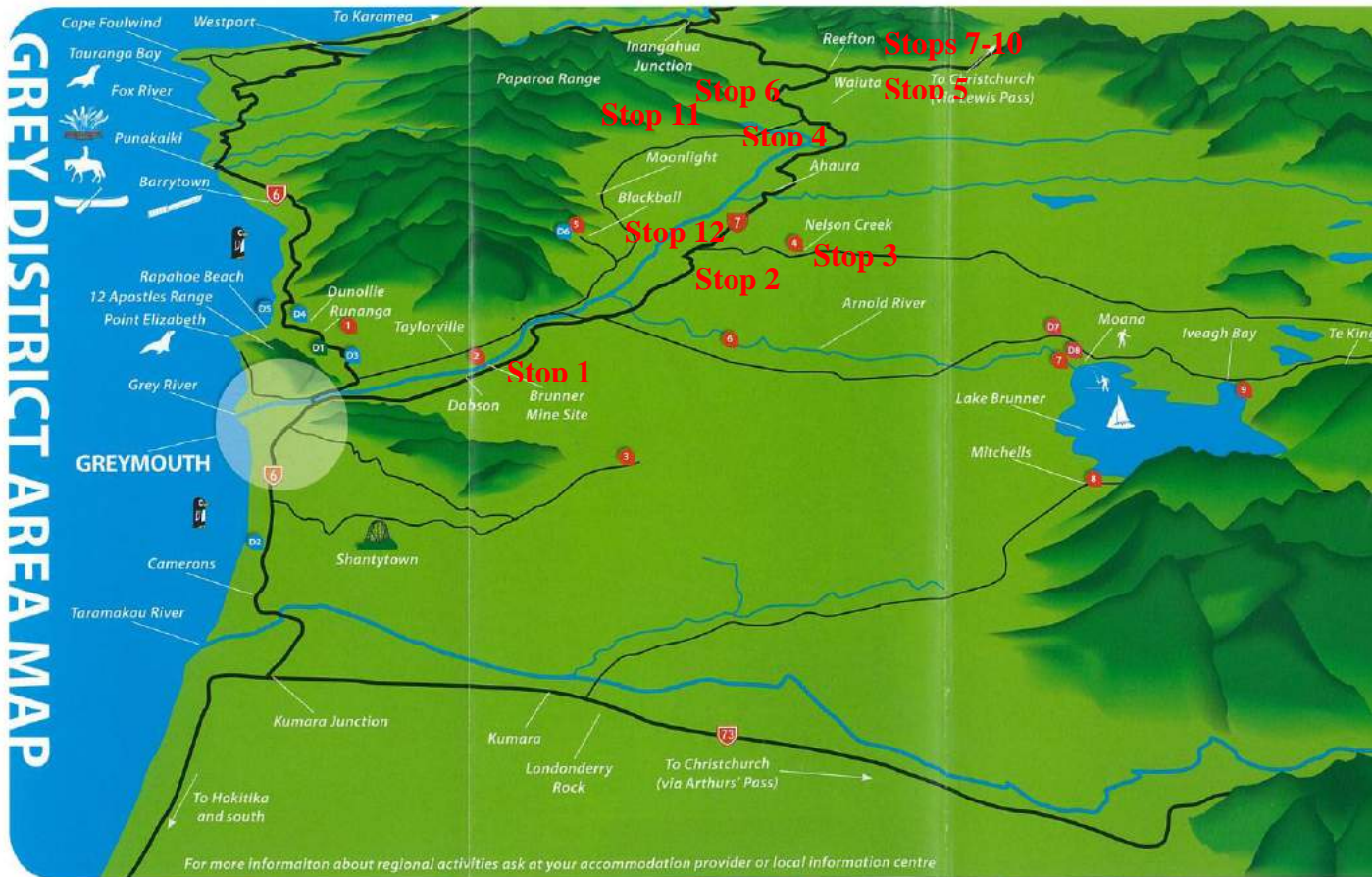


## Field Excursions

Excursion Guides compiled by John Barry with additional contributions  
by Brian Hill

Pre-Conference Field Excursion, 5-6 July



## Excursion Route Map

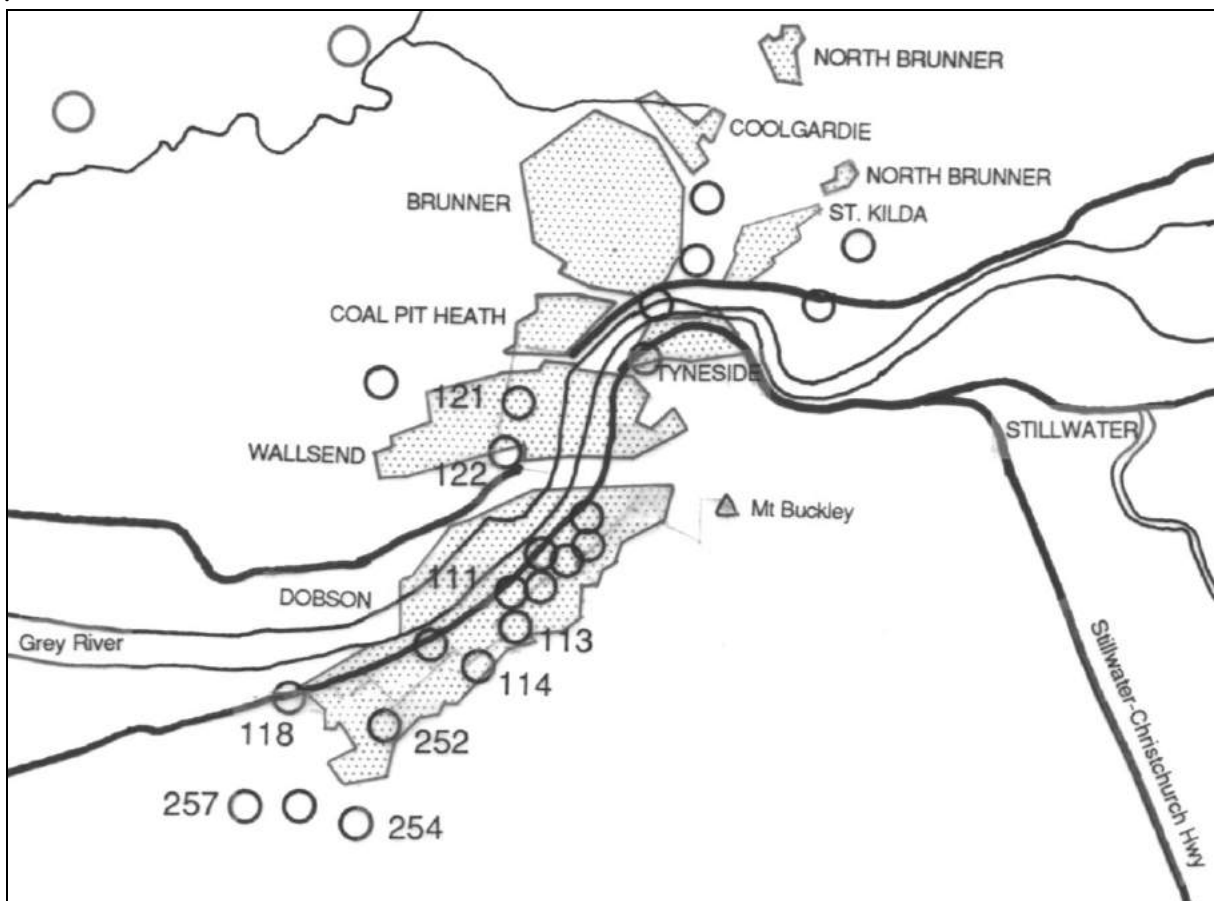
## Stop 1 Tyneside Mine & Brunner Industrial Complex

Since the discovery of coal on the north bank of the Grey River in 1848 by Thomas Brunner around 8,000,000 tonnes of bituminous coal have been mined from the Brunner Coal Measures in the Stillwater-Dobson area (Table 1 & Fig. 1). Significant producers were the Brunner (2.17 MT), Tyneside (0.312 MT), Wallsend (1.782 MT) and Dobson (2.819 MT).

<b>Mine</b>	<b>Operational Period</b>	<b>Production M Tonnes</b>
Brunner	1861-1906	2.17
Wallsend	1875-1960	10782
Tyneside	1876-1930	0.312
Coal Pit Heath	1877-1893	0.577
St. Kilda	1907-1921	0.277
Coolgardie	1892-1932	0.009
Pig & Whistle	1900-1941	0.001
North Brunner	1907-1970	0.124
Stillwater	1918-1934	0.001
Mt. Buckley	1921	0.002
Dobson	1919-1968	2.819
<b>TOTAL</b>		<b>8.074</b>

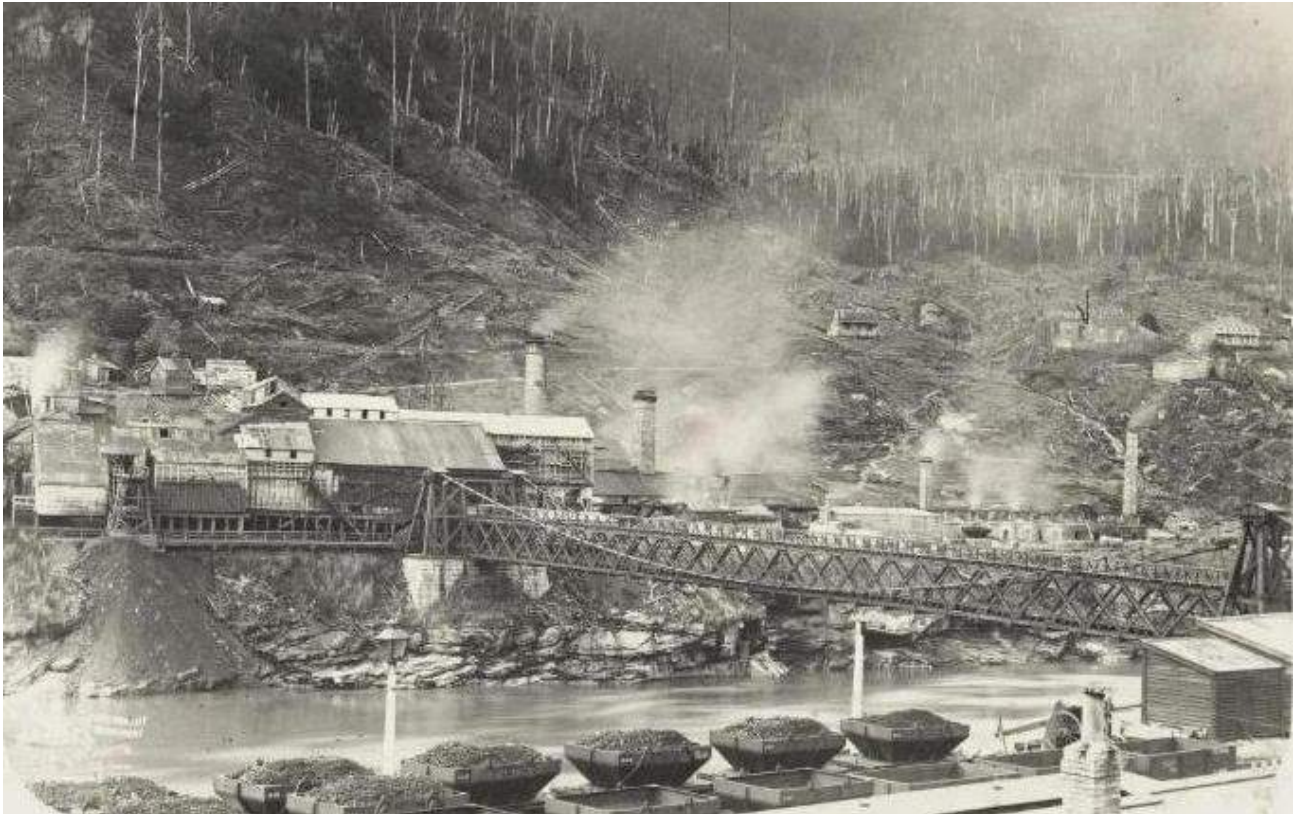
At the Brunner Mine coal was initially extracted from outcrops on the bank of the Grey River and barged to Greymouth for use as a steaming coal (Gage, 1952). Subsequent development of the 2-4m thick seam was by dip drives. On the south side of the river the Wallsend and Tyneside Mines were worked from vertical shafts. Closed in 1964, mainly because of subsidence problems within the

overlying township, the Dobson Mine workings were extensive. The main seam averaged 4.3m in thickness and large quantities of coal remain in pillars within the flooded mine.



*Fig. 1. Plan showing location of principal mines in the Brunnerton Mining Area.*





*Plate 1 Brunnerton Industrial Complex looking NE from the southern bank of the Grey River. The railway to the Port of Greymouth was opened in 1876 (Note the Q wagons in the foreground). Before the opening of the railway coal was carried down river to Greymouth in flat bottomed barges.*



Plate 2 Beehive coke ovens adjacent to the Brunner Mine. After closure in the 1930s the ovens were abandoned and eventually overgrown with native bush. Under the care of the Historic Places Trust the ovens have been cleared, stabilised and protected and now form part of an industrial archaeology complex.





## Stop 2 Rescued from the Rust

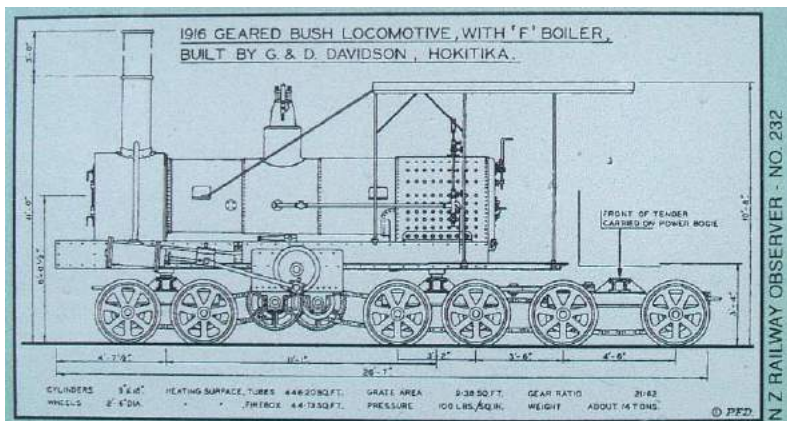
### Davidson Bush Locomotive

Adapted from Department of Conservation Display



*Davidson Locomotive Display at the Kamaka rest area.*

The locomotive was abandoned and partly dismantled. For nearly 40 years the remains stood on this siding, gradually screened from view by regenerating forest. The significance of the rusty remains was recognized in 1974 by an NZ Forest Service employee, Jim Stanton, who retrieved and reassembled what was left. With the addition of a bush walk, the former siding became a popular picnic area. Due to the condition of the locomotive and in recognition of its rarity it was restored by Grey Brothers Engineering, Greymouth in 2001 with funds provided by the Department of Conservation. It was completely dismantled and new parts fabricated where needed. All parts were then sand blasted, zinc coated and painted before assembly.



*Plan of Davidson Bush Locomotive. Many of the locos used boilers purchased secondhand from the New Zealand Railways*

The locomotive displayed at Kamaka was the 25<sup>th</sup> of 26 locomotives built by G & D Davidson's foundry at Hokitika between 1907 and 1925. Like all Davidson models it featured chain-driven bogie wheels that gave maximum traction while spreading the engine's weight on often flimsy bush rails and bridges. It also utilized a heavy duty chain drive, invented and patented by George Davidson. At the end of its working life the

Davidson's foundry was established in 1865. Initially the foundry serviced the gold mining industry but once this went into decline their products changed to meet the requirements of the coal and timber industries. Sawmillers went to Davidsons for haulers and bush locos that were competitively priced, simply built and easily repaired on site.

### Stop 3 Nelson Creek

In mid 1865 the first West Coast gold rush was almost at its peak. Two years earlier the extensive placer gold-deposits were mostly unknown because of the impenetrable bush, swift rivers and dangerous surf. Despite these difficulties news of rich gold deposits in the Greenstone River, a tributary of the Teremakau, attracted miners from Otago and Nelson and a rapid succession of new discoveries were made. Inland in the Grey River valley gold was found in “Moonlight’s Gully” on the west side of the river and in the Twelve Mile, Redjacks and Nelson Creeks on the eastern side.

By May 1866 4 miles of Nelson Creek had been taken up in mining claims. Like other Grey Valley diggings the first workings were in shallow creek gravels where the coarse shotty gold was recovered by pan, cradle and sluice box. The creek bed was then worked by wing dam diversions and the paddocks drained first by manual and water-powered Californian pumps and later by hydraulic elevators. Uncontrollable water flows eventually prevented mining of the deeper permeable gravels. Floods were a persistent problem, filling the paddocks and destroying mining equipment.



*Nelson Creek Township. At the height of the rush there were, scattered about Nelson Creek, about 1200 miners supporting nine hotels and 30 businesses in the township. Note the suspension bridge.*

Terraces flanking Nelson Creek (Try-Again Terrace was especially rich) were also taken up and worked by ground or hydraulic sluicing and by shafts sunk to the basal paydirt. Tailings were conveyed to Nelson Creek by deep tail races. Unlike the creek workings the terrace claims were not so prone to flooding. As the demand for sluicing water exceeded the supply from local races the Government funded a 30km long water race from Lake Hochstetter.



By the time the project was finished in 1878 much of the ground it was built to sluice had already been worked with water from small private races.

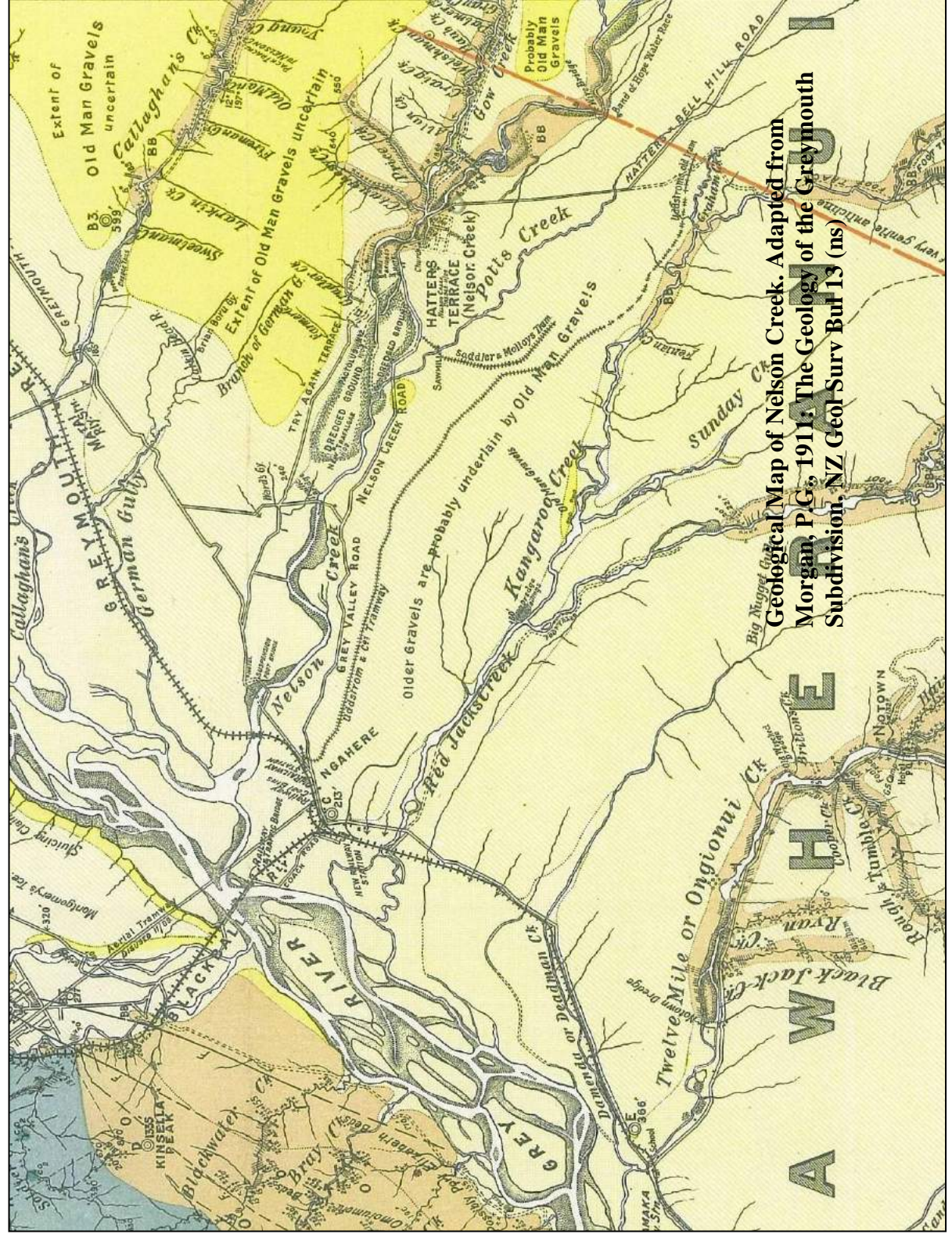
By 1900 mining was at a very low ebb. Most of the sluicing claims had closed and the population had diminished to twenty five European and one Chinese miner. It was in this year that Nelson Creek entered a second period of prosperity with the arrival of steam powered bucket ladder dredges which were able to work the deep, water saturated gravels in the main creek bed. Of the 7 strong fleet, the Reefton based Pactolus Company was the most successful. Operating 2 dredges at the foot of Try Again Terrace the company distributed £66,875 in dividends – amounting to 10 times the original capital.



*Three dredges digging in Nelson Creek in the early 1900s. The dredge in the foreground was probably operated by the Nelson Creek Gold Dredging Company.*

Following the demise of dredging operations about 1919 there was little mining activity until Deep Lead Ltd. (1933-1937) opened out a claim west of Nelson Creek township. The wash was sluiced and elevated from a sump to the gold saving tables by bucket elevator. In the 1990's mining revival several floating recovery plants fed by hydraulic excavators have operated on the terraces and tributaries in the Nelson Creek area.







