



Douglas Partners

Geotechnics • Environment • Groundwater

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**PRELIMINARY CONTAMINATION AND
GEOTECHNICAL ASSESSMENT**

**PROPOSED RESIDENTIAL SUBDIVISION
MINMI AND LINK ROAD**

**Prepared for
COAL & ALLIED INDUSTRIES LTD**

**Project 39663.06
FEBRUARY 2011**



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ATTACHMENTS

APPENDIX A

Notes Relating to this Report
Borehole Logs – Bores 23B , 57, 91, 94, 97 and 98
Test Pit Logs – Pits 1 to 158

APPENDIX B

Laboratory Report Sheets

APPENDIX C

QA / QC

APPENDIX D

Drawing 1 – Minmi North and East Test Location Plan
Drawing 2 – Minmi West Test Location Plan
Drawing 3 – Minmi South Test Location Plan
Drawing 4 – Link Road North and South Test Location Plan

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15 February 2011

**PRELIMINARY CONTAMINATION AND
GEOTECHNICAL ASSESSMENT
PROPOSED RESIDENTIAL SUBDIVISION
MINMI AND LINK ROAD**

1. INTRODUCTION

This report presents the results of a preliminary contamination and geotechnical assessment for a proposed residential subdivision at Minmi and Link Road. The assessment was carried out at the request of Coal & Allied Industries Ltd (Coal & Allied), in consultation with Catylis Pty Ltd.

The assessment comprised the following components:

- Desktop review of regional geology, hydrogeology, and acid sulphate soils;
- Review of previous mining operations beneath the subject site;
- History review including a review of aerial photos since 1955 and interviews with local residents;
- Site walkover survey to describe the current site condition and surface features;
- Subsurface investigation by test pit and drilling;
- Soil sampling and chemical testing;
- Comments on actual and anticipated development constraints and opportunities including the following:
 - Potential contamination;
 - Depth, extent and nature of filling, including the presence of potentially combustible material;

- Depth of groundwater;
- Presence of soft alluvial soils and acid sulphate soils;
- Likely founding conditions;
- Presence of aggressive soil conditions with respect to buried structures;
- Presence of shallow rock;
- General recommendations for further investigation.

The contamination assessment was being carried out in general accordance with the NSW EPA “Guidelines for Consultants Reporting on Contaminated Sites” (Ref 1) and SEPP 55 “Remediation of Land” (Ref 2).

A mine subsidence investigation of the site was conducted in conjunction with this report (DP Project No 39663.06, Ref 3).

2. PROPOSED DEVELOPMENT

It is proposed that the entire Coal & Allied owned Minmi / Link Road and Stockrington sites be rezoned / listed as a ‘State Significant Site’ in Schedule 3 of the State Environmental Planning Policy (SEPP) (Major Development). A draft Schedule 3 listing will be prepared with the Concept Plan Application.

The Concept Plan for a residential subdivision and conservation land transfer of the Minmi / Link Road site will apply to the entire 537 ha Minmi / Link Road and 1,544 ha Stockrington site. The key parameters for the proposed development of the site are as follows:

- Dedication of 1,561 ha of conservation land to the New South Wales Government (NSWG) that is identified in the Lower Hunter Regional Strategy and Lower Hunter Regional Conservation Plan, comprising 1,544 ha of the Stockrington site and approximately 17 ha of the Minmi / Link Road site;
- Maximum dwelling yield of 3,300 dwellings over 520 ha;

- Indicative development staging. The number of lots and extent of staging for release areas will be largely dictated by the service infrastructure requirements as well as responding to market forces;
- The provision of associated infrastructure;
- Torrens title subdivision of the Minmi / Link Road site. The Torrens title subdivision of Coal & Allied land will enable the following:
 - To dissect land on either side of the F3 Freeway and to separate the development lot from the conservation land;
 - To enable the transfer of approximately 17 ha of land at Minmi / Link Road to the North of the Minmi Rural Fire shed to NSWG for conservation purposes.

Approval will not be sought under the Concept Plan for a specific lot or road layout. An indicative lot layout will indicate how the maximum dwelling yield of 3,300 dwellings could be achieved on the site.

Similarly, approval will not be sought under the Concept Plan for subdivision or construction of individual houses. However, the desired future character of the proposed concept plan will be included in Urban Design Guidelines. Urban Design Guidelines will be prepared to inform the Concept Plan in respect of urban form, built form, open space and landscape, access and movement and visual impact for the site.

It is proposed to dedicate land for conservation purposes as part of the Major Project Application via a Voluntary Planning Agreement between Coal & Allied and the NSWG in accordance with S.93F of the Environmental Planning & Assessment Act, 1979.

The proposed Concept Plan and a Plan showing the proposed development areas and conservation areas is included in the Preliminary Environmental Assessment prepared by Urbis.

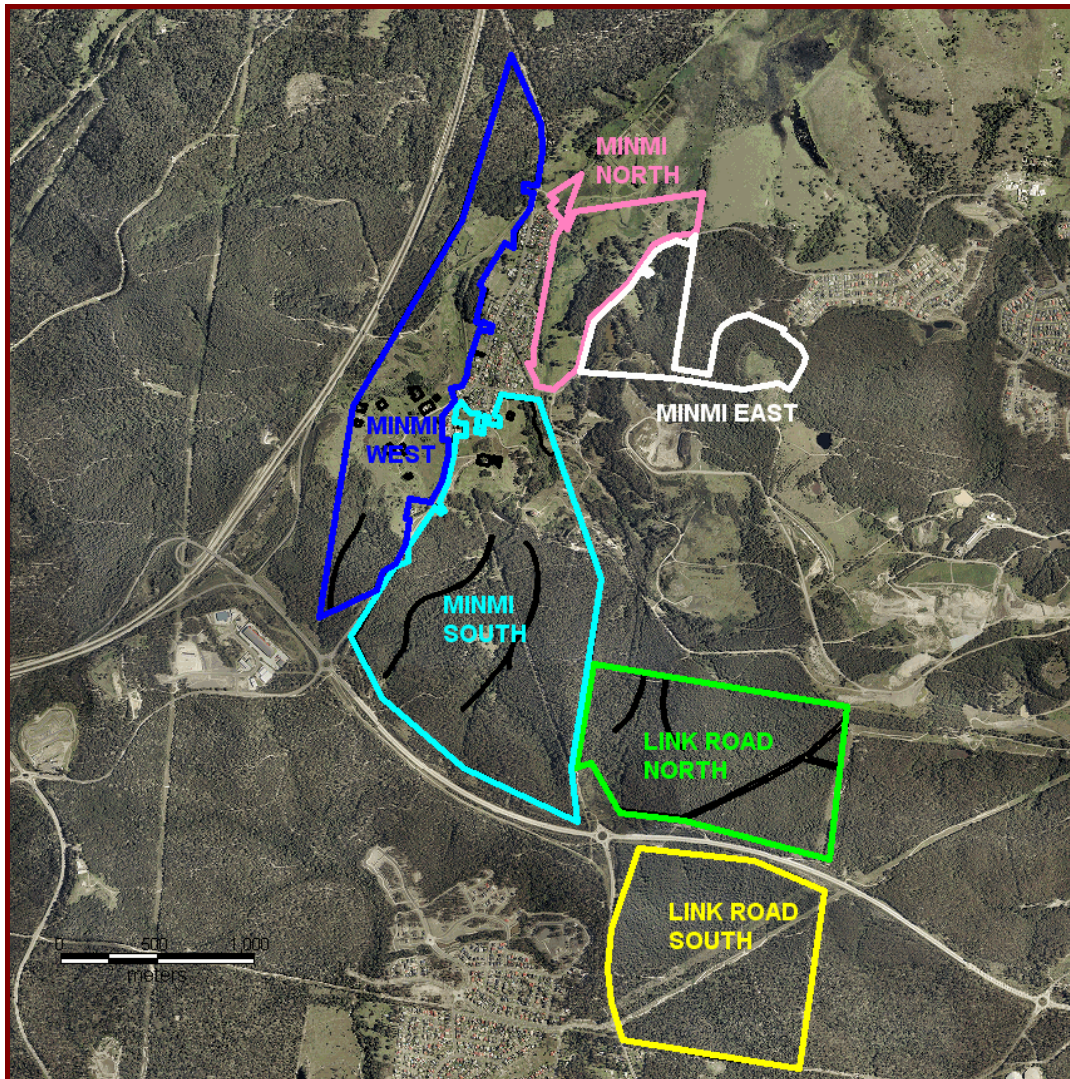
3. SITE IDENTIFICATION

The Minmi/Link Road development site is identified as Lot 71 DP 1065169, Lot 351 DP 1108608 (formerly Lot 35 DP 800036) and Lot 6 DP 1044574, within the Newcastle City Council (NCC) area Lot 6 DP 1044574, Lots 2 and 3 DP 877349 within the Lake Macquarie City Council (LMCC) area.

