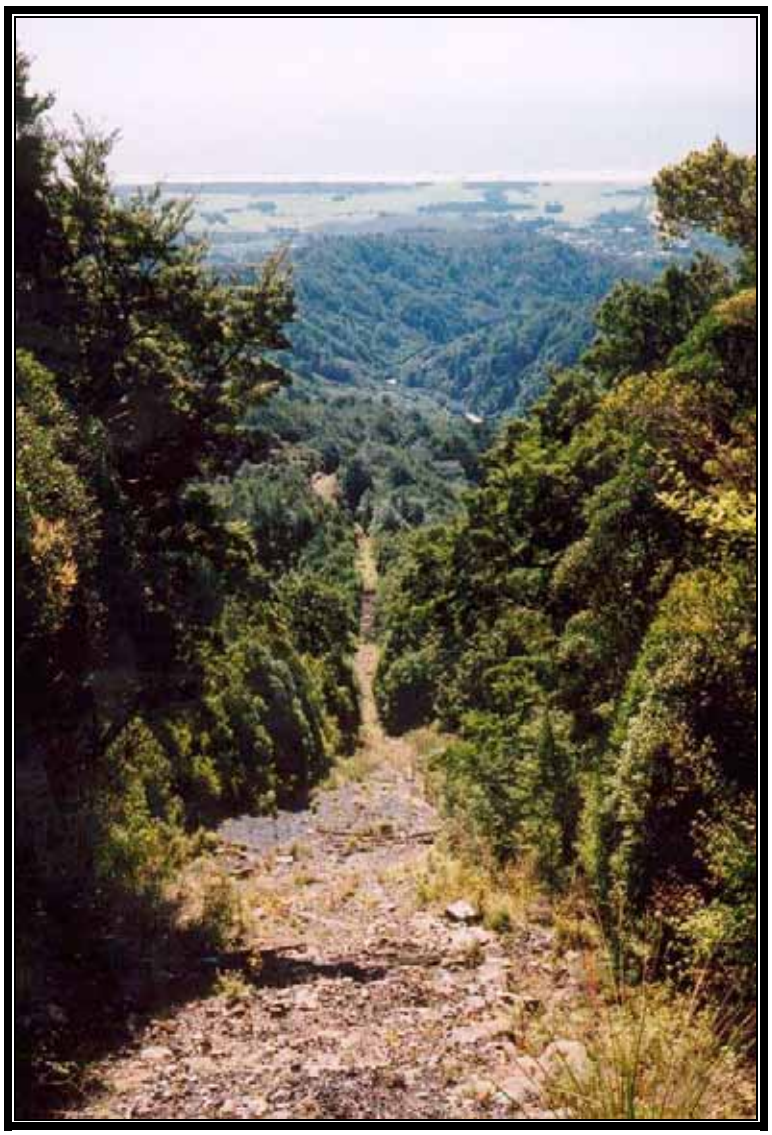
DENNISTON



Archæological Survey Report
for
The Department of Conservation
West Coast Conservancy

P.G. Petchey
Southern Archæology Ltd.
2007

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Cover illustration
Looking down the Denniston Incline towards Waimangaroa and the Tasman Sea.

Southern Archaeology Ltd.
P.O. Box 6331
Dunedin
New Zealand
2007

The Eighth Wonder of the World

It is an often-told story that, when in March 1889 a hurricane hit Apia in Samoa, it was the high quality Denniston coal carried by H.M.S. *Calliope* that enabled her to raise steam and avoid disaster when other warships in the harbour were wrecked.

Between 1880 and 1967 the Denniston Incline worked to bring this first class coal down from the Denniston Plateau to the wharves at Westport. The incline itself was regarded by locals as 'the eighth wonder of the world," descending at grades of almost 1 in 1.25 in places, bringing 105 tons of coal an hour down 1,700 feet from the plateau. It stands as one of New Zealand's foremost Victorian engineering structures, built at the height of the railway and steam age.

The Denniston Incline is now managed by the Department of Conservation as an historic site, and conservation and restoration work is currently underway to improve the interpretation of this site to visitors. In late 2006 an archæological survey was carried out in order to record details of the incline and associated sites, and help guide future conservation work.

Acknowledgements

I would like to thank a number of individuals and organisations for their assistance during this survey. The West Coast Conservancy of the Department of Conservation funded the survey and provided logistical assistance. In particular Jackie Breen of DoC co-ordinated the work and assisted in the field during a very wet ten days, many of which she spent bashing though gorse.

I would particularly like to thank Carmen Sarjeant of the University of Otago, who also assisted during the survey, and spent numerous hours standing at a water-logged plane table.

Gary James of the Friends of the Hill provided warm hospitality on a particularly wet day, acted as a guide around the historic sites in the township, and provided clarification over a number of historical details.

Kevin Jones of the Department of Conservation in Wellington kindly supplied copies of his recent detailed low-altitude aerial photographs of the mining sites on the Denniston Plateau.

My father, David Petchey, provided engineering advice, particularly regarding the oft-misquoted fact that the incline used 4 inch diameter wire rope (actually 4 inch *circumference* rope).

The New Zealand Railway and Locomotive Society gave permission to reproduce images from Bob Meyer's excellent publication *Coaling from the Clouds*.

I would also like to acknowledge the work of Sonia and Terry Sumner, whose 1983 survey of historic coalmining remains was used extensively in the preparation of this report. Their work was so comprehensive that in places all that was really required was the preparation of accurate maps and plans and an update on the condition of sites.

Table of Contents

Introduction....5
Geographical Description....6
Previous Research....8
General History of Denniston and the Incline....9
The Westport Colliery Company & The Westport Coal Company Ltd....10
State Mines Department....11
The Union Movement....11
The 2006 Archæological Survey....13
The Denniston Incline....14
The Upper Incline....18
The Middle Brake....24
Site Description....26
The Lower Incline....29
Conn's Creek Yards....31
Site description....32
The Brakehead....33
Site Description....34
The Bins & Screens....38
The Power House and Winding House....39
Weighbridge....39
The Workshops....40
The Rope Road....42
Site Description....44
The Monocable Aerial Ropeway....45
The Banbury Mine, Banbury Arches & Early Tramway....48
Site Description....49
Denniston Settlement....50
The Camp....52
Site Description....55
Denniston Township....57
Brakehead & Main Town Area....58
South-east Area of Town, School, Power House....60
The Denniston Track....62
Site Description....62
Coalbrookdale....63
Site description....65
Lower Coalbrookdale Valley....65
The Coalbrookdale Sheds....69
The Coalbrookdale Mine Entrance & Bath House....74
The Cascade Mine Entrance & Fan House....77
Discussion....81
Recommendations....83
Specific Recommendations....84
The Incline....84
Conn's Creek Yards....84
Brakehead Area....84
The Camp....85
Denniston Township....85
The Rope Road....85

Coalbrookdale 85
Interpretation 85
Further Survey Work 85
References 87
Published & Unpublished Works 87
Maps & Plans 88
Aerial Photographs 88
Internet web pages 88
Appendix A 89

Denniston
Archæological Survey

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Southern Archæology
2007

Introduction

Denniston is situated on the West coast of the South Island of New Zealand, it is an historic coal mining settlement, with a range of associated coal mining sites and features. Of particular note are the remains of the Denniston Incline, a self-acting incline that brought coal from the mines down to the coast.

This report was commissioned by Jackie Breen of the West Coast Conservancy of the Department of Conservation. Its purpose was to map archaeological features relating to the coal mining and settlement sites in the Denniston Historic Area, complete measured drawings of historic and archaeological remains in the area, provide a written interpretation of the range of remains found, and of specific features of significance. And compile a photographic record of the range of archaeological and historic remains at the site.

The areas that were identified as a priority for archæological survey were the Denniston Incline, the Brakehead and Camp, and Coalbrookdale. This only represents a small proportion of the industrial remains on the Denniston Plateau, but these are the key historic and visitor areas. The most important site is the Denniston Incline, once regarded by locals as "the eighth wonder of the world," and this was recorded in some detail.

Because of the attention paid to the site by railway historians amongst others, there has already been great deal written about Denniston and the incline. Most recently, publication of Jenny Pattrick's historical novel *The Denniston Rose* has increased public awareness of the site, and considerably boosted visitor numbers.

There are a number of recorded archæological sites in the Denniston area (numbers are given in the appropriate sections of this report). Part of the area has been registered as the Denniston Historic Area (NZHPT reg no 7049, under Reserves Act 1977)

Geographical Description

Denniston is located on the West Coast of New Zealand, fifteen kilometres east of Westport and six kilometres form the coast (Figure 1). The town site and associated coal mines are located on the Denniston or Mount Rochfort Plateau, on the west side of the Mount William Range. The plateau is at about 600 metres above sea level, and the western escarpment rises steeply from the coastal plain. It was down this steep escarpment side that the Denniston incline ran. On the north side of the plateau is the steep wooded gorge of the Waimangaroa River, which drains much of the western flank of the Mount William Range.

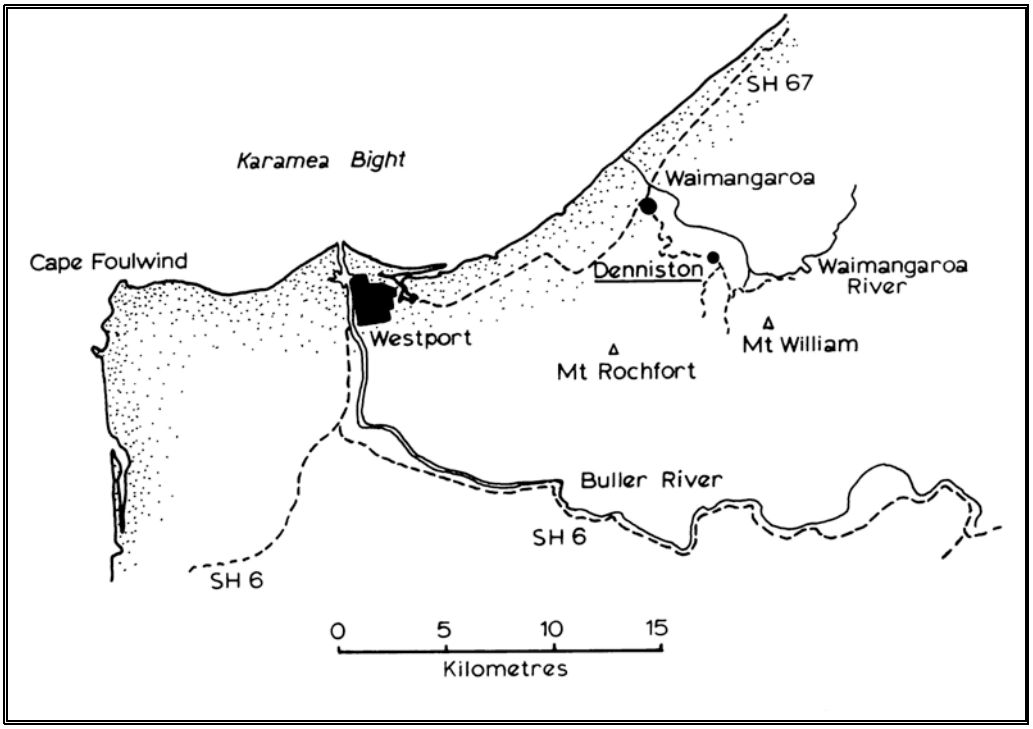


Figure 1
The general location of Denniston

The plateau typically is wetter, windier and foggier than the coastal plain, and is often shrouded in cloud. The soils are extremely thin, and the bedrock is exposed in many places. This means that vegetation on the plateau is extremely stunted and scrubby. A few struggling introduced trees do survive, but not in the numbers that would normally be expected of an abandoned town site. Many areas of past human activity have been colonised by gorse, but in places native scrub is beginning to over-top the gorse bushes. The Department of Conservation is also controlling gorse in some key visitor areas.

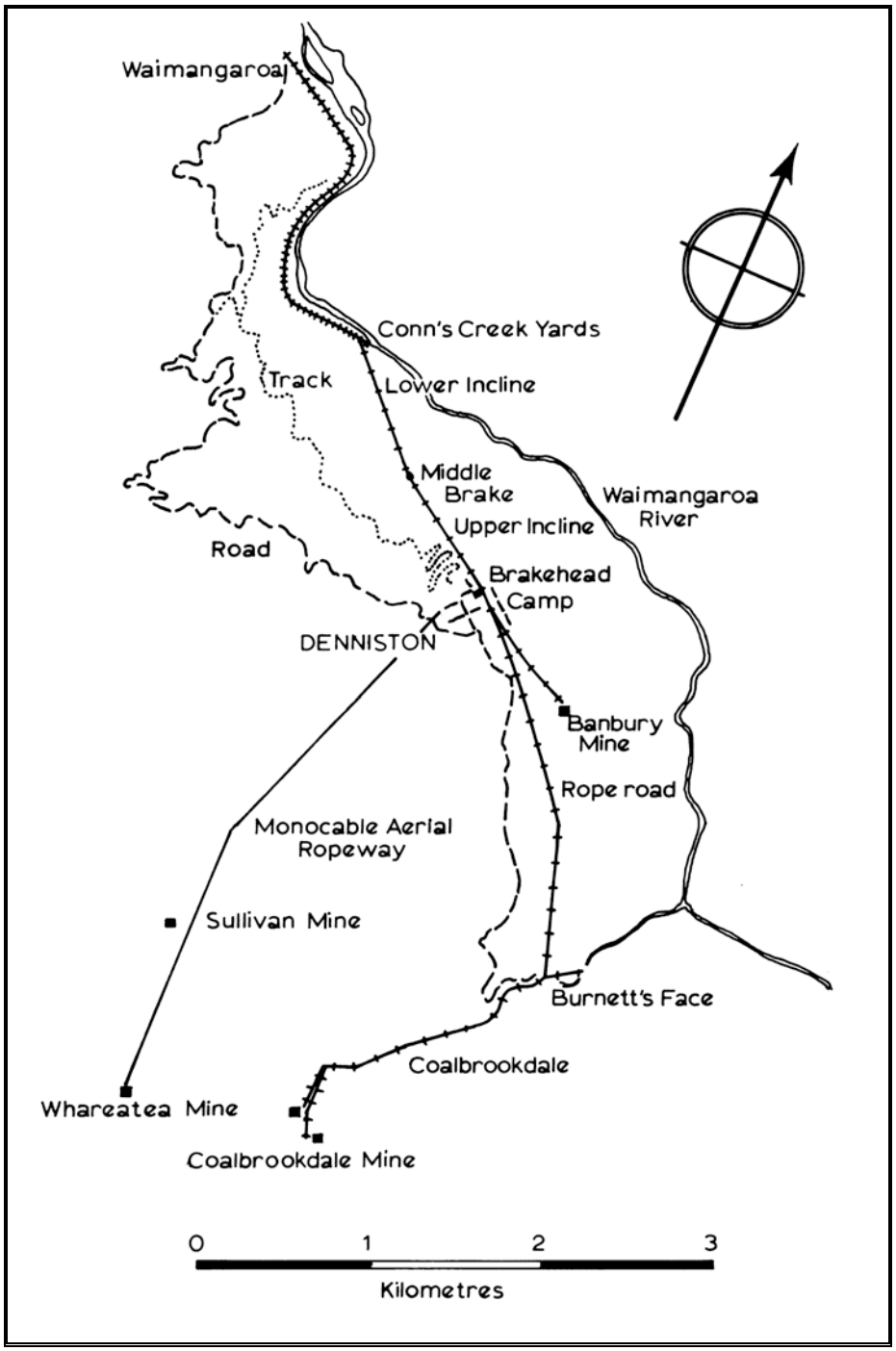


Figure 2
Map showing the main places and areas discussed in this archæological survey report.

Previous Research

There has already been a great deal of research carried out on Denniston, and in particular on the history and operation of the Denniston Incline. Railway history is a niche that has produced some very detailed work about many of New Zealand's main and branch lines, bush tramways and other related operations. *Coaling from the Clouds* (Meyer 1971) contains a very good account of the history and operation of the Denniston Incline and Waimangaroa branch railway, and includes some excellent black and white photographs and maps of the incline and brakehead, a number of which are reproduced in this report. Work is currently underway to republish an updated edition of *Coaling from the Clouds*, and this will be essential reading for anyone interested in the history of the incline. In particular it will include detailed descriptions of the track layout and operation.

A more general history is given in *The Denniston Affair* (Munro 1951). This contains sections on the general setting, background history, the mining company, the settlements and many of the social institutions that once existed there. The author was a teacher at the local school, and it was written when there was still a community in residence on Denniston, and the closure of the incline and abandonment of the townships was still some years away. Personal reminiscences of life on Denniston make up the bulk of *The Hill* (Adams 1971), while the social and political life of the community is the subject of Smallholme-Fraser's 1978 M.A. thesis "The Evolution of the Coal Mining Community of Denniston." This latter work is also particularly concerned with the role that the Denniston mining communities had to play in the emergence of the union movement in New Zealand.

The remote and bleak location of Denniston together with its latter-day status as one of New Zealand's better-known ghost towns has attracted some attention, such as an entry in *Ghost Towns of New Zealand* (McGill 1980). The strange allure of Denniston has also attracted novelists, and the publication of the best-seller novel *The Denniston Rose* (Pattrick 2003) and its sequel *Heart of Coal* (Pattrick 2004) have created a recent boom in visitor numbers to the site. While these books have had the considerable benefit of raising public awareness of Denniston and its history, a drawback is that many people now think of Denniston in terms of fictional characters and events.

Denniston has also been the subject of some past archæological survey work. In 1983 S. & T. Sumner prepared a comprehensive survey of historic coal mining sites for the Department of Lands and Survey (Sumner & Sumner 1983). This "Coalfields Park Report" was the result of a plan to develop an historic coalfields park in the area, incorporating a number of discrete historic mining locations, along the same lines as the Otago Goldfields Park. The report covered a large number of sites from Stockton in the north to the Cascade Mine in the south. While the park location did not eventuate, the Sumners' report contains a great deal of useful detail, representing a great deal of research and field survey. As such, to avoid unnecessary duplication of effort, the 2006 survey used the Sumner report as a base document, and built upon it.

In 1992 Ray Hooker carried out a survey of the Coalbrookdale area as a result of proposals to construct a walkway at Burnett's Face. The survey covered the lower one kilometre of the Coalbrookdale Valley, and resulted in a number of sites being entered onto the New Zealand Archæological Association site record file. The brief survey report that he prepared (Hooker 1992) is appended to the file.

Information about Denniston and the incline is also available on the internet. For example, see (http://www.nzine.co.nz/features/dennistonincline.html). This site includes a written account of the incline and a number of relatively recent photographs.

General History of Denniston and the Incline

As described above, there is already a great deal of both published and unpublished research into the history of Denniston, from both technical and social points of view. There is therefore no need to repeat much of this research in the present report, and what is presented below is a basic historical summary of Denniston, the incline and the mines, in order to put the archæological evidence in context. Detailed historical details are given for each site in the relevant section. The main features of the landscape are shown in Figure 2.

Coal was first discovered in the Papahaua Range by John Rochfort in 1859, when a survey party led by him traversed the range heading for the coast after their canoe had capsized in rapids in the Buller River, with the loss of all of their equipment. His discovery of loose coal in a creek bed was reported to the Provincial Council in Nelson.

In July 1860, during a geological reconnaissance of western Nelson, Dr. Julius von Haast and his assistant James Burnett found a valuable seam of bituminous coal on the plateau, between Mounts Rochfort and William, at a location that he named "Coalbrookdale," after the mining district in Shropshire, England (Morgan & Bartrum 1915: 31). The Nelson Provincial Council sent James Burnett to survey the coalfield, and in his report, published in the Nelson Gazette in 1862, he estimated that 72,600,000 tons of coal could be extracted from the Coalbrookdale 'plateau' alone (Morgan & Bartrum 1915: 31).

During 1872 James Burnett, John Rochfort and a Maori called Paul made detailed surveys of the coal measures at Burnett's face and Coalbrookdale. In his report, Burnett discussed methods of transporting the coal down to Westport, and suggested that a self-acting incline would be a viable proposition (Meyer 1971: 11-12).

In 1873 a complete investigation of the Buller coalfield planned by Dr. (later Sir) James Hector in conjunction with the Public Works Department was set in hand. W.M. Cooper made a detailed topographical survey of the bituminous coal-bearing area, the result of which was embodied in a series of maps published between 1875 and 1878. R.B. Denniston was attached to Cooper's party as "coal-viewer," and he produced reports on the coal outcrops in 1875 and 1877 (Morgan & Bartrum 1915: 4).

Based on this work, and the recovery of some very good quality coal from the plateau in 1877, the Dunedin-based Westport Colliery Company was formed in 1878 as the result of the amalgamation of several small interests (see discussion below). Other coal mining companies in the area were the Wellington Coal Mining Company and the Koranui Coal Mining Company, both of which opened mines on the north side of the Waimangaroa River in the 1870s and 1880s.

To transport the coal that was beginning to be produced from the area, the construction of a railway line north along the coast from Westport had began in 1874, and was opened to Waimangaroa in 1876 and finally to Ngakawau in 1877 (Meyer 1971: 25-27). The line up the Waimangaora Valley was opened to the Wellington Coal Mining Company's mine in 1877. The rails ran up the south side of the valley, with a bridge across the river to connect to the mine on the north bank. On the hillside above the Wellington Company's mine was the Koranui Coal Mining Company's mine, and a long self-acting incline was built to carry coal down the railway. In 1878 the extension to Conn's Creek was opened by the Westport Colliery Company, to meet the bottom of the new Denniston Incline.

The Westport Colliery Company & The Westport Coal Company Ltd.

At least two companies, the Coalbrookdale Colliery Company and J.B. Fisher & Co., had interests on the plateau, but the difficulties of transporting the coal down to the coast were daunting. In 1878 these two companies merged to form the Dunedin-based Westport Colliery Company (Meyer 1971: 15, 31-32, 38; Munro 1951: 5-6). The company intended to work their Banbury coal mine on the plateau by building a narrow gauge tramway to the top of a self-acting incline, which would descend to the bottom of the Waimangaroa River valley, where it would meet an extension of the Wellington Company's railway. The engineers were Young Brothers (Henry William and Robert Austen) of Westport.

Work began on the incline in late 1878, and the last spike was driven in October 1879. The first loads were sent down in April 1880, after the two brakes that controlled the descent of the coal wagons were finished. The overall fall of the incline from the Brakehead at Denniston to the yards at Conn's Creek was 1,700 feet in a track distance of 83 chains (517m fall in 1669m) (NZ Mining Handbook 1906: 387).

Settlement on the Mount Rochfort Plateau had begun in 1871 in the area known as "the Camp," a subsided block flanking the Waimangaoroa Gorge escarpment, but about 200 feet lower than the main plateau. The first survey camp was set up there, and when the Westport Colliery Company began to develop their mining operations that is where the early huts and houses were constructed. The Camp was in easy walking distance to both the brakehead (the area at the top of the incline) and the Banbury Mine workings. Settlement later spread around the brakehead area, and then to the plateau above the brakehead, where the town of Denniston was formally surveyed in 1885 (S.O. 3524).

By 1881 the heavy costs involved with the undertaking found the Westport Colliery Company in trouble, and a new company, the Westport Coal Company Ltd., was formed in September of that year with a capital of £400,000 in 80,000 shares of £5 each, the chief shareholders of the old company acting as the directors of the new one (NZ Mining Handbook 1906: 398; Meyer 1971: 45; Munro 1951: 7).