## **Stop 4 Snowy River Valley**

B. R. Hill

The Snowy River valley provides an example of the compatibility that is possible between properly controlled sustainable mining operations and the environment. Some 300 hectares of the Snowy River valley was dredged for gold over a 6 kilometre long strip, but the valley presents a picture of almost bucolic pristineness with the dredged area, today pasture and forest, hardly discernible from the undredged land.

Early dredging operations in New Zealand caused considerable environmental havoc stripping the surface and leaving behind unsightly heaps of rocks and boulders denuded of soil. Agricultural land, or what could have become farming land, was destroyed as soil and alluvium were removed and washed away in the dredging process. This damage excited considerable hostility in the farming community to alluvial gold mining operations involving sluicing and dredging, and in 1940 strict controls were legislated over dredging operations in New Zealand requiring the restoration of the surface of dredged land.

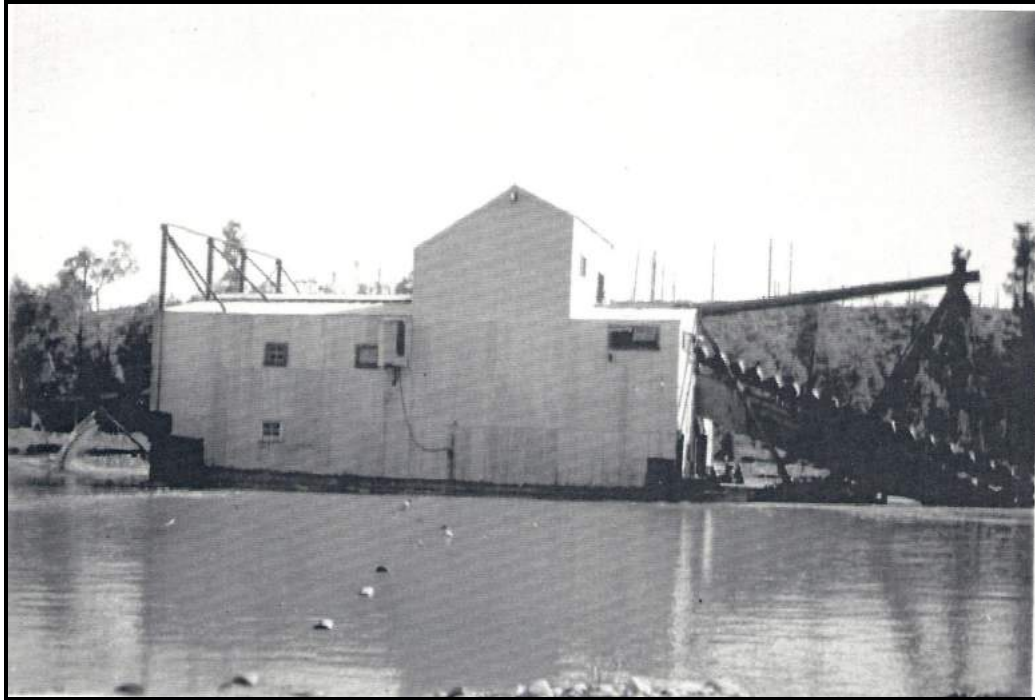
The dredge operating in the Snowy River valley complied with this restoration and rehabilitation requirement mainly by employing a sluice box discharge arrangement, rather than the traditional elevator discharge. In this method adopted by the Snowy dredge, the screened out rocks and larger stones from the material dredged were dropped into the dredge pond through a chute at the rear of the dredge, and the finer gravels and sand screened from the alluvium in the gold-saving function were discharged through a sluice chute which protruded beyond the rear of the dredge depositing a fairly smooth layer of sifted wash dirt on top of the screened out rocks which had been discarded through the shorter chute. The dredge master, Sandy Keith, proudly averred that the dredged ground was so smooth he could ride a push bike over it.

Native grasses and plants like lupins were then sown in this soil, and in some areas the dredging company undertook reafforestation, planting trees and establishing plantations of pine trees. Some of these plantations have since matured and been logged, and neglect has allowed an infestation of gorse in the valley.

The Snowy River dredge was installed and operated by Snowy River Gold Dredging Limited (hereinafter referred to as SRGD) a company formed in Adelaide, because the promoter A. J. (Andy) Davy had once lived there and he had relatives and connections in that city. A boilermaker and welder, Davy had become a dredge engineer when he worked on the construction of the Bululo gold dredge in Papua New Guinea. When in 1937 US company Grey River Gold Dredging was constructing their dredge at Ikamatua near the confluence of the Snowy and Little Grey rivers, Davy was appointed supervising engineer of the dredge construction. He became intrigued by the dredging possibilities of the nearby Snowy river alluvial flats, and established a syndicate with some local prospectors to peg claims over these, and negotiated options with farmers over their land in the valley.

Seeking the capital to finance the substantial drilling programme that would be required to prove that the valley was a viable dredging proposition, Davy approached F. M. Hughes, his niece's employer in Adelaide: a wealthy importer and retailer of chinaware, Hughes was an enthusiastic mining speculator prepared to dabble in an exploration syndicate. The drilling was successful, indicating reserves of nine million cubic metres of wash estimated to contain nearly 63,000 ounces of gold then worth £470,000, of which £263,000 was

expected to be profit from dredging those reserves. A new £70,000 company, Snowy River Gold Dredging Ltd, was floated in Adelaide to take over the syndicate, exercise the options, and install a dredge. SRGD was formed in 1938 and it operated the Snowy dredge until 1957 when domestic inflation in New Zealand caused the closure of the local gold mining industry. During the years that SRGD's dredge operated the gold price increased by two thirds from £7/10s an ounce to £12/10s, but costs soared even more as prices doubled in New Zealand in that period.



*The Snowy River Gold Dredging Ltd dredge at work. The dredge is digging ahead to the right, and the pond is being filled in by the debris behind the dredge at left. Note the sluice box discharge (at the extreme left of the picture) which resulted in the restoration of the dredged ground.*

Installation of the dredge was delayed until 1941 by the wartime scarcity of vital electrical equipment. The Snowy dredge then mined a strip half a kilometre wide six kilometres up the Snowy River valley, which it excavated to an average depth of six metres, handling 13 million cubic metres of low-grade alluvium to produce more than two tonnes of gold.

The dredge, which cost £34,000 to build, weighed some 800 tonnes. It was welded rather than riveted, and it was powered by electricity. It could dig to a depth of ten metres below water level. With a bucket capacity of a quarter of a cubic metre, and designed to operate at 24 buckets a minute, the Snowy dredge could handle nearly half a million cubic metres a year. The dredge worked around the clock six days a week. It employed a total of 14 men, two on the dredge each shift, and the others – the engineer, a tractor driver, and those engaged in clearing scrub ahead of the dredge and in restoration work behind it – on day shift. Shifts were rotated, allowing shift workers a ‘long weekend’ every three weeks.

The dredge floated in a six-metre deep pond. It was manoeuvred and stepped up and held up against the face of the dredge cut with headlines operated by electric winches on the dredge: the headlines were attached to large logs, known as backers or ‘deadmen’ which were buried in strategically placed trenches dug in the shape of a cross. The dredge worked



boustrophedonously back and forth across the face of the cut, digging ahead with its endless chain of buckets bringing the alluvium on board where it was screened and run over tables where riffles trapped the gold. The debris was dumped behind the dredge as described above, filling in the pond behind the dredge so that the pond itself moved forward with the dredge through the dredge ground. The ground was rehabilitated as rough and ready pasture behind the dredge as it worked its way up the valley.

The dredge worked efficiently, profitably dredging alluvium that contained only one portion of gold for every 20 million portions of waste. Average grade was 0.115 grams of gold per cubic metre, and initial costs were less than four pence a cubic metre. Sixty seven and a half thousand ounces of gold were recovered, and the company paid dividends in every year of its operation, returning to shareholders distributions totalling 404 per cent on its £70,000 capital.



*Snowy River Gold Dredging Ltd dredge pictured in the early 1950s. Standing in front of the dredge (from left to right) New Zealand director J. S. (Jock) Robertson of Greymouth, dredge master Alex (Sandy) Keith, and company chairman, W. E. G. Paqualin, of Adelaide.*

Further reading: See Brian R. Hill, 'Snowy River Gold Dredging Ltd: A successful Adelaide dredging company, 1938-1957,' *Journal of Australasian Mining History*, vol. I, 2003, pp 179-187; Darrell Latham, *The Golden Reefs. An account of the Great Days of Quartz-Mining at Reefton, Waiuta and the Lyell*, Nelson 1984; J. H. W. George, *Dredging for Gold*, Melbourne 1964; T. J. Hearn and R. P. Hargreaves, *The Speculators Dream. Gold Dredging in Southern New Zealand*, Dunedin 1985.

## **Stop 5 Blackwater Mine, Waiuta**

### **Prohibition**

B.R.Hill

Some half a kilometre north of the Blackwater Mine at Waiuta some forlorn machinery foundations and a concrete slab mark the site of the Prohibition shaft, the deepest mine shaft ever sunk in New Zealand: with a total depth of 841 metres, this shaft penetrated many metres below sea level. This derelict site once not only set the stage for ferocious corporate skirmishes and capital manoeuvres in far-off London, but it was also the scene of the most daring mining gamble in New Zealand history. With their discovery of the Birthday reef near Blackwater on 9<sup>th</sup> November, 1905 (the birthday of King Edward VII), the prospectors making the discovery pegged four claims which they believed would encompass the entire dimensions and extensions of the reef. When the potential of the reef later became apparent from early exploration, other prospectors pegged claims around the Blackwater mine leases. The claims on the northern boundary, which were named the Prohibition, were vended into a Westport syndicate optimistically titled the Blackwater Extended Goldmining Company.

When he had heard of the discovery of the Birthday Reef Percy Kingswell, a Reefton sharebroker, moved with alacrity to negotiate a 6 months' option to buy the original four claims from the prospectors who found the reef. After carrying out some exploration which indicated the presence of a payable orebody of considerable dimensions, Kingswell exercised his option for £2,000, and optioned the property to Consolidated Gold Fields of New Zealand (hereinafter CGFNZ) – the main company on the Reefton field - for £30,000. CGFNZ swung into action and launched a major exploration programme involving a series of shafts sunk along the reef to test its grade and continuity. Results were so promising that CGFNZ exercised its option with Kingswell three months before its expiry. CGFNZ then formed a substantial company in London, Blackwater Mines Ltd, to operate the mine.

When David Ziman who had floated CGFNZ in London with the Rothschilds in 1896, first visited the Blackwater mine in 1909 he was not only struck with the great length of the orebody that was being opened up in the mine, but presciently discerned that the Birthday reef was plunging to the north, and that at depth it would enter the claims held by the Blackwater Extended Goldmining Company on the northern boundary of the Blackwater mine. Ziman, who was director of Blackwater Mines Ltd, urged the company to acquire the Prohibition lease.

Ziman's notion that the Birthday reef extended into the Prohibition ground was derided by mine management who then believed that the Birthday reef was the usual lenticular-shaped orebody which would be entirely contained within the Blackwater company's existing mine lease. They pointed out that the southern boundary of the Prohibition lease was more than 130 metres north from the known northern extremity of the mine's orebody. [See the Blackwater mine sections later in the Notes which explain Ziman's theory, and what mine management believed at that time, and also show the shape of the orebody as it was eventually mined].





*The Blackwater mine at Waiuta, New Zealand's second biggest historical gold producer. The Prohibition shaft is about half a kilometre north of this, out of sight to the left of the picture.*



David Ziman, fourth from the right, prepares to go underground at the Blackwater mine in 1909

Because of what he saw as the company's intransigence, Ziman negotiated his own option over the Prohibition ground. He then offered this to the Blackwater company at some profit to himself. This created a major row, as the other directors - who had themselves been procrastinating - believed he should have arranged the option directly for the company, of which he was a director. After a bitter dispute in London which led to the resignation of Ernest Spencer who had been CGFNZ group's general manager for 12 years, Ziman transferred his Prohibition option to the Blackwater company. Shallow exploration of the Prohibition carried out from the Blackwater mine workings failed to disclose any ore. This should not have been unexpected considering that if the Birthday reef did enter the Prohibition lease it would be at considerable depth. Despite Ziman's strenuous objections the Blackwater company then dropped its Prohibition option. After unsuccessfully pleading with the company to renew it, Ziman once again arranged an option on the Prohibition for himself. This enraged the other directors of the CGFNZ group who by now were belatedly recognising the possible potential of the Prohibition and hoping that it would eventually fall cheaply into the company's grasp. In a series of bitter corporate struggles, Ziman was then forced off the Board. The corporate brawl spilled over into the courts, and Ziman appealed adverse court decisions in his legal battles with CGFNZ all the way to the House of Lords, but he was unsuccessful.

He spent the last years of his life striving to prove his disputed assertion that the Blackwater mine's orebody ran into his Prohibition lease at depth. To prove his theory would require substantial capital to finance the sinking of a very deep exploration shaft in what then appeared to be a high-risk mining gamble. Shaft sinking costs were then some £45- £50 a metre. By this time World War I inflation of costs had effectively killed off any interest in investment in gold mining, and especially in such a speculative venture.

After failing to interest investors in Johannesburg and London in his Prohibition dream, and finding it impossible to raise any capital on the stock exchanges in New Zealand, Ziman displayed his usual pertinacity and went share-hawking in the New Zealand countryside, door-knocking farmers who were enjoying unprecedented prosperity with the wartime inflation of commodity prices. He was eventually successful in selling enough shares in his Blackwater North Development Syndicate Ltd to be able to start sinking the Prohibition shaft in search of his postulated extension of the Birthday reef. This was a valiant gamble, and Ziman and his backers then had no idea that their exploration shaft would eventually be the deepest shaft ever sunk in New Zealand.

Ziman had originally hoped that the Birthday reef would be struck at a depth of some 180 metres, but the shaft had reached the prodigious depth of 412 metres by 1918 when the Prohibition project ran out of funds and ground to a halt – still with no orebody in sight. Ziman, who suffered from diabetes, died in Hokitika in 1920. He had been the driving force behind the Prohibition project and without him at the helm the syndicate floundered, frittering away a large government subsidy that Ziman had arranged just before his death without sinking the shaft any further. The Blackwater North Development Syndicate Ltd collapsed.

The Blackwater mine company which had previously disparaged Ziman's Prohibition theory and once spurned their own Prohibition option later acquired the Prohibition lease cheaply, mainly by accepting liability for the government loans on it. The Blackwater company then recommenced sinking Ziman's shaft, and another 61 metres down they intersected the Birthday reef which was indeed plunging out of their company's mine lease into the Prohibition lease just as Ziman had always predicted.

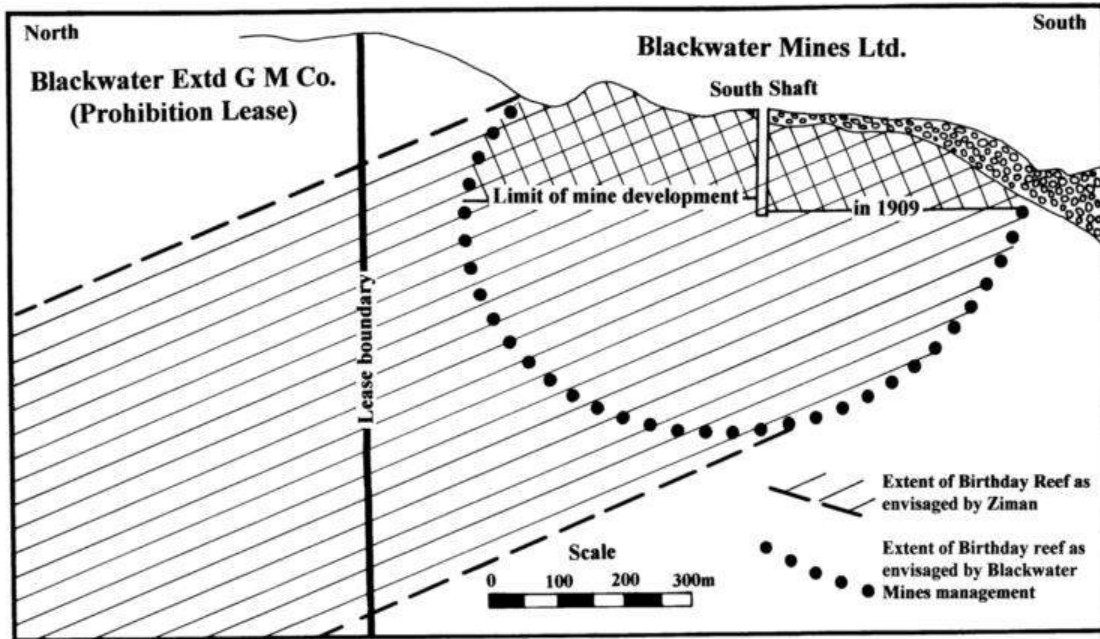


The Blackwater company then turned their mine's main shaft into a ventilation shaft and utilised Ziman's Prohibition shaft as their mine's main ore-haulage shaft because of the bulk of the Blackwater mine's ore would thereafter be produced from the Prohibition lease. (See the mine sections.) A new treatment plant was erected at the Prohibition shaft replacing the Blackwater mine's old mill that was now 1.5 kilometres away to the south in the Snowy river valley. An impressive 274,000 ounces of gold, comprising 37 per cent of the Blackwater mine's total production of 740,000 ounces was produced from ore hauled up Ziman's Prohibition shaft.

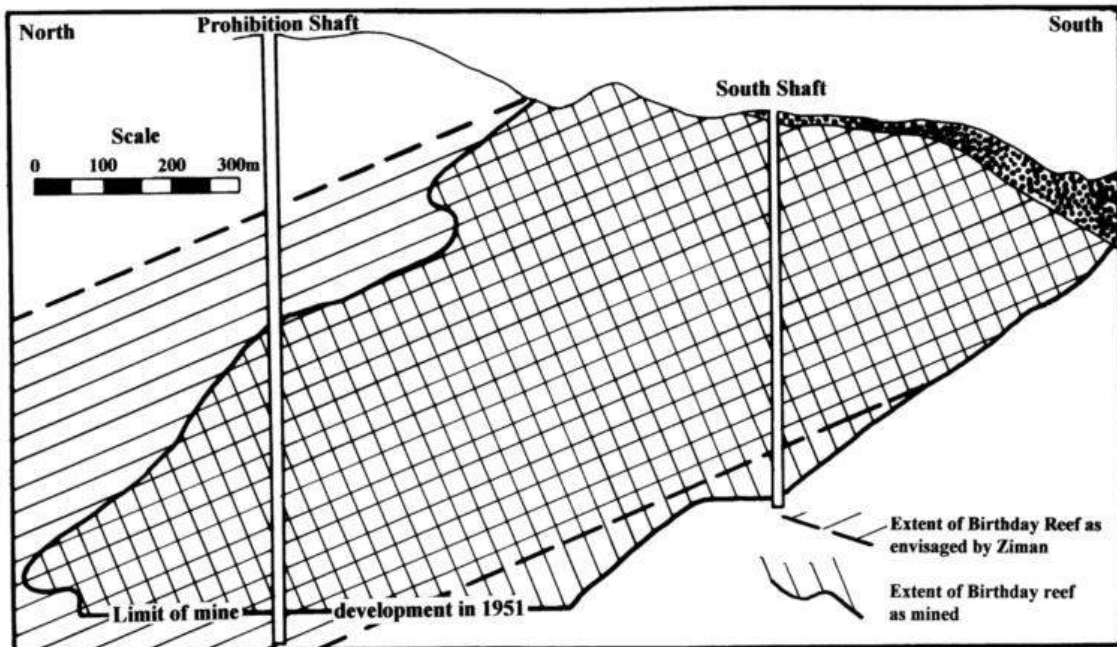
The Blackwater mine closed in 1951 when the ventilation shaft was damaged in a cave-in putting the mine pumps out of action. With the economic conditions then pertaining in New Zealand with very high inflation of costs and a fixed price of gold, it was manifestly unviable for the company to find the additional funds that would be required to repair the mine, and the Blackwater mine closed. In fact, the entire quartz goldmining industry in New Zealand closed that year.

However at the time the mine was closed, the Birthday reef was not mined out and is still continuing underfoot, and even though the Prohibition has been mined to a depth of 841 metres, it is not unlikely that hundreds of millions of dollars worth of gold remain at deeper levels. This is a tempting prize. Australian mining company Golden Shamrock acquired the property when the gold price ran in the late 1970s, and in the early 1980s began attempts to regain access to the Blackwater mine through the Prohibition shaft. These efforts were later continued by Macraes Mining Ltd (the predecessor of Oceana Gold), but technical problems were encountered when the shaft dividers in the Prohibition shaft were removed causing the shaft to cave at the top. This resulted in the abandonment of the attempt to once again reopen the Prohibition and the Blackwater mine, which historically had been New Zealand's second biggest producer of gold.