Within the NCC area the land is zoned 2(a) Residential in the immediate vicinity of Minmi and south of Fletcher, 7(b) Environmental Protection Zone, and 7(c) Environmental Investigation Zone. Within the LMCC area the land is zoned 7(2) Conservation (Secondary) and the south – west corner zoned 10 Urban Conservation, with a small area between the two, zoned 5 Infrastructure.

For purposes of this assessment, the site has been divided into six areas. The extent of each of the potential development areas is shown on Figure 1 below. Each area is described as follows:

- **Minmi West:** This area is between Woodford Street, which bisects the Minmi village in a north-south direction, and the F3 freeway to the west. The area has an irregular shape with an overall area of about 100 hectares;
- **Minmi North:** This area is to the east of the Minmi township and to the north/west of Minmi Road. The area is generally low lying and has an area of about 40 ha;
- **Minmi East:** This area is to the east of Minmi Road and north of the Summerhill Waste Disposal Centre. The area has an irregular shape with two sub areas, one to the west and one to the east. The overall surface area is about 40 ha;
- **Minmi South:** This area is between the Minmi Township and the Newcastle Link Road to the South, it has an area of about 150 ha;
- **Link Road South:** This is an approximately square area to the south of the Newcastle Link Road and East of Minmi Road with an area of about 100 ha;
- **Link Road North:** This area is also approximately square and immediately north of the Link Road. It has an area of about 100 ha.



Locality Plan

Adjacent land use comprised the following:

- Low lying farm land and sewage treatment works north and downslope of Minmi North Area;
- Township of Minmi between Minmi North and West areas, generally upslope;
- Bushland and F3 freeway to west of Minmi West area, generally upslope of site;
- Bushland and Newcastle Link Road to the south of Minmi South area;
- Bushland and Link Road to the south of Link Road North area;
- Bushland to east of Link Road North and South areas;

- Bushland and residential development west and south of Link Road South, generally downslope of the site;
- Summerhill Waste Facility between Minmi East and Link Road North and east of Minmi South areas;
- Minmi Cemetery immediately east of Minmi South area.

4. DESKTOP REVIEW

4.1 Regional Geology and Hydrogeology

The 1:100,000 scale Newcastle Coalfield Regional Geology map indicates the site is generally underlain, from north to south, by the Tomago Coal Measures (siltstone, sandstone, claystone, coal, tuff), the Newcastle Coal Measures Waratah Sandstone, and the Newcastle Coal Measures Lambton Subgroup (sandstone, siltstone, claystone, coal and tuff). The mapping does not indicate the presence of alluvial sediments, however as discussed below, alluvial soils are expected on the northern portions of Minmi West and Minmi North, as mapped on Drawing 4 attached.

Reference to the CALM soil landscape map for Gosford-Lake Macquarie indicates the soils at the site fall into three typical landscapes as follows:

Killingworth: The majority of the site soils including most of the Link Road sites, Minmi South and the southern portions of Minmi West are mapped as the Killingworth Landscape and typical limitations include the following:

- High erosion hazard;
- Mine subsidence;
- Localised foundation hazard;
- Shallow soils;
- Sodic / dispersive soils;
- Strongly acidic.

Bobs Farm: Alluvial soils on the northern parts of Minmi North and Minmi West are mapped as the Bobs Farm Landscape and typical limitations include the following:

- Permanently high water table;
- Seasonal waterlogging;
- Foundation hazard;
- Acid sulphate potential.

Beresfield: The eastern portions of Minmi North as well as undisturbed parts of Minmi East are mapped as the Beresfield Landscape and typical limitations include the following:

- Water erosion hazard;
- Localised foundation hazard;
- Strongly acidic.

Disturbed: The landscape associated with the open cut pits, mostly in Minmi West and Minmi East areas are mapped as disturbed landscapes. Possible limitations include the following:

- Mass movement hazards;
- Foundation hazard;
- Unconsolidated low wet bearing strength;
- Poor drainage;
- Erosion hazard;
- Toxic materials.

Reference to the Beresfield and Wallsend Acid Sulphate Soil Risk Maps prepared by the Department of Land & Water Conservation indicates that there is an area of acid sulphate soil (ASS) at the northern end of the Minmi North and Minmi West areas. The acid sulphate soils are within alluvial soils and mapped as being within 1 m and between 1 m and 3 m below the ground surface. This is consistent with the presence of iron staining in shallow surface water on the northern parts of the site. The ASS Risk Map indicates that there is no known occurrence of acid sulphate soil materials across the remainder of the site.

The regional groundwater flow regime is expected to be controlled by the presence of coal workings and flow is likely to be to the south away from the Hexham Swamp Nature Reserve, which is approximately 0.5 km from the site, and is considered to be the nearest sensitive receptor. It should be noted that groundwater levels are affected by factors such as climatic conditions and soil permeability and will therefore vary with time.

The nearest registered groundwater wells are located in the vicinity of Summerhill Landfill, to the east of the site. The wells are registered for monitoring purposes, and are described below:

- GW079055: Water bearing zone from 4.4 to 15m depth;
- GW079056: Water bearing zone from 4.4 to 15m depth;
- GW079057: Water bearing zone from 12.6 to 14.65m and 35 to 50 m;
- GW079058: Water bearing zone from 12.6 to 14.65m;
- GW078201: Water bearing zone from 28 to 31m;
- GW079065, 079066, 079061, 079063, 078161: No bore details published.

It should be noted that the above wells are probably up gradient or cross gradient of the site.

5. SITE HISTORY

5.1 Overview

The brief review of site history comprised the following:

- Review of historical records regarding mining at the site including mine record traces, newspaper articles and historical reference books;
- Interview with local residents and former mine employee, Mr Ron Perry;
- Review of historical aerial photos;
- Searches with NSW EPA.

The site is underlain by coal mine workings in two seams, the Young Wallsend and the Borehole seams.

5.2 History of Mining

5.2.1 Underground Mining

A, B and C Pits – RT 497

Mining in Minmi commenced with the A, B and C pits starting about 1853. The workings were in the Borehole Seam and comprised bord and pillar workings. The locations of shafts for Pits A, B and C are shown on Drawing 1.

A report by Smith & Moore to the provisional directors of the Melbourne and Newcastle Minmi Coal Company, dated 1862, indicated the following:

- Coal measures exceedingly regular;
- Seam was discovered by outcrops;
- The seam dips southward and eastward at 2°;
- The thickness of the seam averages 8'10" (2.7 m) of which 2' (0.6 m) is left in the roof and 1 foot (0.3 m) in the floor leaving a net thickness mined of 5'6" (1.7 m);
- Coal worked on the pillar and stall system;
- Trucks drawn by horses;
- C Shaft is 92' (28.0 m) deep and 14' (14.3 m) diameter lined with sandstone for the upper 20' (6.1 m);
- B Pit is 56' (17.1 m) deep, 10'7" (3.2 m) diameter and lined with timber;

- An air upcast shaft with fire at its base provided ventilation;
- A water shaft was sunk 39 chains (785 m) from C pit;
- Steam driven winding engines.

The pit infrastructure was mostly on the southern half of the Minmi West area, and included a rail line and Coke Ovens, which appear to have been to the west of Pit B as indicated by the following sketches presented in Figures 1 and 2 below.