In 1879 the output of the Banbury Mine was 2,600 tons, rising to 3,892 tons in 1880, 24,198 tons in 1881 and 50,513 tons in 1882 (Munro 1951: 12), all of which was sent down the incline. In July 1884 a tunnel had been driven right through the Banbury seam, and by 1889 production was from the Coalbrookdale Mine, the skipway or haulage road running through the old Banbury workings to reach the new mine (Meyer 1971: 53).

Transport of the coal to its markets was proving expensive due to the costs of chartering ships, and so the company ordered the construction of three colliers, the *Kawatiri*, *Orowaiti* and *Wareatea*. In 1887 the three colliers were sold to the Union Steam Ship Company in exchange for the latter company's mining interests, which included the first mile of the railway line to Conn's Creek and the Koranui Mine. The Koranui Mine and incline were then closed, all mining being concentrated on the Mount Rochfort Plateau (Meyer 1971: 35; Munro 1951: 12-13).

By 1895 Denniston had become the largest coal producer in New Zealand, with an annual production of 215,770 tons from 257 men at work underground at an average weekly wage of £2/5/-. Six steam hauling engines were at work and two mines in operation, these being Coalbrookdale and Ironbridge (Munro 1951: 13). The Westport Coal Company's output from the Denniston area reached its peak in 1910 when 446 men working underground sent 348,335 tons of coal down the incline, after which production steadily declined (Meyer 1971: 56; Munro 1951: 14). In the same year development work began on the Wareatea area, where in 1912 a seam of coal 25 to 30 feet thick was opened up (Munro 1951: 14). In 1932, in the

middle of the Depression, production declined to 106,440 tons, the lowest since 1886 (Munro 1951: 15).

In June 1929 the Murchison earthquake caused considerable damage, including a large slip on the upper incline, the main haulage plant for the skip road was buried and the boiler house chimney was demolished. The mines were idle for 14 days while repairs were carried out (Meyer 1971: 57-58).

State Mines Department

In 1948 under the Act for the Nationalisation of Coal Mines the State Mines Department acquired the coal-mining operations of the Westport Coal Company, including the Denniston Incline and Conn's Creek railway line, the latter of which was in turn taken over by the Railways Department in 1958 (Meyer 1971: 60; Munro 1951: 16).

The Mines Department decided to install an aerial ropeway to convey coal to the bins from the Whareatea and Escarpment Mines, which had been developed after the Coalbrookdale and Ironbridge Mines had reached the end of their lives in the 1940s (Meyer 1971: 60-61). The new monocable was made by Ropeways Limited of London, and was commissioned in 1952. The skip road was then closed.

In 1965 the first signs of the approaching closure of the Denniston Incline were seen, when the railways began to write off the two main types of wagon used, these being the "Q" and the "L" classes. One of the two bridges on the incline was also badly out of line and level, and there was a falling demand for coal. It was decided to replace rail transport from the plateau with road transport, and on August 16 1967 the Denniston Incline and the Conn's Creek Branch was closed (Meyer 1971: 62).

In May 1968 the Inangahua earthquake hit the region, and caused a major slip on the upper incline. If it had not closed in the previous year, this would probably have forced closure. In August 1969 tenders were called for the removal of materials, including sleepers and rails, from the incline (Meyer 1971: 63). The bins at the Brakehead survived until 1979, when they were destroyed by fire. Coal mining continues on the plateau, but all coal is now taken to Westport by road.

The Union Movement

Denniston had a key role to play in the development of the union movement in New Zealand. New Zealand's first miner's union was formed there in 1884, and in 1896 Denniston miners were the first group of workers to appear before the Arbitration Court (Richardson 1995: 5, 10).

Despite the specific instructions of the Directors of the Westport Colliery Company, British miners with a union background were brought to New Zealand in 1879 at a time when the mines were in need of skilled workers. Although refused work at Denniston, amongst them was John Lomas, who was to become the founding father of mining unionism in New Zealand (Richardson 1995: 21). By 1883 Lomas had got work at Denniston, and in 1884 he became the first president of the new Denniston Miners' Mutual Protection Society. Six weeks later the company reduced the hewing rate for coal, and on 11 December the miners came out on strike (Richardson 1995: 32). The stoppage lasted six months, and although it ended in a union victory, it had been hard won.

In 1890 the Denniston miners were amongst those that came out in sympathy with the Maritime Strike. It was a dispute that was to destroy mining unionism in New Zealand

(Richardson 1995: 44). The company used free labour in the mines, and ultimately would only give work to those who signed an agreement not to join a union (Munro 1951: 30; Richardson 1995: 50).

In 1894 William Pember Reeves' Industrial Conciliation and Arbitration Act was introduced, although it would not become effective for a further two years. This Act gave unions the means to re-establish themselves, and in 1896 the Denniston Industrial Association of Workers and the Westport Coal Company became the first disputants to appear before the Arbitration Court (Richardson 1995: 82, 84). The miners only gained some of their requests, but importantly unionism had been recognised again.

In 1912 the Union withdrew from the jurisdiction of the Court, and the Company refused to sign on men who belonged to unions outside the court. The strike was settled when the Union returned to the Court (Munro 1961: 30).

In 1923 the miners went on a "go-slow," which resulted in them all being put off work. The West Coast Miners' Federation supported the men, and the strike lasted from September 1923 until January 1924 (Munro 1951: 31). There was another strike, for seventeen weeks, in 1931, and not long after work had resumed the effects of the Depression began to be felt, and the miners cut back to part time (Munro 1951: 31). In 1951 the miners came out in sympathy with the waterfront strike, this stoppage lasting 67 days.

One notable labour agitator at Denniston was the late Hon. P.C. Webb, who came to Denniston in 1906, and organised the miners to stand up for better pay and working conditions. In 1908 he was fired and left Denniston, and later became the Minister of Mines in the first Labour government of 1935 (Munro 1951: 29).

The 2006 Archæological Survey

As discussed above in the Previous Research section, Sumner & Sumner carried out a survey that included the Denniston area in 1983. While not published, this information is still held by the Department of Conservation, and provides the best available archæological record of the overall Denniston area. The 2006 survey covered some of the same ground as the 1983 survey, and as such the earlier work is extensively referenced in the discussion below. While good scholarship requires that earlier work should be assessed critically, it is nevertheless wasteful to unnecessarily repeat work that has already been carried out. As such it was felt appropriate that the Sumner's work should be used as a basis for much of the present discussion. The 1983 survey was a wide-scale study, and while it produced numerous maps and plans, these were all sketch plans and none were to scale. The 2006 survey revisited the Middle Brake, Brakehead, Camp and Coalbrookdale and produced accurate scale plans of these areas. The 2006 fieldwork has also allowed an assessment of change and deterioration in these parts of the site over the past 20 years.

The 2006 fieldwork was carried out between November 13 and 21, by Peter Petchey (Southern Archæology), Jackie Breen (Department of Conservation) and Carmen Sarjeant (University of Otago). Three types of survey technique were used. The Brakehead area (including the site of the workshops) and the main industrial areas at Coalbrookdale were mapped using a plane table. The Middle Brake and the Camp were mapped using tape and compass, while details around the site of Denniston township were recorded using overlays on aerial photographs.

The weather for most of the fieldwork was bad, with the wind, rain and mist typical of the Denniston Plateau being much in evidence. Only one fine sunny day was encountered (many of the photographs used in this report were taken on that day), along with a couple of fine but overcast days. The use of permatrace waterproof paper allowed recording to continue throughout all weather conditions.

Access around the area is generally easy, the road up to the Plateau being an all-weather sealed road used by the coal trucks carrying coal from the operative open-cast mine. The most difficult place to get to is the Middle Brake, which can be reached by a branch off the foot track up to Denniston, or by going up or down the incline. Scrub growth, particularly gorse, in some areas around the Brakehead hindered some of the survey work. The Department of Conservation has cleared some areas of gorse, and native vegetation will in time succeed other areas, but in the meantime some house sites in particular were not recorded in detail.

The Denniston Incline
Archæological site K29/55

The Denniston Incline was in reality two separate inclines. The upper incline descended from the Brakehead to the Middle Brake, while the lower incline descended from the Middle Brake to Conn's Creek Yards beside the Waimangaroa River.

Figure 3
The upper incline and Brown's (or McDonald's) Bridge, looking up towards the Brakehead just over the horizon. (N.Z. Mining Handbook 1906).

The following is largely taken from Sumner & Sumner (1983), who in turn quoted heavily from Meyer (1971). Details of the incline's measurements are from the NZ Mining Handbook (1906):

The Incline was known as the "Eighth Wonder of the World" by locals, and at the time of its construction was the biggest civil engineering project in New Zealand. The original plans were drawn up by Young Brothers for the Coalbrookdale Colliery Company and J.B. Fisher and Company. The work was begun in late 1878, and the last spike was driven on 24 October 1879 by Miss Mary Burns, the daughter of Mr. A.J. Burns, General Manager of the Westport Colliery Company. A public holiday in Westport was declared for the opening and a special train laid on to carry people to Waimangaroa. The first load of 60 tons of coal was sent down the incline in April 1880.

The fall from the bins to the foot of the incline at Conn's Creek was 1,694 feet (516m). The upper incline measured 33 chains (663m) horizontally with a fall of 830 feet (253m); the lower incline measured 50 chains (1005m) horizontally with a fall of 864 feet (263m) (NZ Mining Handbook 1906: 387). The incline was built in two sections because of the ruggedness of the country made it impossible to take a straight line. The two sections also

increased the capacity by allowing two wagons to be lowered at the same time- one on the lower and one on the upper.

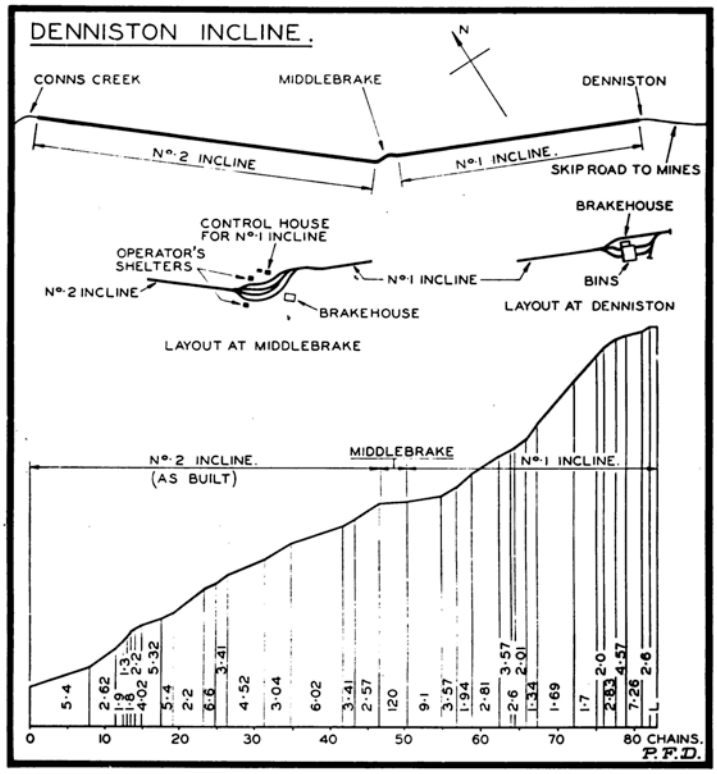


Figure 4
The Denniston Incline, showing plan and grades down the track.
(P.F. Dyer, with permission, N.Z. Railway & Locomotive Society)

The actual system used for working the incline was that of a counter balance, whereby the descending full wagon pulled up the empty one. A 4 inch circumference[1] steel wire rope was used and the rails were laid so that the rope attached to the wagon on the right or "company" side of the line was wound around its side of the drum while the rope on the other or "donkey" side unwound and let the descending wagon down the incline. For the next load the procedure was reversed.

The braking system resembled a direct-acting horizontal winding engine, but the action was directly opposite. Water was used to check the action of the pistons, instead of steam to give them motion. The water was drawn off at each stroke and replaced by a fresh supply, as the severe pressure would raise it to boiling point. There was also a very effective strap brake around the raised centre of the top brake drum that could be used in an emergency or when bringing a load to a stop. This band brake was dispensed with when it was found that it caused excessive rope wear: when the strap was in use the rope had to be replaced after it had lowered 91,000 tons of coal, but when the strap brake was not used rope life increased to 160,000 tons. The diameters of the two brake drums have been variously stated. The top drum was probably 10 feet in diameter, and the Middle Brake drum 9 feet in diameter (Handbook of NZ Mines 1887: 24; NZ Mining Handbook 1906: 400).

[1] It is often stated that a 4 inch diameter wire rope was used, even in contemporary literature (eg the Cyclopedia of New Zealand 1906: 195). This is erroneous, and probably arose because the rope size was sometimes simply given as "4 inch." Wire rope size is quoted in terms of its circumference, and a four inch circumference wire rope is approximately 1.25 inches in diameter.

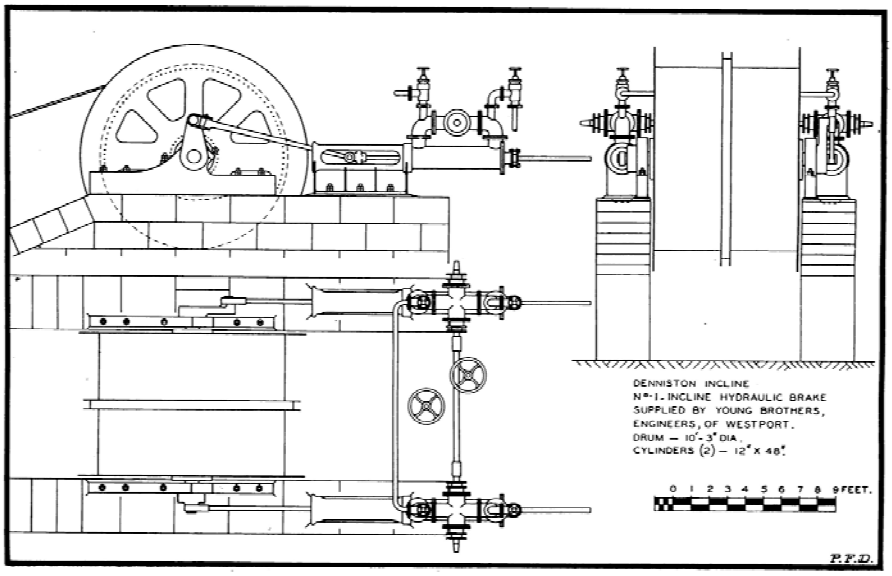


Figure 5
The brake for the upper incline.
(P.F. Dyer, with permission, N.Z. Railway & Locomotive Society)

40lb per yard flat-bottomed rails were used laid to the New Zealand standard gauge of 3ft 6in, the same gauge as the Government railway whose wagons were used. The lower section of each incline was single track, then there was a double track where the full and empty wagons passed at the midway point, and a three rail track on the upper section with a single track on each side for ascending empties which arrived on alternate sides. The single track at the bottom and double track at the top was necessitated by the fact that the two ropes were in motion at the tops of the inclines and might foul; while at the bottoms, below the passing points, only one rope was in motion.

Initially ordinary railway wagons were used but later some were fitted with fixed hoppers to make coal unloading easier. Eventually the 'O' class fixed hopper wagon came into use. It was followed in 1897 by the first 'Q' class removable hopper (see Figure 6). 'L' class highside four wheel wagons were also used. In the final days of the incline 'Q', 'L' and 'E' class wagons were being used. The wagons could hold 8 tons of coal but because of the slope of the incline only 7 tons were loaded and the top was trimmed back to avoid spillage. In 1898 Thomas Waters (the Westport Coal Company's engineer) stated that the time spent on the upper incline was 2 minutes and on the lower 2.5 minutes. He suggested that 12 wagons per hour was normal. Openshaw, however, said that at times of peak production with proficient workmen 18 wagons per hour was considered normal.

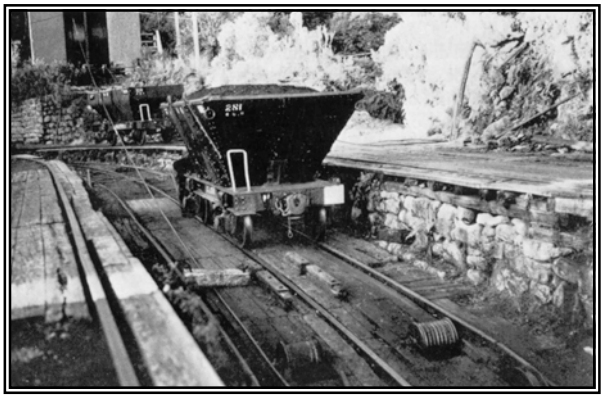


Figure 6
Two "Q" wagons at the Middle Brake. The full wagon in the foreground was about to descend the lower incline. The brake itself is in the background (R.J. Meyer, with permission, N.Z. Railway & Locomotive Society).

Scattered throughout the bush on either side of the incline are the wrecked remains of runaway wagons. If the cable broke, there was nothing that could stop a wagon from running out of control. The runaway would either derail and end up smashed beside the incline, or carry on to the bottom, where at least one ended up in the Waimangaroa River. In 1901 the loss of a wagon would cost the company £116 (Meyer 1971: 53). But a derailment or accident would also often damage the incline, holding up operations until repairs could be made. At the beginning of Denniston's history the incline was the only method of transporting goods or people up the hill. This was dangerous due to the risk of a break-away, and after the construction by 1884 of the foot and horse track, riding the wagons was strictly forbidden.

In 1965 the first rumours of closure were heard, and 'L' and 'Q' class wagons began to be written off. With a drop in demand for coal the incline became uneconomic, as it took the same number of men to operate it regardless of tonnages carried. At 11:59pm on Wednesday 16 August 1967 the incline and Conn's Creek Branch were closed (Meyer 1971: 62). In May 1968 the Inangahua earthquake hit the region, and caused a major slip on the upper incline. If the incline had not closed in the previous year, this would probably have forced closure. In 1969 tenders were called for the recovery of all materials, including sleepers and rails.

The proposed 2007 reprint of Meyer's *Coaling from the Clouds* will include a new chapter on the history of the incline since its closure, and a more detailed interpretation of the rail layouts on the upper and lower inclines.

The Upper Incline

The upper incline measured 33 chains (663m) horizontally with a fall of 830 feet (253m). From the Brakehead the incline dropped steeply down to Brown's (or McDonald's) Bridge below the wagon crossing point. The bridge was initially constructed from timber, but it was later replaced by an iron bridge (which still survives, see discussion below). Below the bridge the line curved slightly to the west to come into the Middle Brake.

At the top of the incline, at the Brakehead, the most significant feature associated with the incline is the foundation for the brake (Figures 7 and 8). This is a stone structure (with some concrete strengthening), in contrast to the Middle Brake foundation that is of concrete. The brake foundation is located in the middle of the area where the railway yards at the top of the incline were situated. It was here that the wagons were marshalled before being filled with coal for their descent back down the incline (see Figure 8).

Figure 7
The foundation for the brake for the upper incline in 2006. Figure 8 (below) was taken looking in the opposite direction.

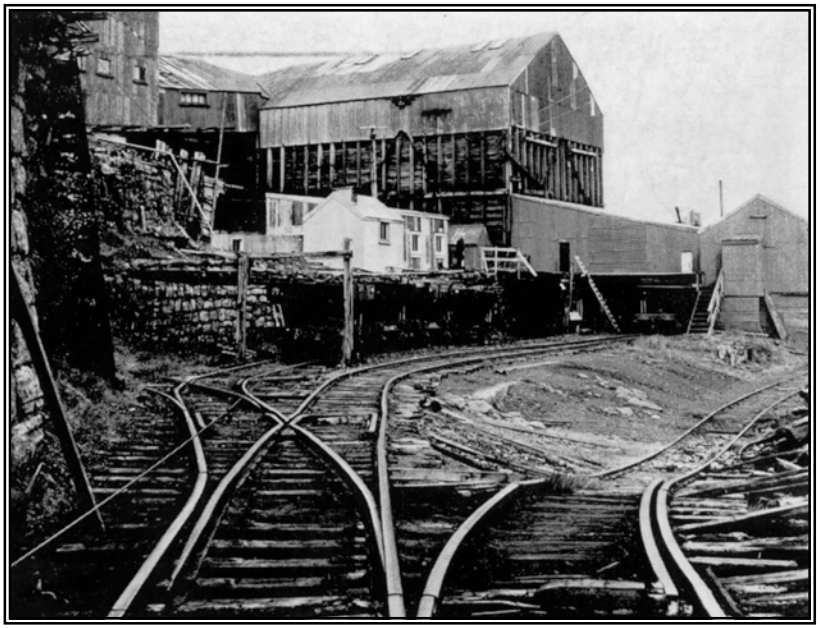


Figure 8
The Brakehead area in the 1960s. The top brake shed is to the extreme right, and the bins are to the left. The wagons were loaded beneath the extension visible between the bins and brake house. (G.T. Radcliffe, with permission, N.Z. Railway & Locomotive Society).

Since the archæological survey was carried out in 2006, the rail in this area has been relaid to reconstruct the yards for display purposes (Figures 9 and 10).

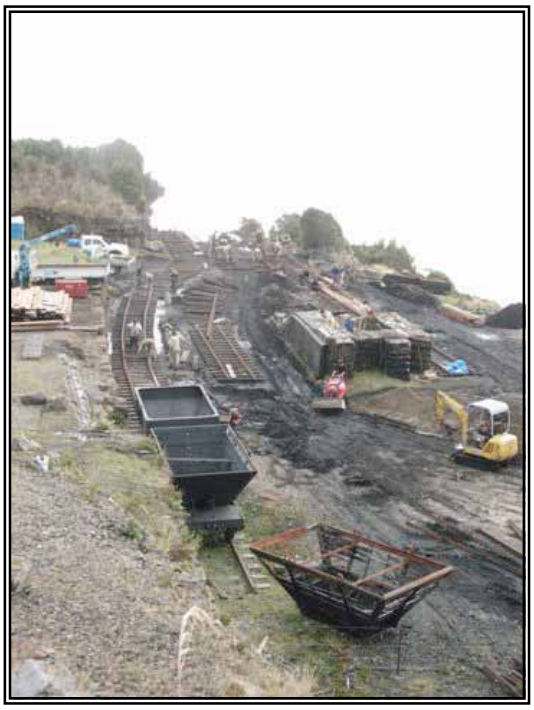
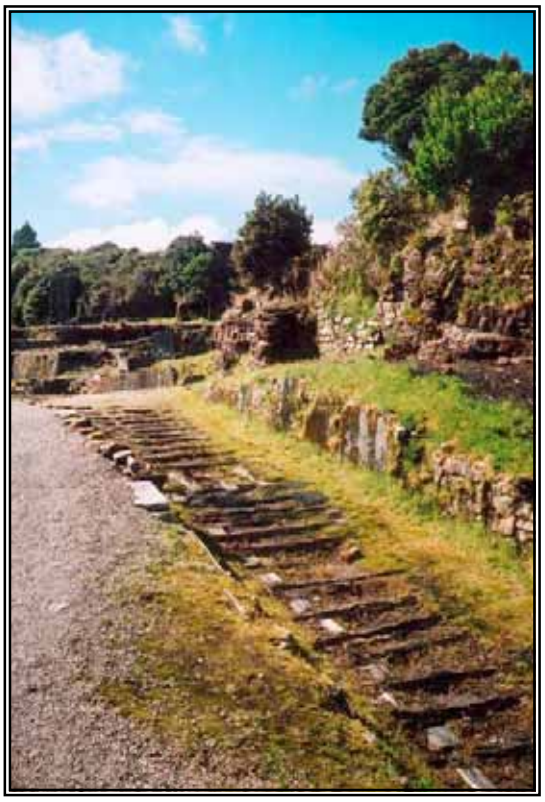


Figure 9 (left)
Work in progress in 2007 relaying rails at the Brakehead (J. Breen, DoC)

Figure 10 (below)
Rails being laid at the top of the incline in 2007 (J. Breen, DoC).