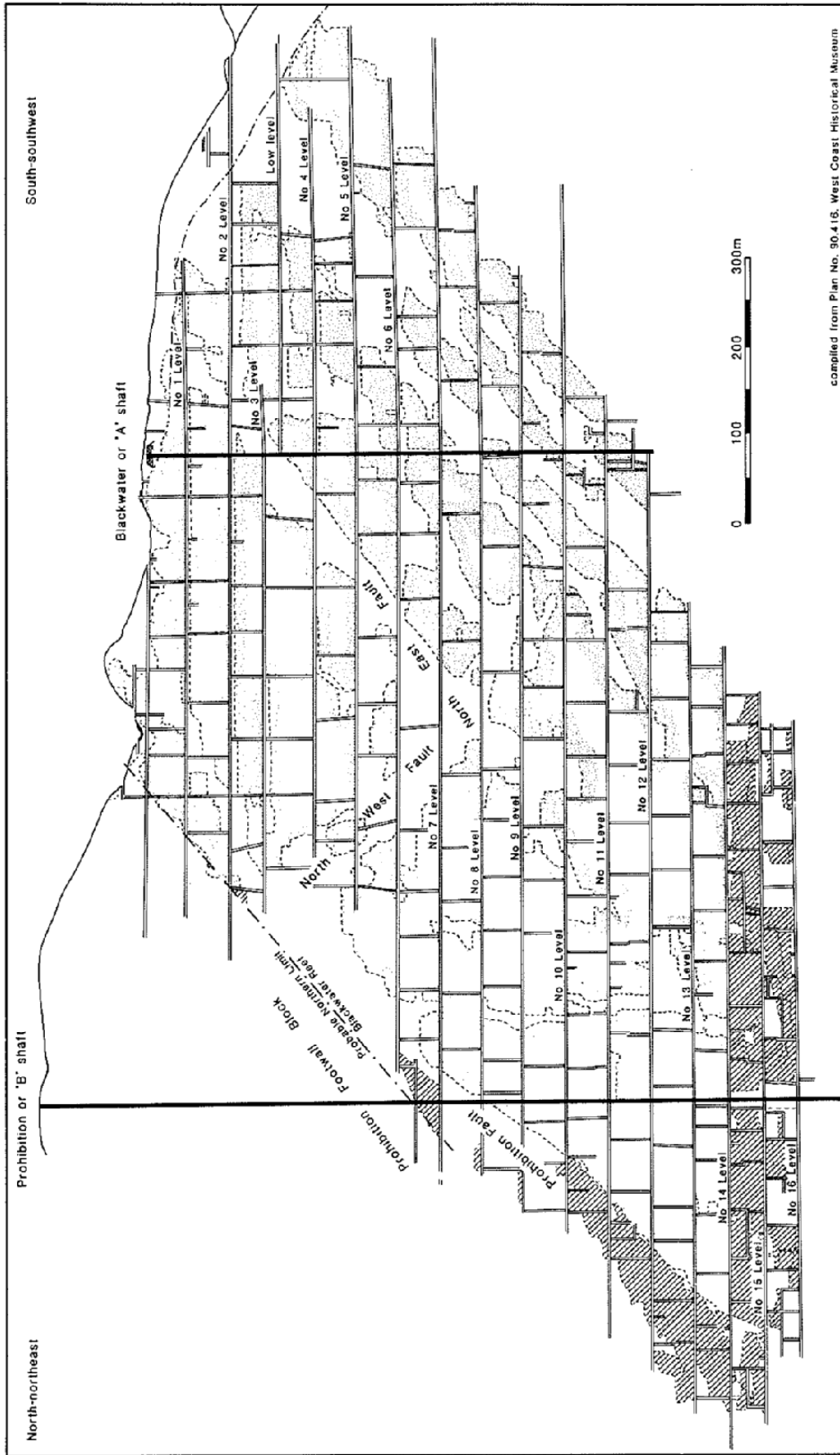
FURTHER READING: John Barry, *The History and Mineral Resources of the Reefton Goldfield*. Wellington 1993; Brian Hill, 'Exciting career of an obscure mining entrepreneur: David Ziman (1862-1920),' *Journal of Australasian Mining History*, vol. 7, 2009, pp 155-168; Darrell Latham, *The Golden Reefs. An Account of the Great Days of Quartz-Mining at Reefton, Waiuta and the Lyell*. Nelson, 1984; Morris, Gerard, *Waiuta. The Gold Mine, the Town, the People*, Reefton, 1986.



***Birthday reef, Blackwater mine section in 1909*** A longitudinal section of the Blackwater mine as it was in 1909 when Ziman postulated that the Birthday reef was plunging to the north and would pass out of the company's ground and enter the Prohibition lease. The dashed lines out lining the lined area with lines sloping to the left depicts Ziman's notion. The dotted line in the 1909 section outlines the dimensions of the lenticular-shaped orebody entirely contained within the Blackwater company's mine lease which the mine management expected at that time.



***Birthday reef, Blackwater mine section, 1951*** This section shows the Blackwater mine as the orebody was eventually mined when the mine closed in 1951. This provides impressive confirmation of Ziman's vision. The hatched area with the lines sloping to the right depicts the extracted ore and the lines sloping to the left depict Ziman's 1909 hypothetical orebody.



compiled from Plan No. 90.416, West Coast Historical Museum

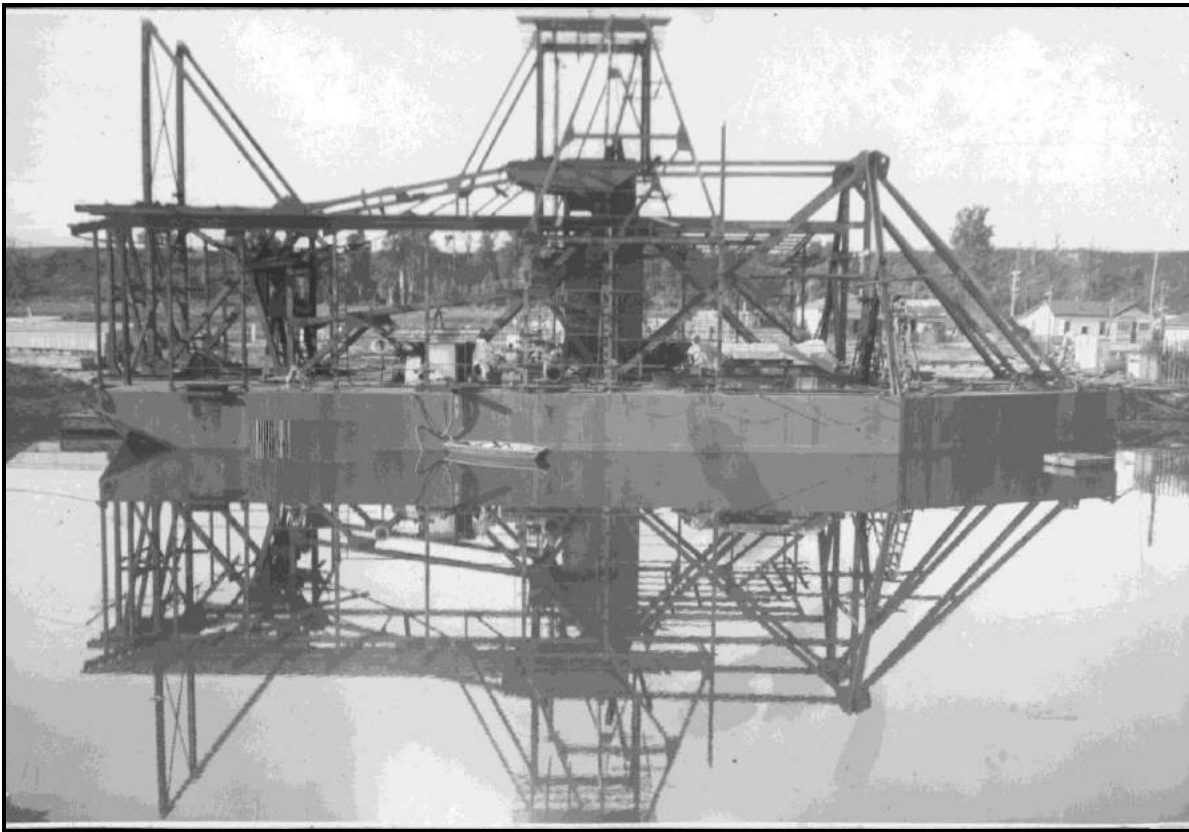
*Longitudinal Section through the Blackwater Mine*



## Stop 6 Grey River Dredging Company Ltd.

Removal of the gold standard in the early 1930s resulted in an increase in the gold price from £3/15/0 in 1931 to £8/4/0 in 1934. This increase together with the availability of cheap labour renewed interest in the low grade alluvial gold deposits of the West Coast. Interest was stimulated by the success of the Rimu Gold Dredging Company's operations on Rimu Flat south of Hokitika. American owned, the company commenced work in September 1922 with a large, powerful dredge, of American design which recovered 316.07 kg of gold in its first year of operation.

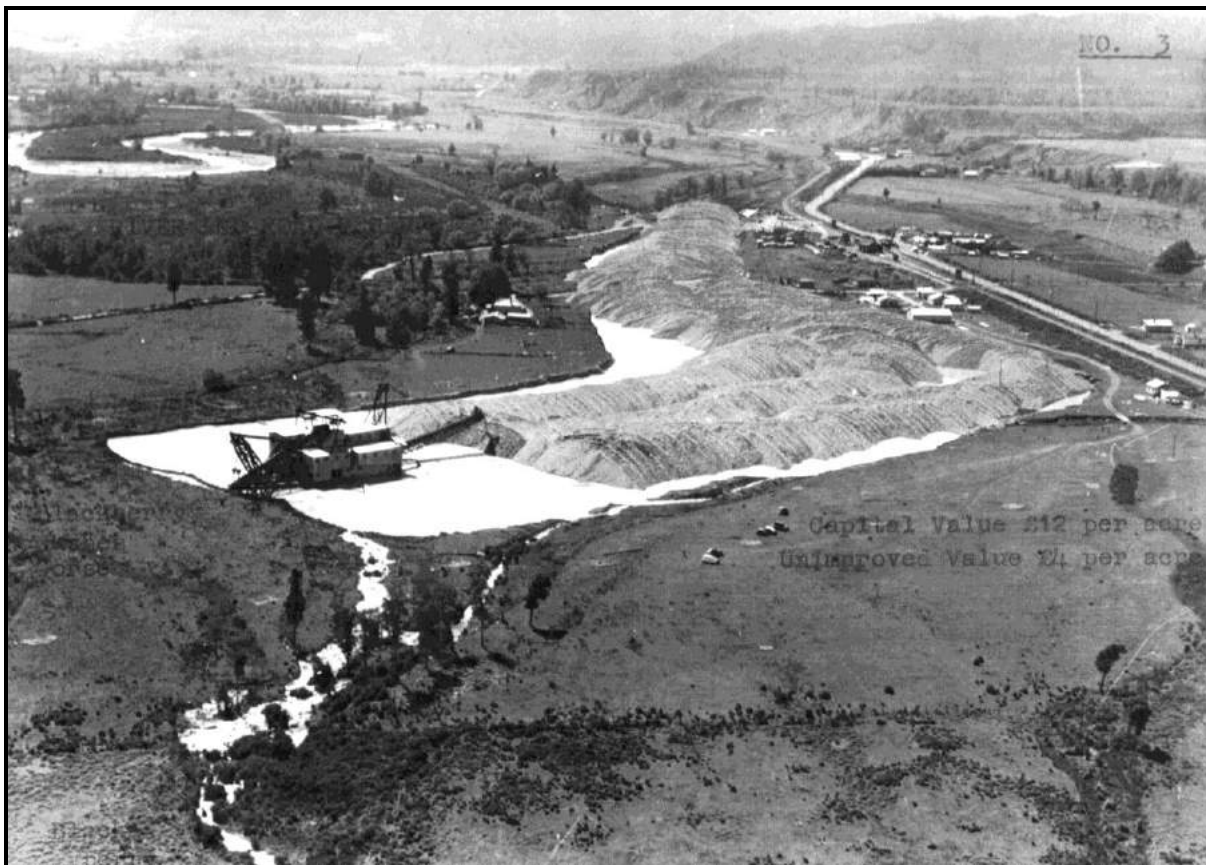
From its inception it was company policy to explore for new dredging properties and over the years many areas were drilled and sampled. In the search for new areas the Company was assisted by local prospectors. One of these, Harry Jones, the retired proprietor of the railway Hotel in Hokitika, persuaded the Company to acquire prospecting rights over land in the Little Grey (Mawheraiti) and Blackwater valleys near Ikatamua. Evaluation of the areas, including the drilling of 750 holes under the supervision of Walter. J. Radford, General Manager of the Rimu Gold Dredging Company, took over 3 years. Radford estimated that of the 3000 acres (1215h) held 1,700 acres (688h) were dredgeable. This area was estimated to contain 62,276,041 yd<sup>3</sup> (4,755,348 m<sup>3</sup>) of gravel with a grade of 1.97 gr/yd<sup>3</sup> (167.3 mg/m<sup>3</sup>). The average depth of the deposit was 28 ft. (8.53 m) with a range of 15 ft. (4.57m) to 43 ft. (13.11m). It consisted of fine to medium gravel with few stones larger than 16 ins. in dia., overlying a clay, sand or fine gravel bottom. The gold was of medium size, 0.962 fine, amalgamated easily and could be recovered on standard gold saving tables.



*View of the pontoon and superstructure of the "Big Grey" after the sideways launching on 23 April 1938. Steelwork was fabricated by Andersons Ltd who were also responsible for the construction of the Snowy River Gold Dredge. Ikamatua township in the background.*

Registered in Wellington on 27<sup>th</sup> February 1937 the capital of the Grey River Dredging Company Ltd., consisted of 570,000 10/- shares of which 250,000 were offered to the public. The Rimu Gold Dredging Company received 200,000 fully paid shares for options to purchase mining rights and land from Henry Jones and to cover exploration expenses. In addition the Rimu Gold Dredging Company paid cash for a further 120,000 shares. Nine local properties were purchased at a total cost of £54,543 cash and £144,000 was set aside for the dredge, spare parts, buildings and equipment.

Andersons of Christchurch were awarded the fabrication and erection contract for the electrically powered all-steel dredge which was designed by Paul. R. Parker, formerly chief engineer of the Yuba Manufacturing Company. Twenty men comprising core personnel from Andersons, assisted by local labour, were engaged to lay out the stocks and assemble the hull under the supervision of J. A. Davy. Levelling of the construction site, adjacent to the Ikamatua railway station, commenced in April 1937. By 9/06/37 the site was level and stock construction commenced. This was well advanced by mid September 1937 when a steam dragline started excavation of the dredge pit and dimensioned and drilled steel-work began to arrive at a new railway siding on flat deck wagons. The pontoon bottom was in place by early October, the longitudinal and transverse frames were then assembled and the sides and hull partitions riveted in place. By year's end the pontoon was almost complete and erection of the main gantry which supported the upper tumbler, digging ladder, bucket driving gear, main hopper and screen commenced.



*The "Big Grey" operating west of Ikamatua in 1939. Up to 1946 the dredge operated along the eastern side of the Little Grey River near Ikamatua. It then cut through the Greymouth-Reefton railway line and main road near the Waiuta turn-off into the Blackwater valley.*



*George Tibbles, Dredgemaster  
1940-1954*

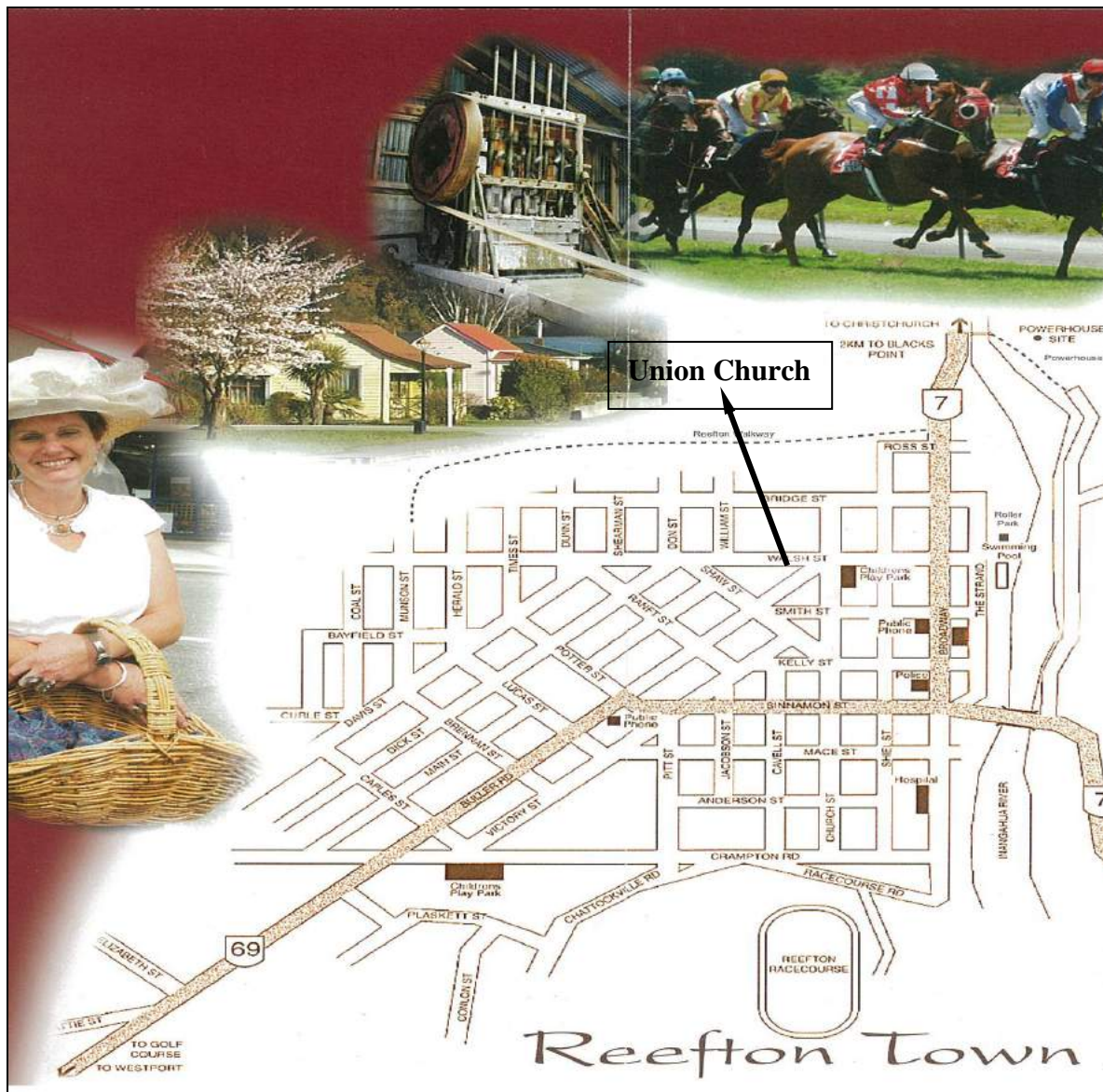
Following launching, the superstructure was finished, the main hopper, screen casing and tables built, electrical wiring completed and equipment installed. The bow gantry was then assembled on the ground and winched into position on 18/10/38. A month later the digging ladder was winched into position, the buckets threaded on to the ladder and the stacker attached. All dredging machinery was built by the New York Engineering Company, New York. Dredging commenced on 3<sup>rd</sup> December 1938 under dredgemaster Arthur Samson. Design throughput of the 1,800 ton (1829 tonne) dredge was 4,500,000 yd<sup>3</sup> (3,436,164 m<sup>3</sup>) per year. There were 77 buckets of 16 cubic feet capacity in the bucketline, each weighing 1.7 tons, discharging at 28 per minute. Maximum digging depth was 40 ft. (12.2m) below water level. Manoeuvring was by head and side lines and a single offset spud. A total of 1266 hp (944 kw) was installed. Electricity was supplied from Lake Coleridge.



*The "Big Grey" operating in the Blackwater Valley. After dredging upstream to Caribou Creek the dredge returned to the mouth of the Blackwater Valley, work ceasing on 14 September 1954. In almost 16 years of operation 164,230.5 ozs (5108 kg) of gold were recovered from 61,459,000 yd<sup>3</sup> (4,692,960 m<sup>3</sup>) of gravel at a recovered grade of 1.28 gr/yd<sup>3</sup> (108.7 mg/m<sup>3</sup>)*



## Stop 7



## **Stop 8 Globe-Progress Opencast Gold Mine**

### **Mining History**

Alluvial gold mining in Devils Creek, north-west of Globe Hill, started in 1866 but it took 10 years to trace the ‘mother lode’, the quartz reef, which was the likely source of the gold. Who made that discovery is uncertain – some accounts name Thomas Davis as the successful prospector while others say the reef was found accidentally by a group of alluvial miners building a dam for their sluicing operation. Whatever the case, ‘hard rock’ mining began – with less than promising results for a decade before another reef was discovered.

As the reef lay in an east-west direction, rather than the north-south strike that was usual for the Inangahua field, experienced mining men predicted it would be a “duffer”. However the Globe-Progress mine, as it eventually became known, lasted well into the 20<sup>th</sup> century and turned out to be the second-largest producer on the field. Following a 21<sup>st</sup> century revival it promises to become richest of all within a few years.

#### **Union Quartz Mining Company 1876-81**

The Union company probed the reef via adits and in 1878 erected a 10 head, steam-powered stamp battery in Devils Creek to crush the gold-bearing quartz, and coal mines were established further up Devils Creek to fuel the steam boilers. All that effort brought just 64 ounces of gold from 600 tons of ore, which was not profitable. The company soon folded, selling its battery to the neighbouring Oriental Company in 1881.

#### **Oriental Gold Mining Company 1876-86**

This company also tunnelled for the reef but was no more successful than its neighbour and went into liquidation in 1886.

#### **Globe Gold Mining Company, 1882-96**

Formed to work a new find of quartz on the Union claim, this company started with just seven shareholders who funded a new 20-head water-powered battery at Crusington, supplied by an aerial ropeway nearly two kilometres long. Their faith in the enterprise was misplaced as results were poor and mining ceased. Parcels of shares were virtually given away and the company faced financial ruin. However in late 1886 two prospectors, who had been employed in a last-ditch bid to find payable quartz, located a reef 300 metres west of the ground worked earlier and very near the boundary with the abandoned Oriental claim. Three metres wide, the new find assayed at two ounces of gold per ton of quartz.