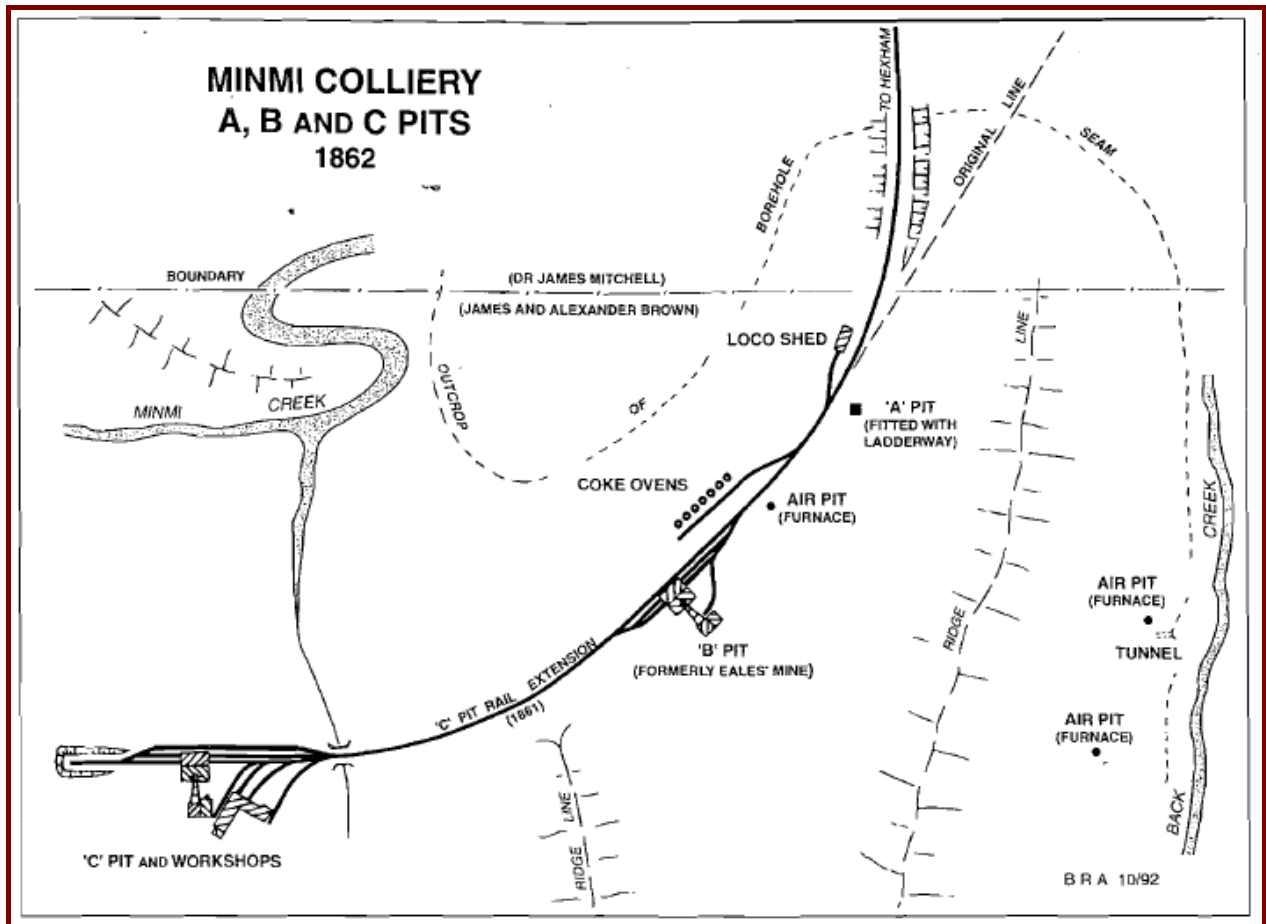


Figure 1 – Layout of Pits A, B and C, 1862 (Andrews, Ref 4)

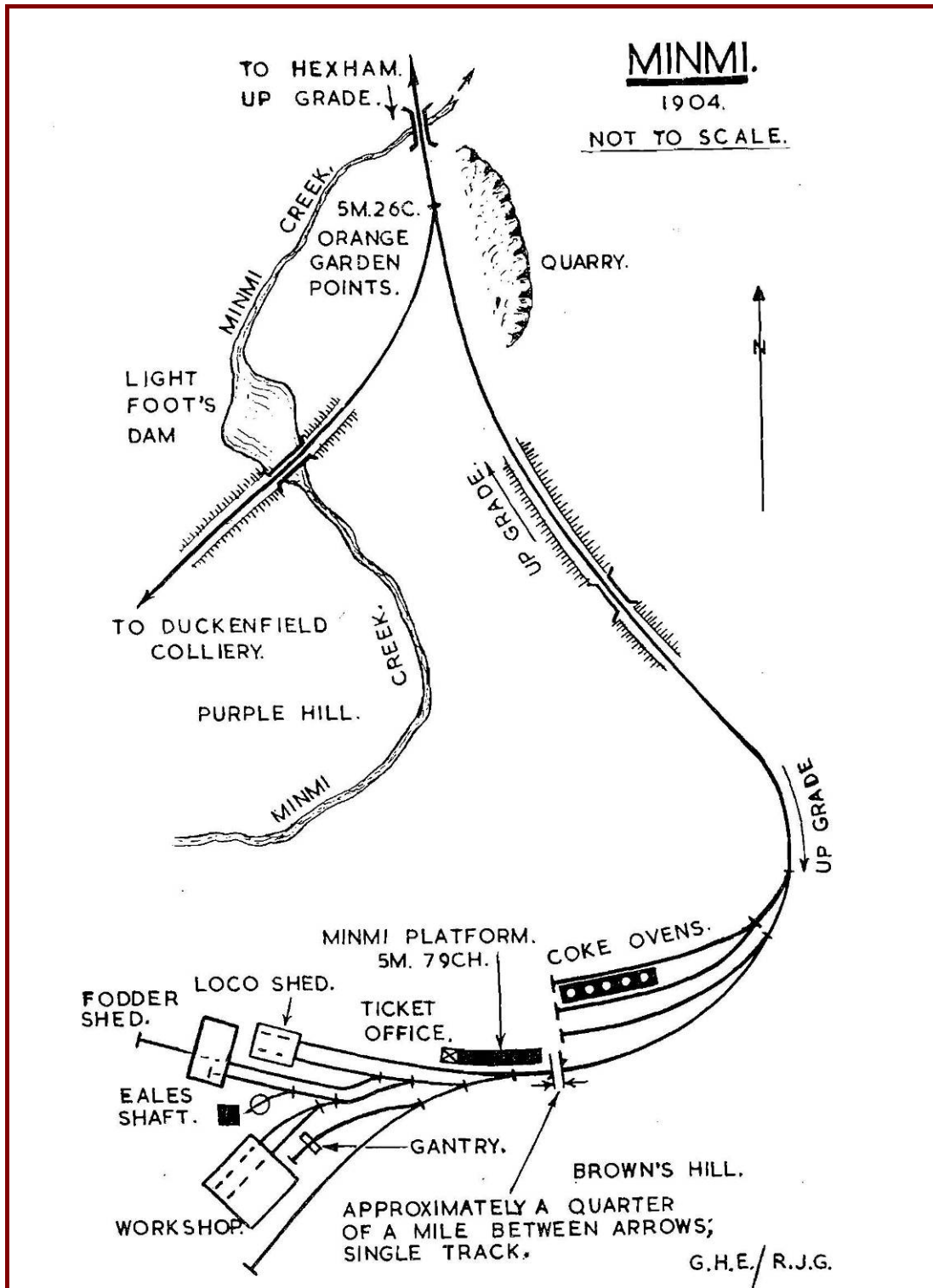


Figure 2 – Layout of Rail Lines, 1905, showing line to Duckenfield (Earley – Ref 5)

In 1859 the coke ovens were expanded to 32 in number and in 1861 a large workshop was also constructed near the C – Pit winding boilers, as shown in Photo 1 below.



Photo 1 – Workshops near Pit C, 1906 (Andrews – Ref 4)

The workings extended below much of the Minmi West and Minmi South areas. The workings were discontinued in 1871 due to flooding of the workings. The railways and workshops remained in operation servicing the Duckenfield Colliery, located to the west of the site

A typical seam section shown on RT 497 indicated a workings section of 5'3" (1.6 m) with 10" (0.25 m) not worked.