Figure 11
The top of the upper incline in 2006, before rail laying started. The original sleepers of the incline were still clearly visible.



A short distance over the brow of the incline is the slip caused by the 1968 earthquake. A viewing area is located near the top of this material, and a good view down the incline and out to the coast can be had on a fine day. Below the slip the railbed of the incline is extremely steep, and is littered with coal, sleepers, rail spikes and occasional rails.

Figure 12 (left)
A view up the upper incline in 2006, from below the bridge. The Brakehead is just over the horizon.

Figure 13 (right)
The opposite view, looking down the incline from below the 1968 slip. The Waimangaroa River valley and the coast are in the background.

Sumner & Sumner (1983: 11-14) provided a detailed description of items and features heading down the incline. This is reproduced below (with updates as necessary). Sumner & Sumner quoted their distances in yards, and these were probably estimated. The same units are quoted here, but the reader can probably safely substitute metres without significant loss of accuracy.

- A track leads down to a viewing point near the top of the slip.
- There are a few sleepers at the very entrance to the incline.
- Three-quarters of the way down the slip there are rails and some stonework.
- Below the slip three rails are in position. On sleepers and pegs there is good walking for about 80 yards. There are rails and stonework beside the track.
- 80 yards below the slip a steel and wood wagon body lies in the bush.
- For the next 80 yards the going underfoot is loose coal, stones and loose sleepers.
- 50 yards beyond the wagon there are some old rails and stone cobbling is visible under the sleepers.

- 60 yards beyond the wagon there are more rails and stone steps beside the track.

- The track crosses a gully. Just before it does the sleepers are loose and patchy. There are many sleepers, loose coal, rails and one wagon body in the bottom of the gully.

- As it crosses the gully the track widens. This is the beginning of the original passing place for the wagons ("the loop"). The track narrows again to cross the bridge. The sleepers are firm. There is scattered coal, loose rails and wire cable. On the north side of the track there are some still-fastened rails. Some sleepers are formed into water channels and some have cable grooves cut into them.

- At the end of the gully is an embedded cable roller. 80 yards beyond the end of the gully the steep top gradient ends. There are many sleepers, many of them firm. There are also wire ropes.

Figure 14 (right)
A detail of the upper incline, looking uphill, in 2006. Surviving sleepers and copious quantities of coal are visible.

- Where the foot track from the bridle track emerges on to the incline the gradient is relatively gentle. There are more loose rails and wire ropes.

- 30 yards beyond the track emergence on the south side of the track there are wagon chassis parts.

- The incline crosses a gully on a bridge (Known as Brown's or McDonald's). It has a 40 yard span. The first (uphill) span has been cut and felled. Other spans are in place but the sleepers are loose and rotting and many are missing.

- Beside the bridge foundation there are one wagon chassis and two wagon bodies (one steel and one wood). Another 15 yards on is another wagon chassis. Another 15 yards on there are some wagon wheels under the bridge.

Figure 15 (left)
Looking down on Brown's/Mcdonald's bridge. The first span has been cut away, but otherwise it is still intact. However, the ironwork is extremely rusty and potentially unstable. Of a number of cable stays that have been connected to the bridge to stop it toppling downhill, only one (in the right foreground) remains intact.

Figure 16 (right)
A detail of the legs of one of the piers of Brown's/McDonald's bridge on the upper incline. As can be seen, some of the steel members are extremely rusty. It is not known whether the angle irons bolted to the legs were to raise the structure or to repair rust-weakened areas.

Figure 17
The twisted chassis of a 'Q' wagon underneath the bridge on the upper incline.

- 20 yards beyond the bridge and 10 yards into the bush north of the track was an old shed that was in reasonable condition in 1983. By 2006 is had partially collapsed.

- In 1983 the track was very overgrown. It is now kept clear by the Department of Conservation.

- In 1983 there was appoints lever and rail plates just before the track swung left into the Middle Brake. This area is now buried by a slip.

- Middle Brake (see below).

The Middle Brake

The Middle Brake was the division between the upper and lower inclines. Wagons that had been lowered down the upper incline were unhitched and manhandled to the top of the lower incline, down which they continued their journey to the yards at Conn's Creek. Figure 18 shows a full wagon just arrived down the upper incline, in the process of being attached to the wire rope from the brake ready for its transfer to the lower incline. Figure 19 shows a similar wagon about to descend down the lower incline, with an empty having arrived up at the 'Donkey' side.

Figure 18
A 'Q' wagon and the brake shed at the Middle Brake, looking back towards the upper incline. (G.T. Radcliffe, with permission, N.Z. Railway & Locomotive Society).

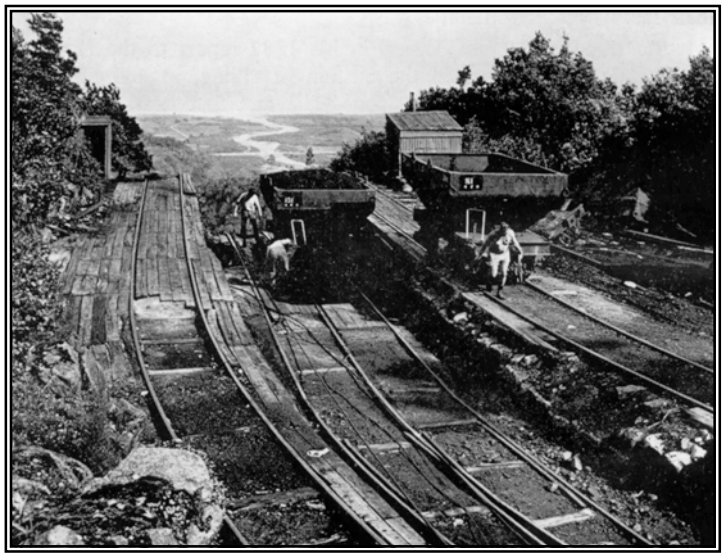


Figure 19
Two 'Q' wagons at the top of the lower incline at the Middle Brake. The wagon on the right has just come up the 'Donkey' side. (G.T. Radcliffe, with permission, N.Z. Railway & Locomotive Society).

Less material was removed from the Middle Brake after the incline closed than from the Brakehead, probably because of the difficulty of moving large amounts of scrap iron without the incline in operation. This even included the brake drum, which was finally removed in 1978 for display in the Coal Museum at Westport (*Westport News 8/6/1978*).

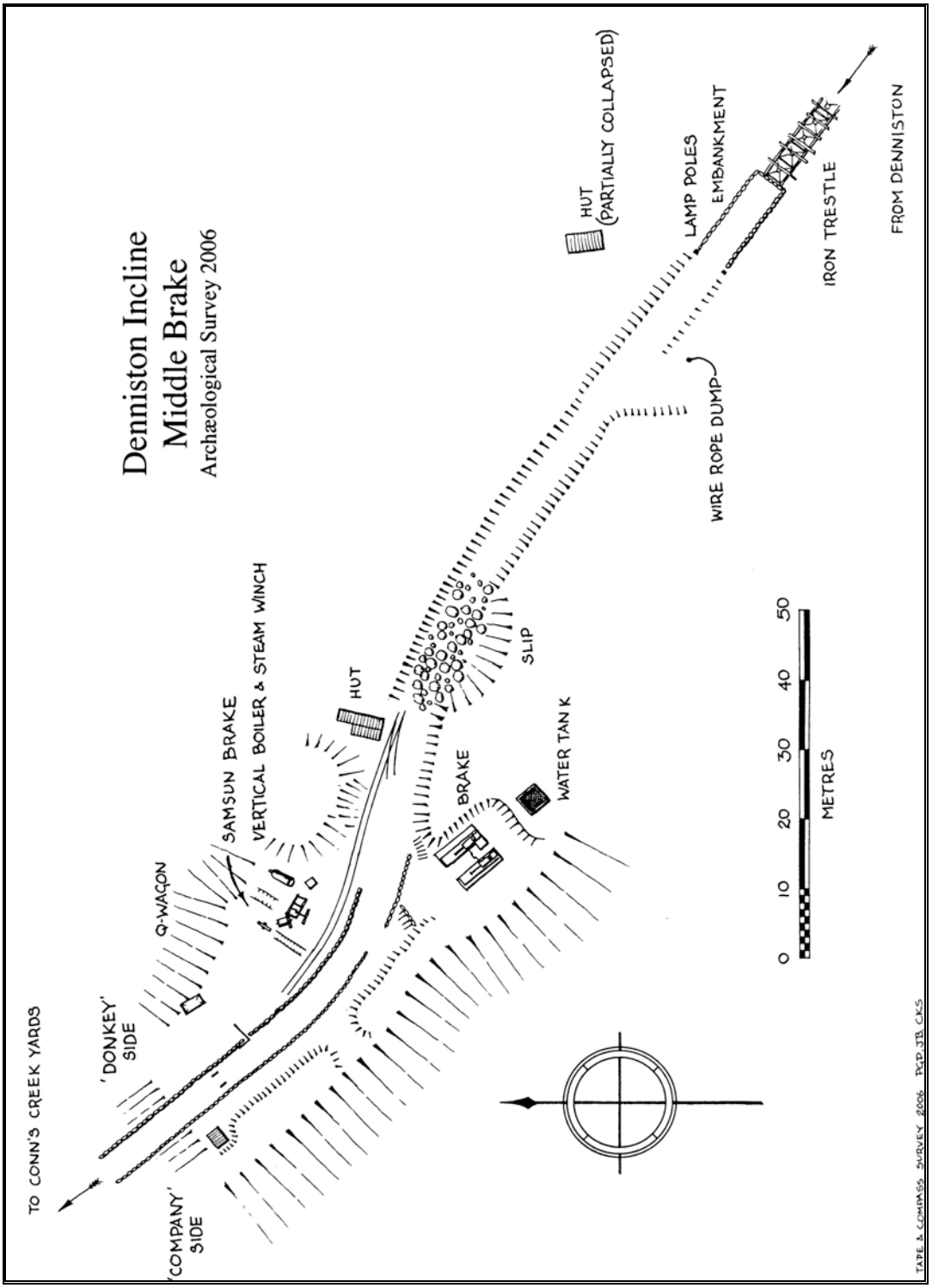


Figure 20
Map of archæological features at the Middle Brake in 2006.

Site Description

The Middle Brake is one of the most intact industrial areas at Denniston, as it inaccessibility meant that much equipment was left on site. A tape and compass map of the area was made in 2006, showing the main surviving archæological features (Figure 20). Sumner & Sumner (1983: 14) also described the site, but since their visit a slip has come down in the bottom cutting of the upper incline, immediately above the Middle Brake. A smaller slip directly across the rails from the brake foundations has been cleared away by the Department of Conservation, although the larger rocks were still on site at the time of the site visit.

The larger slip has covered the points lever that Sumner & Sumner recorded, but the corrugated iron shed on the NE side of the line is still standing, although decay in its timber framing is becoming noticeable. The hut is in a very dark and shady spot. The top of the brick chimney has fallen. The hut measures 10ft. 3in. by 21ft. 3in. (3.12m by 6.48m).

Figure 21
The shed beside the rails at the south-eastern end of the Middle Brake.

Outside this shed is a set of points, and a length of rail is still in situ running onto the 'Donkey' side of the Middle Brake.

The concrete foundations for the brake itself stand on the south side of the Middle Brake area. The cast iron water cylinders are still in place, and it is therefore clear that although the drum was removed in 1978 for museum display, the cylinders that are currently with the drum in the Coaltown museum are not from the Middle Brake. On the hillside behind the brake foundations is the concrete water tank, used to maintain a constant supply of cool water to the brake cylinders.

Figure 22
The Middle Brake foundations and cylinders in 2006.

The brake foundation overlooks the main area of the Middle Brake, where the double line of the lower incline went over the lip, and where the 'Company' and 'Donkey' side lines came up on slightly raised platforms. As discussed above, part of the 'Donkey' side line is still in place. Several cable guide pulleys remain in place in the channel for the main line.

Figure 23
A general view in 2006, looking back towards the brake foundations, while standing on the 'Company' side return line. This is a similar view to that in Figure 18, taken while the incline was working.

Figure 24
Cable guide wheels at the Middle Brake. These are situated in the central railbed where the loaded wagons were rolled to the lip of the lower incline. They guided the main hauling cable.

Figure 25
A general view in 2006 looking out towards the coast from in front of the brake foundation. This is a similar view to that in Figure 19, which was taken while the incline was working. Note the intact railway lines on the right ('Donkey') side.

On the north-eastern side of the Middle Brake is a disassembled steam winch and a vertical cross-tube boiler (lying on its side).[2] Next to these is a shallow channel leading to a braked wheel, which was part of the Samsun Brake. This was used to lower each wagon to the brow before the main rope was hitched on, ensuring a gentle tensioning of the main rope.

Figure 26
The dismantled steam winch at the Middle Brake. In the top right background can be seen the slip that has blocked the bottom of the upper incline.

At the top of the lower incline, on the 'Company' side, one of two operator's shelter sheds is still standing, although it too is suffering from decay of the timber framing. It is a small corrugated-iron clad shed, measuring 8ft. by 6ft. 6in. (2.43m by 1.95m).

Figure 27 (left)
The surviving shelter shed on the 'Company' side of the Middle Brake, at the top of the lower incline.

Figure 28 (right)
The same shed in the 1960s, while the incline was still in use. This photo was taken to illustrate the use of a stop block on the line. (R.J. Meyer, with permission, N.Z. Railway & Locomotive Society).

[2] This winch was probably converted to electric power at some time in its life, and an electrical control box can be seen in Figure 26 (upper right) (J. Staton pers. comm.).

The Lower Incline

The lower incline had gentler grades than the upper incline. It descended 864 feet over a distance of 50 chains (Meyer 1971: 43). At its base the line curved to the west to run in to the Conn's Creek yards (see Figure 29). In 1900 the bridge over Conn's Creek was rebuilt, and a trestle alongside the hillside on the incline above the bridge was replaced by an embankment (Meyer 1971: 55).

The lower incline

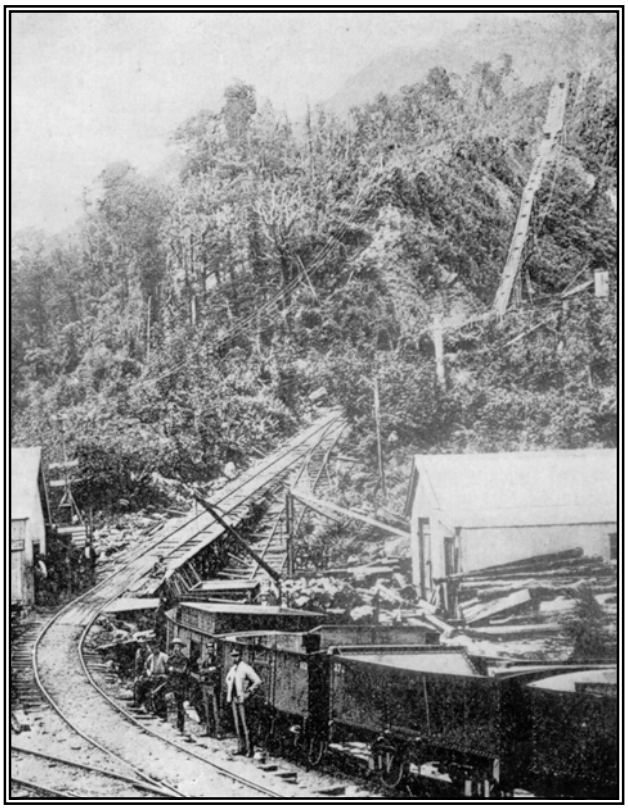


Figure 29
A view up the lower incline from Conn's Creek taken before 1900. The trestle in the top right of this view was later filled in with soild cut from the adjacent hillside. At the bottom of the incline is a line of early 'O' class wagons. (H.T. Locke, with permission, N.Z. Railway & Locomotive Society).

As for the upper incline, Sumner & Sumner (1983: 15-17) produced a detailed description of the lower incline, which is reproduced here, with appropriate updates. Once again, the original measurements in yards as quoted by Sumner & Sumner are used.

- The track drops over a lip from the Middle Brake. The going under foot is loose.
- The first 100 yards are relatively gentle.
- After 15 yards there are some points rails.
- After 30 yards there are several sets of points.
- At 100 yards there is some mechanism, possibly a points component.
- The next 200 yards are steeper and firmer after dropping over a slight lip. The going is easy (downhill) with sleepers laid along the track (there are many sleepers scattered beside the track for the next 400 yards).

- The track eases slightly and then drops again for another 200 yards. Some of the rock in the rail bed has been grooved by the haulage cables.

- The track then narrows sharply (after the wagon-passing section). It is about another 470 yards to the bridge over Conn's Creek.

- The bridge has been felled into the creek where there are concrete foundations and the felled iron truss of the bridge. There is a wagon chassis by the creek and a wagon below it.

- It is about another 180 yards to the foot of the incline at the Conn's Creek yards.

Figure 30
A view up the lower incline from the Conn's Creek yards in 2006, with the hydraulic crane on the right.

Conn's Creek Yards
Archæological site K29/54

Conn's Creek was probably named after a Mr. Conn and party who picked up a 5.5 ounce nugget of gold in the Waimangaroa River in 1879 (Meyer 1971: 35). The railway to Conn's Creek was constructed in 1878 by the Westport Colliery Company, as a 55 chain extension to the line built by the Wellington Coal Mining Company to their mine on the bank of the Waimangaroa River. The extension to the line (and presumably the original yards) were designed by Young Brothers of Westport, the contract for construction being awarded Day & Blair (Meyer 1971: 32).

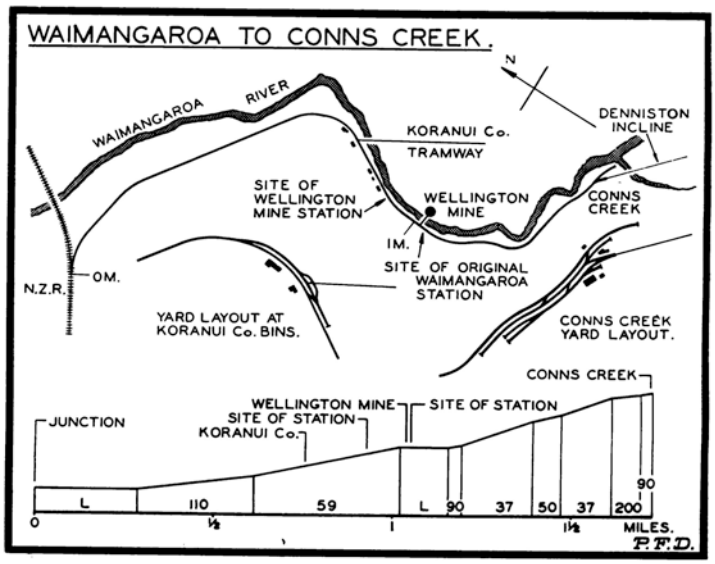


Figure 31
The Conn's Creek branch, including the layout of the Conn's Creek yards. (P.F. Dyer, with permission, N.Z. Railway & Locomotive Society)

The Conn's Creek yards, along with the Conn's Creek Branch, closed in August 1967 when the Denniston Incline (their sole reason for operating) also closed (NZ Railway & Tramway Atlas).

Figure 32
The Conn's Creek yards, probably in the 1950s or 1960s. The incline came in from the left, and the Conn's Creek Branch departed in the centre middle distance. The hydraulic crane on the left is still on site in 2006. (G.T. Radcliffe, with permission, N.Z. Railway & Locomotive Society)

Site description

The Conn's Creek yards are easily accessible, as the old Conn's Creek Branch is now used as a road, and the site of the yards is a carpark at the base of the Denniston Incline. A long backshunt beyond the yards beside the Waimangaroa River is also still kept open as a vehicle track. Much of the original stone revetment can still easily be seen on the south-western side of the road (on the right hand side as one drives into the yards). There is also some impressive stonework below the old railway formation on the road into the yards, particularly where the rails were carried above a bend in the river.

The walking track at present follows the path that the laden coal wagons followed on their descent into the yards. Empty wagons waiting their turn to be hauled back up the incline sat in a siding immediately beside the hydraulic crane (see Figure 32). The crane was used to place good into wagons for transport up to the Brakehead.

The Department of Conservation maintains two 'Q' coal wagons and the old hydraulic crane at the yards (Figure 33, and see also Figure 30). There are no standing remains of the buildings that once existed at the yards, but there is likely to be evidence in the surrounding bush.

Figure 33
Conn's Creek yards in 2006. Two 'Q' wagons and the front of a 'Q' chassis can be seen on the right. The hydraulic crane is beyond them (compare this with Figure 32). The cleared line of the lower incline can be seen in the bush beyond the crane.

The Brakehead

Archæological site K29/58

The Brakehead is the area around the top of the incline. It included the brake and rail sidings for the incline, the coal bins and screens, winding gear for the roperoad/skiproad, workshops, mine office and in the early years was also one of the major commercial and recreational areas.

The original 1885 survey of the Town of Denniston (S.O. 3524) showed that the Brakehead and the Camp were the two main centres of activity. At the Brakehead Elliot and Argyle Streets were lined with buildings, including McGill's Denniston Hotel, a bakery and several stores. There were also numerous company-owned cottages, not all of which were on a formal road line. In the early 1880s the Company built the "Denniston Athenæum and School of Mines," which was later renamed "The Westport Coal Company Employees' Club and Institute" (known as 'The Club') which was complete with billiard tables, card room and library (Munro 1951: 24).

In about 1905 new bins were erected to increase the storage of coal, principally to meet Admiralty requirements (Cyclopedia 1906: 195). The new bins provided storage for some 2,800 tons of coal. The bins were fitted with shaker screens, which operated in connection with steel-plate travelling picking-belts that ran longitudinally with the bin. The belts were fitted with automatic tippers, which could be regulated to deliver coal to any part of the bins. Steel-plate conveyers, running the whole length of the bin, underneath each row of openings, were operated to load the coal into the railway wagons (NZ Mining Handbook 1906: 401).

In the power house at the Brakehead in 1906 there were four boilers with a combined output of 496 h.p., and these supplied power for main haulage along the rope road and at the coal sorting plant, as well as the dynamos for providing electric light (Cyclopedia of New Zealand 1906: 195).

In 1909 there was a big fire in the Brakehead area, and several hotels and shops were destroyed (Munro 1951: 24). But the biggest change came in 1923 when the Company required extensions to the bins, and many buildings in the Brakehead area were demolished. The Club was dismantled and re-erected on Jamieson Street (Munro 1951: 25). Elliot and Argyle Streets effectively ceased to exist.