After calling up more capital from the hard-pressed shareholders, the Globe company sank a vertical shaft -“A” shaft-on the promising reef. Men and materials were raised and lowered by a winch that gained its power from a waterwheel near the battery two kilometres away via an endless rope – a remarkable technical achievement. Success was immediate and sustained. When the company sold out to the London-based Consolidated Goldfields of New Zealand in 1896 it had won 35,457ozs (1103kg) of gold valued at

£141,059, paid out half that in wages and returned shareholders more than £40,950 for the £15,675 they had invested – plus a sale price of £24,000.



Globe or “A” shaft buildings. The shaft, sunk by the Globe Mining Company, was directly below the head frame at left. Engine house for the steam-powered winder is in the centre of photograph.

### **Progress Gold Mining Company, 1886-96**

All plant and the claim held by the defunct Oriental company was bought by a Greymouth businessman, Gerald Perotti, for £320 – less than two years’ wages for a working man in those days. His attempts to form another company gained no support at first, but the new discovery on the Globe claim near the boundary with the Oriental quickly attracted investors from Greymouth and Reefton. Perotti took more than 6000 of the 24,000 shares while at the other end of the ledger a Reefton waitress named Annie Lees bought 50.

As expected the new company, named the Progress, located a continuation of the Globe reef which was worked via two adits in Devils Creek near the former Union battery. From 550m inside the lower tunnel a shaft was sunk four more levels, about 180 metres, using an underground winch driven at first by compressed air and later by steam. Although the Progress did not enjoy the same spectacular success as the Globe it was steady enough, winning 24,271ozs (755kg) of gold and paying £17,400 in dividends before also selling out to Consolidated Goldfields of N.Z

### **Progress Mines Ltd, 1896-1930**

Consolidated Goldfields of New Zealand Ltd was a company founded by David Ziman, a Polish Jew who had made (and lost and regained) a fortune through investment in South



African gold mines. Encouraged by the New Zealand premier (and former West Coast gold mining agent) Richard John Seddon, Ziman revived the fading Reefton quartz field by introducing English capital. Among the properties the company bought were the Globe and Progress, seen as perfectly suited to working as one mine. This was done by Progress Mines Ltd, a subsidiary of Consolidated Goldfields.



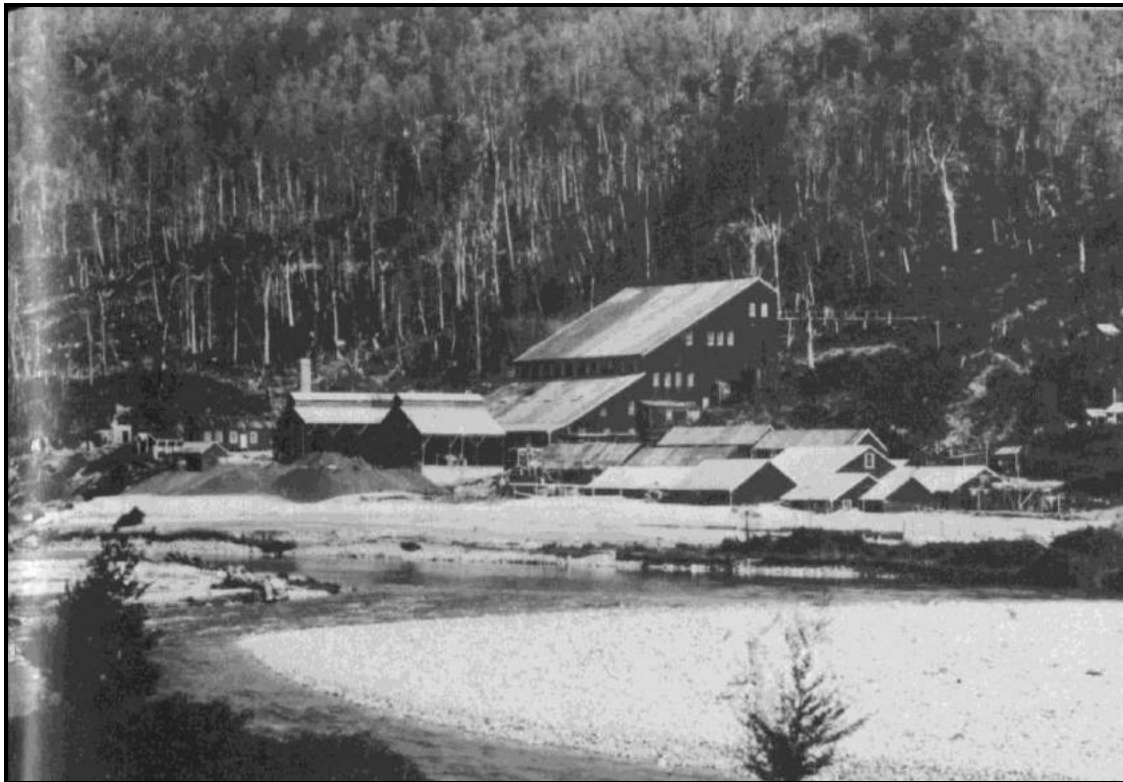
*Progress or "B" shaft. The winding engine was housed in the lean-to at left, blacksmiths shop to right and preparation area for mine timber in the foreground.*



*Ruins of "B" shaft engine house, compressor room and workshop in 1937.*

While it continued to operate the Globe or 'A' shaft, the new company also started to sink the new Progress or 'B' shaft which would eventually reach the 11<sup>th</sup> level, 432 metres below the surface. The deepest shaft sunk on Globe Hill, it ranked 6<sup>th</sup> on the Reefton field, being approximately half the depth of the Prohibition shaft at Waiuta which became New Zealand's deepest at 879m.

A massive new bi-cable aerial tramway was built to carry quartz down to the new Progress battery of 40 stamps adjacent to the Globe plant which by that stage had 25 stamps. Later the Globe battery was retired and the Progress increased to 65 stamps, making it the largest on the West Coast.



*Progress Mines treatment plant on the Inangahua River. The water-powered stamper battery began work in 1898. J.E.J.Lovelock was, for some years, superintendent. He was father of athlete Jack Lovelock who won the 1500m gold medal at the 1936 Berlin Olympics.*

Almost vertical in the upper levels, the reef flattened out in the lower levels and finally ended at a fault. After drilling to 300m below No 11 level failed to strike any more quartz the mine was abandoned, although re-treatment of accumulated tailings from the battery continued for some years. Between 1898 and 1926 the battery treated 911,562 tons of ore for a yield of 359,348ozs (13,012kg) of gold valued at £1,410,952, enabling Progress Mines Ltd to pay dividends of £326,562.

### **Historic Gold Production**

Combined, the five companies to mine on Globe Hill between 1876 and 1920 treated an estimated 1,045,888 tons of quartz, winning 418,343 ozs of gold valued at £1,652,011

and paying £384,062 in dividends. Of the local mines only the Blackwater Mine at Waiuta (1908-1951) with 732,907ozs (22,796kg) produced more.

## **Recent Exploration and Corporate History**

After closure of the Globe-Progress mine in 1920 several efforts were made to assess the potential of the area by geological mapping, resistivity surveying and re-opening and sampling of old workings. No new deposits or extensions to known deposits were discovered. Because of the low gold price little was accomplished until 1983 when CRA Exploration Pty Ltd., now Rio Tinto Ltd., acquired an exploration licence over most of the Reefton Goldfield and commenced a regional exploration programme which identified drilling targets at Caplestone, Crushington, Globe-Progress, Merrijigs and Waiuta. Of the 52 holes drilled by CRA 39 were located in the Globe-Progress Prospect. These successfully defined an area of disseminated mineralisation adjacent to the mined quartz shoots with potential for open pit development. In December 1990 CRA withdrew from New Zealand and invited tenders for their West Coast licence areas. The successful tenderer, Macraes Mining Ltd., operator of the Macraes gold mine 60km north of Dunedin, undertook fill-in drilling and initiated environmental, metallurgical and mining studies. In 1992 gold resources within 150m of the surface were estimated to be 8.94 Mt at 2.69 g/t (in-ground).

In 1998 Macraes Mining Ltd., merged with Gold & Resources Development (GRD) a small Perth based company to become GRD Macraes. Oceana Gold Ltd, was formed in 2003 to take over GRD Macraes gold interests in New Zealand which were sold to overseas institutional investors. Throughout the years of corporate manoeuvring exploration of the Globe-Progress deposit continued with geochemical soil surveys, trenching, Wacker sampling, percussion and diamond drilling and airborne and ground geophysics. As well as increasing resources of the Globe-Progress deposit on-strike extensions were identified south of the Globe-Progress open pit at General Gordon, Empress and Souvenir.

Exploration effort culminated in July 2007 with the official mine opening. Exploration within the mining permit is continuing. Recently (April 2010) Oceana announced the discovery of extensions to the mineralisation at General Gordon, Empress and Souvenir. As at 30/11/2010 proven gold reserves at the Globe-Progress deposit stand at 0.86Mt @ 2.41 g/t (0.5 g/t cut-off grade).

## **Reefton Goldfield Geology**

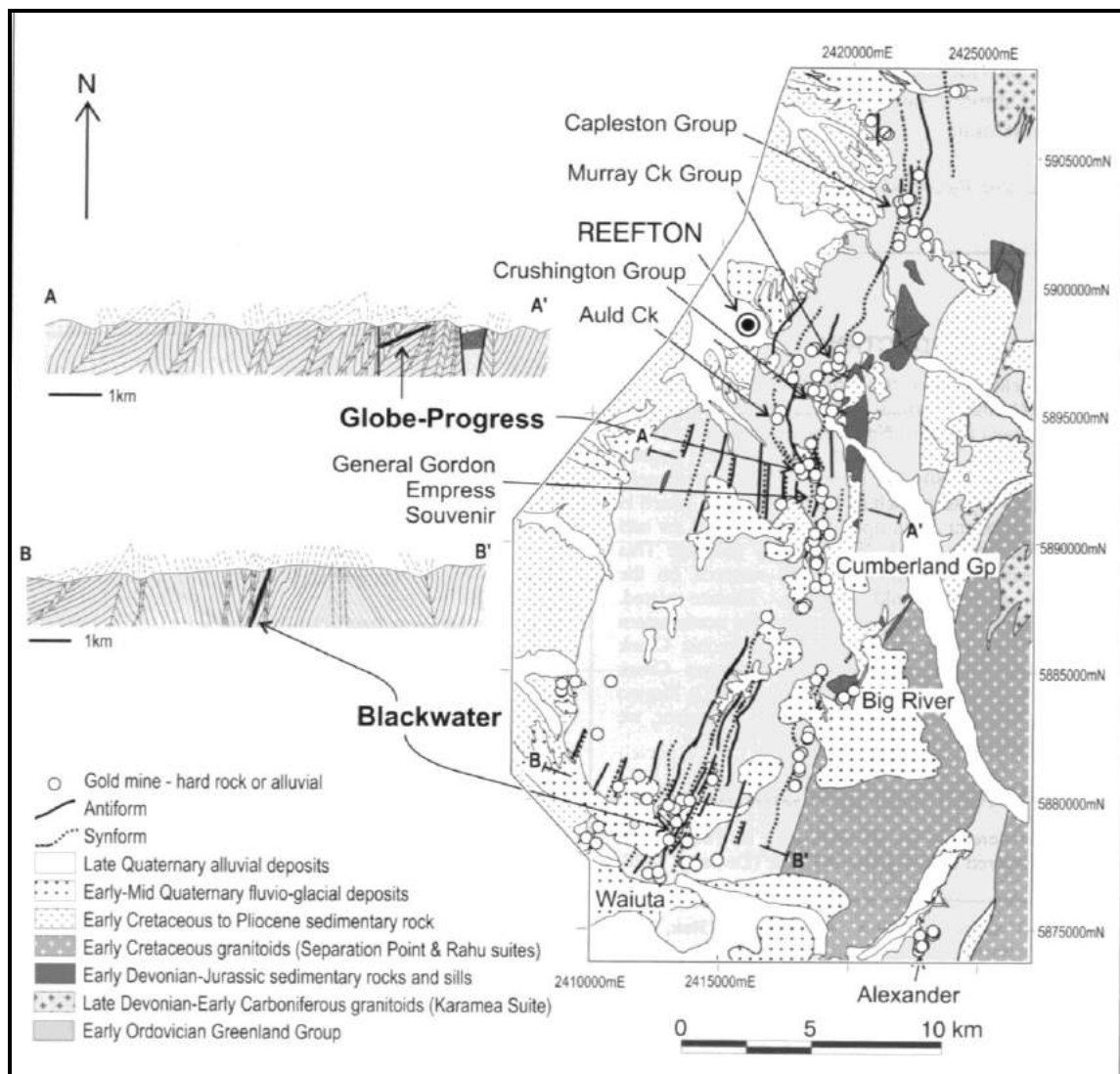
Occupying an area 30-40 km long by 15 km wide in the eastern foothills of the Victoria range the sedimentary rocks hosting the gold mineralisation at Globe-Progress consist of latest Cambrian-Early Ordovician Greenland Group metasediments. The strata comprise a monotonous succession of greywackes (lithic sandstones) and argillites (mudstones) which are interpreted as a continental derived turbidite sequence. During the late Ordovician or early Silurian the Greenland Group was subject to lower greenschist facies metamorphism with the development of north-south trending, gently plunging folds with conspicuous axial plane cleavage and sub-vertical axial planes. The Greenland Group rocks are intruded by Late Devonian-Carboniferous and early Cretaceous granitic plutons



as well as basaltic and lamprophyre dykes. Devonian, Permian, Cretaceous and Tertiary sedimentary rocks are present as fault bounded erosion remnants overlying the basement rocks and Pleistocene fluvio-glacial gravel deposits occur widely as a surficial veneer up to 80m in thickness.

Historic mining in the Reefton Goldfield primarily exploited the free gold-bearing quartz shoots and pods within sub-vertical shear zones or fault structures developed along the axial planes of host rock folds. These shoots are typically tabular with regular parallel-sided geometry. Spaced sub-parallel shoots along a continuous structure are common and alteration halos associated with the shoots are known to be narrow (<10's of metres). Individual shoot dimensions are typically small (50-100m along strike and 100-400m down dip and approximately 1m thick but are high grade (average~12 g/t Au). The limited aerial extent of these deposits means that they are unlikely to be amenable to openpit mining. However they are depth extensive and have underground mining potential. Sulphide-associated mineralisation, such as at Globe-Progress, is interpreted to have formed within persistent cataclastic zones, which could have acted as effective fluid conduits and mixing zones.

The Globe-Progress orebody is the largest sulphide-associated deposit currently known in the Reefton Goldfield. It occurs within an arcuate shear zone with a strike length of approximately 1km discordant to the regional structural trend. Surface dips are steep but the shear zone flattens at depth to form a quarter bowl shape. An alteration halo has been identified that extends >200m beyond the limits of economic mineralisation. In the Globe-Progress deposit high-grade quartz vein mineralisation has been extensively mined out but the sulphide mineralisation was too low grade and metallurgically challenging to be economically treated. Indeed this style of mineralisation receives only passing mention in historical reports and it is possible that sulphide mineralisation is much more widespread than currently documented. The proportion of the Reefton line of strike explored with modern methods for this style of mineralisation is low and the potential for further discoveries is high.



*Geological map of the Reefton area showing the locations of the gold-quartz vein and alluvial gold mines (after Cox et.al., 2002). Cross-sections through the Globe-Progress (A-A') and Blackwater (B-B') deposits. After Christie et. al. 2006).*

## References

Historical notes adapted from "Round the Globe Tours" website 31/05/2010.

Geological data from Whetter N., 1992: Exploration and Redevelopment of the Globe-Progress Mine, Reefton Goldfield. AIMM Monograph 25.

## Stop 9 Reefton's Forgotten War Hero

B.R.Hill

The first name in the list of fallen on the War Memorial in Reefton – Lt. Col. A. Winter Evans – has intrigued locals in recent years, for the passing of time has erased memories of him. Some of the other 59 names of World War I Fallen listed on the War Memorial, which is located in King George V Park on the corner of Buller Street in Reefton, are also unknown to locals because the Reefton mines always

attracted large numbers of itinerant miners including many from Bendigo in Victoria, and some of these men enlisted from Reefton but had only a casual or fleeting connection with that town.

Although he was not a local, having come from South Africa, Alfred Winter Evans did have a connection of some significance with Reefton where he lived from 1909 to 1910 and again from 1911 until his enlistment in the New Zealand army in 1915. A mining engineer, Evans was general manager of the most important mining group on the Reefton Goldfield, the Rothschild-connected Consolidated Gold Fields of New Zealand Ltd. Evans' two children were born while he and his wife lived in Reefton.

Recent research into his life has revealed that Evans had an even more heroic military background than the Reefton people were then aware. Although locals learned at the time of Evans' heroism in WWI when he was twice Mentioned in Despatches and awarded the Distinguished Service Order (DSO), Reefton people did not know that he had been recommended for the Victoria Cross while a teenage soldier in the Boer War and had been awarded the Distinguished Conduct Medal (DCM) for outstanding bravery in action. This was because Evans modestly forebore from mentioning the fact or using the letters of his decoration, as he was entitled.

Evans was born in the then British colony of Natal in February, 1881. During the Boer War he enlisted in the Natal Volunteer Force, serving as a trooper in the Natal Mounted Rifles. He was only 18 years old when he displayed outstanding valour rescuing another trooper under heavy fire.

During the siege of Ladysmith, on 4 November, 1899, Evans was in a patrol of five troopers who were sent to scout an area between Limit Hill and Helpsmakkar Post. They had dismounted to climb a ridge to observe the enemy position when they were fired upon by a large number of Boers who appeared on the ridge directly above them. They ran back to their horses under heavy fire but Trooper Golding was unable to catch his horse which bolted. Evans chased and caught the horse, and unheeding of his own safety, in a valiant act of bravery he rode back with it through a deadly hail of bullets to rescue a grateful Golding, who said in his statement accompanying the VC recommendation for Evans: "I mind I must have lost my life but for Trooper Evans' plucky conduct." Miraculously neither was hit as they escaped, but both horses were wounded. General White's recommendation that the Victoria Cross be awarded to the youthful Evans was not acceded to (this would have made him one of the youngest recipients of this award), but he was decorated with the DCM and later commissioned in the field in the Imperial Light Horse.



**Lt. Colonel A. Winter Evans. DCM, DSO. 1881-1917**





*Boer commandos in action at Ladysmith*

After the Boer War Evans became a mining engineer. He studied at the prestigious Columbia University mining school in USA, graduating in 1906. He then worked in mines in Utah and Arizona before returning to South Africa to work on the Rand. He was a sub-manager of the Simmer and Jack mine, one of the great gold mines of the Consolidated Gold Fields of South Africa group which had been floated by the Rothschilds with Cecil Rhodes, when he was seconded to Reefton to fill in for the Consolidated Gold

Fields of New Zealand Ltd General Manager, Ernest Spencer, who was going on extended leave overseas after 11 years' service.

When Spencer returned, Evans went back to South Africa in 1910. Spencer rowed bitterly with Consolidated Gold Fields of New Zealand founder David Ziman over the Prohibition lease neighbouring the group's Blackwater mine (visited earlier in this tour). Spencer resigned and after a couple of disastrous management appointments which did not work, in 1911 CGFNZ approached Evans and asked him to return to Reefton as General Manager of CGFNZ to sort out the mess. Despite Consolidated Gold Fields of South Africa offering Evans a £500 a year rise in salary to retain him, Evans jumped at the chance to return to Reefton on a five year contract on the then enormous salary of £2,000 a year, plus a car.

A very proficient manager, Evans instituted many improvements in the operation of the Reefton mines. When WWI broke out in 1914 he asked to be released from his contract so that he could join up. The company refused, so Evans joined the part-time New Zealand Territorials or army reserve and he organised and trained a mounted rifle company of volunteer reservists in Reefton. It was 1915 before Evans could enlist in the New Zealand army. He was posted to France where he distinguished himself in the field, being twice Mentioned in Despatches in the battle of Messines and being awarded the DSO.



*The Reefton Territorials, who were commanded by Evans, on parade in Reefton*

Evans was killed in Flanders on 12 October, 1917 – a date now forgotten – but it is the day on which more New Zealanders died than on any other day in that country's history. It was the date of the second New Zealand assault in the Battle of Passchendaele. Evans, by then a Lt. Colonel in command of the Third Battalion, was leading an attack on an emplacement of machine guns at Wolf Farm. According to the *Official History of the New Zealand Rifle Brigade*, "Evans' remarkable genius for organization was equalled only by his extraordinary gallantry under fire . . . he had gone ahead to endeavour by direct personal efforts to get his troops forward, but moving from shell-hole to shell-hole amongst the scattered groups, he drew upon himself the inevitable bursts of machine fire, under which, fearlessly persisting, he at last fell mortally wounded."

