progressively back filled over the life of the mine.

The initial box cut operations for the West Pit on ML 4698 commenced in May 2000 and coal mining commenced in September 2000. ROM (Run of Mine) coal is hauled from the West Pit by trucks via an approved road crossing over the Rosewood – Marburg Road to the existing washery located on ML 4584 for processing.

In September 2001, in-pit dumping of overburden commenced allowing initial rehabilitation works (profiling and top soiling) to commence on the out-of-pit dump. Advanced rehabilitation works (revegetation with grass and tree species) commenced in late 2001.

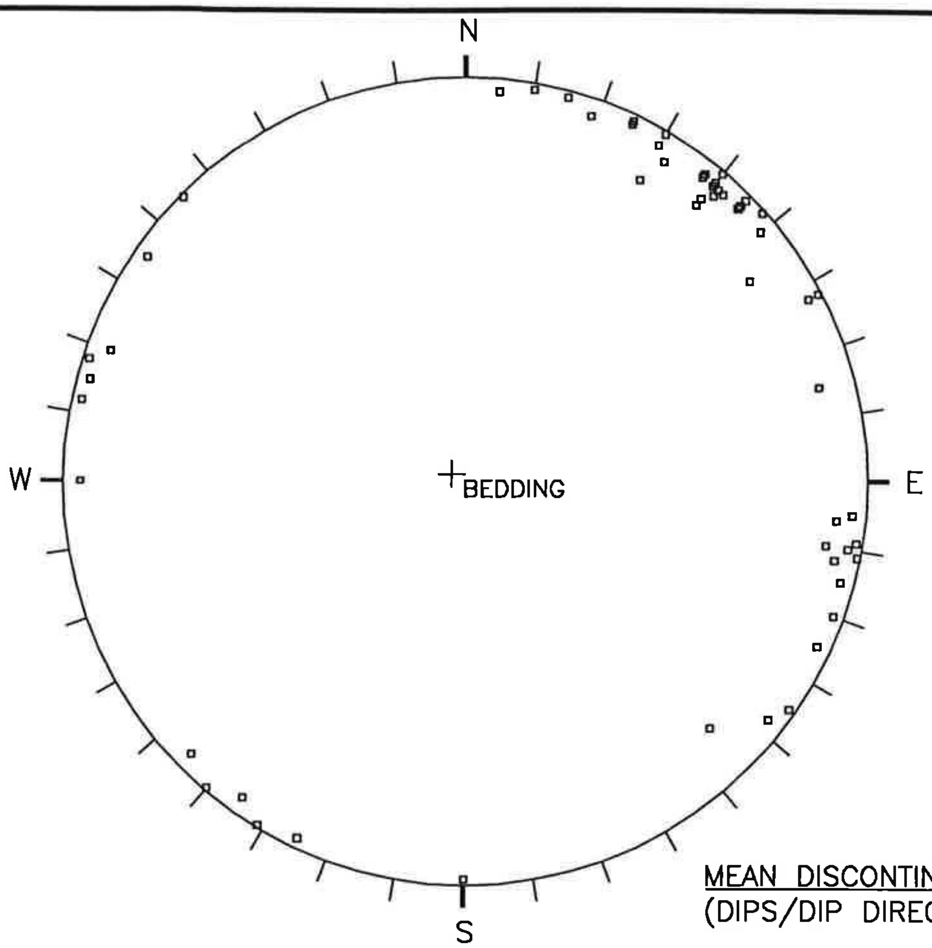


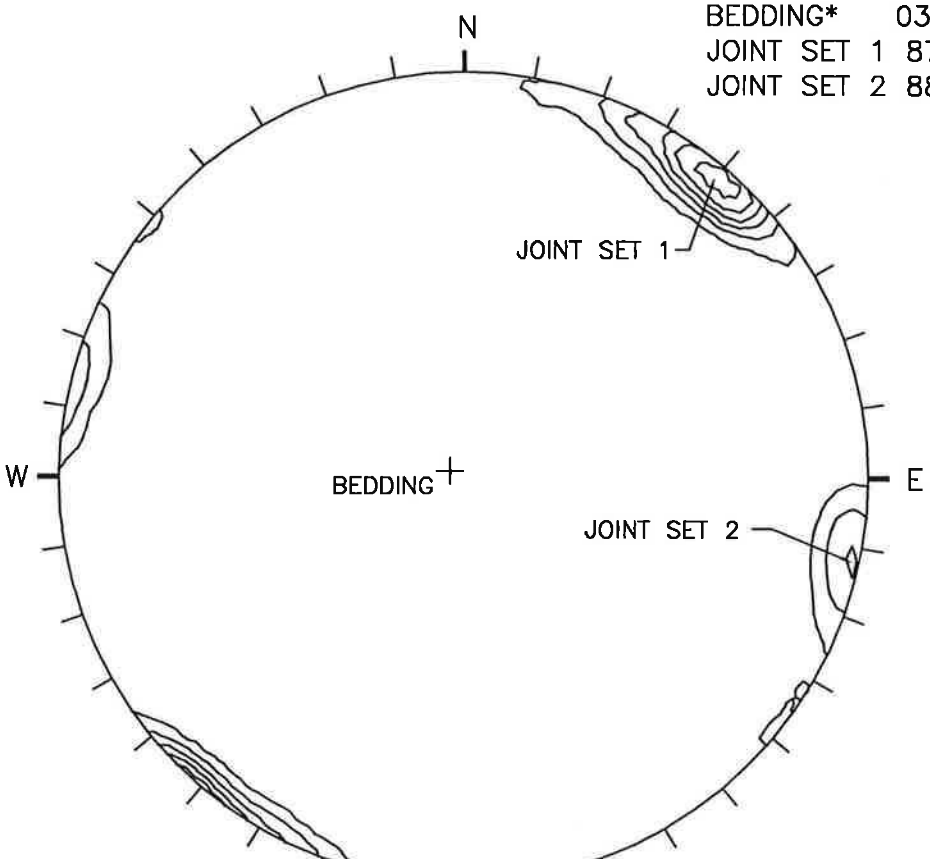
NOTE:
BASE PLAN DERIVED FROM ELECTRONIC DATA SUPPLIED BY NEW HOPE COAL AUSTRALIA ON 23rd MAY 2001.

Golder Associates

CLIENT: New Hope Coal Australia		PROJECT: Oakleigh Coal Project	
DRAWN: LMB	DATE: 24-05-01	TITLE: SITE AND BOREHOLE LOCATION PLAN	
CHECKED: GG	DATE: 28-9-01		
SCALE: 1 : 5000	A3	PROJECT No: 01631002-3B	FIGURE No: 1

S:_Brisbane\2001\Mining\01631002\01631002-3B.dwg Jun 04, 2001 - 3:59pm





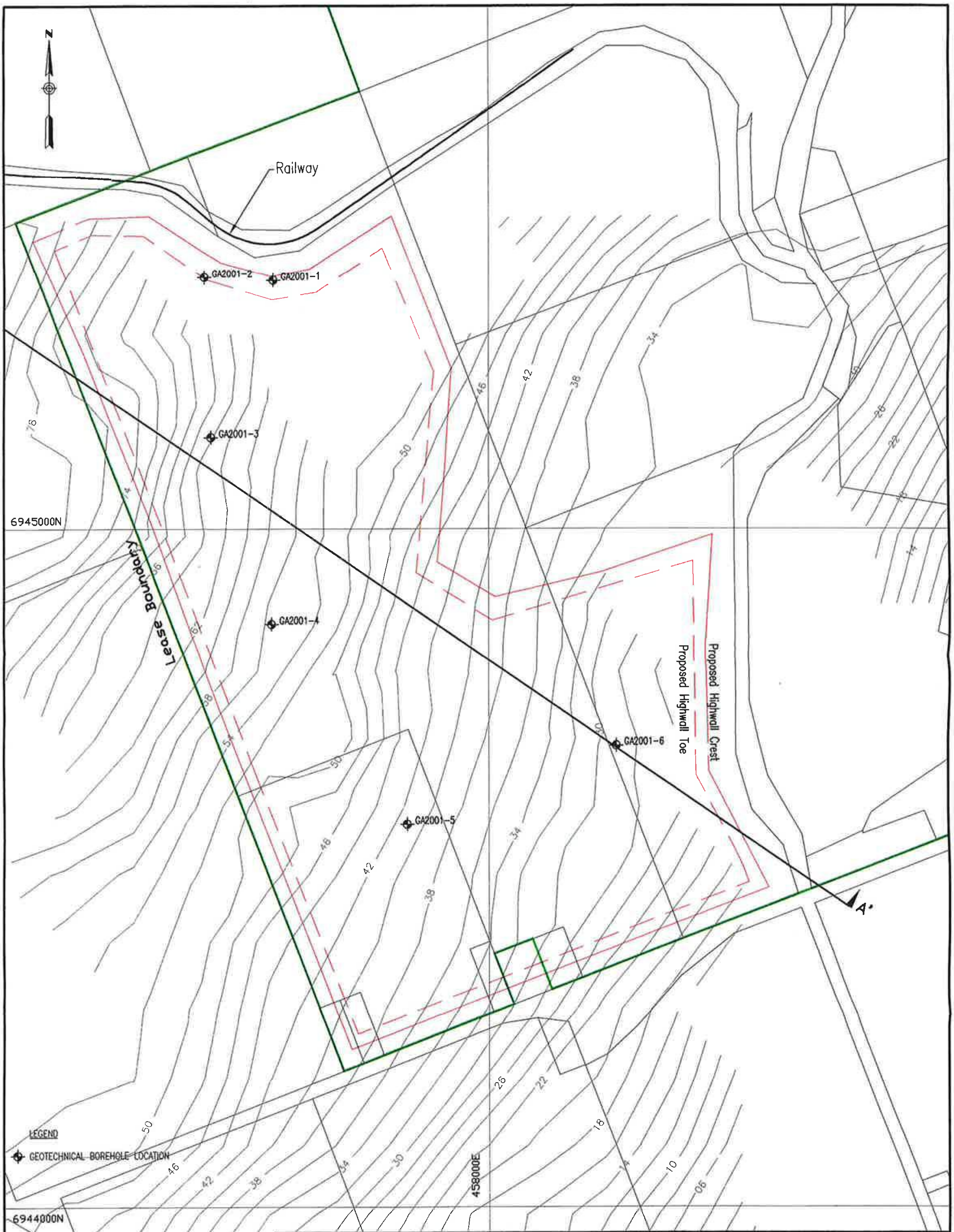
MEAN DISCONTINUITY ORIENTATIONS:
(DIPS/DIP DIRECTION)

BEDDING*	03/120
JOINT SET 1	87/220
JOINT SET 2	88/281

NOTE:
Bedding orientation based on structure contours provided by New Hope.

Golder Associates	CLIENT New Hope Coal Australia		PROJECT Oakleigh Coal Project Pit Geotechnical Mapping	
	DRAWN ALB	DATE 19-03-01	TITLE DISCONTINUITY ORIENTATION STEREOGRAPHIC PROJECTIONS	
	CHECKED RB	DATE 5-4-01		
	SCALE NOT TO SCALE A4		PROJECT No 01631002-2	FIGURE No 2

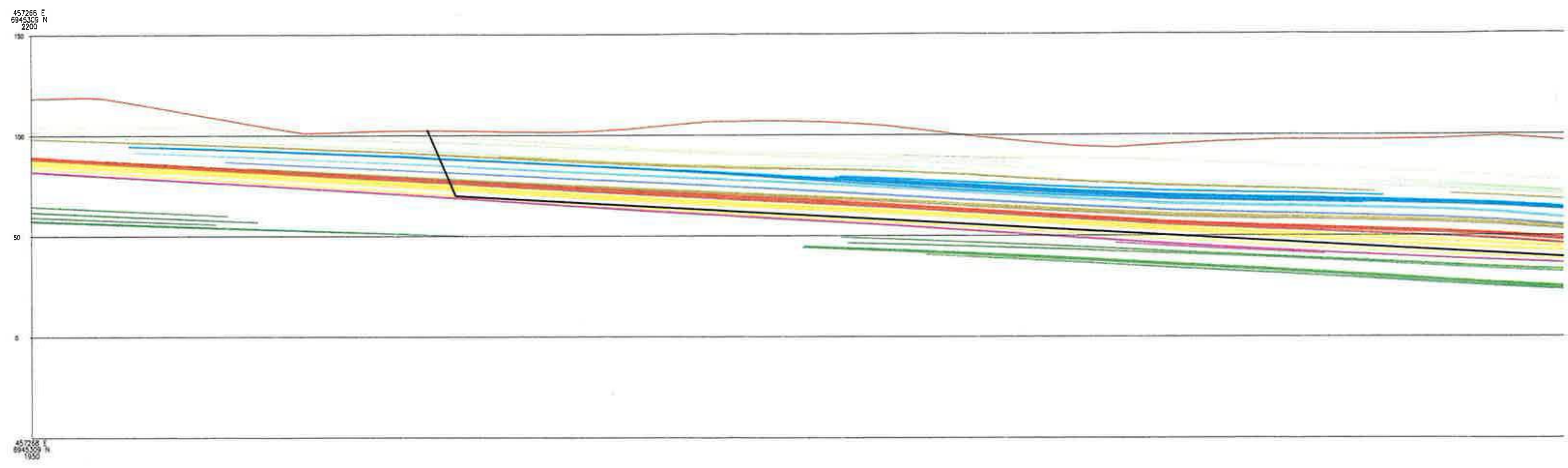
S:_Brisbane\2001\Mining\01631002\01631002-2.dwg Apr 03, 2001 - 2:15pm



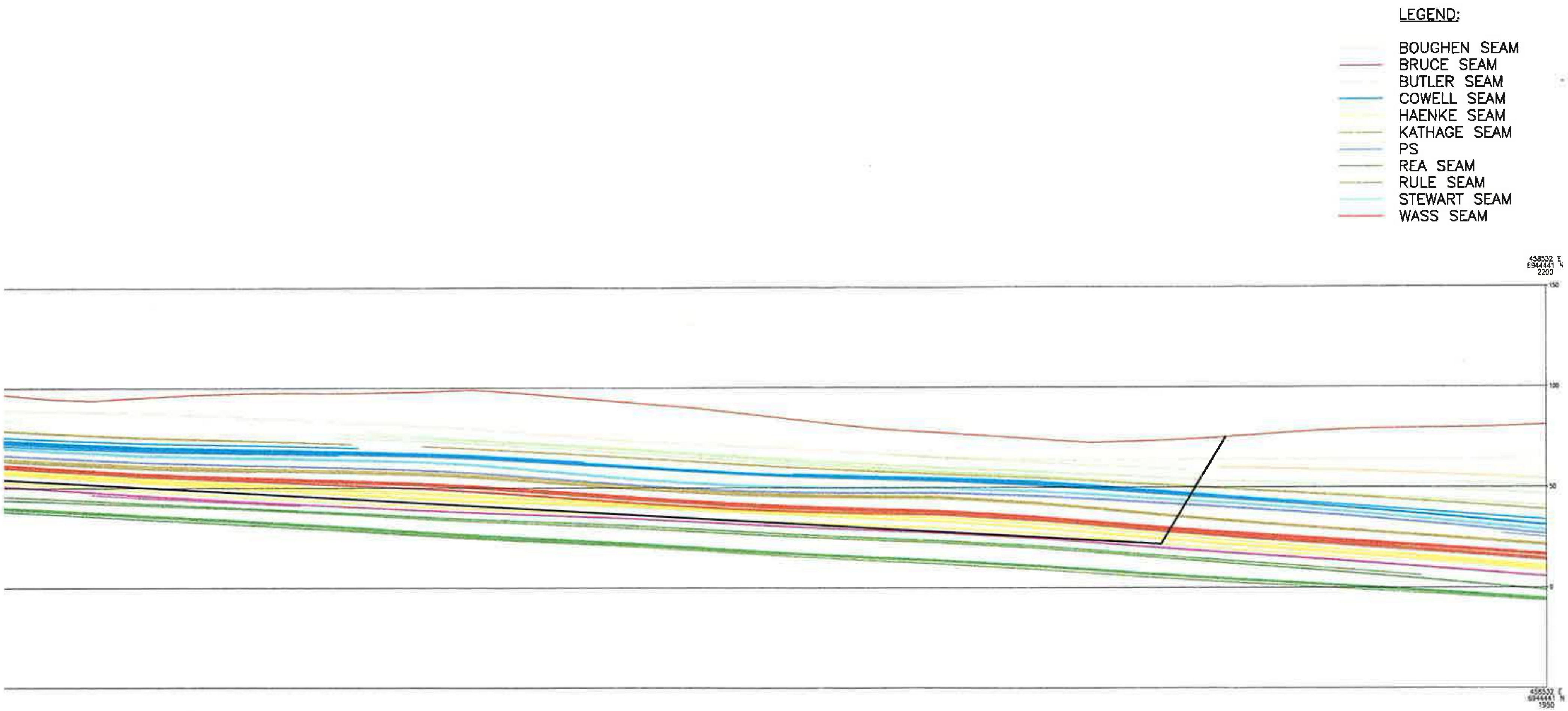
NOTE:
HAENKE 6 SEAM FLOOR CONTOURS PROVIDED IN ELECTRONIC FORMAT BY NEW HOPE COAL AUSTRALIA ON 14th MAY 2001.

Golder Associates	CLIENT: New Hope Coal Australia		PROJECT: Oakleigh Coal Project	
	DRAWN: LMB	DATE: 24-05-01	TITLE: INFERRED CONTOURS ON FLOOR OF HAENKE 6 SEAM	
	CHECKED: BG	DATE: 28-9-01		
	SCALE: 1 : 5000	A3	PROJECT No: 01631002-6	FIGURE No: 3

S:_Brisbane\2001\Mining\01631002\01631002-5-6.dwg Jun 04, 2001 - 3:57pm



NOTE:
CROSS-SECTION PROVIDED IN ELECTRONIC FORMAT BY
NEW HOPE COAL AUSTRALIA ON 4th JUNE 2001.



CLIENT	New Hope Coal Australia		PROJECT	Oakleigh Coal Project
DRAWN ALB	DATE 04-06-01		TITLE	TYPICAL CROSS-SECTION
CHECKED Km	DATE 28/9/01			
SCALE 1:400		A3	PROJECT No 01631002-12	FIGURE No 4

Golder Associates

NOTE:
BASE OF WEATHERING CONTOURS PROVIDED IN ELECTRONIC FORMAT BY NEW HOPE COAL AUSTRALIA ON 14th MAY 2001.

Golder Associates	CLIENT: New Hope Coal Australia		PROJECT: Oakleigh Coal Project	
	DRAWN: LMB	DATE: 24-05-01	TITLE: INFERRED CONTOURS ON BASE OF WEATHERING	
	CHECKED: GB	DATE: 28-8-01		
	SCALE: 1 : 5000	A3	PROJECT No: 01631002-5	FIGURE No: 5

S:_Brisbane\2001\Mining\01631002\01631002-5-6.dwg Jun 04, 2001 - 3:57pm

APPENDIX I

LOGS OF GEOTECHNICAL BOREHOLES

Golder Associates

REPORT OF BOREHOLE: GA2001-1

CLIENT: NEW HOPE COAL AUSTRALIA	COORDS 457680.1 m E 6945369.75 m N	SHEET: 1 OF 3	
PROJECT: OAKLEIGH COAL PROJECT	SURFACE RL: 134.85 m DATUM: AHD	DRILL RIG:	
LOCATION: NR IPSWICH, QLD	INCLINATION: -90°	LOGGED: PWB	DATE: 19/3/01
JOB NO: 01631002		CHECKED:	DATE:

METHOD	WATER	TCR	RQD (SCR)	DEPTH (meters)	DEPTH / RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	DEFECT DESCRIPTION & Additional Observations
HQ3		91	0	0	134.85		CORE LOSS	RS	
					0.27 / 134.58		MUDSTONE Dark brown, massive (weathered to clay)	EW	
					0.67 / 134.18		SANDSTONE Light brown, fine, massive, muddy (weathered to clay)		
		57	0	3	3.00 / 131.85		CORE LOSS		
					4.70 / 130.15		SANDSTONE Light brown, fine, massive, muddy (weathered to sandy clay)	EW	
		83	0	6	6.00 / 128.85		MUDSTONE Light brown, massive	DW	2B PL Ro
					6.70 / 128.15		CARBONACEOUS MUDSTONE Dark grey, massive (weathered to clay)	EW	
					6.97 / 127.88		CORE LOSS		
		74	0		7.17 / 127.68		MUDSTONE Light brown and light grey, very thinly bedded, fine sandy	EW	
					9.40 / 125.45		CORE LOSS		
				10					

Inferred strength: Is(50) MPa — EL VL L M H VH EH (0.03 0.1 0.3 1 3 10). Fracture frequency (Defects per unit metre length): 5 15 20 25 30.

This report of borehole must be read in conjunction with accompanying notes and abbreviations. It has been prepared for Geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

REPORT OF BOREHOLE: GA2001-1

Golder Associates

CLIENT:	NEW HOPE COAL AUSTRALIA	COORDS 457680.1 m E 6945369.75 m N	SHEET: 2 OF 3	
PROJECT:	OAKLEIGH COAL PROJECT	SURFACE RL: 134.85 m DATUM: AHD	DRILL RIG:	
LOCATION:	NR IPSWICH, QLD	INCLINATION: -90°	LOGGED: PWB	DATE: 19/3/01
JOB NO:	01631002		CHECKED:	DATE:

Drilling | Field Material Description | Defect Information

METHOD	WATER	TCR	RQD (SCR)	DEPTH (meters)	DEPTH RL	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	DEFECT DESCRIPTION & Additional Observations
HQ3				10	10.17	CORE LOSS		
		96	0		10.17 / 124.68	MUDSTONE Light grey to grey brown, occasionally mottled orange, very thinly bedded, fine sandy	EW	
				11	10.90 / 123.95	IRONSTONE Dark reddish grey, not intact	SW	
					11.29 / 123.56	MUDSTONE Light brown grey to brown grey	EW	
				12	11.79 / 123.06	. carbonaceous bands at 11.79-11.80 m, 12.20-12.26 m		
					12.29	CORE LOSS		
		100	0	13	122.48	MUDSTONE Light brown grey to brown grey		
					13.40	MUDSTONE Light grey and dark grey, very thinly bedded		
				14	13.59 / 121.26	. coaly carbonaceous mudstone bands at 13.59-13.65 m, 13.74-13.79 m and 13.88-13.92 m		
		100	100		14.25 / 120.60	SANDSTONE Grey, fine, thinly bedded with occasional soft mudstone laminae	DW	14.25: J Pl Sm B Un Ro
				15	14.80 / 120.05	MUDSTONE Grey, very thinly bedded to laminated, with sandy bands	DW	
					15.84	. carbonaceous 15.84-15.89 m		
				16	118.98	SANDSTONE Light brown, fine, massive to thinly bedded	SW	
		95	70	17	17.20 / 117.65	. light grey below 17.2 m	EW / SW	17.30: J Un Ro
				18			DW	18.27: B Pl Ro, 87° to Ca
		97	67		18.53 / 116.32	MUDSTONE Brown grey, massive	FR	18.60: J Pl Ro, 35° to Ca 18.80: J Un Ro, 5° to Ca
				19	19.26 / 115.59	SANDSTONE Light grey, fine, very thinly bedded, with some very thin carbonaceous laminae, muddy		
				20				

Graphic log, inferred strength (Is(50) MPa: EL 0.03, VL 0.1, L 0.3, M 1, H 3, VH 10, EH) and fracture frequency (defects per unit metre length: 5 10 15 20 25 30) columns shown graphically.

This report of borehole must be read in conjunction with accompanying notes and abbreviations. It has been prepared for Geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP Form No. 10 RL 2

REPORT OF BOREHOLE: GA2001-1

Golder Associates

CLIENT:	NEW HOPE COAL AUSTRALIA	COORDS 457680.1 m E 6945369.75 m N		SHEET: 3 OF 3	
PROJECT:	OAKLEIGH COAL PROJECT	SURFACE RL: 134.85 m	DATUM: AHD	DRILL RIG:	
LOCATION:		INCLINATION: -90°		LOGGED: PWB	DATE: 19/3/01
JOB NO:	01631002			CHECKED:	DATE:

METHOD	WATER	TCR	RQD (SCR)	DEPTH (meters)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH $Is_{(50)}$ MPa	DEFECT DESCRIPTION & Additional Observations	FRACTURE FREQUENCY (Defects per unit metre length)
HQ3				20	20.46		SANDSTONE Light grey, fine, very thinly bedded, with some very thin carbonaceous laminae, muddy	FR		19.85: J Un Ro, 18° to Ca	
					114.39 / 21.09		SANDSTONE Light grey, very fine, massive				
				21	113.76		End of Borehole @ 21.09 m				
				22							
				23							
				24							
				25							
				26							
				27							
				28							
				29							
				30							

This report of borehole must be read in conjunction with accompanying notes and abbreviations. It has been prepared for Geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP Form No. 10 RL 2

REPORT OF BOREHOLE: GA2001-2

Golder Associates

CLIENT: NEW HOPE COAL AUSTRALIA	COORDS 457578.07 m E 6945374.16 m N	SHEET: 1 OF 3	
PROJECT: OAKLEIGH COAL PROJECT	SURFACE RL: 127.61 m DATUM: AHD	DRILL RIG:	
LOCATION:	INCLINATION: -90°	LOGGED: PWB	DATE: 20/3/01
JOB NO: 01631002		CHECKED:	DATE:

METHOD	WATER	TCR	RQD (SCR)	DEPTH (meters)	DEPTH / RL	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	DEFECT DESCRIPTION & Additional Observations
HQ3		80	0	0	127.61	CORE LOSS	RS	
					0.40 / 127.21	SILTY CLAY Dark brown with rootlets		
					0.70 / 126.91	MUDSTONE Light brown and orange brown, massive sandy (weathered to clay)	EW	
					1.90 / 125.71	MUDSTONE Light grey mottled orange, massive (weathered to clay)		
		78	0		4.70 / 122.91	SANDSTONE Light brown and orange brown, fine, thinly bedded, muddy with mudstone laminae	DW	
					5.20 / 122.41	CORE LOSS		
		100	0		6.00 / 121.61	MUDSTONE Light grey, grey and orange, very thinly bedded (weathered to clay)	EW	
		100	0		7.15 / 120.46	. fine, gravely band 7.15-7.25 m		8.35: J Pl Sm, 5° to Ca
		100	41		8.50 / 119.11	SANDSTONE Light grey, very fine, massive	SW	9.00: J St Ro, 10° to Ca
					9.22	IRONSTONE Orange and red brown, massive, not intact		
					9.35 / 118.26	SANDSTONE Light grey, very thinly bedded with dark grey mudstone laminae		9.35: J Un Sm, 10° to Ca

Inferred strength $Is_{(50)}$ MPa: EL 0.03, VL 0.1, L 0.3, M 1, H 3, VH 10, EH. Fracture frequency (Defects per unit metre length): 5 10 15 20 25 30.

This report of borehole must be read in conjunction with accompanying notes and abbreviations. It has been prepared for Geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

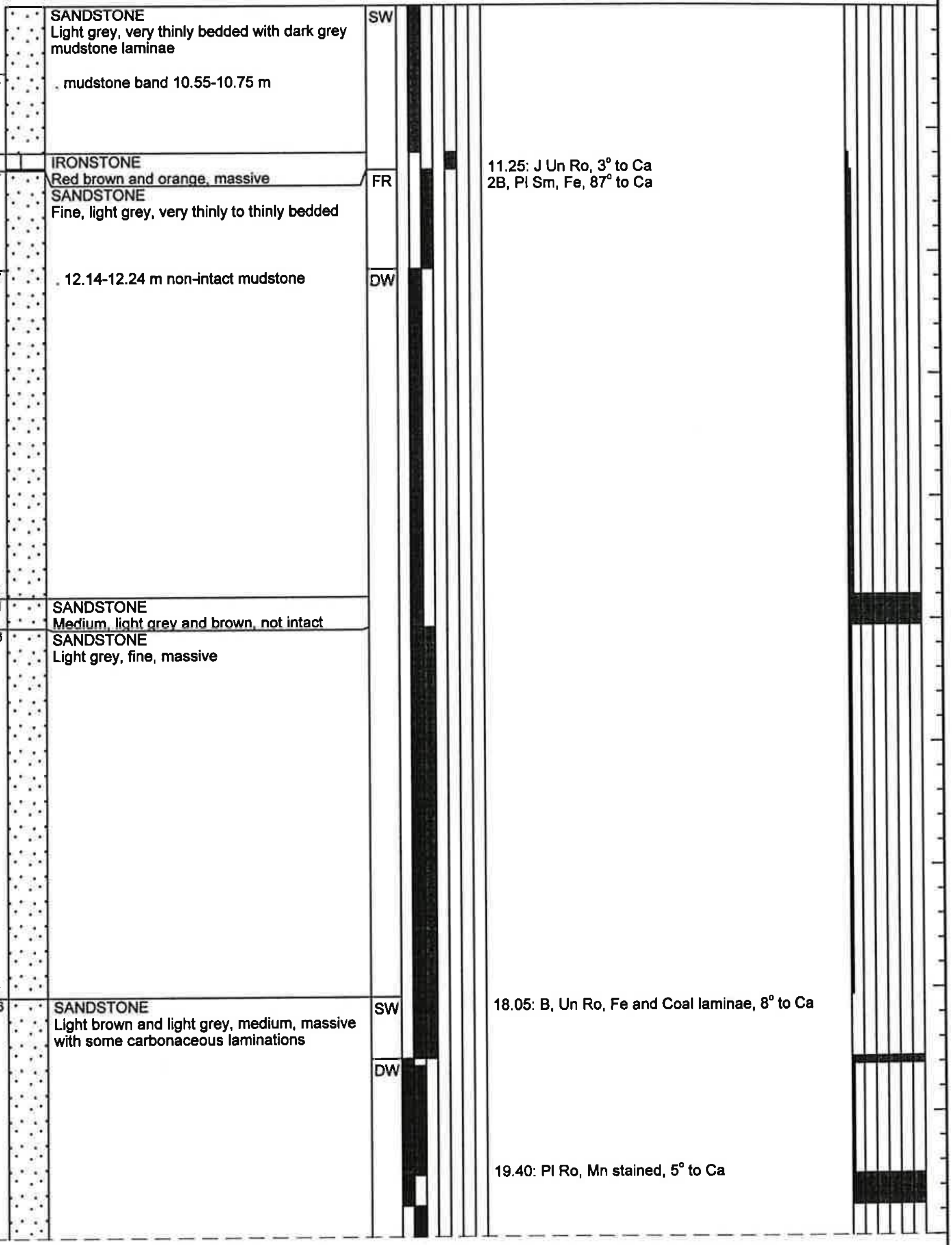
GAP Form No. 10 RL 2

REPORT OF BOREHOLE: GA2001-2

CLIENT: NEW HOPE COAL AUSTRALIA	COORDS 457578.07 m E 6945374.16 m N	SHEET: 2 OF 3	
PROJECT: OAKLEIGH COAL PROJECT	SURFACE RL: 127.61 m DATUM: AHD	DRILL RIG:	
LOCATION:	INCLINATION: -90°	LOGGED: PWB	DATE: 20/3/01
JOB NO: 01631002		CHECKED:	DATE:

Drilling — METHOD: HQ3

TCR	RQD (SCR)	DEPTH (meters)	DEPTH / RL	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	DEFECT DESCRIPTION & Additional Observations
		10		SANDSTONE Light grey, very thinly bedded with dark grey mudstone laminae	SW	
			10.55 / 117.06	. mudstone band 10.55-10.75 m		
		11	11.20 / 11.34	IRONSTONE Red brown and orange, massive		11.25: J Un Ro, 3° to Ca
			116.27	SANDSTONE Fine, light grey, very thinly to thinly bedded	FR	2B, Pl Sm, Fe, 87° to Ca
		12	12.14 / 115.47	. 12.14-12.24 m non-intact mudstone	DW	
100	93	13				
		14	14.80 / 112.81	SANDSTONE Medium, light grey and brown, not intact		
		15	15.05 / 112.56	SANDSTONE Light grey, fine, massive		
98	85	16				
		17				
		18	18.05 / 109.56	SANDSTONE Light brown and light grey, medium, massive with some carbonaceous laminations	SW	18.05: B, Un Ro, Fe and Coal laminae, 8° to Ca
100	89				DW	
		19				19.40: Pl Ro, Mn stained, 5° to Ca
		20				



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REPORT OF BOREHOLE: GA2001-2

Golder Associates

CLIENT: NEW HOPE COAL AUSTRALIA
PROJECT: OAKLEIGH COAL PROJECT
LOCATION:
JOB NO: 01631002

COORDS 457578.07 m E 6945374.16 m N
SURFACE RL: 127.61 m DATUM: AHD
INCLINATION: -90°

SHEET: 3 OF 3
DRILL RIG:
LOGGED: PWB DATE: 20/3/01
CHECKED: DATE:

METHOD	TCR	RQD (SCR)	DEPTH / RL	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	DEFECT DESCRIPTION & Additional Observations
HQ3	87	77	20.42 / 107.09	COAL Black, massive, muddy (weathered to soil)	DW / EW	
			20.74 / 106.87	CARBONACEOUS MUDSTONE Dark grey, very thinly interbedded with light brown mudstone	DW	
				MUDSTONE Light brown, light grey and occasionally orange, very thinly bedded (weathered almost to clay)		
			21.41 / 106.20	COAL Black	FR	21.40: Drilling water circulation lost at 21.4 m (in coal band)
	100	60	21.80 / 105.81	MUDSTONE Light grey and dark grey, thinly bedded		
			22.20 / 105.41	COAL Black, not intact, with rare mudstone interbeds		
			23.06 / 104.55	SANDSTONE Light grey, very fine to fine, very thinly interbedded with grey mudstone		
			24.00 / 103.61	End of Borehole @ 24.00 m		

REPORT OF BOREHOLE: GA2001-3

Golder Associates

CLIENT: NEW HOPE COAL AUSTRALIA	COORDS 457588.2 m E 6945136.48 m N	SHEET: 1 OF 5	
PROJECT: OAKLEIGH COAL PROJECT	SURFACE RL: 105.42 m DATUM: AHD	DRILL RIG:	
LOCATION:	INCLINATION: -90°	LOGGED: PWB	DATE: 21/3/01
JOB NO: 01631002		CHECKED:	DATE:

METHOD	WATER	TCR	RQD (SCR)	DEPTH / RL	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	DEFECT DESCRIPTION & Additional Observations
HQ3		93	32	0.20 / 105.42	CORE LOSS	RS	
				0.33	SILTY CLAY Dark grey with rootlets (topsoil)		
				105.09	SANDY CLAY Light brown and orange brown, hard		
				1.90 / 103.52	SANDSTONE Light brown, medium, massive	EW	2.45: B, Un Ro, 20 mm clay, 85° to Ca
		96	61	3.00 / 102.42	CORE LOSS		
				3.30 / 3.40	SANDSTONE Light brown, medium, massive	EW	
				102.02	MUDSTONE Light grey, massive with closely spaced, irregular incipient fracture structure	DW	
				4.45 / 100.97	MUDSTONE Light grey, massive, sandy		
				4.97 / 5.14	MUDSTONE Light grey, very thinly bedded with interbedded dark grey carbonaceous mudstone		
				100.28	MUDSTONE Light grey and orange brown, massive, very fine sandy		
		100	72	6.00 / 99.42	MUDSTONE Light grey and grey, occasionally orange, thinly to medium interbedded mudstone and sandy mudstone		6.00: B, Pl Sm, 10 mm clay
				7.75 / 97.67	. interlaminated carbonaceous mudstone 7.75-8.05 m		7.80: B, Pl Sm, 10 mm clay
				9.60 / 95.72	CARBONACEOUS MUDSTONE Dark grey and black, thinly laminated		

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GAP Form No. 10 RL 2

REPORT OF BOREHOLE: GA2001-3

Golder Associates

CLIENT:	NEW HOPE COAL AUSTRALIA	COORDS 457588.2 m E 6945136.48 m N		SHEET: 2 OF 5	
PROJECT:	OAKLEIGH COAL PROJECT	SURFACE RL: 105.42 m	DATUM: AHD	DRILL RIG:	
LOCATION:		INCLINATION: -90°		LOGGED: PWB	DATE: 21/3/01
JOB NO:	01631002			CHECKED:	DATE:

Drilling | Field Material Description | Defect Information

METHOD	TCR	RQD (SCR)	DEPTH (meters)	DEPTH / RL	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	DEFECT DESCRIPTION & Additional Observations
HQ3	100	100	10		SANDSTONE Light grey and light brown, fine, very thinly bedded . some carbonaceous laminae	DW	10.70: J, Un Ro, 2° to Ca; 11.50: J, Pl Ro, Mn stained, 20° to Ca
				12.75 / 92.67	MUDSTONE Light grey and grey, very thinly bedded (weathered to clay) . carbonaceous mudstone bands at 12.75-12.78 m and 12.94-12.99 m	EW	
	100	65	13	13.27 / 92.15	MUDSTONE Light grey, very thinly bedded	FR	
			14	14.00 / 91.42	SANDSTONE Light grey and orange brown, massive to very thinly bedded	SW	13.95: B, Un Ro, 10 mm rubble, 90° to Ca
			15	15.45	MUDSTONE Light brown, massive		
				15.55 / 89.76	CARBONACEOUS MUDSTONE Dark grey, laminated to massive (weathered to clay)	EW	
	100	96	16		COAL Black, not intact (weathered to soil)	FR	
					MUDSTONE Grey, massive to thinly laminated		
			17	17.23 / 88.13	COAL (RU1) Black, not intact		
				17.52	CARBONACEOUS MUDSTONE Dark grey and black, not intact		
	100	15		17.72 / 87.70	COAL (RU1) Black, not intact		
			18	18.20 / 87.22	CARBONACEOUS MUDSTONE Black and dark grey, thinly laminated		
				18.45 / 86.97	COAL (RU) Black, not intact		
					MUDSTONE Light grey, massive		
			19	19.05 / 86.27	MUDSTONE Grey and light grey, very thinly bedded to laminated		
				19.44 / 85.98	COAL Black, not intact		
	100	71		19.73 / 85.69	MUDSTONE Light grey, massive		2B, Un Ro, 88° to Ca
			20		SANDSTONE		

INFERRED STRENGTH $Is_{(50)}$ MPa: 0.03, 0.1, 0.3, 1, 3, 10 (EL, VL, L, M, H, VH, EH)

FRACTURE FREQUENCY (Defects per unit metre length): 5, 10, 15, 20, 25, 30

REPORT OF BOREHOLE: GA2001-3

Golder Associates

CLIENT:	NEW HOPE COAL AUSTRALIA	COORDS 457588.2 m E 6945136.48 m N		SHEET: 3 OF 5	
PROJECT:	OAKLEIGH COAL PROJECT	SURFACE RL: 105.42 m	DATUM: AHD	DRILL RIG:	
LOCATION:		INCLINATION: -90°		LOGGED: PWB	DATE: 21/3/01
JOB NO:	01631002			CHECKED:	DATE:

Drilling — METHOD: HQ3; WATER; TCR; RQD (SCR); DEPTH (meters): 20 – 30

TCR	RQD (SCR)
93	60
98	72
100	37
100	83

Field Material Description — DEPTH / RL; GRAPHIC LOG; ROCK / SOIL MATERIAL DESCRIPTION; WEATHERING; INFERRED STRENGTH $Is_{(50)}$ MPa (0.03, 0.1, 0.3, 1, 3, 10; EL, VL, L, M, H, VH, EH)

DEPTH	RL
20.31	
20.51	84.91
21.05	84.34
21.49	83.93
21.82	
21.93	83.49
22.51	82.83
23.07	82.35
23.42	81.99
23.74	81.62
24.30	81.12
24.60	80.82
25.60	79.82
26.90	78.52
27.22	
27.33	78.09
27.65	
27.79	77.63
28.50	
28.60	76.82
29.60	75.82

ROCK / SOIL MATERIAL DESCRIPTION:

- Light grey, fine, massive, muddy — FR
- MUDSTONE: Brown, thinly bedded
- COAL (CW): Black, not intact
- MUDSTONE: Brown, massive
- COAL (CW): Black, not intact
- MUDSTONE: Brown, massive
- COAL (CW): Black, not intact
- MUDSTONE: Light grey and grey, very thinly bedded with soft clay seams parallel to bedding at 21.54 m (10 mm), 21.57 m (SMH) and 21.68 m (5 mm) — EW / FR
- CARBONACEOUS MUDSTONE: Dark grey, not intact (weathered to soft clay)
- SANDSTONE: Light grey, very fine, thinly interlaminated, muddy with dark grey mudstone — EW / FR
- COAL: Black, not intact
- SANDSTONE: Light grey, muddy, very fine, very thinly interbedded with grey mudstone laminae — FR
- MUDSTONE: Grey, thickly laminated with thin light grey, very fine sandstone laminae . extremely weak, 10 mm band at roof of coal below (23.42-23.43 m)
- COAL: Black and brown, thinly bedded
- CARBONACEOUS MUDSTONE: Dark grey, laminated
- COAL: Black, not intact
- MUDSTONE: Dark grey, very thinly bedded, with some very fine, light grey sandstone laminae
- SANDSTONE: Light grey, fine, very thinly interbedded with grey, very fine sandy mudstone
- SANDSTONE: Light grey, medium grained, medium bedded with some grey mudstone laminae
- MUDSTONE: Grey brown, massive to thinly laminated
- CARBONACEOUS MUDSTONE: Dark grey brown, massive to thinly laminated
- COAL (PS1): Black, thinly banded claystone in places, not intact — EW / FR
- MUDSTONE: Grey, massive
- CARBONACEOUS MUDSTONE: Black to greyish brown, soft, thinly laminated bedding with alternating hard/soft claystone (sandy, not intact)
- MUDSTONE: Grey, massive, very fine sandy, with interbedded fine sandstone beds
- SANDSTONE: Light grey to grey, very fine to fine, very thin bedding, with some grey mudstone interbeds
- SANDSTONE: Light grey, medium, medium bedded with some grey mudstone laminae

Defect Information — DEFECT DESCRIPTION & Additional Observations; FRACTURE FREQUENCY (Defects per unit metre length) 5 10 15 20 25 30

- 20.46 - 20.51 m soft bedding - parallel clay band at roof of coal, 90° to Ca
- 21.54, 21.57, 21.68, 3 bedding - parallel clay seams, 5-10 mm thick, 86° to Ca
- 22.50 - 22.51 m, B, Pl, Sm 87° to Ca, 10 mm clay
- 23.42 - 23.43 m, extremely weak band at roof of coal, 10 mm thick, 88° to Ca
- 23.50: J, St Sm, calcite coating, 0° to Ca
- 9B, Pl Ro, 89° to Ca
- 24.95: B, Pl Ro, Mn stained, 88° to Ca
- 25.35: B, Un Ro, Mn stained, 84° to Ca
- 26.90: B, Un Sm, 86° to Ca
- 3B, Un-Pl Sm, 88° to Ca
- 28.30: J, Pl, Sl, 27° to Ca
- 28.50: B, Pl, Sm, 5 mm clay infill

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GAP Form No. 10 RL 2

REPORT OF BOREHOLE: GA2001-3

Golder Associates

CLIENT: NEW HOPE COAL AUSTRALIA	COORDS 457588.2 m E 6945136.48 m N	SHEET: 4 OF 5	
PROJECT: OAKLEIGH COAL PROJECT	SURFACE RL: 105.42 m DATUM: AHD	DRILL RIG:	
LOCATION:	INCLINATION: -90°	LOGGED: PWB	DATE: 21/3/01
JOB NO: 01631002		CHECKED:	DATE:

Drilling — METHOD | WATER | TCR | RQD (SCR) | DEPTH (meters)

Field Material Description — DEPTH RL | GRAPHIC LOG | ROCK / SOIL MATERIAL DESCRIPTION | WEATHERING | INFERRED STRENGTH $Is_{(50)}$ MPa (0.03, 0.1, 0.3, 1, 3, 10; EL, VL, L, M, H, VH, EH)

Defect Information — DEFECT DESCRIPTION & Additional Observations | FRACTURE FREQUENCY (Defects per unit metre length) (5, 10, 15, 20, 25, 30)

Method: HQ3

Depth interval (m)	TCR	RQD (SCR)
30 – 33.0	100	32
33.0 – 36.1	100	42
36.1 – 39.1	100	65

Depth / RL: 30.05; 30.32, 75.10; 30.64, 74.78; 30.98, 74.44; 31.22, 74.15; 31.76, 73.66; 32.00, 73.42; 32.20, 73.22; 32.45; 32.60; 32.75; 32.90, 72.47; 33.67, 71.75; 33.88, 71.54; 34.17, 71.25; 34.43, 70.99; 35.21, 70.21; 35.66; 35.83, 69.59; 36.13; 36.30; 36.40, 69.02; 36.62; 36.80, 68.62; 37.28, 68.08

Depth scale: 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40

Rock / Soil Material Description

- MUDSTONE
  Grey brown, massive to thinly laminated
- MUDSTONE
  Grey, grey brown, thinly laminated, not intact (weathered to clay)
  . occasional very low strength laminae
- CARBONACEOUS MUDSTONE
  Dark brown, very thinly bedded
- COAL (KH1)
  Black, thinly bedded
  . very low strength sandy mudstone at 30.64-30.69, light brown
- CARBONACEOUS MUDSTONE
  Dark brown, thickly laminated
  . light brown mudstone at 31.22-31.28 m
- COAL (KH2)
  Black and dark brown, very thinly bedded, with carbonaceous mudstone bands
- MUDSTONE
  Light grey, very thinly bedded, very fine sandy
- COAL (HN3)
  Black, massive
- CARBONACEOUS MUDSTONE
  Dark brown to black, thinly bedded with coaly bands
- COAL (WS1)
  Black with dark brown carbonaceous mudstone at 32.45-32.55 m
- MUDSTONE
  Light brown, massive, fine sandy
- COAL (WS2)
  Black and dark brown, very thinly interbedded with low strength light brown mudstone
- MUDSTONE
  Light brown, massive
- COAL (WS3)
  Black, massive with muddy coal and carbonaceous low strength mudstone bands
- MUDSTONE
  Dark grey and light brown, thinly bedded
  . carbonaceous 33.67-33.75 m
- COAL (WS4)
  Black, not intact
  . occasional carbonaceous mudstone laminae
- MUDSTONE
  Grey, massive, very fine sandy
- SANDSTONE
  Light grey, fine, very thinly interbedded with grey mudstone laminae
- COAL (HN1)
  Black, massive
- MUDSTONE
  Light brown, massive, very fine sandy
- COAL (HN2)
  Black, massive
- MUDSTONE
  Light brown, massive
- CARBONACEOUS MUDSTONE
  Dark grey brown, massive, fissile
- COAL (HN3)
  Black, not intact
- SANDSTONE
  Light brown, massive, medium to coarse grained, silicious
- COAL (HN4)
  Black, very thinly interbedded with low strength carbonaceous mudstone
- CARBONACEOUS MUDSTONE
  Dark grey, thinly laminated, very fine sandy
- SANDSTONE
  Light grey, fine to medium, very thinly bedded, with occasional grey mudstone laminae

Weathering: EW / FR (from 30.05 m); EW (at ~34 m); EW / FR (at ~35.3 m)

Defect Description & Additional Observations

- 30.05 - 30.15, clay band, parallel to bedding, 89° to Ca
- 3B, Pl Sm, 89° to Ca
- 3B, Pl Sm, 88° to Ca
- 31.76: J, Pl Sm, 46° to Ca
- J, Pl Sl, 40° to Ca
- 2B, Pl Ro, 88° to Ca
- J, Un Ro, light green stain, 0° to Ca
- 33.83 - 33.88 m, clay band, 50 mm parallel to bedding at roof of coal seam
- 2B, Un Sm, 84° to Ca
- 2J, St Sm, 5° to Ca
- 2J, St Sm, 0° to Ca
- 2B, Pl Sm, 89° to Ca
- 36.94: J, Pl Ro, 0° to Ca
- B, Pl Ro, 89° to Ca
- 3B, Un Sm, 84° to Ca

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GAP Form No. 10 RL 2

GAP3.GLB CORED BOREHOLE I:\BRISBANE.01\MINING.01\01631002\LOGS\31002RL.GPJ GAP3.GDT 16/05/2001 16:31:21

REPORT OF BOREHOLE: GA2001-3

Golder Associates

CLIENT: NEW HOPE COAL AUSTRALIA	COORDS 457588.2 m E 6945136.48 m N	SHEET: 5 OF 5	
PROJECT: OAKLEIGH COAL PROJECT	SURFACE RL: 105.42 m DATUM: AHD	DRILL RIG:	
LOCATION:	INCLINATION: -90°	LOGGED: PWB	DATE: 21/3/01
JOB NO: 01631002		CHECKED:	DATE:

METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH / RL	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	DEFECT DESCRIPTION & Additional Observations
HQ3		85	42	40	40.40 / 65.02	SANDSTONE Light grey, fine to medium, very thinly bedded, with occasional grey mudstone laminae . thick sandy clay bands and very low strength bands between 40.4 and 42.13 m	FR, DW, EW, DW	40.40 - 42.13 m, mostly not intact
				41	41.58 / 63.84	CORE LOSS		
		81	20	42	42.13 / 63.29	CARBONACEOUS MUDSTONE Dark grey, brown, massive	FR	42.30: B, Pl Sm, 5 mm clay, 89° to Ca
					42.34	SANDSTONE Light grey, fine, massive	EW	42.52 - 42.58 m, not intact zone
					42.50	CARBONACEOUS MUDSTONE Dark grey, thinly laminated	FR	
					42.62 / 62.73	SANDSTONE Light grey, fine, massive		4B, Pl Sm, 89° to Ca; 4B, Un Sm, 88° to Ca
				43	42.89 / 62.44	COAL (HN6) Black, not intact		
					43.25 / 62.09	SANDSTONE Light grey, fine		
					43.61 / 61.81	CARBONACEOUS MUDSTONE Dark grey brown, thinly laminated, fissile		
				44		MUDSTONE Light grey and grey, thinly to thickly laminated		
						CARBONACEOUS MUDSTONE Dark grey brown, thickly laminated		
						CORE LOSS		
						End of Borehole @ 43.61 m		

Headings: Drilling; Field Material Description; Defect Information; INFERRED STRENGTH $Is_{(50)}$ MPa (0.03, 0.1, 0.3, 1, 3, 10; EL VL L M H VH EH); FRACTURE FREQUENCY (Defects per unit metre length) 5 10 15 20 25 30; GRAPHIC LOG.

Depth scale: 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50

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GAP Form No. 10
RL 2

GAP3.GLB CORED BOREHOLE I:\BRISBANE.01\MINING.01\01631002\LOGS\31002RL.GPJ GAP3.GDT 16/05/2001 16:31:23

REPORT OF BOREHOLE: GA2001-4

Golder Associates

CLIENT:	NEW HOPE COAL AUSTRALIA	COORDS 457678 m E 6944859.55 m N		SHEET: 1 OF 5	
PROJECT:	OAKLEIGH COAL PROJECT	SURFACE RL: 94.68 m	DATUM: AHD	DRILL RIG:	
LOCATION:		INCLINATION: -90°		LOGGED: PWB	DATE: 23/3/01
JOB NO:	01631002			CHECKED:	DATE:

Drilling / Field Material Description / Defect Information

METHOD	TCR	RQD (SCR)	DEPTH / RL	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	DEFECT DESCRIPTION & Additional Observations
HQ3	86	0	0.16	SILTY CLAY (TOPSOIL) Dark brown, firm, with rootlets	RS	
			0.30 / 94.38	SANDY CLAY Soft, grey brown, fine sandy	RS	
				MUDSTONE Light brown, orange and grey, thickly bedded (weathered to clay)	EW	
			1.72	CORE LOSS		
			1.90			
	100	0	2.00 / 92.68	SANDSTONE Light grey/orange, very fine grained, massive, sideritic	DW / EW	4B, Un, Ro, Fe Sn 87° to Ca 2.0 - 2.07 m, 70 mm soft clay band
			2.45 / 92.19	MUDSTONE Orange grey, medium bedding (weathered to clay)	DW / EW	
			2.77	SANDSTONE Orange brown, very fine grained	DW	
			2.94 / 91.74	MUDSTONE Orange grey, medium bedding, ironstone band	EW / DW	2.94: B, Un, Ro, Fe Sn, 87° to Ca
			3.40 / 91.28	MUDSTONE Orange grey, medium bedding, sandy (fine)	EW	3.40: Water circulation loss at 6.0 m
				SANDSTONE Orange brown, very fine to fine grained, turns muddy toward base	DW	
	100	37		MUDSTONE Light grey, grey and occasionally mottled orange, thickly bedded (mostly weathered to clay)		
			5.23 / 89.45	SANDSTONE Light grey and orange, fine, massive (weathered to sandy clay)		
			5.84 / 88.84	SANDSTONE Light grey, fine to medium grained, massive	EW / FR	3B, Pl-Un Ro, Fe stained, 90° to Ca 6.00: J, Un Ro, Mn stained, 24° to Ca
	92	0	6.50 / 88.18	SANDSTONE Light brown, coarse and fine, thickly bedded (weathered to sandy clay)	EW / DW	
			7.70 / 86.98	MUDSTONE Light grey and orange, massive, fine sandy (weathered to sandy clay)		
			7.90 / 86.78	SANDSTONE Light grey, fine, massive		
	100	84	8.50 / 86.18	MUDSTONE Grey, occasionally orange, very thinly bedded	EW / DW	
			10.00			

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GAP Form No. 10 RL 2

GAP3.GLB CORED BOREHOLE I:\BRISBANE.01\MINING.01\01631002\LOGS\31002RL.GPJ GAP3.GDT 18/05/2001 16:32:58

Golder Associates

REPORT OF BOREHOLE: GA2001-4

CLIENT:	NEW HOPE COAL AUSTRALIA	COORDS 457678 m E 6944859.55 m N	SHEET: 2 OF 5
PROJECT:	OAKLEIGH COAL PROJECT	SURFACE RL: 94.68 m DATUM: AHD	DRILL RIG:
LOCATION:		INCLINATION: -90°	LOGGED: PWB DATE: 23/3/01
JOB NO:	01631002		CHECKED: DATE:

Drilling: METHOD HQ3; TCR / RQD (SCR): 88 / 0; 101 / 87; 100 / 56; 100 / 63

DEPTH (meters)	DEPTH / RL	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	DEFECT DESCRIPTION & Additional Observations
10	84.68	SANDSTONE Grey and orange, fine, very thinly bedded	DW	
	10.45 / 84.23	MUDSTONE Grey, occasional orange, massive		10.45: J, Pl Ro, carbonaceous coating and FE stain, 0° to Ca
	10.77	CORE LOSS		10.77 - 10.99 m, soft clay band
11	10.96 / 83.62	MUDSTONE Light brown, massive (partly weathered to clay)	EW / FR	11.06: J, Pl Ro, Mn stained, 58° to Ca
	11.35 / 83.33	IRONSTONE Grey and red brown, massive	EW	
12–13		MUDSTONE Grey and brown, thinly to medium bedded (weathered to clay in places)	DW / EW / DW / EW	12.90: B, Pl Ro, 10 mm clay, 88° to Ca 13.24: B, Pl Ro, 10 mm clay, 88° to Ca
	13.36 / 81.32	SANDSTONE Light grey and orange, fine, massive	DW	13.47: B, Pl Ro, 5 mm clay, 89° to Ca
	13.70 / 80.98	MUDSTONE Light brown and orange, massive	SW	
14	13.94 / 80.74	CARBONACEOUS MUDSTONE Black, massive, coaly, fissile	DW	
	14.28 / 80.40	MUDSTONE Light brown and grey, massive		
	14.58	COAL Black, not intact	FR	
	14.69 / 79.95	CARBONACEOUS MUDSTONE Dark grey brown, massive		
15	15.11	MUDSTONE Grey, massive		15.1 - 15.11 m B, Pl Sm, 10 mm soft clay, 40° to Ca
	15.23 / 79.45	COAL Black, not intact		
	15.56 / 79.12	CARBONACEOUS MUDSTONE Dark grey, brown, massive	EW / FR	15.55 - 15.56 m, B, Pl Sm, 10 mm soft clay, 90° to Ca
16		COAL (CW) Black and grey brown, thinly bedded, with bands of muddy coal and carbonaceous mudstone		
	16.54 / 78.14	MUDSTONE Light grey, thinly laminated, very fine sandy		
17	17.12 / 77.46	CARBONACEOUS MUDSTONE Dark brown, fissile, not intact	DW / FR	
	17.54 / 77.14	MUDSTONE Light grey, very thinly bedded, very fine sandy		
	17.75 / 76.85	SANDSTONE Light grey, fine		17.75: B, Pl Ro, 5 mm soft clay at roof of coal
18		COAL Black, not intact		
		MUDSTONE Light grey, thickly laminated		
	18.45	COAL Black, not intact		
	18.64	MUDSTONE Grey, massive, with carbonaceous bands at 18.48-18.52 m and 18.62-18.64 m (at contacts with coal)		
19	18.82 / 19.00 / 75.68	COAL Black, not intact		18.82: J, Pl Ro, 2° to Ca B, Pl Sm, 88° to Ca
	19.42 / 75.26 / 19.65 / 75.03	CARBONACEOUS MUDSTONE Dark grey, massive, with occasional coaly laminations		
20				

This report of borehole must be read in conjunction with accompanying notes and abbreviations. It has been prepared for Geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP Form No. 10 RL 2

GAP3.GLB CORED BOREHOLE I:\BRISBANE.01\MINING.01\01631002\LOGS\31002RL.GPJ GAP3.GDT 16/05/2001 16:33:00

REPORT OF BOREHOLE: GA2001-4

Golder Associates

CLIENT:	NEW HOPE COAL AUSTRALIA	COORDS 457678 m E 6944859.55 m N		SHEET: 3 OF 5	
PROJECT:	OAKLEIGH COAL PROJECT	SURFACE RL: 94.68 m	DATUM: AHD	DRILL RIG:	
LOCATION:		INCLINATION: -90°		LOGGED: PWB	DATE: 23/3/01
JOB NO:	01631002			CHECKED:	DATE:

Drilling | **Field Material Description** | **Defect Information**

METHOD: HQ3

TCR	RQD (SCR)
100	83
100	100
99	81
100	70

DEPTH RL	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING
	COAL Black, not intact	FR
	SANDSTONE Light grey, fine to medium, muddy, very thinly interbedded with grey mudstone laminae . large coal stringer at 19.65-19.80 m	
21.70	SANDSTONE Light grey, fine to medium, muddy, very thinly interbedded with grey mudstone laminae	
21.85 72.83	SANDSTONE Medium grey, very fine to fine grained, grading to medium grained in places, thin interbeds of dark grey mudstone	
22.17 22.34 72.34	SANDSTONE Light grey, grades from fine to medium grained carbonaceous mudstone lithics, thin dark grey, mudstone interbeds	
	SANDSTONE Light grey, fine grained with medium grained beds, grading to dark grey mudstone in places	
24.20	SANDSTONE Light grey, fine to medium grained, grading to dark grey mudstone in places, thin carbonaceous (coaly) interbeds	
24.40 70.28	MUDSTONE Medium dark grey to yellow brown, to occasional light grey, medium grained sandstone interbeds	
24.65 70.03	SANDSTONE Light grey, fine to medium, very thinly interbedded with grey mudstone	
25.30 69.38	CARBONACEOUS MUDSTONE Dark brown grey, massive	
25.70	COAL (PS1) Black, massive, partly not intact	
25.82 68.86	MUDSTONE Pale grey, massive	
	CARBONACEOUS MUDSTONE Dark brown	
27.10	MUDSTONE Grey and dark grey, thinly laminated to massive, very fine sandy	
27.22 67.46	MUDSTONE Light brown and grey, very thinly bedded with occasional carbonaceous laminae	
27.52 67.14	COAL (KH) Black, not intact	
28.17	MUDSTONE Light greenish grey, occasional fine sand, grains, occasional carbonaceous material	
28.35 66.33	COAL Black, brownish black, occasional coaly shale, occasional thin (5 cm thick) light grey mudstone interbeds, not intact in places, some calcite filled veins	SW FR DW FR
28.66 66.02 29.00 65.68	MUDSTONE Dark brownish grey to light brownish grey, light greenish grey, carbonaceous in places, thinly bedded	
	COAL Black, brownish black, not intact, shaly coal in places	
29.95	CARBONACEOUS MUDSTONE	

INFERRED STRENGTH $Is_{(50)}$ MPa: EL 0.03 VL 0.1 L 0.3 M 1 H 3 VH 10 EH

FRACTURE FREQUENCY (Defects per unit metre length): 5 10 15 20 25 30

DEFECT DESCRIPTION & Additional Observations

- 24.20: J, Pl, Ro, Carbonate infill, 10° to Ca
- 24.40: B, Pl, Sl, 85° to Ca
- 24.65: B, Pl Sm, carbonaceous coating, 85° to Ca
- 3B, Un Ro, 87° to Ca
- J, Pl Ro, 3° to Ca
- 26.30: J, Un Ro, carbonaceous film, 73° to Ca
- 26.80: J, Un Sl, Carbonaceous film, 35° to Ca
- 26.99: J, Un Sl, carbonaceous film, 34° to Ca
- 27.02: J, Pl Sl, carbonaceous film, 55° to Ca
- 27.73: B, Un, Ro, 84° to Ca
- 27.92: B, Pl, Ro, 82° to Ca
- 27.96: B, Pl, Ro, 76° to Ca
- 27.98: B, Pl, Ro, 78° to Ca
- 28.03: B, Pl, Ro, 73° to Ca
- 28.10: J, Pl, S,m, 6° to Ca
- 28.50 - 28.53 m, B, Pl Ro, 30 mm clay, 86° to Ca
- 28.88: B, Pl, Ro, 82° to Ca
- 29.45: J, Pl, Ro, carbonate infill, 0° to Ca

GAP3.GLB CORED BOREHOLE I:\BRISBANE.01\MINING.01\01631002\LOGS\31002RL.GPJ GAP3.GDT 16/05/2001 16:33:02

Golder Associates

REPORT OF BOREHOLE: GA2001-4

CLIENT:	NEW HOPE COAL AUSTRALIA	COORDS 457678 m E 6944859.55 m N		SHEET: 4 OF 5	
PROJECT:	OAKLEIGH COAL PROJECT	SURFACE RL: 94.68 m	DATUM: AHD	DRILL RIG:	
LOCATION:		INCLINATION: -90°		LOGGED: PWB	DATE: 23/3/01
JOB NO:	01631002			CHECKED:	DATE:

Drilling — METHOD: HQ3; TCR / RQD (SCR): 93 / 42, 93 / 53, 100 / 88, 100 / 92

Field Material Description

DEPTH (meters)	DEPTH / RL	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING
30	30.07 / 30.20	Brownish grey, occasional coal bands	FR
	30.40	MUDSTONE Light grey, massive, silty in places	
	64.28 / 30.60	CARBONACEOUS MUDSTONE Brownish grey, dark brown, occasional coaly material	
	30.83 / 63.85	COAL Black, shaly coal in places	SW / FR
31	31.50	CARBONACEOUS MUDSTONE Brownish grey, brown, carbonaceous material in places	
		CORE LOSS	DW
	62.99	COAL Black, not intact	FR
32	32.00 / 62.63 / 32.35	MUDSTONE Brown, speckled white, massive, occasional coaly stringers	DW / FR / FR
	62.33	COAL Black and dark grey brown, mostly not intact	
		CARBONACEOUS MUDSTONE Dark grey brown, massive	
33	33.06	MUDSTONE Light brown, massive (weathered to clay)	
	33.20	CARBONACEOUS MUDSTONE Dark grey brown, massive	
	33.40 / 61.28	MUDSTONE Light brown, massive, (weathered to clay)	
	33.75	COAL Black, medium bedded, partly not intact	
34	60.70	CARBONACEOUS MUDSTONE Dark grey, massive	
	34.44	MUDSTONE Light grey, thickly laminated, very fine sandy	
	60.24 / 34.74 / 59.94	SANDSTONE Grey, fine to medium very thinly interbedded with dark grey, sandy carbonaceous mudstone	
35	35.02 / 35.20	MUDSTONE Grey, massive	
	59.38	CARBONACEOUS MUDSTONE Dark brown, grey, massive	
		COAL (HN1) Black, partly not intact, sharp contact with unit below	
36	35.96 / 58.72	MUDSTONE Medium grey, extremely closely spaced bedding planes	
	36.60	COAL (HN2) Black, not intact	
	58.08	MUDSTONE Medium grey, extremely closely spaced bedding planes, silty in parts	
37		COAL (HN2) Black, partly not intact, mudstone layers	
	37.30 / 57.38 / 37.60	MUDSTONE Light grey, occasional dark grey, massive . faulted contact between mudstone and coal	
	57.08 / 37.98	COAL (HN3) Black, partly intact, carbonate veining, occasional shaly coal	
38	56.70	CARBONACEOUS MUDSTONE Brownish grey, occasionally brownish black, massive, occasionaly laminated pyrite, occasional coal beds	
	38.72 / 38.92 / 39.09	COAL (HN4) Black, not intact . sharp contact with lower unit, partially slickensided	
39	55.59 / 39.34 / 55.34	MUDSTONE Dark to medium grey, black, black thin carbonaceous (coal) bands, massive	
	39.60 / 55.08 / 39.94	SANDSTONE Light grey, predominantly fine, grading to medium grained with some very fine grained,	
40			

INFERRED STRENGTH $Is_{(50)}$ MPa: EL 0.03, VL 0.1, L 0.3, M 1, H 3, VH 10, EH

Defect Information

DEFECT DESCRIPTION & Additional Observations

- 29.90: J, Un, Sl, 45° to Ca
- 30.03: B, Pl, Sl, 85° to Ca, carbonate infill
- 30.15: J, Pl, Sm, 10° to Ca
- 30.31: B, Un, ro, 82° to Ca
- 2B, Pl Sm, 88° to Ca
- 2B, Pl Sm, 88° to Ca
- 31.69: J, Un Sm, 0° to Ca
- 32.02 - 32.05 m, B, Un Ro, 30 mm clay
- B, Un Sm, 87° to Ca
- 32.39: J, St Ro, 3 mm clay, 65° to Ca
- 33.20: B, Pl Ro, 85° to Ca
- 33.75: B, Pl, Ro, 80° to Ca
- 34.44: Sz, Un, Sl, 1 mm clay infill, 35° to Ca (faulted contact between mudstone and coal)
- 34.84: J, Pl, Ro, clay infill, 20° to Ca
- 35.20: B, Pl, Sl, 88° to Ca
- 36.60: B, Pl Ro, 80° to Ca
- 37.60: B, Pl Ro, carbonaceous film, 87° to Ca
- 38.72: B, Un Ro, 82° to Ca, contact with coal
- J, Pl Ro, 0° to Ca
- 2B, Pl Ro, 86° to Ca (top and bottom contacts)
- 39.09: B, Un Ro, 5 mm coal, 87° to Ca
- 2J, Pl Ro, 0° to Ca
- 39.60: J, Pl Sm, 0° to Ca
- B, Pl Ro, 87° to Ca, clay film

FRACTURE FREQUENCY (Defects per unit metre length): 5 10 15 20 25 30

REPORT OF BOREHOLE: GA2001-4

Golder Associates

CLIENT: NEW HOPE COAL AUSTRALIA	COORDS 457678 m E 6944859.55 m N	SHEET: 5 OF 5	
PROJECT: OAKLEIGH COAL PROJECT	SURFACE RL: 94.68 m DATUM: AHD	DRILL RIG:	
LOCATION:	INCLINATION: -90°	LOGGED: PWB	DATE: 23/3/01
JOB NO: 01631002		CHECKED:	DATE:

Drilling						Field Material Description				Defect Information	
METHOD	WATER	TCR	RQD (SCR)	DEPTH (meters)	DEPTH / RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH $Is_{(50)}$ MPa (EL VL L M H VH EH; 0.03 0.1 0.3 1 3 10)	DEFECT DESCRIPTION & Additional Observations	FRACTURE FREQUENCY (Defects per unit metre length) 5 10 15 20 25 30
HQ3		100	98	40	54.58		thinly to thickly laminated bedding	FR		40.10: J, Un Sl, 70° to Ca, clay film	
							MUDSTONE Light to medium light grey, massive, silty in places				
					40.60 / 54.08		SANDSTONE Light grey and dark grey, very thinly bedded to thickly laminated, fine grading to medium				
				41			SANDSTONE Grey, fine, massive				
							MUDSTONE Grey and light grey, thinly laminated . fine sandy below 37.6 m				
							SANDSTONE Light grey and grey, fine to medium, very thinly bedded to thickly laminated, with occasional grey sandy mudstone bands and some carbonaceous laminae				
				42			COAL (HN6) Black, with dark brown coaly mudstone bands				
							CARBONACEOUS MUDSTONE Dark grey brown, very thinly bedded				
							COAL (HN6) Black, not intact				
				43			CARBONACEOUS MUDSTONE Dark grey brown, massive with occasional coal laminations				
							COAL (HN6) Dark grey brown and black, massive muddy, with some carbonaceous mudstone bands			43.60: B, Pl Ro, carbonaceous film, 82° to Ca	
		100	100	44			CARBONACEOUS MUDSTONE Dark grey brown, thinly bedded, with coal band at 39.75-39.80 m				
					44.30 / 50.38		MUDSTONE Light brown, massive, sideridic				
							CARBONACEOUS MUDSTONE Dark grey brown, massive				
				45			MUDSTONE Grey, thickly laminated, fine sandy				
							SANDSTONE Light grey and grey, thinly to medium bedded, fine to medium with some dark grey carbonaceous laminae . sideridic bands of .40 m at 44.30 m				
				46	45.90 / 48.78		SANDSTONE Medium to coarse grained, massive bedding, coal lenses and wisps throughout				
				47	46.73 / 47.88		COAL Black, massive, with calcite film on cleats . tight contact with sandstone			46.73: J, Un, Sm, Calcite film, 0° to Ca	
							End of Borehole @ 46.80 m				
				48							
				49							
				50							

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REPORT OF BOREHOLE: GA2001-5

Golder Associates

CLIENT:	NEW HOPE COAL AUSTRALIA	COORDS	457878.92 m E 6944564.01 m N	SHEET:	1 OF 8
PROJECT:	OAKLEIGH COAL PROJECT	SURFACE RL:	80.15 m DATUM: AHD	DRILL RIG:	
LOCATION:		INCLINATION:	-90°	LOGGED: PWB	DATE: 27/3/01
JOB NO:	01631002			CHECKED:	DATE:

Method	TCR	RQD (SCR)	Depth (m) / RL	Graphic Log	Rock / Soil Material Description	Weathering	Defect Description & Additional Observations
HQ3			0.15 / 80.00		SILTY CLAY (TOPSOIL) Dark grey brown, sandy, with some rootlets		
			0.45 / 79.70		SILTY CLAY Light grey brown, stiff		
	100	0	1.60		MUDSTONE Brown and light brown, occasionally red brown, massive (weathered to clay)	EW	
			1.70 / 78.45		IRONSTONE Red brown, not intact (weathered to clayey gravel)		
			2.10 / 78.05		MUDSTONE Light brown and orange, massive, fine to medium sandy (weathered to clay)		
			2.70 / 77.45		MUDSTONE Light grey, mottled orange, massive (weathered to clay)		
	100	0	4.00 / 76.15		MUDSTONE Light brown, occasionally orange, massive, fine sandy		
	100	0	5.20		MUDSTONE Light brown, light grey and orange, massive (weathered to clay)		
			5.39 / 74.71		SANDSTONE Light grey and orange, medium grained, thickly laminated . very closely spaced bedding partings . ironstone band at 5.39 to 5.44 m	DW / EW	7B, Un Ro, Fe stained, 90° to Ca
			5.83 / 74.32		MUDSTONE Light brown and orange, massive, fine sandy (weathered to clay)		
			6.38 / 73.77		MUDSTONE Light grey and dark brown, occasionally orange, very thinly bedded (weathered to clay)		
	100	0	7.63 / 72.52		MUDSTONE Pale grey, light brown and orange, medium to very thinly bedded (weathered to clay)		
			9.26 / 70.89		MUDSTONE Grey, light grey and occasionally orange, medium bedded, fine sandy in places		
			9.99		MUDSTONE Light grey, mottled orange, massive (weathered to clay)	DW	

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GAP Form No. 10 RL 2

Golder Associates

REPORT OF BOREHOLE: GA2001-5

CLIENT:	NEW HOPE COAL AUSTRALIA	COORDS 457878.92 m E 6944564.01 m N		SHEET: 2 OF 8	
PROJECT:	OAKLEIGH COAL PROJECT	SURFACE RL: 80.15 m	DATUM: AHD	DRILL RIG:	
LOCATION:	NR IPSWICH, QLD	INCLINATION: -90°		LOGGED: PWB	DATE: 27/3/01
JOB NO:	01631002			CHECKED:	DATE:

Method: HQ3

TCR	RQD (SCR)	Depth / RL	Rock / Soil Material Description	Weathering	Defect Description & Additional Observations
100	100	10.20	SANDSTONE Light grey, massive, medium	SW	
		10.32 / 69.83	MUDSTONE Light grey and orange, thinly laminated, fine sandy	DW	
		10.60 / 69.55	CARBONACEOUS MUDSTONE Dark grey, massive (weathered to firm clay)		
			MUDSTONE Light brown, massive		
			MUDSTONE Light grey, massive, fine sandy		
103	76	12.10 12.23 / 67.92	SANDSTONE Medium to coarse, light grey and orange staining, fine bedding . mudstone band at 12.23-12.36 m		12.20: J, Pl, Ro, Black staining 15° to Ca 12.35: J, Pl. Un, Black staining, 27° to Ca 12.50: B, Pl, Ro, 79° to Ca
		12.94 / 67.21	MUDSTONE Light grey, bedded to laminated, sporadic white claystone lenses toward base		1J, 25° to Ca, Un, Ro carbonaceous staining 1J, 72° to Ca, Un, Ro, Fe stain -14.2 m, siderite nodule in mudstone
		14.30 / 65.85	SANDSTONE Light grey, occasional orange, fine grained, very thinly bedded to thickly laminated		2B, Pl, Un, Ro, 82° to Ca 1B, Fe staining, 90° to Ca, Pl, Ro 2B, carbonaceous staining, 90° to Ca, Pl, Ro
88	50	15.40 / 64.75	COAL (CW) Black, massive, mostly not intact . extremely low strength mudstone band at 15.73 m with polished plane at 52° to Ca	FR DW FR	-15.74 m, Sz, Pl Sm, 52° to Ca, 20 mm clay (extremely loose mudstone)
		15.73 / 64.42			
		16.20 / 63.95	MUDSTONE Grey, massive, slightly fine sandy		-16.5 m, Sz, 3 x Un Sl, 56° to Ca
		16.50 / 63.65	CORE LOSS		16.50: Sz, Un Sl, 10 mm crushed rock (possibly 370 mm core loss)
		16.87 / 63.28 17.10 / 63.05	MUDSTONE Grey, massive, slightly sandy . carbonaceous mudstone bands at 17.1-17.15 m		17.37: Sz, Un Sl, 70° to Ca, 30 mm crushed rock 2B, Pl Ro, 70° to Ca, carbonaceous film 17.52: Sz, Pl Sl, 70° to Ca, 2 mm clay
100	59	18.18 / 61.97	SANDSTONE Light grey, fine, thickly interlaminated with thin carbonaceous sandstone laminae		
		18.67 18.78 / 61.37	COAL Black, massive		
			MUDSTONE Greya nd light grey, thickly laminated		
		19.12 / 61.03	COAL (ST) Black, massive . carbonaceous mudstone bands at 19.12-19.22 m and 20.1-20.20 m (dark grey, massive)		2B, Pl Ro, 88° to Ca J, Un Ro, 0° to Ca

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GAP Form No. 10
RL 2

REPORT OF BOREHOLE: GA2001-5

Golder Associates

CLIENT:	NEW HOPE COAL AUSTRALIA	COORDS 457878.92 m E 6944564.01 m N		SHEET: 3 OF 8	
PROJECT:	OAKLEIGH COAL PROJECT	SURFACE RL: 80.15 m	DATUM: AHD	DRILL RIG:	
LOCATION:		INCLINATION: -90°		LOGGED: PWB	DATE: 27/3/01
JOB NO:	01631002			CHECKED:	DATE:

Drilling: METHOD HQ3; WATER; TCR; RQD (SCR); DEPTH (meters) 20–30

Weathering: FR

TCR	RQD (SCR)	DEPTH / RL	ROCK / SOIL MATERIAL DESCRIPTION	DEFECT DESCRIPTION & Additional Observations
		20.20 / 59.95	MUDSTONE Grey, massive	
		20.50 / 59.65	SANDSTONE Light grey, medium, massive	
99	87	22.32 / 57.83	COAL (PS1) Black, massive, partly not intact	2B, St Ro, 90° to Ca; J, St, Ro, 3° to Ca
		22.66 / 57.49	MUDSTONE Light grey and grey, thinly laminated . carbonaceous mudstone band at 22.66-22.69 m	2B, Pl-Un Ro, 89°
		23.74 / 56.41	CARBONACEOUS MUDSTONE Brownish grey, brown, massive, occasional coal material	23.74: J, Un, ro, 75° to Ca
		24.00	COAL Black, massive, calcite veining parallel to core axis . bedding joint at contact with unit below	24.08: J, Pl, Ro, Calcite infill, 0° to Ca
		24.17		24.17: B, Pl, Ro, 88° to Ca
		24.35		24.26: B, Pl, Ro, 86° to Ca; 24.30: J, Pl, Ro, Calcite infill, 0° to Ca
		24.62	MUDSTONE Light grey, massive, thin coal band	24.39: J, Un, Sl, light clay infill, 64° to Ca; 24.50: J, Pl, Sl, light mudstone infill, 88° to Ca
100	72	24.80	COAL Black, massive, calcite veining parallel to core axis	24.95: J, Pl, Ro, Calcite veining, 0° to Ca; 24.98: B, Pl, Sm, light clay infil, 86° to Ca; 25.11: J, Pl, Ro, occasional calcite infill, 0° to Ca
		55.10 / 25.27 / 54.85	CARBONACEOUS MUDSTONE Medium brownish grey, brownish black, very thinly laminated coal bands with mudstone bands, occasional fine sand in parts	25.27: B, (contact with nit above), Pl, Ro, 89° to Ca
		25.65 / 25.76 / 54.39	COAL Black, brownish black, occasional mudstone interbeds	
			MUDSTONE Light grey, massive	
			COAL Black, massive, with some calcite veining parallel to core axis, occasional thin mudstone interbeds	26.60: B, Pl, Ro, 88° to Ca
		27.10 / 53.05	CARBONACEOUS MUDSTONE Light to medium brownish grey, light grey in places, massive	
100	100		COAL Black, massive, with some calcite veining parallel to core axis	
			MUDSTONE Light grey, massive	
			COAL Black, massive, with some calcite veining parallel to core axis	
		28.70	MUDSTONE Light brown, massive silty in part	
		28.80 / 51.35	CARBONACEOUS MUDSTONE Light to dark brownish grey, brownish black, occasionally light grey, with some medium spaced interbedded black coal bands	
		29.44 / 50.71	COAL Black, thinly laminated mudstone band, occasional calcite infilled veins parallel to core axis	
		29.70 / 29.80		2B, Un Ro, 85° to Ca; 2B, Pl Sm, 86° to Ca (top and bottom contacts)

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GAP Form No. 10 RL 2

Golder Associates

REPORT OF BOREHOLE: GA2001-5

CLIENT: NEW HOPE COAL AUSTRALIA
PROJECT: OAKLEIGH COAL PROJECT
LOCATION:
JOB NO: 01631002

COORDS 457878.92 m E 6944564.01 m N
SURFACE RL: 80.15 m DATUM: AHD
INCLINATION: -90°

DRILL RIG:
LOGGED: PWB DATE: 27/3/01
CHECKED: DATE:

Drilling | Field Material Description | Defect Information

METHOD: HQ3 | WATER | TCR / RQD (SCR): 100 / 75; 100 / 77; 100 / 73; 100 / 90 | DEPTH (meters): 30–40 | WEATHERING: FR | INFERRED STRENGTH $Is_{(50)}$ MPa | FRACTURE FREQUENCY (Defects per unit metre length)

DEPTH / RL	ROCK / SOIL MATERIAL DESCRIPTION
30.17 / 49.98	. bedding joint at contact with unit above
	MUDSTONE Light grey, medium light grey interbeds, silty in parts, thickly to thinly laminated
30.54 / 49.61	SANDSTONE Light grey, fine, very thinly interbedded to thickly interlaminated with grey, fine sandy mudstone
31.10 / 48.93	MUDSTONE Brown, massive, sideritic
31.50 / 48.65	SANDSTONE Light grey, medium, massive
31.80 / 48.35	MUDSTONE Light grey and grey, thinly laminated, very fine sandy
	CARBONACEOUS MUDSTONE Dark grey, massive
	MUDSTONE Brown, massive
	COAL (WS) Black, massive
33.10	CARBONACEOUS MUDSTONE Dark grey, very thinly bedded
33.22 / 33.35 / 46.80	COAL (WS) Dark grey brown, massive, muddy
33.70 / 46.45	MUDSTONE Light brown, massive
34.09 / 46.06	COAL (WS) Black, thinly to medium bedded . carbonaceous mudstone bands at 30.54-30.70 m, 30.92-30.94 m, 30.98-30.99 m, 31.07-31.10 m
34.75 / 45.40	MUDSTONE Light brown, very thinly bedded . carbonaceous mudstone band at 31.17-31.19 m
35.22 / 44.93	COAL (WS) Black and dark grey brown, massive
	SANDSTONE Light grey, fine, massive to thickly laminated . sideritic 31.80-31.95 m
	MUDSTONE Grey, massive, slightly fine sandy
35.95 / 44.20	CARBONACEOUS MUDSTONE Dark grey, massive
36.30 / 43.85	COAL (HN1) Black, not intact . faulted lower contact
36.54 / 36.70 / 43.45	MUDSTONE Grey, massive, slightly fine sandy . 15 mm coal band at 34.09 m
37.14 / 42.95	SANDSTONE Light grey, fine, thickly laminated
37.45	COAL (HN2) Black, massive, with light grey mudstone band at 35.10-35.14 m
37.82 / 42.33	SANDSTONE Light grey, fine, thickly laminated
38.30 / 41.85	MUDSTONE Grey, massive, slight to very fine sand
	CARBONACEOUS MUDSTONE Dark grey brown, massive
	COAL (HN3) Black, thinly to medium bedded . carbonaceous mudstone bands at 36.70-36.80 m and 36.86-36.92 m
	CARBONACEOUS MUDSTONE Dark grey brown, massive
39.36 / 40.76	SANDSTONE Light grey, fine to medium, thinly bedded to thickly laminated
39.72 / 40.35	MUDSTONE Grey, thickly laminated, fine sandy
	COAL (HN4)

DEFECT DESCRIPTION & Additional Observations

29.83: B, Pl Ro, 88° to Ca (bottom contact)
29.87: B, Pl Ro, 2 mm clay, 86° to Ca (contact with coal)
29.94: B, Pl, Sm, 88° to Ca
30.02: B, Pl Sm, 3 mm clay, 74° to Ca (contact with coal)
3B, Pl Ro, 88° to Ca
-30.44 m, coal not intact
4B, Pl Ro, 88° to Ca
33.70: Sz, Pl Sl, 22° to Ca
2B, Pl Ro, 86° to Ca
4B, Pl-Un, Ro, 84° to Ca
36.70: J, St Ro, 5° to Ca
37.17: J, Un Sl, 45° to Ca
37.63: J, Un Ro, 10° to Ca
39.34: J, Un Sl, 80° to Ca
2B, Pl-Un Ro, 84° to Ca
2J, Un Sl, 60-70° to a
39.78: J, Un Sl, 76° to Ca

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Golder Associates

REPORT OF BOREHOLE: GA2001-5

CLIENT:	NEW HOPE COAL AUSTRALIA	COORDS 457878.92 m E 6944564.01 m N		SHEET: 5 OF 8	
PROJECT:	OAKLEIGH COAL PROJECT	SURFACE RL: 80.15 m	DATUM: AHD	DRILL RIG:	
LOCATION:		INCLINATION: -90°		LOGGED: PWB	DATE: 27/3/01
JOB NO:	01631002			CHECKED:	DATE:

Drilling | **Field Material Description** | **Defect Information**

Method: HQ3   Weathering: FR

TCR	RQD (SCR)
99	93
100	100
100	100

DEPTH / RL	ROCK / SOIL MATERIAL DESCRIPTION
40.06 / 40.09	Black, partly not intact . carbonaceous mudstone band at 37.60-37.63 m
	MUDSTONE Grey, massive, fine sandy
	COAL Black and dark grey brown, very thinly interbedded with thick grey mudstone laminae
41.20 / 38.95	MUDSTONE Grey, massive to thinly laminated, fine sandy
	COAL Black and dark grey brown, very thinly bedded, muddy with carbonaceous mudstone interbeds
	CARBONACEOUS MUDSTONE Dark grey brown, massive
	MUDSTONE Light brown, massive, sideritic
42.70 / 37.45	MUDSTONE Grey, massive, fine sandy
43.10	SANDSTONE Light grey, fine to medium, thickly to thinly laminated, with dark grey mudstone bands
43.22 / 36.93	MUDSTONE Light to medium light grey, thickly and thinly laminated, massive in places, occasional carbonaceous material
43.42 / 36.73	
43.81	CARBONACEOUS MUDSTONE Light to dark brown, massive
43.98	COAL Black, brownish black, with some mudstone material . sharp bedding joint at base of unit
44.20 / 35.95	MUDSTONE Light grey, massive with occasional carbonaceous bands, ocasional coal band
44.66 / 35.49	CARBONACEOUS MUDSTONE Dark brown to brown, massive, with a little coal material
44.90 / 35.25	COAL Black, massive, not intact . sharp bedding joint with base unit contact
45.24 / 34.91	MUDSTONE Light grey, massive
45.50 / 34.65	SANDSTONE Light grey, medium to coarse grained
45.80 / 34.35	MUDSTONE Grey, thinly laminated, very fine sandy
46.50 / 33.65	MUDSTONE Grey, massive
	MUDSTONE Light brown, massive
	MUDSTONE Grey, massie, slightly very fine sandy
	SANDSTONE Light grey, fine, very thinly bedded
	SANDSTONE Light grey and grey, medium to coarse, thinly to medium bedded

DEFECT DESCRIPTION & Additional Observations
41.00: J, Pl Sl, 45° to Ca
41.65: Unbroken joint, 50° to Ca
43.35: J, Pl, Ro, 5° to Ca
43.42: B, Pl, ro, 88° to Ca
44.04: B, Pl, Ro, 86° to Ca
45.72: J, Pl Sl, 52° to Ca