Browns Colliery – RT 257

Browns colliery was opened in 1876, with the pit top located on the northern parts of Minmi South area. Tunnel entries No 2 and No 4 are shown on Drawing 1. The arrangement at the pit top is shown on Figures 3 to 5 below (Ref 4) and included the following:

- Stables;
- Cabins;

- Screens;
- Rail lines and sidings;
- Boiler.

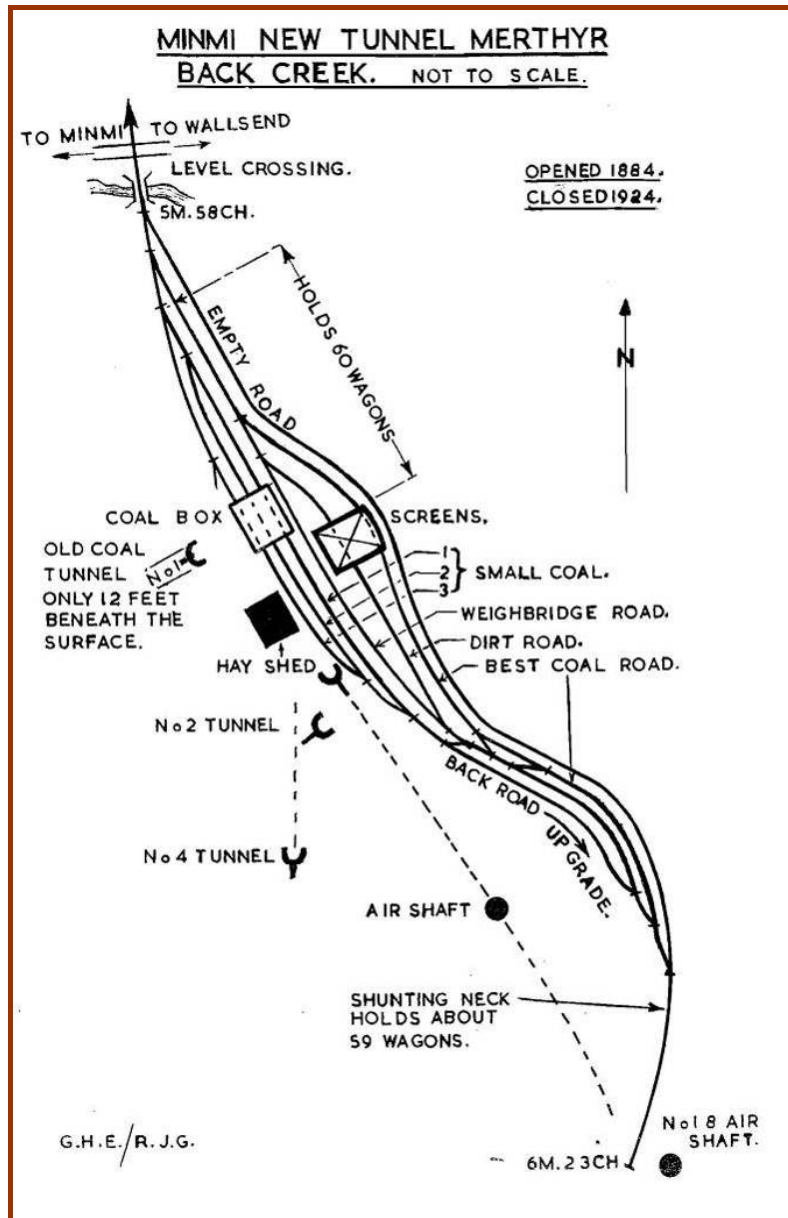
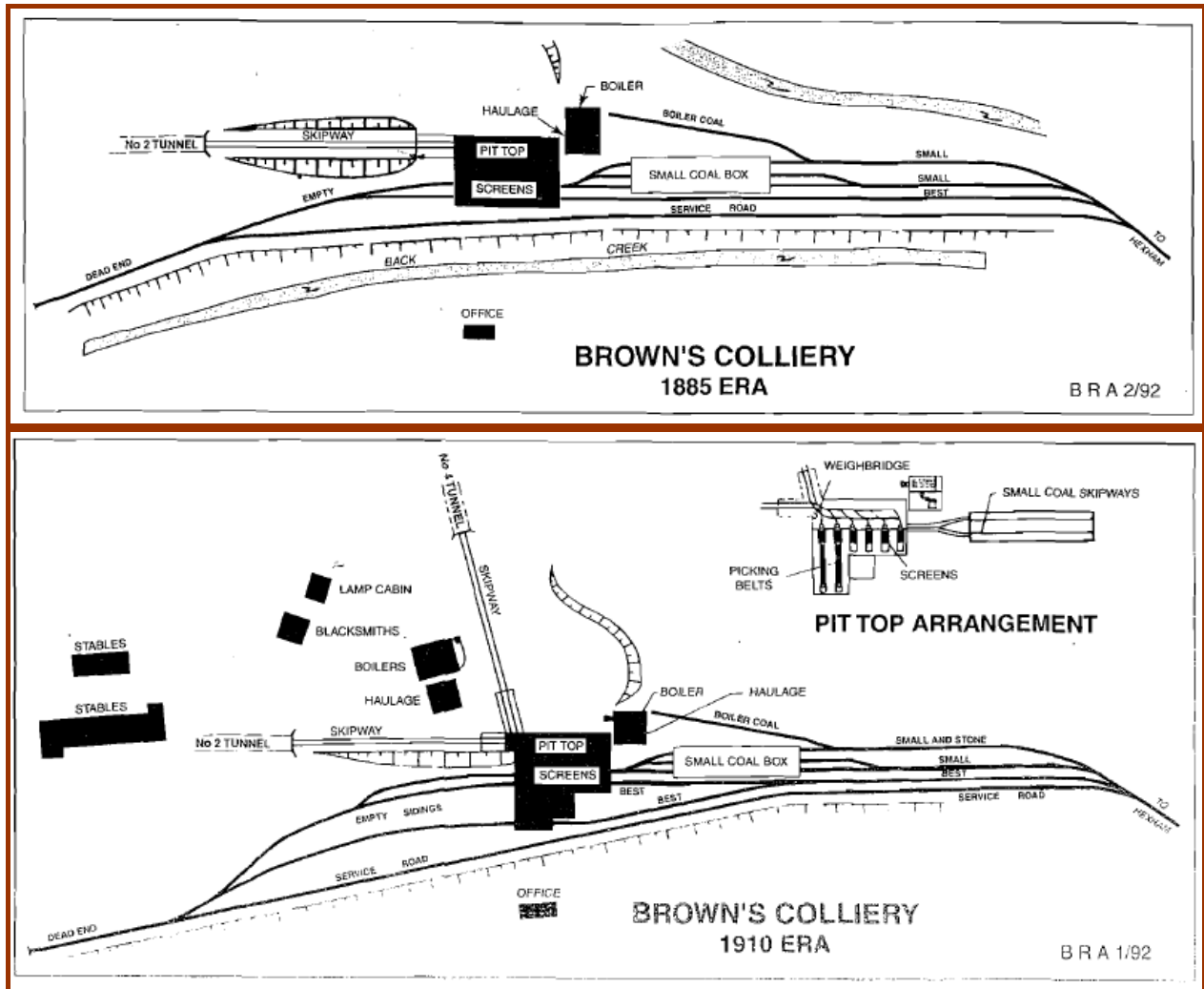


Figure 3 – General Arrangement of rail lines relative to Browns Colliery tunnel entries 1924 era (Earley – Ref 5)



Figures 4 and 5 – Showing arrangement of Browns Colliery Facilities in 1885 and 1910 (Andrews – Ref 4)

A photo of Browns Colliery from late in the 1800s is shown below (Photo 2), probably taken from the southern end of the Minmi township, looking south west.