Examination of 1946 aerial photographs (Run 1275) show that even after the extension of the bins, a number of small cottages still existed in this older area of town. Further modification occurred in 1967 when a new road was cut down from the top of the plateau above to allow motor trucks to drive in to the base of the bins after the incline closed.

The bins themselves survived until 1979 when they were destroyed by fire.

Site Description

The overall Brakehead area is shown in detail in Figure 37. In general, there is little equipment left on site, and most features consist of various concrete foundations, and stone revetments fronting the various levels of the site. There are three main levels: the incline brake and rail yards level; the bins foundation level; and the rope road, power house and workshops level. A revetted ramp joins the bin and power house levels. These levels have been partly cut out of bedrock, and partly constructed using fill behind stone revetting.

Figure 34
A general view over part of the Brakehead area, showing the top of the incline (top right), and brake foundation in the middle of the rail yards area (right). On the higher terrace to the left is the water tank for the pressure accumulator (left centre) and bins area (beyond water tank).

Figure 35
A view of the Brakehead area from the opposite direction to Figure 34. The photograph was taken from near the top of the incline. Looking up towards the power house and rope road terrace. The bins were off to the right.

Some areas of filled ground are now beginning to cause serious problems, with slumping and subsidence evident in a number of places, and with the partial failure of some stone revetments. One section of unusual revetment, showing a high degree of improvisation on the part of the builders, was constructed by using coal tubs (as used for hauling coal from the mines) filled with slack coal (Figure 36, and marked as 'I' on Figure 37).

Figure 36
Coal tubs used as a revetment, fronting the ramped track between the bins level and power house level.

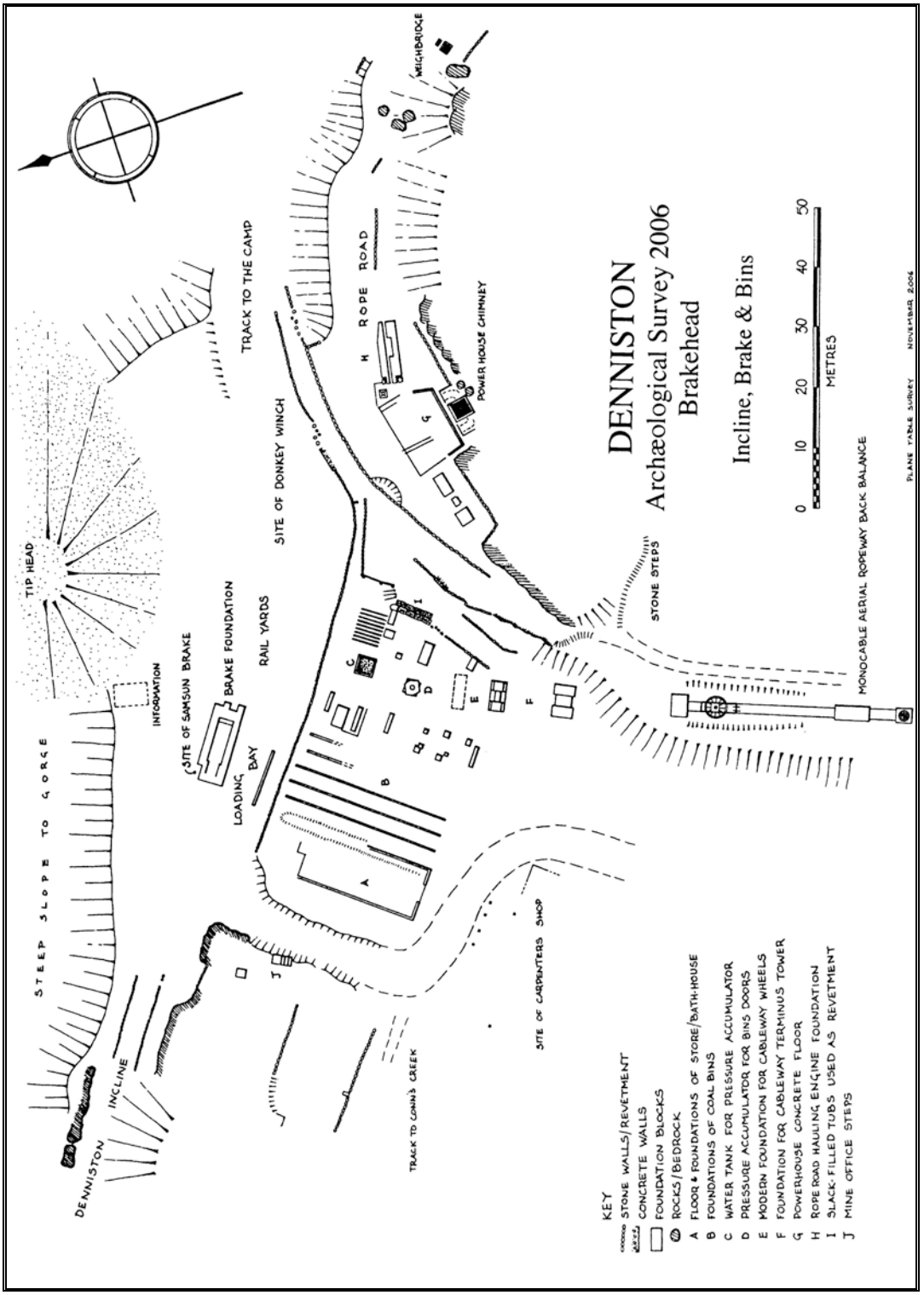


Figure 37
Map of the archæological features at the Brakehead in 2006.
The Incline top, Brake, Bins, Power House, Rope Road Hauler, Monocable Aerial Ropeway.

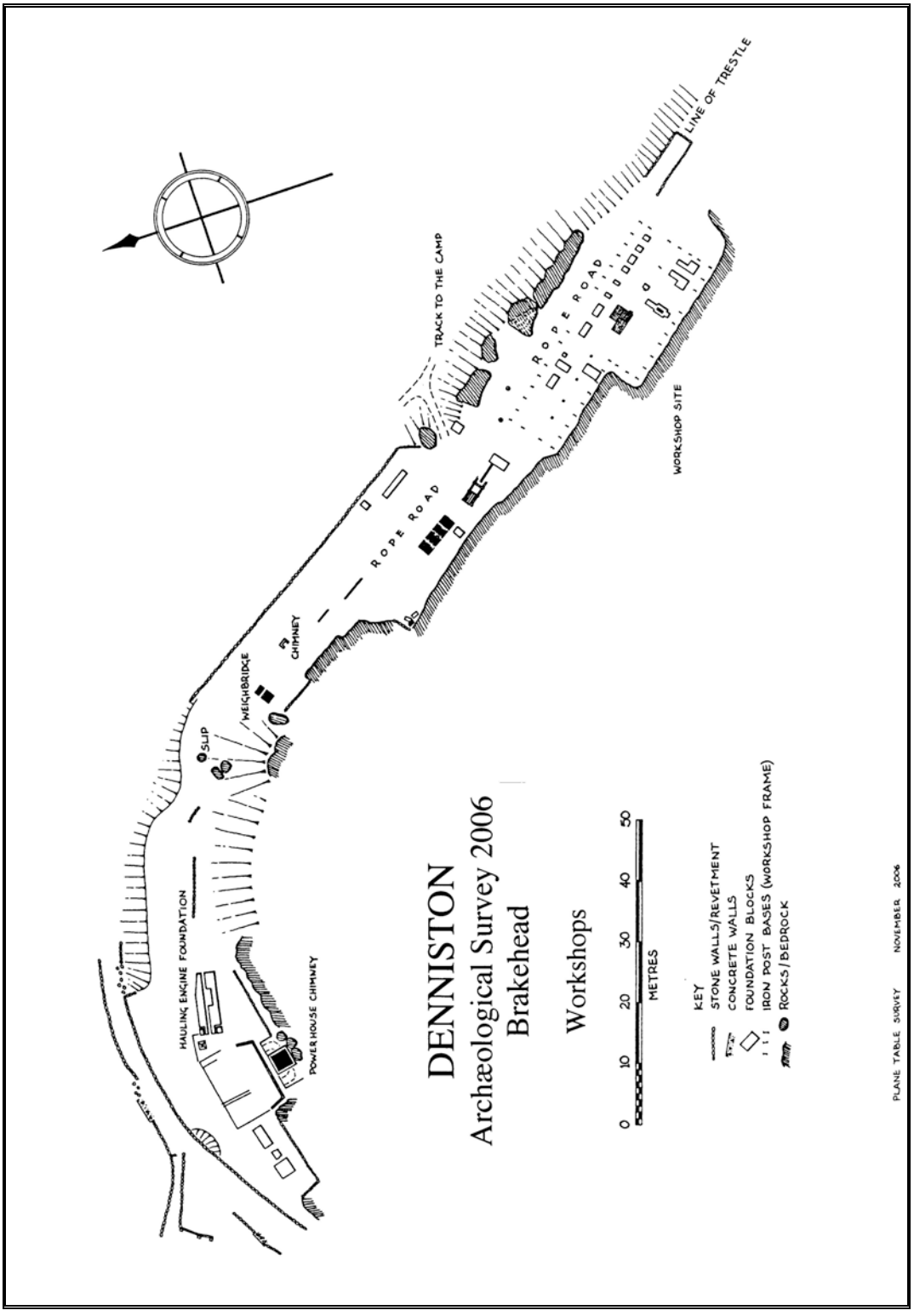


Figure 38
Map of the archæological features at the Brakehead in 2006.
The Power House, Rope Road Hauler and Workshops.

The Bins & Screens

All that remains of the bins themselves are a series of heavy timber beams set into the ground ('B' in Figure 37, and see also Figure 39). There is ample evidence of the fire that destroyed the bins in 1979, as the timber beams are charred, and there is still a great deal of coke (created by heating coal in the absence of oxygen, as would have happened in the centre of the fire). Although most of the debris of the destroyed bins have long since been cleared away, a surviving cast iron cable wheel is sitting on the site, and has been distorted in the fire (Figure 40). As iron melts at 1,535°C, this illustrates how hot was the fire at the bins.

Figure 39
A general view of the bins site from the carpark above. The bins were in the centre of this view. To the upper right is the top of the incline. The road that curves around behind the bins was cut when the incline closed in 1967 to allow trucks to load from the bins.

Figure 40
An iron cable wheel at the bins site. Note how this has begun to distort in the heat of the fire that destroyed the bins.

There are a series of concrete foundations on the bins level. The cement floor on the north-western side of the bins is the remains of the store building ('A' on Figure 37). On the south-eastern side of the bins are the foundations for the Monocable aerial Ropeway ('F'), the pressure accumulator for the bins doors and hydraulic crane[3] ('D') and the water tank for the pressure accumulator ('C'). Also on the site are the remounted main return wheels from the aerial ropeway ('E'). The concrete mounts for these wheels are modern and intrusive.

[3] The hydraulic crane was similar to the one that survives at the Conn's Creek yards. It was mounted beside the rail yards, and was removed in 1967 when the access road to the bins was cut.

The Power House and Winding House

The power house and winding house for the rope road were situated on the top terrace of the Brakehead site ('G' and 'H' on Figure 37). The power house was equipped with four boilers, but all that remains now is the concrete floor and the base of the stone chimney, the top of which was demolished by the Murchison earthquake in July 1929. The chimney base displays some of the finest stonework to be found at Denniston, all of the revetment work at the Brakehead being quite rough. The concrete bed of the hauler for the rope road is situated immediately to the east of the power house. To the west of the boiler house site are a series of concrete foundations for a generator (J. Green, pers. comm.).

Figure 41
The concrete bed for the rope road hauler in the foreground, with the boiler house site behind. At the left rear is the ashlar masonry chimney base for the power house.

Weighbridge

From the hauler site, the rope road formation leads of to the south, towards the workshops site (Figure 43). On the rope road formation the remains of the weighbridge are still obvious (Figure 42), close to the brick chimney from the Smoko Shed (see Figure 43).

Figure 42
The weighbridge on the rope road between the workshop and power house sites.

The Workshops

The site of the workshops is on the steep hillside above the Camp. The workshop area was partly blasted out of the bedrock, and partly built up with fill behind a large stone retaining wall. The overall area is long and thin, measuring 100 metres by approximately 15 metres. The rope road ran through the middle of the site, and several rollers are still in place where a slight change of direction occurred.

Figure 43 (left)
A view along the site of the workshops in 2006, standing on a slip boulder beside the weighbridge. This view looks directly down the line of the rope road. The rocks on the right have names and dates marked on them. The chimney of the smoko shed is on the left.

There were numerous buildings in the workshops complex, including the Fitters' Shop, Welding Shop, Blacksmiths' Shop, Tub Repair Shop, and various storage sheds. What remain now are numerous concrete machinery beds, the stubs of iron girders from the frameworks of some of the buildings, timbers and a scatter of artefacts (see Figures 43 and 44).

Figure 44
The site of the Fitters' Shop in 2006. The concrete beds for various lathes and the steam hammer can be seen. The rope road formation is on the right.

Over the retaining wall on the north-eastern side of the site a large amount of debris has been dumped. This includes iron girders, iron sheet and steel rope. This is probably the scraps from remains of the buildings, after the majority had been taken away for scrap.

Sumner & Sumner (1983) produced a large sketch plan of the site showing the features visible then, which all still visible today. Another plan of the site has also been made, and is held by the Department of Conservation West Coast Conservancy. This is unsigned, but interprets the remains, and is accompanied by a drawing (probably a tracing of a photograph) that shows the layout and function of the main buildings. The information from these drawings is shown here in Figures 45 and 46.

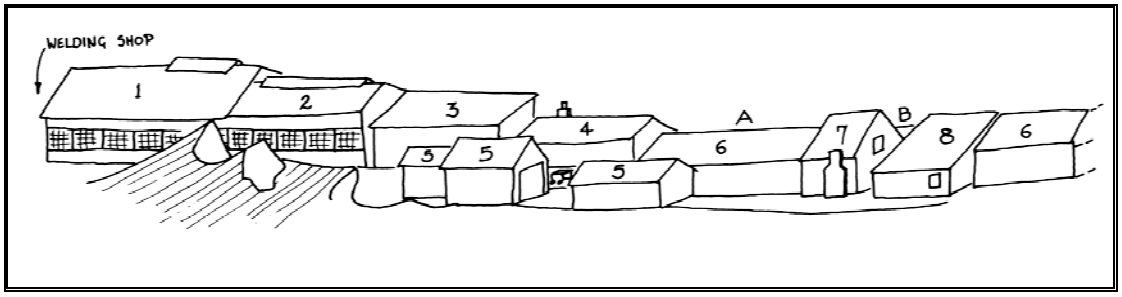


Figure 45
Drawing of the workshops area as it appeared when in use.

1	**Fitters' shop**	**2**	**Blacksmiths' shop**
3	**Tub body shop**	**4**	**Tub repair shop**
5	**Storage sheds**	**6**	**Shelter over rope road (continued around to bins)**
7	**Smoko shed**	**8**	**Weighbridge & token cabin**
A-B	**Clipping area**		

Note: the welding shop was on the end of the Fitters' shop, and in shadow in the original view.

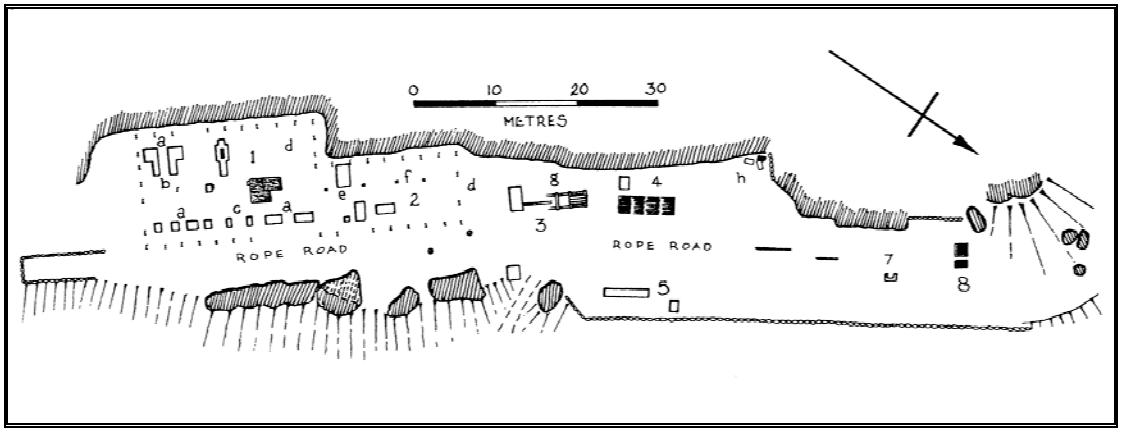


Figure 46
Plan of archæological features at the workshop site in 2006. For key see Figure 38. Areas marked 1 to 8 as for Figure 45.

a	**Lathes**	**b**	**Gas production**
c	**Steam hammer**	**d**	**Storage area**
e	**Forge**	**f**	**Supports for steel bench**
g	**Foundations for punching, rolling & shearing machines**		
h	**Area for storing repaired tubs.**		

The Rope Road

The rope road was the means by which coal was transported from the various mines on the plateau to the bins at the Brakehead. It was a double 2ft. gauge tramway along which tubs of coal were hauled by an endless wire rope (originally a chain was used). Full tubs were hauled to the bins on one tram line, and empties were returned along the other. The original haulage way was from the Banbury Mine, which was then extended to the Coalbrookdale Mine when a tunnel was driven right through the Banbury workings.

By 1900 the old haulage road through the Banbury workings to the Coalbrookdale workings (see discussion below) had become unreliable as the result of ground movements and high maintenance, and between 1900 and 1904 it was replaced by a surface rope road (Meyer 1971: 55). The new rope road was 120 chains long, and included a 6 chain tunnel and an iron trestle and girder bridge (Sumner & Sumner 1983: 78). The rope road to the Brakehead was powered by a steam engine at the Brakehead end, and ran to the junction near the 'Wooden Bridge' (at Burnett's Face). There it met the subsidiary rope roads from the Coalbrookdale Mine (1 mile 60 chains long) and the Ironbridge Mine (1 mile 14 chains long).

Figure 47
The rope road between Burnett's Face and the Brakehead in about 1906.
(Morgan & Bartrum 1915)

The rope road was laid with 30lb to the yard steel rails, to a gauge of 2ft., carrying mine tubs with a capacity of 12cwt. (609kg). The tubs were attached to the rope by means of chain clips, and were delivered to the screens at a rate of eighteen score per hour (NZ Mining Handbook 1906: 400).

The rope road was abandoned in 1952 when a new monocable aerial ropeway was commissioned (see discussion below). The ends of the tunnel were blasted closed sometime after closure.

Figure 48
The rope road trestle just past the workshop site in about 1906. The old tramway to the Banbury Mine can be seen to the left, at a lower level than the far end of the new trestle. (Morgan & Bartrum 1915).

Site Description

The early rope road to the Banbury Mine can still be partially followed. It is described in the section on the Banbury Mine below.

The later rope road stretches from the Brakehead to Burnett's face, and can be traced easily for most of this distance (see Figure 2). The places where it can no longer be seen or followed are in the area of the main power house (not the early power house at the Brakehead) where it has been buried by coal by a modern coal storage operation, and through the tunnel as this has been blasted at the entrances. The rails have been lifted, but occasional roller and other items can be found.

From the Brakehead the rope road passed the workshops and then immediately was carried on an iron trestle (Figure 48). Most of this trestle has now collapsed or been felled, and many twisted girders and cast iron posts lie in the scrub. But a short length at the south-eastern end is still standing (Figure 49).

Figure 49 (right)
The remaining section of the rope road trestle in 2006.

Beyond the trestle the rope road ran in a series of shallow cuttings or embankments across the plateau. Much of this line is now partially overgrown, and sections in cuttings have become boggy. One section where the rope road passed Denniston, and a side road crossed the rope road twice, has had the two road bridges replaced by embankments, effectively damming the rope road, which is now flooded for a distance (Figure 50).

Figure 50 (left)
The rope road formation where it passes Denniston. A road embankment has blocked the cutting, causing it to flood.

The Monocable Aerial Ropeway
Archæological site K29/59

In the 1950s the Mines Department decided to install an electrically-powered aerial ropeway to convey coal to the bins from the Whareatea and Escarpment Mines (Meyer 1971: 60-61). The new monocable was made by Ropeways Limited of London, and had a capacity of 800 tons per day. It was commissioned in 1952, and the surface rope road was then closed. After the closure of the incline in 1967, continuing falling demand for coal resulted in the ropeway also being closed in 1968. It was replaced by road haulage from the mines to the bins (Meyer 1971: 63).

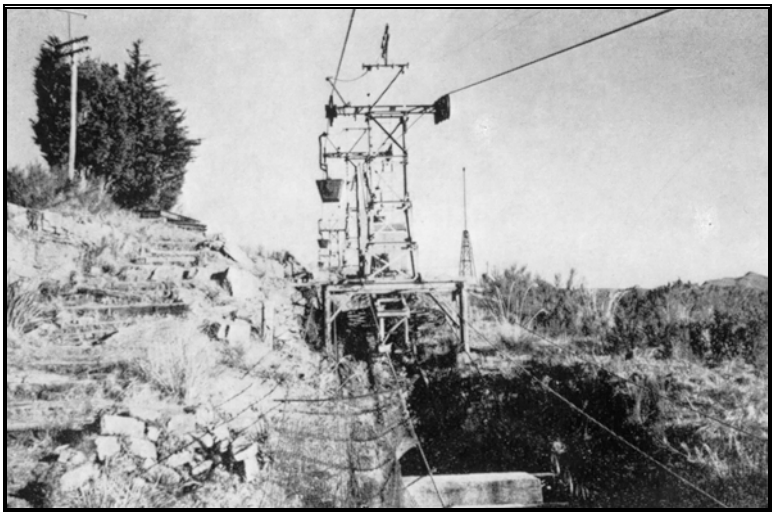


Figure 51
The tensioning equipment and towers near the bottom of the Monocable Aerial Ropeway in 1967. (R.J. Meyer, with permission, N.Z. Railway & Locomotive Society).

Most of the cableway towers were removed for scrap, but several were left standing and are now maintained by the Department of Conservation (see Figure 53). The terminal tower at the bins (with giant return wheels) and the tensioning mechanism were also left on site adjacent to the bins. The terminal tower remained for some years after the bins were destroyed by fire in 1979 (Figure 52), but it was finally demolished in the 1990s. The two return wheels were then set up on new concrete plinths in front of the place that the tower stood.

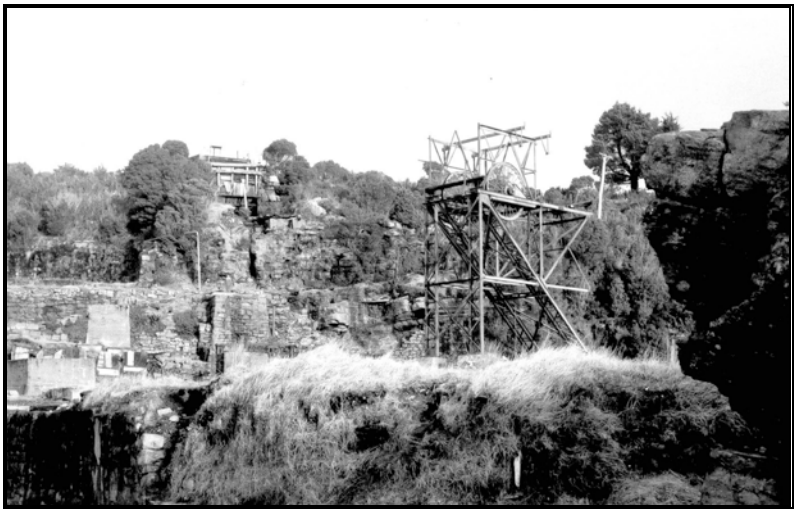


Figure 52
The Monocable Aerial Ropeway terminus tower at the Brakehead in 1988.