Confirmation was provided in an extraordinary newspaper interview published in 2001 with a soldier who was wounded in the same burst of machine gun fire that killed Evans. What was extraordinary was that the interview took place that week in October, 2001 – 84 years after the event being described. The reason for this unusual happening was that the 104-years' old Bright Williams was being interviewed as the last WWI survivor in New Zealand after the death that week of the second-to-last veteran. Despite his great age Bright Williams had perfect recall of that fateful day at Passchendaele 84 years before:

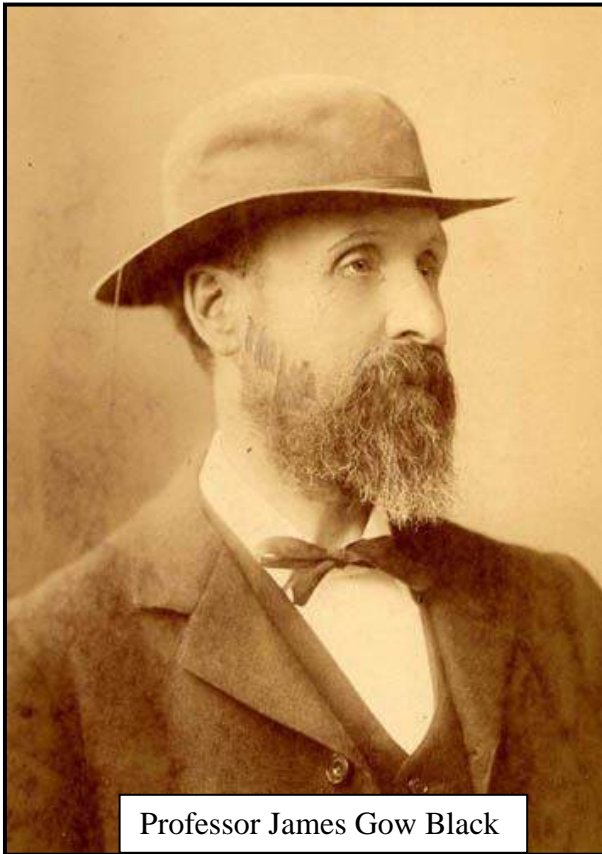
*We knew where that damned machinegun was. Every time the colonel (Col. Winston-Evans [sic]) and I came into view we got peppered. One ear would be ringing then the other. We were diving for the next shell hole deep in the ground or whatever.*

Both of them were hit. Williams said Evans struggled on with a tourniquet on his wound trying to press on the attack, but his tourniquet was not secure and he died about 50 yards further on. The severely wounded Bright Williams, who was then only 20, spent a day and a night lying out in the cold and rain before being picked up by stretcher bearers. Evans' body was never recovered from the muddy hell of No Man's Land at Passchendaele so he has no known grave, but his name is commemorated on the New Zealand Memorial in Tyne Cot Military Cemetery at Passchendaele in Belgium. And of course, on the War Memorial in Reefton.

When Reefton learned of Evans' death the Union Jack was unfurled at half mast over CGFNZ's Reefton office, and "the sad news quickly spread through the district and cast a gloom over the town." Reefton's daily newspaper *The Inangahua Herald* carried a rather perfunctory 150-word obituary that made no mention of any of Evans' decorations for bravery, but it did state that he had also served in the Boer war. *The Grey River Argus*, one of the two daily newspapers in Greymouth, published a more detailed and appropriate obituary, giving Evans a bar to his DSO but not mentioning his earlier recommendation for the VC, of which they were unaware. The far-off *Mining & Scientific Press*, a mining paper published in San Francisco carried a more complete obituary, but it said that Evans had twice been recommended for the Victoria Cross.

**FURTHER READING:** Glyn Harper, *Massacre at Passchendaele. The New Zealand Story*, Auckland 2000; W. S. Austin, *The Official History of the New Zealand Rifle Brigade*. Wellington 1924; Brian R. Hill, 'Reefton's Forgotten War Hero: Mining Engineer A. Winter Evans,' *The Journal of Australasian Mining History*, vol. 3, 2005, pp157-170; J. Bryant Haigh and A. J. Polashek, *New Zealand and the Distinguished Service Order*, Christchurch, 1993. (Even this compilation of all New Zealand DSO winners is not cognisant of Evans' Boer War service and DCM, listing his medals as "Distinguished Service Order, British War Medal, Victory Medal, and Mentioned in Dispatches (twice)." It failed to mention Evans' Distinguished Conduct Medal, awarded when General White's VC recommendation was not acceded to, nor his South African Medal and six bars.)

## Stop 10 Reefton School of Mines



Professor James Gow Black

The Reefton School of Mines (Reefton Mining Institute), the first regional school of mines to be formed outside Otago, was founded in March 1885 following a lecture tour of South Island mining communities by Professor James Gow Black of the University of Otago. Professor Black took up the Chair of Natural Science at the University of Otago in 1871. First and foremost Black was a teacher with a lucid forceful style tinged with humour.

Funded by an annual subscription and with the support of the Reefton business community the Committee applied to the Government for a building site and financial assistance. Both William Larnach, Minister of Mines and Premier Richard Seddon supported practical mining education. Consequently the Government provided the present Shiel Street site and a pound-for-pound subsidy for a two roomed wooden building comprising a lecture room and a laboratory. Funds were also provided for chemicals and laboratory apparatus. Future building additions included a furnace room and chimney (1899), library (1892), office and balance room (1903) and classroom (1936-1937). To assist teaching of mineral and rock

identification the school was given a collection of ores, rocks and minerals. Purchased from “Krantz” in Germany the standard collection consisting of “200 specimens of metallic ores, 50 specimens of rocks and 30 specimens of minerals that accompany the metallic ores and are indicative of the same” (Anon, 1887).

Thomas Fenton, assistant to Professor Black, was appointed Director in late 1866 with responsibility for branch schools at Boatmans, Denniston and the Lyell. The first Reefton classes were on 14 February 1887. Fenton also taught at Westport, Kumara and as far away as Nelson.

Since the early days there have been twelve Directors. Prominent among these were T. O. Bishop (1902-1903), an early student and Otago School of Mines graduate whose later career included terms as Inspector of Mines, Secretary of the Employers Federation and Speaker of the Legislative Council. Successor to Otto Bishop was John Henderson (1903-1911), another Otago School of Mines graduate, who became Director of the New Zealand Geological Survey.

By far the longest serving Director was James Bolitho (1938-1970), a local from Blacks Point who guided the school through the change from gold to coal mining education which lead to a greater reliance on Government (Mines Department) funding. Regional schools of mines were in the spotlight again in the 1950's when a commission into mining education recommended closure of the Reefton school. The Director and Council fought resolutely against the decision which culminated in a Mines Department announcement, in October 1955, that the subsidy on the Director's salary was to be withdrawn and mining tuition undertaken by the Westport Technical School. However after pressure





from the media, public and the School of Mines Council the Minister reversed his decision. Tuition of coal mine officials, on site in Reefton, and by correspondence continued until Jim Bolitho's resignation due to illness on 31 December 1970.

The significance of the Reefton School of Mines as a centre of early mining education was recognised by the NZ Historic Places Trust in 1990 when the school was listed in Category 1 as a building of national significance. Since then much of the building has been restored, its contents assessed and the mineral collection, still housed in the 1887 display cases, catalogued, cleaned and partly relabeled. The building is managed by the Department of Conservation and administered by the Reefton School of Mines Council.

*The late Jim Bolitho was very proud of the School of Mines collection of gold-bearing quartz. It includes specimens from the Reefton Goldfield and samples from lesser known reefs in the Taupo and Wilberforce valleys, Blackball and Mokonui.*

References:

Bolitho, E. E., 1999: Reefton School of Mines: Stories of Jim Bolitho. Friends of Waiuta Inc.  
Fenby, D.V.: Black, James Gow (1835-1914). Dictionary of NZ Biography.

## Harry Evans

Henry James (Harry) Evans, second son of Henry and Eva Evans was born on 7th November 1912. Harry's early years were spent in Greymouth where his father worked as a carpenter. About 1914 the family moved to Reefton to help on the Evans family farm at Burkes Creek while other family members were serving in the armed forces. Sadly, in February 1922 Harry's father was drowned while attempting to rescue some Reefton school children who were picnicking at the Blaketown Beach, Greymouth.

Harry received his education at the Waitahu Primary School and the Reefton High School. On leaving school Harry's first job was as an assistant in the cyanide plant and assay office at the Alexander Gold Mine. Because of a hunting accident this did not last long. Fortunately his geological talents were well known and he secured a position at the Reefton School of Mines in 1932 as assistant to the Director, Lionel Stevens, resigning on June 15<sup>th</sup> 1935. As well as providing a free assay service to prospectors the school provided assay facilities for prospecting and mining companies involved in the evaluation of the West Coast gold placer deposits. In addition to his laboratory duties Harry enrolled in the school's geology and mining courses.



*Harry Evans examining fluvio-glacial silts in the Nelson Creek area.*

*(Max Gage photo)*

In 1936 Harry was appointed geologist-in-charge of a Government sponsored prospecting party to follow-up the coal and mineral occurrences reported by Charles “Mr Explorer” Douglas” at Paringa, South Westland. Harry was also responsible for a mapping and sampling program around the abandoned Alpine Mine at the Lyell.

A friend of the Reefton School of Mines Director, E.O. Macpherson, who led a Geological Survey party re-mapping the geology of the Reefton Goldfield, is thought to have been responsible for Harry’s first appointment as a professional geologist with the New Zealand Petroleum Company in 1938. Over the next six years he was involved with oil rig supervision, cutting and drill core logging and stratigraphic mapping both on the West Coast, Taranaki and on the North Island East Coast. He spent most of 1945 with the Geological Survey which was undertaking a resource assessment of the Greymouth Coalfield.

In 1946 Harry joined the Zinc Corporation and was appointed Chief geologist with Frome Broken Hill Pty Ltd., searching for oil and gas in various parts of Australia. In 1955 Harry led a group of petroleum geologists to Cape York Peninsula. The party quickly concluded that the peninsula was not prospective, but Harry did collect six samples of some reddish-brown pebbles found near the Weipa Mission Station. Subsequent analyses confirmed the presence of bauxite. Harry returned in October with a dinghy and outboard motor and examined the coastline south of Weipa. From the results of this survey Harry estimated bauxite resource of 250,000,000 tonnes. Subsequent exploration proved the reserves to be much greater. Although Harry made the field discovery of the Weipa deposit some of the credit is due to Maurice Mawby, Director of Exploration who prior to the departure of the York expedition had advised all geologists to be on the “look out” for bauxite, phosphate and potash.

The discovery of bauxite was of immense economic importance to Australia. It lead to the formation of the Commonwealth Aluminium Corporation (COMALCO) in 1956 and the subsequent development of Comalco’s fully integrated mining, alumina refining and aluminium smelting business. Harry was in charge of exploration at Weipa, returning to CRAE as Chief Geologist in 1964. While on secondment to Rio Tinto he discovered another important bauxite deposit in Brazil. Australia acknowledged Harry’s contribution to the mineral industry by the award of the OBE in 1965 and the Australian Institute of Mining and Metallurgy President’s Award in 1988. After 28 years service with CRA Harry retired in 1974. Harry Evans died in Melbourne on 9 November 1990.

#### References

Australian Prospectors & Miners Hall of Fame ([www.mininghall.com](http://www.mininghall.com))

Bolitho. E. E., 1999: Reefton School of Mines: Stories of Jim Bolitho.

Gage, M. & Nathan, S., 1999: *A Geologist Remembers. Recollections of fieldwork. Geol Soc. NZ. Misc Pub. 102.*

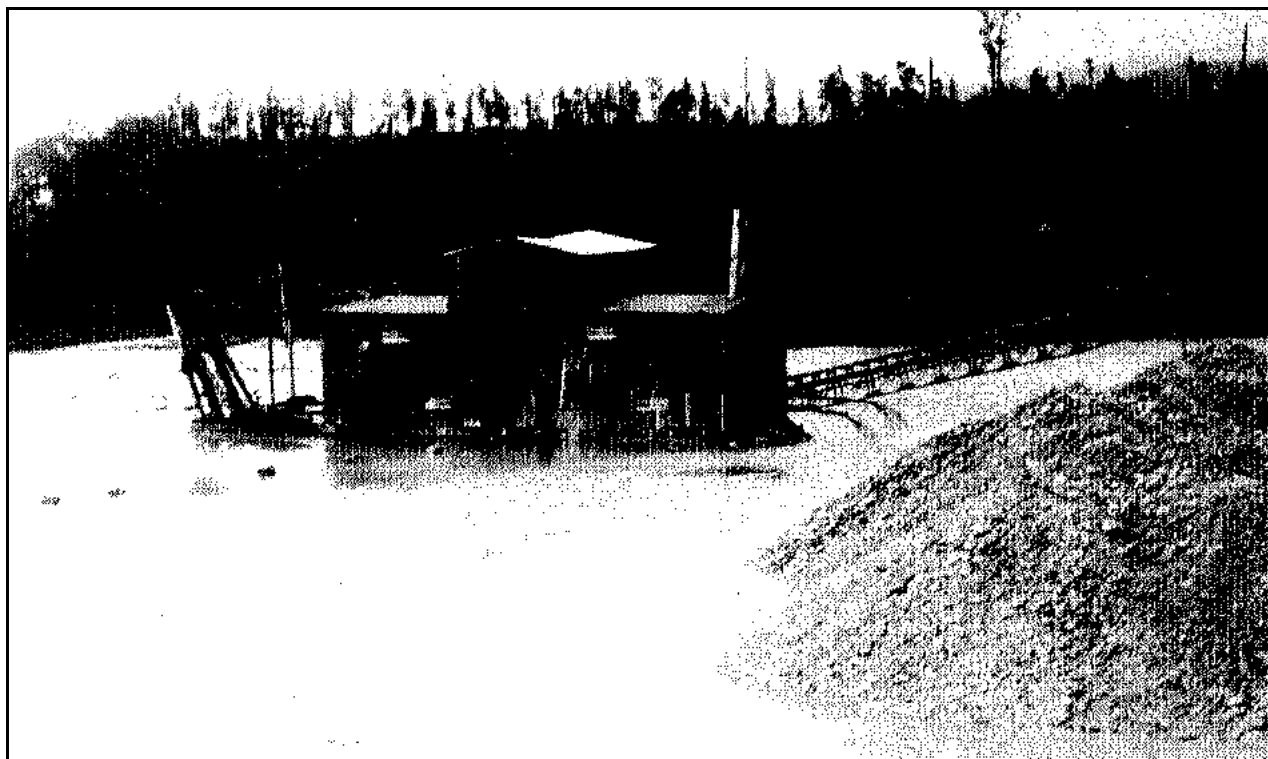


## Field Excursion, 8 July

### Gold Dredging in the Blackball Area

(For location see Stop 12 on map of Pre-Conference Excursion)

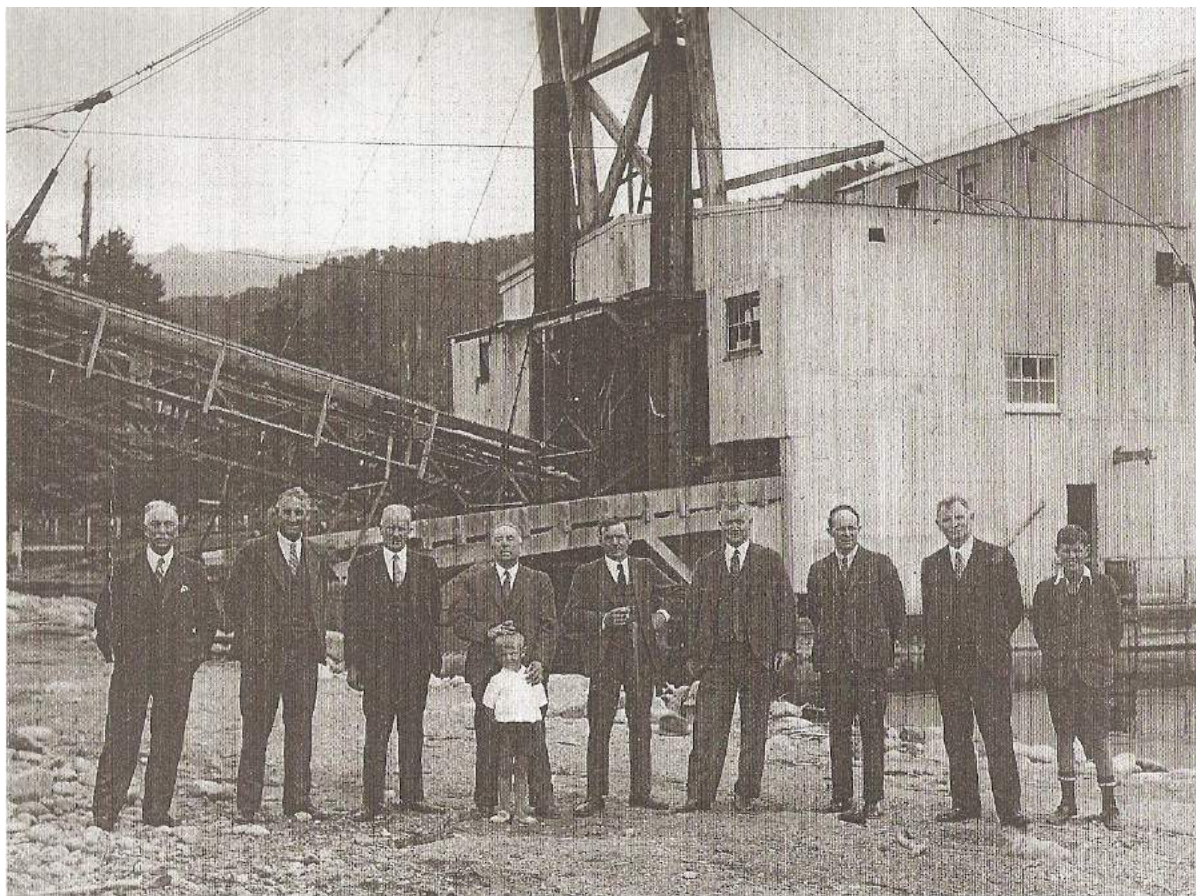
The Birchfield or Grey River gold dredge, the last bucket ladder gold dredge operating in the southern hemisphere, is now operating near the confluence of the Grey River with Fords and Blackball Creeks. This area was the location of several earlier gold dredging endeavours which targeted flats formed by creeks which had cut down through fluvioglacial gravels. First on the scene was the Ford's Creek Gold Dredging Company which placed a small steam powered dredge near the mouth of Ford's Creek. The venture was short lived (1900-1902) because of buried timber and the inability of the dredge to reach bottom.



*The Blackball Creek Gold Dredging Company's dredge operated for 40 years for 4 owners in different locations. It was originally purchased from Australia in the early 1900s and rebuilt on the Ahaura River. The Blackball Creek Company were the only owners to have worked it profitably.*

Better results were achieved in the 1930s by larger, locally owned, electrically powered dredges of the Blackball and Argo Gold Dredging Companies. Operating in Ford Creek the former company worked for 9 years (1938-1947) to recover 15390.8oz (478.6kg) of gold. A total of £23000 was distributed in dividends representing a 130% return on the subscribed capital of £18000.

Between 1935 and 1942 Blackball Creek, east of Ford Creek, was worked by the Argo Gold Dredging Company. Designed and built by W.G. McKay the dredge dug to a depth of 10.7m with 4.5 ft<sup>3</sup> buckets and was designed to process 10,000-13,000m<sup>3</sup> of gravel per week. A total of 489.8kg of gold was produced and £41200 was returned to shareholders amounting to a 206% return on capital.



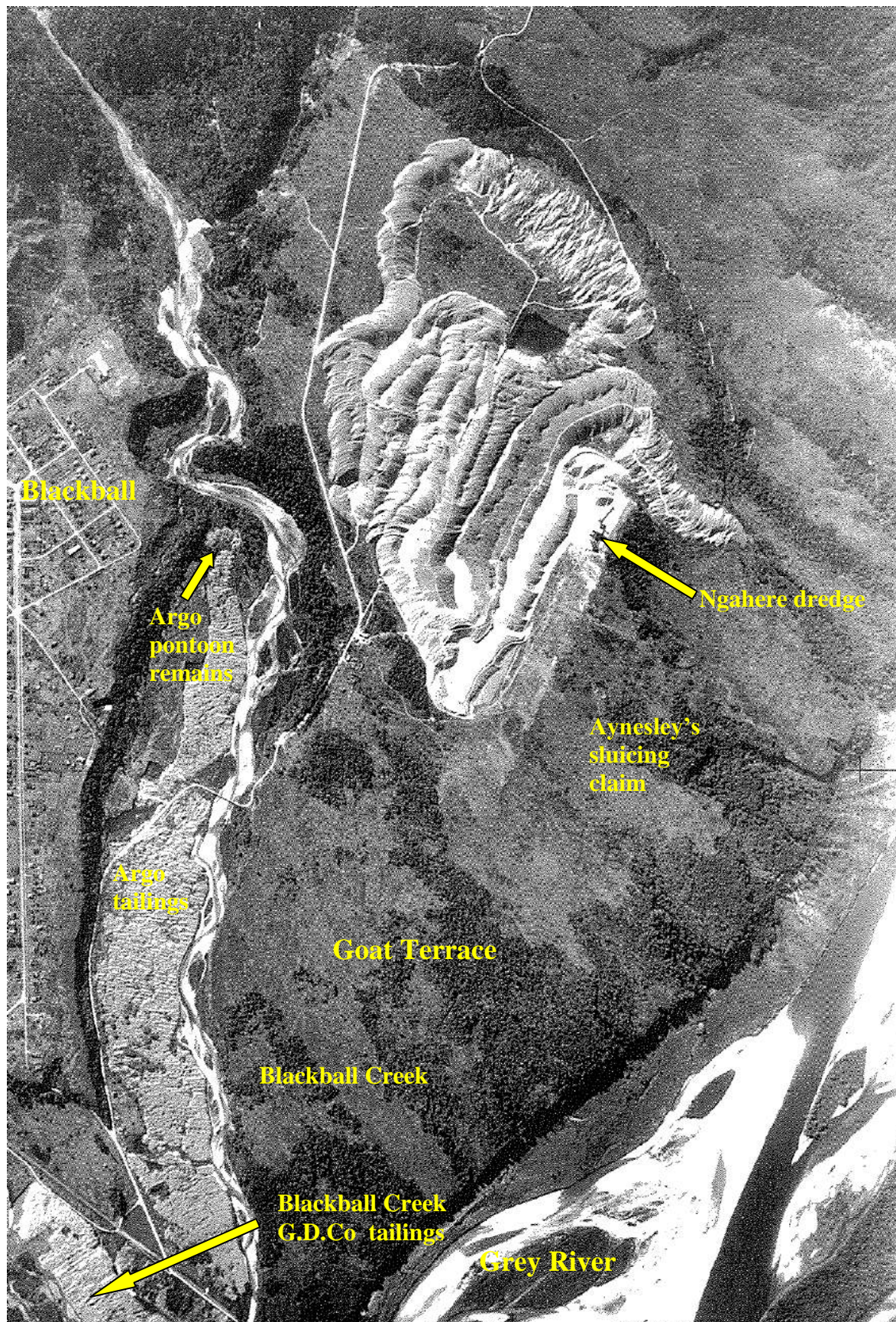
*The Directors Argo Gold Dredging Company, dredgemaster Fred Fisher is fifth from left.*

While the Ford, Blackball and Argo dredges worked recent gravel deposits, the parent fluvioglacial gravels have been sluiced and dredged. Two large sluicing claims, the Montgomery and Aynesley, sluiced the terrace facing the Grey River which was also dredged by the Ngahere Gold Dredging Company.