Depth scale (meters): 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50

INFERRED STRENGTH $Is_{(50)}$ MPa: 0.03 0.1 0.3 1 3 10 — EL VL L M H VH EH

FRACTURE FREQUENCY (Defects per unit metre length): 5 10 15 20 25 30

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GAP Form No. 10 RL 2

REPORT OF BOREHOLE: GA2001-5

Golder Associates

CLIENT:	NEW HOPE COAL AUSTRALIA	COORDS 457878.92 m E 6944564.01 m N	SHEET: 6 OF 8
PROJECT:	OAKLEIGH COAL PROJECT	SURFACE RL: 80.15 m DATUM: AHD	DRILL RIG:
LOCATION:		INCLINATION: -90°	LOGGED: PWB DATE: 27/3/01
JOB NO:	01631002		CHECKED: DATE:

Drilling — METHOD: HQ3; WATER; TCR / RQD (SCR): 100 / 93; 100 / 80; 100 / 99

DEPTH (m) / RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	DEFECT DESCRIPTION & Additional Observations
50.00 – 50.50 / 29.65	Sandstone	SANDSTONE Light grey and grey, medium to coarse, thinly to medium bedded	FR	
50.50 – 50.75 / 29.40	Conglomerate	CONGLOMERATE Coarse gravel and cobble sized mudstone clasts in coarse grey sandstone matrix		
50.75 – 52.32 / 27.83	Sandstone	SANDSTONE Light grey, medium to coarse, massive, with occasional carbonaceous laminae		
52.32 – 52.60 / 27.55	Mudstone	CARBONACEOUS MUDSTONE Dark grey brown, massive		52.32: B, St, Ro, 89° to Ca
52.60 – 53.15 / 26.92	Coal	COAL (RE3) Black and brownish black, thinly bedded, muddy, with occasional carbonaceous mudstone bands		52.60: B, Pl Ro, 88° to Ca; J, St Ro, 0° to Ca
53.15		MUDSTONE Light grey and dark grey, very thinly bedde		
	Coal	COAL (RE4) Black, not intact		
53.55 – 53.65 / 26.50		MUDSTONE Grey, massive		53.60: J, Un Sl, 43° to Ca; 3B, St Ro, 88° to Ca; 53.68: J, Un Ro, 0° to Ca
– 54.24 / 25.91	Coal	COAL (RE5) Black and brownish black, stony		
54.24 – 54.55 / 25.60	Mudstone	MUDSTONE Grey, massive, very fine sandy		
54.55 – 56.25 / 23.90	Sandstone	SANDSTONE Light grey and grey, muddy, very thinly interbedded to interlaminated with grey, fine sandy mudstone and occasional carbonaceous laminae		56.10: B, Un Ro, 80° to Ca, 3 mm coal
56.25 – 56.66 / 23.49	Mudstone	MUDSTONE Grey, massive, very fine sandy		
56.66 – 58.20 / 21.95	Sandstone	SANDSTONE Light grey fine to medium grained, thin to medium bedding and some mudstone laminae . sideritic 56.66-56.98 m		56.66: J, Un, Sl, 51° to Ca
58.20 – 60.00	Sandstone	SANDSTONE Light grey, coarse grained thinly bedded and some coal wisps and mudstone laminae		

INFERRED STRENGTH $Is_{(50)}$ MPa: EL VL L M H VH EH (0.03, 0.1, 0.3, 1, 3, 10)

FRACTURE FREQUENCY (Defects per unit metre length): 5 10 15 20 25 30

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GAP Form No. 10 RL 2

REPORT OF BOREHOLE: GA2001-5

Golder Associates

CLIENT: NEW HOPE COAL AUSTRALIA	COORDS 457878.92 m E 6944564.01 m N	SHEET: 7 OF 8	
PROJECT: OAKLEIGH COAL PROJECT	SURFACE RL: 80.15 m DATUM: AHD	DRILL RIG:	
LOCATION:	INCLINATION: -90°	LOGGED: PWB	DATE: 27/3/01
JOB NO: 01631002		CHECKED:	DATE:

Drilling — METHOD: HQ3; WATER; TCR / RQD (SCR): 100 / 93 (60.00–62.40 m); 100 / 87 (62.40–65.40 m); 100 / 80 (65.40–68.40 m); 98 / 95 (68.40–70.00 m)

Field Material Description — Weathering: FR

DEPTH / RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION
60.00 – 60.55	Sandstone	SANDSTONE Light grey, coarse grained thinly bedded and some coal wisps and mudstone laminae
60.55 / 60.68 / 19.47	Sandstone	SANDSTONE Light grey, fine, and mudstone clasts and laminae and sideritic
– 62.00	Sandstone	SANDSTONE Light grey, coarse grained massive with some coal lenses and lenticles
62.14 / 62.27	Coal	COAL Black, massive
62.47 / 17.68	Mudstone	MUDSTONE Light grey brown, massive with occasional carbonaceous laminae
62.85 / 17.30		COAL (F1) Black, stony, thickly laminated
		CARBONACEOUS MUDSTONE Dark brown grey, thickly laminated
63.40 / 16.75		SANDSTONE Light grey, fine, very thinly interbedded to thickly interlaminated with grey mudstone
		MUDSTONE Grey, massive to thickly laminated, with some sandy laminations
64.14 / 64.30 / 15.85		MUDSTONE Brownish grey, massive to thinly laminated, with some sandstone laminations below 64.0 m
64.75		SANDSTONE Light grey, medium grained, massive
64.93		MUDSTONE Grey brown, massive
65.07 / 65.23 / 14.92		CARBONACEOUS MUDSTONE Dark grey brown, massive
		COAL (F2) Black, not intact
65.70 / 14.45		CARBONACEOUS MUDSTONE Dark grey brown, massive
		COAL (F2) Black and dark grey brown, thinly bedded, with stony bands
66.30 / 13.85 / 66.50 / 13.65		MUDSTONE Grey, thinly to thickly interlaminated with very fine to fine, light grey sandstone . massive sandstone band at 66.30-66.45 m . carbonaceous mudstone bands at 66.22-66.24 m, 66.50-66.57 m and 67.61-67.65 m
67.65 / 12.50 / 67.89	Coal	COAL (F3) Black, thinly bedded . grey mudstone band at 67.89-67.91 m
12.19	Coal	COAL (F3) Black, thinly bedded, with some stony bands
68.50 / 11.65	Mudstone	MUDSTONE Grey and dark grey, massive

Defect Information

Depth	DEFECT DESCRIPTION & Additional Observations
62.14	2B, Un Ro, 85° to Ca
62.27	62.27: B, Pl Ro, 85° to a, 5 mm coal
62.85	62.85: Evidence of healed micro-faulting
64.14	64.14: B, Un Sm, 80° to Ca, carbonaceous film
64.60	64.60: J, Un Sl, 35° to Ca
64.80	64.80: J, Un Sl, 62° to a
64.90	64.90: J, Pl Sl, 42° to Ca
65.07	65.07: Evidence of healed micro-faulting
66.54	66.54: B, Pl Ro, 87° to Ca, 5 mm coal
67.80	67.80: J, St Ro, 0° to a
67.89	2B, Un-St, Ro, 88° to Ca

REPORT OF BOREHOLE: GA2001-5

Golder Associates

CLIENT:	NEW HOPE COAL AUSTRALIA	COORDS 457878.92 m E 6944564.01 m N		SHEET: 8 OF 8	
PROJECT:	OAKLEIGH COAL PROJECT	SURFACE RL: 80.15 m	DATUM: AHD	DRILL RIG:	
LOCATION:		INCLINATION: -90°		LOGGED: PWB	DATE: 27/3/01
JOB NO:	01631002			CHECKED:	DATE:

Drilling						Field Material Description				Defect Information	
METHOD	WATER	TCR	RQD (SCR)	DEPTH (meters)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH $Is_{(50)}$ MPa (EL 0.03 VL 0.1 L 0.3 M 1 H 3 VH 10 EH)	DEFECT DESCRIPTION & Additional Observations	FRACTURE FREQUENCY (Defects per unit metre length) 5 10 15 20 25 30
HQ3				70 – 71.40	71.40 / 8.75		MUDSTONE Grey and dark grey, massive	FR			
							End of Borehole @ 71.40 m				

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GAP Form No. 10
RL 2

GAP3.GLB CORED BOREHOLE I:\BRISBANE.01\MINING.01\01631002\LOGS\31002RL.GPJ GAP3.GDT 18/05/2001 16:35:30

REPORT OF BOREHOLE: GA2001-6

Golder Associates

CLIENT:	NEW HOPE COAL AUSTRALIA	COORDS 458189.51 m E 6944679.66 m N		SHEET: 1 OF 6	
PROJECT:	OAKLEIGH COAL PROJECT	SURFACE RL: 81.25 m	DATUM: AHD	DRILL RIG:	
LOCATION:		INCLINATION: -90°		LOGGED: PWB	DATE: 30/3/01
JOB NO:	01631002			CHECKED:	DATE:

Method	TCR	RQD (SCR)	Depth (m)	RL	Rock / Soil Material Description	Weathering	Defect Description & Additional Observations
HQ3			0.00	81.25	CORE LOSS		
			0.60–0.70	80.55	SILTY CLAY Dark grey brown, with some rootlets	EW	
			0.70–1.15	80.10	MUDSTONE Grey brown, very stiff, fine sandy (weathered to clay)		
	80	0	1.15–1.60	79.65	MUDSTONE Light brown, occasionally mottled orange, fine sandy (weathered to clay) . soft clay band at 1.6-1.63 m		1.60: Partial drilling water circulation loss below 1.6 m
			1.83–2.66	79.42	MUDSTONE Dark grey brown and light brown, occasionally mottled orange, fine sandy, massive (weathered to clay)		
			2.66–3.10	78.59	MUDSTONE Dark grey brown, massive (weathered to clay)		
	90	0	3.10–9.17	78.15	MUDSTONE Brown and grey brown, occasionally mottled orange, fine sandy with some very sandy bands (weathered to clay)		
	96	0					
			9.17	72.08	SANDSTONE Light brown and orange brown, massive, fine to medium, muddy (weathered to sandy clay) . ironstone band at 9.58-9.68 m (weathered to gravelly clay)		
			9.58	71.67			

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GAP Form No. 10
RL 2

GAP3.GLB CORED BOREHOLE I:\BRISBANE.01\MINING.01\01631002\LOGS\31002RL.GPJ GAP3.GDT 16/05/2001 16:37:07

REPORT OF BOREHOLE: GA2001-6

Golder Associates

CLIENT:	NEW HOPE COAL AUSTRALIA	COORDS 458189.51 m E 6944679.66 m N		SHEET: 2 OF 6	
PROJECT:	OAKLEIGH COAL PROJECT	SURFACE RL: 81.25 m	DATUM: AHD	DRILL RIG:	
LOCATION:		INCLINATION: -90°		LOGGED: PWB	DATE: 30/3/01
JOB NO:	01631002			CHECKED:	DATE:

Drilling | Field Material Description | Defect Information

METHOD: HQ3

TCR	RQD (SCR)	DEPTH / RL	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING
39	0	10.05 / 71.20	CORE LOSS	
0	0			
0	0			
0	0			
0	0	13.00 / 68.25	MUDSTONE Orange brown and grey, massive	EW
97	0	13.25 / 68.00	CARBONACEOUS MUDSTONE Dark grey and brown, thinly to medium bedded, with occasional coaly bands (weathered to clay)	DW
		14.20 / 67.05	MUDSTONE Light brown, occasional orange, massive	
90	90	15.05 / 66.20	SANDSTONE Light grey, fine, massive	SW
		15.53 / 65.63	MUDSTONE Light brown, massive	DW
			SANDSTONE Light grey, fine, medium bedded	SW
		16.03 / 65.22	MUDSTONE Orange and grey, very thinly bedded to thickly laminated	DW
		16.54 / 64.71	MUDSTONE Grey, medium bedded	SW / DW / SW
		17.55	CARBONACEOUS MUDSTONE Dark grey brown, massive	FR
		17.70 / 63.55	COAL (BT5) Black not intact	DW / FR
		18.20	. light grey brown mudstone band at 18.20-18.23 m	
		18.40 / 62.85	MUDSTONE Grey, thinly to medium interbedded with light grey, thickly laminated fine sandstone	
98	73	19.33 / 61.86	CARBONACEOUS MUDSTONE Dark grey, massive	
		19.63	COAL (RU1) Black and dark grey brown, medium bedded	
		19.82		

INFERRED STRENGTH $Is_{(50)}$ MPa: EL 0.03 VL 0.1 L 0.3 M 1 H 3 VH 10 EH

FRACTURE FREQUENCY (Defects per unit metre length): 5 10 15 20 25 30

DEFECT DESCRIPTION & Additional Observations

- 10.05: Core loss due to chert cobble rolling under bit. Some chert fragments recovered after rods pushed without rotation
- 15.10: J, Un Ro, 33° to Ca, Fe stained
- 15.40: J, Un, Ro, 80° to Ca, Fe stained
- 15.41: J, Un, Ro, 65° to Ca, Fe stained
- 2B, Un Ro, 87° to Ca, Fe stained
- 16.70: B, Un Ro, 88° to Ca, Fe stained
- 17.70: B, Pl Sm, 78° to Ca, 10 mm clay (at roof of coal)
- 2B, Pl Ro, 88° to Ca
- 2J, Pl Ro, 0° to Ca
- 18.55: B, Pl Sm, 89° to Ca
- 19.39: B, Pl Sm, 89° to Ca, 5 mm clay (roof of coal)
- 19.43: B, Pl Sm, 88° to Ca
- 19.84: B, Pl Sm, 88° to Ca

REPORT OF BOREHOLE: GA2001-6

Golder Associates

CLIENT: NEW HOPE COAL AUSTRALIA	COORDS 458189.51 m E 6944679.66 m N	SHEET: 3 OF 6	
PROJECT: OAKLEIGH COAL PROJECT	SURFACE RL: 81.25 m DATUM: AHD	DRILL RIG:	
LOCATION:	INCLINATION: -90°	LOGGED: PWB	DATE: 30/3/01
JOB NO: 01631002		CHECKED:	DATE:

Drilling | **Field Material Description** | **Defect Information**

METHOD	WATER	TCR	RQD (SCR)	DEPTH (meters)	WEATHERING
HQ3		100	77	20–~23.8	FR
HQ3		100	77	~23.8–~26.9	FR
HQ3		100	55	~26.9–~29.8	FR

Columns: DEPTH RL | GRAPHIC LOG | ROCK / SOIL MATERIAL DESCRIPTION | WEATHERING | INFERRED STRENGTH $Is_{(50)}$ MPa (EL VL L M H VH EH; 0.03 0.1 0.3 1 3 10) | DEFECT DESCRIPTION & Additional Observations | FRACTURE FREQUENCY (Defects per unit metre length) 5 10 15 20 25 30

DEPTH / RL: 61.35, 20.30, 60.95, 20.60, 20.75, 20.89, 60.31, 21.39, 21.57, 21.67, 59.58, 23.04, 23.16, 58.09, 23.37, 57.83, 24.02, 57.23, 24.23, 56.94, 24.80, 56.45, 25.10, 56.15, 26.94, 54.31, 27.85, 53.40, 28.90, 52.35, 29.30, 51.90, 29.87

ROCK / SOIL MATERIAL DESCRIPTION

- . light grey mudstone band at 19.63-19.66 m
- CARBONACEOUS MUDSTONE
  Dark grey brown, massive
- MUDSTONE
  Grey, massive
- MUDSTONE
  Grey, massive, very fine sandy
- MUDSTONE
  Grey, massive
- COAL
  Black, massive
- CARBONACEOUS MUDSTONE
  Dark grey brown, massive
- SANDSTONE
  Light grey, fine, thickly interlaminated with grey mudstone
- COAL
  Black and dark grey brown, massive
- CARBONACEOUS MUDSTONE
  Dark grey brown, massive, coaly
- MUDSTONE
  Grey, massive
- CARBONACEOUS MUDSTONE
  Dark grey brown, massive
- COAL (CW)
  Black and dark grey brown, massive to thickly laminated, muddy in places
- MUDSTONE
  Light brown speckled white, massive
- COAL (CW)
  Black, not intact in places
- CARBONACEOUS MUDSTONE
  Dark grey brown, massive
- MUDSTONE
  Light grey brown, very thinly bedded, with carbonaceous mudstone band at 24.26-24.28 m
- COAL (ST)
  Black, massive, partly not intact
- MUDSTONE
  Grey, massive
- SANDSTONE
  Light grey, very fine to fine, very thinly interbedded to thickly interlaminated with grey mudstone
- MUDSTONE (26.94 / 54.31)
  Grey, massive
  . with some pyrite nodules
- SANDSTONE (27.85 / 53.40)
  Light grey, fine to medium grained, some carbonaceous wisps
- MUDSTONE (28.90 / 52.35)
  Grey, thinly laminated
  . carbonaceous at base 29.30-29.35 m
- MUDSTONE (29.30 / 51.90)
  Grey, sandy, thickly laminated, carbonaceous wisps

DEFECT DESCRIPTION & Additional Observations

19.87: Fault plane, Un Sl, 60° to Ca
19.90: B, Pl Sm, 88° to Ca
20.10: Fault plane, Un Sl, 34° to Ca
20.30: Fault plane, Un Sl, 52° to Ca
20.42: B, Pl Ro, 82° to Ca
20.80: J, Pl Ro, 0° to Ca
2J, Pl Ro, 3° to Ca
21.67: Fault plane, Un, Sl, 45° to Ca
23.20: J, St Ro, 5° to Ca
24.14: B, Pl Sm, 89° to Ca
24.23: B, Pl Sm, 89° to Ca, 10 mm extremely low mudstone
24.25: B, Pl Sm, 89° to Ca, 30 mm clay
24.31: B, Pl Ro, 88° to Ca, (contact with coal)
2J, Un Ro, 3° to Ca
2J, Un Ro, 0° to Ca
27.05: Sz, Un, Sl, 45° to Ca
27.62: Sz, Pl, Sl, 40° to Ca
27.85: J, Pl, Ro, with calcite coating, 0° to Ca
28.15: J, Pl, Ro, with calcite coating, 0° to Ca
3B, Pl, Sm

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REPORT OF BOREHOLE: GA2001-6

Golder Associates

CLIENT:	NEW HOPE COAL AUSTRALIA	COORDS 458189.51 m E 6944679.66 m N	SHEET: 4 OF 6
PROJECT:	OAKLEIGH COAL PROJECT	SURFACE RL: 81.25 m DATUM: AHD	DRILL RIG:
LOCATION:		INCLINATION: -90°	LOGGED: PWB DATE: 30/3/01
JOB NO:	01631002		CHECKED: DATE:

Drilling — METHOD: HQ3; WATER; TCR / RQD (SCR): 100 / 77; 100 / 72; 100 / 86

Field Material Description — WEATHERING: FR; INFERRED STRENGTH $Is_{(50)}$ MPa (0.03, 0.1, 0.3, 1, 3, 10; EL, VL, L, M, H, VH, EH)

Defect Information — FRACTURE FREQUENCY (Defects per unit metre length) 5 10 15 20 25 30

DEPTH	RL	ROCK / SOIL MATERIAL DESCRIPTION	DEFECT DESCRIPTION & Additional Observations
30.06	51.14	SANDSTONE Light grey, fine, massive	30.11: B, Pl, Ro, 87° to Ca (contact with coal)
		CARBONACEOUS MUDSTONE Dark grey and grey, fine sandy, thinly interlaminated with fine, light grey muddy sandstone	2J, Pl Ro, 0° to Ca; 2B, Pl Ro, 88° to Ca; 30.60: J, Pl Ro, 0° to Ca; 2B, Pl Ro, 88° to Ca
30.76	50.40	COAL black, thinly to medium bedded, partly not intact	30.80: Fault plane, Un Sl, 45° to Ca
		MUDSTONE Grey, thinly laminated, slightly carbonaceous	
		SANDSTONE Light grey, fine, thickly interlaminated with grey, fine sandy mudstone	
31.66	49.59	SANDSTONE Light grey, medium to coarse, thickly bedded, with occasional carbonaceous laminae	
32.59		CARBONACEOUS MUDSTONE Dark grey and grey, thickly laminated	
32.77	48.48	COAL (PS1) Black, thinly bedded, partly not intact	32.77: B, St Ro, 87° to Ca; 2J, Pl Ro, 0° to Ca
33.15	48.10	MUDSTONE Grey, massive	33.15: B, Pl Ro, 89° to Ca; 33.36: Sz, 3xUn Sl, 24°, 42° and 64 to Ca
33.64		MUDSTONE Light grey brown, massive	33.64: B, Pl Ro, 88° to Ca
33.82	47.27	COAL (PS2) Black and dark grey brown, massive . carbonaceous mudstone band at 33.68 to 33.70 m	33.82: Sz, 2xUn Sl, 52° to Ca, 10 mm crushed rock; 33.88: J, Un Sl, 45° to Ca
34.21	47.04	MUDSTONE Grey, massive . light brown mudstone band at 33.91 to 33.94 m	
34.57	46.68	SANDSTONE Grey, massive, very fine to fine, muddy	34.57: B, Pl Sm, 89° to Ca, clay coating; 34.59: B, Pl Ro, 89° to Ca, clay coating
34.92	46.33	COAL (KH) Black and dark grey brown, thinly to medium bedded, with mudstone bands at 34.30 to 34.32 m	34.98: B, Un Ro, 85° to Ca
35.26	45.99	MUDSTONE Light brown, thinly laminated	
35.57		COAL (KH) Black and dark grey brown, very thinly to medium bedded, with mudstone bands at 34.30 to 34.32 m and 33.40 to 33.43 m	
35.75	45.50	COAL (KH) Black and dark grey brown, very thinly to medium bedded, with light grey brown mudstone band at 35.17 to 35.18 m	
36.43	44.82	CARBONACEOUS MUDSTONE Dark grey brown, thinly to thickly laminated, with occasional light grey mudstone and black coal bands	
37.73	43.52	MUDSTONE Light grey, massive, silty	
		SANDSTONE Light grey, fine grained, thinly laminate	37.95: Closely spaced incipient sheared bedding planes 37.95-38.15 m; 2 x Sz, low strength fragments in very low to extremely low breccia matrix
38.27	42.98	MUDSTONE Light grey, fine sandy laminae, sideritic towards base	
		SANDSTONE Light grey, fine to medium	
38.94	42.31	MUDSTONE Grey, massive	38.94: J, Pl Ro, 0° to Ca
39.17			
39.30	41.95	COAL (WS1) Black and dark grey brown, thinly bedded, with occasional thick, light brown mudstone laminae	2B, Pl Ro, 87° to Ca; 3B, Pl Ro, 87° to Ca
39.77	41.48	MUDSTONE Light brown, massive, with occasional coal	39.77: B, Un Ro, 87° to Ca, 5 mm clay

Depth scale (metres): 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40

Golder Associates

REPORT OF BOREHOLE: GA2001-6

CLIENT:	NEW HOPE COAL AUSTRALIA	COORDS 458189.51 m E 6944679.66 m N		SHEET: 5 OF 6	
PROJECT:	OAKLEIGH COAL PROJECT	SURFACE RL: 81.25 m	DATUM: AHD	DRILL RIG:	
LOCATION:		INCLINATION: -90°		LOGGED: PWB	DATE: 30/3/01
JOB NO:	01631002			CHECKED:	DATE:

Drilling — METHOD | WATER | TCR | RQD (SCR) | DEPTH (meters)

Field Material Description — DEPTH RL | GRAPHIC LOG | ROCK / SOIL MATERIAL DESCRIPTION | WEATHERING | INFERRED STRENGTH $Is_{(50)}$ MPa (EL 0.03, VL 0.1, L 0.3, M 1, H 3, VH 10, EH)

Defect Information — DEFECT DESCRIPTION & Additional Observations | FRACTURE FREQUENCY (Defects per unit metre length) 5 10 15 20 25 30

Method: HQ3

TCR	RQD (SCR)
100	47
100	83
99	98
100	100

Depth (meters): 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50

DEPTH / RL: 40.15, 41.02, 40.79, 40.46, 41.26, 39.93, 41.75, 39.50, 42.05, 39.20, 42.75, 38.50, 43.00, 38.17, 43.73, 37.52, 44.00, 44.10, 37.15, 44.50, 44.60, 44.76, 44.95, 36.30, 45.26, 35.99, 46.05, 35.20, 48.35, 32.90, 48.61, 32.58, 49.70, 31.47

Weathering: FR

ROCK / SOIL MATERIAL DESCRIPTION

laminae

COAL (WS2)
Black and dark grey brown, thinly bedded, partly not intact
. light brown mudstone band at 39.77 to 39.80 m

MUDSTONE
Light brown speckled white, massive

COAL (WS3/WS4)
Black and dark grey brown, thinly to medium bedded, partly not intact

MUDSTONE
Grey, very thinly to thinly interbedded with light grey, fine to medium sandstone

CARBONACEOUS MUDSTONE
Dark grey brown, massive

COAL (HN1)
Black, partly not intact

SANDSTONE
Light grey, fine, thinly bedded, grading to thickly interlaminated with carbonaceous sandstone laminae

MUDSTONE
Grey and light grey, thinly to thickly laminated, fine sandy in places

COAL (HN2)
Black, massive

MUDSTONE
Light grey, massive

COAL
Black, massive

SANDSTONE
Light grey, fine, very thinly interbedded to thinly interlaminated with grey, fine sandy mudstone and carbonaceous sandstone laminae

MUDSTONE
Grey, thinly to thickly laminated, with occasional very thin, fine sandstone beds

CARBONACEOUS MUDSTONE
Dark grey brown, very thinly bedded

COAL (HN3)
Black, massive

SANDSTONE
Light brown speckled dark grey, medium grained, massive

COAL (HN4)
Black, thinly bedded, with light brown mudstone bed at 44.70 - 44.72 m

MUDSTONE
Grey and light grey, medium bedded
. fine, light grey sandstone band at 44.95 to 45.08 m

SANDSTONE
Light grey and grey, fine to medium, thinly interbedded to thinly interlaminated with grey, fine sandy mudstone

SANDSTONE
Light grey, massive, with occasional carbonaceous wisps

CARBONACEOUS MUDSTONE
Dark grey brown, very thinly bedded, with occasional coal laminae

COAL
Black, massive

SANDSTONE
Light grey, fine, thinly interbedded to thickly interlaminated with grey mudstone laminae

MUDSTONE
Grey, thickly laminated

DEFECT DESCRIPTION & Additional Observations

J, Pl Sl, 68° to Ca

2J, Un Ro, 0° to Ca

42.10: J, Pl Sl, 45° to Ca

44.30: J, St Ro, 3° to Ca

44.55: B, Un Ro, 83° to Ca

44.60: B, Pl Sm, 87° to Ca, clay film (contact with coal

2B, Pl, Ro, 88° to Ca

48.47: B, Un Ro, 87° to Ca

48.67: J, Un Sl, 48° to Ca

49.78: J, Un Sl, 22° to Ca

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REPORT OF BOREHOLE: GA2001-6

CLIENT:	NEW HOPE COAL AUSTRALIA	COORDS 458189.51 m E 6944679.66 m N	SHEET: 6 OF 6		
PROJECT:	OAKLEIGH COAL PROJECT	SURFACE RL: 81.25 m DATUM: AHD	DRILL RIG:		
LOCATION:		INCLINATION: -90°	LOGGED: PWB	DATE: 30/3/01	
JOB NO:	01631002		CHECKED:	DATE:	

Drilling						Field Material Description				Defect Information	
METHOD	WATER	TCR	RQD (SCR)	DEPTH (meters)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH $Is_{(50)}$ MPa (EL VL L M H VH EH; 0.03 0.1 0.3 1 3 10)	DEFECT DESCRIPTION & Additional Observations	FRACTURE FREQUENCY (Defects per unit metre length) 5 10 15 20 25 30
HQ3				50			COAL Black and dark grey brown, massive, muddy	FR		49.80: J, Pl Ro, 0° to Ca	
					50.26		CARBONACEOUS MUDSTONE Dark grey, massive, fine sandy at base				
					50.36 30.89		MUDSTONE Grey, medium interbedded to thickly interlaminated with light grey, fine sandstone			50.50: J, Pl Sl, 46° to Ca	
					50.75 30.50		End of Borehole @ 50.75 m				
				51							
				52							
				53							
				54							
				55							
				56							
				57							
				58							
				59							
				60							

This report of borehole must be read in conjunction with accompanying notes and abbreviations. It has been prepared for Geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP Form No. 10
RL 2

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EXPLANATION OF NOTES, ABBREVIATIONS & TERMS USED ON BOREHOLE AND TEST PIT REPORTS

DRILLING/EXCAVATION METHOD

AS*	Auger Screwing	RD	Rotary blade or drag bit	HQ	Diamond Core - 63 mm
AD*	Auger Drilling	RT	Rotary Tricone bit	NMLC	Diamond Core - 52 mm
*V	V-Bit	RAB	Rotary Air Blast	NQ	Diamond Core - 47 mm
*T	TC-Bit, e.g. ADT	RC	Reverse Circulation	BH	Tractor Mounted Backhoe
HA	Hand Auger	PT	Push Tube	EX	Tracked Hydraulic Excavator
DTC	Diatube Coring	CT	Cable Tool Rig	EE	Existing Excavation
WB	Washbore or Bailer	JET	Jetting	HAND	Excavated by Hand Methods

PENETRATION/EXCAVATION RESISTANCE

L **Low resistance.** Rapid penetration possible with little effort from the equipment used.

M **Medium resistance.** Excavation/possible at an acceptable rate with moderate effort from the equipment used.

H **High resistance** to penetration/excavation. Further penetration is possible at a slow rate and requires significant effort from the equipment.

R **Refusal or Practical Refusal.** No further progress possible without the risk of damage or unacceptable wear to the digging implement or machine.

These assessments are subjective and are dependent on many factors including the equipment power, weight, condition of excavation or drilling tools, and the experience of the operator.

WATER

▽	Water level at date shown	◁	Partial water loss
▷	Water inflow	◀	Complete water loss

GROUNDWATER NOT OBSERVED	The observation of groundwater, whether present or not, was not possible due to drilling water, surface seepage or cave in of the borehole/test pit.
GROUNDWATER NOT ENCOUNTERED	The borehole/test pit was dry soon after excavation. However, groundwater could be present in less permeable strata. Inflow may have been observed had the borehole/test pit been left open for a longer period.

SAMPLING AND TESTING

SPT	Standard Penetration Test to AS1289.6.3.1-1993
4,7,11 N=18	4,7,11 = Blows per 150mm. N = Blows per 300mm penetration following 150mm seating
30/80mm	Where practical refusal occurs, the blows and penetration for that interval are reported
RW	Penetration occurred under the rod weight only
HW	Penetration occurred under the hammer and rod weight only
HB	Hammer double bouncing on anvil
DS	Disturbed sample
BDS	Bulk disturbed sample
G	Gas Sample
W	Water Sample
FP	Field permeability test over section noted
FV	Field vane shear test expressed as uncorrected shear strength s_v
PID	Photoionisation Detector reading in ppm
PM	Pressuremeter test over section noted
PP	Pocket penetrometer test expressed as instrument reading in kPa
U63	Thin walled tube sample - number indicates nominal sample diameter in millimetres

Ranking of Visually Observable Contamination and Odour (for specific soil contamination assessment projects)

R = 0	No visible evidence of contamination	R = A	No non-natural odours identified
R = 1	Slight evidence of visible contamination	R = B	Slight non-natural odours identified
R = 2	Visible contamination	R = C	Moderate non-natural odours identified
R = 3	Significant visible contamination	R = D	Strong non-natural odours identified

ROCK CORE RECOVERY

TCR = Total Core Recovery (%)

$$= \frac{\textit{Length of core recovered}}{\textit{Length of core run}} \times 100$$

SCR = Solid Core Recovery (%)

$$= \frac{\sum \textit{Length of cylindrical core recovered}}{\textit{Length of core run}} \times 100$$

RQD = Rock Quality Designation (%)

$$= \frac{\sum \textit{Axial lengths of core} > 100\ mm}{\textit{Length of core run}} \times 100$$

METHOD OF SOIL DESCRIPTION USED ON BOREHOLE AND TEST PIT REPORTS

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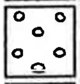
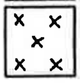
GRAPHIC LOG - TYPICAL SYMBOLS FOR SOILS

 FILL

 GRAVEL (GP OR GW)

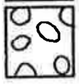
 SAND (SP or SW)

 SILT (ML or MH)

 CLAY (CL or CI)

 CLAY (CH)

 Organic Soils (OL or OH or Pt)

 COBBLES or BOULDERS

Combinations of these basic symbols may be used to indicate mixed materials such as sandy clay.

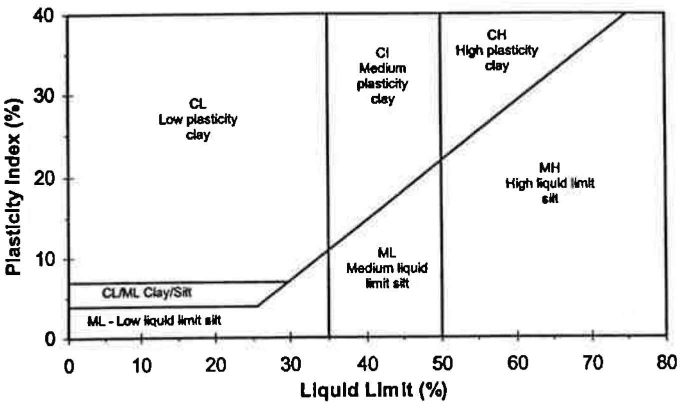
CLASSIFICATION AND INFERRED STRATIGRAPHY

Soil and Rock is classified and described in Reports of Boreholes and Test Pits using the preferred method given in AS1726 - 1993, Appendix A. The material properties are assessed in the field by visual/tactile methods.

Particle Size

Major Division	Sub Division	Particle Size
BOULDERS		> 200 mm
COBBLES		63 to 200 mm
GRAVEL	Coarse	20 to 63 mm
	Medium	6.0 to 20 mm
	Fine	2.0 to 6.0 mm
SAND	Coarse	0.6 to 2.0 mm
	Medium	0.2 to 0.6 mm
	Fine	0.075 to 0.2 mm
SILT		0.002 to 0.075 mm
CLAY		< 0.002 mm

Plasticity Properties



MOISTURE CONDITION

AS1726 - 1993

Symbol	Term	Description
D	Dry	Sands and gravels are free flowing. Clays & Silts may be brittle or friable and powdery
M	Moist	Soils are darker than in the dry condition & may feel cool. Sands and gravels tend to cohere
W	Wet	Soils exude free water. Sands and gravels tend to cohere.

CONSISTENCY AND DENSITY

AS1726 - 1993

Symbol	Term	Undrained Shear Strength
VS	Very Soft	0 to 12 kPa
S	Soft	12 to 25 kPa
F	Firm	25 to 50 kPa
St	Stiff	50 to 100 kPa
VSt	Very Stiff	100 to 200 kPa
H	Hard	above 200 kPa

Symbol	Term	Density Index %	SPT "N" #
VL	Very Loose	Less than 15	0 to 4
L	Loose	15 to 35	4 to 10
MD	Medium Dense	35 to 65	10 to 30
D	Dense	65 to 85	30 to 50
VD	Very Dense	above 85	Above 50

SPT correlations are not stated in AS1726 – 1993, and may be subject to corrections for overburden pressure and equipment type.
In the absence of test results, consistency and density may be assessed from correlations with the observed behaviour of the material.

TERMS FOR ROCK MATERIAL STRENGTH & WEATHERING AND ABBREVIATIONS FOR DEFECT DESCRIPTIONS

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STRENGTH

Symbol	Term	Point Load Index, $Is_{(50)}$ (MPa)	Field Guide
EL	Extremely Low	< 0.03	Easily remoulded by hand to a material with soil properties.
VL	Very Low	0.03 to 0.1	Material crumbles under firm blows with sharp end of pick; can be peeled with knife; too hard to cut a triaxial sample by hand. Pieces up to 30 mm can be broken by finger pressure.
L	Low	0.1 to 0.3	Easily scored with a knife; indentations 1 mm to 3 mm show in the specimen with firm blows of pick point; has dull sound under hammer. A piece of core 150 mm long by 50 mm diameter may be broken by hand. Sharp edges of core may be friable and break during handling.
M	Medium	0.3 to 1	Readily scored with a knife; a piece of core 150 mm long by 50 mm diameter can be broken by hand with difficulty.
H	High	1 to 3	A piece of core 150 mm long by 50 mm diameter cannot be broken by hand but can be broken with pick with a single firm blow; rock rings under hammer.
VH	Very High	3 to 10	Hand specimen breaks with pick after more than one blow; rock rings under hammer.
EH	Extremely High	>10	Specimen requires many blows with geological pick to break through intact material; rock rings under hammer.

ROCK STRENGTH TEST RESULTS

▼	Point Load Strength Index, $Is_{(50)}$, Axial test (MPa)
◀	Point Load Strength Index, $Is_{(50)}$, Diametral test (MPa)

ROCK MATERIAL WEATHERING

Symbol		Term	Field Guide
RS		Residual Soil	Soil developed on extremely weathered rock; the mass structure and substance fabric are no longer evident; there is a large change in volume but the soil has not been significantly transported.
EW		Extremely Weathered	Rock is weathered to such an extent that it has soil properties - i.e. it either disintegrates or can be remoulded, in water.
DW	HW	Distinctly Weathered	Rock strength usually changed by weathering. The rock may be highly discoloured, usually by iron staining. Porosity may be increased by leaching, or may be decreased due to deposition of weathering products in pores.
	MW		
SW		Slightly Weathered	Rock is slightly discoloured but shows little or no change of strength relative to fresh rock.
FR		Fresh	Rock shows no sign of decomposition or staining.

ABBREVIATIONS FOR DEFECT TYPES AND DESCRIPTIONS

Defect Type

B	Bedding parting
X	Foliation
L	Cleavage
J	Joint
SZ	Sheared zone (Fault)
CS	Crushed seam (Fault)
DS	Decomposed seam
IS	Infilled seam
S	Schistocity
V	Vein

Coating or Infilling

Cn	Clean
Sn	Stain
Vr	Veneer
Ct	Coating

Planarity

Pl	Planar
Un	Undulating
St	Stepped

Roughness

Sl	Slickensided
Sm	Smooth
Ro	Rough

Vertical Boreholes – The dip (inclination from horizontal) of the defect is given.
Inclined Boreholes – The inclination is measured as the acute angle to the core axis.

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REPORT ON GROUNDWATER STUDY

NEW OAKLEIGH COAL MINE, ROSEWOOD

prepared for
NEW HOPE COAL AUSTRALIA LTD

Project 33358A
August 2004

Douglas Partners
Geotechnics • Environment • Groundwater

REPORT
ON
GROUNDWATER STUDY

NEW OAKLEIGH COAL MINE, ROSEWOOD

prepared for
NEW HOPE COAL AUSTRALIA LTD

Project 33358A
August 2004

Douglas Partners Pty Ltd
ABN 75 053 980 117

439 Montague Road
WEST END QLD 4101
Phone (07) 3237 8900
Fax (07) 3237 8999
brisbane@douglaspartners.com.au

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CD/ANL

Project 33358A
August 2004

REPORT ON
GROUNDWATER STUDY
NEW OAKLEIGH COAL MINE, ROSEWOOD

1.0 INTRODUCTION

The report describes the results of a groundwater study carried out on the New Oakleigh Coal Mine located at Rosewood. Douglas Partners Pty Ltd (DP) was commissioned by New Hope Coal Australia Ltd to carry out the study.

The groundwater study was conducted to address the requirements of groundwater conditions C2-1 to C2-4 of the new Environmental Authority M5637 issued with the granting of a new mining lease, ML50175. The groundwater conditions comprised:

- C2-1 states that a groundwater study must be undertaken of the existing groundwater regimes with the aim of proposing any necessary monitoring programs and contaminant limits;
- C2-2 states that groundwater levels must be monitored and drawdowns in excess of 2 m per year, not resulting from the pumping of licensed bores, must be notified to the administering authority;
- C2-3 states that the sampling of groundwater should comply with the Environmental Protection Authority's (EPA's) water quality sampling manual; and
- C2-4 states that additional testing is to be carried out on Mrs Svennson's property to assess the impact of blasting on groundwater, and continue until the EPA is satisfied that blasting can have no impact to the aquifers on Mrs Svennson's property.

The objective of the groundwater study was to investigate the aquifers and groundwater quality surrounding New Oakleigh Coal Mine to satisfy the above four groundwater conditions. The study comprised the review of existing groundwater data, drilling and installation of monitoring bores, installation of data loggers to monitor groundwater levels, groundwater sampling and monitoring of groundwater quality.

2.0 SITE INFORMATION

2.1 Location, Climate and Topography

New Oakleigh Coal Mine is located near the town of Rosewood, approximately 65 km west of Brisbane as shown on Drawing 1. The mine currently holds six mining leases which occupy a total area of approximately 994 ha (refer Drawing 1). Mining lease ML50175 has an area of approximately 85 ha and is approximately 2.5 km east of Mrs Svennson's property.

Climatic information obtained from the Bureau of Meteorology shows that the New Oakleigh Mine area has a subtropical climate of warm wet summers and cool dry winters. The average annual rainfall is 865 mm and the wettest months of the year are December, January and February that average approximately 120 mm per month of rainfall.

The topography of the mine site and surrounding area is steep with the land generally sloping towards the south. The surface is dominated by a ridge with a topographic high of approximately 2200 mAHD situated to the north and northeast of the active open cut pit, and slopes down to elevations of approximately 2050 mAHD within the town of Rosewood and along the Bremer River. Ephemeral gullies drain stormwater runoff from the mine site into Western Creek, which joins the Bremer River about 1 km south of Rosewood.

2.2 Regional Geology and Hydrogeology

The Geological Survey of Queensland's 1:100,000 series Ipswich Sheet indicates the New Oakleigh Mine site to be underlain by the Jurassic aged Walloon Coal Measures comprising shale, coal, siltstone and sandstone. These strata are characterised by thin coal seams with multiple splits interlayered with the shale, siltstone, and sandstone. To the southeast of the mine site near Reinke and Urry Roads, Quaternary aged alluvial sediments associated with the Bremer River overlie the coal measures. The alluvial sediments comprise undifferentiated floodplain and river terrace deposits of sand, silt, gravel and clay. The surface geology of the region is shown on Drawing 2.

The Groundwater Resources of Queensland Map, produced by the Queensland Water Resources Commission (1987), indicates that the potential for groundwater within the Walloon coal measures beneath the New Oakleigh Coal Mine and Rosewood district is limited with bore yields typically less than 5 L/s and water quality only marginal for most stock use, ie a total dissolved salt (TDS) content of between 1,500 – 5,000 mg/L. The New Oakleigh Coal Mine EMOS (2002)[1] states that results of monitoring of groundwater from underground workings within the coal measures show the groundwater has an electrical conductivity of 5,000 to 7,000 µS/cm indicating the groundwater to be brackish.

The groundwater resources map indicates that the potential for groundwater within the unconsolidated alluvial sediments is higher, with bore yields expected to be 5 – 15 L/sec. Water quality is suitable for most uses, although marginal for human consumption, with a TDS of between 500 – 1,500 mg/L.

3.0 REVIEW OF EXISTING INFORMATION

3.1 NRM Groundwater Database

The groundwater database held by the Queensland Department of Natural Resources and Mines (NRM) does not show any privately owned registered bores within the Rosewood district. This is because the area is not within a Proclaimed Groundwater Area under the Water Resources Act1989 and Water Act 2000, and therefore the bores drilled in the district do not require registration with the NRM.

The NRM database did provide details of monitoring bores installed by NRM near Lane Road Lanefield, as well as along Rosewood-Warrill View Road, in Rosewood. Some of these bores are used to monitor groundwater levels on a six monthly basis. Bore logs obtained from NRM are provided in Appendix A. The bores are installed within the Bremer River alluvium and provide background information on water quality and groundwater levels within this aquifer. The details are summarised in Table 1.