Figure 53
The surviving aerial ropeway tower above the Brakehead in 2006. This tower is maintained by the Department of Conservation. Two buckets have been mounted on the tower to give an impression of how it would have appeared when working. Note that the buckets have been braced to withstand the strong winds in this area.

Parts of the cable tensioning apparatus do survive, on the hillside above the bins site (Figure 37). These consist of the tension trolley (Figure 54), part of the back balance adjustment, and the back balance weight. The way these operated is illustrated in Figure 55.

Figure 54
The Monocable Aerial Ropeway tension trolley in 2006. This can also be seen in the middle of Figure 51, beneath the closest tower.

Figure 55 (over page) is a reworking of an unsigned drawing of the mechanism held by the Department of Conservation, with some interpretation by Frank Hawes of Waimangaroa that was obtained in 1983. The aerial cableway brought buckets of coal from the Whareatea and Sullivan Mines. The full buckets arrived at the end of the ropeway and were transferred to the "meat rail" where they were tipped, their contents emptied into the bins, and then they were returned empty to the outgoing rope. To maintain an even tension on the ropeway the cable went around one return wheel and back to the large wheel mounted on the tension trolley, and then back to the other return wheel and out again on the cableway. The tension trolley was attached to the back balance weight, which maintained an even tension on the rope. Adjustments could be made using the back balance adjustment, that had an electric motor drive allowing the tension trolley to be moved forward or back.

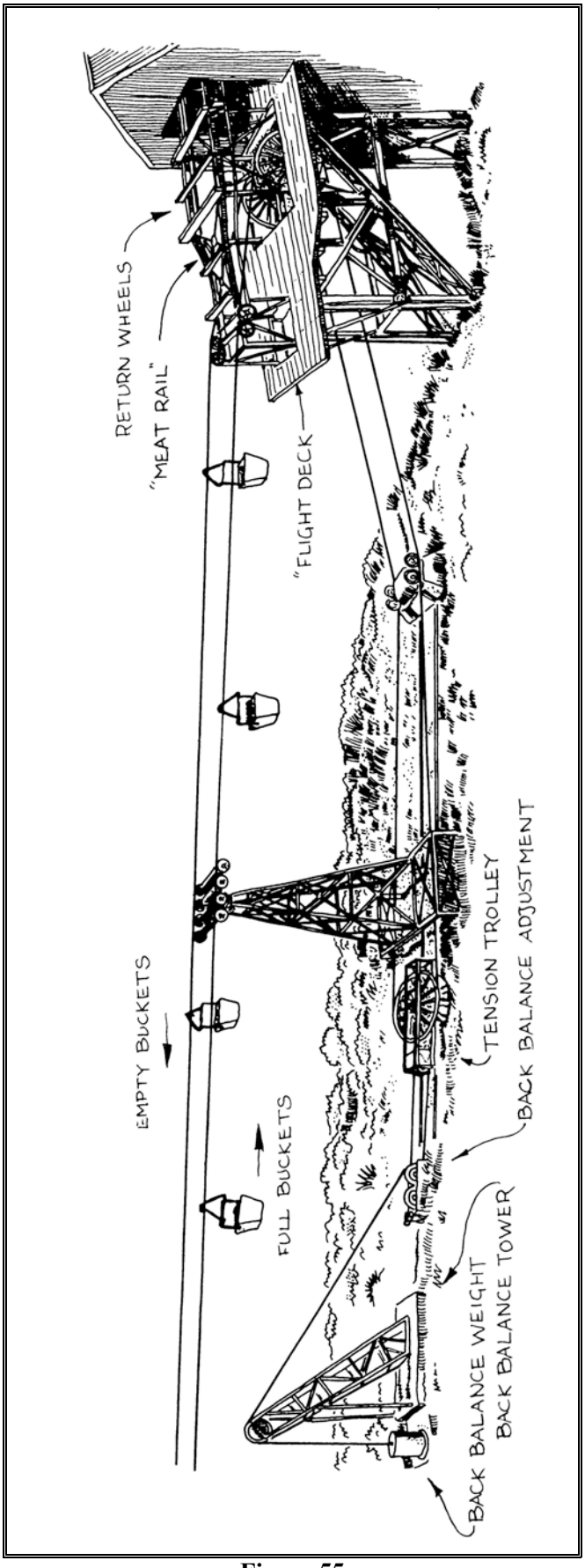


Figure 55
The Monocable Aerial Ropeway terminus & tensioning mechanism

The Banbury Mine, Banbury Arches & Early Tramway

Archæological site K29/60 (Banbury Mine); K29/61 (Banbury Arch)

The following is largely quoted from Sumner & Sumner (1983: 34-36):

The Banbury was the closest mine to the Brakehead and first to be worked at Denniston. Originally known as the Fisher Mine, its name was changed to Banbury in 1880 (Morgan & Bartrum 1915: 32). The coal was of good quality but the seam was only 3 feet to 4 feet thick and extraction was labour intensive. Work was slow in the Banbury seam because water seepage made the roof unsafe and a lot of timbering was necessary. There was no market for slack coal and thousands of tons was dumped- some down a chasm in the mine and rest over the side of the hill at the Brakehead.

A 28 chain, 2 feet gauge double track horse tramway was constructed to connect the Brakehead and mine mouth. The tramway included a viaduct that was 15 feet from ground to rail level and approximately 4 chains long. The grade of the tramway was 1 in 120 in favour of the loaded tubs. The director of the Westport Colliery Company talked in February 1880 of buying a locomotive to work this line but nothing came of it. In 1883 the horses were replaced by an endless chain, powered by a steam hauler. The endless chain, 3/4in in diameter, rested on top of the tubs in Vs (Handbook of NZ Mines 1887: 23).

The mine began operating in 1878 and 2,600 tons of coal were produced in 1879. The coal was packed in sacks at the mine mouth. The first load was sent down the incline in 1880, in which year 3,892 tons were produced. Once the incline was in use production increased substantially, 24,198 tons being sent down in 1881 and 50,513 tons in 1882.

By July 1884 a tunnel had been driven right through the Banbury seam, and by the end of the year the Company was ready to exploit the Coalbrookdale seam. This had been their original aim, as the Coalbrookdale seam was much bigger than the Banbury, and different rates of pay applied to the seams because of the difficulties of the job at the Banbury.

The haulage road was extended right through the Banbury workings to the Coalbrookdale Mine, but the extra distance showed up the disadvantages of the endless chain, which was replaced by the endless rope in 1887.

Between 1884 and 1886 the Banbury and Coalbrookdale Mines were worked simultaneously, but after 1886 the Banbury ceased production and was used only as the haulage route to the Brakehead. By 1887 the iron bridge which would link up to what was to be the Ironbridge Mine was under construction. By 1889 the Coalbrookdale and Ironbridge Mines made Denniston the largest coal producer in New Zealand with an annual production of 215,770 tons.

By 1900 the haulage route through the old Banbury workings was proving unsatisfactory for the tonnages being produced, and a new overland rope road to the bins at the Brakehead was completed. The old Banbury workings were then abandoned, but for a period the route through the mine was kept open as an alternative walk to work for the miners during wet weather (NZ Mines Record, V. 10, 1906/07).

Site Description

The Banbury Mine is accessible along the old tramway formation, but this is quite overgrown, and the site of a trestle has to be skirted around. It is reached by following an unmarked (and not maintained) track from the end of the workshop near the Brakehead (see Figure 60). This is the point at which the 'new' rope road met the old tramway formation. The Department of Conservation has recently been clearing the vegetation from around the mine entrance and the Banbury Arch, and during this work a second, smaller arch was found to exist next to the main arch (J. Breen, DoC, pers. comm.). The Banbury Arches can be viewed from below, via a track through the Camp. Since the 2006 survey was carried out the Department of Conservation has placed a series of coal tubs on top of the Arches, which can be viewed from this viewpoint.

The Banbury Mine has been gated just inside the portal to prevent visitor entry. It is not known how much of the underground workings remain standing.

Figure 56
The Banbury Arches in 2007, after vegetation clearance. Note the coal tubs placed on the tramway in the same year (J. Breen, DoC).

Figure 57
The entrance to the Banbury Mine in 2006.

Denniston Settlement

Including the Camp, the settlement at the Brakehead, and the surveyed town

The following is largely taken from Sumner & Sumner (1983)

Settlement on Denniston dates from 1871 when the first survey camp was established in the area known as 'The Camp' (Matthews). Until 1880 there was no township as such. The construction workers who were temporarily housed at 'The Camp' during the week went down to Waimangaroa or Westport at the weekends. Once the development of the colliery was almost complete, the company undertook an extensive building programme to provide basic housing for the mining population. The first houses were rough 2-roomed cottages followed, in 1881, with the first 4-roomed cottage. In 1882 there were a dozen or so cottages divided between the Brakehead and 'The Camp' with the one store about halfway between the two (Smallholme-Fraser 1978: 55).

Living conditions were squalid. The cottages were utilitarian in the extreme- small wooden buildings with a roof and chimney of corrugated iron. There were no sanitary facilities and no running water. Oil drums doubled as ovens and kerosene tins served for most other household purposes (Smallholme-Fraser 1978: 57).

The plateau was not a healthy place to live. Visitors complained of the unsanitary "smelly" aspect of the township. And there was very little soil, it was impossible to bury refuse and most of it was dumped over the cliff or in the creeks. When a short spell of dry weather exhausted their water tanks, residents had to walk some distance to find pure water for household purposes (Smalholme-Fraser 1978: 60).

Even in 1919 similar conditions prevailed. A report to the Coal Industry of that year stated "much of the industrial unrest and dissatisfaction of the miners may be attributed to the sordidness of their housing conditions and monotony of their home life. There is no proper water supply or drainage. Conditions generally are insanitary and the surroundings are dreary in the extreme. In spite of the disadvantages under which the occupants labour, some of the houses are kept in excellent manner, tended with the greatest care and pride, but these stand out as isolated examples among the general mass of inconvenient, unhealthy and crowded homes." A doctor, living on the Hill in the 1920s also talked about "crude looking, unpainted" company houses and "poor, rather neglected" homes.

Added to the squalid living conditions was the cost of living on Denniston. In theory a miner's projected weekly wage over a 5 day, 60 hour week was £4/5/-, which compared very favourably with other workers in New Zealand in the 1890s (Smallholme-Fraser 1978: 15). Real wages, however, were not only tied to the nature of the working place and the availability of work but were also tied to the cost of living on Denniston and this was extremely high because of the isolation of the township- thus minimising the benefits of the supposed higher wages. Coal mining was in fact characterised by financial uncertainty and danger (Smallholme-Fraser 1978: 15-21).

In spite of these problems, the new inhabitants immediately set about the task of creating a community. Lectures were held, a Drum and Fife band and later the Banbury Brass Band came into being. A school was started, church services were held and the community also acted together to secure adequate medical services (Smallholme-Fraser 1978: 57-59). By 1885, social activities had broadened and the Denniston track was completed (Smallholme-Fraser 1978: 63). By 1887 there were three hotels, a postal and telegraph office, four general stores, three butchers and three bakers (Smallholme-Fraser 1978: 67). The settlement quickly spread from 'The Camp' and the Brakehead areas up onto the plateau itself. The township

was surveyed in 1885 and by 1889 when the first Roman Catholic church was built on Church Street the main area of settlement on Denniston must have been established.

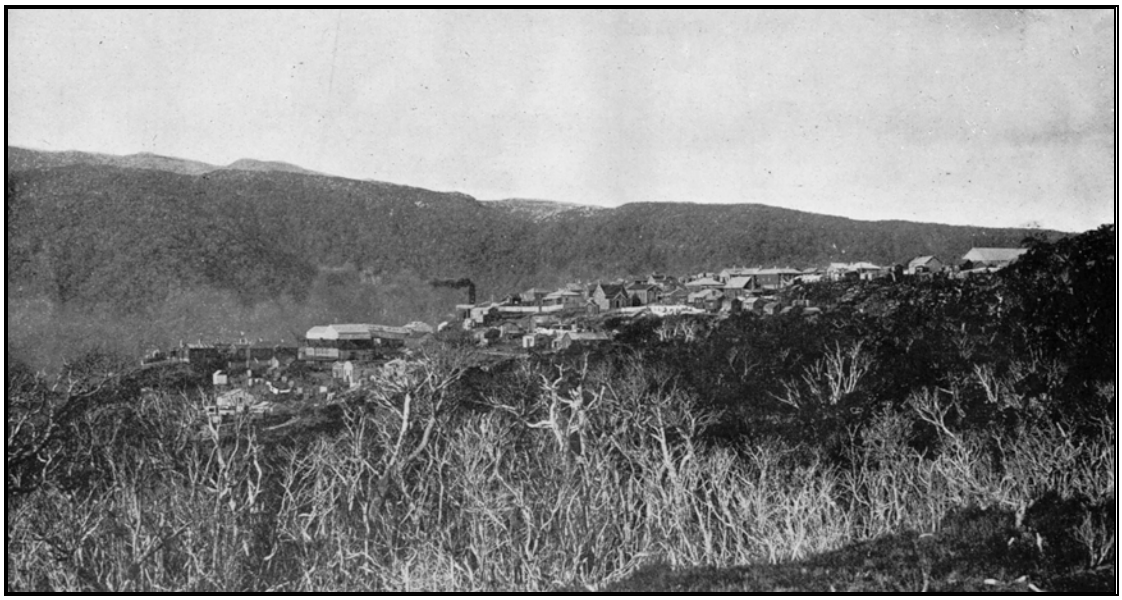


Figure 58
Denniston in 1906. The bins at the Brakehead can be seen to the left of centre, with the smoke from the power house chimney to their right. By this date houses were spread from the Brakehead all the way up to the plateau (Morgan & Bartrum 1915).

"The miners on Denniston not only worked together but necessarily lived together. Their families shared a common fate. Company housing was a great leveller of status differences and the year of hardship they shared on Denniston created a bond of loyalty seldom found in other communities. The settlement became inward-looking and socially self-sufficient- a typical coal mining community, set apart only by its unique situation" (Smallholme-Fraser 1978: 44).

The peak of population came in 1926 when there were 910 people living in the township (Dept. of Statistics). This was probably the first census recorded after the establishment of the Marshallvale settlement. With the Depression of 1932-35 the shift from the Hill began- many houses being sold for removal. The process continued after World War II, many residents having shifted their houses in sections for re-erection at Waimangaroa or Westport. The strike of 1952 was the last straw with many men moving away to find work elsewhere. For those that stayed, the provision of special buses for miners made it no longer necessary to live on the Hill and enabled them to enjoy the milder climate and the amenities of life on the coastal plain.

The 1960s saw the closure of the school, the hospital, the last shop and the last hotel and in 1971 the last of the public buildings, the Post Office closed- exactly 88 years after postal services were first established in 1883.

The Camp

The Camp area is a subsided block flanking the Waimangaroa gorge escarpment, but approximately 200 feet (60 metres) lower than the main plateau. The Camp was flanked to the south by a steep rock face and the main haulage road to the Banbury Mine entrance at the far end of the Camp, while the northern limit was the steep slopes of the Waimangaroa gorge.

The Camp was the site of the first survey camp in 1871, and subsequent initial settlement on the plateau also took place there. A store was started at the Camp by William Hoskie, and in 1886 William Harrison built another store and hotel there (Munro 1951: 9). Other hotels at the Camp were McMahon's "Sons of Freedom" and Shearlock's "Royal" (Munro 1951: 9).

An 1886 survey (S.O. 3678) showed the Camp in detail (Figure 59). This plan showed the school house, Harrison's Hotel, public library, butcher's shop, and 37 other buildings. All were labelled, some simply as "huts," some by the name of the owner, but most simply as "W.C.C." for the Westport Coal Company, who owned most of the houses. Most of the buildings were situated along the main track through the Camp. This road was shown simply as a right of way on the 1886 plan (S.O. 3678), while the large road reserve (Camp Street) had only a few small cottages along it.

The early cottages were of the small 'gable-roof with lean-to' type, with usually a corrugated iron shed with shelves as a general purpose storeroom and wash-house and the usual toilet shed sited over one of the numerous crevices which provided sewerage. Most of these cottages were wired to the solid rock for security against the north-west winds which swept across the Camp (from "N.Z. Coal" magazine, June 1961, quoted in Sumner & Sumner 1983: 7).

By 1946, when a series of aerial photographs was flown over the plateau (Run 1275, Nos. 6 & 7), just seven or eight buildings appeared to still be standing. These were situated mainly near the distinctive kink in the main street through the Camp. The school house and Harrison's Hotel had both gone by this date.

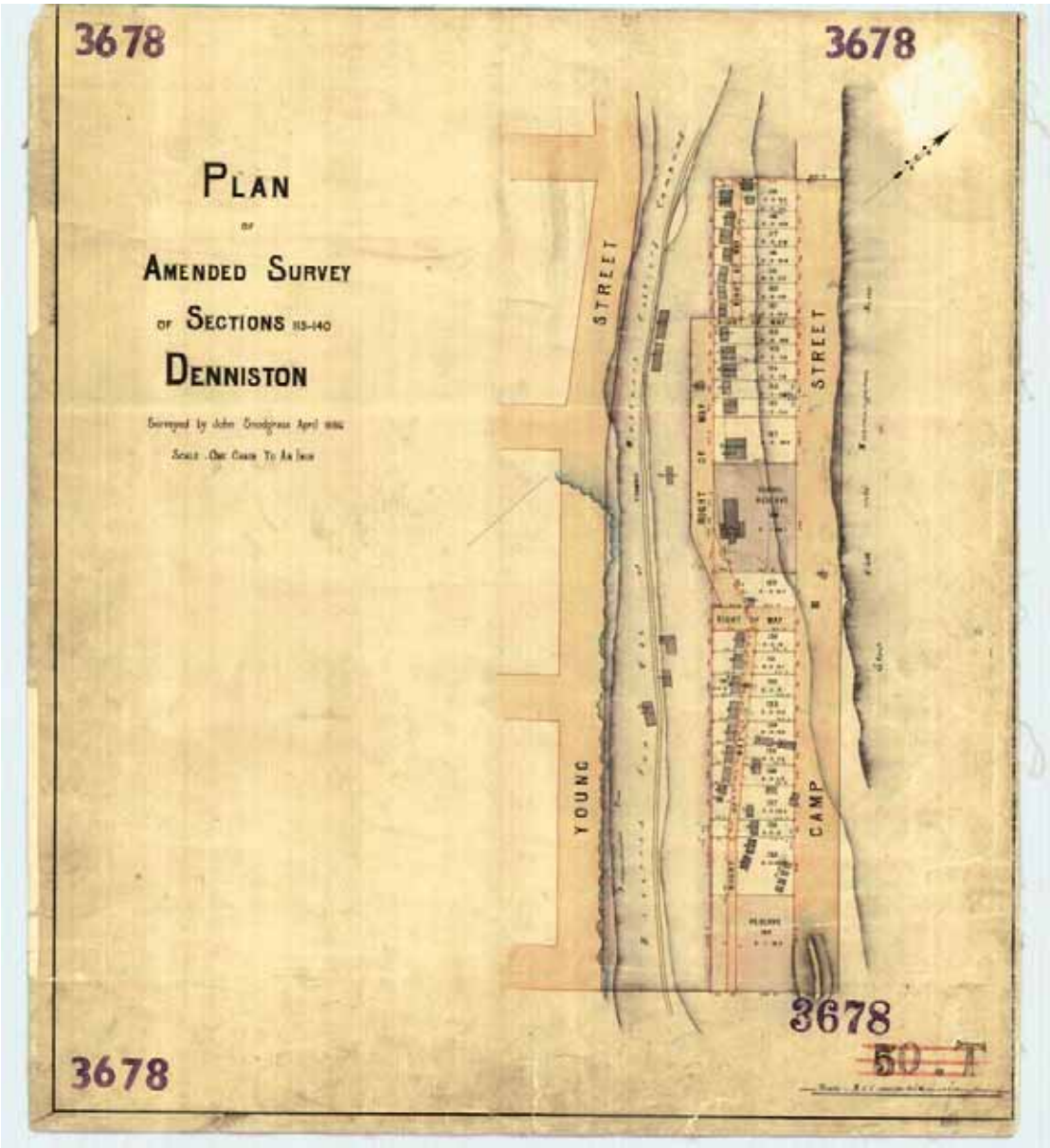


Figure 59
The 1886 plan showing details of the Camp.
(S.O. 3678)

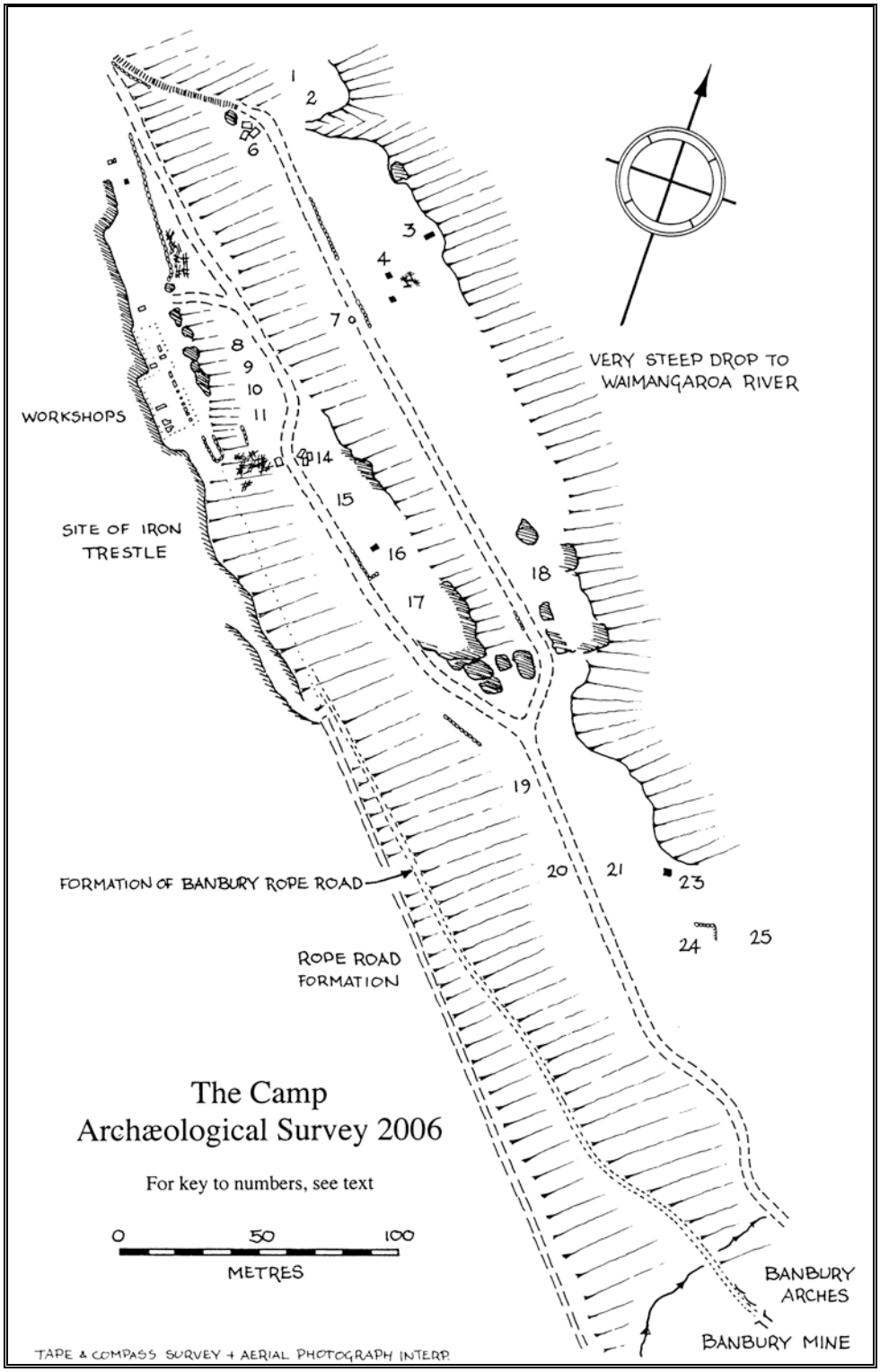


Figure 60
Plan of the archæological features at the Camp in 2006. This plan also shows the positions of the Banbury Mine entrance, Banbury tramway and the workshops.