Located on Goat Terrace the Ngahere Gold Dredging Company's claim, estimated to contain  $36,700,000\text{m}^3$  at a grade of  $254\text{mg/m}^3$ , was purchased from British Developments Ltd., by the Ngahere Gold Dredging Company Ltd. The capital, 200,000 ordinary £1 shares and 100,000 deferred 1/- shares was fully subscribed. Principle shareholders included Alluvial Prospectors of Sydney, British Developments Ltd., and N.Z. Prospecting & Mining Ltd., both of Timaru.

The property was equipped with a large American style dredge with  $18\text{ ft}^3$  buckets which commenced work in January 1940. From the outset it was apparent that the dredge was not recovering the gold that the ground was supposed to contain. The treatment plant, short riffle tables discharging into primary and secondary jigs, could not be faulted and the directors were confronted with the fact that the true grade of the ground was less than the drilling estimates. Nevertheless the directors were confident that with careful management the claim could still be profitably worked. Apart from the low gold recovery the operation was beset by two strandings, when the dredge buckets broke into an old prospecting tunnel and also by a prolonged labour dispute. On the first stranding the dredge was undamaged but on the second the ladder was fractured forward of the bow gantry. Dredging ceased on 11/4/1950. After remaining idle for 2 years the dredge was beached and the company went into voluntary liquidation. A total of 2363.53kg of gold was produced. No dividends were paid.





*Aerial Photograph of the Blackball dredging areas.*



# The Grey River Dredge, West Coast, South Island

R J Cotton<sup>1</sup> and A Birchfield<sup>2</sup>

## ABSTRACT

The Grey River Dredge, also known as the Birchfield Dredge, mined alluvial gold in the Grey River near Ngahere, 20 km inland from Greymouth, between 1992 and 2004. It worked a total of 220 hectares, processing 44 Mm<sup>3</sup> of alluvial gravel to produce 55 000 fine ounces of gold. The gold was mined using a bucket ladder of 104 0.57m<sup>3</sup> buckets. Two 10 m diameter radial (trapezoidal) jigs were used for primary gold recovery on the dredge, with further concentration by jigs. The dredge, the last alluvial gold mining bucket ladder operation in the Southern Hemisphere, is now in care and maintenance.

**Keywords:** gold, alluvial gold, placer, mining, bucket ladder dredge, Grey River, West Coast.

## HISTORICAL BACKGROUND

The Grey River Dredge (Figure 1), also known as the Birchfield Dredge (Gregg, 1994), started life as the Kaniere Dredge, working terrace alluvium 7 km east of Hokitika over a period of 15 years (1938-1953) (Plate V, Williams, 1965). It was then relocated to Kumara and worked in the bed of the Greenstone and Taramakau Rivers between 1956 and 1982. The dredge was then transported to Ngahere (Figure 1), 20 km inland from Greymouth, with the intention of re-establishing it in the bed of the Grey River. This proposal foundered, and apart from assembly of new pontoons, the dredge sat idle until 1986. In that year, Kaniere Gold Dredging Limited was purchased by Grey River Gold Mining Limited (GRG), a joint venture between the R A Hanson Company of Spokane, Washington, USA (RAHCO) and Giant Resources Ltd of Australia. The dredge was radically redesigned and construction was completed in 1989. GRG converted the dredge to run a prototype suction cutter system for

overburden removal, associated with a traditional bucket line to recover basal gold bearing gravels. In practice the dredge proved difficult to operate when both systems were running together. Reliability was low and the design throughput of 1500 m<sup>3</sup>/hour was never achieved. Matching the mining rates of the two components, keeping both operational for extended periods and maintaining a stable platform for the on-board gold recovery circuit proved to be impossible. Gold recovery also never met grade expectations based on many years of drilling in and around the mined area. After ten months of commissioning, and a total expenditure approaching \$50 million, the dredge was mothballed.

In late 1992, the assets of Grey River Gold Mining Limited were purchased by Birchfield Minerals Limited, of Greymouth.

1. MAusIMM, Westland District Council, Private Bag 704, Hokitika 7900, New Zealand. Email: richard.cotton@westlanddc.govt.nz
2. Birchfield Minerals Ltd, Dredge Road, Ngahere, New Zealand.



FIG 1 - The Grey River dredge operated by Birchfield Minerals Ltd at Ngahere. The dredge is 150 m long from the front A frame to the end of the stacker and reaches 30 m above the water line.

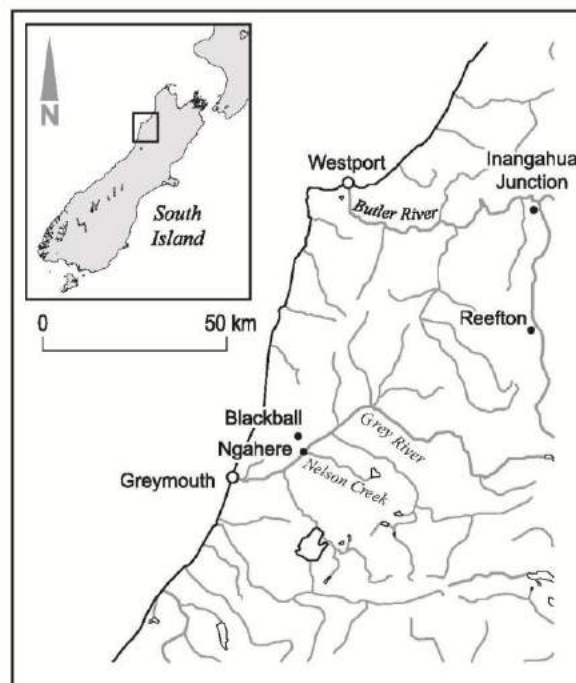


FIG 2 - Location of Ngahere where the Grey River dredge operated between 1992 and 2004.



The dredge was converted back to a traditional bucket line configuration, and the overburden system was removed. The stacker was extended, the operation placed under tight financial control, and a significant drilling program was carried out to more closely define the dredge path.

### GOLD MINING

The redesigned dredge processed all the material dredged from the bed of the Grey River at a rate of 850 m<sup>3</sup>/hour. The gravels ranged between about 20 and 22 m in depth and had an *in situ* grade of 100 mg/m<sup>3</sup>. Recovery averaged about 75 per cent for a final recovered grade of 75 mg/m<sup>3</sup>. The gold recovered was consistently 930 fine. Contrary to the grade distribution model upon which Hanson had designed the dual mining system, gold proved to be present at low grades throughout the mined interval, although the best grades were on the 'bottom', which is composed of Pliocene Old Man Group Gravels and Rotokohu Coal Measures (Johnson, 1987).

The resource worked by the dredge was contained within a 379 hectare mining licence issued in 1980. A total of 1000 boreholes were drilled in this licence area by Kaniere Gold Dredging, RAHCO and Birchfield to define the mineable resource. Most of these boreholes were small diameter (75 mm) percussion RC holes drilled with a Becker casing hammer. Reliability, repeatability and comparability with other forms of drilling were all low, but the large number of samples and hence large statistical database allowed reasonable correlations between average borehole grade and dredge returns, and provided for an accurate definition of the dredge path.

Between 1992 and 2004, the dredge worked a total of 220 ha, processed 44 Mm<sup>3</sup> and recovered 55 000 fine oz of gold, an average recovery of 160 kg per year. It employed a staff of 18. The land mined was all initially rough riverbed on the south-eastern bank of the Grey River (Figure 3). Mined land was restored to rolling pasture as tailings were re-contoured and developed into grazing land.



FIG 3 - The Grey River dredge at Ngahere, with the Grey River beyond (photo courtesy of Birchfield Minerals/Stewart Nimmo Photography).

The dredge worked a path downstream of the confluence with Nelson Creek, which had hosted very successful dredges in the 1930s. The basal gold concentration was probably derived from the Nelson Creek catchment, with a lesser gold input from the Grey River, mostly restricted to the upper 10 - 15 m of the gravel column.

Once the economically mineable areas on the southeast side of the Grey River had been mined, the intention was to move the

dredge to the northwest bank, close to Blackball, and mine the area at the confluence of the Grey River, and Fords and Blackball creeks. A combination of difficult consent conditions, a buffer zone to be left around the active channel of the Grey River, and some vocal opposition to the proposed mine plan all militated against this proposal and the dredge ceased operations in April 2004. The dredge, the last alluvial gold mining bucket ladder operation in the Southern Hemisphere, has again been put onto care and maintenance.

### GOLD PROCESSING

Gravels were mined with a line of 104 0.57 m<sup>3</sup> buckets at a rate of 25 per minute (Figures 4 and 5). The dredge was capable of a maximum digging depth of 30 m. Oversize boulders were scalped over a grizzly and dropped to the bottom of the pond through a well in the centre of the dredge. Sub 300 mm material was passed to a 3 m diameter polyurethane lined trommel screen with oversize discharged via a 70 m long stacker to the rear of the 150 m long by 300 m wide dredge pond (Figure 6). The dredge was controlled by a headline system, rather than spuds.



FIG 4 - Bucket line with 0.57 m<sup>3</sup> buckets (photo courtesy of Birchfield Minerals/Stewart Nimmo Photography).

Gold was separated from the trommel undersize and concentrated on two 10 m diameter radial (trapezoidal) jigs (Figure 7) mounted on either side of the trommel. Secondary concentration was by conventional Panam jigs. Hanson used an on-board Wilfey table for tertiary concentration, but Birchfield installed a series of Knudsen bowls, and later secondary and tertiary jigs, on the plant to produce a gold concentrate, which was taken ashore and processed over a Wilfey table.

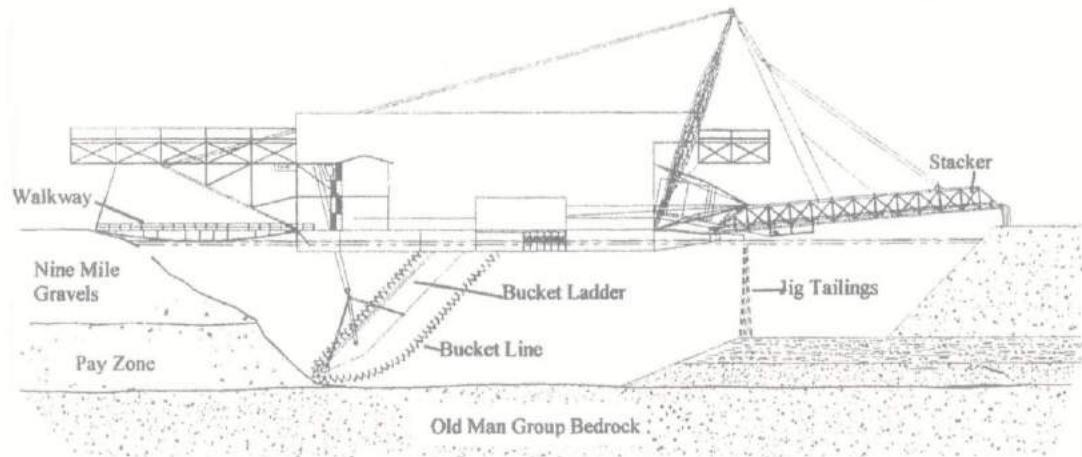


FIG 5 - Schematic cross-section of the Grey River gold dredge.



FIG 6 - Stacker depositing fine tailings (photo courtesy of Birchfield Minerals/Stewart Nimmo Photography).



FIG 7 - Radial jig in operation (photo courtesy of Birchfield Minerals/Stewart Nimmo Photography).





FIG 8 - Restoration to high-quality pasture behind the dredge.

### Restoration

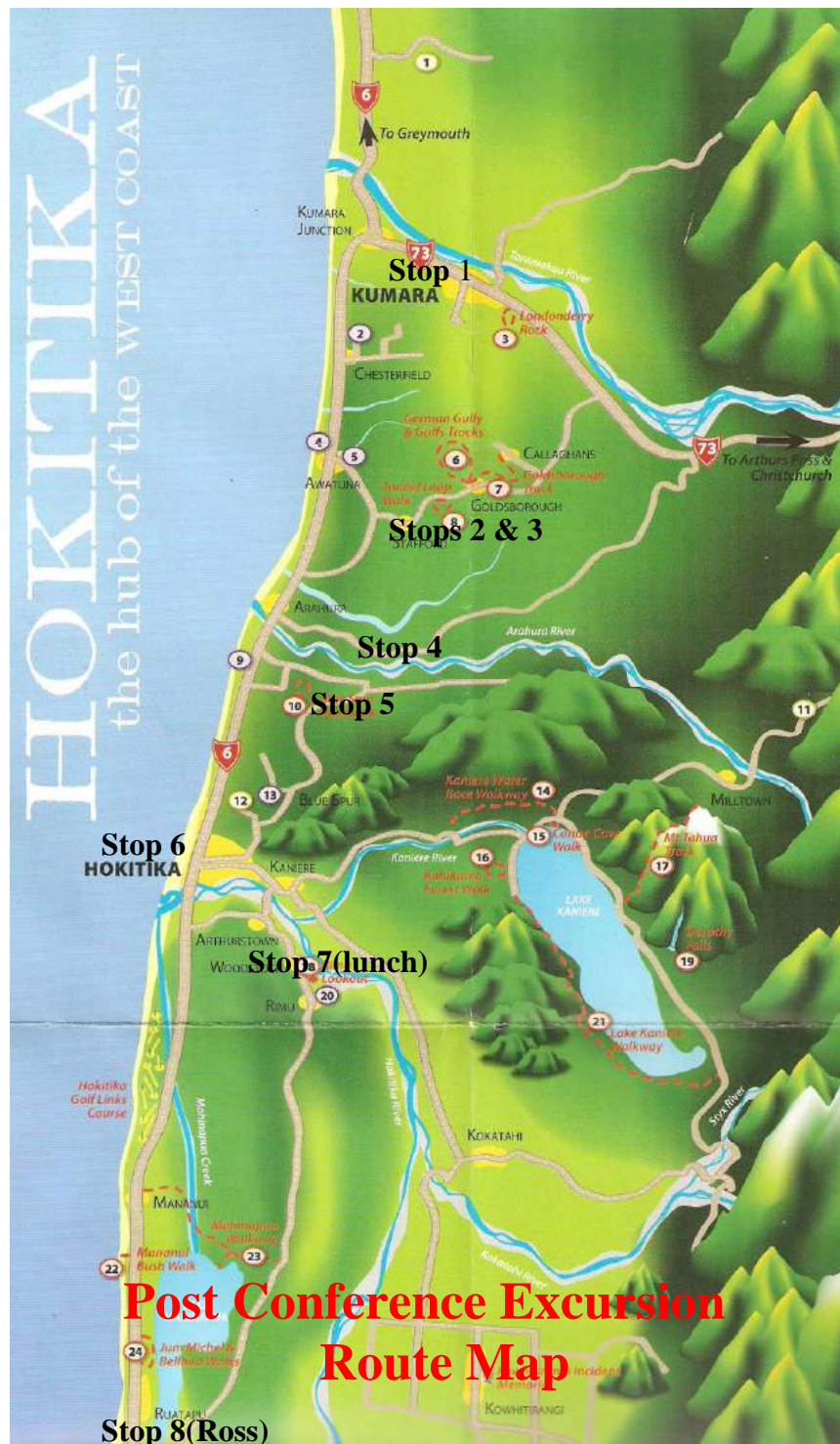
The land prior to dredging was predominantly poor quality pasture within 1 - 3 m of river level. It carried grazing cattle and was regularly flooded by the Grey River. Topsoil, where present, was stripped prior to dredging and carted behind the plant to be placed and spread over levelled and contoured tailings. Close to the river, a stopbank was built to minimise flooding during mining. This wall was incorporated into the final contour of the land, which was raised 3 - 5 m by the 'swell' caused by the loose packing of the tailings. The restored land has been converted to high-quality pasture grazing dairy cows, is now protected from

flooding and is much more productive due to the well drained contours that were developed across each cut the dredge made parallel to the main channel of the river (Figure 8).

### REFERENCES

- Gregg, R, 1994. The Grey River Dredge - A kiwi success story, *New Zealand Mining*, 15:8-11.
- Johnson, M, 1987. The Rotokohu coal measures, MSc thesis (unpublished), The University of Canterbury.
- Williams, G J, 1965. Economic Geology of New Zealand, *Eighth Commonwealth Mining and Metallurgical Congress, Volume 4* (The Australasian Institute of Mining and Metallurgy: Melbourne).

## Post Conference Field Excursion, 11 July





## **Stop 1 Kumara**

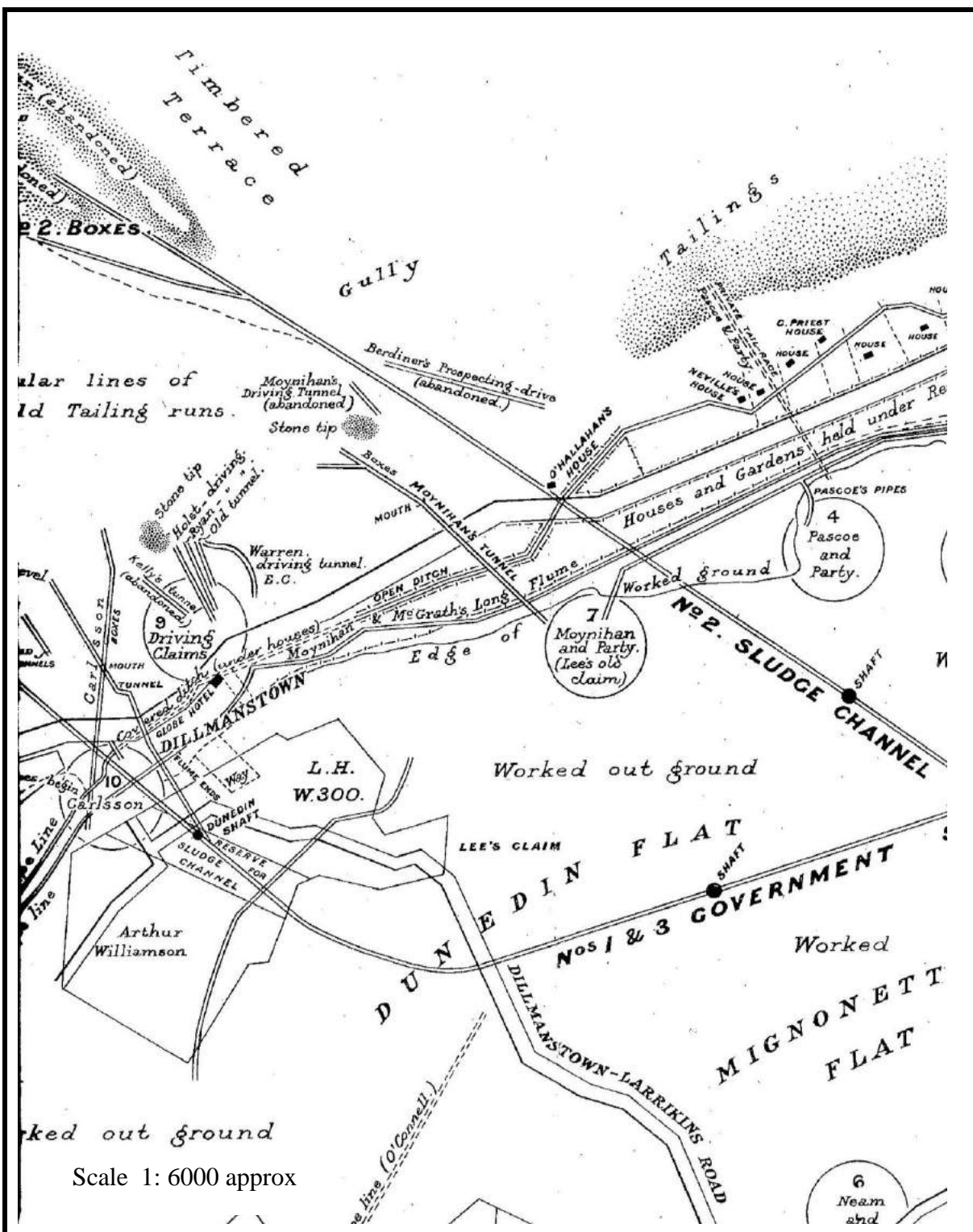
### **“The Last Fling”**

In 1864 and for the 3 years following, the Coast boomed as rush followed rush. By 1876, all was over, the early cream-picking men long gone and the remaining miners had settled into organised and systematic working of the deposits. In 1876, the news of a potential field at Kumara resulted in the West Coast's last major gold rush. Recognition for the discovery was given to James Robertson who had been prospecting the heavily forested area south of the Teremakau and Greenstone Rivers. A more colourful discredited explanation was that it was discovered by two 'moonlighters', Cashman and Houlahan while digging the foundations of an illicit whisky still near Dillmanstown.

It was the first major find for some time. There was a liberal sprinkling of inexperienced men who soon became discouraged, but a larger number of experienced miners gathered, possibly drawn from other work for one “last fling”. These men carefully noted returns and conditions before making any move on their own part. Townships were established at Larrikins (Kumara) and Dillmanstown. A population of 6000 was reputed to be on the field by the end of 1876 and about half this number were still there 18 months later. Kumara grew into a thriving town with about 50 hotels. It was serviced by coaches from Hokitika and a horse tram running on wooden rails from Greymouth. Dillmanstown boasted 6 hotels, 4 butchers and a bakery.