[1] New Hope Coal Australia Ltd, April 2002, *EMOS: Environmental Management Overview Strategy New Oakleigh Coal Mine ML4568, 4584, 4683, 4698, 4699, and MLA50175.*

Table 1: NRM Monitoring Bores; Groundwater Levels and Quality

Bore No.	Date Drilled	Depth	Lithology (Aquifer)	Groundwater Quality			Groundwater Level
				TDS (mg/L)	EC (uS/cm)	pH	
14310142	13/1/1965	9.14	BR alluvium	NR	NR	NR	NR
14310143	27/1/1965	21.30	BR alluvium	2100	3900	7.4	8.60
14310144	20/1/1965	18.50	BR alluvium	7396	11700	7.8	8.24
14310145	2/4/1965	20.42	BR alluvium	1638	3000	7.2	6.40
14310146	18/1/1965	20.11	BR alluvium	295	646	6.7	7.74
14310147	25/3/1965	18.30	BR alluvium	3855	7500	7.2	7.60
14310148	22/1/1965	20.11	BR alluvium	1931	3636	8.0	10.57
14310149	24/5/1965	NR	BR alluvium	NR	NR	NR	9.89
14310068	19/3/1958	19.80	BR alluvium	803	NR	6.8	8.16
14310069	2/12/1957	16.40	BR alluvium	855	NR	7.4	7.31
14310070	19/10/1966	NR	BR alluvium	NR	NR	NR	6.17
14310071	31/3/1957	20.10	BR alluvium	2045	4020	7.8	14.00
14310072	26/3/1957	18.28	BR alluvium	1613	3100	7.6	9.88
14310073	26/2/1958	15.70	BR alluvium	1767	3320	7.8	5.17
14310074	NR	NR	BR alluvium	NR	NR	NR	3.11
14310075	24/11958	15.24	BR alluvium	1358	2510	7.9	9.40
14310076	10/2/1958	16.20	BR alluvium	2960	5000	7.9	5.10

Note:
1) BR – Bremer River.
2) NR – No records available.
3) Groundwater levels are the latest recorded water level on the NRM bore log. Measured as depth below reference point.
4) TDS – Total dissolved salt.
5) EC – Electrical conductivity.

The NRM database shows that groundwater quality within the Bremer River alluvium aquifer varies between fresh and brackish with a total dissolved salt (TDS) content of 295 mg/L to 7,396 mg/L. The pH is generally neutral to slightly alkaline.

Since approximately 1965, NRM have monitored groundwater levels in several of the bores listed in Table 1. Hydrographs of the groundwater level monitoring carried out by NRM on three bores (14310071, 14310143, and 14310144) are provided in Appendix B. Since there are no known water supply bores near these bores, the water level fluctuations are considered to be natural and in response to variations in rainfall. The hydrographs show that the natural range in groundwater levels over the monitoring period varied from approximately 4 m in 14310144 to 7.5 m in 14310143, and that levels in 2003 were generally 3 m to 5 m lower when compared to groundwater levels in the 1970's and 1980's.

3.2 New Oakleigh Coal Mine Data

Bore logs for exploration bores that intersected groundwater were obtained from New Oakleigh Coal Mine and reviewed. Copies of the bore logs are attached in Appendix C. The bores were drilled to between 18.0 m and 119 m depth to the south and southwest of ML 50175 at the locations shown on Drawing 1. The bores were drilled through the Walloon Coal Measures, and the general stratigraphy comprised clay and gravel to approximately 11 m depth, underlain by sandstone/siltstone interlayered with carbonaceous mudstone and coal. The coal seams varied in thickness from 0.1 m to 2.3 m.

Groundwater was intersected generally when the first or second coal seam was encountered at depths between 14 m and 24 m depth below ground level. No information was recorded regarding groundwater quality. Airlift flow rates from the bores ranged between 500 gal/hour (0.6 L/s) and 700 gal/hr (0.9 L/s).

The New Oakleigh Coal Mine EMOS (2002) states that yield from exploration bores and active mining pits has been very low or nil, and no significant groundwater resource has been encountered by the mining operations. Also, groundwater level data from the mine site indicates a hydraulic gradient sloping from north to south reflecting the surface topography. Drilling completed across the mining area showed that the only usable groundwater resource was the old underground mine workings.

3.3 New Oakleigh Mine Groundwater Usage

During dry times it is understood that the mine extracts groundwater from three bores within old underground mine workings to supplement the demand of the washplant. These bores are located on Blakes Road (bore 8315P), Rosewood-Marburg Road (bore 8171WB), and near Perrins Lane on Bulow's property (bore 8373P). Ms Shiralee Neverov, Senior Geologist with New Oakleigh Coal Mine, stated that the bores are able to be pumped dry within a day and then take 1-2 days to recharge. Bore locations are shown on Drawing 1.

These bores recharge slowly because once groundwater stored within the void of the old workings is extracted, the system then relies upon the rock mass to supply groundwater seepage to slowly recharge and fill up the void. This indicates the surrounding rock mass has a low permeability and the underground workings are not a continuous aquifer system.

Records from the mine showed that the Blake's Road bore and Marburg Road bore are mainly used to supply water for the washplant. The Marburg Road Bore extracted a total volume of 29,200 m^3 between May 2003 and May 2004, an average of 80 m^3/day. The Blake's Road bore extracted a total volume of 5,100 m^3 between August 2003 and May 2004, an average of approximately 19 m^3/day. Water level monitoring in these two bores showed the static water levels remained stable over the pumping period with no significant increase or decrease. The extraction rates are considered to be low and minor in comparison to the total recharge entering the aquifer.

Groundwater was also extracted from the Perrins Lane bore, also installed within old mine workings, to supplement the supply for the washplant. No records are available of the volumes extracted from the bore, except that groundwater was pumped irregularly from the bore between 24 November 2003 and 17 February 2004 over the previous year.

Groundwater is also extracted from a fourth bore, known as Kelly's bore (Bore 8345WB), which extracts groundwater from a fractured rock aquifer within the coal measures. This bore is located approximately 5 m from 8345P (refer Drawing 1), and was monitored by DP over the previous six months (refer section 4.3). No records of the volumes extracted from the bore were available, except that groundwater was pumped irregularly from the bore between September 2003 and June 2004 for dust suppression. On 30 June 2004, the mine was extracting groundwater from this bore at a rate of approximately 1.0 L/s to 1.5 L/s.

4.0 FIELD INVESTIGATION

The field investigation for this project was carried out by a Hydrogeologist from DP between September 2003 and June 2004 and comprised:

- Drilling and installation of three monitoring bores (8377P, 8378P, and 8401P);
- Inspection of Mrs Svennson's existing bore;
- Development and groundwater sampling of the monitoring bores;
- Field analysis of groundwater quality; and
- Installation of data loggers to continuously monitor groundwater levels.

4.1 Drilling and Installation of Monitoring Bores

Monitoring Bores 8377P, 8378P, and 8401P were drilled by S and K Drilling, with a Mayne 1000 truck-mounted drilling rig using conventional rotary with air drilling techniques. Bores were installed at the locations shown on Drawing 1. The locations were chosen to allow the groundwater levels within the two potential aquifers within the Walloon Coal Measures and alluvium, to be monitored off the mine site as well as on Mrs Svennson's property (213 Stevens Road, Ashwell).

The bores were drilled to between 12.5 m and 34.0 m depth. Each bore was lithologically logged onsite based on an inspection of the drill cuttings. Logging of the bores indicated that the subsurface profile comprised colluvial or alluvial sediments underlain by the Walloon Coal Measures. Further details of the subsurface conditions encountered are described on the test bore report sheets in Appendix D.

8377P was drilled on Mrs Svennson's property approximately 4 m from an existing bore within a dry gully that drained to the southeast. The depth of the existing bore was 11.0 m below ground level and the groundwater was measured at 9.7 m below ground level on 28 September 2003. The bore was constructed with six inch (152 mm) diameter steel casing that was heavily corroded near the surface. Bore 8377P intersected colluvial sediments comprising silty clay and clayey gravel to 7.5 m depth, underlain by weathered siltstone and clay. Groundwater was encountered at 11.0 m depth whilst drilling within the siltstone of the Walloon Coal Measures. Upon completion of the monitoring bore, groundwater was measured at 1.4 m below ground level.

8378P was drilled to 18.0 m depth and the subsurface comprised alluvial sediments comprising silty clay to 6.0 m depth, underlain by gravelly clay/clayey gravel to 18.0 m depth. Groundwater was intercepted at 10.0 m depth.

8401P was drilled to 34.0 m depth and intersected alluvial sediments comprising clay and clayey gravel to 13.0 m depth, underlain by siltstone and thin coal seams to 34.0 m depth. Groundwater was observed at 20 m depth within the Walloon Coal Measures. No groundwater was observed in the alluvium whilst drilling.

The bores were completed as monitoring bores by installing 50 mm diameter, PVC casing with a slotted screen. A filter pack consisting of 2-3 mm sand or 3–5 mm gravel was installed in the annulus between the bore wall and casing/screen. A bentonite seal was placed in the annulus above the screen to prevent surface water from entering the bores. A protective steel monument cover was concreted over the top of the PVC casing. On completion, New Hope Coal surveyed the bores.

Construction details for the monitoring bores are summarised in Table 2 and are illustrated on the bore report sheets in Appendix D.

Table 2 – Monitoring Well Construction Details

Monitoring Bore	Ground Elevation RL[1]	Total Depth (mBGL)	Screen Interval (mBGL)	Filter Pack (mBGL)	Water Level (mBGL)	Water Level RL (m)
8377P	75.05	12.5	10.5 – 12.5	6.5 – 12.5	1.40	73.65
8378P	51.09	17.0	11.0 – 17.0	1.5 – 17.0	2.20	48.89
8401P	60.59	34.0	16.0 – 34.0	14.0 – 34.0	12.95	47.64

Note: 1) RL – relative level of ground surface in mAHD.
2) mBGL – metres below ground level.

4.2 Bore Development and Groundwater Sampling

Monitoring bores were installed and developed in accordance with the Agriculture and Resource Management Council of Australia and New Zealand's 'Minimum Construction Requirements For

Water Bores In Australia', dated July 1997. The bores were drilled without using any polymer drilling fluid additive, thus there was no need for any chemical breakdown products to be used during development.

Bore development involved airlifting and bailing of groundwater to remove the fine sand/silt/clay introduced into the bores during drilling. Bailing continued until the discharged water was visibly clean, and the pH, EC and temperature of the groundwater had stabilised.

To ensure that representative groundwater samples were obtained, bores were sampled in accordance with the EPA's (December 1999) Water Quality Sampling Manual, as well as the 'Murray-Darling Basin Groundwater Quality Sampling Guidelines", published by the Murray-Darling Basin Commission in 1997. Sampling of monitoring bores 8377P, 8378P, 8345WB, and 8401P was carried out using a stainless steel bailer on two occasions; initially when the bores were installed in September and October 2003, and in January 2004 to assess any seasonal variations in quality. Sampling equipment was cleaned and decontaminated between each monitoring bore location. The samples were transferred to the appropriate preserved containers and kept chilled until delivered to the laboratory for analysis.

4.3 Groundwater Monitoring - Field Analyses

Groundwater was monitored once per month from January 2004 to June 2004. Depth to groundwater was measured and samples were analysed on-site for pH, electrical conductivity (EC), and temperature using pre-calibrated hand held equipment. Results of the groundwater monitoring and field analyses are provided in Table 3.

Table 3 – Groundwater Field Monitoring Results

Bore	Sampling Date	SWL (mBTOC)	SWL (mBGL)	Ph	EC	Temp
8377P	28/09/2003	1.4	0.7	7.0	15,500	23.5
	31/01/2004	3.71	2.77	6.9	15,450	23.5
	20/02/2004	2.95	2.01	6.9	15,100	23.0
	26/03/2004	2.18	1.24	-	-	-
	30/04/2004	2.56	1.62	6.8	14,100	22.5
	31/05/2004	3.45	2.51	6.8	14,200	22.2
	30/6/2004	3.99	3.05	6.6	13,200	22.2
8378P	1/10/2003	2.40	2.20	7.6	7730	23.0
	7/01/2004	3.46	2.71	6.3	6540	23.5
	22/01/2004	3.69	2.94	-	-	-
	20/02/2004	3.62	2.87	6.4	6600	23.0
	26/03/2004	3.47	2.72	-	-	-
	30/04/2004	3.31	2.56	6.3	6570	22.7
	31/05/2004	3.38	2.63	6.2	6760	21.6
	30/6/2004	3.34	2.59	6.3	6700	21.3
8401P	13/10/2003	13.66	12.86	7.2	12700	23.0
	7/01/2004	14.04	13.05	6.7	15400	24.0
	22/01/2004	13.72	12.73	-	-	-
	20/02/2004	13.59	12.6	6.8	14,800	23.5
	26/03/2004	13.40	12.41	-	-	-
	30/04/2004	13.07	12.08	6.8	14,650	22.5
	31/05/2004	13.52	12.53	6.7	14,700	22.1
	30/6/2004	13.40	12.41	6.6	13,500	21.6
8348P (8345WB)	13/10/2003	18.4[4]	17.13	7.1	12700	21.5
	7/01/2004	12.28	10.96	7.2	12200	23.2
	30/04/2004	8.48	7.16	7.0	13,300	21.8
	30/05/2004	9.05	7.73	7.0	12,300	21.8
	30/6/2004	13.97[4]	12.65	6.7	13,500	22.1

Notes:
1) EC – Electrical Conductivity.
2) mBTOC – metres below top of steel casing, except 8345P which is below PVC casing.
3) mBGL – metres below ground level.
4) 8348P monitored from a 50 mm monitoring bore approximately 5 m from the water supply bore 8345WB. On 13/10/03 and 30/6/04 New Oakleigh Coal Mine was pumping from the water supply bore.

The results for bores 8377P, 8401P, and 8348P indicate the groundwater within the fractured rock aquifer within the coal measures is brackish to saline, with EC levels ranging between 12,200 and 15,500 μS/cm. These levels are greater than those interpreted from the Groundwater Resources of Queensland Map. The pH of the groundwater was slightly acidic to neutral.

Bore 8378P is screened within the Bremer River alluvium and the monitoring results indicate the groundwater has a lower TDS content than groundwater within the coal measures, as EC levels varied between 6,540 and 7,730 μS/cm. The pH of the groundwater was slightly acidic.

4.4 Installation of Data Loggers

Data loggers were installed in monitoring bores 8378P and 8401P on the 7 January 2004, as well as in 8377P on Mrs Svennson's property on 31 January 2004. The loggers were Odyssey capacitive water level probes capable of monitoring groundwater level variations of up to 3 m. The loggers were installed to allow continuous monitoring of groundwater levels within the bores in relation to rainfall, groundwater extraction and blasting on the mine site. This monitoring was required to comply with groundwater conditions C2-2 and C2-4 of the new Environmental Authority M5637. Data loggers were set to record a water level reading every 30 minutes. Data were downloaded at the end of each month and the results were plotted as depth to groundwater over the six months of monitoring. To allow comparison with rainfall, daily rainfall obtained from New Oakleigh Coal Mine's weather station has been included on the hydrographs attached in Appendix E.

The three hydrographs show a general increase in groundwater levels from January to April in response to the above average rainfall in January (156.5 mm), February (119.5 mm), and March (149.5 mm). The hydrographs show a decreasing trend in groundwater levels during May and June in response to the low rainfall, as April recorded only 20 mm of rain, May 10 mm, and June 1.5 mm for the month. The changes in groundwater level from the beginning to the end of the six month monitoring period were:

- 8377P – decrease of 0.10 m;
- 8378P – increase of 0.20 m; and
- 8401P – increase of 0.69 m.

The variation in groundwater levels in the bores, ie difference between the highest and lowest groundwater levels recorded over the monitoring period were:

- 8377P – 1.90 m;
- 8378P – 0.53 m; and
- 8401P – 1.36 m.

The hydrographs show the response to rainfall and variations in water level are greater in bores 8377P and 8401P compared to those recorded in bore 8378P. This is caused by the difference in aquifer porosity and storage properties between the fractured rock aquifer, monitored by bores 8377P and 8401P, and the clayey gravel/gravelly clay alluvium aquifer monitored by bore 8378P. The groundwater is above the level of the aquifer indicating the water in both aquifers is under pressure and the loggers are recording the potentiometric surface (pressure reading of the water within the pore spaces/voids) and not the water table. As recharge enters the aquifers from rainfall, water is added to the pore spaces or fractures, which compresses the water resulting in a pressure increase and a rise in the water level in the monitoring bore. Since the storage is greater within the alluvium sediments, probably several orders of magnitude, increases in groundwater level in response to rainfall are smaller.

5.0 LABORATORY TESTING

5.1 Laboratory Analyses

Groundwater samples were collected from bores 8377P, 8378P, 8345WB, and 8401P on two occasions and analysed for the following parameters:

- Total dissolved salts (TDS);
- Arsenic, cadmium, chromium, copper, iron, nickel, lead and zinc;
- Major cations – sodium, calcium, magnesium, and potassium
- Major anions – chloride, bicarbonate, carbonate, and sulfate.

5.2 Regulatory Criteria

Groundwater results have been compared to the National Environmental Protection Measures (1999) and ANZECC/NHMRC *Australian Water Quality Guidelines for Fresh and Marine Waters* (2000) Guidelines for the Protection of Freshwater Aquatic Ecosystems, and the guidelines for livestock drinking water.

5.3 Laboratory Results

Laboratory results are summarised in Table 4 for bores 8377P and 8378P, and Table 5 for 8348P and 8401P. The laboratory reports and chain of custody documentation are attached in Appendix F.

Table 4 – Laboratory Results For Bores 8377P and 8378P

Analyte	Unit	ANZECC Guideline		8377P		8378P	
		Fresh Water[1]	Stock Water[2]	28/9/03	31/1/04	1/10/03	7/1/04
TDS	mg/L	1000	5000	9060	9670	6300	4650
pH – field	Units	6.5-8.0	-	7.0	6.9	7.6	6.3
EC – field	µS/cm	5000	-	15,500	15,450	7730	6540
Major Cations:							
Calcium	mg/L	-	1000	167	225	405	238
Magnesium	mg/L	-	2000	438	610	423	224
Sodium	mg/L	-	-	2190	3120	1050	1070
Potassium	mg/L	-	-	20	22	8	8
Major Anions:							
Chloride	mg/L	-	-	4360	5820	1200	1360
Sulfate	mg/L	-	1000	199	146	2640	1210
Carbonate	mg/L	-	-	<1	<1	<1	<1
Bicarbonate	mg/L	-	-	677	1430	669	718
Heavy Metals:							
Arsenic	mg/L	0.094	0.5	<0.001	<0.001	0.031	0.014
Cadmium	mg/L	0.0004	0.01	0.0002	0.0001	0.0002	0.0001
Chromium	mg/L	-	1	0.029	<0.001	0.016	<0.001
Copper	mg/L	0.0018	0.4	0.002	0.002	0.015	0.004
Nickel	mg/L	0.0013	1	0.002	0.004	0.007	0.004
Lead	mg/L	0.0056	0.1	<0.001	<0.001	<0.001	<0.001
Zinc	mg/L	0.0015	20	0.042	0.030	0.018	0.082

Notes:
1) ANZECC 90% protection trigger level for freshwater – lowland rivers.
2) ANZECC Livestock drinking water guidelines. Sheep may tolerate up to 10,000 mg/L.
3) Ph and EC were analysed in the field.
4) <LOR – less than laboratories level of reporting (ie detection limits).
5) Shaded – level exceeds ANZECC livestock guideline.

Table 5 – Laboratory Results For Bores 8348P and 8401P

Analyte	Unit	ANZECC Guideline		8348P		8401P	
		Fresh[1] Water	Livestock Water[2]	13/10/03	7/1/04	13/10/03	7/1/04
TDS	mg/L	1000	5000	8380	8840	7760	11300
pH – field	Units	6.5-8.0	-	7.1	7.2	7.2	6.7
EC – field	µS/cm	5000	-	12700	12200	12700	15400
Major Cations:							
Calcium	mg/L	-	1000	116	117	108	150
Magnesium	mg/L	-	2000	93	99	196	424
Sodium	mg/L	-	-	2870	3030	2520	3480
Potassium	mg/L	-	-	16	19	11	15
Major Anions:							
Chloride	mg/L	-	-	3300	3470	3040	5550
Sulfate	mg/L	-	1000	1340	1450	883	1000
Carbonate	mg/L	-	-	<1	<1	<1	<1
Bicarbonate	mg/L	-	-	993	1010	1270	981
Heavy Metals:							
Arsenic	mg/L	0.094	0.5	<0.001	0.002	<0.001	<0.001
Cadmium	mg/L	0.0004	0.01	<0.0001	0.0002	<0.0001	0.0001
Chromium	mg/L	-	1	0.008	0.008	0.013	0.006
Copper	mg/L	0.0018	0.4	0.003	0.004	0.004	0.003
Nickel	mg/L	0.0013	1	0.003	0.007	0.004	<0.001
Lead	mg/L	0.0056	0.1	<0.001	<0.001	<0.001	<0.001
Zinc	mg/L	0.0015	20	0.035	0.196	0.070	0.076

Notes:
1) ANZECC 90% protection trigger level for freshwater.
2) NHMRC/ARMCANZ National Water Quality Management Strategy Australian Drinking Water Guidelines 1996.
3) Ph and EC were analysed in the field.
3) <LOR – less than laboratories level of reporting (ie detection limits).
4) Shaded – level exceeds ANZECC livestock guideline.

6.0 QUALITY ASSURANCE/QUALITY CONTROL

6.1 Quality Assurance

Quality assurance (QA) was maintained by:

- Compliance with a Project Quality Plan written for the objectives of the study;
- Using a qualified Environmental Engineer and Hydrogeologist to conduct field investigation;
- Compliance with DP QA procedures for soil sampling, field testing and decontamination;
- Dispatching samples using appropriate chain of custody procedures;
- Using a NATA registered laboratory that uses standard laboratory methods of the USEPA and the APHA.

6.2 Quality Control

Quality control of the laboratory analyses was achieved by the following means:

- laboratory control spikes: samples were spiked by the laboratory with a known concentration of contamination and subsequently tested for percent recovery;
- Equipment blanks: the laboratory ran reagent blanks to confirm the equipment and standards used were uncontaminated.

Results of all quality testing conducted by the laboratory are attached with the laboratory reports in Appendix F.

6.3 Quality Control Results

6.3.1 Laboratory Spikes

The laboratories spiked samples with a known concentration of contaminants. The spiked recovery percentages were reported by the laboratory within the acceptable ranges of 75% to 125% for metals.

6.3.2 Equipment Blanks

All equipment/method blanks returned results lower than the laboratory detection limit or level of reporting (LOR), therefore are acceptable.

6.4 Summary - QA/QC

On the basis of the analytical data validation procedure used by DP and ALS, as well as the quality assurance measures maintained, the quality of the soil analytical data produced is considered to be acceptable for interpretive use.

7.0 CONCEPTUAL HYDROGEOLOGICAL MODEL (GROUNDWATER REGIME)

The conceptual hydrogeological model, or description of the groundwater regimes, is based upon a review of the geological and topographic maps for the area, data supplied by New Hope Coal Australia Ltd, field observations, and from the drilling and installation of monitoring bores. The model or groundwater regime is described in the following sections.

7.1 Geological Setting

Three different groundwater regimes were identified by this study, and include:

- Bremer River Alluvium aquifer;
- Walloon Coal Measures fractured rock (coal seam) aquifers; and
- Voids within the old mine workings.

The Bremer River alluvium comprises undifferentiated floodplain and river terrace deposits of sand, silt, gravel and clay, as discussed in section 2.2. The aquifer lithology generally comprises clayey gravel which is confined by the overlying sandy clay and silty clay lithologies.

The Walloon Coal Measures contain fractured rock aquifers mainly present within the various coal seams, but also possibly within carbonaceous mudstone/siltstone lithologies. The coal measures comprise a layered sequence of shale, coal, carbonaceous mudstone, siltstone and sandstone. Groundwater is confined by the low permeability siltstone or sandstone present above and below the coal seams.

Voids within the old mine workings were formed when past underground mining of the coal was carried out. Groundwater is largely present within the voids left by past mining and is confined by the surrounding bedrock, most likely siltstone or sandstone, which have a low permeability.

7.2 Hydrogeology

The Bremer River alluvium aquifer, as intersected by 8378P and the NRM monitoring bores, is considered to be a semi-confined aquifer that receives recharge primarily through rainfall infiltration and leakage through the overlying clay sediments. Groundwater quality is generally brackish with a TDS of approximately 4,500 mg/L and is slightly acidic. The groundwater is suitable for most livestock, but not for human consumption. Water inputs to the aquifer include recharge via rainfall infiltration. Water outputs or losses from the aquifer include discharge to Bremer River and groundwater extraction from bores.

The groundwater in the fractured coal seam or siltstone aquifers, as intersected by 8401P, 8345WB and Mrs Svennson's monitoring bore 8377P, is considered to be under confined conditions. The groundwater flows within the cleats or fractures within the coal seams, and bore yields are generally restricted to <2 L/s depending on the continuous nature of the fractures. Groundwater quality is poor, ie generally saline with a TDS of approximately 9,500 mg/L and neutral pH, and is not suitable for livestock or for human consumption. Multiple aquifers may exist within the different fractured systems or coal seams. However, these aquifers are separated by the confining units and due to the discontinuous nature of the fractures, pumping from one aquifer is unlikely to affect the water levels in another. Water inputs to the aquifer include recharge via rainfall infiltration. Water outputs or losses from the aquifer include groundwater extraction from bores.

Groundwater in the voids of the old mine workings, as intersected by bores 8315P, 8171WB, and 8373P, is considered to be a confined aquifer that receives recharge through rainfall infiltration and leakage from upgradient coal seams (if still present and hydraulically connected to the void). Groundwater quality is generally brackish to slightly saline, as information from New Oakleigh Coal Mine suggests it has a TDS of approximately 4,000 mg/L. This groundwater is suitable for most livestock, but not for human consumption. Water inputs to the aquifer include recharge via rainfall infiltration and leakage from coal seam and surrounding bedrock. Water outputs or losses from the aquifer include discharge to the down-gradient coal seam and groundwater extraction from bores.

7.3 Groundwater Levels and Flow Patterns

Groundwater flow direction within the Bremer River alluvium aquifer is likely to reflect the topography of the region and be directed towards the Bremer River. The data logger installed in 8378P indicated the groundwater elevation at the end of June was approximately 47.8 mAHD. Groundwater will flow in a southerly direction from this bore towards the Bremer River. As discussed in section 4.4 the data logger installed within 8378P recorded variations in the potentiometric surface (pressure reading of the water within the pore spaces/voids) and not the water table. The hydrograph in Appendix E indicates that the groundwater fluctuates according to changes in rainfall.

Groundwater flow direction within the fractured coal seam aquifers is likely to reflect the surface topography and be directed towards the south from the mine site. The data loggers installed in 8377P on Mrs Svennson's property and 8401P indicated the groundwater elevation at the end of June was approximately 72.0 mAHD in 8377P and 48.2 mAHD in 8401P. Groundwater will flow in a southerly direction from these bores. As discussed in section 4.4 these data loggers recorded variations in the potentiometric surface (pressure reading of the water within the pore spaces/voids) and not the water table.

The hydrographs in Appendix E indicate the groundwater levels fluctuated in response to changes in rainfall. The two bores are unlikely to be hydraulically connected due to the distance between them and the discontinuous nature of the fractured rock aquifers within the coal seams. Bore 8401P is located closer to the mine site and water supply bore 8345WB, which the mine has used to extract groundwater for dust suppression purposes on the haul roads. The hydrographs show no drawdown of the levels in response to the groundwater extraction.

Groundwater flow direction within the voids of the old mine workings aquifer is likely to reflect the topography of the basement of the voids or the dip direction of the coal seam that was mined. Groundwater gradient within the old workings is probably relatively flat.

8.0 GROUNDWATER MONITORING - MRS SVENNSON'S PROPERTY

To comply with groundwater condition C2-4 of the new Environmental Authority M5637, monitoring of the groundwater on Mrs Svennson's property was carried out to assess if mining activities, particularly blasting, was impacting upon the groundwater regime. The monitoring comprised the following activities:

- Inspection and airlift test of the existing bore equipped with a windmill pump;
- Drilling and installation of a monitoring bore (8377P) on Mrs Svennson's property next to an existing bore;
- Installation of a data logger to continuously monitor the groundwater level from January to June 2004. The hydrograph from the bore showing the changes in groundwater level elevation and rainfall is attached in Appendix E; and
- Monitoring of groundwater quality from September 2003 to June 2004.

The existing bore on Mrs Svennson's property was equipped with a windmill pump and constructed with six inch (152 mm) diameter steel casing that was heavily corroded near the surface. Minimal quantities of groundwater were discharged on to the ground next to the bore by the pump. No details on the bore construction (ie depth and type of screen) were available from Mrs Svennson. The total depth of the bore was 11.0 m below ground level and the groundwater was measured at 9.7 m below ground level on 28 September 2003.

The bore was airlifted in an attempt to clean the bore and improve its yield, however the bore produced only a few litres (<5 L) of turbid water, which contained fragments of corroded steel, before being pumped dry within minutes. Corrosion of the bore casing has probably closed up the slots in the steel casing/screen restricting the inflow of groundwater into the casing.

Monitoring bore 8377P was drilled approximately 4 m from the existing bore to a similar depth. This bore intersected a fractured rock aquifer at approximately 11 m depth and monitoring has showed the groundwater level (potentiometric surface) varies between 2 m and 4 m below ground level, considerably higher than that measured in the existing bore (9.7 m). This suggests that the corrosion of the existing bore is extensive, and is causing the screen or slotted casing to be practically sealed off from the aquifer.

Blasting records for New Oakleigh Coal Mine were obtained and are attached in Appendix G. The records show that blasting was carried out on the following days during the monitoring period:

- 24, 25, 26, and 27 February 2004;
- 1 and 2 March 2004;
- 25 May 2004; and
- 11, 28, 30 June 2004.

The hydrographs for 8377P and 8401P, located approximately 1.5 km closer to the mine, show no change in the water level or a decreasing trend following the days that blasting was carried out. 8377P shows a greater response to variations in rainfall probably due to the lower aquifer storage and the fractures less extensive compared to the aquifer intersected by 8401P. This also indicates that the bores have intersected separate aquifers that are not hydraulically connected.

The hydrographs also show no impact or drawdown of the groundwater levels as a result of the groundwater extraction as described in section 3.3.

Monitoring of groundwater quality showed no decrease in the quality of groundwater within 8377P. Table 2 shows the pH and EC of the groundwater remained the same throughout the six month monitoring period, with a slight decrease in EC (decrease in salt content or increase in quality) recorded in June 2004. No impact to the quality of the groundwater was observed following blasting.

Monitoring of groundwater quality and levels in 8377P, located on Mrs Svennson's property, and 8401P situated closer to the mine showed no impact from blasting or groundwater extraction at the New Oakleigh Coal Mine. Taking into account the discontinuous nature of the fractured rock aquifers, the poor groundwater quality, and the results of the monitoring over the previous six months, it is considered that future monitoring is not required on Mrs Svennson's property as there is no future risk of the mine impacting upon the groundwater regime on the property.

9.0 SUMMARY AND CONCLUSIONS

The groundwater study carried out for New Oakleigh Coal Mine concluded the following:

- Three separate aquifers or groundwater regimes were identified within the mining lease areas of New Oakleigh Coal Mine:

    - Bremer River Alluvium aquifer;
    - Walloon Coal Measures fractured rock (coal seam) aquifers; and
    - Voids within the old mine workings.

- Groundwater quality within the Bremer River alluvium was brackish with a TDS of approximately 4,500 mg/L (or EC of 7,000 μS/cm). The groundwater is suitable for most livestock, but not for human consumption.

- Fractured rock aquifers within the Walloon Coal Measures contain groundwater of poor quality, ie saline with a TDS of approximately 9,500 mg/L (or EC of 14,500 μS/cm), which is not suitable for livestock or human consumption. Multiple aquifers that are not hydraulically connected may exist within the different coal seams and carbonaceous mudstone layers.

- Groundwater quality within the old mine workings was brackish to slightly saline with a TDS of approximately 4,000 mg/L (or EC of 6,000 µS/cm). This groundwater is suitable for most livestock, but not for human consumption.

- Groundwater is extracted periodically from four bores by the mine to supplement the requirements for the washplant and for dust suppression.

- The existing bore on Mrs Svennson's property was constructed with steel casing that was highly corroded, which appeared to restrict the inflow of groundwater to the bore. As a result, the groundwater level and bores yield were significantly impacted when compared to the results of new monitoring bore 8377P.

- Monitoring of groundwater levels and quality on Mrs Svennson's indicated there was no impact from blasting or groundwater extraction at the New Oakleigh Coal Mine. Given the discontinuous nature of the fractured rock aquifer and the distance between the property and the mine, it is considered that the mining activities would not impact upon the groundwater regime in the future.

10.0 RECOMMENDATIONS

Based upon the results of this groundwater study, the following is recommended:

- Monitoring of groundwater on Mrs Svennson's property be discontinued.

- Monitoring of groundwater quality and levels within bores 8401P, 8378P and 8348P be continued on a quarterly basis (every three months) to assess the seasonal variations in quality for at least two years to obtain reliable background data. Monitoring should also be carried on those bores used as a water source by the mine to supplement the demand of the washplant, ie Blakes and Rosewood-Marburg Road Bores. Once this background information has been obtained and assessed, then groundwater quality objectives (ie contaminant limits) for the mine site should be developed.

11.0 LIMITATIONS OF THIS REPORT

DP has performed investigation and consulting services for this project in accordance with current professional and industry standards for hydrogeological assessments. DP's assessment is necessarily based on the results of limited site investigations and upon the restricted programme of surface/subsurface sample screening and groundwater testing. Neither DP, nor any other reputable consultant, can provide unqualified warranties, nor does DP assume any liability for site conditions not observed, or accessible during the time of the investigations.

Despite all reasonable care and diligence, the ground conditions, groundwater flow patterns, and groundwater quality measured may not be representative of conditions between the locations sampled and investigated. In addition, site characteristics may change over time in response to variations in natural conditions, chemical reactions and other events, *eg* groundwater movement, recharge and/or spillage of contaminating substances. These changes may occur after DP's investigations and assessment.

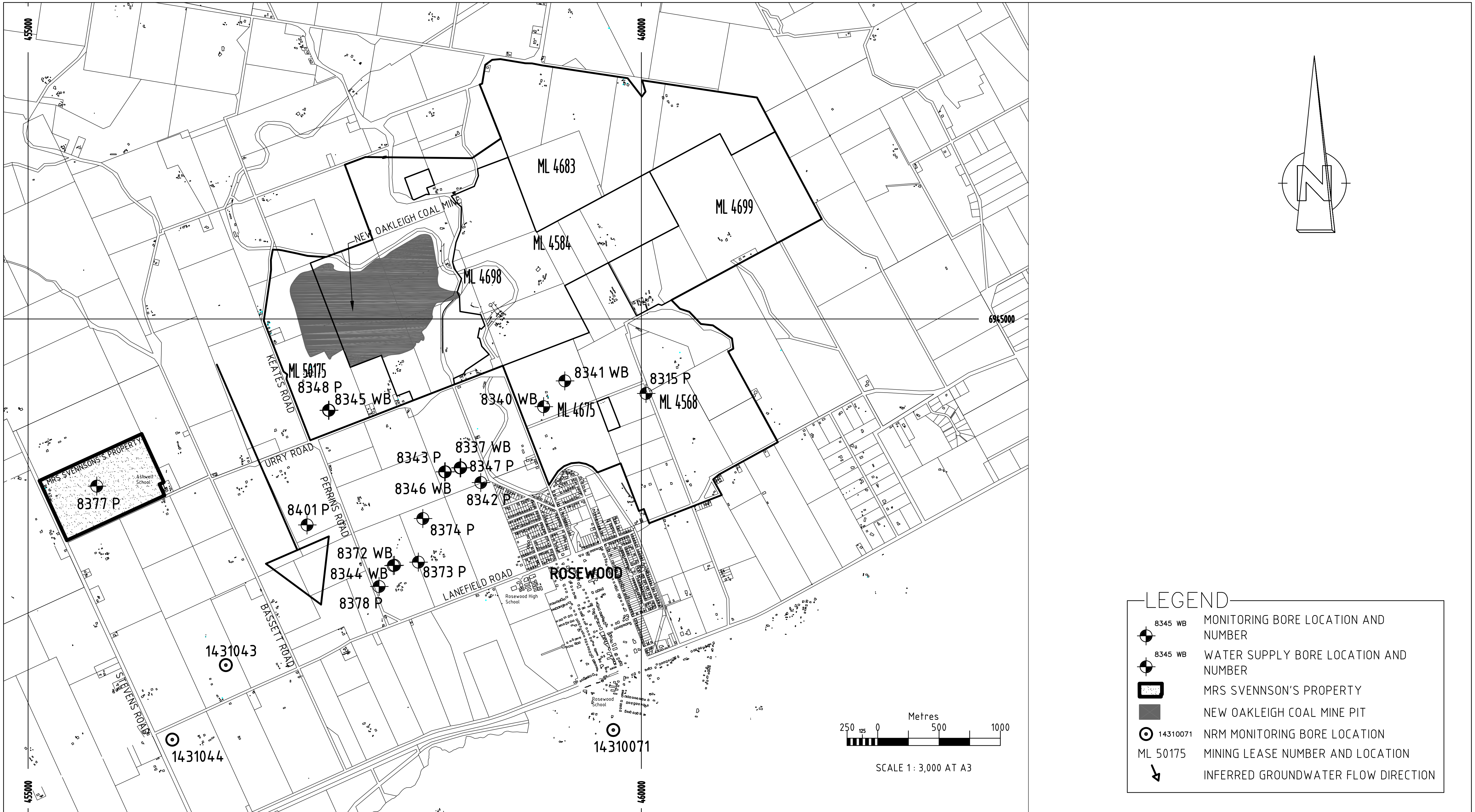
This report and associated documentation and the information herein have been prepared solely for the use of New Hope Coal Australia and any reliance assumed by third parties on this report shall be at such parties' own risk. Any ensuing liability resulting from use of the report by third parties cannot be transferred to DP.

DOUGLAS PARTNERS PTY LTD

Reviewed by:

Carl Deegan
Associate/Hydrogeologist

Alan Lee
Principal - Environment



NOTES:-

1. ADAPTED FROM OAK_WBORES SUPPLIED BY NEW HOPE COAL AUSTRALIA Ltd.

2. TEST LOCATIONS ARE APPROXIMATE ONLY AND ARE SHOWN WITH REFERENCE TO EXISTING SITE FEATURES

Douglas Partners

Geotechnics · Environment · Groundwater

Sydney, Newcastle, Brisbane, Melbourne, Perth, Darwin

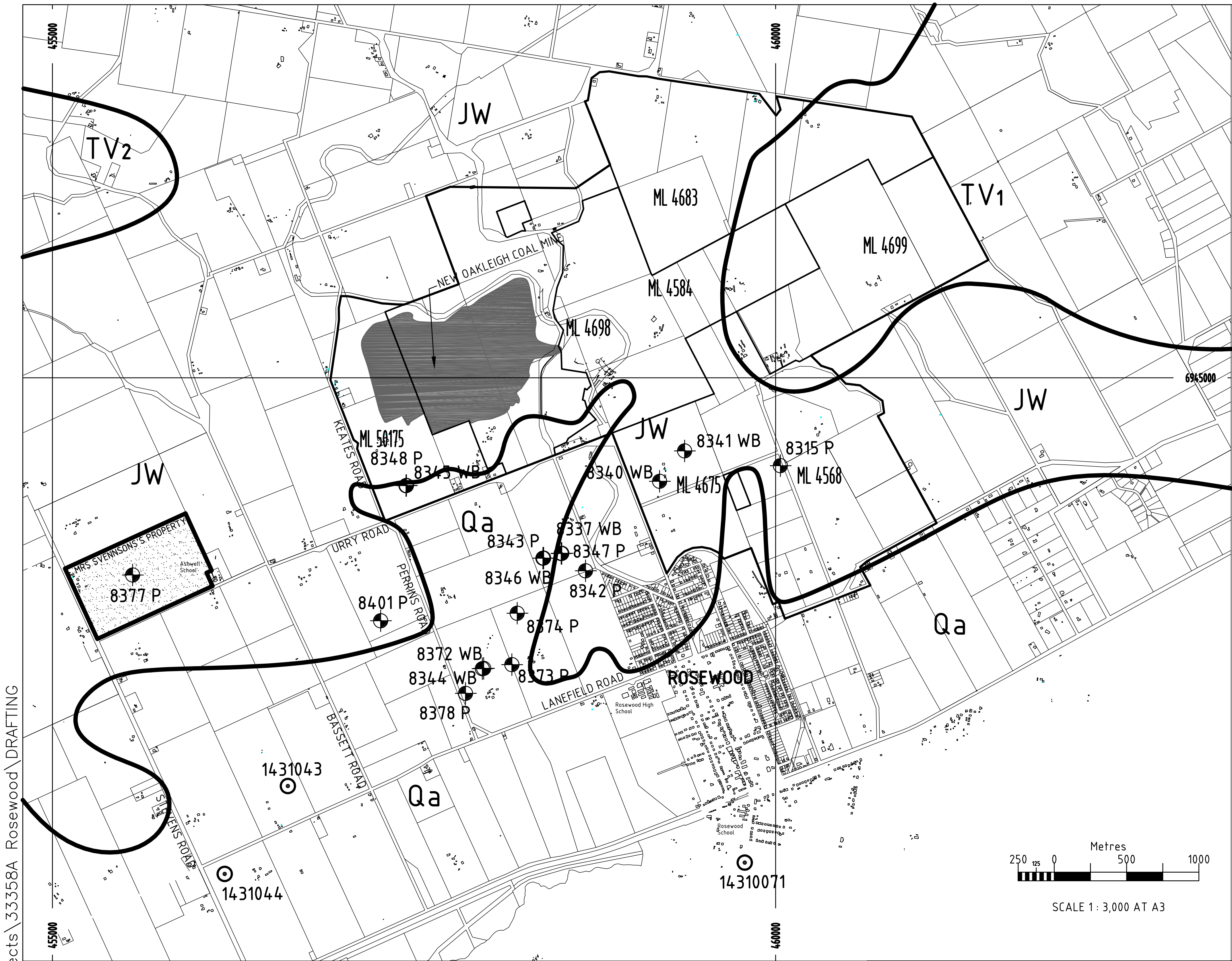
Campbelltown, Townsville, Cairns, Wollongong, Wyong

TITLE:

SITEPLAN AND BORE LOCATION PLAN, GROUND WATER STUDY NEW OAKLEIGH COAL MINE, ROSEWOOD

CLIENT: **NEW HOPE COAL AUSTRALIA**			OFFICE: **BRISBANE**
DRAWN BY: VTE	SCALE: AS SHOWN	PROJECT No: 33358A	DRAWING No: **1**
APPROVED BY:		DATE: AUGUST 2004	

CAD FILE O:\Groundwater projects\33358A Rosewood\DRAFTING



LEGEND

8345 WB	MONITORING BORE LOCATION AND NUMBER
8345 WB	WATER SUPPLY BORE LOCATION AND NUMBER
	MRS SVENNSON'S PROPERTY
	NEW OAKLEIGH COAL MINE PIT
14310071	NRM MONITORING BORE LOCATION
ML 50175	MINING LEASE NUMBER AND LOCATION

GEOLOGICAL UNITS:

Qa	QUARTERNARY ALLUVIUM
TV1	CREATACEOUS BASALT
TV2	TERTIARY BASALT, MINOR VOLCANIC BRECCIA
Jw	JURASSIC WALOON COAL MEASURES

NOTES:-
1. INFERRED FROM GEOLOGICAL SURVEY OF QUEENSLAND 1:100 000 SERIES IPSWICH SHEET.