Site Description

The site of the Camp was surveyed in 1983 by Sumner & Sumner, and they recorded a 20 building sites in the area, including the school site. [4] In 2006 the site was again inspected, and a tape and compass traverse made around the main walking tracks, which still follow the original road lines. The vegetation growth obscures most of the archæological evidence, while any timber and many metal items are gradually decaying away in the wet conditions.

From the Brakehead a track leads around to the south-east, and this forks. The left hand fork descends a 50 metre flight of stone steps to reach the bottom road of the Camp. The right fork goes along beneath the stone retaining wall of the workshops and continues on as the main upper road of the Camp, and ultimately leads to the lookout point for the Banbury Arches. The lower road joins this road 300 metres after the first fork, meaning that is easy to walk in a loop around the site in about ten minutes. The tracks are kept clear by the Department of Conservation.

The 2006 map of the site (Figure 60) includes the sites described by Sumner & Sumner (using their numbering). The list of sites below is taken from their report, with 2006 updates. Missing numbers (12, 13) are for the workshops, which are discussed separately here.

1	House site-	Wooden piles and foundations
2	House site-	Two chimney bases and fallen chimneys. Coal range top.
3	House site-	A large chimney base, fence of wood and steel plates.
4	House site-	Brick chimney base.
5	House site-	Concrete steps, fence posts, wooden piles.
6		Three overturned rope road tubs.
7		Fan wheel.
8	House site-	Nothing left.
9	House site-	Nothing left.
10	House site-	Chimney base.
11	House site-	Nothing left (overgrown).
12-13		Workshops etc (discussed separately).
14	House site-	Fireplace.
15	House site-	Large tin chimney (lying in grass), bolts in rock, fence posts.
16	Hotel site-	Harrison's Hotel. Fireplace covered in ivy (Figure 61), fence posts.
17	School site-	Opened in 1883 and continued in use as a side school for some time after the new school on the plateau was opened in 1891. Used by the Salvation Army for services in the 1890s (Munro). All that remains now are the steel bolts and posts in the rock.
18	House site-	Nothing left.
19	House site-	Overgrown.
20	House site-	Overgrown.
21	House site-	Nothing left.
22		15" – 16" diameter pipe sticking out of ground.
23	House site-	Brick fireplace, fence posts.
24	House site-	Nothing left.
25	House site-	Fence posts, concrete water tank built into the rock.

N.B. These house sites were identified by an old resident who lived in the camp during the twenties and early thirties. Presumably at one time there would have been more buildings in the Camp of which no visible trace now remains (Sumner & Sumner 1983: 8-10).

[4] Sumner & Sumner also recorded the Workshops as part of the Camp area, but here they are discussed separately.

Figure 61
The overgrown (by introduced ivy) brick chimney of Harrison's Hotel (site 16) at the Camp in 2006.

Figure 60 also shows the close proximity of the Banbury Mine to the Camp, which would have been an important consideration in the late 1870s when work began in the area. Within 15 years some men were having to walk several miles to work as the system of mines and rope roads expanded.

Denniston Township
Archæological site K29/57

As discussed above, settlement on the plateau began at The Camp, and later spread to the area around the Brakehead. In 1885 the Town of Denniston was formally surveyed (S.O. 3524), and this survey shows both the obvious intent for the town's development (with the formal township largely situated on the plateau above both the Camp and the Brakehead), and the then-current situation (with most existing buildings at the lower two sites). By the late 1880s the development of the Town of Denniston was probably well underway.

The peak of population was in 1926, when 910 people were recorded as living in the township. The decline began with the depression of 1932-35, when people began moving away and houses were sold for removal. The Second World War and the 1952 strike only fuelled this movement off the Hill. The school, hospital, last shop and last hotel all closed in the 1960s, and in 1971 the Post Office closed.

Today the main street grid remains, based on the 1885 survey, but only a few buildings still stand. The high school is now occupied by the Friends of the Hill, while the police house is still standing, but privately owned. The fire station, probably the last building to be erected in the township is also now privately owned.

Most of the sites of houses, business premises and public buildings are now abandoned and covered in low scrub or gorse. In places chimneys and foundations can be see, but the most common surviving structures are the square concrete water tanks that many houses had. Numerous such tanks can be seen beside the road or hidden in regenerating scrub and bush.

Sumner & Sumner surveyed the town site in 1983, and recorded the visible archæological evidence and surviving standing buildings at that date. Their survey was very comprehensive in coverage, but the maps were not to scale. Since then several more buildings have been destroyed. The town was not surveyed in detail during the 2006 survey, but the areas around the Brakehead and around the Town Walk were inspected (Figures 62 and 65).

Brakehead & Main Town Area

Figure 62 shows the Brakehead and main area of town (see Figure 37 for the Brakehead area itself). The town itself was not surveyed (much is still in private ownership), but the main surviving buildings are shown.

1 Brakehead.
2 Site of carpenters' shop.
3 Foot track.
4 Abandoned section of foot track (overgrown).
5 Two brick chimneys and concrete water tank beside a clear grassed area.
6 Chimney and concrete tank (overgrown).
7 Chimney base and water tank.
8 Chimney bases.
9 Steel frame of workshop for Monocable Aerial Ropeway (Figure 63).
10 Old ambulance shed.
11 Police house and gaol (privately owned).
12 Remains of three houses. Chimneys and chimney bases in recently cleared area.
13 Fire station building. Privately owned.

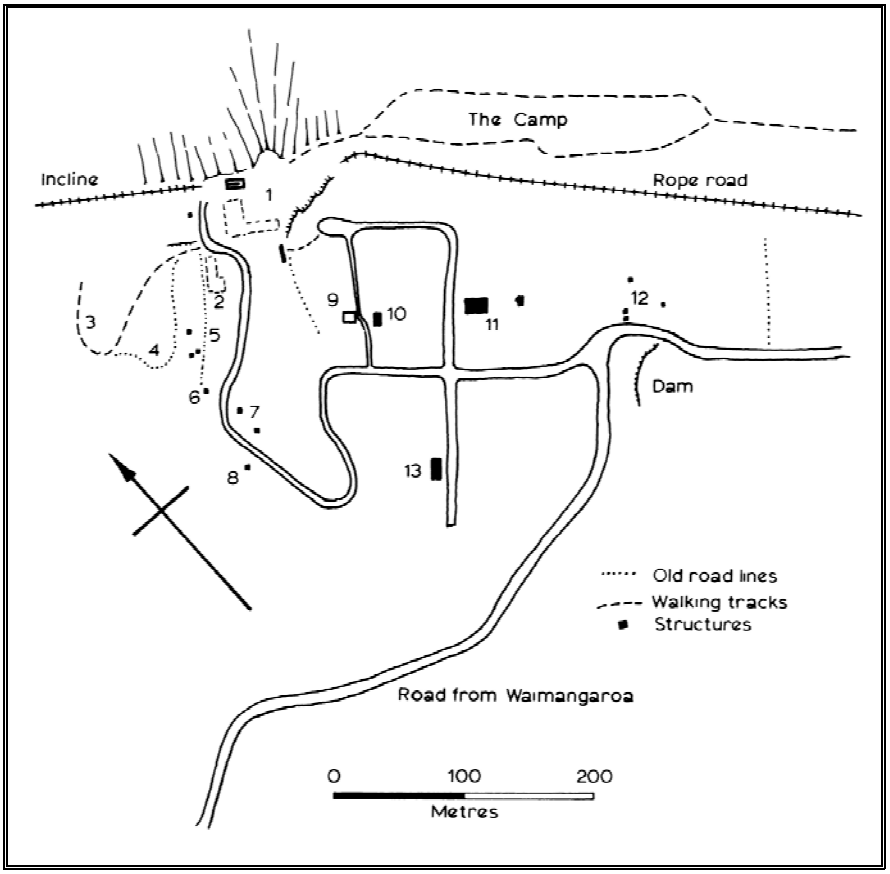


Figure 62
The Denniston town area, Brakehead and Camp.

Figure 63
The old State Mines Department workshop at Denniston. Site 9 in Figure 62.

Figure 64
Typical brick fireplace at an abandoned house site, surrounded by gorse. Site 20 in Figure 65.

South-east Area of Town, School, Power House.

Figure 65 shows the area to the south-east of the main town, and includes the Power House and School buildings. The old road on the north-east side of the rope road is now used as a walking track, and the building remains in that area are easily found a short distance off the track. The bowling green and house sites 22 to 25 are also along a walking track.

14 Chimney and timbers.
15 brick chimney and concrete foundations.
16 Concrete water tank and old car chassis.
17 Concrete foundations of doctor's house.
18 Concrete foundations.
19 Brick chimney, wooden piles and garage site.
20 Concrete water tank, brick fireplace (Figure 64), timbers.
21 Concrete water tanks.
22 Chimneys.
23 Chimney and timbers beside row of pine trees.
24 Fireplace and concrete foundations. Site of Catholic Church.
25 Two brick chimneys.
26 School site.

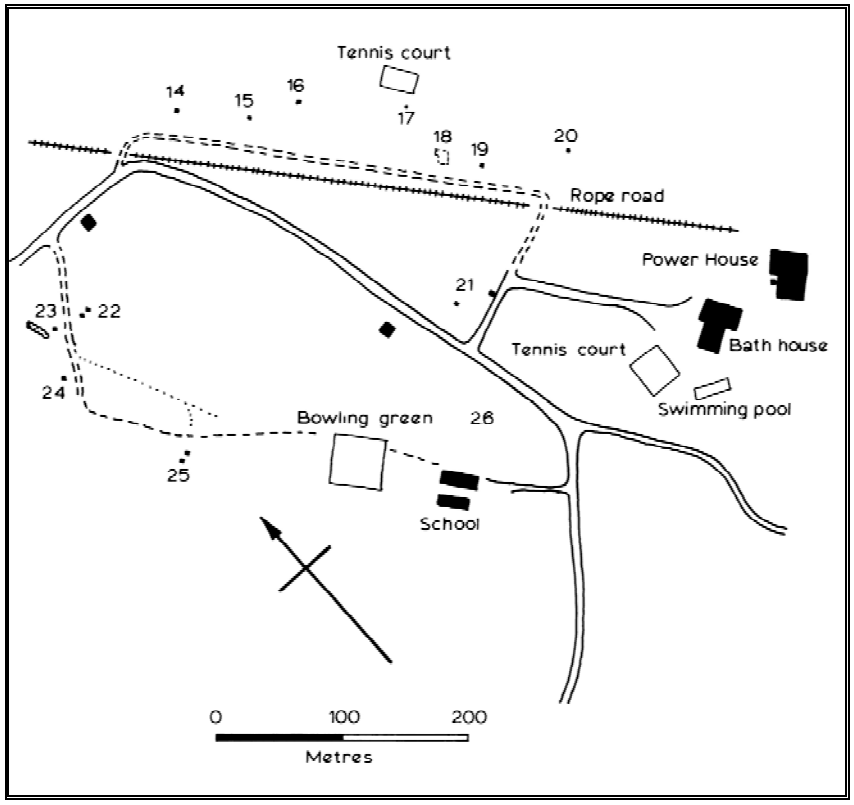


Figure 65
The area to the south-east of the main town, showing the tennis courts, bowling green, swimming pool, school and power house.

The surviving school building was built in 1930 as a Secondary and Manual Training Block. In 1950 the building was taken over by the State Mines department and used for storage. More recently it has been acquired by the Friends of the Hill, and has been restored and is in use as a museum and meeting room.

The Original power house was built in 1921, and contained two generators. The power not only supplied the mines, but also Denniston township and the collieries at Granity and Millerton. In 1940 a new steam plant was installed, and a new building was constructed to house the boiler. The power house supplied electricity to the Buller district until the area was connected to the national grid in the 1950s (Sumner & Sumner 1983: 61).

The remains in this area illustrate the way that many amenities were eventually provided at Denniston. The Bowling Green was initially laid in 1928, but was stripped back to bare rock and relaid in the 1930s. The swimming pool was built in about 1939, and there were two sets of tennis courts.

The Denniston Track
Archæological site K29/56

In the early days of Denniston's history the only way of transporting goods or people up the hill was along the incline. A rough bush track certainly existed (otherwise no mining could have commenced prior to the opening of the incline), and the "spinner" was used to haul timber up to the plateau from the Waimangaroa Gorge. The "spinner" was a plank chute with a windlass at the top (Munro 1951: 6-7, 33).

Riding the incline was dangerous due to the ever-present risk of a wagon breaking away. In 1884 an accident on the incline badly injured a local hotel keeper and killed the local County Councillor, and there was a rapid response. Within a month the Government inspecting engineer had surveyed the Denniston track (Smallholme-Fraser 1978: 62), and in 1884-85 the track was cut down from the plateau to the Waimangaroa with the aid of a Government grant. After the completion of the track riding the incline was strictly forbidden. The track was described in 1891:

> "…about four feet wide, which for three and a half miles winds up the side of a steep, bushy acclivity. The journey up, although trying to most people, affords magnificent views of the surrounding countryside and of the sea beyond" (quoted in Munro 1951: 8).

In 1900 work began on the construction of a 6.5 mile road up to the plateau that would be suitable for wheeled traffic. The 'New Track' was opened in 1902 by the mine manager, who rode up in a horse and trap (Munro 1951: 23).

The 1884 bridle track was reopened in the 1970s as part of the New Zealand Walkway system.

Site Description

The bridle track is still in use as a walking track. For most of its length the original formation is in use (see Figure 2), and in places wide stone steps indicate that it was designed for the use of horses. However, at the very top of the track a short-cut has been cut, and the original last few hundred yards are no longer in use and have become overgrown (see Figure 62).

Otherwise, the track zig-zags down the hillside below the Brakehead through the native forest, much as described in contemporary accounts.

Coalbrookdale

This account is largely taken from Sumner & Sumner (1983: 96-98).

It was at Coalbrookdale that Dr. Julius von Haast found a valuable seam of bituminous coal on the plateau in July 1860. He named the location "Coalbrookdale," after the mining district in Shropshire. Although the Westport Mining Company long intended mining the Coalbrookdale seam, it was not until the Banbury seam was holed through in 1884 and the rope road could be extended to Coalbrookdale that production started there.

After this date the Banbury and Coalbrookdale Mines were worked simultaneously (Smallholme-Fraser 1978). The men preferred to work in the Coalbrookdale Mine so places were balloted to give every man a fair chance of a good work place. The sheer siize of the Coalbrookdale seam meant that the most dangerous part of mining, dropping the coal, had to be repeated less often (Smallholme-Fraser 1978).

By 1886 the endless rope method of haulage was in use and by 1889 the Coalbrookdale Mine was in full swing (Meyer 1971: 53). The Coalbrookdale rope road delivered coal to the junction with the main rope road to the Brakehead at Wooden Bridge. It was 1 mile 60 chains long, and laid to a gauge of 2ft. (NZ Mining Handbook 1906: 400).

In 1891 the Coalbrookdale Mine was the first mine in New Zealand to reach a total output of 1,000,000 tons (Smallholme-Fraser). The Coalbrookdale operation, along with its offspring, the Wareatea, had the second largest (after Millerton) set of continuous workings in New Zealand (Westport News Supplement).

The lower Coalbrookdale Valley (approximately the one kilometre upstream from Burnett's Face) was surveyed as the 'Village of Coalbrookdale' in 1891 (S.O. 4539). This showed a highly optimistic layout of streets across the surrounding hillsides, but also 21 extant buildings in the valley. Thirteen of these were owned by the Westport Coal Company and were within the tramway reserve, and were almost certainly small miners' huts. Six of the other structures were also owned by the company. The only privately owned buildings belonged to Harris, Saunders and Tinker. All of the buildings were close to the rope road, and as there was no other road this track had to be used for access by women and children as well as miners (Meyer). The population of Coalbrookdale settlement peaked in 1896 when there were 165 people living in the valley. Thereafter it declined until in 1926 there were only 64 people left (Dept. of Statistics). Census figures for Coalbrookdale ceased at this date any by 1946 when a series of aerial photographs was taken (Run 1276) there were only ten buildings left alongside the road in Coalbrookdale Valley. The last permanent resident was Mrs. Crawford, who moved to Waimangaroa in 1956 (J. Crawford pers. comm., cited in Hooker 1992: 2).

In 1926 a 70 metre drive to the surface from the depths of the Coalbrookdale Mine was the beginning of the Whareatea (or Wareatea) Mine. This entrance which came out beside the Whareatea Stream was known as the Whareatea entrance[5] but was officially still only part of the Coalbrookdale Mine- the entrance was also known as "The Steps" because of the 142 steps cut from sandstone rock (Westport News Supplement). The new opening provided an air intake and also helped save the considerable time it took for the men working in the Wareatea section to travel underground from the Coalbrookdale entrance. It was at this time that a new road was constructed from Denniston to Whareatea (Westport New Supplement).

[5] To confuse the issue, the Coalbrookdale Mine entrance in the Coalbrookdale Valley was also apparently also known as the "Whareatea Mine" in the 1940s, presumably as it was then being used to access the Whareatea section of the mine.

By the time the aerial ropeway replaced the rope road in 1952, a new stone drive had been driven alongside the Steps entrance on an easier gradient to allow the coal to be taken out by conveyer belt. This also became the new entrance with the steps opening being relegated to the fandrift and alternative access.

Meanwhile, after World War II, demand for coal had dropped markedly and the Coalbrookdale Mine ceased operations soon after the Ironbridge Mine in 1948. With the demise of the rope road and the stepping up of the Wareatea operation, the Coalbrookdale entrance was closed off and the Wareatea Mine officially took over the 60-year-old underground workings that stretched out for nearly four kilometres (Westport News Supplement). The Wareatea Mine was closed in 1971 but reopened eleven years later in 1982 as an underground hydro mine. It has since closed, and much of the above-ground infrastructure has been removed. The entrances remain but have been barred.

Site description
Lower Coalbrookdale Valley

The Coalbrookvale valley stretches for about 2km south-west and then south from the site of Burnett's face. Coalbrookdale Stream flows into Burnett's Stream, a tributary of the Waimangaora River. From Burnett's Face the rope road to the Coalbrookdale Mine ran along the south-eastern side of the valley to the Coalbrookdale Sheets (see discussion below). This rope road is now used as a walkway. A short distance of track and a few coal tubs have been set up at the start of the track to provide the visitor with an impression of how the system worked. On the other side of the stream is the old road, which is still useable by four wheel drive vehicles.

In 1992 Ray Hooker (then of the Department of Conservation) undertook an archæological survey of the Coalbrookdale valley from the Burnett's face to the Coalbrookdale Sheets as part of the work required when the walkway was constructed. He used a combination of field survey, local knowledge (from G. James) and aerial photograph mapping to record 12 building sites in the lower valley. His map is redrawn here as Figure 66.

The sites recorded in the valley were (original imperial site numbers in parenthesis):

L29/24 (S23/34)
The rope road formation between Burnett's face and the Coalbrookdale Sheets.

L29/25 (S23/35)
House site. An artificial terrace some 12 metres square. Two chimneys are near the centre of the terrace, the southern one appears to have been for a coal range.

L29/26 (S23/36)
House site. A small terrace some 10m by 10m, with stone revetment on the northern side.

L29/27 (S23/37)
House site. A large terrace seom 70 metres long by 15 to 20 metres wide on the south side of the rope road. Two building sites are indicated by chimneys at the eastern end.

L29/28 (S23/38)
House site. A long terrace some 100 metres long by 15 metres wide adjacent to the rop road. One chimney visible at the rear of the western end.

L29/29 (S23/39)
Hotel site. A terrace adjacent to the road on two levels (25 by 15 metres). A stone wall is immediately adjacent to the roadway and beside a small creek. This building was constructed in 1890 and was known as Lancaster's 'Crown Hotel,' licensed in 1894. The licence was shifted to Burnett's Face c.1921 and the original building destroyed by fire iin 1926.

L29/30 (S23/40)
House sites. Three small terraced house sites adjacent to the road. The first is some 60 metres from the small creek beside the Hotel, and has a foot path leading up to the house site and a set of steps from the road. Chimney remains on the terrace. The second is some 60 metres west of the first house site, and is a small terrace divided into two levels with a chimney on each. The third site is some 40 metres west of the second, is a terrace some 40 metres by 10 metres.

L29/31 (S23/41)
House site. A terrace some 60 metres long by 15 metres wide. One chimney at the western end, with remnants of other foundations scattered along the terrace.

L29/32 (S23/42)
House site. The site comprises three stepped terraces all of which show evidence of buildings. Covers an area of 35 metres by 10 metres. The upper terrace has a chimney, some remnant piles and a stone wall on the north side. The chimney is built of local sandstone and brick.

L29/33 (S23/43)
House site. A house platform, measuring 12 metres by 4 metres. A benched path leads up to the house site from the road, with steps at the top. A stone retaining wall above the pathway, and another along the south side of the house platform.

L29/34 (S23/44)
House sites. Three small terraces at the foot of gentle spur. The upper limit of the Coalbrookdale Village.

L29/35 (S23/45)
House site. A small terrace on the toe of the hill above the road. Reportedly the location of the last standing cottage of Coalbrookdale.

L29/36 (S23/46)
House site. A flat, excavated beside the rope road, filled with rock and walled to a height of ca. 7 metres beside the stream. Covers an area of 15 metres by 20 metres.