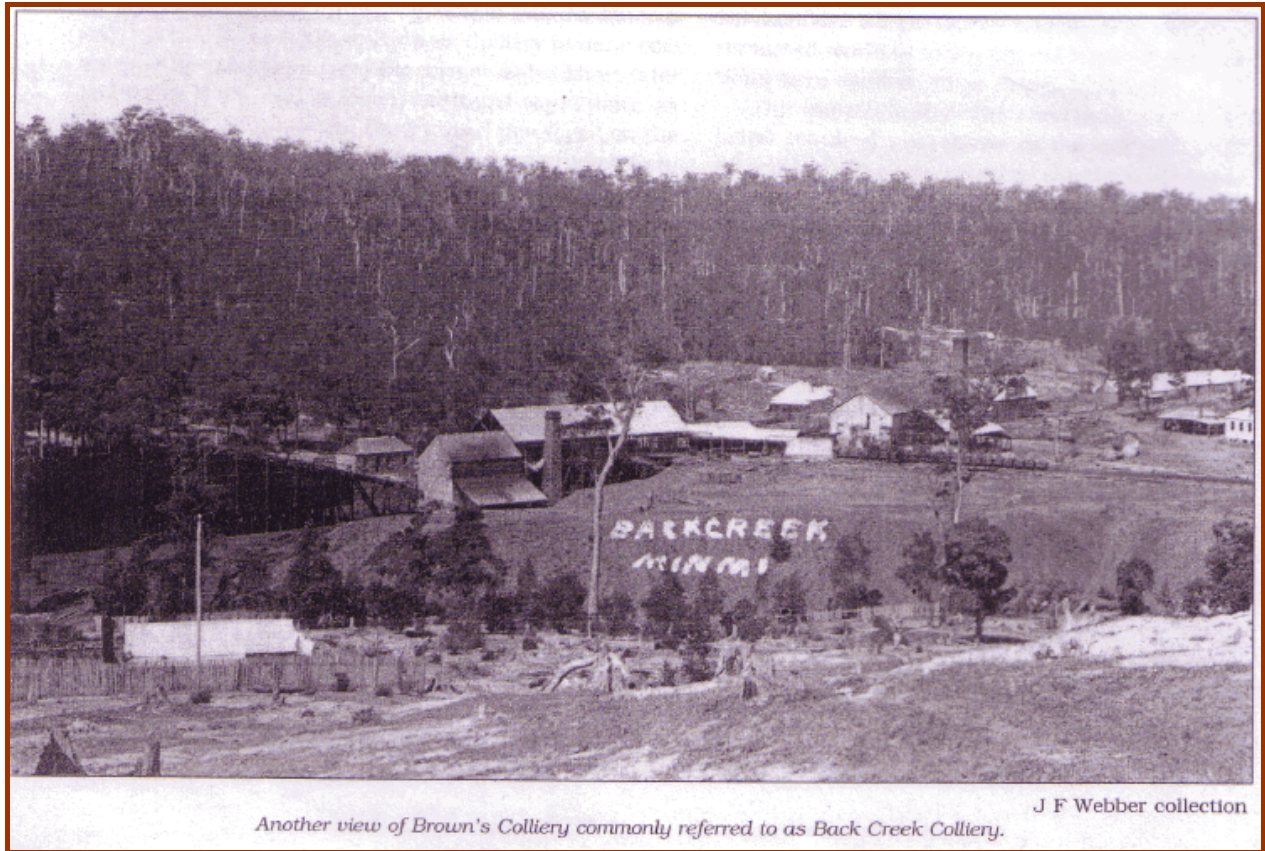


Photo 2 – Browns Colliery in Back Creek (Andrews – Ref 4)

A second tunnel (Tunnel 4) was driven in 1888. Workings of the Browns Colliery, as shown on RT 257 extended under most of Minmi South as well as Link Road North. The workings were bord and pillar with some pillar extraction on the southern parts of the site.

Minmi East

The eastern section of the Minmi East area is underlain by the following workings in the Borehole seam:

- Co-operative Colliery – RT 527;
- Cramp Colliery – RT 282;
- Wentworth Colliery – RT 305.

The workings were undertaken in the late 1800s and comprised Bord and Pillar workings. Numerous shafts and entries are shown on the RTs, as mapped on Drawing 1 attached.

The RTs indicate seam thicknesses in the order of 6' (1.8 m). The workings sections are not shown.

Young Wallsend Seam – RT 701 and 574

Workings in the Young Wallsend seam were undertaken by the Wallsend Borehole Colliery (RT 701) under the southern parts of Minmi West and most of Minmi South. The Link Road South and North are underlain by workings in the Gretley Colliery (RT574). Record traces indicated workings on the northern parts of the site in the 1970s. The workings comprised bord and pillar workings, typically with 5 m wide bords, and pillar extraction in some areas.

An entry to the Young Wallsend Seam was located in Minmi South in a former open cut pit as shown on Drawing 3. A wash plant was located to the east, partly encroaching onto Blue Gum Hills Regional Park.

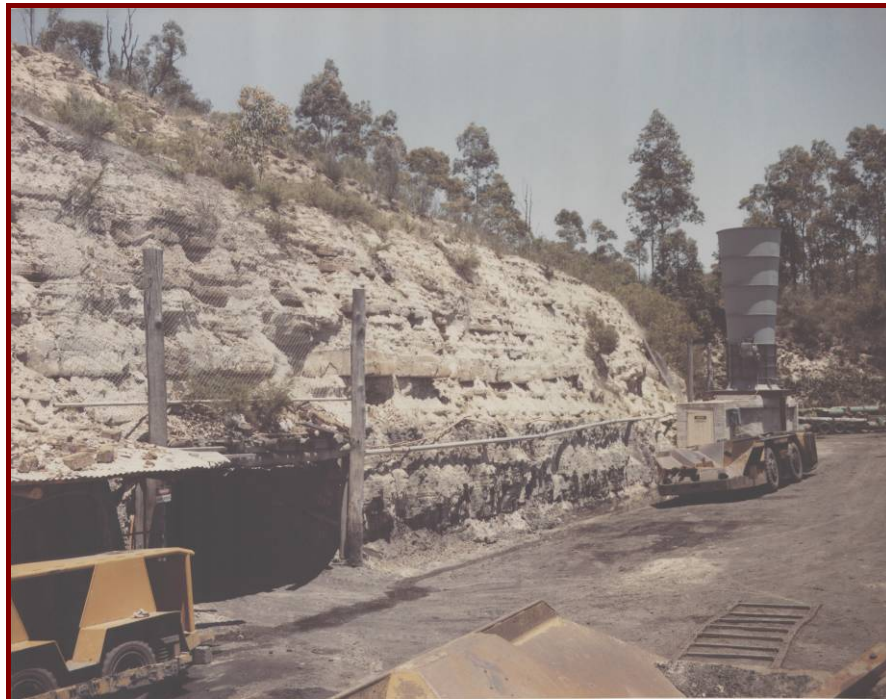


Photo 2a – Wallsend Borehole Colliery Entry No 2

5.2.2 Open Cut Pits – RT 621

Open cut pits have been identified on the site as follows:

Purple Hill Open Cut. Located on the central western parts of the Minmi West area and continues to the west of the site. The cut was in the Borehole Seam, with the mining undertaken in the period 1948 to 1954. Underground workings were broken into on the south side of the cut.

Back Creek Open Cut. This is located on the north eastern boundary of Minmi South. The cut was in the Borehole Seam and was undertaken in 1949. The open cut continues to the south and east of the site. The thickness of coal as shown on the RTs ranges from 5' (1.5 m) to 7'6" (2.3 m).

Old Workings in Young Wallsend Seam: There are two smaller open cuts shown on the central parts of the Minmi South area, where there were workings of the Young Wallsend Seam. The workings were undertaken in 1953. No details of the seam or working depth are shown. One of these workings was later used as the No 2 Entry to the Wallsend Borehole Colliery (Photo 2a).

Browns Colliery: A continuation of the Back Creek open cut extended to encroach onto the south western part of Minmi East. The workings were in the Borehole Seam and were undertaken in 1950 and 1951. The workings broke into the Browns Colliery underground workings.

Wallsend Borehole Colliery (Young Wallsend Seam) : Open cut workings of the Wallsend Borehole Colliery extended onto the eastern part of the Minmi East area. The workings were undertaken in 1984 and did not extend to the outcrop. Base of seam contours are shown on Drawing 1.