Dunedin Flat, near the centre of the field was the richest. Here the wash-dirt, up to 30 ft thick, was overlain by 50ft of gravel. Generally the wash-dirt was 6-8ft thick and 50-100ft below the surface. At the ‘Shallow Lead’ near the township, the wash-dirt was 4-5 ft. thick and lay on a false bottom 20ft. down. At this time tunnelling and shaft and windlass were the main mining methods used. The usual method of working was for a man to form a small party and the profits were split. Very few companies worked on the Kumara field, although one, the Kumara Long Tunnel Company, which started working in 1882, worked successfully throughout the life of the field.

The problem of tailings disposal was overcome by the opening of the first Government sludge channel in 1882. Altogether, 5 main tailings channels with various extensions and deviations were built with Government subsidy at various times. These were run in conjunction with Government water-races from Kapitea Creek and the Waimea system. In 1884 there were 27 giant nozzles using Government water. Water was conveyed to the claims by an elaborate network of wooden fluming. However maintenance costs were high and by 1891 the fluming was being replaced by iron pipes and syphons.





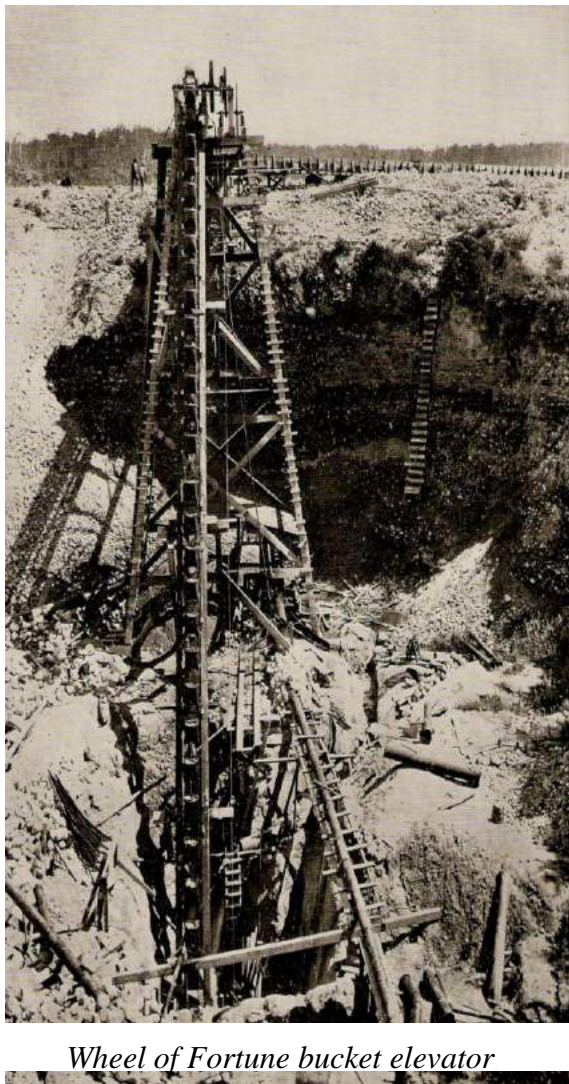
*View of Dillmanstown from the southwest with Dunedin Flat workings in the foreground.  
Kumara Government water-race crosses middle of photo.*

Sluicing continued through the 1890s with a gradual decline in men and production despite the construction of two Government subsidized sludge channels. Difficulties were also experienced in maintaining tail-race fall as the workings moved further away from the river. Through the 1900s production steadily declined and no new ground was found despite extensive prospecting. The Government water-race system was abandoned in 1922. Total production from the Kumara field is estimated to be about 500,000oz from 32,687,600 yd<sup>3</sup> of gravel (7.6 grs/yd<sup>3</sup>) or 15.55 tonnes from 24,990,000m<sup>3</sup> (620mg/m<sup>3</sup>).

Adapted from Cavaney. R. J., 1967: A history and the workings of the Kumara Goldfield, Westland. Ministry of Economic Development, NZ. Unpub rept MR 1253.

## Stops 2 and 3 Rush to the Waimea

Late in 1864 gold was found in the bed and tributaries of Waimea Stream. By March 1865 three thousand five hundred men were working the beds of the main tributaries where the wash dirt was 2-3 ft. thick on a clay bottom. Boisterous mining townships grew up at Goldsborough and Stafford. Upon depletion of the recent gravel deposits the miners' efforts were directed to the small marginal terraces which were worked by ground sluicing. Water was captured from streams above the claims and conveyed to the faces by short water-races.



*Wheel of Fortune bucket elevator*

Early in 1866 there were further discoveries in Pretty Woman's Gully and on Ballarat Hill where the wash dirt was a cemented black sand. This narrow beach lead was quickly traced to Scandinavian Hill and by the end of September had been extended as far as the Seventh Hill between Waimea Stream and Kapitea Creek.

Situated between Ballarat Hill and Scandinavian workings Stafford, named after storekeeper Thomas (Pegleg) Stafford, in its heyday had 37 hotels, 17 stores, 4 churches and a Literary Institute. The townships of Stafford and Goldsborough even had their own newspaper – the Waimea Chronicle. The mining population reached a peak of 6350 in January 1867.

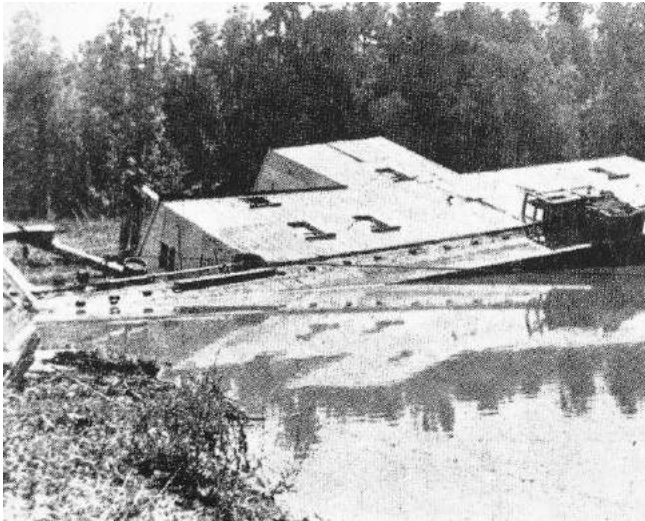
The Wheel of Fortune sluicing claim west of the township used a bucket elevator to remove tailings from the pit. The elevator was driven by a pelton wheel with water from Lake Mudgee 6 miles away.

Dredge remains at the corner of Stafford Road and Stafford Loop Road have a long history. The dredge first worked in Antonio's Creek. It was then moved to Humphrey's Gully by the Westland Prospecting Syndicate where it was operated by the Chambers

Reward Gold Dredging Company. This company ceased digging in 1920 and sold the dredge to the Awatuna Gold Dredging Company which re-erected it on a beach claim at Awatuna, south of Hokitika.

After working off and on for 9 years it was purchased and rebuilt by the Stafford Gold Dredging Company on Waimea Creek near Stafford Township. Early in March 1938 the hull was punctured, the dredge listed to port and sank in 4-5m of water. Because of the





water depth it is unlikely that any equipment was salvaged. Currently parts of the port side of the pontoon and gantries and parts of the bucket drive gears protrude from the water.

*Stafford dredge sunk in its pond, March 1938*



*Remains of the Stafford dredge, 2002.*



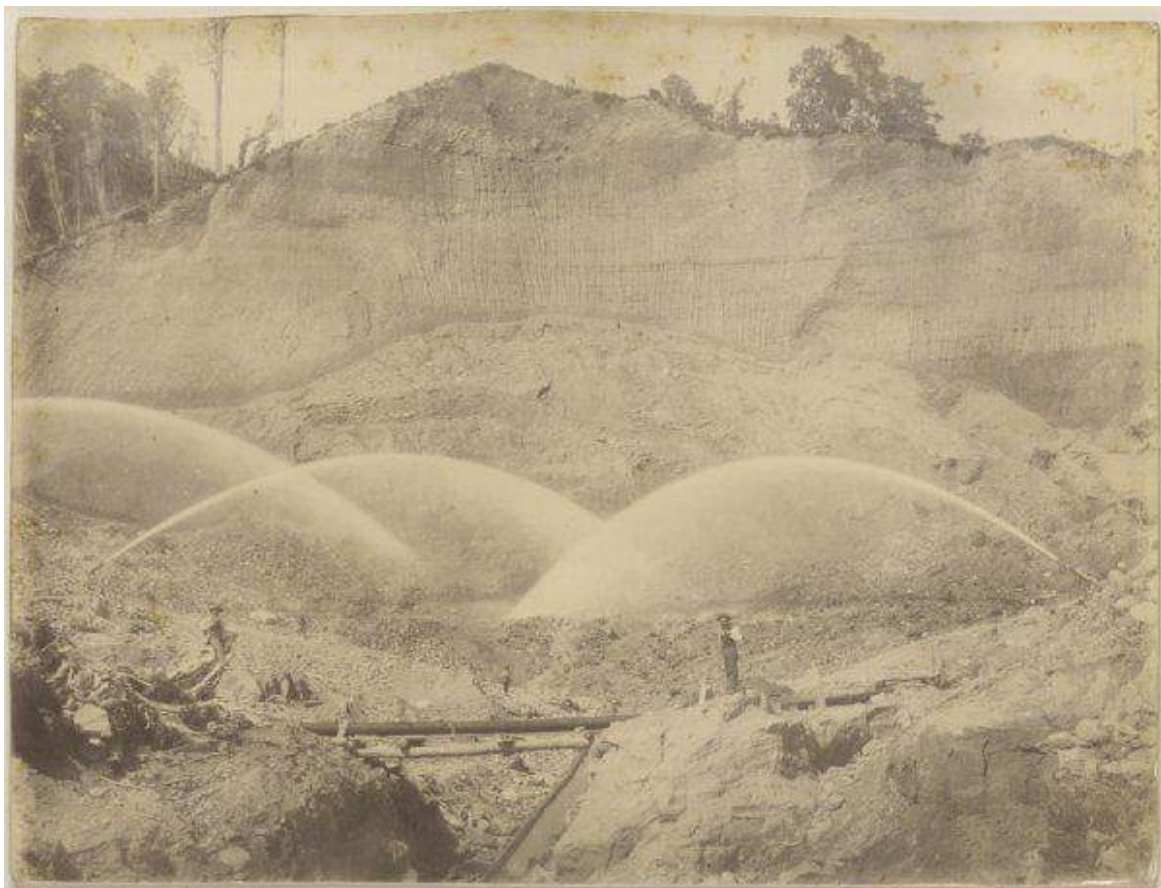
*Goldsborough in the 1860s, looking east along Barff Street. A horse tram connected the Goldsborough and Stafford townships*



*View of Stafford township looking southwest from the cemetery showing fan of gravel tailings from workings in Pretty Woman's Gully.*

## Stop 4 Arahura Valley

On the old coach road from Christchurch, the Arahura Valley was the location of the Humphrey's Gully workings where gold was found in a stiff glacial clay and extracted by the use of pug mills. When worked by the Humphrey's Gully United Company in 1885 the 300 ft high sluicing face was worked by two 6 inch giant nozzles. The claim operated successfully (1885-1905) to recover about 12,000oz of gold at an average grade of  $85\text{mg}/\text{m}^3$ . A dredge, operated as the 'Chambers Reward' by the Westland Prospecting Syndicate worked briefly (1919-1920) in the gully but the ground was too patchy and low grade to be profitable. Beach gold was also found on the coastal terraces which were worked by sluicing and tunnelling.



National Library of Australia

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*Humphrey's Gully sluicing claim in 1885. One of the largest sluicing claims on the coast it was serviced by a 12 mile long water-race.*

In 1938 Alluvial Gold Ltd., located a payable ( $37,078,250\text{m}^3 @ 275\text{mg}/\text{m}^3$ ) deposit of dredgeable ground on the north bank of the Arahura River (Malfroy's area). An  $18\text{ft}^3$  dredge with a designed throughput of  $267,500\text{m}^3$  per month commenced digging in August 1939.



Sectional Elevation of the 18 c. ft. Bucket Dredge now being installed near Hokitika by both Kanieri Gold Dredging Ltd. and Arahura Gold Dredging Ltd. The dredges for the two companies are identical and are designed to dig to a depth of 115 ft. (85 ft. below water level). These dredges will compare in size and capacity with any operated elsewhere in the world. Gold collection will be by jigs arranged below the screen. The dredges have been designed by Alluvial Mining Equipment Ltd., Sydney.



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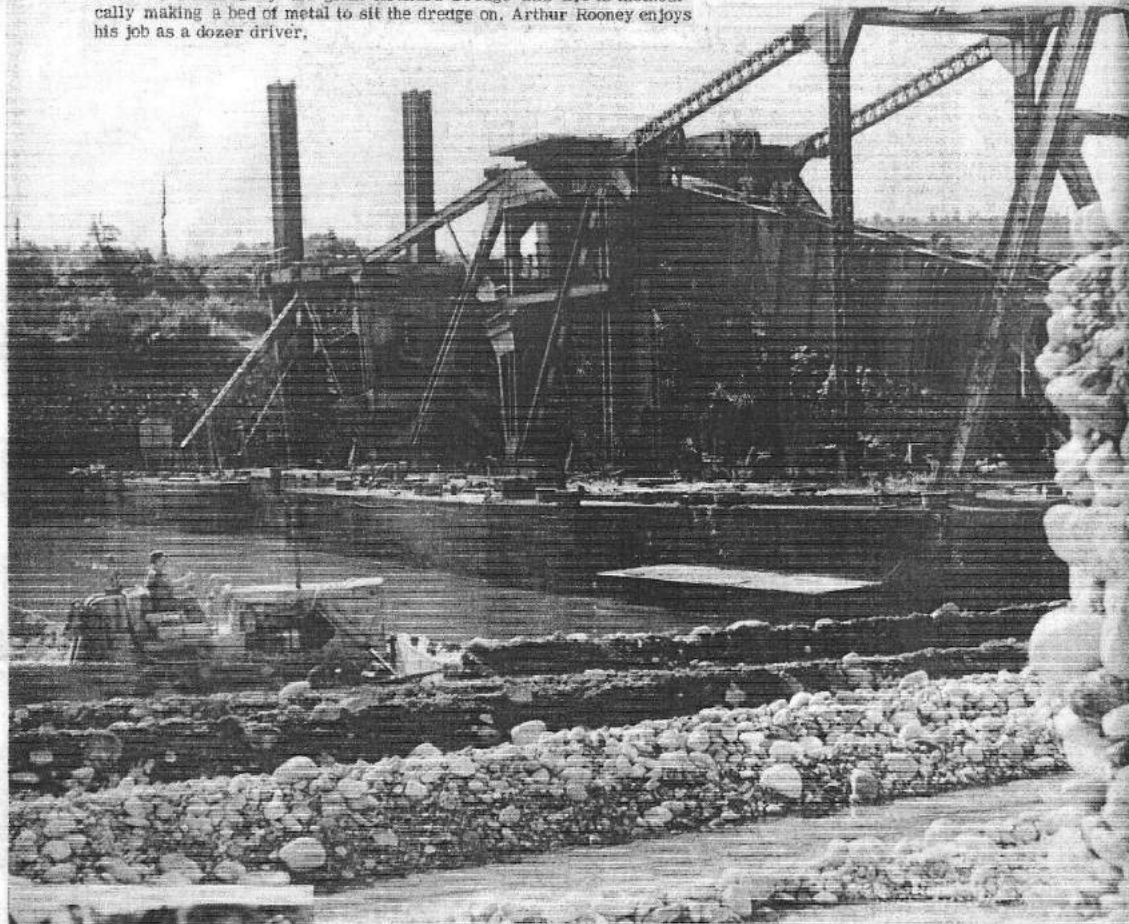
A sharp gold price rise in 1979-1980 encouraged renewal of mining in the Arahura valley when a co-operative venture between the Mawhera Incorporation (Maori landowners) and DML Resources Ltd., commenced investigations in the middle Arahura valley in 1989. By 1991 a small floating plant commenced work in the Humphrey's Gully area. Two other plants eventually worked other areas of the deposit.



*L&M No. 6 plant in the Arahura Valley in 1998. Prior to mining the top and sub soils were pre-stripped and replaced sequentially on levelled tailings after mining. Following settling and sowing the land was returned to dairy pasture. (Nic McArthur photo).*

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BELOW: Dwarfed by the giant Arahura Dredge this D.5 is methodically making a bed of metal to sit the dredge on. Arthur Rooney enjoys his job as a dozer driver.

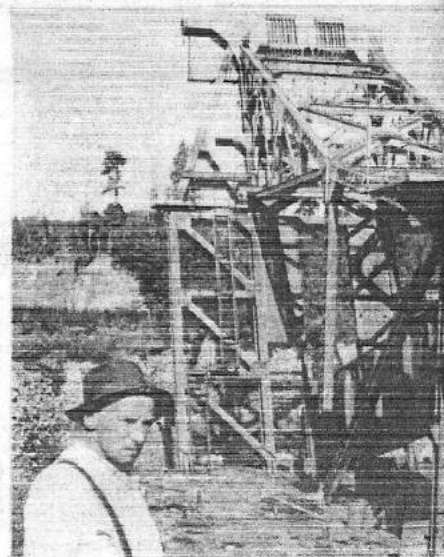


## Dismantling Old Gold Dredge At Arahura

Since the dredge stopped work about five and a half years ago, it has provided a useful source of spare parts for its twin - the Kumara dredge. Many parts have found use in sawmills and in bridge building.

LEFT: Rigger Jim Mattland guides a heavy load into position.

RIGHT: Old hand is Bill Silcock - 33 years with the company after starting with them in Barrytown. See the deck of the dredge stripped down.





# Arahura gold



PICTURE: West Coast Historical Museum

Peter Karam

Brian McCarthy

Martin Muir

Hee Tinsell

The large footprint of stone tailings are the only remaining evidence of the once familiar landmark of the Arahura gold dredge, which ground its way up the north side of the Arahura Valley in the middle of last century. PAUL McBRIDE finds there are only a few left with first-hand knowledge of the dredge.

**T**here is a silence in the Arahura Valley today, but for years the distinctive sound of the massive gold dredge grinding and crushing through the valley floor was an accepted part of life for residents and visitors to the area.

Peter Karam was born and bred in the Arahura Valley. He saw the dredge as a big operation and the sound of it grinding away during the night was an accepted sound of life in the valley.

"Everyone gives you a little sound and really it was only when it stopped did everyone wonder what was actually wrong. It was when there was no sound it was time to go to sleep," Peter said.

My brother, Larry and Jack, helped build the dredge. Larry was an engineer and helped construct it and kept it operating. Jack was a machine welder.

The dredge started operation in 1909 and they bought the land of my uncle Bob (Healy's) for \$2000. When you look back at it, it was well understood. There was a lot of gold taken out of the valley and it was a big enterprise at the time.

The Arahura gold dredge started the working operation behind the Arahura cemetery and over time worked its way inland. It employed up to 25 workers in a three-shift operation operating over a six-day week.

Wokaka (today) Brian McCarthy worked on the dredge. In the bush gang and general maintenance of the bucket system.

"I was in the bush gang and on job was to clear everything ahead of the dredge, as they didn't want timber going through the screen," Brian said.

Bob (Healy) was the boss here, he was a big fellow, a good man. In the gang were Bob Neilson, Alan Hales and Ned Liggins.

"We would back over the standing timber in front, the popper would start up, the men over with the bucket in the room came up as well, then we would drag away and on up with the conveyor."

"I remember getting the job in which after, after seven years I left — there all the work in the bush and walked off the job. If the men were not here we would plant 12 inches of jelly and remove the screen that way."

"The bucket was down in the water and we would take up the bucket with shovels of good a dredge and out the logs each morning with the crane — Brian said.

The dredge had a network operation consisting of a bush gang of five. Bill Merewether ran a shore gang of five men who dug the pocket holes for the dredge. Production and maintenance staff consisting of an electrician, carpenter, welder, engine, iron and timber, rope splicer and pump operators.

There were 100 large, 18 cubic feet buckets, which weighed 350 tons each, on a bucket line which operated on a bucket ladder, digging at a 100 feet per minute. Brian said.

The fill was passed across screened plates, and the fine wash transferred across tables, while the coarser sand and large rocks were conveyed behind up the incline and pushed out over the end of the dredge as tailings.

There were three eight-hour shifts. Four workers on the dredge — two on the low and two on the high. There was a sign, or pipe, in the centre of the dredge indicating 100 tons each, which was an anchor of types.

"The dredge floated in the middle of the pool, which was around 70 feet deep and five to six acres in size, and progressively worked its way up the valley. The workers walked on to the dredge over an elevated walkway, or railway."

With 100 buckets operating on a progressive digging cycle, year and year was an issue and maintenance of the equipment was an important factor to the success of the operation. Keeping the bucket line and screen operating to full capacity was paramount as the dredge rounded near 24 hours a day, six days a week.

Two or three buckets would be replaced most days, normally by the day shift. The timing of the buckets had three buckets in reserve.

"The bucket gangs would normally maintain the screen, too. There were 48 different plates on each screen, attached by counter-sunk bolts. It was another part of our job," Brian said.

According to long-time Arahura Valley resident Martin Muir, the dredge was always operating and had a distinctive sound.

"It sounded like a herd of elephants when it was grinding away," Martin said.

"It was just enormous. I used to go up to the dredge for fun. My old man was the splicer and used to repair and make all the wire ropes for the winches and things. I remember he said to the dredge owner in the time, Dave Bridgman, who didn't teach the winchmen to splice. He said 'I was there when they didn't break them so easy'. He was right, the winchmen hated splicing wire ropes and were more careful," Martin chuckled.

The Arahura River was always ready for years, never dried. The dredge got its water from Lake Mudge and from Fox Creek. They used up the creek to turn it into a dredge pool. No settling ponds in those days, the dirty water would filter straight into the river. It never affected the wharf or trout, though. The boat used to stream up still.

The dredge workers would come out by bus from Hokitika. Tom Brooks used to drive the bus, he would be there every shift and heading back at the end of the shift would get a ride into town.