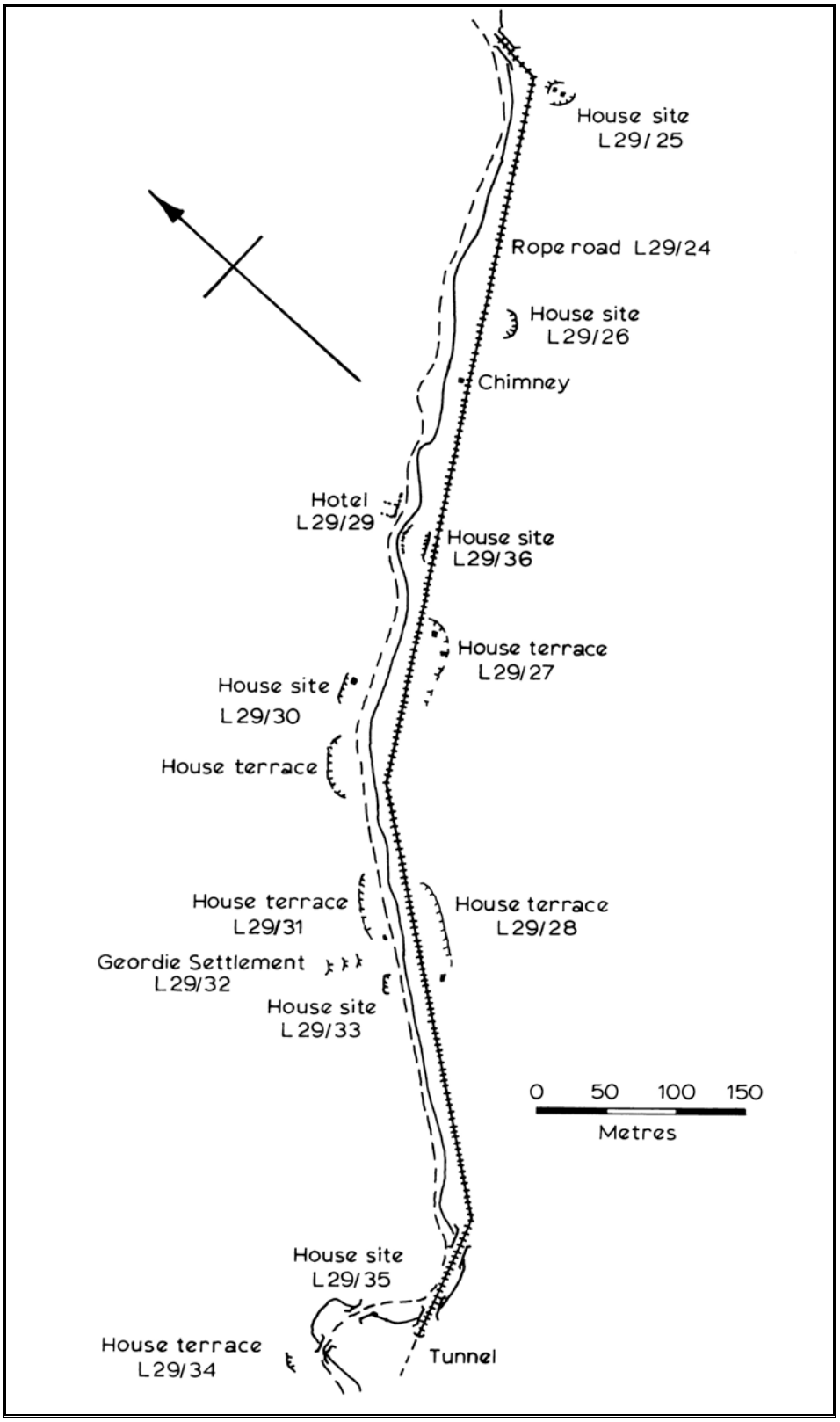


Figure 66
Map of archæological sites in the lower Coalbrookdale Valley.
Redrawn from Hooker (1992) with site numbers converted to new metric series.
Note that this map meets Figure 67 at the tunnel (note the different north orientation).

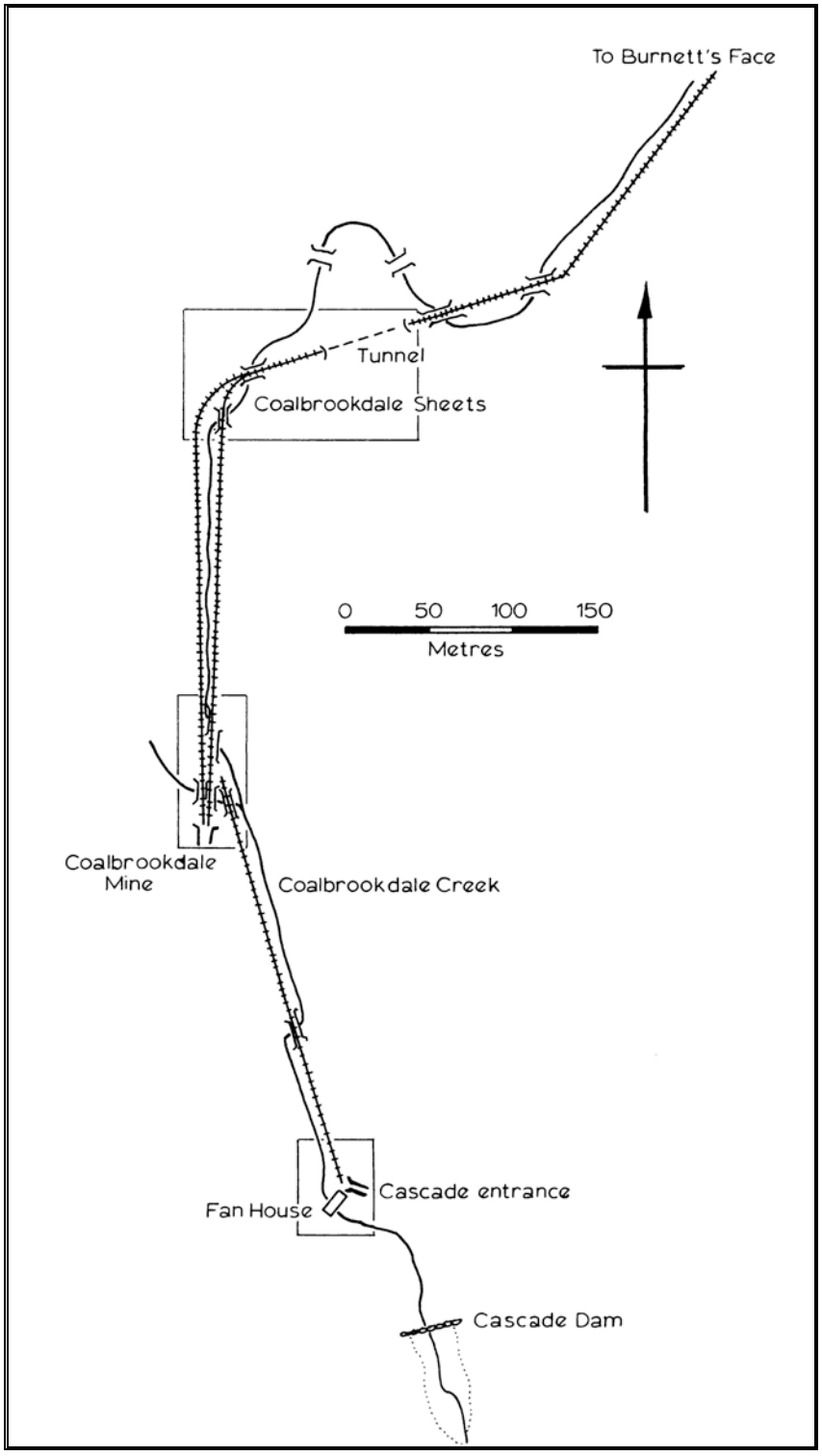


Figure 67
A general map of the upper Coalbrookdale Valley, showing the location of the rope roads and the areas covered by Figures 69, 77 and 81 in the following discussion.

The Coalbrookdale Sheds

The Coalbrookdale Sheds (also known as the Coalbrookdale Sheets)[6] was the location of the hauling engines that powered the rope roads to the Cascade and Coalbrookdale entrances to the mine, and the main Coalbrookdale rope road out to Burnett's face. The interpretation here is based heavily on notes by Geoff Kitchin, who worked on the rope roads at Wooden Bridge and Coalbrookdale from 1941 until 1947, and then down the mine until 1974. These notes are now held by the Department of Conservation in Hokitika.

The site of the Coalbrookdale Sheds is reached by following the walking track along the old rope road from Burnett's Face. After two long straight stretches, the rope road bore right, crossed two bridges and passed through a 48 metres long tunnel (Figure 68). On the western side of this tunnel is a flat area with a two-storey brick chimney.

Figure 68 (left)
The tunnel at the Coalbrookdale Sheds. A view looking from the western (mine) end.

This area was the point at which several rope roads met, and tubs from the Cascade and the Coalbrookdale sections of the mine were transferred to the rope road that ran out to Burnett's Face and Wooden Bridge, where they were again transferred to the rope road to the Brakehead. The system underwent several modifications over the years. An 1890 survey (S.O. 4442) shows a single line going up the valley to the Coalbrookdale Mine, but later a double set of tramways was built for part of the length of the valley. In 1946-47 the system was rationalised to one tramway again, after the Cascade section of the mine ceased work.

Prior to 1946, the rope road from the Cascade entrance ran along the valley to the bathhouse beside the Coalbrookdale Mine entrance, where it curved to the right between two bridges, and then ran along the eastern side of the stream and across another bridge to the Sheets (where the Cascade hauler was located). At the same time, the Coalbrookdale (also known as the Whareatea) rope road ran from the mine, across a bridge, and then along the western side of the stream to the sheets. Thus, the two rope roads ran in parallel along part of the valley, one on each side of the stream. Each had a hauler, and there was a third hauler for the rope rode to Burnett's Face. An operator in a control tower at the junction of the roads controlled the system, with a distinctive signal bell for each road: the Coalbrookdale/Whareatea Mine was a deep bass, the Cascade Mine was a buzzer type, and the Coalbrookdale road to Burnett's Face was shrill (G. Kitchin, n.d.).

[6] There appears to be some variation in the name of this area. According to Gary James' (Friends of the Hill) informants, the proper name of the site was the "Coalbrookdale Sheds." The "sheets" were areas in a mine where two tramways met, and where there was a sheet of iron allowing tubs coming in on one line to be spun around in line with the other. There was a set of sheets there, and "Coalbrookdale Sheets" was the slang name for the site based on this feature (G. James, pers. comm.).

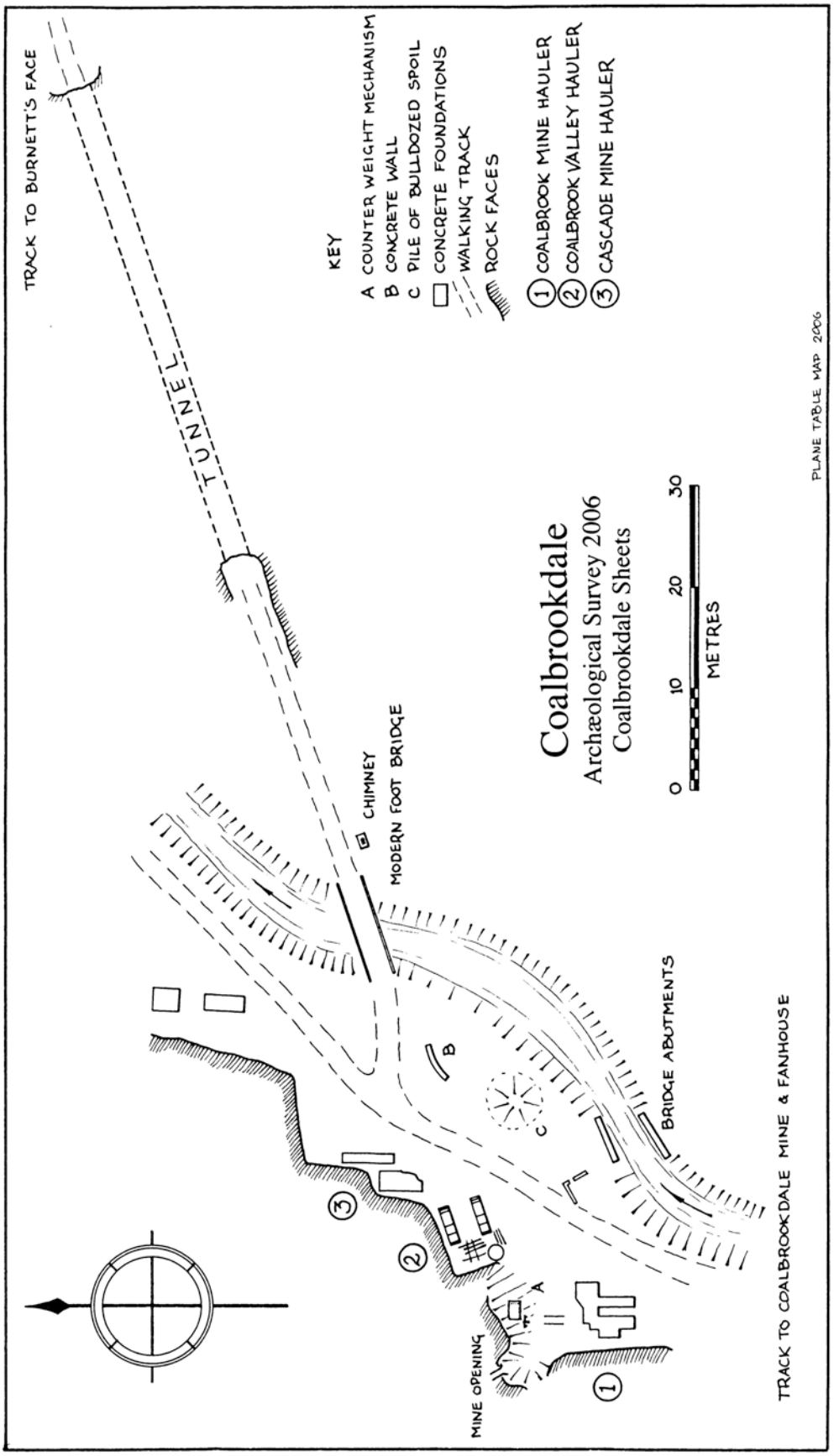


Figure 69
Plan of the archæological features at the Coalbrookdale Sheds.

In about 1946-47, the Cascade rope road was closed, and the Coalbrookdale (Whareatea) rope road realigned out of the mine mouth, and led along the old Cascade formation to the sheets.[7] It is possible that this was a return to the original layout (see S.O. 4442, dated 1890). The modification was apparently never a complete success, and the sharp corner by the tunnel was known as the "Kangaroo curve" because of the way the tubs would skip around the bend (G. Kitchin, n.d.). In the 1960s some further mining work in the creek bed damaged the stonework along the banks upstream of the sheets (G. Kitchin, n.d.). The progression of rope road use is shown in Figures 71 and 72.

The archæological evidence of this complex system at the Coalbrookdale Sheds consists of:

- The formations of three rope roads (one from Burnett's Face to the sheets; one along the eastern bank of the stream from the sheets to the Coalbrookdale (Whareatea) Mine, and one along the western bank of the stream to the Cascade entrance (but which was later in part used for the Coalbrookdale Mine).
- The concrete beds for three steam haulers, one for each of the rope roads.
- Bridge abutments for the places where the rope roads crossed the stream.
- Various other building foundations.
- A series of drives into the mine workings along the western face of the valley.

The set of four bridges near the Coalbrookdale Mine entrance and the bath house site is discussed in detail below, and the termination of the Cascade rope road is discussed in the subsequent section.

The three hauler beds are situated close to each other, and each faces squarely the line of the rope road that it once powered.

Figure 70
The bed for the hauler that powered the rope road along the Coalbrookdale Valley from the Coalbrookdale Sheds to Burnett's Face. It is surrounded by timber building debris, and an old corrugated iron water tank

[7] This was described by G. Kitchin, and is supported by examination of the 1946 aerial photograph (Run 1277).

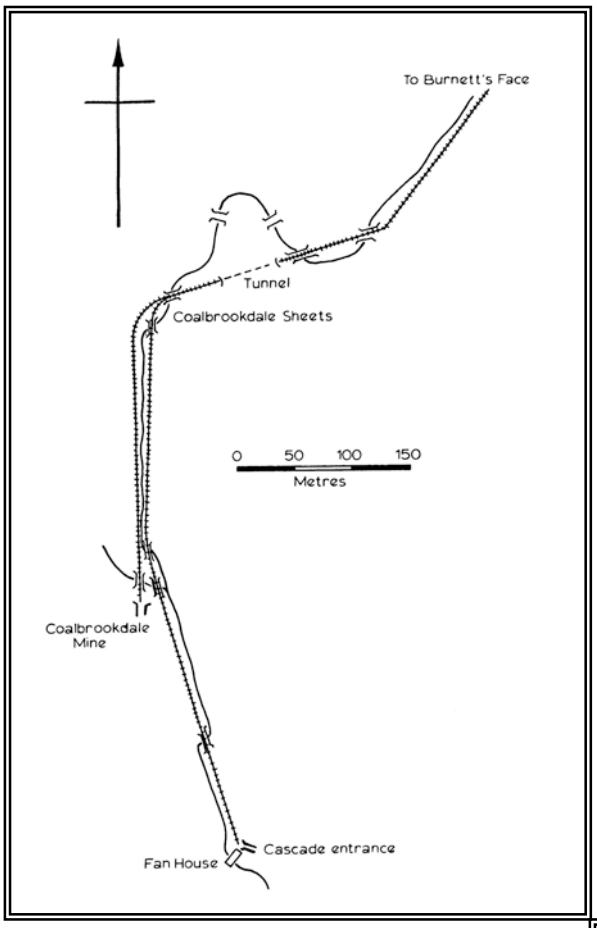


Figure 71
The rope road system in the Coalbrookdale Valley prior to 1946. The rope road from the Cascade entrance runs along the eastern side of the valley, while the rope road from the Coalbrookdale Mine (Whareatea section) runs along the western side. Both rope roads supplied tubs to the main rope road that lead to Burnett;s Face and ultimately the Brakehead.

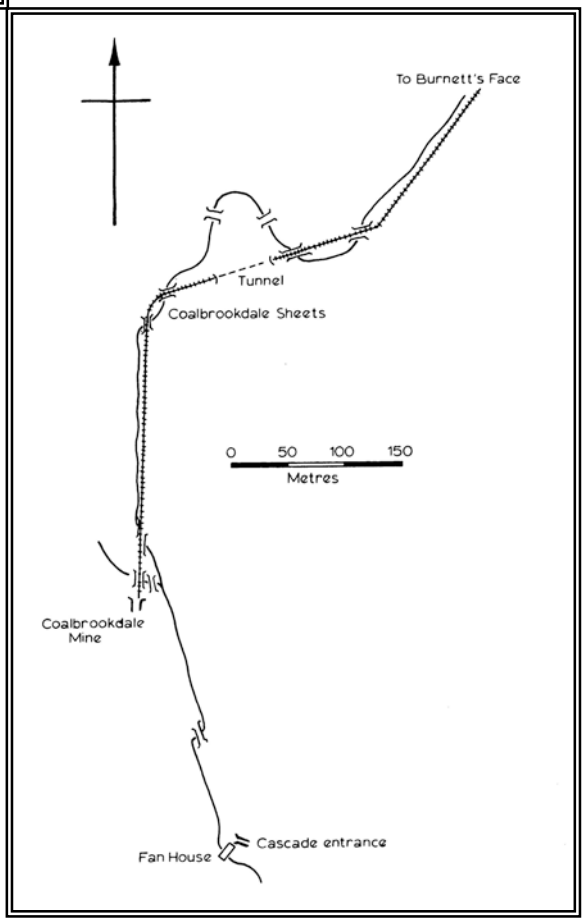


Figure 72
The rope road system in the Coalbrookdale Valley after 1946. The rope road on the eastern side of the valley was redirected to the Coalbrookdale Mine, and the section to the Cascade entrance was closed. It is possible that this was a return to the original rope road layout, as it is shown in an 1890 survey plan (S.O. 4442).

Figure 73
The hauler that drove the rope road on the western side of the stream from the Coalbrookdale (Whareatea section) Mine prior to the reconstruction of the system in 1946-47. Behind the bed are the remains of the counterweight tension system that kept the rope road cable taut.

Figure 74
A view looking to the north along the Coalbrookdale Valley towards the Coalbrookdale sheets (out of sight). The walking track (on the left) follows the old rope road formation to the Coalbrookdale Mine (Whareatea section), while on the other side (right) of the stream is the old Cascade rope road that was changed over to the Coalbrookdale Mine in 1946-17.

The Coalbrookdale Mine Entrance & Bath House

The entrance to the Coalbrookdale Mine is situated at the edge of a large flat open area beside the Coalbrookdale Stream. This was also the site of a bath house that was erected in 1922, but was not regarded as satisfactory by the miners because of its distance from their homes (Munro 1951: 15). It was subsequently replaced by the bath house at the power house site (see Figure 65).

The site of the bath house and entrance to the Coalbrookdale Mine is today kept clear by the Department of Conservation. When the Sumner & Sumner surveyed it in 1983 this area was heavily overgrown in gorse (Sumner & Sumner 1983: 102). The concrete floor of the bath house is now (2006) clearly visible, along with the bases of some of the cubicle division walls. The foundations have been partially cut through by the construction of a later rope-road from the Coalbrookdale Mine entrance (discussed further below). The surviving foundations indicate that the bath house building measured 34 metres by 9.5 metres (111ft 6in by 31ft). On the west side of the bath house foundation are two brick fireplaces and a brick foundation. Sumner & Sumner (1983: 105, item 16) identified these as being part of the mine offices.

Figure 75
The floor of the Coalbrookdale bath house (left) and the entrance to the Coalbrookdale Mine (right).

Figure 76
The chimneys of the mine offices beside the entrance to the Coalbrookdale Mine.

On the south side of the bath house are a pile of clinker, a pile of chain links, a brick foundation base and some timbers. Sumner & Sumner (1983, item 11) identified these as the remains of a blacksmith's shop. The presence of clinker and chain links supports this identification.