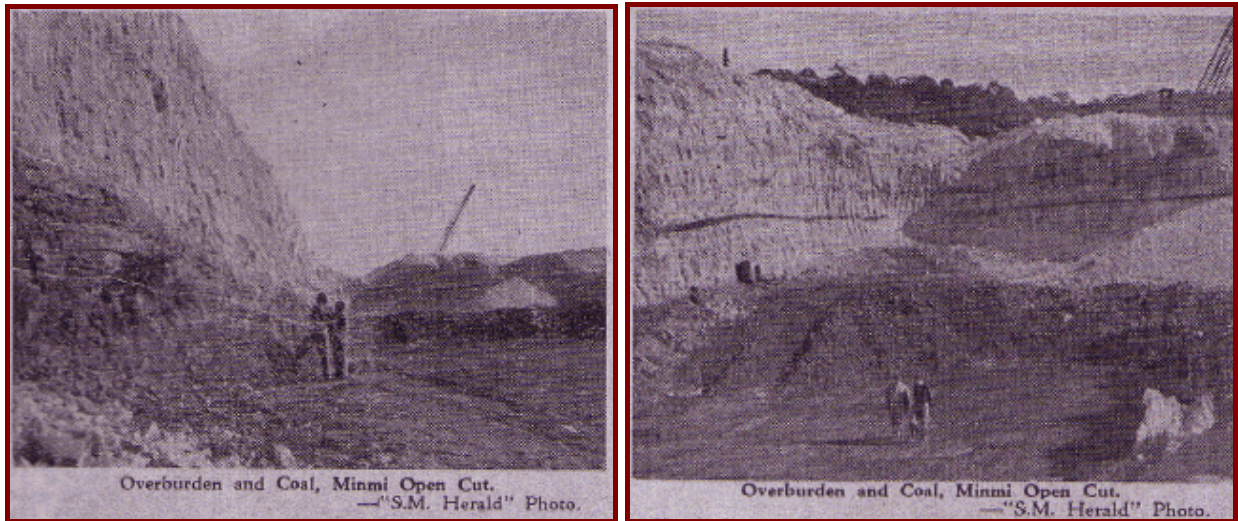
A Newcastle Herald article from 1950 and an article in Australian Coal, Shipping, Steel and The Harbour, dated 1 August 1949, indicated the following regarding the Purple Hill and Back Creek mining operations:

- Cuts in the order of 30' (9.1 m) to 45' (13.7 m) (about 9 m to 14 m);
- Cuts fringed with 'peaks of earth';
- 14' (4.3 m) of water in open cut;
- Diesel shovel used in places (see Photo 3 below);
- Blasting used, as well as bulldozers and drag lines;
- Coal seams 7'6" (2.3 m) thick;
- Overburden taken with scrapers to surrounding land which is not coal bearing;
- Old workings broken into : "although in old mines very accurate maps of workings were not made, and the layout was not set down with such mathematic precision of today, the present operators have a general idea of the size, direction and depth of the workings".

With respect to the old underground workings the Newcastle Herald article indicated the following:

"an experienced eye can gain a very good idea on the points from the depressions left when the old abandoned workings caved in. The fall-ins are plainly discernable in many places where new workings will be over old. The bords and pillars of half a century ago were much smaller than those of today. An old miner at Minmi informed me that his father had often told him he had driven a cut through in a day. The main headings were kept fairly even but driving was done by sound and it was left to the deputies to preserve some semblance of a line and to tell the miners where to put the bords and cut throughs".

Typical photos of the open cuts from 1949 are shown below.



Photos 3 and 4 – Photos of typical open cut mines - 1949

For the Purple Hill and Back Creek open cuts a screening plant was constructed on the Minmi West area, near the base of a ridge. An access road was constructed to the west of the rail line to service the Purple Hill Mine and a loop road was constructed off Woodford Road, presumably to accept trucks from the Back Creek Mine via Minmi Road. The general arrangement is shown on Figure 6 below and a photo of the screening plant is shown on Photo 5.

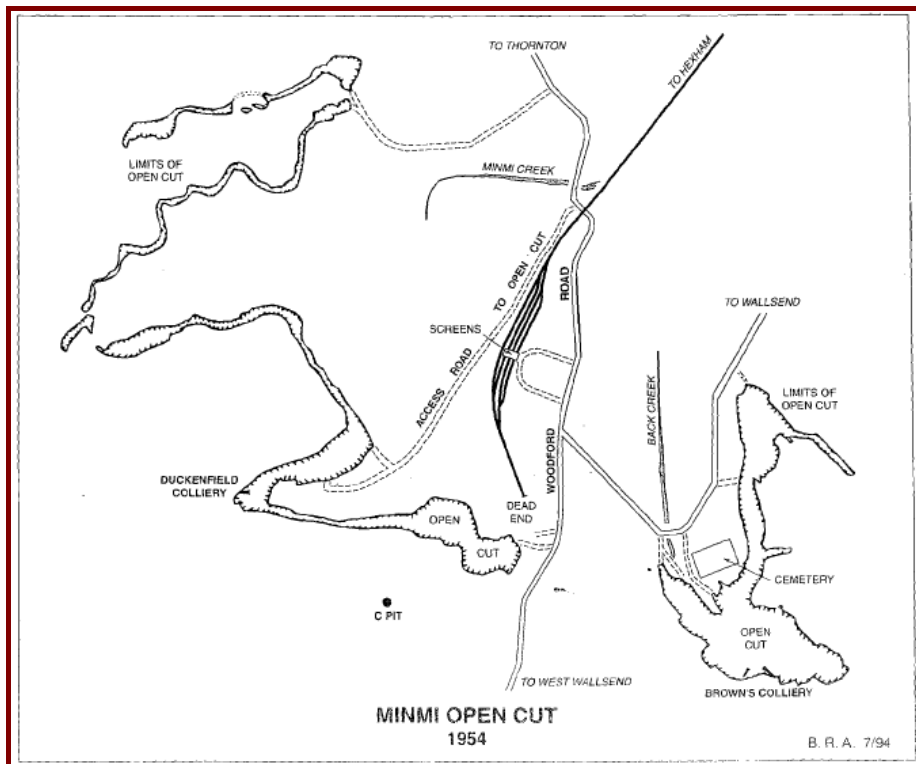


Figure 6 – Arrangement of rail lines and road loops relative to open cuts (Andrews – Ref 4)

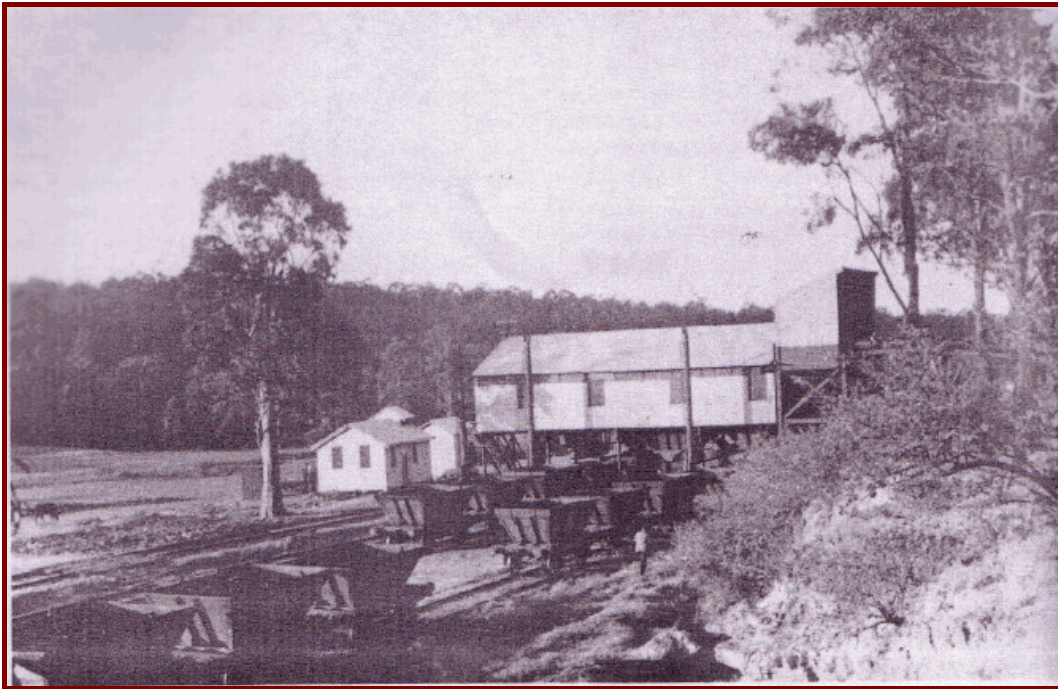


Photo 5 – Rail siding screening plant for open cuts, on east side of Minmi West (Eardley – Ref 5)

5.3 Interviews with Personnel Familiar with the Site

As most of the mining-related activities at the site occurred over 50 years ago, it is difficult to find people who have direct knowledge of operations on site.