Douglas Partners
Geotechnics · Environment · Groundwater

Sydney, Newcastle, Brisbane, Melbourne, Perth, Darwin

Campbelltown, Townsville, Cairns, Wollongong, Wyong

TITLE:
SURFACE GEOLOGY PLAN
NEW OAKLEIGH COAL MINE, ROSEWOOD

CLIENT: **NEW HOPE COAL AUSTRALIA**			OFFICE: **BRISBANE**
DRAWN BY: VTE	SCALE: AS SHOWN	PROJECT No: 33358A	DRAWING No: **2**
APPROVED BY:		DATE: AUGUST 2004	

CAD FILE O:\Groundwater projects\33358A Rosewood\DRAFTING

- LEGEND -

Creek Alignment

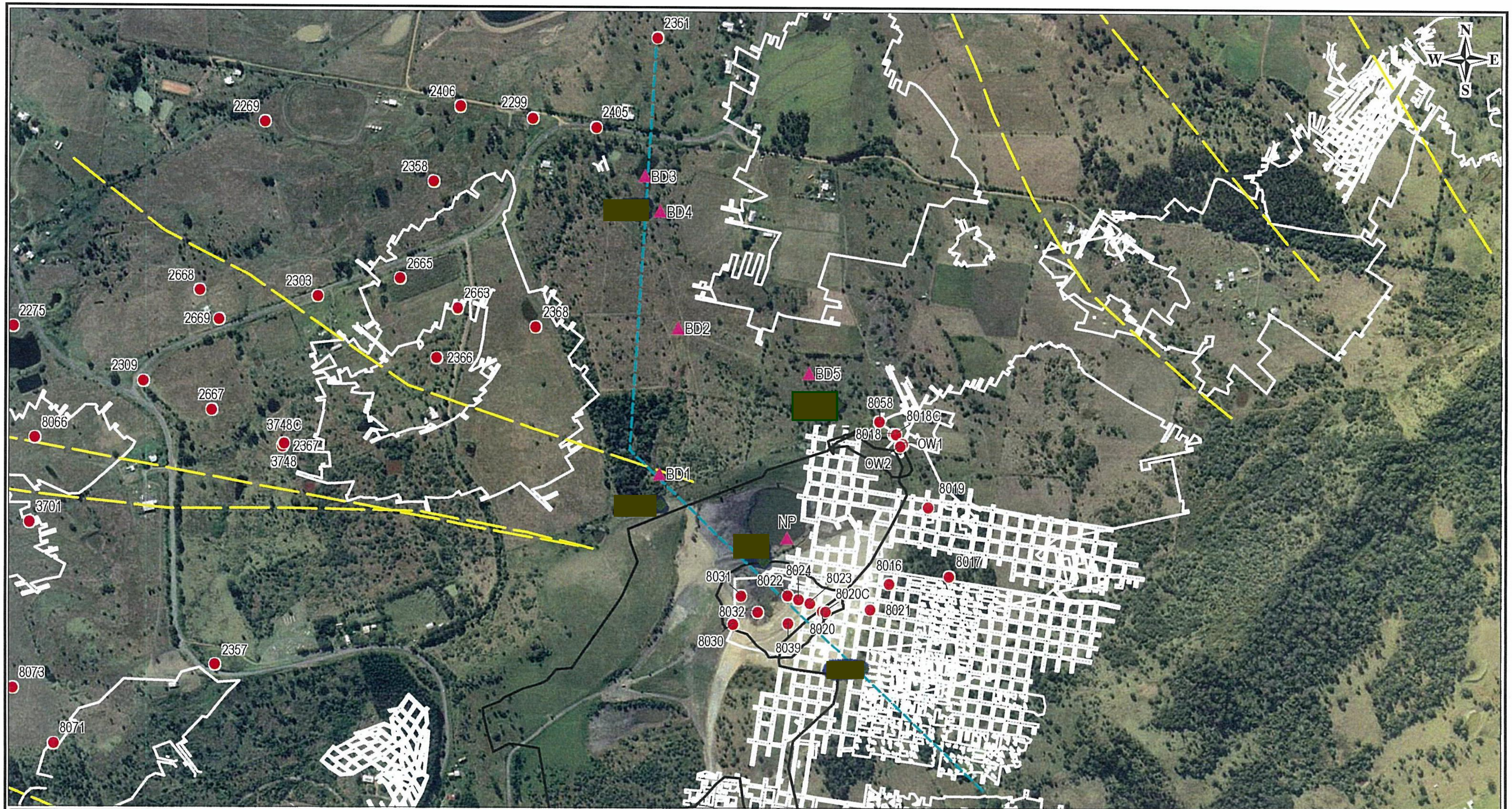
Property Boundary (2004 Data)

Pit Outline

Underground Mine Workings

AUSTRALASIAN GROUNDWATER & ENVIRONMENTAL CONSULTANTS PTY LTD
36 JEAYS STREET BOWEN HILLS QLD 4006 AUSTRALIA

TITLE: NEW OAKLEIGH MINE NORTH PIT SEEPAGE - TASK 1 DATA REVIEW SITE LAYOUT			
CLIENT: New Hope Coal Australia Pty Ltd			OFFICE: Brisbane
DRAWN BY: TMM	SCALE: 1 : 13,000 (A4)	PROJECT No: G1453	DRAWING No: 1
APPROVED BY:		DATE: March 2009	

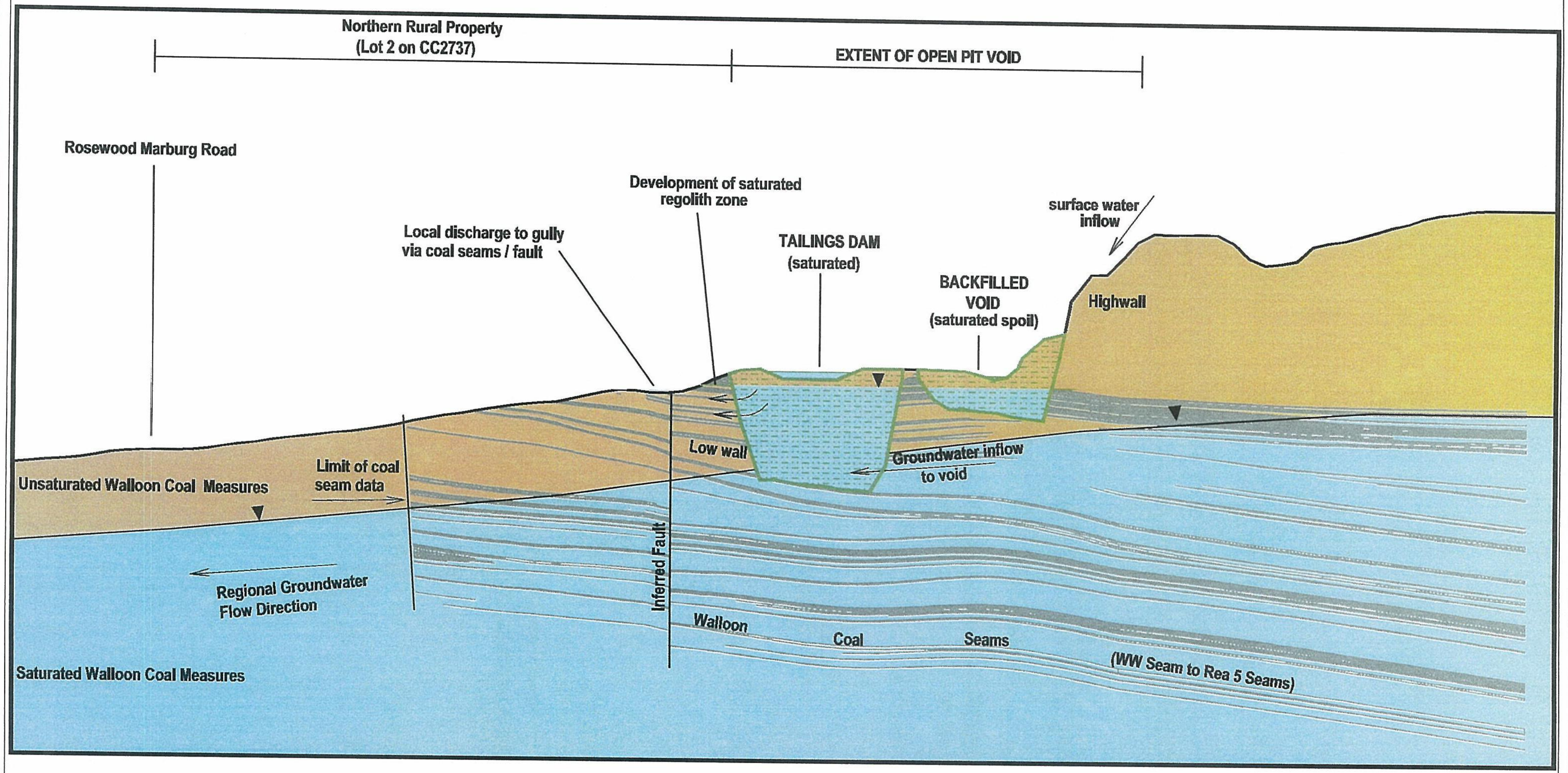


- LEGEND -

Exploration Drillhole	Cross Section
Seepage Monitoring Locations	Fault
	Underground Mine Workings
	Pit Outline

AUSTRALASIAN GROUNDWATER & ENVIRONMENTAL CONSULTANTS PTY LTD
36 JEAYS STREET BOWEN HILLS QLD 4006 AUSTRALIA

TITLE: NEW OAKLEIGH MINE NORTH PIT SEEPAGE - TASK 1 DATA REVIEW PROPOSED INVESTIGATION SITES			
CLIENT: New Hope Coal Australia Pty Ltd			OFFICE: Brisbane
DRAWN BY: TMM	SCALE: 1 : 12,000 (A4)	PROJECT No: G1453	DRAWING No: 2
APPROVED BY:		DATE: March 2009	



AUSTRALASIAN GROUNDWATER & ENVIRONMENTAL CONSULTANTS PTY LTD
36 JEAYS STREET BOWEN HILLS QLD 4006 AUSTRALIA

TITLE: NEW OAKLEIGH MINE NORTH PIT SEEPAGE - TASK 1 DATA REVIEW CONCEPTUAL CROSS SECTION			
CLIENT: New Hope Coal Australia Pty Ltd			OFFICE: Brisbane
DRAWN BY: JST	SCALE: V:H 3:1	PROJECT No: G1453	DRAWING No: 3
APPROVED BY:		DATE: March 2009	

Table 1: SUMMARY OF NORTH OAKLEIGH PIT EXPLORATION/RESOURCE BOREHOLES DATA

Borehole	Easting (m)	Northing (m)	Elevation (mAHD)	Total Depth (m)	Base of Weathering (m)	Weathered Coal (m)	Coal Seam Depth (m)		Seams Intersected (m)	Underground Workings (m)
							from	to		
2299	456,479.1	6,943,749.3	102	82	12	-	14.6	24.0	HN3 – RE2	-
2361	458,989.0	6,947,325.2	101	31	9.1	6-7	9.1	21.7	RE1 – RE3	-
2368	458,725.6	6,946,709.6	117	36	-	-	21.0	21.7	-	-
2404	458,857.3	6,947,134.6	107	-	13	-	12.2	36.0	HN1 – RE3	-
2406	458,566.9	6,947,179.4	99	41	12.2	-	-	-	-	-
8016	459,478.6	6,946,162.9	195.9	210	15	-	51.8	193.1	WW – F1	-
8017	459,607.4	6,946,178.7	204.2	75	20	-	65.3	73.5	WW – HR3	73.6 – 75.0
8018	459,490.5	6,946,481.6	178.5	60	18	-	22.9	52.5	WW – RT2	-
8019	459,563.4	6,946,326.1	190.9	110	8.0	3.5-4	41.0	100.8	WW – BT5	-
8020C	459,342.3	6,946,103.6	187.2	66	-	-	46.3	57.1	WW – JN2	59.0 – 60.0
8021	459,438.2	6,946,108.9	192.9	78	18	6-6.2	51.3	75.2	WW – LJ1	-
8022	459,261.9	6,946,138.2	188.8	72	21	-	46.2	58.3	WW – JN2	60 – 61
8023	459,308.6	6,946,122.5	188.6	63	-	-	47.8	59.4	WW – JN2	60 – 63
8024	459,284.4	6,946,129.9	188.8	63.5	20	-	47.3	59.0	WW – JN2	61 – 63.5
8030	459,144.5	6,946,077.4	163.8	60	6	-	17.7	53.5	WW – JY2	-
8031	459,161.5	6,946,138.0	160.2	54	9	-	15.4	50.0	WW – JY2	-
8032	459,197.6	6,946,103.1	171.4	60	9	-	27.9	52.9	WW – RT1	51.8 – 55.5
8039	459,262.0	6,946,078.7	179.8	72	14	-	40.5	51.8	WW – JN2	-
8058	459,460.1	6,946,508.4	170	54	15	-	15.6	44.1	HD1 – RT3	-
OW2	459,504.5	6,946,456.0	181.4	10	-	-	-	-	-	-

Note: - no data available

New Hope Coal Infrastructure Decommissioning Report

JEEBROPILLY AND NEW OAKLEIGH MINES

Final

06 July 2009

New Hope Coal
Infrastructure Decommissioning Report

JEEBROPILLY AND NEW OAKLEIGH MINES

Final

06 July 2009

Sinclair Knight Merz
ABN 37 001 024 095
32 Cordelia Street Street, South Brisbane 4101
PO Box 3848,
South Brisbane, 4101 Australia
Tel: +61 7 3026 7100
Fax: +61 7 3026 7307
Web: www.skmconsulting.com

SKM

Contents

Figures

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2	24/06/09	T Jensen	P Smith	24/06/09	Final

Distribution of copies

Revision	Copy no	Quantity	Issued to
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Name of organisation:	Sinclair Knight Merz
Name of project:	New Hope Coal Infrastructure Decommissioning Study
Name of document:	Infrastructure Decommissioning Report – Jeebropilly and New Oakleigh Mines
Document version:	Final
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Executive Summary

Due to the pending closure of New Hope Coal's New Oakleigh and Jeebropilly mines located in West Morton, Queensland, SKM were requested to carry out a desk top assessment to address the removal of all mine site infrastructure. This Report outlines the following components for decommissioning of each site.

Environmental Assessment

There are environmental and legal requirements that will need to be met during the decommissioning, rehabilitation and closure process and these include conditions (attached to approvals, environmental authorities, mine leases), guidelines and policies (environmental limits, goals and parameters), government planning requirements and achieving best practice closure standards. These factors will have implications for future land use and remediation options for each site and further assessment should be carried out as a part of closure planning process.

Contaminated Land and Waste Assessment

There is currently no quantitative data which can be used to verify the presence or extent of contamination and to what extent remediation will be required as part of mine closure. Remediation on both sites is estimated to cost $2.6 million in total and will likely involve combinations of on-site disposal (e.g. to mine pit, co-disposal area etc), bio-remediation, on-site capping, and either off-site disposal to landfill or on-site disposal to a monocell for highly contaminated material.

Whilst not within the scope of this study, contaminated land may also be present in areas subject to previous mining workings and/or mine waste disposal, and rehabilitated areas. The need and extent of remediation in these areas will also need to be considered.

Cost Estimate

A cost estimate was undertaken based on the current available information. It provided an estimate of $10.5 million to demolish, pack or flat pack all infrastructure located within each mine site, including contingencies. The cost estimate was based on a number of assumptions such as the work being done under an EPCM agreement, that materials will be sold/auctioned where possible, and based on a targeted accuracy range of ± 25%.

Key risks that were identified and will require further investigation included;

- Management and remediation of co-disposal/tailings areas;
- Management of settlement and landform stability in rehabilitated areas;

- Shallow capping on some rehabilitated co-disposal areas may limit future land use; options as excavations may expose the capped material;
- Current land use classifications; and
- Historical mine workings.

The above risks will require further investigation in subsequent planning for decommissioning of both the Jeebropilly and New Oakleigh mine sites.

1. Introduction

New Hope Corporation Limited owns and operates two open cut coal mines - the New Oakleigh mine near the town of Rosewood, 23 kilometres west of Ipswich and Jeebropilly mine, located approximately 18 kilometres west of Ipswich.

It is expected that the Jeebropilly mine may have a remaining five to ten year mine life, with the New Oakleigh site approximately three to five years, but may possibly close sooner.

SKM has been commissioned to undertake a site assessment and develop an infrastructure removal plan for the New Oakleigh and Jeebropilly coal mines sites.

This Report presents the infrastructure decommissioning studies carried out to assist in the closure planning process and is divided into the following areas:

- an environmental assessment;
- a contaminated land and waste assessment;
- a cost estimate for demolition; and
- identification of any information gaps

The locations of the two sites are shown in **Figures 1** and **2**.

NEW HOPE COAL
AUSTRALIA

17 Lowry Street, Ipswich QLD 4305
Ph (07) 3810 0500
Fax (07) 3810 0515
www.newhopecoal.com.au

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metres

JEEBROPILLY PROJECT

Date of Photography: 30 July 2008

Workspace: 2008 map Jeebropilly_A3.wor		Size: A3	
Drawn: SLM	Date: 18 Sept 2008	Datum: AGD84 Z56	
Checked:	Date:	Issued: 18/09/2008	

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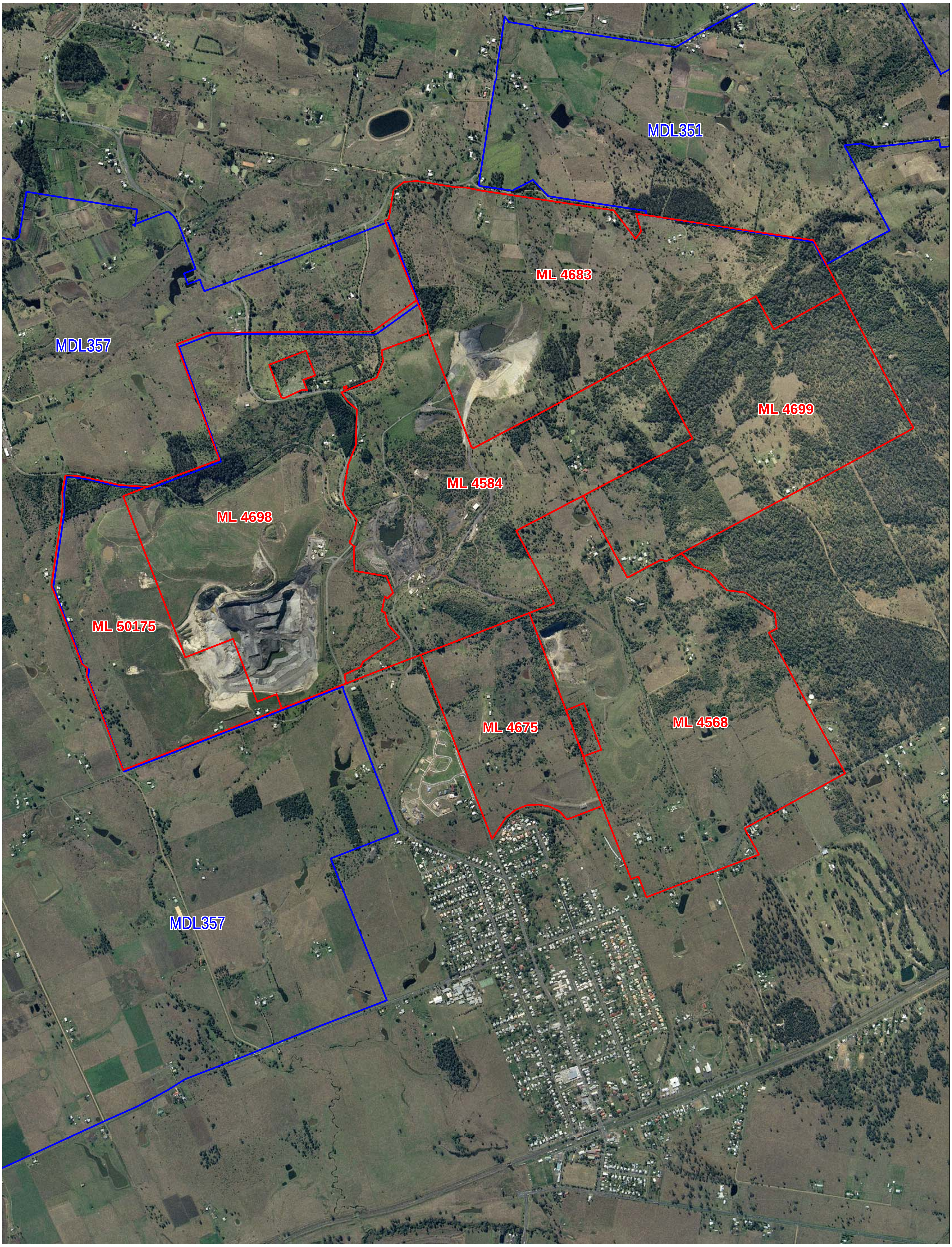

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N W E S

0 350 700
metres

NEW OAKLEIGH PROJECT

Date of Photography: 30 July 2008

Workspace: 2008 map Oakleigh_A3.wor		Size: A3
Drawn: SLM	Date: 18 Sept 2008	Datum: AGD84 Z56
Checked:	Date:	Issued: 18/09/2008

V:\Mine Tenures Atlas\Workspaces\2008 map Oakleigh_A3.wor Created: 18/09/2008

2. Environmental Assessment

The environmental assessment included the identification of potential post-closure environmental impacts and an appraisal of the post mining potential land use options and constraints for each site.

The following criteria are considered key in achieving successful decommissioning, rehabilitation and closure:

- There must be agreement on the long term post-mining land use objective for the area with the relevant government authorities, local government council and the community;
- The final land use must be compatible with community needs, any legal requirements, climate, soils and the local topography, and the degree of management available after rehabilitation;
- It is important that the post-mining landform, drainage and vegetation associations are stable and self-sustaining, visually compatible with the surrounding land and meet community expectations; and
- Due to proximity to urban areas there may be opportunities to rehabilitate the sites and develop landforms suited to industrial, recreational or residential development.

2.1. Key Environmental Issues

The following have been identified as potential post-closure environmental impacts factors and may constrain final land use at the sites and will require environmental management strategies for each aspect to be developed as part of the decommissioning, rehabilitation and closure planning process.

Jeebropilly site:

- Planning for progressive rehabilitation and earthworks based on where voids will be and the proposed final land use for void areas;
- Management and ongoing monitoring of pit lake water quality and quantity;
- Management, remediation and final land use for co-disposal areas;
- Management, rehabilitation and final land use of infrastructure and service areas following removal of infrastructure;
- Management and future use of water management systems (e.g. use for farm dams);
- Requirements for construction of a waste disposal facility (monocell);
- Management of settlement and landform stability in rehabilitated areas; and

- Shallow capping on some rehabilitated co-disposal areas may limit future land use options as excavations may expose the capped material.

New Oakleigh site:

- Management, rehabilitation and final land use of infrastructure and service areas following removal of infrastructure;
- Planning for progressive rehabilitation and earthworks based on where voids will be and the proposed final land use;
- Management and ongoing monitoring of pit lake water quality and quantity;
- Management and remediation of tailings areas;
- Current land use classification of the New Oakleigh site is 'rural/open space';
- East of the Rosewood-Marburg Road has steeply sloping areas that may not be suitable for development; and
- Potential impacts and management of historical mine workings within the mine lease.

2.2. Alternative Beneficial Use

Consideration of an alternative use for the sites from pre-mining land use would need to be justified on the basis that it is technically possible or feasible, that there is community support for the nominated use and the land use is able to meet all regulatory and statutory requirements. Justification may involve:

- A materials budget which demonstrates that there is sufficient growth media and fill material to fully rehabilitate areas; and
- Evidence that the land will be stable during and after the lease period; and
- That no unacceptable levels of environmental impacts (air, dust, water and visual effects) are likely to be generated.

2.3. Rehabilitation Requirements - Overview

A key objective for rehabilitation is the preference for progressive rehabilitation wherever practical on site. Progressive rehabilitation has been carried out on both sites with large areas already rehabilitated, a majority of the void areas backfilled and areas currently being backfilled. Other areas at the Jeebropilly and New Oakleigh sites will be rehabilitated as they become available throughout the operational life of the sites.

The following general rehabilitation aspects should be considered and further developed as part of the ongoing rehabilitation planning process for the sites:

- Safety measures – safety hazards that may remain at mine closure or may develop after mine closure (i.e. steep slopes, exposure of hazardous material, subsidence or potentially unsafe structures) should be assessed and management controls developed (e.g. exclusion of access, safety barriers, capping of hazardous material, safety assessment of slopes >30˚ and >5m height).
- Water Management and Water Quality – conceptual plans for re-construction of water courses or proposals to contain surface water on site should be developed. These plans should be revised following the evaluation of ongoing surface water and groundwater monitoring to validate the accuracy of post-closure management assumptions. The risk of any significant environmental harm resulting from potentially contaminated water entering surface waters or groundwater should be assessed. An assessment of the possible quality of water impounded in a final void or surface dam should be carried out.
- Landforms – a detailed conceptual model of the post-mining topography of the site should be developed. A contoured plan of the final shape of waste rock heaps, tailings dams and voids should be developed. The proposed landforms for each site should be supported by an assessment of the factors that will affect long-term stability with particular reference to hazardous materials, protective capping, geotechnical stability and surface stability under the proposed post-mining land use.
- Land Use – the proposed post-mining land use should be clearly specified for the site, or portions of the site, using terms such as grazing (up to a particular intensity), cropping (including crop type), native ecosystem use (for a nominated species), commercial (special industry, heavy industry), green space (recreational, bush walking), urban land (residential, institutional). The prior land capability and use of the site, the existing uses of adjacent land and the views of landholders when considering options for future land use should be considered.
- Vegetation – when establishment of a native ecosystem is a rehabilitation objective for the mine site, the ecosystem(s) or habitats that are intended to be developed should be planned in detail (e.g. trials carried out) and reference/analogue sites that can be used for comparison nominated.
- Socio-economic objectives – might be considered at New Oakleigh and Jeebropilly if mining occurs on land at or near the site classified as good quality agricultural land and there is agreement to return the land to similar productive use so that it will support a viable community similar to what was there before mining.

2.4. Rehabilitation Planning - Overview

General rehabilitation planning has been integrated with the site operational planning process for both sites. Under the approved Environmental Authority (EA) for each site, provisions have been agreed to for final land use conditions. For both sites the agreed post closure option is to re-instate the previous land use which was grazing land.

Options for changing this agreed land use to industrial for Jeebropilly and residential for New Oakleigh respectively are currently under consideration by New Hope Coal and have not been further discussed in this report. These proposed land use options fit with criteria 3 of the DERM Rehabilitation Hierarchy to 'develop an alternative outcome with higher economic value than the previous land use' which is a higher criteria level than to 're-instate previous land use' (former EPA, 2008).

Future rehabilitation planning and design should be developed in consideration of the following guidance documents:

- *Guideline 18 – Rehabilitation Requirements for Mining Projects, former EPA, 2008*
- *Enduring Value, Minerals Council of Australia, 2004*
- *Best Practice Environmental Management in Mining – Mine Decommissioning, Leading Practice Sustainable Development Program for the Mining Industry, DITR, 2002*
- *Best Practice Environmental Management in Mining – Mining Rehabilitation, Leading Practice Sustainable Development Program for the Mining Industry, DITR, 2006*
- *Best Practice Environmental Management in Mining – Mine Closure and Completion, Leading Practice Sustainable Development Program for the Mining Industry, DITR, 2006*
- *Strategic Framework for Mine Closure, ANZMEC/MCA, August 2000*
- *Overview of Best Practice Environmental Management in Mining, Environment Australia, 2002.*
- *Guidelines for Mine Closure Planning in Queensland, Queensland Mining Council, 2001.*

2.5. Land Use - Strategic Planning Context

Both the Jeebropilly and New Oakleigh sites are located in the Ipswich City local government area (LGA) which is located within the Western Corridor of South East Queensland (SEQ). The South East Queensland Regional Plan (SEQRP) 2005-2026 is the key strategic planning instrument for the SEQ Region, encompassing both Jeebropilly and New Oakleigh sites.

The SEQRP has been reviewed and amended and a Draft South East Queensland Regional Plan 2009-2031 has been released for public comment. A final updated SEQRP is due to be finalised in July, 2009. Until the Draft has been finalised, the current regional plan remains in effect.

Both the current SEQRP and the Draft SEQRP strategic regional planning directions have been considered.

At a local level, the Ipswich Planning Scheme provides strategic and statutory guidance to land use and development within the Ipswich City LGA. The Ipswich Planning Scheme contains a ‘Strategic Framework’ that provides strategic direction for the long term growth and development of the LGA, with strategies developed around urban areas, township areas, rural areas and key resource areas.

Desired Environmental Outcomes (DEO’s) support the strategic framework and convey Ipswich City Council’s strategic drivers for future development. DEO’s are based on ensuring development achieves overall outcomes related to community, land use, environment and health and safety within the LGA.

Regional planning instruments and local government planning schemes will have implications for future land use and remediation options for each site and should be reviewed and considered as a part of closure planning process.

3. Closure Obligations

3.1. Legal Requirements

There are legal requirements on New Hope Coal that will need to be met during the decommissioning and closure process and these are summarised in Section 3.3 – Obligations Register. These include; conditions attached to approvals, EA's, mine leases and various subsidiary licences and permits may specify certain limits and parameters for decommissioning, rehabilitation and closure.

Potential restrictions are also found in government planning instruments such as state, regional and local environmental plans and council zoning plans as introduced in Section 2.5. These may limit the range of uses available, in particular, planning instruments may restrict visual impacts of mined land, require preservation of items of cultural heritage value and dictate the vegetation species which can be used for rehabilitation.

In Queensland, rehabilitation is required under the *Environmental Protection Act 1994*. Section 4(6) of the Act requires that all reasonable and practicable measures are taken to protect environmental values from all sources of environmental harm.

Section 201 to 203 of the EP Act requires all Level 1 mining projects to have an environmental management plan (EM Plan) which states the objectives for progressive and final rehabilitation as well as measurable indicators and standards that are to be achieved.

3.2. Regulatory Framework - Rehabilitation and Closure

The *Environment Protection Act 1994* requires a program for rehabilitation to be developed for all mining operations which is detailed in the Plan of Operations. For both operations New Hope Coal would be required to submit a Final Rehabilitation Report (FFR) with an application for surrender of tenure under the EA.

The FFR would need to contain sufficient information to allow DERM to decide whether the conditions of the EA and completion criteria have been met, whether the land has been satisfactorily rehabilitated, detailed information about the status of the rehabilitation, details of transfer of ownership of infrastructure and details of any ongoing monitoring maintenance or management requirements. The FRR must also state the extent to which activities carried out under each relevant mining tenement are consistent with the environmental protection commitments and have met the conditions of the EA.

DERM must be satisfied with the rehabilitation before it can certify progressive rehabilitation for part of a mining project or accept the surrender of an EA for the whole or part of the mine. DERM's decision will be based on an assessment of either a progressive rehabilitation report for part of the project (s266G) or a final rehabilitation report (s274)

The DME will not grant surrender of mine tenure until DERM has granted the surrender of the EA, thereby concluding that all environmental management conditions and commitments have been fulfilled. New Hope Coal may voluntarily seek approval from the EPA for an environmental management program or DERM may require New Hope Coal to submit an EM Program to manage any outstanding environmental conditions or commitments following the surrender of tenure.

New Hope Coal may apply for a specified amount of financial assurance to be discharged when applying to surrender the tenure and EA. DERM will grant this request following their assessment that there are no residual commitments or if an EM Program is required and has been approved.

Once New Hope Coal has satisfied obligations under Queensland regulations (see **Section 3.3**) the surrender application will be approved and financial assurance discharged, returning responsibility for management and maintenance to the landowner.

3.3. Obligations Register

Aspect	Legislation	Objective	Obligation
Flora and Fauna	*Environmental Protection and Biodiversity Conservation Act 1999*	To provide a federal environmental protection framework as well as determining nationally endangered species and communities.	Any Matters of National Environmental Significance impacted by the Project may need to be considered during the closure period. If MNES impacted rehabilitation may need to be in accordance with EPBC Act requirements.
Due Diligence	*Environmental Protection Act 1994*	To protect the environment while allowing development that improves the total quality of life and ecologically sustainable development.	General environmental 'duty of care' to be observed to ensure that any potential environmental impact from the Project is minimised.
Rehabilitation	*Environmental Protection Act 1994*	Certification can be given to a particular area within the mining tenement that has been rehabilitated to all requirements under the Act, the EA and other relevant guidelines.	An application may be made for an area subject to progressive rehabilitation to be certified as rehabilitated under all relevant requirements. The certified rehabilitated area must be maintained under the conditions of the EA in force when the certification occurred. A progressive rehabilitation report for the EA must be prepared along with an audit statement for the report.
Contamination	*Environmental Protection Regulation 2008*	Lists Environmentally Relevant Activities, which are activities that may potentially cause environmental harm and require approval through the IDAS process. Also gives effect to National Environment Protection (National Pollutant Inventory) Measure 1998 (NPI NEPM).	The NPI NEPM for Site Contamination allows the site specific clean-up criteria to determine the required level of remediation. These criteria are known as Health Investigation Levels (HIL's).
Waste	*Environmental Protection (Waste) Policy 2000*	Provides waste management strategies to limit impact of waste on the environment.	Management of regulated wastes and on-site landfills, if applicable, will be subject to this legislation.
Water	*Environmental Protection (Water) Policy 1997*	Provides a framework to develop water quality guidelines to protect Queensland waters and prevent pollution.	Water quality objectives, measurement parameters and management goals may be sourced from this document and relevant guidelines.

Aspect	Legislation	Objective	Obligation
Air	*Environmental Protection (Air) Policy 2008*	Specifies air quality indicators and goals to protect the environmental values and provides a framework for making consistent and fair decisions about managing the air environment and involving the community.	Air quality objectives, measurement parameters and management goals may be sort from this document and relevant guidelines.
Authority	Jeebropilly Environmental Authority - MIM900121203	Environmental Authority to allow for Environmentally Relevant Activities to proceed, conditions provided.	Requires NHC to progressively rehabilitate, rehabilitate to the specified land form, rehabilitation to achieve grazing pasture outcome, submit a rehabilitation report within 12 months, rehabilitate to a specified residual void outcome and remove all infrastructure unless otherwise agreed.
Authority	Jeebropilly Environmental Authority - MIM900121203	Environmental Authority to allow for Environmentally Relevant Activities to proceed, conditions provided.	All monitoring results are required to remain available to the administering authority for 5 years. Monitoring is to be conducted by an appropriately qualified person.
Authority	New Oakleigh Environmental Authority – MIN100551907	Environmental Authority to allow for Environmentally Relevant Activities to proceed, conditions provided.	Requires NHC to progressively rehabilitate, rehabilitate to specified landform, rehabilitate to achieve grazing pasture and native ecosystem outcome submit a rehabilitation report within 12 months and rehabilitate to a specified residual void outcome.
Authority	New Oakleigh Environmental Authority – MIN100551907	Environmental Authority to allow for Environmentally Relevant Activities to proceed, conditions provided.	All monitoring results are required to remain available to the administering authority for 5 years. Monitoring is to be conducted by an appropriately qualified person.
Safety	*Workplace Health and Safety Act 1995* *Mining and Quarrying Safety Act 1999* *Coal Mining Safety and Health Act 1999*	To prevent a person's death, injury or illness being caused by a workplace, by a relevant workplace area, by work activities, or by plant or substances for use at a workplace.	Compliance with safety requirements throughout the closure period to be incorporated into the closure plan.
Industrial Relations	*Workplace Relations Act 1996*	The principal object of this Act is to provide a framework for cooperative workplace relations which promotes the economic prosperity and	Closure plan to consider impact on employees of the smelter.

Aspect	Legislation	Objective	Obligation
		welfare of the people of Australia.	
Water	*Water Resource (Moreton) Plan 2007*	To provide a framework for sustainably managing water and the taking of water. The water resource plan provides a 10-year framework for the sustainable allocation and management of the water resources within the plan area.	Framework may be followed to ensure there are no adverse impacts on the Bremer River and sub-catchment, the Warrill-Bremer groundwater management area and associated entities that may use the river and groundwater resources.
Water	*ANZECC Guidelines*	Provide guidelines for the monitoring and management of water ways	Guidelines to provide details of water monitoring requirements.
Land Use	*Land Act 1994*	Relates to the administration and management of non-freehold land and deeds of grant in trust and the creation of freehold land, and for related purpose	Regulates the opening and closing of road reserves and land dealings relating to changes in land tenure.
Indigenous Heritage	*Native Title (Queensland) Act 1993*	Recognised the rights of traditional land owners to 'claim' land. Provided a framework for processing of native title claims.	If applicable to the site, Native Title occupants may require conditions for rehabilitation of the land.
Flora and Fauna	*Nature Conservation Act 1992*	To provide framework for the protection of state listed threatened species and communities.	Rehabilitation strategies may need to include any state listed threatened species or communities that occur in the area.
Flora and Fauna	*Vegetation Management Act 1999*	Regulates clearing of vegetation to ensure appropriate management and conservation.	Development to comply with state and regional vegetation management plans and policies and also comply with vegetation management practices on leased and freehold land.
Land Use	Ipswich Planning Scheme 2006	Planning scheme determines land-use and development process required.	The planning authority will ensure that sites of potential contamination are suitable for intended use. The planning authority will determine remediation targets specified for closure plan and rehabilitation requirements.
Due Diligence	*Minerals Council of Australia (MCA) (2000) Code for Environmental Management.*	Now superseded by Enduring Value - the Australian Minerals Industry Framework for Sustainable Development.	Highlights a range of closure scenarios should be considered during planning. Scenarios include:

Aspect	Legislation	Objective	Obligation
			Planned Closure: This occurs when mining and processing ceases due to economic or operational requirements, or if the resource is exhausted. In this situation a decommissioning and closure plan would be prepared and submitted to the regulatory authorities for approval prior to closure. Unplanned Closure: This occurs when processing ceases due to financial constraints or non-conformances with regulatory requirements. In this situation a decommissioning plan will be prepared immediately. Care and Maintenance: This can occur if the economics of the project area are unfavourable or if there is some impediment to extracting the resource. In this situation a 'caretaker' manages the site until conditions become favourable again. A decommissioning plan would be prepared which takes into account the re-commencement. The plan would be implemented when a decision has been made to close the operation.
Land Use	*Mineral Industry Code of Practice*	Enduring Value - the Australian Minerals Industry Framework for Sustainable Development: Provides for effective and sustainable use of Australia's resources.	Ensuring decommissioned sites are rehabilitated and left in a safe and stable condition, after taking into account beneficial uses of the site and surrounding land.
Land Use	*Mineral Industry Code of Practice*	Enduring Value - the Australian Minerals Industry Framework for Sustainable Development: Provides for effective and sustainable use of Australia's resources.	Develop clearly defined rehabilitation plans, monitor and review rehabilitation performance and progressively refine such plans.

Aspect	Legislation	Objective	Obligation
Accounting	*Mineral Industry Code of Practice*	Enduring Value - the Australian Minerals Industry Framework for Sustainable Development: Provides for effective and sustainable use of Australia's resources.	Determine and account for rehabilitation and decommissioning costs and periodically review their adequacy during the life of the operation.
Land Use	*Mineral Industry Code of Practice*	Enduring Value - the Australian Minerals Industry Framework for Sustainable Development: Provides for effective and sustainable use of Australia's resources.	Establish a program of progressive rehabilitation commensurate with the nature of the operation and the rate of disturbance.
Land Use	*Mineral Industry Code of Practice*	Enduring Value - the Australian Minerals Industry Framework for Sustainable Development: Provides for effective and sustainable use of Australia's resources.	Periodically review the rehabilitation and decommissioning strategies over the life of the operation to incorporate changing legislative requirements, public expectations and environmental and cultural heritage information.
Land Use	*Mineral Industry Code of Practice*	Enduring Value - the Australian Minerals Industry Framework for Sustainable Development: Provides for effective and sustainable use of Australia's resources.	Address issues and programs related to long-term management in the final decommissioning plan
Land Use	*Strategic Framework for Mine Closure - Australian and New Zealand Minerals Council of Australia.*	States mine life criteria and rehabilitation guidelines.	May be relevant to rehabilitation requirements.
Land Use	*Best Practice Environmental Management in Mining Series (EA, 1995a-c; EA, 1997a, b; EA, 1998; EA, 1999; EA, 2002).*	Includes requirements for environmental management on mine sites.	May be relevant to rehabilitation requirements.

4. Contaminated Land and Waste Assessment

This section provides a preliminary appraisal of the potential for contaminated land in association with key infrastructure areas at the New Oakleigh and Jeebropilly coal mines sites (e.g. coal washing plants, tank farms etc). The major infrastructure areas were identified with New Hope Coal in a meeting on the 20 May 2009. This section is intended to provide an overview of the potential risks associated with these areas.

4.1. Key Issues

This section identifies key contaminated land issues associated with the infrastructure areas at the mine sites:

Jeebropilly Industrial Areas:

- Key industrial areas with the potential for contaminated land include the wash plant, workshops, fuel farm, explosive storage, area, and the land farm.
- Other areas with the potential for contaminated land include land subject to mining workings, co-disposal areas, etc. The appraisal of these areas however was outside the scope of this study.
- There is currently no contaminated land data to estimate the extent and cost of remediation required.
- The extent of remediation required will be affected by the post-mining landuse (e.g. industrial area, parks, etc). In general a greater degree of remediation is required where the proposed landuse is more sensitive. For example open space is considered to be a more sensitive landuse when compared to commercial/industrial land.
- Contaminated land issues associated with the infrastructure areas is unlikely to preclude the use of these areas for a commercial/industrial landuse. It should be noted however that a commercial/industrial landuse may be precluded from areas which have been subject to mining or mine waste disposal due to subsidence issues and potentially ground gas (e.g. from methane).
- Contaminated land issues associated with the infrastructure areas is unlikely to preclude the use of these for open space.
- Remediation will most likely involve a combination of measures such as on-site disposal (e.g. to mine pit or co-disposal area), bio-remediation, on-site capping, and either off-site disposal to landfill or on-site disposal to a monocell for highly contaminated material (if present).

- Areas of open space or parks may require additional remedial measures such as capping, and will depend on whether contamination present poses an unacceptable risk to human health or the environment.
- Remediation may also be required in areas which have been subject to mining or mine waste disposal, and areas which have been rehabilitated. The need for remediation will be driven by whether contamination in these areas (if present) poses an unacceptable risk to human health in the context of the future landuse (e.g. open space).