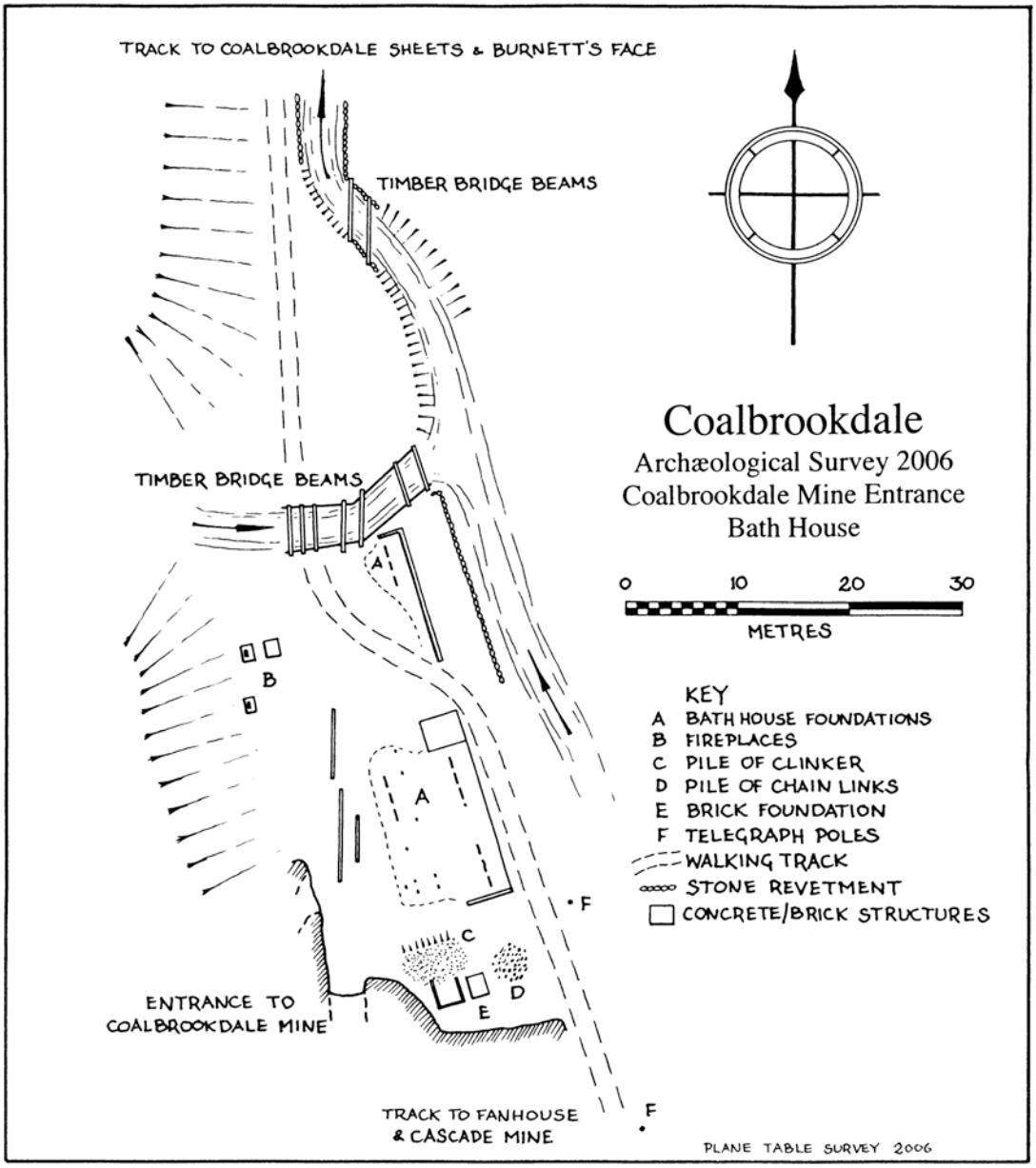


Figure 77
Plan of the archæological features at the entrance to the Coalbrookdale Mine, including the Coalbrookdale bath house foundations and four rope road bridges.

The entrance to the Coalbrookdale Mine is still open, although it has been barred by timber and wire netting by the Department of Conservation for safety reasons. In line with the entrance are a number of long timbers set into the ground that are the remains of the rope road out of the mine.

There are the remains of four bridges in this area: three close together over the tributary of the Coalbrookdale Stream, and one over the main stream. The western of the three bridges lined up with the Coalbrookdale Mine entrance, and was on the line of the rope road that ran along the western side of the Coalbrookdale Stream to the Coalbrookdale Sheets (the original rope road to the mine). The middle one of three bridges also lined up with the entrance to the mine, but was on the line of the rope road that ran on the eastern side of the stream (the rope road line used after about 1946). It crossed the main stream on the fourth bridge mentioned above. The eastern bridge was on the rope road line from the Cascade Mine entrance (abandoned when the Coalbrookdale rope road was moved across in about 1946, see discussion below).

All four bridges (the three over the side stream and one over the Coalbrookdale Stream) were still partially standing in 2006 (Figures 78 and 79). The main stringers were all still in place, although obviously decaying, but the rest of the woodwork was in poor condition. The present walkway bridge is built over the western bridge (but does not rely on it for structural strength).

Figure 78
The middle and eastern bridges over the tributary of the Coalbrookdale Stream. The far bridge, that supported the rope road from the Cascade Mine entrance, is nearing the point of complete collapse.

Figure 79
The bridge over the Coalbrookdale Stream. Note the pile of discarded wire rope beside the track. This is discarded hauling cable from the rope road.

The Cascade Mine Entrance & Fan House

At the end of the walkway along the old rope road up the Coalbrookdale Valley is the Cascade Mine entrance and the Fan House.

There are the remains of two fans at Coalbrookdale. In 1904-05 a steam-driven Hayes double-inlet fan with a capacity of 150,000 cubic feet of air per minute was installed to ventilate the mine (Wright 2000). It was described as the largest in New Zealand at the time, and was built by Johnston and Sons, Invercargill, from a design by Mr. J. Hayes, the Government Inspecting Engineer (Cyclopedia of New Zealand 1906: 195).

In 1912 a new fan house was built to improve ventilation and meet extended requirements as workings were developed in the Cascade and Whareatea sections of the mine. The Sirocco fan, which was capable of moving 200,000 cubic feet of air per minute, remained in use until 1954 when extraction and ventilation were done from the Steps entrance at the other end of the mine (Wright 2000). Originally steam powered, the fan was converted to electric power in the 1920s.

Today the 1912 Fan House is the main destination feature at the end of the Coalbrookdale walkway. The brick Fan House (Figure 80) is actively managed by the Department of Conservation, and has recently had a roof built over it to prevent water damage. The original concrete roof is still in place. New doors have also been installed, preventing visitor access into the Whareatea section of the mine. The Cascade return airway is also blocked.

Figure 80
The 1912 Fan House with the entrance to the Cascade section of the mine on the left. This view looks along the walkway, which follows the line of the old rope road. In the left foreground is the site of the stables and mine office.

At the rear of the Fan House is the concrete motor floor, along with the stripped-down remains of the power transformer and electric motor that drove the fan (Figure 82). The motor house superstructure does not survive, although the Fan House Conservation Plan (Wright 2000) recommends the construction of a roof over the surviving motor parts.

On the north-west side of the Fan House are the remains of the earlier, 1904, Fan House and its steam engine foundations (Figure 83). Behind these is a fenced-off opening to the mine.

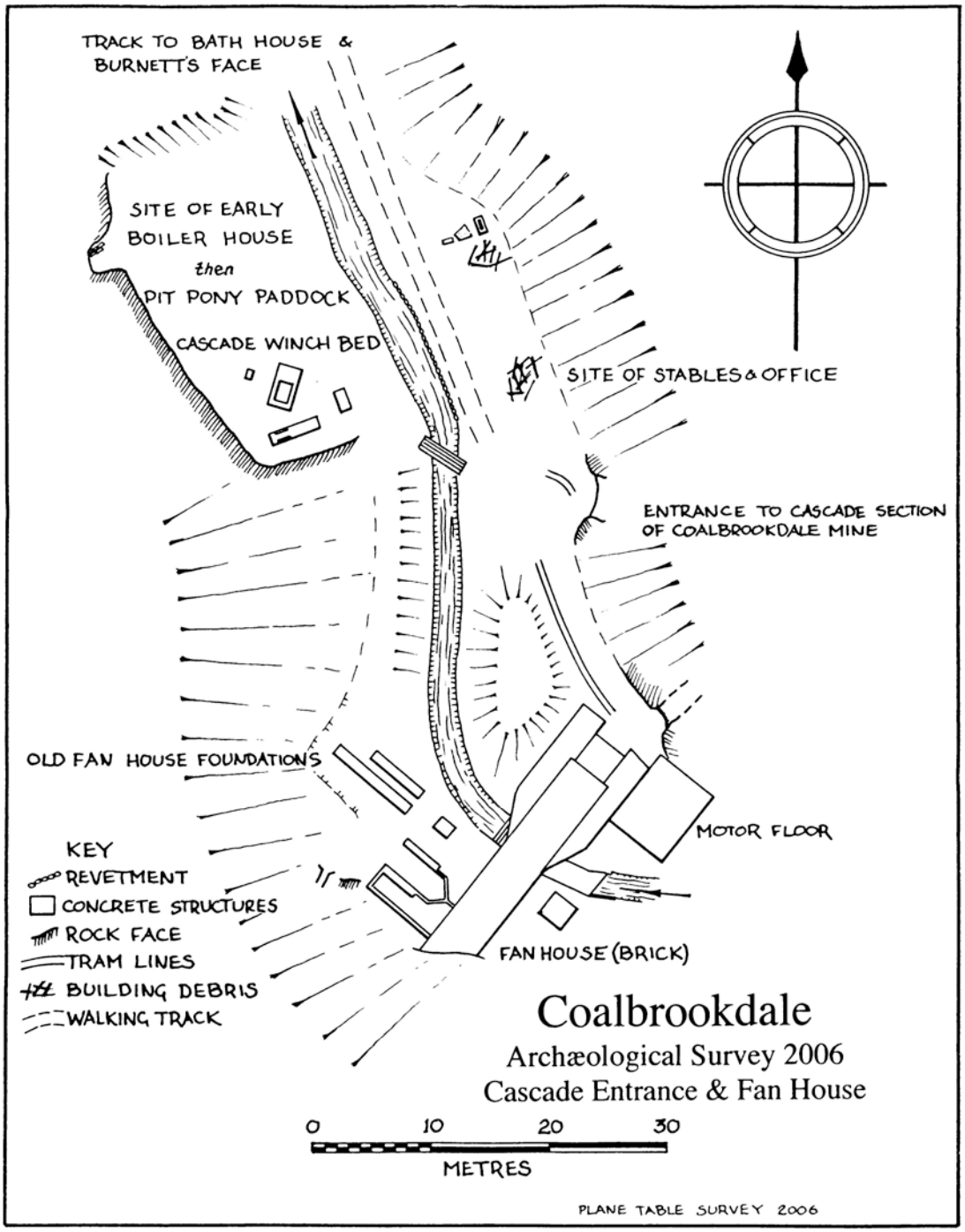


Figure 81
Plan of the archæological features at the Cascade entrance of the Coalbrookdale Mine, including the Fan House.

Figure 82
The motor floor at the rear of the Fan House, showing the transformer (left) and electric motor (right).

Figure 83
The remains of the 1904 Fan House, with the 1912 replacement to the left. In the right foreground is part of the steam engine foundation for this fan. In the right background is an opening to the mine.

On the east side of the walking track, to the north of the Cascade entrance, is the site of the stables and mine office. There is a scatter of building debris and a fallen brick chimney there now.

On the western side of the stream and track, to the north-west of the Fan House is an area that was used as a paddock for pit ponies. This had earlier been the site of several industrial buildings. The concrete foundations (Figure 84) at the southern end of the paddock are from a winch house for the Cascade workings, and a structure is visible there in the 1946 aerial photograph of the area (Run 1277). This paddock area had earlier been the site of the steam plant and compressors for the mine (and presumably the Fan House prior to electrification). A distinctive indentation in the bank at the rear of the area was the site of the chimney (Notes from G. Kitchin).

Upstream from the Fan House there were two dams. The upper one has probably been destroyed by modern coal mining operations, but the lower dam survives. It has a stone upstream face, and has been breached by the stream. When the fan and haulers were steam powered, a constant reliable source of water would have been required.

The stream bank has been revetted for some of its length, to allow a straight run for the rope road to be engineered.

Figure 84
The pit pony paddock and the concrete winch foundation for the Cascade section of the Coalbrookdale Mine. This was originally the site of the steam plant and air compressors for the mine.

Discussion

This survey has documented the archæological evidence of a number of the main elements of a complex industrial archæological site. Denniston is best known for the Incline, widely regarded as on of New Zealand's foremost industrial archæological sites. However, the Incline did not exist in a vacuum, and a large and ultimately complex system evolved to send coal down to the wharves at Westport. In this sense, the Incline was one of the last links in the chain, and one that by 1967 was made redundant by a combination of the steady evolution of road transport, and its own dependence on large quantities of coal and a large work force.

Back up on the plateau, the wider landscape consisted of the natural features that made life so bleak at times, but included the coal measures that were the only reason for human presence there. Working into these measures were the mines, some stretching for miles underground. From the mine face a network of tramways and rope roads, later replaced by conveyor belts and aerial ropeways, transported the coal out into the daylight, and over the plateau to the screens and bins at the top of the incline. Powering these transport networks were steam haulers and steam generators, themselves fuelled by the coal from the mines.

And actually doing the mining and operating the haulers, rope roads, power houses and myriad of other jobs were the miners and workers. And along with these miners were their wives and children, and the shop keepers, hoteliers, school teachers, doctors and the rest of the communities of Denniston, Marshallvale, Burnett's Face and Coalbrookdale. These communities required more than just places of work, and the tennis courts, swimming pool and bowling green have all survived to the present day better than most of the houses that were once inhabited by their players and swimmers.

As the economies of coal mining changed, demand declined, mechanisation increased and road communications improved, it was probably inevitable that a remote and climatically hostile place such as Denniston would begin to shrink as the workforce declined, particularly when more temperate locations were only a short drive away. Denniston was a product of a time when New Zealand was rapidly developing, extractive industries were often in very remote places, and the workers in these industries had no alternatives but to live next to their place of work. Many of New Zealand's ghost towns such as Macetown, Port Craig and Cromarty owed their existences to extractive industries based on a single product found in very remote places. But as the single industry failed there was no other reason for those towns to remain. Denniston still has coal, and coal mining is still carried out on the plateau, but far fewer people are involved, and it is a short car drive up from the lowland communities of Westport or Waimangaroa. There is no longer the need for a large mining population to live at the mines.

In terms of archæological sites, the Denniston Plateau is extremely rich. As discussed above, there are the remains of both the industrial systems and the communities that once existed on the Plateau. The lack of other development (apart from ongoing mining) has meant that good archæological evidence has survived of most of these systems. While the haulers and rails of the rope roads have been lifted, the hauler beds and rope road formations for the most part survive. Similarly, while most houses have been shifted off the hill or burnt down, most house sites have some evidence of former occupation, such as concrete water tanks and brick chimneys.

What this means is the Plateau can be studied in detail from an archæological perspective, and the systems of industrial operations or social interaction (to name just two possibilities) can be examined. As a general rule this can be done best in places where whole systems have survived, which is generally only in remote areas where land development pressures are low. In this respect the Plateau is an ideal location, and the archæological remains there are

significant. The Incline is highly regarded as a discrete site, but in its entire landscape/systems context it is even more important. Understanding of complete systems is crucial to the interpretation of industrial sites: the Incline is meaningless without the coal mines and rope roads that brought the coal to the Brakehead. The survival of the complete systems makes Denniston a highly significant archæological landscape.

From a wider public perspective, the intact nature of this archæological landscape means that visitors can inspect the site and gain an appreciation of what occurred there with a minimum of interpretation. The heavy stone foundations at the Brakehead indicate that a major industrial operation has existed there, and the rope road formations are clear evidence that a narrow gauge railway once ran there, even to a visitor with no specialist knowledge. And the skeletal State Mines workshop building, abandoned chimneys and water tanks, and roads-to-nowhere scattered throughout the town site are highly evocative of the classic "ghost town." Many visitors are going to the site having read "*The Denniston Rose*," and already have some understanding that a community once existed there, and the central role that the mines and the Incline played in that community. They might be looking for places where events that never actually occurred happened, but at least they are looking at the Denniston landscape with a picture in their mind's eye of a living place.

The 2006 archæological survey has only begun to interpret this landscape. The work done by Sumner and Sumner in 1983 has in places been updated, and accurate maps made of some key areas such as the Brakehead, Camp and Coalbrookdale. But as discussed above, it is clear that the Denniston landscape is large and complex. The communities of Marshallvale and Burnett's Face were not examined in 2006, and much work can be done there. Similarly, Denniston itself was once a thriving town, and no comprehensive survey has been carried out. The underground history of the mines has not been touched upon, although the safety concerns of abandoned coal mines means that an underground archæological survey will probably never be carried out. However, this report does begin to describe the rich archæological landscape evidence on the Denniston Plateau, and provide a basis for managing and interpreting some of the key sites.

Recommendations

These recommendations are the product of an examination of the archæological evidence on the Denniston Plateau. They comprise general comments about the management of this place, as well as specific recommendations for site management and future research.

- Denniston is a large site that can only be interpreted at a landscape level. By "Denniston," I mean here the township site itself as well as all associated sites and infrastructure such as the incline, brakehead, mines, roperoad and other satellite settlements (such as Burnett's Face).

- In the absence of a conservation plan, it is important that robust general conservation practice is followed in all decisions regarding Denniston. It is recommended that a conservation plan is prepared, particularly for key areas such as the brakehead and the incline.

- Although work at Denniston is being driven by visitor demand, it is the historic features that are the attraction to visitors, and consideration of historic values MUST drive all decisions.

- All features and sites are of archæological value. An archæological authority from the New Zealand Historic Places Trust will be required to modify any site that pre-dates 1900 (as set out in the historic Places Act 1993).

- In general, a principle of minimal intervention should be followed. Some repair work is urgently needed to stonework at the Brakehead, but this should be carried out only after appropriate professional conservation advice is sought and received.

- New intrusive elements should not be introduced to the site. The concrete plinths that were constructed recently to mount the two winding wheels at the Brakehead should be removed. Where new material is introduced (such as in the reconstruction of the rail layout at the Brakehead) appropriate conservation planning must be carried out. Any additions must be sympathetic to the place, all additions must be fully recorded, and any additions must be capable of removal without damaging original historic fabric.

- Introduction of new visitor facilities such as a new interpretation centre, toilets and carpark require careful planning. The present interpretation structure has already been moved once, and a third location will create a future archæological problem, whereby a plethora of building sites (with sub-surface evidence) is being created that have no relation to the historic activities at the site. Its final location needs to be considered very carefully. Toilet facilities are probably best provided a short distance away at the Friends of the Hill museum.

Specific Recommendations

The Incline

- The Incline is a key feature. Ongoing vegetation management on the formation is recommended.
- The iron trestle bridge near the Middle Brake is of considerable concern. It is an important feature on the incline, but is extremely rusty and may be unstable. An engineering report has already been prepared by Montgomery Watson. If it is not possible to conserve the structure, it should be fully photographically recorded. It is already fenced off to keep visitors away. Demolition is not a preferred option, but may have to be considered in the event of a partial collapse.

At the Middle Brake the relatively intact and complete nature of the remains means that this area has very high heritage and interpretative value. The difficult nature of access will discourage some visitors, but will add to the experience for others. The difficult access is also undoubtedly the reason that so much has survived there.

- Vegetation management should be continued.
- Removal of slip material should continue where practicable.
- An assessment of metal conservation issues should be made. The cast iron brake cylinders are robust, but the vertical boiler, some winch parts and the rails may require some conservation intervention. For the boiler this may include standing it up or raising it just off the ground.
- The possibility of relaying the rails at the Middle Brake should be examined. A pile of dismounted rail has been gathered at the site, and this could be used. Ideally no new fabric should be introduced (apart from timber sleepers), so a partial reconstruction might only be possible.
- The two surviving corrugated iron buildings at the Middle brake should be repaired and maintained. They are an integral part of this important site, and add considerably to its interpretative and historic value.

Conn's Creek Yards

- Vegetation management should continue.
- Active management of the hydraulic crane should continue.
- The 'Q' class wagons should be conserved in as close as possible to their current appearance. The 'Q' class wagons at the Brakehead have been over-restored.
- Further archæological recording work could be carried out here, particularly in areas that are currently overgrown.

Brakehead Area

The Brakehead area is important, as it will probably be visited by the most visitors, as it requires little walking to view.

- The current relaying of rails has interpretative value, so long as it can be carried out without disturbing any original heritage fabric (including in-ground archæological evidence).
- The basic fabric of the brakehead area should be considered. Several areas of stone retaining walls are failing, possibly due to the large amounts of unconsolidated fill behind them combined with drainage issues. The original heritage fabric of the site is of paramount importance. The consequences of ongoing failure will be a gradual deterioration of the basic site fabric, and costs of remedying this will rise significantly

over time. Particularly at risk are the terraces to the south-east of the brake foundation, below the power house site.
- The intrusive modern concrete plinths at the Brakehead built to hold the Monocable return wheels should be removed. Ideally the return wheel gantry should be rebuilt, with the wheels mounted in their original positions. Failing this the wheels should be left on site.

The Camp

- The camp is a significant area of early settlement, but requires little intervention other than maintenance of the existing walkways.

Denniston Township

- The township is in a mixture of private and public ownership, and therefore DoC intervention will be limited in some instances.
- In general, the air of a ghost town is an important part of the visitor experience. Therefore, retention of features such as abandoned chimneys and water tanks is important. Vegetation management is an issue, and while gorse is not desirable, it may be acting as a nursery crop for native regeneration. Expert advice should be sought.
- The State Mines dept. workshop, while skeletal, adds considerably to the abandoned air of the place. It should be maintained as a ruined structure.

The Rope Road

- The rope road has considerable potential as a walkway between Denniston and Burnett's Face. In places it requires improved drainage Draining the flooded section will require the removal of the road embankments that block the formation, to be replaced by footbridges.
- In the area beside the Power House where the formation is buried future options for track restoration should be investigated. This area is presently licensed to Cascade Mining.

Coalbrookdale

- Coalbrookdale is an area of considerable interest, and is already well managed.
- Vegetation management should continue.
- Active management of the Fan House should continue.

Interpretation

There is need for interpretation of all of the main sites and areas. This should be kept an unobtrusive as possible. The temptation of using "*The Denniston Rose*" as a basis for interpretation should be avoided, and all information presented to the public should be kept strictly factual.

Further Survey Work

There is a great deal of future survey work that could usefully be carried out, particularly in the old township areas. Gorse growth in particular slowed down the 2006 survey, and some areas such as the house sites near the Brakehead could not be surveyed in detail because of this. Even those sites that have been covered in 1983 (Sumner & Sumner), 1992 (Hooker) and 2006 (Petchey) will almost certainly yield more information. The sites that could be

inspected further are Denniston, the Brakehead, Marshallvale, Burnett's Face and Coalbrookdale.

The most effective way of surveying these sites will be by using very low altitude, high resolution vertical aerial photographs, preferably flown for the project. In many places even overgrown features such as chimneys and water tanks poke though the gorse cover, so will show up on such aerial photographs.

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S.O. 3678 (Nelson Survey District) Plan of Amended Survey of Section 115-140 Denniston, John Snodgrass, April 1886.

S.O. 4442 (Nelson Survey District) Westport Coal Cos Coalbrookdale Tramway.

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Aerial Photographs

Run 1275. Buller Coalfield, Flown 25/3/1946. Aerial Mapping Branch, Lands & Survey Department.

Run 1276. Buller Coalfield, Flown 25/3/1946. Aerial Mapping Branch, Lands & Survey Department.

Run 1277. Buller Coalfield, Flown 25/3/1946. Aerial Mapping Branch, Lands & Survey Department.

Internet web pages

http://www.nzine.co.nz/features/dennistonincline.html

Appendix A

Glossary of Terms

Bord and pillar	A method of mining coal which consists in excavating a series of chambers, rooms or stalls, leaving pillars of coal in between to support the roof.
Chain	Unit of length, equal to 22 yards. Approximately 20 metres.
cwt.	Hundredweight. Unit of weight, equal to 112 pounds. Approximately 51kg.
Gauge	The distance between the inside edges of the rails of a permanent way.
Hauler	An engine (generally a steam engine) that drove the *rope roads* between the mines and the Brakehead. Effectively a winch that pulled in the loaded coal tubs attached to the *rope road* cable.
Rope road	A double tramway along which coal tubs ran. The tubs were pulled along by an endless rope, powered by a *hauler*. Full tubs ran one on tram line, while empties returned along the parallel line.
Slack coal	Small coal. In nineteenth century there was no market for small coal, only for larger lumps.
Yard	Unit of distance, equal to three feet. Approximately 0.91 metre.