Discussions were undertaken with the following:

Ron Perry, Local Resident

Ron is a local amateur historian buff and indicated the following:

- John Eales commenced mining;
- J & A Brown bought out Eales in the mid 1850s;
- There was a furnace shaft for ventilation;
- A railway was constructed to Hexham initially with the aid of horses and then steam locomotives;
- Underground workings near Minmi closed in 1923;

- Useful information to be found in publications of railways of J A Browns by Gifford Eardley (Ref 5) and Andrews (Ref 4);
- Open cut mines started in 1949 during a seven week strike. During this time, the army commenced open cut operations.

Bill Freeman

Bill Freeman is a long time resident and amateur historian and artist. Bill indicated that there were coke ovens located on the site and provided a schematic plan showing the approximate location, to the west of former Pits A and B. The approximate location is shown on Drawings 1 to 4.

Kerry Hinds

Kerry is a long time resident and amateur historian. She provided a number of historical photographs of Minmi in the late 1800s and early 1900s. She indicated the following:

- There were scattered residences across many of the areas now used for pasture / agistment and this accounts for much of the undulating surface in these areas. Many of the houses had brick cisterns dug into the ground for storage of water. These areas included the pasture in Minmi West and Minmi North;
- The majority of the former Browns Colliery infrastructure was to the east of the site in Blue Gum Hills National Park;
- The coke ovens were located in Minmi West, to the north of Railway Street and to the west of the houses on Woodford Street. She provided a photograph indicating the approximate location.

Additional interviews were undertaken with respect to mine subsidence issues and these are summarised in the Mine Subsidence Risk Assessment (Ref 3).

5.4 Review of Historical Aerial Photos

The following historical aerial photos were reviewed:

Table 1 – Aerial Photo Review

Year	Approximate Scale	Black and White/Colour
1954	1:40000	Black and White
1966	1:38000	Black and White
1975	1:40000	Black and White
1984	1:40000	Black and White
1996	1:50000	Colour
2006	1:25000	Colour

1954 Aerial Photograph

- Purple Hill Open Cut;
- No obvious infrastructure near C Pit;
- Haul road and rail lines evident in Minmi East;
- Road loop to open cut rail siding screens evident, screen not clearly visible;
- Back Creek workings;
- Various cleared areas and tracks on Minmi South;
- Most existing homes in Minmi present;
- Surface disturbance around former Browns Colliery (Back Creek) pit head.

1966 Aerial Photograph

- Open cut rail siding screens evident;
- Possible dam at north end of Minmi North;
- Browns Open Cut mine, including present surface water feature;
- Heavy disturbance around Browns Colliery (Back Creek) pit head;
- Some additional clearing in Minmi South;

- Disturbance near shaft at south end of Minmi South;
- Transmission line on Link Road South.

1975 Aerial Photograph

- Dam on northern part of Minmi South evident with surrounding surface disturbance;
- Track to dam and shaft at south end of Minmi South;
- Open cut rail siding screens still present;
- Additional clearing on northern end of Minmi West.

1984 Aerial Photograph

- Borehole Colliery open cut present on western part of Minmi East;
- Open cut rail siding screens removed.

1996 Aerial Photograph

- F3 Freeway to west of site;
- Link Road present;
- Surface disturbance in former Purple Hill Open cut area on Minmi West;
- Surface disturbance on Minmi South around Young Wallsend open cuts;
- Surface disturbance around shaft at south end of Minmi South.

Information obtained from aerial photos was limited by the relatively small scale and poor resolutions.

NSW Environmental Protection Authority (DECCW)

A property information inquiry with the NSW DECCW indicated that the site has no statutory notices issued under the provision of the Contaminated Land Management Act.

5.5 Summary of Site History

Underground mining commenced at Pits A, B and C in Minmi West in mid 1800s. Infrastructure included the following:

- A rail line along the eastern side of Minmi West with cutting/quarry on west side;
- A rail line running diagonally across the north end of Minmi West to Duckenfield Colliery;
- Boilers;
- Screens;
- Workshops;
- Coke ovens;
- Locomotive sheds.

Underground mining at Browns Colliery (Back Creek) at the northern end of Minmi South in the late 1800s. Infrastructure included the following:

- Rail line running north crossing Minmi Road and continuing along the western side of Minmi North, connecting with the lines from Minmi West at the northern tip of Minmi North;
- Numerous sidings;
- Screens;
- Stables;
- Various tunnels and shafts.

Mining occurred also at the eastern end of Minmi East in the later 1800s (Cooperative, Cramp and Wentworth Collieries), with numerous tunnels and shafts marked on the RT. Limited information is available regarding surface infrastructure.

Open cut mining commenced at Purple Hill (Minmi West) and Back Creek (north end of Minmi South) and Browns Colliery (west side of Minmi East) in the mid 1900s. The workings ranged up to about 10 m to 15 m deep. The coal was transferred by truck to a rail siding on the eastern side of Minmi West.

Open cut mining as part of the Wallsend Borehole Colliery occurred on the western part of Minmi East in 1984. It is likely that coal was trucked out using an access track to Minmi Road.

The No 2 Entry to Wallsend Borehole Colliery was located in a former open cut pit at Minmi South.

5.6 Minmi West

Most of the Minmi West area is grassed and used for grazing horses. There are some scattered houses off Railway St on the southern parts of the site and there is dense bushland at the northern and southern ends of the site, as well as the western fringes. Surface levels range from about 40 m AHD at the northern end to 4 m AHD on the lower central portions and then rise to 50 m AHD at the southern end.

A creek winds across the site from the western boundary on the southern parts of the site to the eastern boundary on the northern parts of the site.

Specific features include the following:

- Numerous horse paddocks (Photo 6);
- Mounded filling on the north eastern parts, to the east of the former rail line, including building rubble and fibro sheeting (Photos 7 to 9);
- A cut into rock on the central western parts of the site, probably to form the rail line route. (Photo 10) This is also near the likely location of the screening siding for the open cut;
- Fill embankment along western part of site to south of cut, again likely to have been constructed for the rail lines to A, B and C pits (Photo 11);

- Former Purple Hill Open Cut which has been partly filled and appears to have mounded filling around the perimeter (Photos 12 and 13, 18 and 19) , in particular the eastern and northern sides. There is still a valley feature in the former pit, running west to east and this contains concrete weir structures, probably associated with the control of stormwater from the F3 freeway (Photo 14);
- Undulating ground with shallow rock on the southerly trending slopes to the south of the open cut, probably from collapse of shallow mine workings (Photos 16 and 17);
- Fill embankments and slight cuttings on the western side of the site, north of the open cut, associated with the rail line to Duckenfield Colliery and the haul road to the open cut. Culverts were observed through the fill embankment where the former road/rail lines cross the creek;
- Low lying land to the north west of the former Duckenfield Rail;
- Undulating grassed ground which appears to have been disturbed in the area surrounding the scattered houses associated with Railway Street. This is the area of the former B and C pits (Photos 20 and 21) and associated infrastructure including rail siding, boilers, workshops and coke ovens and locomotive sheds. Little direct evidence of the former structures was observed;
- The southern parts of the site are densely vegetated with a number of tracks, one of which leads to a former water shaft. The shaft has been capped;
- There is a cleared area off Woodford St, immediately to the south of the site, where significant dumping has occurred, including filling and fibro (Photo 21a).