New Oakleigh Industrial Sites:

- Key industrial areas with the potential for contaminated land include the former wash plant, workshops, fuel farm, and the land farm.
- Other areas with the potential for contaminated land include land in the vicinity of the railway corridor and ICC landfill, and areas subject to mining works, tailings dam, etc.
- There is currently no contaminated land data to estimate the extent and cost of remediation required.
- The extent of remediation required will be affected by the post-mining landuse (e.g. industrial area, parks, etc). In general a greater degree of remediation is required where the proposed landuse is more sensitive. For example a low density residential landuse (i.e. a house with a garden) is considered to be a more sensitive landuse when compared to open space or commercial/industrial land.
- An urban residential landuse has been proposed for the New Oakleigh site. Contaminated land issues associated with the infrastructure areas may preclude the use of these for residential land. For example if contamination is present, extensive and an unviable degree of remediation may be required to enable a residential landuse. This scenario may also be applicable to areas which have been subject to mining, mine waste disposal, and have been rehabilitated due to contaminated land issues (if present), subsidence issues, and potentially ground gas (e.g. from methane).
- DERM closely scrutinises developments which propose to change a landuse from a low sensitivity (e.g. industrial or mining) to high sensitivity (e.g. residential). This is due to the potential health risks to the future users of the land. Without extensive contaminated land data which demonstrates that the land which has been subject to mine related activities is suitable for a low density residential landuse (e.g. through remediation), it is considered likely that DERM will have significant concerns with such a change in landuse.
- It is considered likely that properties will need to be removed from the EMR in order for a low density residential landuse to be developed. Depending on the extent of contamination, it may be uneconomically viable to remove properties from the EMR.

- A more feasible landuse for areas subject to mine related activities is likely to be open space or recreational areas. These areas may require additional capping, and will depend on whether contamination is present and poses an unacceptable human health or environmental risk.
- Remediation will most likely involve a combination of on-site disposal (e.g. to mine pit, co-disposal area etc), bio-remediation, on-site capping, and either off-site disposal to landfill or on-site disposal to a monocell for highly contaminated material.

4.2. Current Knowledge

New Hope Coal maintains a register of potentially contaminated sites at each mine site. There is currently no quantitative data which can be used to verify the presence or extent of contamination, and to what extent remediation will be required as part of mine closure. This means that it is currently not possible to reliably estimate the cost of remediation.

Accordingly the remediation estimate provided in **Section 4.3** should be considered as preliminary only, and SKM accepts no liability this estimate.

A cost-estimate has been prepared for a preliminary investigation of the infrastructure areas at both mine sites and is provided in **Appendix B**. The cost-estimate should be considered indicative only, and assumes that the all of the infrastructure areas would be investigated as part of one investigation (to reduce mobilisation costs). It is not intended that the investigation undertaking or report prepared would be used in any development approval. Such reports require a level of detail which is not considered necessary for mine closure planning.

Once a decision has been made to investigate the infrastructure areas, the cost-estimate will need to be planned in detail. The preliminary investigation would include:

- an expanded desk-study which considers the history of the infrastructure area being investigated including landuse prior to mining (e.g. are there historical activities which are a potential risk such as cattle dips), when the area was first used for mining, whether the use of the area has changed over time, and whether the risk of contamination is uniform through the infrastructure area or there are portions which are of higher (e.g. areas subject to frequent spills) and lower risk;
- the derivation of a plan for a preliminary intrusive investigation based on the expanded desk-study;
- an preliminary intrusive investigation comprising a limited number of trial pits and soil tests, and based on the findings of the investigation a review of:
  - the potential remedial requirements and remediation cost estimates;

- potential constraints on proposed future uses of the infrastructure area; and
- the need for detailed investigation.

4.3. Preliminary Remediation Estimate for Infrastructure Areas

A preliminary remediation estimate for the Infrastructure Areas within the Jeebropilly Mine and New Oakley Mine is provided in **Appendix B** based on a range of assumptions. As there is currently no quantifiable contaminated land data for the sites which can be used to prepare remediation estimates, the use of the estimate provided in **Appendix B** should be limited accordingly. SKM accepts no liability for the use of the estimate provided. The cost of remediation may vary considerably from the estimate provided in **Appendix B**. Remediation may also be required in other areas within the Mining Lease which have not been considered in this study (e.g. mined areas, waste dumps, tailings dams, etc.).

4.4. Regulatory Framework

4.4.1. Assessment and Management of Contaminated Land

Legislative requirements covering contaminated land in Queensland are primarily contained in the *Environmental Protection Act 1994* and subordinate policies and regulations. The methodology used in this assessment is based largely on the following Australian guideline publications:

- National Environment Protection (Assessment of Site Contamination) Measure 1999 ("the NEPM"); and
- DERM Draft Guidelines for the Assessment and Management of Contaminated Land in Queensland, 1998 ("the Draft Guidelines").

These documents provide a framework for assessing and managing contaminated soil and/or groundwater based on an evaluation of three components in the risk chain, identified below. Each of these links must be present in the risk chain for a potential risk to exist:

a) Contamination (source): Soil and/or groundwater contamination must be present. Contamination is the release of a hazardous contaminant into the environment that is likely to cause serious or material environmental harm because of its physical, chemical, infectious characteristics or concentration.

b) Receptors: Humans and/or a receiving environment must be present and be potentially impacted by the identified contaminants.

c) Pathways: The contamination must be able to contact receptors by means such as:

- Humans – ingestion, skin contact, inhalation; and
- Environment – seepage into waterways, wind-blown deposition on plants, root uptake, ingestion, skin contact and inhalation by various life forms.

Appendix 9 of the Draft Guidelines provides investigation thresholds for contaminated soils in Queensland. The threshold levels are based on the risk of human exposure to potential contaminants in soil in association with particular types of land use (e.g. residential, open space recreation and industrial). The threshold levels do not necessarily take into account environmental concerns such as the protection of a species or ecosystem.

4.4.2. Environmental Management Register

The principal sources of land-use planning data for contaminated land in Queensland are the Environmental Management Register (EMR) and Contaminated Land Register (CLR) databases administered by the EPA. The EMR is a land-use planning and management register for land that has been or is being used for a notifiable activity, and for which the EPA has been notified. The EMR provides information on historic and current land uses, including whether the land has been or is currently used for a notifiable activity, or has been contaminated by a hazardous contaminant.

The New Oakleigh mine has two properties which are listed on the EMR, these include:

- The fuel farm and the disused underground fuel tank for the notifiable activity ‘Petroleum Product or Oil Storage’.

The Jeebropilly mine has ten properties which are listed on the EMR, these include:

- The former and current co-disposal areas for the notifiable activity ‘Mine Wastes’;
- The explosive compound for the notifiable activity ‘Explosive production or storage’;
- The fuel farm for the notifiable activity ‘Petroleum Product or Oil Storage’;

The CLR is a register of ‘risk’ properties which have been identified (through scientific investigation) as contaminated land which is causing or may cause serious environmental harm . Land is recorded on the CLR when scientific investigation shows it is contaminated and action is required to remediate or manage the land. None of the properties within the New Oakleigh or Jeebropilly Mining Leases are listed in the CLR.

5. Facilities and Infrastructure Cost Estimates

5.1. Estimate Basis and Assumptions

5.1.1. General

The estimate is based site visits, photographic records (located in **Appendix A**) and the team's previous experience in similar projects.

This cost estimate includes all direct and indirect costs for the Jeebropilly and New Oakleigh mining areas. It presents a capital cost estimate for the decommissioning of above ground plant, materials handling components and buildings of the Jeebropilly and the New Oakleigh coal mining project.

An Area Breakdown Structure (ABS) was developed for the project, which allocated the several building and items to a geographic area. The ABS also provides a rigorous structure for the preparation of the capital estimate indirect costs.

The table below outlines the several ABS areas.

Estimate Area
ABS 1000 Jeebropilly
ABS 2000 New Oakleigh
ABS 8000 Project services
ABS 9000 Contingency

5.1.2. Estimate Classification

This estimate is a Class 4 Pre-Feasibility Estimate with a targeted accuracy range of +/- 25%.

5.1.3. Estimate information

The estimate has been undertaken based site visits, photographic records, site layout plans and existing aerial photographs.

5.1.4. Base date

The base date adopted for the estimate is 2 June 2009. All pricing data will relate back to this date. No escalation has been included in the base estimate.

SKM

5.1.5. Currency Rates

The estimate is reported in Australian Dollars.

5.2. Estimate Methodology

Separate methodologies were applied to the following elements of the estimate:

- **Concrete** – quantities estimated based on the site inspection and previous experience. It is assumed that the material will removed with excavators and trucks, and disposed of offsite.
- **Structural Steel** - quantities are estimated based on the rate of 13kg of steel per cubic meter of building. The steelwork will be placed in a laydown area adjacent to the building position.
- **Mechanical** - mechanical equipment will be dismantled and placed in laydown areas adjacent to the decommissioning area.
- **Piping** – it is assumed that piping will be demolished. It is assumed there will be no contaminated material in or around the piping areas.
- **Electrical** – it is assumed that all power lines except high voltage power lines are buried. The estimate included disconnecting the electrical cabling, installing terminations and burying the remaining cable.
- **Taxes** – all taxes, including Sales and Goods and Services Taxes are excluded unless otherwise stated;
- **EPCM Services** – It is assumed that the project will be implemented using an EPCM methodology, EPCM labour has been allowed on the basis of a factor of 10% of the direct capital cost. This is based on SKM's experience with projects in the mining sector. However should New Hope Coal select an alternative method or delivery of the project, this figure should be considered separately;
- **Growth** - growth is treated as an integral part of the base estimate. Provision is provided for parts of the defined scope which are not fully known, specified or measurable at this time. This should not be confused with contingency, which is considered separately. Growth is applied to each line item in the estimate on the basis of 'level of quantity source' and 'cost data source'. The combination of these dictates the growth percentage to be applied to the line item. The net overall growth included in the estimate is 15%;
- **Contingency** – contingency is defined as an allowance that is included, over and above the base cost, to ensure the success of the project from a cost perspective and to address uncertainties related to the following:

- risks associated with probable under/overruns of costs from variations in quantities and technical parameters and elements within the project risk register which are considered to be within the project scope and thereby part of the "Project Approved Budget".
- contingency is included as part of the base estimate and has been assessed as part of a "below the line" item at a percentage of all capital costs. Contingency is not to be considered together with estimate growth as they are not related. Contingency is expected to be expended during the life of the project. The contingency has been assessed as a "below the line" item at 25% of all capital costs.

5.2.1. Exclusions

The following aspects and areas are not included in this estimation:

- ground surface rehabilitation using soil and seeding grass or plants;
- demolition of underground services such as pipelines or power distribution;
- repairing potholes along service roads or in the mining areas;
- moving the historical trains from the mining areas and rebuilding the rail track;
- demolition of the weight bridge on the Oakleigh Mining site; and
- owners costs.

5.2.2. Qualifications

SKM has assumed that significant components of buildings and equipment have value for reuse or selling. Decommissioning should be carried out in a manner which ensures this occurs. This assumption should be validated during the decommissioning process.

5.3. Estimates Summary

The following table provides a summary of the cost estimate, including labour and contingency. The full estimate is attached as **Appendix A** together with corresponding photographs.

Description	Amount ($)
Jeebropilly Coal Plant and Surface Facilities Decommissioning	6,471,540
New Oakleigh Coal Plant and Surface Facilities Decommissioning (excluding weight bridge)	1,195,091
EPCM (10%)	766,663
Contingency (25%)	2,108,324
Total Cost	**10,541,618**

6. Closure Options & Strategy

6.1. Closure Options

The post-closure land use options have been proposed based on the following:

- Planning scheme, constraints and opportunities;
- Preliminary site assessment; and
- Advice from New Hope Coal on preferred options.

At this stage specific characteristics of the post-closure land use options are not available and have been defined in general terms:

- Jeebropilly Commercial/industrial land use: following closure, the site will be decommissioned and rehabilitated to a standard suitable for commercial or industrial land use with some areas of Recreational/Open Space land use. Tenure will be transferred to a third party for commercial or industrial purposes.
- New Oakleigh land use: The preferred land use options for New Hope Coal are to decommission and rehabilitate the site to a standard suitable for residential land use with tenure transferred to a third party for residential development purposes.

6.2. Closure Strategy

The purpose of the Closure Strategy for the Jeebropilly and New Oakleigh sites is to outline strategies for the decommissioning of infrastructure and rehabilitation of land disturbance by its operations in accordance with the proposed post-closure commercial/industrial land-use. From an environmental perspective the goal for closure is that the land will be stable during and after the release period and that no unacceptable levels of environmental impacts (air, water, dust and visual effects) are likely to be generated.

Central to the closure plan for these sites is progressive rehabilitation which ensures:

- Post-mining landscape is safe and stable from a physical, geochemical an ecological perspective;
- The quality of the surrounding water resources is protected;
- The agreed sustainable post-mining land use is established and clearly defined to the satisfaction of the community and government; and
- Success criteria are agreed with relevant stakeholders, monitored and reported to stakeholders.

Where land on the mining lease has not been disturbed by operational activities (e.g. buffer zone around the mine lease boundary) a continuation of the existing land use is recommended. Where land has been disturbed by operations (e.g. the mined areas) the closure strategy will aim to re-develop and prepare the land for commercial/industrial activity. This rehabilitation and re-development of the site may include the following activities:

- Clean-up and final assessment of contaminated areas;
- Ground levelling and stabilisation as required;
- Removal of buildings, concrete and footings;
- Clean-up of the site to a level safe for the proposed post-closure land use;
- Access controls for physical structures that remain onsite;
- Remediation of aesthetically acceptable portions of the site;
- Monitoring of contaminant containment, control or treatment systems;
- Rehabilitation of landfill areas; and
- Decommissioning and closure of ponds not required for future use.

It is likely that following closure some areas will fall within the definition of contaminated land and may require ongoing management and/or land use restrictions. On the property title there will be a requirement to register any contaminants, wastes or structures remaining that may restrict future land use and/or that require periodic monitoring to ensure continued integrity.

7. Conclusions and Recommendations

This Report represents the first phase of the closure planning assessment for the New Oakleigh and Jeebropilly mines and associated infrastructure. It constituted a high level assessment aimed at identifying key risks and focusing future studies as well as providing a cost estimate for the decommissioning works.

Future phases should provide a comprehensive assessment and more detailed review of the following aspects:

- an assessment of the feasibility to achieve the various decommissioning options;
- the demolition and removal or burial of all structures not required for other uses;
- removal, remediation or encapsulation of contaminated materials;
- establishment of stable landforms; and
- plans for completion of rehabilitation.

7.1. Environmental Aspects

The assessment of environmental aspects and land use planning requirements identified a number of issues. These included typical environmental issues associated with decommissioning of mines sites; remediating tailings/co-disposal area, landform stability and contaminated areas.

Any substantial change from the agreed landform and post closure landuse will need to be contemplated only after further research has been undertaken and following full consultation with the local community and regulatory authorities. Early research and a detailed assessment of post closure land use options will provide reasonable confidence that the proposed option is acceptable, achievable and economically viable.

7.2. Contaminated Land and Waste Management

There is currently no quantitative data which can be used to verify the presence or extent of contamination and to what extent remediation will be required as part of mine closure. This means that it is currently not possible to reliably estimate the cost of remediation, however, an approximate total remediation cost for Jeebropilly and New Oakleigh sites has been calculated to be around $2,600,000.

Key industrial areas at both mine sites with the potential for contaminated land include the washing plant, workshops, land farms, and areas where fuel has been stored.

The extent of remediation required will be affected by the post-mining landuse (e.g. industrial, parks, residential, etc.) with more sensitive landuse (e.g. residential) requiring higher degrees of remediation and investigation.

Remediation on both sites will likely involve combinations of on-site disposal (e.g. to mine pit, co-disposal area etc), bio-remediation, on-site capping, and either off-site disposal to landfill or on-site disposal to a monocell for highly contaminated material.

It is considered critical that a viable post-mining landuse be determined at an early stage, so that rehabilitation/remediation being undertaken now is appropriate to satisfy the future landuse.

DERM closely scrutinises developments which propose to change a landuse from a low sensitivity (e.g. industrial or mining) to high sensitivity (e.g. residential). This is due to the potential health risks to the future users of the land. Without extensive contaminated land data which demonstrates that the land which has been subject to mine related activities is suitable for a low density residential landuse (e.g. through remediation), it is considered likely that DERM will have significant concerns with such a change in landuse. Concern may also be raised for in regard to any built developments (including commercial/industrial developments) on mine areas which have been subject to mining (including waste dumps, tailings dams, etc.) due to ground subsidence, and potentially ground gas.

Whilst not within the scope of this study, contaminated land may also be present in areas subject to previous mining workings and/or mine waste disposal, and rehabilitated areas. The need and extent of remediation in these areas will also need to be considered.

A cost-estimate has been prepared for a preliminary investigation of the infrastructure areas at both mine sites. The cost-estimate should be considered indicative only. Once a decision has been made to investigate the infrastructure areas, the cost-estimate will need to be planned in detail.

7.3. Cost Estimates of Facilities and Infrastructure Decommissioning

Preliminary cost estimates for the proposed decommissioning were carried out with the total cost of the works being estimated at $10,541,618. This total included a 25% contingency and a 10% EPCM cost.

7.4. Overall Cost Estimate

The total cost estimate for decommissioning of plant and surface facilities and the remediation of contaminated land at both Jeebropilly and New Oakleigh mine sites is **$13,141,618.**

Appendix A Cost Estimate Spreadsheet and Photographs

Jeebropilly & New Oakleigh Coal Plant and Surface Facilities Decomissioning

Code	Description	Photo-Number	UoM	QTY	LABOUR									PLANT HIRE		MATERIAL		OTHER ALLOWANCE		TOTAL COST
					Unit Hrs	Number of Crews	Labour per crew	Duration (days)	Hours/day(h)	Total hours	Labour Rate	Distributables	Total Labour Cost	Unit Rate	Total Cost	Unit Rate	Total Cost	Unit Rate	Total Cost	
1000	Jeebropilly Coal Plant & Surface Facilities Decommissioning																			
1100	**OUT SITE AREA**																			
1110	**HV Vehicle Workshop Demolish is LxBxH is 40m *20m*12m*13t/m3/1000**	A1																		
	Remove Equipment,		LOT	1.00	400.00	1.00	6.00	6.67	10.00	400.00	70.00	130.00	80,000.00	-	-	-	-	-	-	80,000.00
	Strip Sheeting		M2	1,880.00	0.15	1.00	4.00	7.05	10.00	282.00	70.00	130.00	56,400.00	-	-	-	-	-	-	56,400.00
	Remove Steel is LxBxH is 40m *20m*12m*13t/m3/1000		T	125.00	4.00	1.00	5.00	10.00	10.00	500.00	70.00	130.00	100,000.00	-	-	-	-	-	-	100,000.00
	Crane on Rail ca 5 ton		Each	1.00	40.00	1.00	4.00	1.00	10.00	40.00	70.00	130.00	8,000.00	1,000.00	1,000.00	-	-	1,000.00	1,000.00	10,000.00
	Remove Concrete Slab, thick ca. 0.40 & foundation		M3	350.00	0.80	1.00	3.00	9.33	10.00	280.00	70.00	130.00	56,000.00	-	-	-	-	-	-	56,000.00
	Containers for Equipment storage		EACH	10.00	40.00	2.00	5.00	4.00	10.00	400.00	70.00	130.00	80,000.00	2,000.00	20,000.00	-	-	1,000.00	10,000.00	110,000.00
	Electrical demolition		m2	1,000.00	0.20	1.00	5.00	4.00	10.00	200.00	70.00	130.00	40,000.00		-	-	-		-	40,000.00
																				452,400.00
1120	**LV Work shed L-Form 10m*20m*10m*13t/m3/1000**	A2																		
	Remove Equipment,		LOT	1.00	40.00	1.00	6.00	0.67	10.00	40.00	70.00	130.00	8,000.00		-		-		-	8,000.00
	Strip Sheeting		M2	600.00	0.15	1.00	4.00	2.25	10.00	90.00	70.00	130.00	18,000.00		-		-		-	18,000.00
	Remove Steel 10m*20m*10m*13t/m3/1000		T	26.00	4.00	1.00	5.00	2.08	10.00	104.00	70.00	130.00	20,800.00		-		-		-	20,800.00
	Remove Concrete Slab, thick ca. 0.25 & foundation		M3	60.00	0.80	1.00	3.00	1.60	10.00	48.00	70.00	130.00	9,600.00		-		-		-	9,600.00
	Containers for Equipment storage		EACH	1.00	40.00	1.00	5.00	0.80	10.00	40.00	70.00	130.00	8,000.00	2,000.00	2,000.00		-	1,000.00	1,000.00	11,000.00
	Electrical demolition		m2	200.00	0.20	1.00	5.00	0.80	10.00	40.00	70.00	130.00	8,000.00		-		-		-	8,000.00
																				75,400.00
1130	**1) LV Work shed 15m*10m*10m*13t/m3/1000**	A3																		
	Remove Equipment,		LOT	1.00	200.00	1.00	6.00	3.33	10.00	200.00	70.00	130.00	40,000.00		-		-		-	40,000.00
	Strip Sheeting		M2	400.00	0.15	1.00	4.00	1.50	10.00	60.00	70.00	130.00	12,000.00		-		-		-	12,000.00
	Remove Steel 15m*10m*10m*13t/m3/1000		T	20.00	4.00	1.00	5.00	1.60	10.00	80.00	70.00	130.00	16,000.00		-		-		-	16,000.00
	Remove Concrete Slab, thick ca. 0.25 & foundation		M3	40.00	0.80	1.00	3.00	1.07	10.00	32.00	70.00	130.00	6,400.00		-		-		-	6,400.00
	Containers for Equipment storage		EACH	1.00	40.00	1.00	5.00	0.80	10.00	40.00	70.00	130.00	8,000.00	2,000.00	2,000.00		-	1,000.00	1,000.00	11,000.00
	Crane on Mast ca. 2 ton		Each	1.00	20.00	1.00	2.00	1.00	10.00	20.00	70.00	130.00	4,000.00	1,000.00	1,000.00	-	-	1,000.00	1,000.00	6,000.00
	Electrical demolition		m2	150.00	0.20	1.00	5.00	0.60	10.00	30.00	70.00	130.00	6,000.00		-		-		-	6,000.00
																				97,400.00
1140	**2) LV Work shed 10m*10m*10m*13t/m3/1000**	A3																		
	Remove Equipment,		LOT	1.00	200.00	1.00	6.00	3.33	10.00	200.00	70.00	130.00	40,000.00		-		-		-	40,000.00
	Strip Sheeting		M2	300.00	0.15	1.00	4.00	1.13	10.00	45.00	70.00	130.00	9,000.00		-		-		-	9,000.00
	Remove Steel 10m*10m*10m*13t/m3/1000		T	13.00	4.00	1.00	5.00	1.04	10.00	52.00	70.00	130.00	10,400.00		-		-		-	10,400.00
	Remove Concrete Slab, thick ca. 0.25 & foundation		M3	30.00	0.80	1.00	3.00	0.80	10.00	24.00	70.00	130.00	4,800.00		-		-		-	4,800.00
	Containers for Equipment storage		EACH	1.00	40.00	1.00	5.00	0.80	10.00	40.00	70.00	130.00	8,000.00	2,000.00	2,000.00		-	1,000.00	1,000.00	11,000.00
	Electrical demolition		m2	100.00	0.20	1.00	5.00	0.40	10.00	20.00	70.00	130.00	4,000.00		-	-	-		-	4,000.00
																				79,200.00
1150	**3) Storage shed behind LV Workshop 10m*10m*10m*13t/m3/1000**	A4																		
	Remove Equipment,		LOT	1.00	300.00	1.00	6.00	5.00	10.00	300.00	70.00	130.00	60,000.00		-		-		-	60,000.00
	Strip Sheeting		M2	450.00	0.15	1.00	4.00	1.69	10.00	67.50	70.00	130.00	13,500.00		-		-		-	13,500.00
	Remove Steel 25m*10m*3m*13t/m3/1000		T	10.00	4.00	1.00	5.00	0.80	10.00	40.00	70.00	130.00	8,000.00		-		-		-	8,000.00
	Remove Concrete Slab, thick ca. 0.25 & foundation		M3	75.00	0.80	1.00	3.00	2.00	10.00	60.00	70.00	130.00	12,000.00		-		-		-	12,000.00
	Containers for Equipment storage		EACH	5.00	40.00	1.00	5.00	4.00	10.00	200.00	70.00	130.00	40,000.00	2,000.00	10,000.00		-	1,000.00	5,000.00	55,000.00
	Electrical demolition		m2	250.00	0.20	1.00	5.00	1.00	10.00	50.00	70.00	130.00	10,000.00		-	-	-		-	10,000.00
																				158,500.00
1160	**First Aid & Office Containers**	A5																		
	Dismantle internal equipment& make safe for transport		Each	3.00	4.00	1.00	3.00	0.40	10.00	12.00	70.00	130.00	2,400.00		-		-		-	2,400.00
	Disconnect, remove from stands & load on transport		Each	3.00	8.00	1.00	3.00	0.80	10.00	24.00	70.00	130.00	4,800.00	2,000.00	6,000.00		-	1,000.00	3,000.00	13,800.00
	Remove Steel 10m*10m*10m*13t/m3/1000		T	1.00	4.00	1.00	5.00	0.08	10.00	4.00	70.00	130.00	800.00		-		-		-	800.00
	Remove Concrete Slab, thick ca. 0.25 & foundation		M3	30.00	0.80	1.00	3.00	0.80	10.00	24.00	70.00	130.00	4,800.00		-		-		-	4,800.00
	Electrical Area demolition		m2	50.00	0.20	1.00	5.00	0.20	10.00	10.00	70.00	130.00	2,000.00		-	-	-		-	2,000.00
																				23,800.00
1170	**Recreational Containers**	A6																		
	Dismantle internal equipment& make safe for transport		Each	5.00	10.00	1.00	5.00	1.00	10.00	50.00	70.00	130.00	10,000.00		-		-		-	10,000.00
	Disconnect, remove from stands & load on transport		Each	5.00	8.00	1.00	5.00	0.80	10.00	40.00	70.00	130.00	8,000.00	2,000.00	10,000.00		-	1,000.00	5,000.00	23,000.00
	Remove Steel 10m*10m*10m*13t/m3/1000		T	10.00	4.00	1.00	5.00	0.80	10.00	40.00	70.00	130.00	8,000.00		-		-		-	8,000.00
	Remove Concrete Slab, thick ca. 0.25 & foundation		M3	100.00	0.80	1.00	3.00	2.67	10.00	80.00	70.00	130.00	16,000.00		-		-		-	16,000.00
	Remove boardwalks and add-ons		LOT	1.00	200.00	1.00	4.00	4.55	11.00	200.00	70.00	130.00	40,000.00		-		-		-	40,000.00
	Electrical Area demolition		m2	300.00	0.20	1.00	5.00	1.20	10.00	60.00	70.00	130.00	12,000.00		-	-	-		-	12,000.00
	Rainwater tank		Each	1.00	2.00	1.00	2.00	0.10	10.00	2.00	70.00	130.00	400.00		-			1,000.00	1,000.00	1,400.00

Jeebropilly & New Oakleigh Coal Plant and Surface Facilities Decomissioning

Code	Description	Photo-Number	UoM	QTY	LABOUR									PLANT HIRE		MATERIAL		OTHER ALLOWANCE		TOTAL COST
					Unit Hrs	Number of Crews	Labour per crew	Duration (days)	Hours/day(h)	Total hours	Labour Rate	Distributables	**Total Labour Cost**	Unit Rate	**Total Cost**	Unit Rate	**Total Cost**	Unit Rate	**Total Cost**	
																				110,400.00
1180	**Open Shed Old**	A7																		
	Remove Equipment		Lot	1.00	20.00	1.00	3.00	0.67	10.00	20.00	70.00	130.00	**4,000.00**		-		-		-	**4,000.00**
	Only steel structure & Roof cladding		m2	200.00	0.15	1.00	2.00	1.50	10.00	30.00	70.00	130.00	**6,000.00**		-		-		-	**6,000.00**
																				10,000.00
1190	**Open Shed New**	A8																		
	Remove Concrete Slab, thick ca. 0.25 & foundation		M3	45.00	0.80	1.00	3.00	1.20	10.00	36.00	70.00	130.00	**7,200.00**		-		-		-	**7,200.00**
	Only steel structure & Roof cladding		m2	175.00	0.15	1.00	2.00	1.31	10.00	26.25	70.00	130.00	**5,250.00**		-		-		-	**5,250.00**
																				12,450.00
1195	**Admin Container**	A9																		
	Dismantle internal equipment& make safe for transport		Each	5.00	4.00	1.00	4.00	0.50	10.00	20.00	70.00	130.00	**4,000.00**		-		-		-	**4,000.00**
	Disconnect, remove from stands & load on transport		Each	5.00	8.00	1.00	4.00	1.00	10.00	40.00	70.00	130.00	**8,000.00**	2,000.00	**10,000.00**		-	1,000.00	**5,000.00**	**23,000.00**
	Remove Steel 10m*10m*10m*13t/m3/1000		T	2.00	4.00	1.00	3.00	0.27	10.00	8.00	70.00	130.00	**1,600.00**		-		-		-	**1,600.00**
	Remove Concrete Slab, thick ca. 0.25 & foundation		M3	50.00	0.80	1.00	3.00	1.33	10.00	40.00	70.00	130.00	**8,000.00**		-		-		-	**8,000.00**
	Electrical Area demolition		m2	100.00	0.20	1.00	5.00	0.40	10.00	20.00	70.00	130.00	**4,000.00**		-	-	-		-	**4,000.00**
																				40,600.00
1196	**Car park Admin**	A10																		
	Only steel structure & Roof cladding		m2	300.00	0.15	1.00	4.00	1.13	10.00	45.00	70.00	130.00	**9,000.00**		-		-		-	**9,000.00**
																				9,000.00
1200	**Fuel Station & Tank Area**	A11																		
	Remove Equipment		Lot	1.00	200.00	2.00	5.00	2.00	10.00	200.00	70.00	130.00	**40,000.00**	-	-	-	-	-	-	**40,000.00**
	Remove Fuel Tank		Each	9.00	5.00	1.00	3.00	1.50	10.00	45.00	70.00	130.00	**9,000.00**	2,000.00	**18,000.00**	-	-	1,000.00	**9,000.00**	**36,000.00**
	Strip Sheeting		M2	375.00	0.15	1.00	3.00	0.67	28.00	56.25	70.00	130.00	**11,250.00**		-		-		-	**11,250.00**
	Remove Steel 10m*10m*10m*13t/m3/1000		T	15.00	4.00	1.00	3.00	0.69	29.00	60.00	70.00	130.00	**12,000.00**		-		-		-	**12,000.00**
	Remove Bridge, Staircase		m	50.00	2.00	1.00	3.00	3.33	10.00	100.00	70.00	130.00	**20,000.00**		-		-		-	**20,000.00**
	Remove Concrete Footing 25*15*.3 & boundary wall & foundations Tanks		m3	150.00	0.80	1.00	3.00	4.00	10.00	120.00	70.00	130.00	**24,000.00**		-		-		-	**24,000.00**
	Remove Concrete Footing 25*15*.3 & boundary wall & foundations Pumps		m3	150.00	0.80	1.00	3.00	3.64	11.00	120.00	70.00	130.00	**24,000.00**		-		-		-	**24,000.00**
	Containers Equipment		Each	4.00	8.00	1.00	5.00	0.64	10.00	32.00	70.00	130.00	**6,400.00**	2,000.00	**8,000.00**		-	1,000.00	**4,000.00**	**18,400.00**
	Electrical demolition		m2	575.00	0.20	1.00	5.00	0.92	25.00	115.00	70.00	130.00	**23,000.00**		-		-		-	**23,000.00**
																				208,650.00
1300	**Wash Bay & Shed**	A12																		
	Remove Equipment		Lot	10.00	4.00	1.00	2.00	2.00	10.00	40.00	70.00	130.00	**8,000.00**	-	-	-	-	-	-	**8,000.00**
	Strip Sheeting		M2	90.00	0.15	1.00	2.00	0.68	10.00	13.50	70.00	130.00	**2,700.00**	-	-	-	-	-	-	**2,700.00**
	Remove Steel		T	2.00	4.00	1.00	2.00	0.40	10.00	8.00	70.00	130.00	**1,600.00**	-	-	-	-	-	-	**1,600.00**
	Remove Concrete Footing 10mx10m x.2 & foundations		m3	35.00	0.80	1.00	3.00	0.93	10.00	28.00	70.00	130.00	**5,600.00**	-	-	-	-	-	-	**5,600.00**
	Electrical demolition		m2	100.00	0.20	1.00	2.00	1.00	10.00	20.00	70.00	130.00	**4,000.00**	-	-	-	-	-	-	**4,000.00**
																				21,900.00
1400	**Storage Sheds**																			
1410	**Old Shed 4m*6m*3m**	A13																		
	Remove Equipment,		LOT	1.00	100.00	1.00	6.00	1.67	10.00	100.00	70.00	130.00	**20,000.00**		-		-		-	**20,000.00**
	Strip Sheeting		M2	75.00	0.15	1.00	4.00	0.28	10.00	11.25	70.00	130.00	**2,250.00**		-		-		-	**2,250.00**
	Remove Steel 10m*10m*10m*13t/m3/1000		T	1.00	4.00	1.00	5.00	0.08	10.00	4.00	70.00	130.00	**800.00**		-		-		-	**800.00**
	Remove Concrete Slab, thick ca. 0.25 & foundation		M3	6.00	0.80	1.00	3.00	0.16	10.00	4.80	70.00	130.00	**960.00**		-		-		-	**960.00**
	Containers for Equipment storage		EACH	2.00	40.00	1.00	5.00	1.60	10.00	80.00	70.00	130.00	**16,000.00**	2,000.00	**4,000.00**		-	1,000.00	**2,000.00**	**22,000.00**
	Electrical demolition		m2	100.00	0.20	1.00	5.00	0.40	10.00	20.00	70.00	130.00	**4,000.00**		-	-	-		-	**4,000.00**
																				50,010.00
1420	**New Shed 15m*12m*6m**	A14																		
	Remove Equipment,		LOT	1.00	50.00	1.00	4.00	1.25	10.00	50.00	70.00	130.00	**10,000.00**		-		-		-	**10,000.00**
	Strip Sheeting		M2	540.00	0.15	1.00	4.00	2.03	10.00	81.00	70.00	130.00	**16,200.00**		-		-		-	**16,200.00**
	Remove Steel 15m*12m*6m*13t/m3/1000		T	14.00	8.00	1.00	5.00	2.24	10.00	112.00	70.00	130.00	**22,400.00**		-		-		-	**22,400.00**
	Remove Concrete Slab, thick ca. 0.25 & foundation		M3	60.00	0.80	1.00	3.00	1.60	10.00	48.00	70.00	130.00	**9,600.00**		-		-		-	**9,600.00**
	Containers for Equipment storage		EACH	2.00	20.00	1.00	3.00	1.33	10.00	40.00	70.00	130.00	**8,000.00**	2,000.00	**4,000.00**		-	1,000.00	**2,000.00**	**14,000.00**
	Electrical demolition		m2	180.00	0.20	1.00	5.00	0.72	10.00	36.00	70.00	130.00	**7,200.00**		-	-	-		-	**7,200.00**
	Roller Doors 6m *4m		Each	2.00	20.00	1.00	5.00	0.80	10.00	40.00	70.00	130.00	**8,000.00**	-	-	-	-	-	-	**8,000.00**
																				87,400.00
1430	**Old Sea Container**																			
	Sea Container, only moving	A15	Each	1.00	1.00	1.00	2.00	0.05	10.00	1.00	70.00	130.00	**200.00**	-	-	-	-	1,000.00	**1,000.00**	**1,200.00**
																				1,200.00
1440	**Big Shed with office room on Level 1**	A16																		
	Remove Equipment,		LOT	1.00	100.00	1.00	3.00	3.33	10.00	100.00	70.00	130.00	**20,000.00**	3,000.00	**3,000.00**		-		-	**23,000.00**

Code	Description	Photo-Number	UoM	QTY	LABOUR									PLANT HIRE		MATERIAL		OTHER ALLOWANCE		TOTAL COST
					Unit Hrs	Number of Crews	Labour per crew	Duration (days)	Hours/day(h)	Total hours	Labour Rate	Distributables	Total Labour Cost	Unit Rate	Total Cost	Unit Rate	Total Cost	Unit Rate	Total Cost	
	Strip Sheeting		M2	1,200.00	0.15	1.00	4.00	4.50	10.00	180.00	70.00	130.00	**36,000.00**		-		-		-	**36,000.00**
	additional allowance for downpipes and gutters		m	120.00	0.25	1.00	4.00	0.75	10.00	30.00	70.00	130.00	**6,000.00**		-		-		-	**6,000.00**
	Remove Steel 15m*12m*6m*13t/m3/1000		T	42.00	4.00	1.00	5.00	3.36	10.00	168.00	70.00	130.00	**33,600.00**		-		-		-	**33,600.00**
	additional allowance for shelf outside, staircase & porch roof		T	5.00	4.00	1.00	5.00	0.40	10.00	20.00	70.00	130.00	**4,000.00**		-		-		-	**4,000.00**
	additional allowance for shelfs and second level		T	15.00	4.00	1.00	5.00	1.20	10.00	60.00	70.00	130.00	**12,000.00**		-		-		-	**12,000.00**
	Remove Concrete Slab, thick ca. 0.25 & foundation		M3	110.00	0.80	1.00	3.00	2.93	10.00	88.00	70.00	130.00	**17,600.00**		-		-		-	**17,600.00**
	Containers for Equipment storage		EACH	4.00	20.00	1.00	5.00	1.60	10.00	80.00	70.00	130.00	**16,000.00**	2,000.00	**8,000.00**		-	1,000.00	**4,000.00**	**28,000.00**
	Electrical demolition		m2	360.00	0.20	1.00	5.00	1.44	10.00	72.00	70.00	130.00	**14,400.00**		-	-	-		-	**14,400.00**
	Roller Doors 6m *4m		Each	3.00	20.00	1.00	5.00	1.20	10.00	60.00	70.00	130.00	**12,000.00**	-	-	-	-	-	-	**12,000.00**
	Rainwater tank		Each	1.00	2.00	1.00	1.00	0.20	10.00	2.00	70.00	130.00	**400.00**		-			1,000.00	**1,000.00**	**1,400.00**
	Air conditioner		EACH	4.00	5.00	1.00	2.00	1.00	10.00	20.00	70.00	130.00	**4,000.00**	-	-	-	-	-	-	**4,000.00**
	Hotwatersystem		EACH	1.00	5.00	1.00	2.00	0.25	10.00	5.00	70.00	130.00	**1,000.00**	-	-	-	-	-	-	**1,000.00**
																				193,000.00
1450	**Cleaning Area**																			
	Cleaning Area		m2	40,000.00	0.01	2.00	5.00	4.00	10.00	400.00	70.00	130.00	**80,000.00**	-	-	-	-	-	-	**80,000.00**
	Scrap Container		EACH	20.00				#DIV/0!	10.00	-	70.00	130.00	-	500.00	**10,000.00**	-	-	-	-	**10,000.00**
	Forklift/Mobil Crane		LOT	2.00				#DIV/0!	10.00	-	70.00	130.00	-	5,000.00	**10,000.00**	-	-	-	-	**10,000.00**
	Old mobile E-house		LOT	1.00	20.00	1.00	2.00	1.00	10.00	20.00	70.00	130.00	**4,000.00**	1,000.00	**1,000.00**	-	-	-	-	**5,000.00**
	Remove Equipment,		LOT	1.00	200.00	1.00	6.00	3.33	10.00	200.00	70.00	130.00	**40,000.00**	3,000.00	**3,000.00**		-		-	**43,000.00**
	Containers for Equipment storage		EACH	5.00	40.00	1.00	5.00	4.00	10.00	200.00	70.00	130.00	**40,000.00**	2,000.00	**10,000.00**		-	1,000.00	**5,000.00**	**55,000.00**
																				203,000.00
1500	**Com Mast**	A17																		
1510	Mast & Foundation		Lot	1.00	40.00	1.00	4.00	1.00	10.00	40.00	70.00	130.00	**8,000.00**	2,000.00	**2,000.00**	-	-	1,000.00	**1,000.00**	**11,000.00**
																				11,000.00
	NOTE: length of conveyor = length on ground + 10% evaluation																			
1600	**RAW COAL AREA**	A18																		
1610	Hopper Bridge		LOT	1.00	30.00	1.00	3.00	1.00	10.00	30.00	70.00	130.00	**6,000.00**	5,000.00	**5,000.00**	-	-	-	-	**11,000.00**
1620	Hopper Bin		LOT	1.00	30.00	1.00	3.00	1.00	10.00	30.00	70.00	130.00	**6,000.00**	-	-	-	-	-	-	**6,000.00**
1630	Access and platform		LOT	1.00	15.00	1.00	3.00	0.50	10.00	15.00	70.00	130.00	**3,000.00**	-	-	-	-	-	-	**3,000.00**
1640	Retaining Wall		LOT	1.00	15.00	1.00	3.00	0.50	10.00	15.00	70.00	130.00	**3,000.00**	-	-	-	-	-	-	**3,000.00**
1650	Area Lighting		LOT	200.00	0.20	1.00	2.00	2.00	10.00	40.00	70.00	130.00	**8,000.00**	-	-	-	-	-	-	**8,000.00**
1660	RAW CAOL BIN Conveyor		m	72.00	1.25	1.00	3.00	3.00	10.00	90.00	70.00	130.00	**18,000.00**	-	-	-	-	-	-	**18,000.00**
	A-Frame 3*20m+ 1*9m		m	70.00	0.50	1.00	2.00	1.75	10.00	35.00	70.00	130.00	**7,000.00**	-	-	-	-	-	-	**7,000.00**
1670	RWA COAL BIN		LOT	1.00	100.00	1.00	3.00	3.33	10.00	100.00	70.00	130.00	**20,000.00**	-	-	-	-	-	-	**20,000.00**
1680	CHPP Conveyor		m	44.00	1.25	1.00	3.00	1.83	10.00	55.00	70.00	130.00	**11,000.00**	-	-	-	-	-	-	**11,000.00**
1690	BIN access & cable alignment		m	28.00	1.25	1.00	3.00	1.17	10.00	35.00	70.00	130.00	**7,000.00**	-	-	-	-	-	-	**7,000.00**
																				94,000.00
1700	**CHPP AREA**	A19																		
1711	CHPP Plant 11,250 m3 200kg/m3		m3	2,250.00	8.00	3.00	5.00	120.00	10.00	18,000.00	70.00	130.00	**3,600,000.00**	-	-	-	-	-	-	**3,600,000.00**
1712	Strip Sheeting		M2	750.00	0.15	1.00	4.00	2.81	10.00	112.50	70.00	130.00	**22,500.00**		-		-		-	**22,500.00**
1713	Remove Concrete Slab, thick ca. 0.3 & foundations		M3	1,500.00	0.80	1.00	3.00	40.00	10.00	1,200.00	70.00	130.00	**240,000.00**		-		-		-	**240,000.00**
1721	Thickener 1 Dia 14 m		LOT	1.00	200.00	1.00	5.00	4.00	10.00	200.00	70.00	130.00	**40,000.00**	-	-	-	-	-	-	**40,000.00**
1721	Thickener 2 Dia 13 m		LOT	1.00	200.00	1.00	5.00	4.00	10.00	200.00	70.00	130.00	**40,000.00**	-	-	-	-	-	-	**40,000.00**
1721	Thickener 3 Dia 8 m		LOT	1.00	80.00	1.00	3.00	2.67	10.00	80.00	70.00	130.00	**16,000.00**	-	-	-	-	-	-	**16,000.00**
1730	Transferstation 10 *5 m ca 15m		T	15.00	4.00	1.00	3.00	2.00	10.00	60.00	70.00	130.00	**12,000.00**	-	-	-	-	-	-	**12,000.00**
1740	Product Bin Dia 8m		T	20.00	4.00	1.00	3.00	2.67	10.00	80.00	70.00	130.00	**16,000.00**	-	-	-	-	-	-	**16,000.00**
1750	Sizer ca 6 * 4 m		T	20.00	4.00	1.00	3.00	2.67	10.00	80.00	70.00	130.00	**16,000.00**	-	-	-	-	-	-	**16,000.00**
1760	Reject Bin Dia 8m		LOT	30.00	4.00	1.00	3.00	4.00	10.00	120.00	70.00	130.00	**24,000.00**	-	-	-	-	-	-	**24,000.00**
1770	Fines Bin Dia 8m		LOT	30.00	4.00	1.00	3.00	4.00	10.00	120.00	70.00	130.00	**24,000.00**	-	-	-	-	-	-	**24,000.00**
																				4,050,500.00
1780	**Conveyors**																			
1781	Fines Conveyor		m	66.00	1.25	1.00	3.00	2.75	10.00	82.50	70.00	130.00	**16,500.00**	-	-	-	-	-	-	**16,500.00**
	A-Frame 15m+ 10m		m	25.00	0.50	1.00	2.00	0.63	10.00	12.50	70.00	130.00	**2,500.00**	-	-	-	-	-	-	**2,500.00**
1782	Rejects Conveyor		m	73.00	1.25	1.00	3.00	3.04	10.00	91.25	70.00	130.00	**18,250.00**	-	-	-	-	-	-	**18,250.00**
	A-Frame 15m+ 10m		m	25.00	0.50	1.00	2.00	0.63	10.00	12.50	70.00	130.00	**2,500.00**	-	-	-	-	-	-	**2,500.00**
1783	Thickener Conveyor		m	11.00	1.25	1.00	3.00	0.46	10.00	13.75	70.00	130.00	**2,750.00**	-	-	-	-	-	-	**2,750.00**