Photo 6 – Horse paddocks



Photo 7 – Mounded filling including building rubble



Photo 8 – Filled batter on western side of former railway, to the east of the open cut screens



Photo 9 – Fibro waste



Photo 10 - Cut batter on eastern side of former rail line



Photo 11 – Fill embankment from former rail line



Photo 12 – Creek with former Purple Hill Open cut in background



Photo 13 - Battered filling on northern side of former Open Cut



Photo 14 – Drainage structure in former open cut



Photo 15 – Former rail embankment



Photos 16 and 17 – Undulating surface to south of open cut – probable potholes



Photos 18 and 19 – Filled area north of open cut near existing access track to F3



Photo 20 – Former B Pit location



Photo 21 - Former C Pit location



Photo 21 a – Fly tipping at southern boundary of Minmi West

5.7 Minmi North

Most of the Minmi North area is grassed and used for grazing horses (Photo 22). There is bushland along the eastern boundary beside Minmi Road. Surface levels range from about 2 m AHD in the lower northern parts to 30 m AHD in the south eastern parts.

Back creek winds to the north close to the eastern boundary toward low lying areas on the northern parts of the site which contained surface water at the time of the assessment. The northern parts of the creek, where it meets Minmi Road, were dry at the time of the assessment (Photo 23).

Specific features include the following:

- Former rail alignment along the western boundary which appears to be benched into the hillside (Photos 24 and 25), however also contains sections cut into rock (Photo 26, Photo 28) and embankments (Photo 27);
- There is a Sewage Pump Station and a small cattle yard near the north western corner of the site, however it appears that these may not be on the subject site (Photo 29);
- There is a triangular area at the north western corner which is bounded on the east and west sides by rail embankments from the former rail lines to Back Creek and Pit C. The embankments meet at the northern tip of the site and continue to the north of the site. (Photo 30). This is the former rail line to Hexham. The area between the embankments is low lying and contained reeds and shallow surface water with iron staining (Photo 31);
- The eastern slopes of the site fall to the west. An area on the northern boundary of the slopes has been cleared and there are signs of cut and fill, including a benched area of cut and a fill mound and ramp. The area to the north is low lying and may have been cut as suggested by the review of aerial photographs (Photos 32 and 33);
- The eastern slopes show signs of shallow soil erosion and associated slope instability in the form of slumping. The erosion may have been initiated by rabbit warrens. (Photos 34 to 36);
- A stone lined well was noted on the lower eastern slopes, close to the creek (Photos 37 and 38);
- The grassed slopes on the southern part of the site are undulating with some chitter apparent at the surface, suggesting prior disturbance. A possible pothole feature was observed near Minmi Road.



Photo 22 – Grazing land to north of Minmi Road



Photo 23 – Back Creek where it meets Minmi Road



Photos 24 and 25 – Former Rail Line to Back Creek

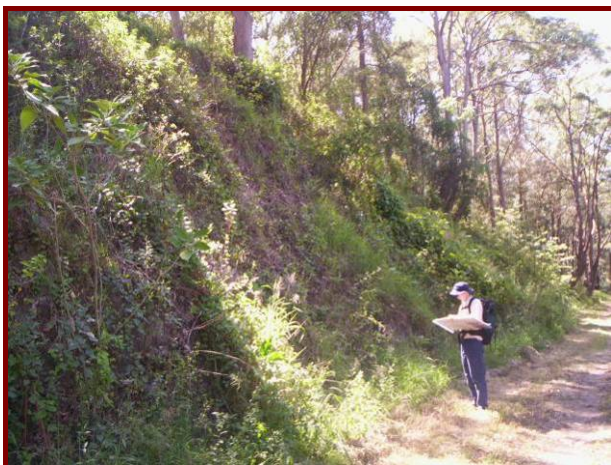


Photo 26 – Cut into rock for former rail line

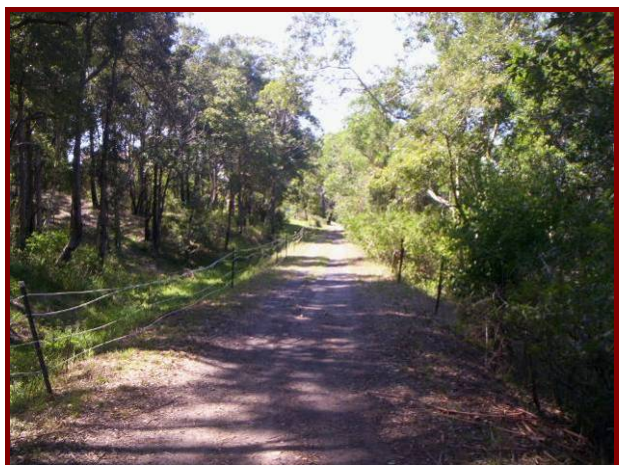


Photo 27 - Embankment along former rail line



Photo 28 – Rock exposed at northern end of access track



Photo 29 – Cattle Yard near sewer pump station



Photo 30 – Fill embankments where former rail lines meet



Photo 31 – Iron staining in low lying wet area at north of site



Photo 32 – Area of cut at north east corner of site



Photo 33 – Fill ramp in foreground and possible area of cut in background



Photo 34 – Slumping/erosion of slopes on Western side



Photo 35 – Piping erosion of slope



Photo 36 – Piping erosion of slope



Photo 37 – Stone lined well

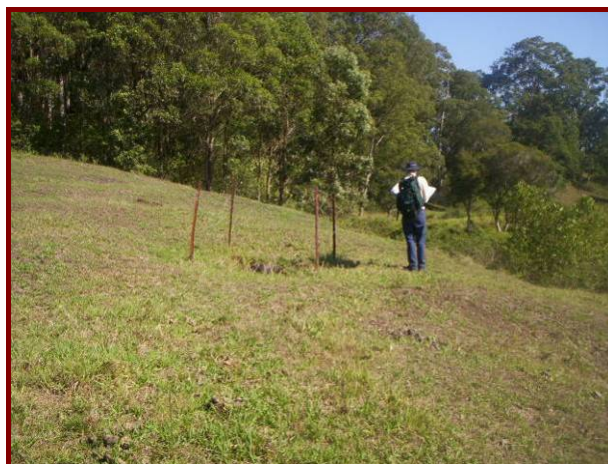


Photo 38 – Stone lined well / cistern

5.8 Minmi East

Minmi East can be divided into two district areas, the western and the eastern. Both areas contain former open cut mines. Ground surfaces are typically between 8 m to 50 m AHD on the western area and up to 70 m AHD on the eastern area.

Eastern Parts

The eastern parts contain the former Wallsend Borehole Colliery open cut in the Borehole Seam. The open cut was undertaken on the crest of the hill and the current landform is a bowl type shape at the top of the hill with steep natural slopes to the east, north and west and backfilled open cut rising to the south.

The former open cut area contains grass and bushes and there is a low lying reeded area in the south western corner (Photos 39 and 40). The open cut is surrounded on the east, north and west by bushland which slopes away from the open cut, typically at about 20°, but locally up to about 40° on the western side (Photo 41). The lower slopes have a heavily undulating surface which is likely to be from collapse of shallow Borehole Seam workings (Photo 42).

There is a mound of overburden with some smaller mounds of building rubble, including fibro sheeting near the north east access to the site (Photo 43).



Photos 39 and 40 – Former Wallsend Borehole Colliery Open Cut



Photos 41 and 42 – Steep slopes and pothole subsidence around former Wallsend Borehole Colliery Open Cut



Photos 43 and 44 – Mounds of overburden and building rubble including fibro sheeting

Western Parts

The eastern side of the western area is mostly bushland. There is a track along the eastern boundary which contains significant fly tipping (opportunistic tipping) including car wrecks, batteries, fibro sheeting (Photos 45 to 47). The bushland contains an eroded gully with steeply sloping and slumping banks, as shown on Drawing 1.

The western area contains the former Browns Colliery Open Cut, much of which has been backfilled, with mine spoil battered around the perimeter (Photo 48). There is a water body located within the backfilled area (Photos 49 and 50).