Jeebropilly & New Oakleigh Coal Plant and Surface Facilities Decomissioning

Code	Description	Photo-Number	UoM	QTY	LABOUR									PLANT HIRE		MATERIAL		OTHER ALLOWANCE		TOTAL COST
					Unit Hrs	Number of Crews	Labour per crew	Duration (days)	Hours/day(h)	Total hours	Labour Rate	Distributables	Total Labour Cost	Unit Rate	Total Cost	Unit Rate	Total Cost	Unit Rate	Total Cost	
1784	Product Conveyor 1 (2 * 36m=72)		m	80.00	1.25	1.00	3.00	3.33	10.00	100.00	70.00	130.00	**20,000.00**	-	-	-	-	-	-	**20,000.00**
1785	Product Conveyor 2		m	52.00	1.25	1.00	3.00	2.17	10.00	65.00	70.00	130.00	**13,000.00**	-	-	-	-	-	-	**13,000.00**
	A-Frame 20m+ 25m		m	45.00	0.50	1.00	2.00	1.13	10.00	22.50	70.00	130.00	**4,500.00**	-	-	-	-	-	-	**4,500.00**
1786	Sizer Conveyor 1		m	17.00	1.25	1.00	3.00	0.71	10.00	21.25	70.00	130.00	**4,250.00**	-	-	-	-	-	-	**4,250.00**
	A-Frame 15m		m	15.00	0.50	1.00	2.00	0.38	10.00	7.50	70.00	130.00	**1,500.00**	-	-	-	-	-	-	**1,500.00**
1787	Sizer Conveyor 2		m	11.00	1.25	1.00	3.00	0.46	10.00	13.75	70.00	130.00	**2,750.00**	-	-	-	-	-	-	**2,750.00**
	A-Frame 15m		m	15.00	0.50	1.00	2.00	0.38	10.00	7.50	70.00	130.00	**1,500.00**	-	-	-	-	-	-	**1,500.00**
1788	Sizer Conveyor 3		m	13.00	1.25	1.00	3.00	0.54	10.00	16.25	70.00	130.00	**3,250.00**	-	-	-	-	-	-	**3,250.00**
	A-Frame 15m		m	15.00	0.50	1.00	2.00	0.38	10.00	7.50	70.00	130.00	**1,500.00**	-	-	-	-	-	-	**1,500.00**
1789	Sizer Conveyor 4		m	12.00	1.25	1.00	3.00	0.50	10.00	15.00	70.00	130.00	**3,000.00**	-	-	-	-	-	-	**3,000.00**
	A-Frame 15m		m	15.00	0.50	1.00	2.00	0.38	10.00	7.50	70.00	130.00	**1,500.00**	-	-	-	-	-	-	**1,500.00**
																				99,250.00
1800	**INFRASTRUCTURE**																			
1810	CHPP Transferstation 8*3m		LOT	1.00	50.00	1.00	5.00	1.00	10.00	50.00	70.00	130.00	**10,000.00**	5,000.00	**5,000.00**	-	-	-	-	**15,000.00**
1820	Reject Bin Transferstation? 3*5m		LOT	1.00	50.00	1.00	5.00	1.00	10.00	50.00	70.00	130.00	**10,000.00**	5,000.00	**5,000.00**	-	-	-	-	**15,000.00**
1830	E-House behind Store		LOT	1.00	50.00	1.00	5.00	1.00	10.00	50.00	70.00	130.00	**10,000.00**	5,000.00	**5,000.00**	-	-	1,000.00	**1,000.00**	**16,000.00**
																				46,000.00
1900	**ADMIN AREA**																			
1910	**Store Shed 10m*20m*5m**	A20																		
	Remove Equipment,		LOT	1.00	300.00	1.00	6.00	5.00	10.00	300.00	70.00	130.00	**60,000.00**		-		-		-	**60,000.00**
	Strip Sheeting		M2	300.00	0.15	1.00	4.00	1.13	10.00	45.00	70.00	130.00	**9,000.00**		-		-		-	**9,000.00**
	Remove Steel 10m*20m*5m*13t/m3/1000		T	13.00	4.00	1.00	5.00	1.04	10.00	52.00	70.00	130.00	**10,400.00**		-		-		-	**10,400.00**
	Remove Concrete Slab, thick ca. 0.25 & foundation		M3	60.00	0.80	1.00	3.00	1.60	10.00	48.00	70.00	130.00	**9,600.00**		-		-		-	**9,600.00**
	Containers for Equipment storage		EACH	1.00	40.00	1.00	5.00	0.80	10.00	40.00	70.00	130.00	**8,000.00**	2,000.00	**2,000.00**		-	1,000.00	**1,000.00**	**11,000.00**
	Electrical demolition		m2	200.00	0.20	1.00	5.00	0.80	10.00	40.00	70.00	130.00	**8,000.00**		-		-		-	**8,000.00**
																				108,000.00
1920	**Workshop 10m*20m*5m**																			
	Remove Equipment,	A20	LOT	1.00	300.00	1.00	6.00	5.00	10.00	300.00	70.00	130.00	**60,000.00**		-		-		-	**60,000.00**
	Strip Sheeting		M2	300.00	0.15	1.00	4.00	1.13	10.00	45.00	70.00	130.00	**9,000.00**		-		-		-	**9,000.00**
	Remove Steel 10m*20m*5m*13t/m3/1000		T	13.00	4.00	1.00	5.00	1.04	10.00	52.00	70.00	130.00	**10,400.00**		-		-		-	**10,400.00**
	Remove Concrete Slab, thick ca. 0.25 & foundation		M3	60.00	0.80	1.00	3.00	1.60	10.00	48.00	70.00	130.00	**9,600.00**		-		-		-	**9,600.00**
	Containers for Equipment storage		EACH	1.00	40.00	1.00	5.00	0.80	10.00	40.00	70.00	130.00	**8,000.00**	2,000.00	**2,000.00**		-	1,000.00	**1,000.00**	**11,000.00**
	Electrical demolition		m2	200.00	0.20	1.00	5.00	0.80	10.00	40.00	70.00	130.00	**8,000.00**		-		-		-	**8,000.00**
																				108,000.00
1930	**Open Hall left side workshop**																			
	Remove Equipment,	A21	LOT	1.00	50.00	1.00	6.00	0.83	10.00	50.00	70.00	130.00	**10,000.00**		-		-		-	**10,000.00**
	Strip Sheeting		M2	220.00	0.15	1.00	4.00	0.83	10.00	33.00	70.00	130.00	**6,600.00**		-		-		-	**6,600.00**
	Remove Steel 10m*20m*5m*13t/m3/1000		T	13.00	4.00	1.00	5.00	1.04	10.00	52.00	70.00	130.00	**10,400.00**		-		-		-	**10,400.00**
	Remove Concrete Slab, thick ca. 0.25 & foundation		M3	60.00	0.80	1.00	3.00	1.60	10.00	48.00	70.00	130.00	**9,600.00**		-		-		-	**9,600.00**
	Containers for Equipment storage		EACH	0.50	40.00	1.00	5.00	0.40	10.00	20.00	70.00	130.00	**4,000.00**	2,000.00	**1,000.00**		-	1,000.00	**500.00**	**5,500.00**
	Electrical demolition		m2	200.00	0.20	1.00	5.00	0.80	10.00	40.00	70.00	130.00	**8,000.00**		-		-		-	**8,000.00**
																				50,100.00
1940	**Office and Bathroom**																			
	Dismantle internal equipment& make safe for transport	A22	Each	6.00	4.00	1.00	6.00	0.40	10.00	24.00	70.00	130.00	**4,800.00**		-		-		-	**4,800.00**
	Disconnect, remove from stands & load on transport		Each	6.00	8.00	1.00	4.00	1.20	10.00	48.00	70.00	130.00	**9,600.00**	2,000.00	**12,000.00**		-	1,000.00	**6,000.00**	**27,600.00**
	Remove Concrete Slab, thick ca. 0.25 & foundation		M3	20.00	0.80	1.00	3.00	0.53	10.00	16.00	70.00	130.00	**3,200.00**		-		-		-	**3,200.00**
	Electrical Area demolition		m2	40.00	0.20	1.00	5.00	0.16	10.00	8.00	70.00	130.00	**1,600.00**		-	-	-		-	**1,600.00**
	Front porch roof 2m*18m		m2	36.00	0.15	1.00	4.00	0.14	10.00	5.40	70.00	130.00	**1,080.00**		-		-		-	**1,080.00**
	Remove Steel 2m*18m*3m*13t/m3/1000		T	1.00	4.00	1.00	5.00	0.08	10.00	4.00	70.00	130.00	**800.00**		-		-		-	**800.00**
	Back porch roof 6m*18m		m2	110.00	0.15	1.00	4.00	0.41	10.00	16.50	70.00	130.00	**3,300.00**		-		-		-	**3,300.00**
	Remove Steel 6m*18m*3m*13t/m3/1000		T	3.00	4.00	1.00	5.00	0.24	10.00	12.00	70.00	130.00	**2,400.00**		-		-		-	**2,400.00**
																				44,780.00
1950	**Weight Bridge 18m*3.5m**																			
	Weight Bridge		Lot	1.00	30.00	1.00	3.00	1.00	10.00	30.00	70.00	130.00	**6,000.00**	5,000.00	**5,000.00**		-	1,000.00	**1,000.00**	**12,000.00**
	Remove Concrete Slab, thick ca. 0.25 & foundation		M3	35.00	0.80	1.00	3.00	0.93	10.00	28.00	70.00	130.00	**5,600.00**		-		-		-	**5,600.00**
	Remove Bridge, Staircase or Handrail		m	40.00	1.00	1.00	3.00	1.33	10.00	40.00	70.00	130.00	**8,000.00**		-		-		-	**8,000.00**
																				25,600.00
																	Grand Total Jeebropilly			**6,471,540.00**

Code	Description	Photo-Number	UoM	QTY		LABOUR								PLANT HIRE		MATERIAL		OTHER ALLOWANCE		TOTAL COST
					Unit Hrs	Number of Crews	Labour per crew	Duration (days)	Hours/day(h)	Total hours	Labour Rate	Distributables	Total Labour Cost	Unit Rate	Total Cost	Unit Rate	Total Cost	Unit Rate	Total Cost	
2000	New Oakleigh Coal Plant and Surface Facilities Decommissioning																			
2100	**Remove Fuel Station and auxiliary building**	B1																		
2110	**Remove Fuel Tank**																			
2111	Remove Fuel Tank small size		EACH	3.00	6.00	1.00	6.00	0.30	10.00	18.00	70.00	130.00	3,600.00		-		-		-	3,600.00
2112	Remove Fuel Tank big size		EACH	2.00	8.00	1.00	6.00	0.27	10.00	16.00	70.00	130.00	3,200.00		-		-		-	3,200.00
2113	Remove fuel supply station equipment (include pressure vessel)		LOT	1.00	45.00	1.00	6.00	0.75	10.00	45.00	70.00	130.00	9,000.00		-		-		-	9,000.00
2114	Remove concrete slab and border (12 long x7widex 0.4 m thick)		M3	40.00	0.80	1.00	6.00	0.53	10.00	32.00	70.00	130.00	6,400.00		-		-		-	6,400.00
2115	Remove steel frame and steel platform (3x3x6*0.013+ 0.8)		T	1.50	4.00	1.00	6.00	0.10	10.00	6.00	70.00	130.00	1,200.00		-		-		-	1,200.00
2116	Strip Sheeting(3m6m)		M2	18.00	0.15	1.00	6.00	0.05	10.00	2.70	70.00	130.00	540.00		-		-		-	540.00
2117	Remove piping services		LOT	1.00	75.00	1.00	6.00	1.25	10.00	75.00	70.00	130.00	15,000.00		-		-		-	15,000.00
2118	Remove electrical services		LOT	1.00	15.00	1.00	6.00	0.25	10.00	15.00	70.00	130.00	3,000.00		-		-		-	3,000.00
																				41,940.00
2120	**Remove Fuel Station auxiliary building**																			
2121	**Remove Beside Fuel Station shed**																			
	Remove Shed include steel and sheeting		LOT	1.00	75.00	1.00	6.00	1.25	10.00	75.00	70.00	130.00	15,000.00		-		-		-	15,000.00
	Remove shed Slab		LOT	1.00	50.00	1.00	6.00	0.83	10.00	50.00	70.00	130.00	10,000.00		-		-		-	10,000.00
	Remove Service pipe		LOT	1.00	15.00	1.00	6.00	0.25	10.00	15.00	70.00	130.00	3,000.00		-		-		-	3,000.00
																				28,000.00
2122	**Remove Car Park shed behind Fuel Station**																			
	Remove Car Park shed behind Fuel Station(include steel and sheeting)		LOT	1.00	30.00	1.00	6.00	0.50	10.00	30.00	70.00	130.00	6,000.00		-		-		-	6,000.00
2200	**Remove Workshop and auxiliary building**	B2																		6,000.00
2210	**Remove Workshop**																			
2211	Remove Equipment		LOT	1.00	45.00	1.00	6.00	0.75	10.00	45.00	70.00	130.00	9,000.00		-		-		-	9,000.00
2212	Strip Sheeting		M2	700.00	0.15	1.00	6.00	1.75	10.00	105.00	70.00	130.00	21,000.00		-		-		-	21,000.00
2213	Remove Steel is LxWxH is 20m *12m*8m*13t/m3/1000		T	25.00	4.00	1.00	6.00	1.67	10.00	100.00	70.00	130.00	20,000.00		-		-		-	20,000.00
2214	Crane on Rail ca 5 ton		LOT	1.00	40.00	1.00	6.00	0.67	10.00	40.00	70.00	130.00	8,000.00		-		-		-	8,000.00
2215	Remove Concrete Slab, thick ca. 0.40 & foundation		M3	96.00	0.80	1.00	6.00	1.28	10.00	76.80	70.00	130.00	15,360.00		-		-		-	15,360.00
2216	Electrical service demolition		LOT	1.00	30.00	1.00	6.00	0.50	10.00	30.00	70.00	130.00	6,000.00		-		-		-	6,000.00
2217	Containers for Equipment storage		EACH	10.00	40.00	2.00	5.00	4.00	10.00	400.00	70.00	130.00	80,000.00		-		-		-	80,000.00
																				159,360.00
2220	**Remove workshop auxiliary building**																			
2221	Remove Storage shed		LOT	1.00	25.00	1.00	6.00	0.42	10.00	25.00	70.00	130.00	5,000.00		-		-		-	5,000.00
2222	Remove Car parks shed		LOT	1.00	25.00	1.00	6.00	0.42	10.00	25.00	70.00	130.00	5,000.00		-		-		-	5,000.00
																				10,000.00
2300	**Remove Wash Bay incl. Piping and sewage**	B3																		
2310	Remove steel and metal panel		LOT	1.00	20.00	1.00	6.00	0.33	10.00	20.00	70.00	130.00	4,000.00		-		-		-	4,000.00
2320	Remove piping and equipment		LOT	1.00	25.00	1.00	6.00	0.42	10.00	25.00	70.00	130.00	5,000.00		-		-		-	5,000.00
2330	Remove steel frame beside weight bridge		T	1.50	4.00	1.00	6.00	0.10	10.00	6.00	70.00	130.00	1,200.00		-		-		-	1,200.00
2340	Remove Water tank		EACH	1.00	2.00	1.00	1.00	0.20	10.00	2.00	70.00	130.00	400.00		-		-		-	400.00
2350	Remove Water tank foundation (4*4*0.25)		M3	4.00	0.80	1.00	6.00	0.05	10.00	3.20	70.00	130.00	640.00		-		-		-	640.00
																				11,240.00
2400	**Remove Lay down hopper**	B4																		
2410	Remove Steel Hopper and steel		LOT	1.00	150.00	1.00	6.00	2.50	10.00	150.00	70.00	130.00	30,000.00		-		-		-	30,000.00
2420	Remove concrete Pad footing		EACH	4.00	6.00	1.00	6.00	0.40	10.00	24.00	70.00	130.00	4,800.00		-		-		-	4,800.00
2430	Remove Block Wall		M2	40.00	0.30	1.00	6.00	0.20	10.00	12.00	70.00	130.00	2,400.00		-		-		-	2,400.00
																				37,200.00
2500	**Demolish Storage yard Concrete**	B5																		
2510	Remove Pad Footing		EACH	5.00	6.00	1.00	6.00	0.50	10.00	30.00	70.00	130.00	6,000.00		-		-		-	6,000.00
2520	Remove Concrete Slab 3 block 25 M2 slab		M3	18.75	0.80	1.00	6.00	0.25	10.00	15.00	70.00	130.00	3,000.00		-		-		-	3,000.00
2530	Remove Concrete Wall (2x5longx 3 high x 0.25 thick)		M3	7.50	1.50	1.00	6.00	0.19	10.00	11.25	70.00	130.00	2,250.00		-		-		-	2,250.00
2540	Remove Concrete steel pole		EACH	11.00	1.00	1.00	6.00	0.18	10.00	11.00	70.00	130.00	2,200.00		-		-		-	2,200.00
																				13,450.00
2600	**Demolish two storage house on hill**	B6																		
2610	**Brick wall storage room**																			
2811	Remove Block Wall		M2	128.70	0.30	1.00	6.00	0.64	10.00	38.61	70.00	130.00	7,722.00		-		-		-	7,722.00
2812	Remove concrete slab		M3	16.88	0.80	1.00	6.00	0.23	10.00	13.50	70.00	130.00	2,700.00		-		-		-	2,700.00
2813	Strip Sheeting		M2	93.63	0.15	1.00	4.00	0.35	10.00	14.04	70.00	130.00	2,808.75		-		-		-	2,808.75

Code	Description	Photo-Number	UoM	QTY	LABOUR									PLANT HIRE		MATERIAL		OTHER ALLOWANCE		TOTAL COST
					Unit Hrs	Number of Crews	Labour per crew	Duration (days)	Hours/day(h)	Total hours	Labour Rate	Distributables	Total Labour Cost	Unit Rate	Total Cost	Unit Rate	Total Cost	Unit Rate	Total Cost	
2814	Remove metal door		EACH	3.00	0.50	1.00	4.00	0.04	10.00	1.50	70.00	130.00	300.00		-		-		-	300.00
2815	Remove timber frame		M2	120.00	0.25	1.00	4.00	0.75	10.00	30.00	70.00	130.00	6,000.00		-		-		-	6,000.00
																				19,530.75
2620	**Timber cladding Storage room**																			
2621	Demolish timber cladding Storage room include behind metal sheeting		M2	50.00	1.20	1.00	4.00	1.50	10.00	60.00	70.00	130.00	12,000.00		-		-		-	12,000.00
																				12,000.00
2700	**Demolition of Workshop**	B7																		
2710	Remove Equipment,		LOT	1.00	600.00	1.00	6.00	10.00	10.00	600.00	70.00	130.00	120,000.00		-		-		-	120,000.00
2720	Strip Sheeting		M2	1,237.50	0.15	1.00	4.00	4.64	10.00	185.63	70.00	130.00	37,125.00		-		-		-	37,125.00
2730	Remove Steel is LxBxH is 30m *15m*8m*13t/m3/1000		T	46.80	4.00	1.00	5.00	3.74	10.00	187.20	70.00	130.00	37,440.00		-		-		-	37,440.00
2740	Crane on Rail ca 5 ton		EACH	1.00	40.00	1.00	4.00	1.00	10.00	40.00	70.00	130.00	8,000.00		-		-		-	8,000.00
2750	Remove Concrete Slab, thick ca. 0.40 & foundation		M3	237.60	0.80	1.00	3.00	6.34	10.00	190.08	70.00	130.00	38,016.00		-		-		-	38,016.00
2760	Containers for Equipment storage		EACH	15.00	40.00	2.00	5.00	6.00	10.00	600.00	70.00	130.00	120,000.00		-		-		-	120,000.00
2770	Electrical demolition		M2	450.00	0.20	1.00	5.00	1.80	10.00	90.00	70.00	130.00	18,000.00		-		-		-	18,000.00
																				378,581.00
2800	**Demolition of buildings on the hill behind railway**	B8																		
2810	**Demolition of repair room**	***B8-1***																		
2811	Remove Equipment,		LOT	1.00	50.00	1.00	6.00	0.83	10.00	50.00	70.00	130.00	10,000.00		-		-		-	10,000.00
2812	Strip Sheeting		M2	205.00	0.15	1.00	4.00	0.77	10.00	30.75	70.00	130.00	6,150.00		-		-		-	6,150.00
2813	Remove Steel is LxBxH is 10m *10m*6m*13t/m3/1000		T	7.80	4.00	1.00	5.00	0.62	10.00	31.20	70.00	130.00	6,240.00		-		-		-	6,240.00
2814	Remove Concrete Slab, thick ca. 0.25 & foundation		M3	25.00	0.80	1.00	3.00	0.67	10.00	20.00	70.00	130.00	4,000.00		-		-		-	4,000.00
2815	Containers for Equipment storage		EACH	1.00	40.00	2.00	5.00	0.40	10.00	40.00	70.00	130.00	8,000.00		-		-		-	8,000.00
2816	Electrical demolition		M2	100.00	0.10	1.00	5.00	0.20	10.00	10.00	70.00	130.00	2,000.00		-		-		-	2,000.00
																				36,390.00
2820	**Demolition of workshop room**	***B8-2***																		
2821	Strip Sheeting		M2	335.00	0.15	1.00	4.00	1.26	10.00	50.25	70.00	130.00	10,050.00		-		-		-	10,050.00
2822	Remove Steel is LxBxH is 12m*6m*6m*13t/m3/1000		T	5.62	4.00	1.00	5.00	0.45	10.00	22.46	70.00	130.00	4,492.80		-		-		-	4,492.80
2823	Remove Concrete Slab, thick ca. 0.25 & foundation		M3	108.00	0.80	1.00	3.00	2.88	10.00	86.40	70.00	130.00	17,280.00		-		-		-	17,280.00
2824	Electrical demolition		M2	72.00	0.10	1.00	5.00	0.14	10.00	7.20	70.00	130.00	1,440.00		-		-		-	1,440.00
																				33,262.80
2830	**Demolition of Timber frame shed beside Repair Room**	***B8-3***																		
2831	Strip Sheeting		M2	35.00	0.15	1.00	4.00	0.13	10.00	5.25	70.00	130.00	1,050.00		-		-		-	1,050.00
2832	Remove timber frame		M2	17.50	0.80	1.00	5.00	0.28	10.00	14.00	70.00	130.00	2,800.00		-		-		-	2,800.00
2833	Remove Concrete Slab, thick ca. 0.25 & foundation		M3	4.38	0.80	1.00	3.00	0.12	10.00	3.50	70.00	130.00	700.00		-		-		-	700.00
2834	Piping service demolish		LOT	1.00	50.00	1.00	5.00	1.00	10.00	50.00	70.00	130.00	10,000.00		-		-		-	10,000.00
																				14,550.00
2840	**Demolition of timber frame house behind repair room**	***B8-4***																		
2841	Demolition of timber frame house behind repair room all included		M2	50.00	1.20	1.00	5.00	1.20	10.00	60.00	70.00	130.00	12,000.00		-		-		-	12,000.00
																				12,000.00
2850	**Demolition of shed behind repair room**	***B8-5***																		
2851	Demolition of shed behind repair room all included		M2	30.00	1.00	1.00	5.00	0.60	10.00	30.00	70.00	130.00	6,000.00		-		-		-	6,000.00
																				6,000.00
2860	**Demolition of tyre change room**	***B8-6***																		
2861	Remove Equipment		LOT	1.00	50.00	1.00	6.00	0.83	10.00	50.00	70.00	130.00	10,000.00		-		-		-	10,000.00
2862	Strip Sheeting		M2	300.60	0.15	1.00	4.00	1.13	10.00	45.09	70.00	130.00	9,018.00		-		-		-	9,018.00
2863	Remove Steel is LxBxH is (8m *4.5m*4m+8m*6m*5m)*13t/m3/1000		T	4.99	4.00	1.00	5.00	0.40	10.00	19.97	70.00	130.00	3,993.60		-		-		-	3,993.60
2864	Remove Concrete Slab, thick ca. 0.25 & foundation		M3	21.00	0.80	1.00	3.00	0.56	10.00	16.80	70.00	130.00	3,360.00		-		-		-	3,360.00
2865	Containers for Equipment storage		EACH	1.00	10.00	2.00	5.00	0.10	10.00	10.00	70.00	130.00	2,000.00		-		-		-	2,000.00
2863	Electrical demolition		M2	84.00	0.10	1.00	5.00	0.17	10.00	8.40	70.00	130.00	1,680.00		-		-		-	1,680.00
																				30,051.60
2870	**Demolition of shed on the top of hill behind repair room**	***B8-7***																		
2871	Strip Sheeting		M2	147.50	0.15	1.00	4.00	0.55	10.00	22.13	70.00	130.00	4,425.00		-		-		-	4,425.00
2872	Remove Steel is LxBxH is (10*5*3)*13t/m3/1000		T	1.95	4.00	1.00	5.00	0.16	10.00	7.80	70.00	130.00	1,560.00		-		-		-	1,560.00
2873	Remove Concrete Slab, thick ca. 0.25 & foundation		M3	12.50	0.80	1.00	3.00	0.33	10.00	10.00	70.00	130.00	2,000.00		-		-		-	2,000.00
2874	Containers for Equipment storage		EACH	1.00	40.00	2.00	5.00	0.40	10.00	40.00	70.00	130.00	8,000.00		-		-		-	8,000.00
2875	Electrical demolition		M2	50.00	0.10	1.00	5.00	0.10	10.00	5.00	70.00	130.00	1,000.00		-		-		-	1,000.00
																				16,985.00
2900	**Remove Steel Tank**	B9																		
2910	Remove steel tank		EACH	2.00	6.00	1.00	4.00	0.30	10.00	12.00	70.00	130.00	2,400.00		-		-		-	2,400.00
2920	Remove steel frame		T	0.50	8.00	1.00	5.00	0.08	10.00	4.00	70.00	130.00	800.00		-		-		-	800.00

Jeebropilly & New Oakleigh Coal Plant and Surface Facilities Decomissioning

Code	Description	Photo-Number	UoM	QTY	LABOUR									PLANT HIRE		MATERIAL		OTHER ALLOWANCE		TOTAL COST
					Unit Hrs	Number of Crews	Labour per crew	Duration (days)	Hours/day(h)	Total hours	Labour Rate	Distributables	Total Labour Cost	Unit Rate	Total Cost	Unit Rate	Total Cost	Unit Rate	Total Cost	
2930	Remove steel protection		T	0.80	10.00	1.00	5.00	0.16	10.00	8.00	70.00	130.00	1,600.00		-		-		-	1,600.00
																				4,800.00
2950	**Remove Underground fuel tank**																			
2951	Remove underground fuel tank and equipment		LOT	1.00	100.00	1.00	5.00	2.00	10.00	100.00	70.00	130.00	20,000.00		-		-		-	20,000.00
																				20,000.00
2960	**Allowance to Clean-Up Site (Undergrowth)**																			
			HRS	1,125.00	1.00	1.00	4.00	28.13	10.00	1,125.00	70.00	200.00	303,750.00							303,750.00
																				303,750.00
																Grand Total New Oakleigh				1,195,091.15
																Total Direct Cost				7,666,631.15
3000	**EPCM Cost (10%)**																			766,663.12
4000	**CONTINGENCY (25%)**																			2,108,323.57
																Grand Cost				10,541,617.83

Notice :

1. This Capital estimate assumes that workshop equipment and other saleable items will be stored in containers, to be sold or auctioned on site.

Jeeborpilly Coal Plant Demolish

1100 HV Vehicle Workshop

A1 –Heavy Vehicle Workshop

1120   LV Work shed L-Form

A2 – LV Work shed L-Form

1130-1140   LV Worksheet

A3- LV Worksheet

1150 Storage sheet behind LV Workshop

A4

1160 First Aid & Office Containers

A5

1170 Recreational Containers

A6

1180 Open Shed Old

A7

1190 Open Shed New

A8

1195 Admin Container

A9

1196 Car park Admin

A10

1200 Fuel Station & Tank Area

A11

1300 Wash Bay & Shed

A12

1410 Old Shed

A13

1420 New Shed

A14

1430 Old Sea Container

A15

1440 BIG Shed with office room on Level 1

A16

1500 Com Mast

A17

1600 RAW COAL AREA

A18

1700 CHPP AREA

A19

1910 Store Shed/1920 Workshop

A20

1930 Open Hall left side workshop

A21

1940 Office and Bathroom

A22

New Oakleigh - Coal Plant Building Demolish

2100 Remove Fuel Station and auxiliary building

B1

2200 Remove Workshop and auxiliary building

B2

B2

2300 Remove Wash Bay incl. Piping and sewage

B3

2400 Remove lay down hopper

B4

B4

2500 Demolish Storage yard Concrete

B5 – Pad Footing

B5 – Concrete Block NO.1

B5 – Concrete Block NO.2

B5 – Concrete Block NO.3

B5- Concrete Wall

B5 – Concrete Steel Pole

2600 Demolish two storage house on hill

B6

B6 – Brick Wall Storage Room

B6 - Timbale Cladding Room

B6 – Uncover Storage (exclude estimate cost)

2700 Demolition of Workshop

B7 – Workshop outside View

B7 – Workshop inside View

2800 Demolition of buildings on the hill behind railway

B8 - 1 Repair Room

B8 - 2 Workshop Room

B8-3 Timbale frame shed beside Repair Room

B8-4 Timbale frame house behind repair room

B8-5 Shed behind Repair Room

B8-6 Tyre change Room

B8 – 7 Shed On The Top of Hill Behind Repair Room

2900 Remove Steel Tank

B9 Steel Tank

2950 Underground Fuel Tank

No Picture

Appendix B Cost Estimate Contaminated Land Remediation

B.1 Jeebropilly Mine

B.2 New Oakleigh Mine

Table 1: Contaminated Land Knowledge Base Jeebropilly

DESCRIPTION OF FUNCTIONAL AREA				ASSESSMENT OF EXISTING KNOWLEDGE BASE				ASSESSMENT OF KNOWLEDGE BASE GAP	ASSUMED VOLUME OF CONTAMINATED LAND REQUIRING REMEDIATION					ASSUMED REMEDIATION METHOD INPUT 4					COST ESTIMATE	
Area ID	Recorded on NHC Contaminated Site Register	Recorded on EMR	Key Potential Contaminants	Knowledge Base (KB)	Suitability Rating of KB INPUT 1	Assumed Risk of Functional Area Resulting in Contamination to Underlying Soil/Groundwater INPUT 2	Basis for Risk Rating of Potential for Contamination	Resulting Risk Rating of Knowledge Base Gap from INPUT 1 & 2	Size of Functional Area (m^2) Refer to Sheet 2	Assumed % of Surface Area of Land in Functional Area which is Contaminated	Assumed Area of Contamination	Assumed Depth of Contamination	Assumed Volume of Contamination (m^3)	Assumed % of Material Suitable for Disposal to Mine Pit (or equivalent) @ \$7 per m^3	Assumed % of Suitable for Bio-Remediation and Reuse on Site @ \$15 per m^3	Assumed % of Requring Capping with Clean Fill @ \$20 per m^3	Assumed % Requiring Disposal to Monocell @ \$26 per m^3	Assumed % Requiring Disposal to Swanbank Landfill @ \$100 per m^3	Assumed Remediation Cost (Based on INPUT 3 INPUT 4, and Unit Rates in Table 2)	Preliminary Site Investigation Costs (Indicative Only)
1A. Wash Plant, Workshop, and ROM	Yes	No	Metals, Organics (PAHs, TPH, PCB)	No data on contaminated land	Low	Medium	Risk of contamination has assumed to be medium based on some pollution controls in place within Function Area (i.e. Hardstanding).	High	105,000	90%	94,500	0.5	47,300	95%			5%		$380,000	35,000
2A. Bulk Fuel Storage	Yes	Yes	Metals (Lead), Organics (TPH, BTEX, PAH)	No data on contaminated land	Low	High	Risk assumed to be high on basis of absence of pollution controls and visible spillage in and outside the bund (sealed bund)	High	900	100%	900	3	2,700		90%		10%		$50,000	13,000
2B. Heavy Vehicle Workshop & Washdown Bay	Yes	Yes	Metals, Organics (PAHs, TPH, SVOC, VOC)	No data on contaminated land	Low	Medium	Risk of contamination has assumed to be medium based on some pollution controls in place within Function Area (i.e. Hardstanding).	High	17,900	70%	12,530	0.5	6,300	50%	40%		5%	5%	$100,000	18,000
3. Warehouse & Laydown	No	No	Metals, Organics (PAHs, TPH, SVOC, VOC)	No data on contaminated land	Medium	Medium	Risk of contamination has assumed to be medium based on some pollution controls in place within Function Area (i.e. Hardstanding).	Medium	7,700	60%	4,620	0.5	2,400	60%	30%		5%	5%	$40,000	6,000
4. Explosive Store	Yes	Yes	Organics (TPH/BTEX), Ammonia	No data on contaminated land	Medium	Medium	Risk of contamination has assumed to be medium based on some pollution controls in place within Function Area (i.e. Bunded tank).	Medium	2,900	50%	1,450	0.5	800		95%		5%		$20,000	4,000
5. Explosive Magazine	Yes	Yes	-	No data on contaminated land	Medium	Low	Risk of contamination in this area considered low. A small allowance however has been made for contaminated land.	Low	12,500	10%	1,250	0.5	700	95%			5%		$10,000	4,000
6. Landfarm	Yes	No	Metals, Organics (PAHs, TPH, SVOC, VOC)	No data on contaminated land	Low	High	This area was not reviewed, however the risk of contamination has been assumed to be high based on purpose of funcational area.	High	6,800	100%	6,800	2	13,600	20%	60%		15%	5%	$270,000	16,000
7. Contractors Depot	No	No	Metals, Organics (PAHs, TPH, SVOC, VOC)	No data on contaminated land	Low	Medium	Risk of contamination has assumed to be medium based on some pollution controls in place within Function Area (i.e. Bunded tank).	High	6,000	50%	3,000	0.5	1,500	60%	30%		5%	5%	$30,000	6,000
Total																			$1,200,000	$102,000

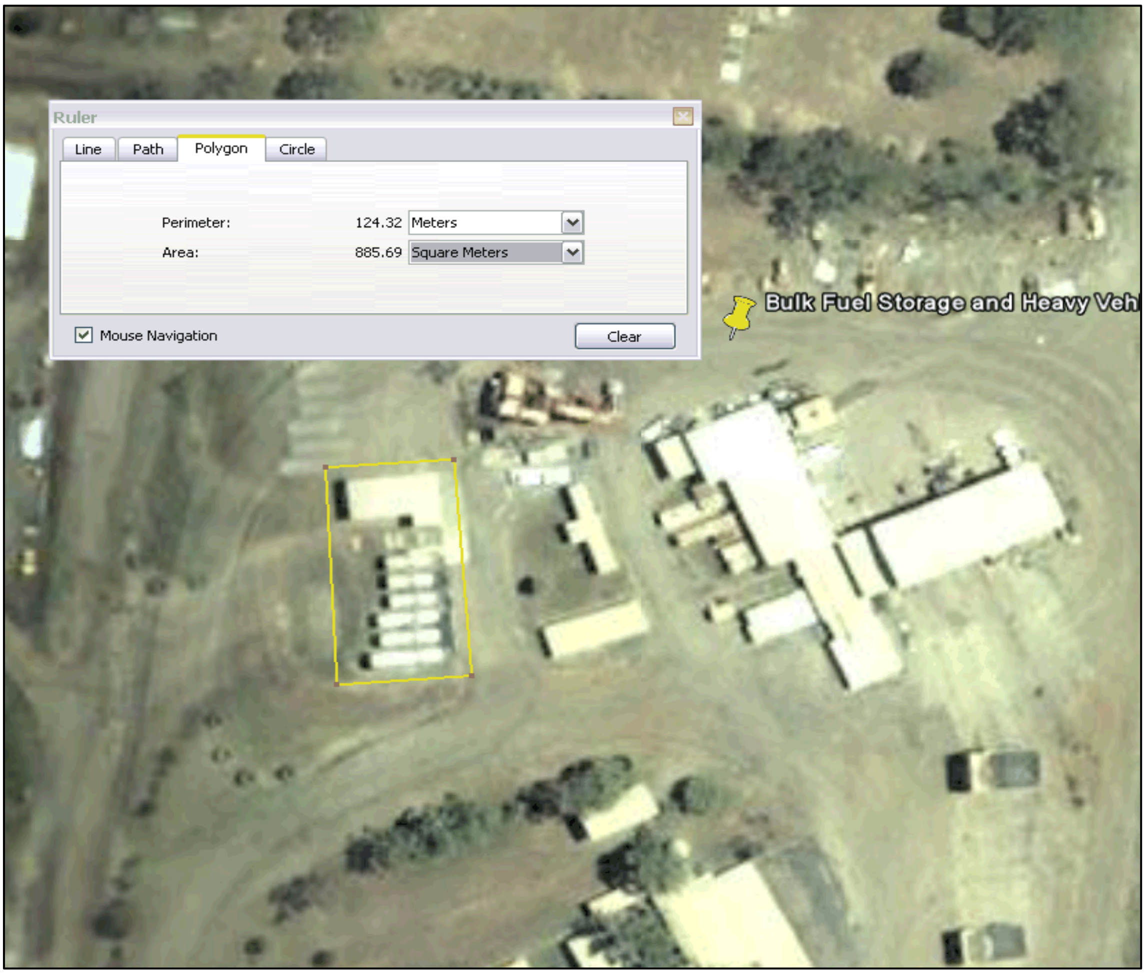
TABLE 2: ASSUMED UNIT RATES

Remediation Method	Assumed Cost (\$ per m^3)
Disposal to Mine Pit (or equivalent)	7
Bio-Remediation and Reuse elsewhere on-site	15
Capping with Clean Fill	20
Disposal to On-site Monocell	26
Disposal to Swanbank Landfill (highly contaminated to Monocell)	100

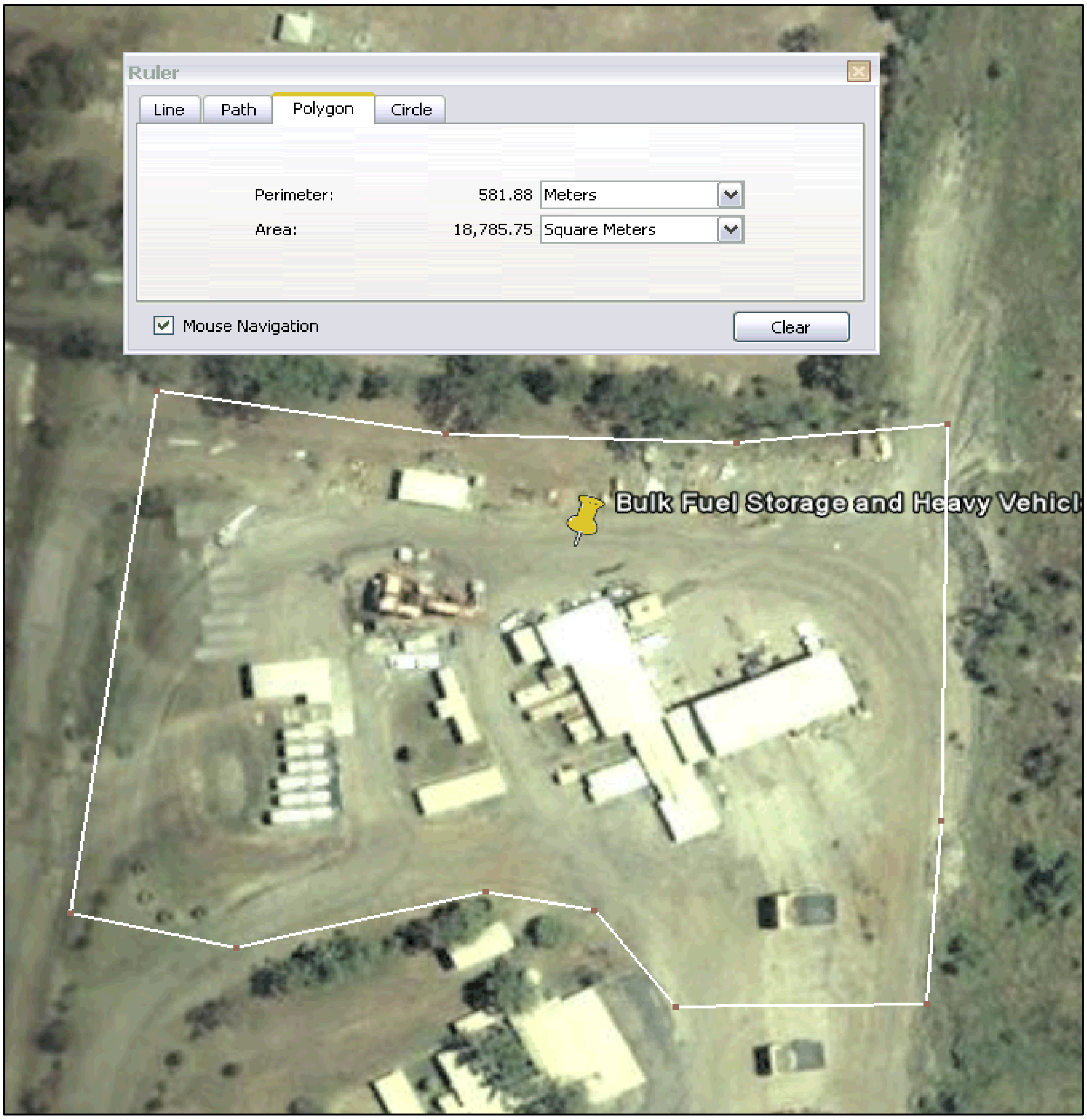
Important Note: There is currently no quantifiable contaminated land data for the sites which can be used to prepare remediation estimates, the use of the estimate provided should be limited accordingly. SKM accepts no liability for the use of the estimate provided. The cost of remediation may vary considerably from the estimate shown. Remediation may also be required in other areas within the Mining Lease which have not been considered in this study (e.g. mined areas, waste dumps, tailings dams, etc.).

Area 1 - Washplant, Workshop, and ROM

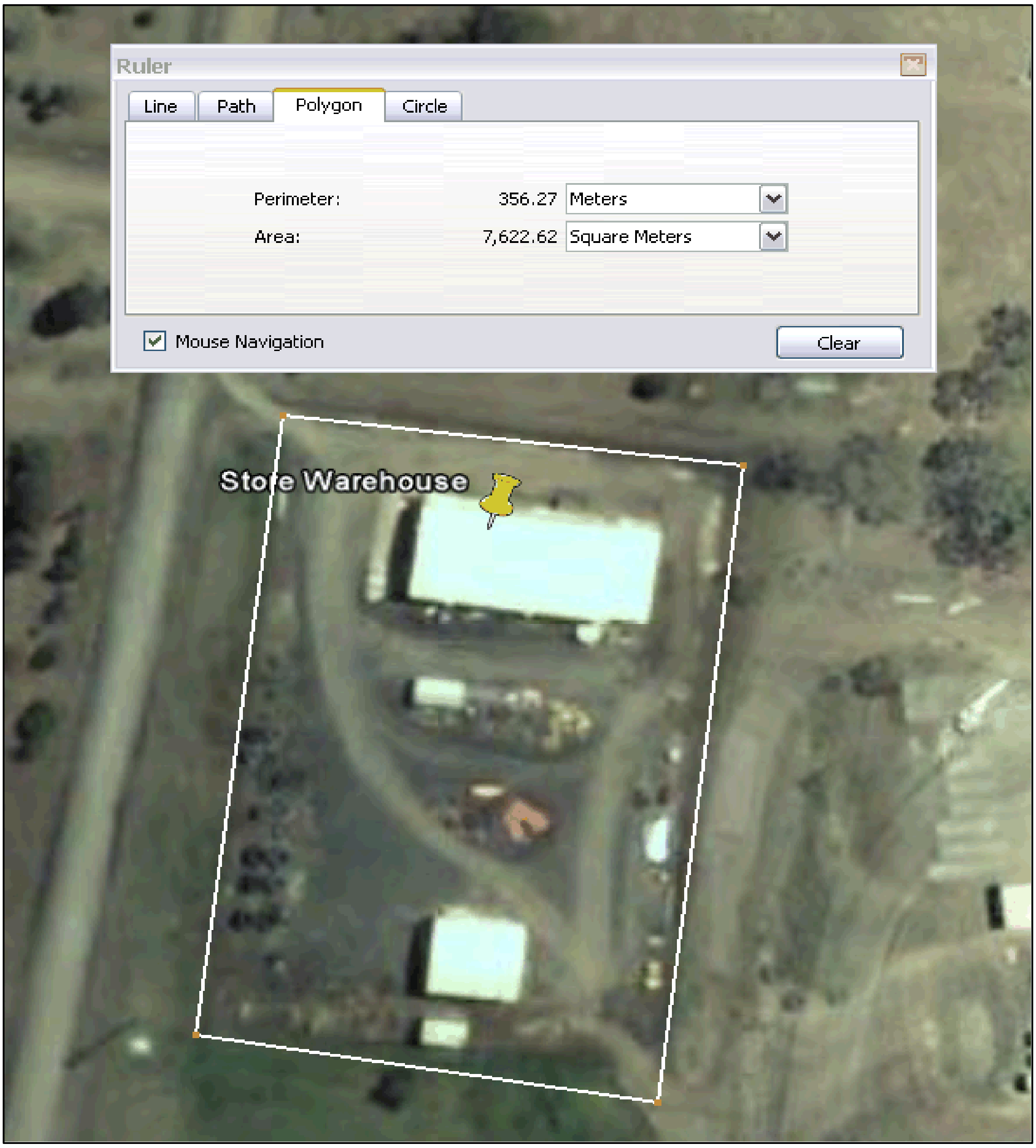
Area 2A - Bulk Fuel Storage



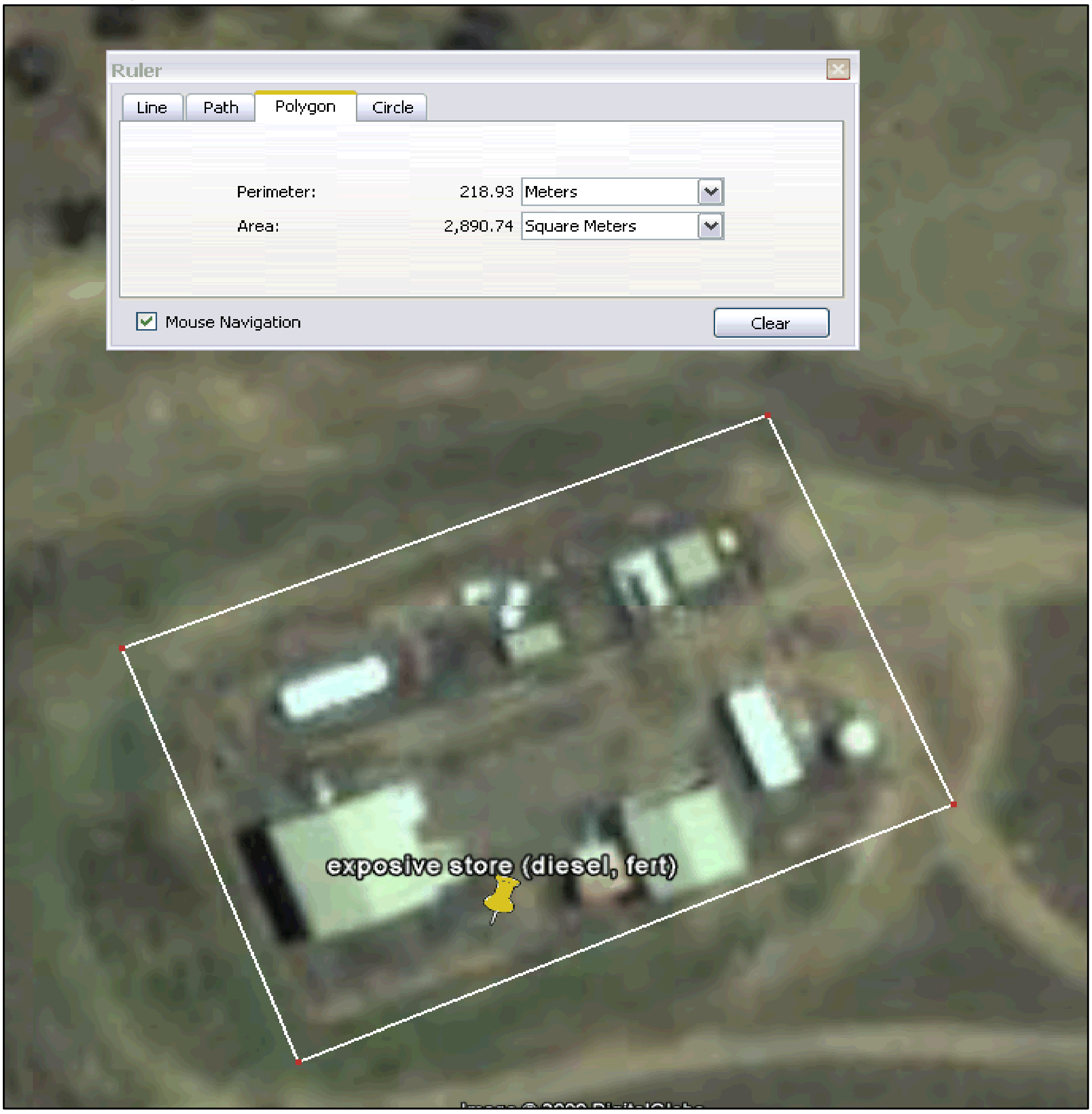
Area 2B - Heavy Vehicle Workshop & Washdown Bay



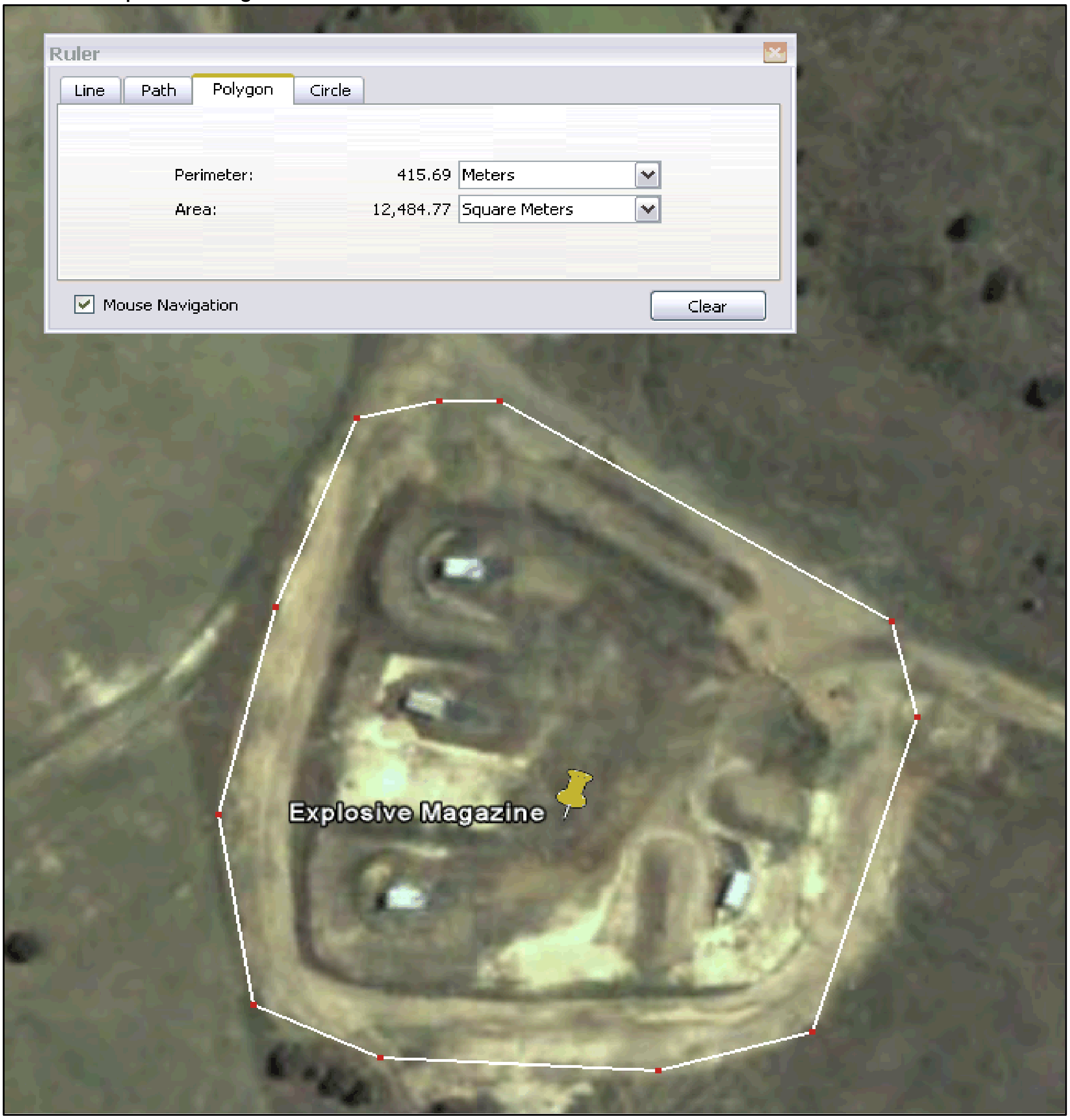
Area 3 - Warehouse & Laydown Area



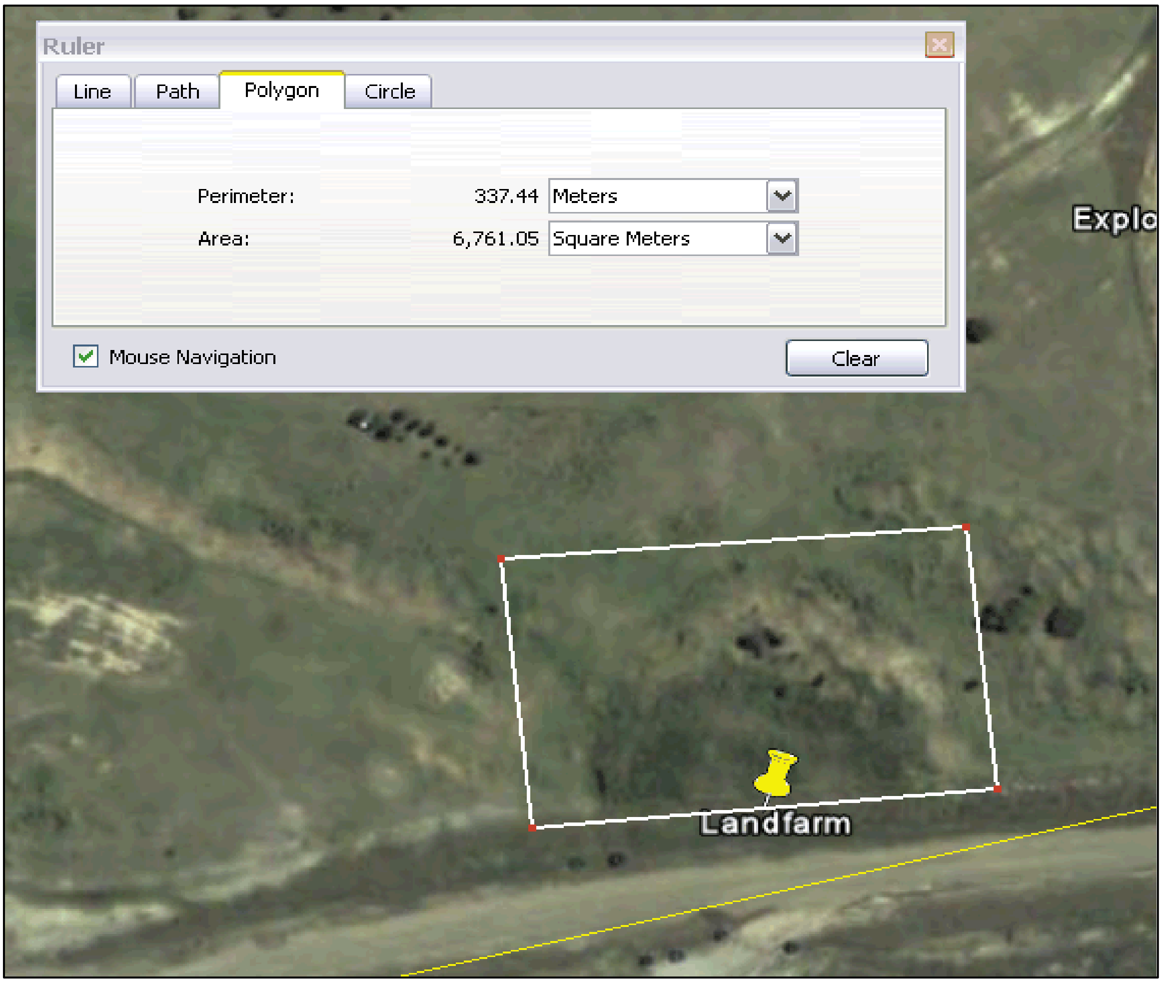
Area 4 - Explosive Store



Area 5 - Explosive Magazine



Area 6 - Landfarm



Area 7 - Contractors Depot

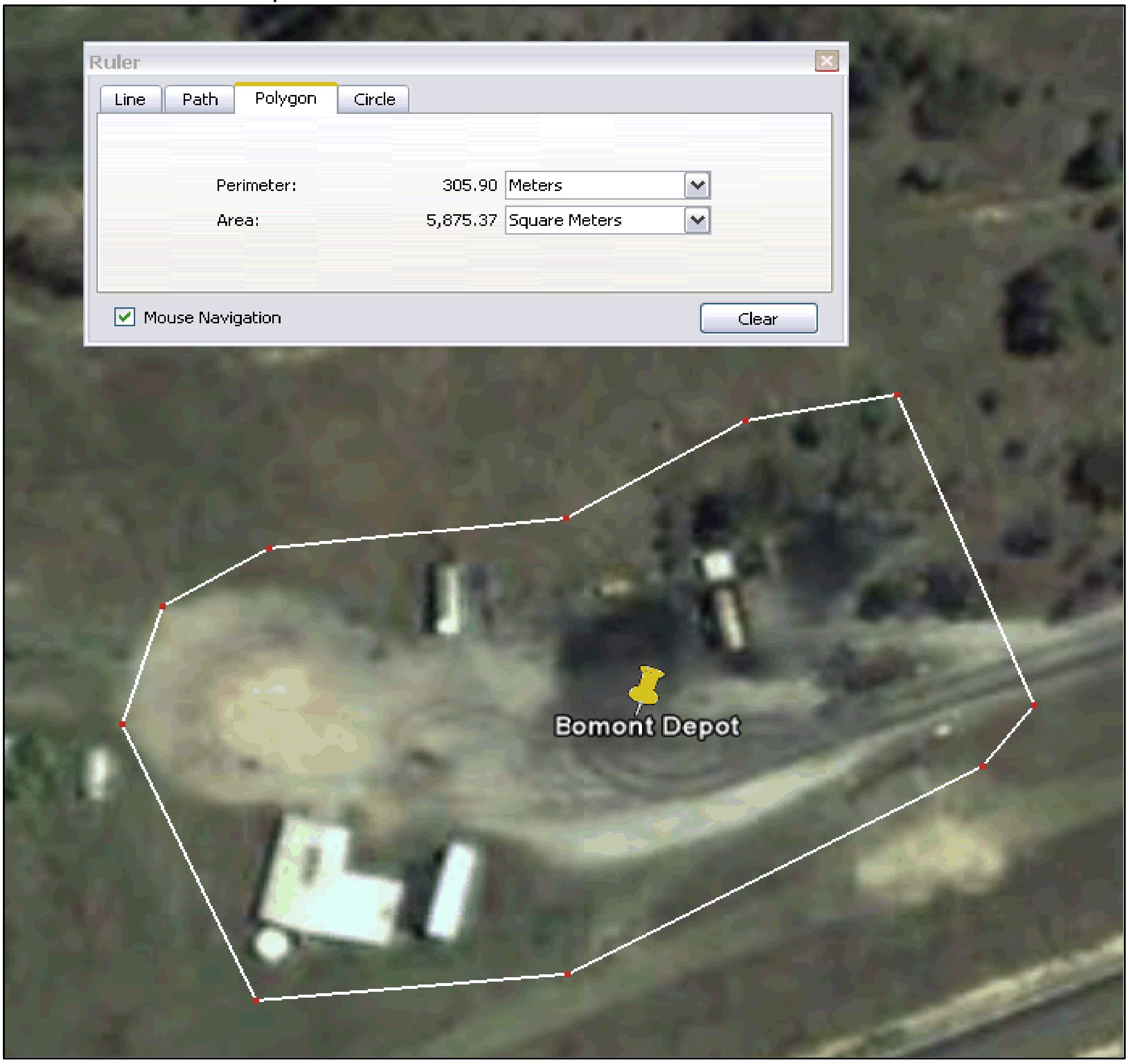


TABLE 1: CONTAMINATED LAND KNOWLEDGE BASE NEW OAKLEIGH

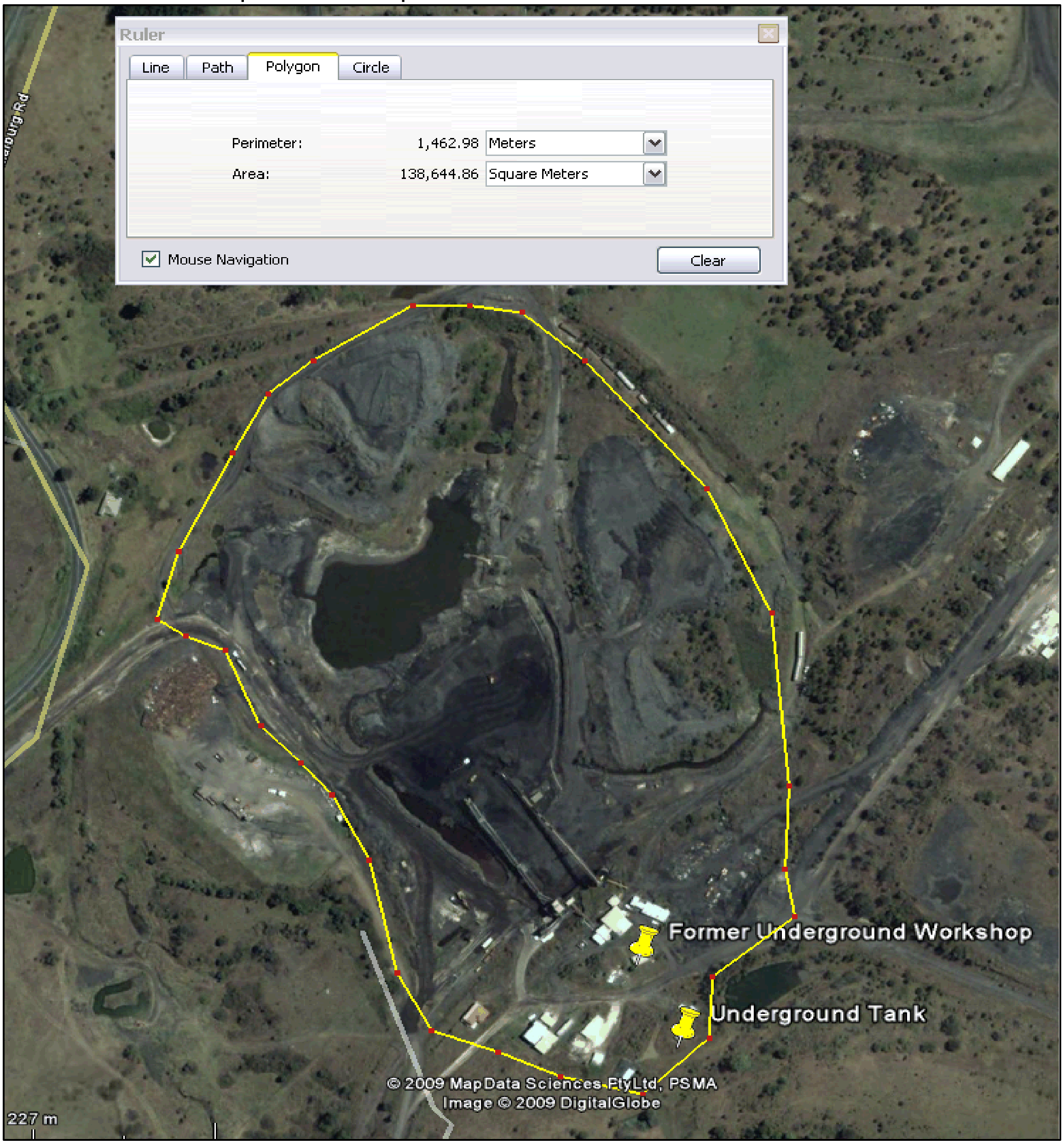
DESCRIPTION OF FUNCTIONAL AREA				ASSESSMENT OF EXISTING KNOWLEDGE BASE				ASSESSMENT OF KNOWLEDGE BASE GAP	ASSUMED VOLUME OF CONTAMINATED LAND REQUIRING REMEDIATION					ASSUMED REMEDIATION METHOD INPUT 4					COST ESTIMATE	
Area ID	Recorded on NHC Contaminated Site Register	Recorded on EMR	Key Potential Contaminants	Knowledge Base (KB)	Suitability Rating of KB INPUT 1	Assumed Risk of Functional Area Resulting in Contamination to Underlying Soil/Groundwater INPUT 2	Basis for Risk Rating of Potential for Contamination	Resulting Risk Rating of Knowledge Base Gap from INPUT 1 & 2	Size of Functional Area (m^2) Refer to Sheet 2	Assumed % of Surface Area of Land in Functional Area which is Contaminated	Assumed Area of Contamination	Assumed Depth of Contamination	Assumed Volume of Contamination (m^3) INPUT 3	Assumed % of Material Suitable for Disposal to Mine Pit (or equivalent) @ \$7 per m^3	Assumed % of Suitable for Bio-Remediation and Reuse on Site @ \$15 per m^3	Assumed % of Requring Capping with Clean Fill @ \$20 per m^3	Assumed % Requiring Disposal to Monocell @ \$26 per m^3	Assumed % Requiring Disposal to Swanbank Landfill @ \$100 per m^3	Assumed Remediation Cost (Based on INPUT 3 INPUT 4, and Unit Rates in Table 2)	Preliminary Site Investigation Costs (Indicative Only)
1A. Former Wash Plant, Workshop, and ROM	Yes	No	Metals, Organics (PAHs, TPH, PCB), Asbestos	No data on contaminated land	Low	High	Risk of contamination has assumed to be high based on absence of apparent pollution controls (e.g. Hardstanding) and site specific data.	High	140,000	80%	112,000	0.5	56,000	95%				5%	$660,000	$41,000
1B. Underground Tank	Yes	Yes	Metals (Lead), Organics (TPH/BTEX)	No data on contaminated land	Low	High	Risk of contamination has assumed to be high based on experience. It is typical for an underground fuel tanks/lines to leak.	High	1,600	100%	1,600	3	4,800		100%				$80,000	$9,000
2. Former Workshop and Laydown Area	Yes	No	Metals, Organics (PAHs, TPH, SVOC, VOC)	No data on contaminated land	Low	High	Risk of contamination has assumed to be high based on absence of apparent pollution controls (e.g. Hardstanding) and site specific data.	High	21,700	70%	15,190	0.5	7,600	60%	35%			5%	$110,000	$21,000
3. Former Workshop, Laydown Area, Oil Tanks	Yes	No	Metals, Organics (PAHs, TPH, SVOC, VOC)	No data on contaminated land	Low	High	Risk of contamination has assumed to be high based on absence of apparent pollution controls (e.g. Hardstanding) and site specific data.	High	9,000	70%	6,300	0.5	3,200	60%	35%			5%	$50,000	$9,000
4A. Workshop, Laydown Area, Washdown, Oil Tanks	Yes	No	Metals, Organics (PAHs, TPH, SVOC, VOC)	No data on contaminated land	Low	Medium	Risk of contamination has assumed to be medium based on some pollution controls in place within Function Area (i.e. Hardstanding and bunding).	High	14,600	60%	8,760	0.5	4,400	60%	35%			5%	$70,000	$12,000
4B. Tank Farm	Yes	Yes	Metals (Lead), Organics (TPH, BTEX, PAH)	No data on contaminated land	Low	Medium	Risk of contamination has assumed to be medium based on some pollution controls based on bunding in place. Evidence of hydrocarbon spillage to adjacent ground was noted during the site inspection.	High	400	50%	200	2	400		95%			5%	$10,000	$11,000
5. Landfarm (note area not confirmed)	Yes	No	Metals, Organics (PAHs, TPH, SVOC, VOC)	No data on contaminated land	Low	High	This area was not reviewed, however the risk of contamination has been assumed to be high based on purpose of funcational area.	High	2,500	100%	2,500	2	5,000	60%	35%			5%	$80,000	$13,000
Total																			$1,400,000	$116,000

TABLE 2: ASSUMED UNIT RATES

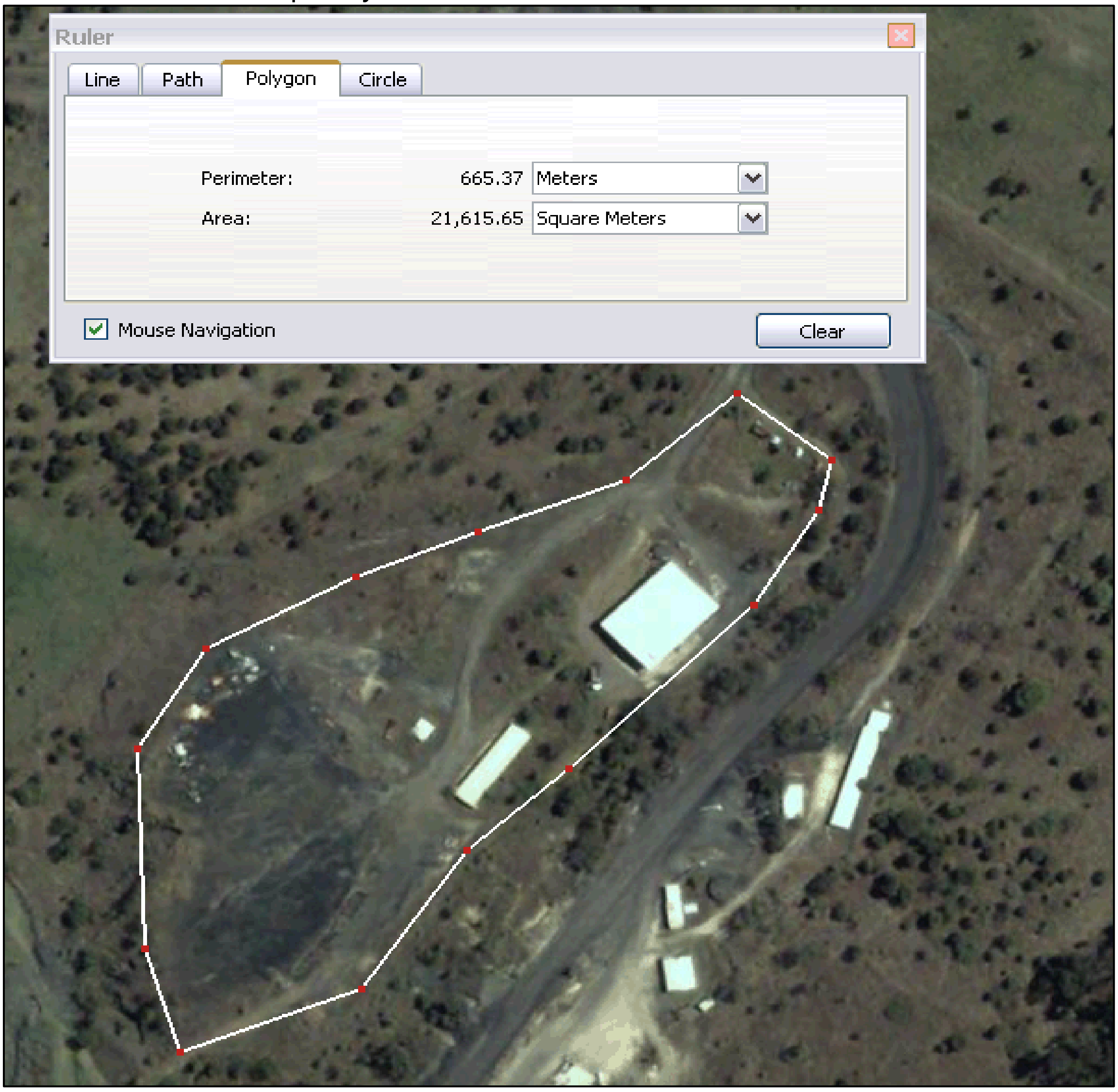
Remediation Method	Assumed Cost (\$ per m^3)
Disposal to Mine Pit (or equivalent)	7
Bio-Remediation and Reuse elsewhere on-site	15
Capping with Clean Fill	20
Disposal to On-site Monocell	26
Disposal to Swanbank Landfill (highly contaminated to Monocell)	100

Important Note: There is currently no quantifiable contaminated land data for the sites which can be used to prepare remediation estimates, the use of the estimate provided should be limited accordingly. SKM accepts no liability for the use of the estimate provided. The cost of remediation may vary considerably from the estimate shown. Remediation may also be required in other areas within the Mining Lease which have not been considered in this study (e.g. mined areas, waste dumps, tailings dams, etc.).

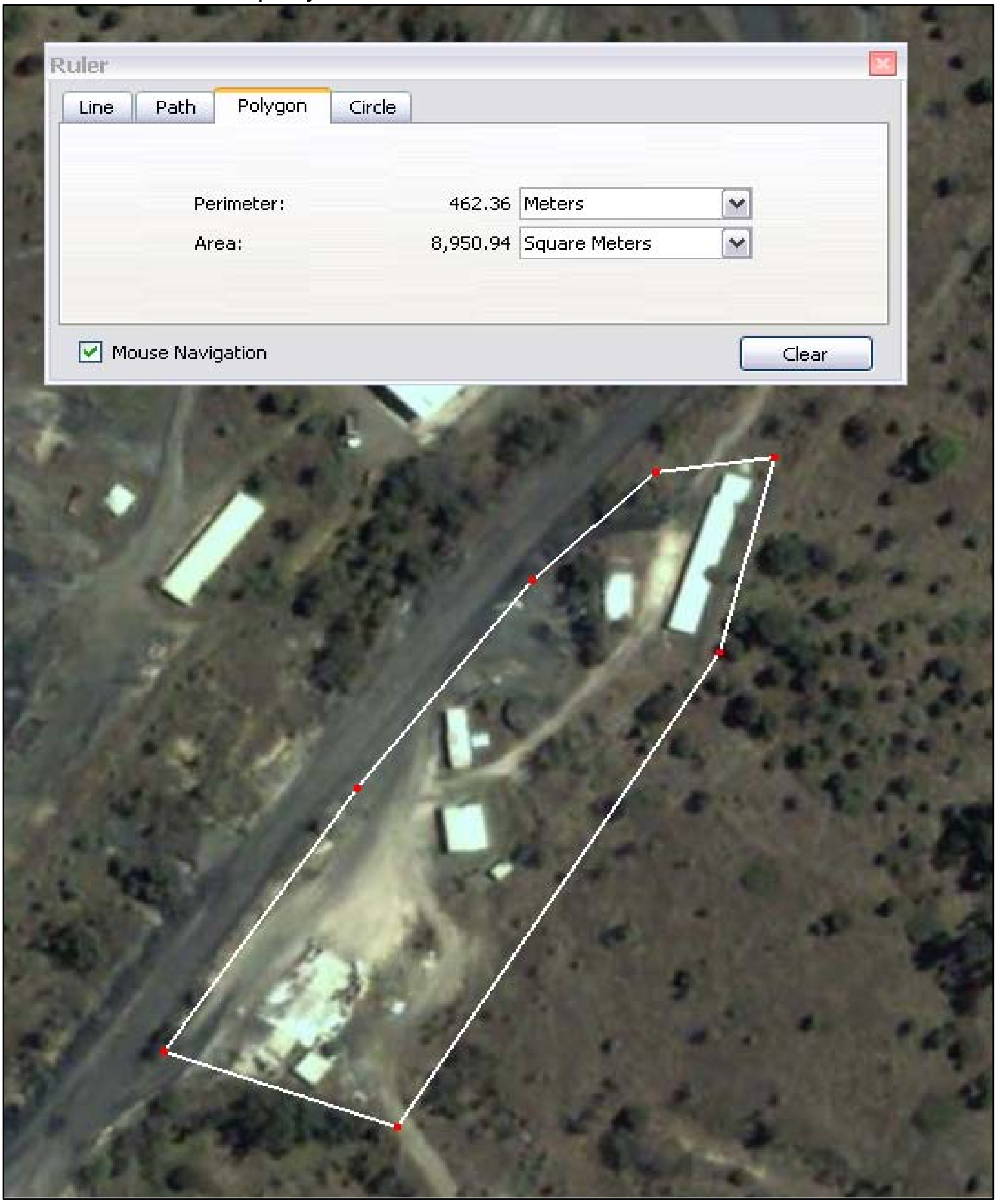
Area 1 - Former Washplant, Workshop, and ROM



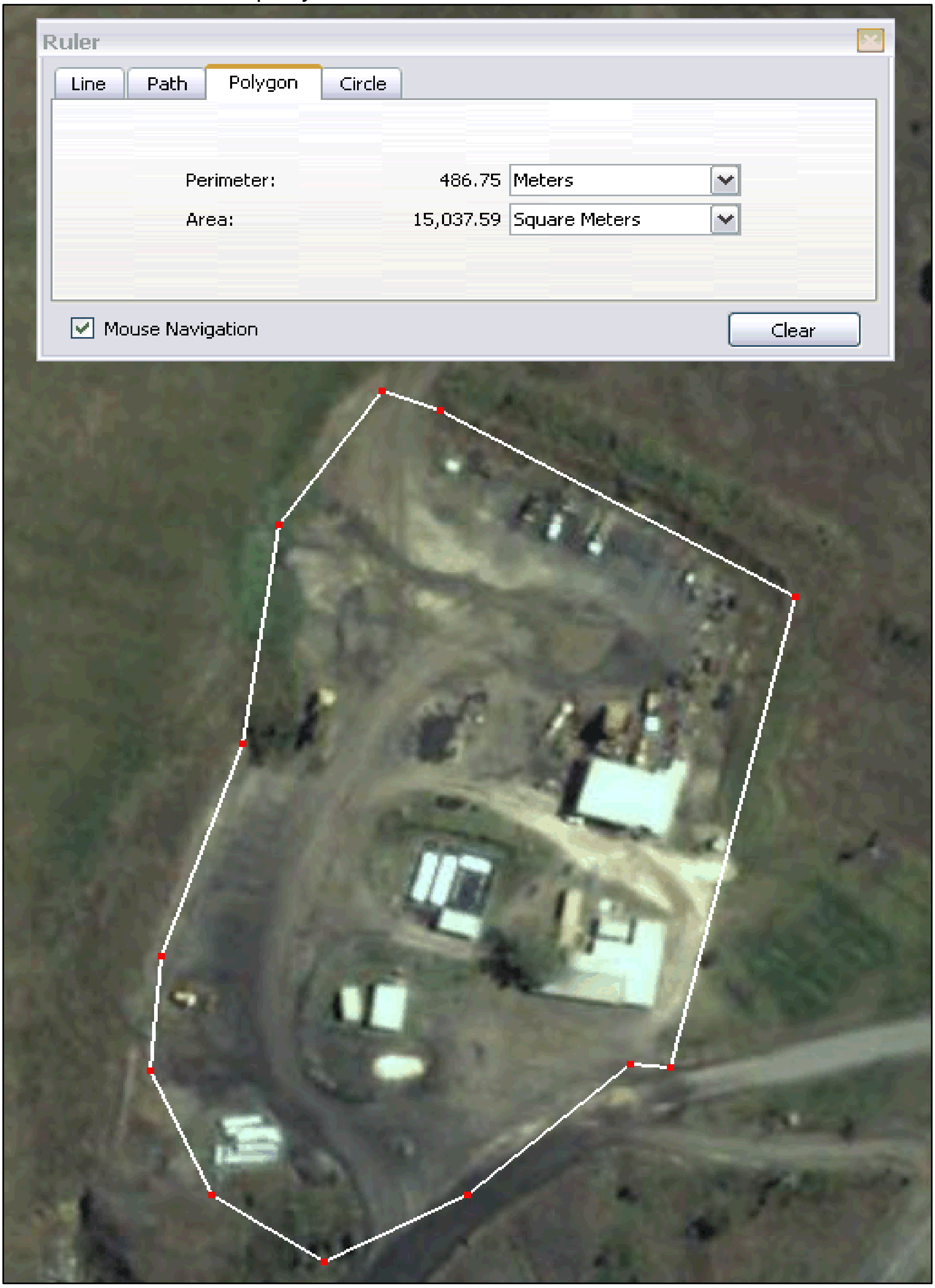
Area 2 - Former Workshop & Laydown Area



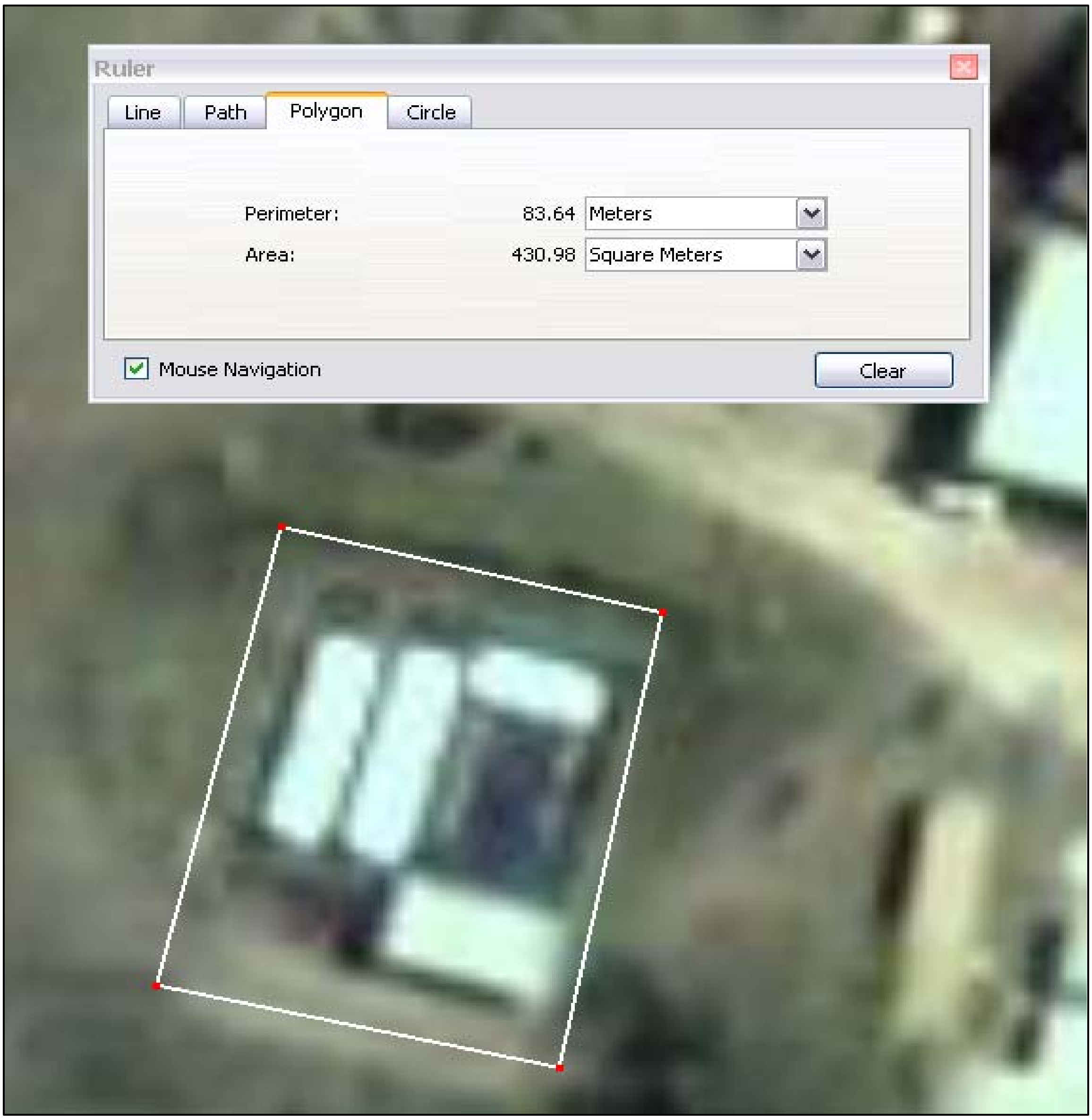
Area 3 - Former Workshop, Laydown Area, Oil/Fuel Tanks



Area 4A - Former Workshop, Laydown Area, Oil/Fuel Tanks



Area 4B - Tank Farm



GHD

201 Charlotte Street Brisbane QLD 4000
GPO Box 668 Brisbane QLD 4001
T: (07) 3316 3000 F: (07) 3316 3333 E: bnemail@ghd.com.au

Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
A	R Watson	D Morris		D Morris		13/2/12
0	R Watson	K Woods		K Woods		13/06/12

GHD

180 Lonsdale Street
Melbourne, Victoria 3000
T: (03) 8687 8000 F: (03) 8687 8111 E: melmail@ghd.com.au

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Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
A	T Cauchi	TR Anderson		D Morris		13/2/12
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