The dredge would always stop at midnight on Saturday and start again midnight on Sunday. The shifts were continuous. I remember Doc (Baldwin) only worked four days after finding out he was better off because of a different car not he got over every day working for."

Hee (Spud) Tinsell, of Arahura, said a large number of local Māori were employed and he recalls the mental incentive driving up the ground over time.

"All the boys used to walk to work up through the cemetery over the track, until they got the bus, said."

"The dredge would bring up the valley for seven or eight miles. Started from behind the cemetery and went straight up the valley. When it was right up the valley you couldn't hear it from house."

"My brother-in-law Fred Tinsell was drowned in it when it tipped over in 1948. It took a very long time before they found his body."

"Harry Mason was a welder, George Tinsell and Mick Mason worked on the screen. Les Reid was an electrician, Elmer Tinsell, Wally Tinsell, he was a winchman. I remember going one night on the dredge when we made Wally was working the night shift. The dredge person actually took below the water and all our job and fishing gear was washed out the bottom deck," Hee said.

"There have been a lot of gold prospectors looking for gold over the side. Back then it wasn't worth much and so no one really wanted too much about it, not like today."

The existing boulders from the Arahura dredge were digging 400 cubic metres of ground on bank, for an average of four ounces of gold, but the best returns during a two-week period was 2700 ounces, which on today's price would fetch over \$4.2 million.

"There were some good strikes but they would be the best," Brian McCarthy said.

"It took a lot of gold out of the valley. Because of the weight, precious boulders, too, used to run up the incline and roll back down, but there was no water during the war for greenstone."

On a gold dredge all the miners in gold, and the case of the Arahura dredge, until Captain Edward Morland is well documented after he was eventually charged with the theft of 3500 ounces of gold in 1908.

Morland was employed to wash and melt the precious metal, but over a period of time he began hiding the returns.

Peter Karam remembers Morland and the gold trail that followed his departure from the dredge.

"I was working in a blacksmith in Hokitika for G.C. West and remember Morland came into the shop and wanted some gold melted down. I remember him well. He was a big man, heavy, the boss, said to him 'we don't melt gold for you buggers, get out of here.' Not long after, two policemen came in, I remember them, too — Talloch and Jordana. They were looking for Morland, they were late shot out in a bushy area by Stanley Graham," Peter said.

Morland had fled the country and had cut out the centre of large boulders, enclosing the gold within, and left with 11 large ones weighing 15000 to 20000 pounds each. He was caught at the Canadian border after customs were tipped off by an American agent that he was carrying gold.

The gold was found in his foot 92 case — over 230 pounds melted down in the doos and hidden compartments of Morland's car, which weighed well in excess of a conventional coupe, setting off alarm bells on the border.

Says Brian McCarthy: "The dredge actually gave him a break at the time when he was looking for a job in Alaska. They couldn't prove he had taken the gold from the dredge so he got it before it went through the books of the company. They were

able to prove, though, that it was Arahura gold by the tin and copper content. He was charged with taking gold out of the country and spent three years in Paparua jail."

"The Arahura dredge had a number of dredge masters over the years, including Dave Desjardins, Alan Steger, Ben Neilson and Doug Sullivan, who also had his dredgemaster's ticket."

"I remember Hoy Olsen fell off the top mounds, about 60 feet, and landed on the bucket line and fell unconscious into the dredge pool. Alan Steger, the dredgemaster at the time, died in and saved him. Got him out and saved his life."

"There was a great bunch of fellows who worked up the valley," Brian said.

Both Neilson was a great workman, Tim Hadden, New Tees, Noel Walter, Benner Walter, Norm Friesed and Alan Bowers, he was a battery, a really good fellow."

At with all workplaces there were always bonuses times, and the dredge on certain occasions provided entertainment for those who worked there.

"Bob Neilson was willing to show photos and Peter Tinsell was the whole thing, his job was to operate the screen while and give the signal for the which operate — not blow for go, another for stop and two for reverse."

"Bob said the area was haunted, especially the cemetery. That evening, while the dredge was changing away, young Tinsell was in the room and he used to operate screen."

"Bob had got there before him, put a bag over covered in ferns on the spot and had buried him. When Peter had finished he looked behind him, but in business had disappeared on the shore. He came out of the bush with his trousers still around his ankles washed," Brian laughed.

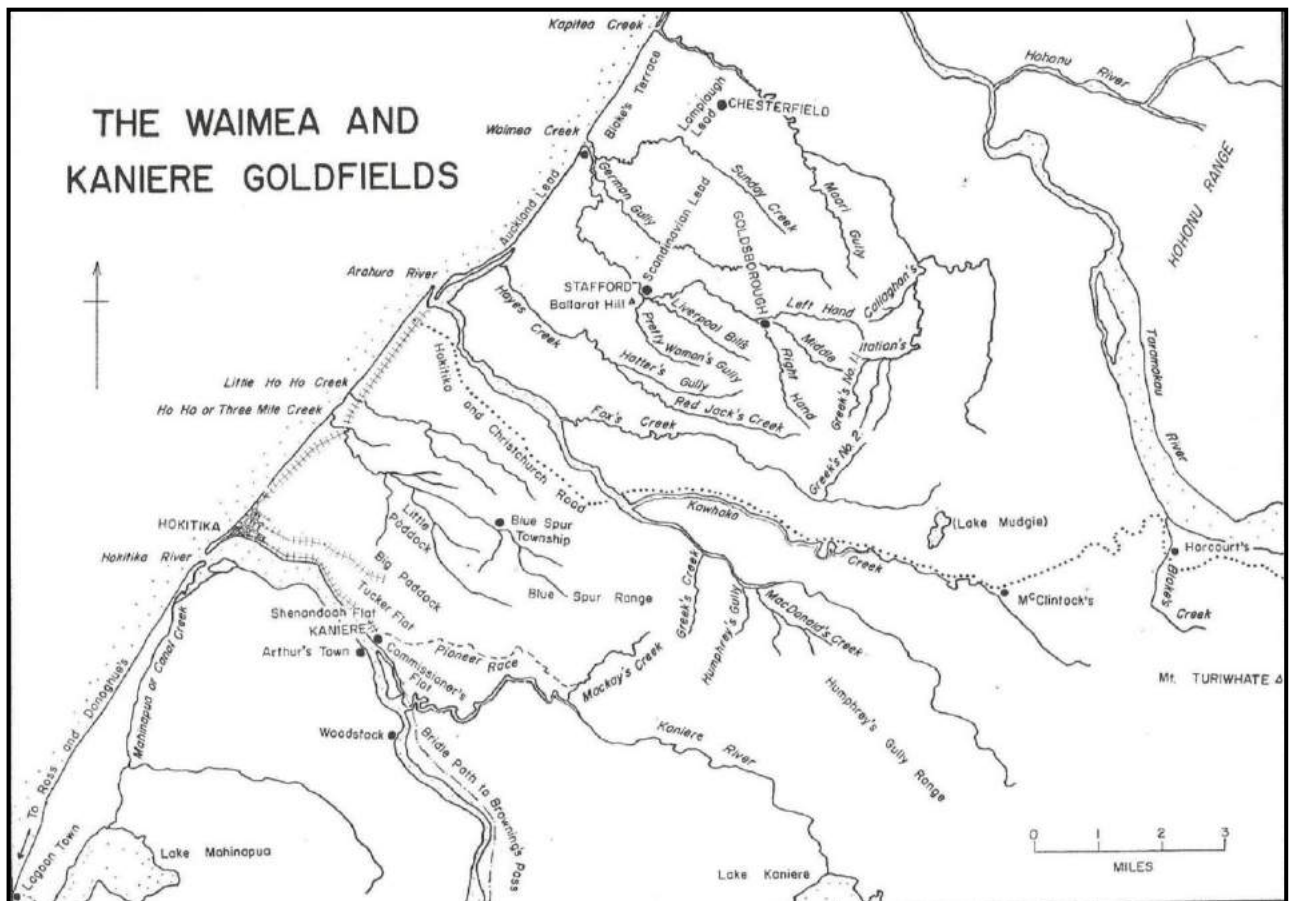
"We also had a little bit of which bag out, spread over the dredge pool, which we used as a toilet."

"Every time someone went in to see it, the screen would drop a huge boulder just below the shed and whoever was inside was covered in water."

The dredge was reduced after the tragedy of 1908 and continued to work, the excellent skills of the Arahura River until ceasing operation in September 1962, after which the old workmen were out on the scene.

## Stop 5 1865 Kaniere Rushed

Following the rush to Waimea in January 1965 another major find was made at the junction of the Kaniere and Hokitika Rivers, 3 miles east of Hokitika township. Rich wash-dirt, overlain by fluvioglacial gravels, occurred on both sides of the river. At Kaniere the broad flats and terraces were paddocked, shafted and tunnelled. Large glacial boulders in the wash and groundwater inflow made tunnelling and shafting difficult.



Plan of the Kaniere and Waimea Goldfields (After May, 1967)



*Tucker Flat, Kaniere about 1869.  
Ground below the trestle fluming has  
been paddocked. Overshot wheel is  
probably driving a Californian pump.*

A variety of mining techniques were used on the Kaniere Field. Paddocking was practised on the flats. Kaniere Terrace was ideally suited to ground sluicing and Commissioners Flat to moderately deep shaft sinking, while the higher terraces at Woodstock and Arthur's Town were tunnelled. Initially dewatering was by horse-whims and brake-pumps. Later Californian pumps and bucket elevators operated by overshot wheels were used.



Even after steam powered pumps were introduced by miner co-operatives claim drainage was a continual problem. Construction of the Pioneer water race which provided a regular supply of water for ground sluicing extended the life of the Kaniere terrace workings.

The lead, an often cemented black sand, was followed parallel to the coast to a flat above the Kaniere diggings. Eventually 5 distinct parallel beach leads were located. Blue Spur township was the centre of the Ho-Ho diggings. After nearly 3 years of frenzied activity Kaniere's boom times were over and the diggers began to leave for the north.

Interest in the Kaniere Goldfield was revived in the 1930's when Tucker Flat was prospected and drilled by Alluvial Tin (Australia) Ltd., a member of the Pratten group of companies. Drilling established a significant gold resource (42 million m<sup>3</sup> at an average recoverable grade of 201 mg/m<sup>3</sup>). The Kaniere Gold Dredging Company Ltd., was registered in 1936 and a large capacity (18ft<sup>3</sup>) electric bucket dredge designed by Alluvial Mining Equipment Ltd of Sydney. The construction contract was let to the New Zealand Railways Workshops, Addington and the dredge commissioned in December 1938. In 15 years of operation (1938-1953) 28,279,000m<sup>3</sup> were dredged with an average recovered grade of 193 mg/m<sup>3</sup>.



*Kaniere dredge operating on Tucker Flat in the vicinity of the Kaniere township. Work ceased in 1953. The dredge was then dismantled and rebuilt near Kumara where it worked down the lower Greenstone into Teremakau River from 1956-1981.*

## Stop 8 The Ross Goldfield “Ballarat of Westland”

### Deep Lead Mining

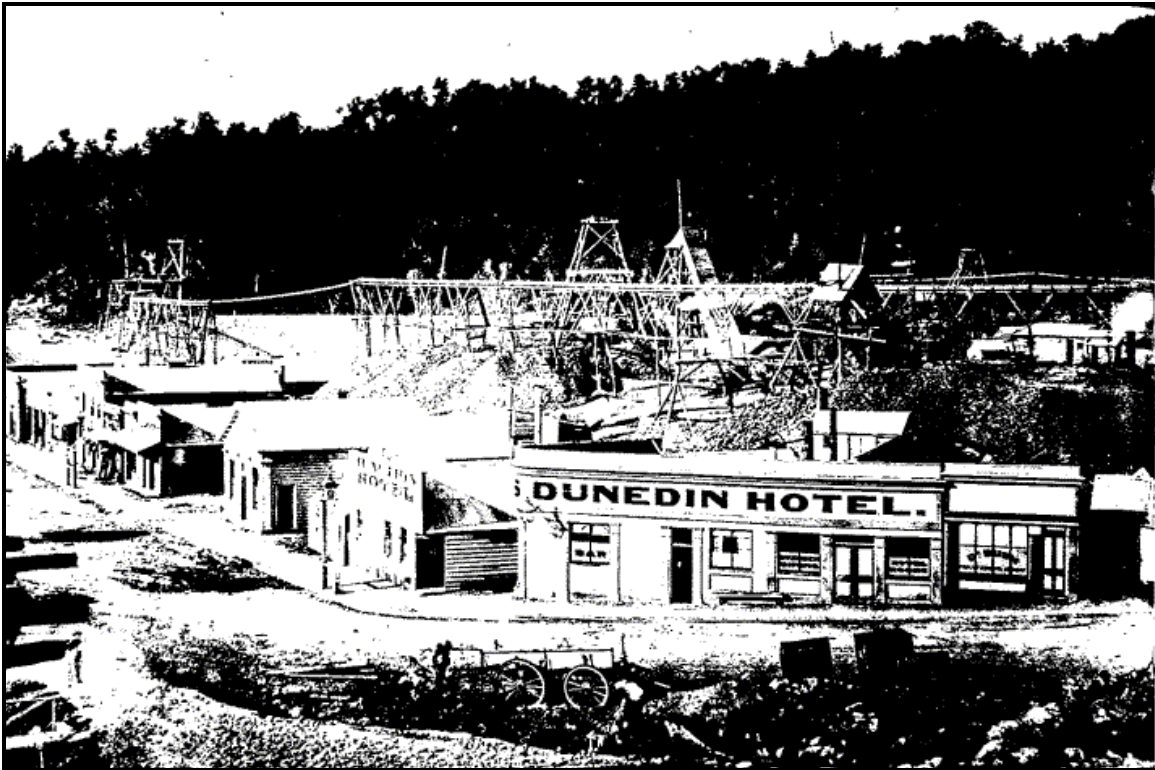


*Weighing 3.1kg (99oz 12dwt 12gr) New Zealand's largest gold nugget was unearthed in a Jones's Creek claim by Scott and Sharp. It was hand size, about 250mm thick and slightly impregnated with quartz. It was christened "the Honourable Roddy" after the then Minister of Mines.*

coarse gravel horizons with high gold grades ( $1-3 \text{ g/m}^3$ ) which diverged and dipped northwards under the town site, becoming increasingly separated by low grade zones ( $<100\text{mg/m}^3$ ) of relatively fine silty gravel. Under the town, and to the north, the bottoms are relatively flat lying and evenly distributed through a 100-120m thickness of gravel. Steam power was introduced in 1867 using boilers and engines from wrecks on the Hokitika bar and several shafts were soon sunk to 70m, encountering 6 'bottoms'. The high water table and unplanned interconnected workings from 45 shafts in a 7 hectare area led to flooding problems which resulted in a rapid decline in production after 1868 (May, 1970).

In 1882, the Ross Flat Gold Mining Company commenced sinking the Ross United shaft, the deepest on the flat, located close to the corner of Sale and Simpson Streets. Although it reached a depth of 119.5m in 1884 little gold was recovered. Nine distinct 'bottoms' were intersected but the supposed 'true bottom', expected to be very rich, was not met. Malfroy, a mining engineer and the first mayor of Ross, drew a graphic log of the materials intersected in the shaft. A version of this log with specimens of the gravels encountered during shaft sinking is in the West Coast Historical Museum, Hokitika. After flooding episodes, company reorganizations, several share floats, and many attempts at dewatering the workings were finally abandoned to tributaries in 1916 for a total production of 131 kg (4200oz) of gold over 34 years (May, 1970).

The Ross goldfield was discovered by Jones and Donnelly in March 1865 (May, 1967). From the original discovery sites in the beds of Jones and Donnelly Creeks shallow high grade alluvium was followed downstream from the original discovery sites and found to deepen rapidly northwards. The miners, many with experience from the Victorian Goldfields, sank numerous shallow shafts into the south end of what became Jones Flat and discovered that the gold was not concentrated at a single distinct basal horizon, as in Victoria and most other New Zealand alluvial deposits, but formed a series of 'bottoms'. These consisted of



*Northeast view of the junction of Aylmer and Bold Streets about 1870 showing the poppet heads on Jones Flat. From the left they are: Band of Hope, Morning Star, Royal Standard or Excelsior with the Scandinavian in the background (May, 1970).*

## **Hydraulic Mining**

A large open pit was excavated by hydraulic elevating near the mouth of Jones Creek by the Ross United Company in 1887. This operation worked at least 6 of the 'bottoms' destroying the collars and workings of many of the earlier shafts. About 622kg (20,000ozs) of gold were recovered before this operation closed in 1898 (May, 1970).

A long-lived and very successful sluicing claim, the Mont d'Or, on the hillside 1 km west of Ross recovered 1212kg (38,964oz) of gold between 1882 and 1917 (May, 1970) from perhaps 7 million m<sup>3</sup> of gravel for a recovered grade of 180 mg/m<sup>3</sup> (Cavaney, 1968). The Prince of Wales elevating claim at Donoghue's, 2km to the west, recovered 1026kg (33,000oz) between 1887 and 1902 (May, 1970).

## **Dredging**

At least 3 dredges worked river flats in the Ross area prior to 1914. All were unsuccessful, recovering no more than 155-311kg (5,000-10,000oz) between them.



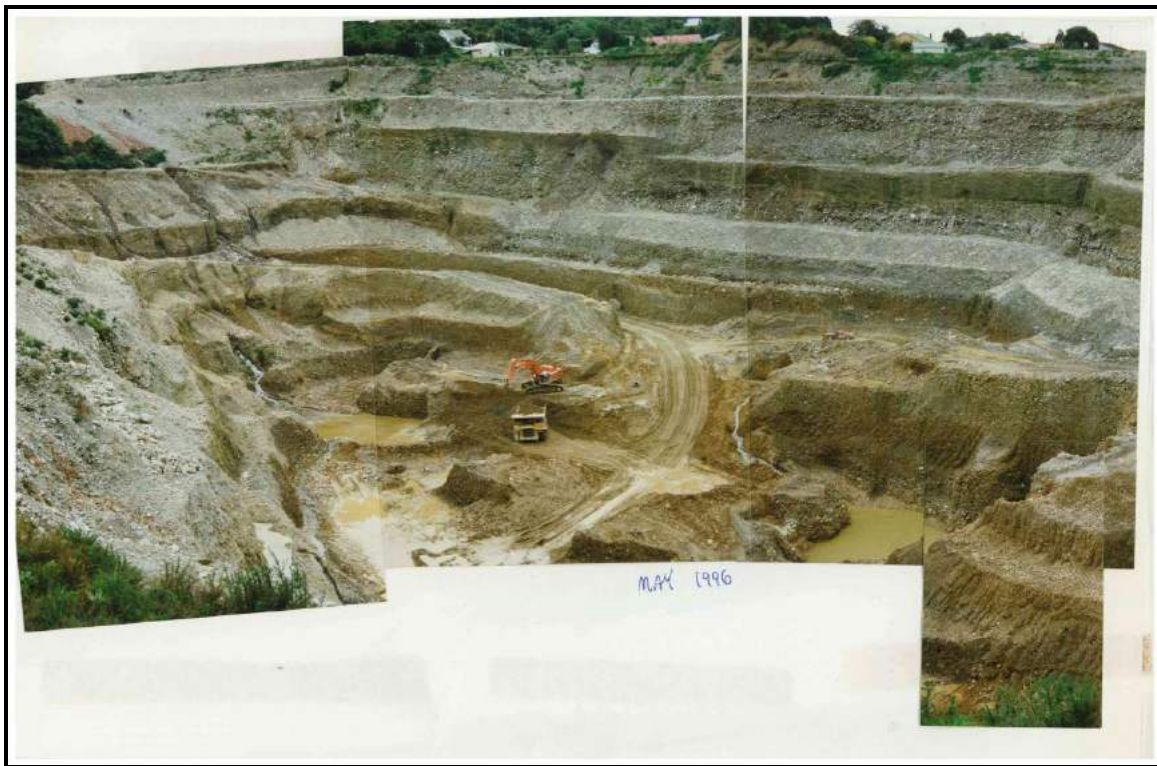
## Hard Rock Mining

Hard rock mining of gold occurred widely in the Donnelly Creek and around the flanks of Mt Greenland. About 124kg (4000oz) came from the Cedar Creek mine. The remaining mines were all very small, often short-lived operations.

## Historic Gold Production

In total, up to 1939, when all mining ceased in the Ross area, the declared gold production amounted to 9,950kg (320,000oz) from all sources within the area encompassed by the Miconui, Donnelly, and Totara catchments, including the Ross Basin (Douch, 1993). Total production from the Jones Flat underground workings is unlikely to have exceeded about 4,666kg (150,000oz) at average grades of 3-7 g/t (Douch, 1993).

## Recent Mining



*Birchfield Ross Mining Ltd., openpit, 1996, on the southern edge of Ross. Total depth 85m. The excavator is an 80 tonne machine. Five "bottoms" with very coarse gravels can be seen in the pit wall. (R.J. Cotton photograph).*

No attempt was made to resurrect one of the deepest and highest grade alluvial gold deposits in New Zealand using modern techniques and equipment until 1988 when Birchfield Ross Mining Ltd (BRML) commenced work on contract to mining licence holder Ray Thomas. BRML built a static gold recovery plant on the western slopes of

Donnelly Creek. Hydraulic excavators were used to selectively mine the beds of coarse bouldery gravels (the 'bottoms' of the early miners) from the old Ross United elevator pit. These were carted to the treatment plant by dump truck. Tailings and the low grade finer silty gravels were dumped. Eventually the BRML pit reached 90m below the surface. Operations ceased in mid-2004 as the pit could not be widened or deepened without encroaching into the township. During the period 1989 to February 2004 a total of 3Mm<sup>3</sup> of material was hauled from the pit. Processed material had an average grade of 400 mg/m<sup>3</sup> and a total production of 2,022kg (65,000oz ) was achieved by BRML from the Jones Flat area. Since early 2003 BRML have mined the Aylmer Lead, a shallow beach strand line north of the town.

Other mechanical mining operations worked a number of areas in and around Ross between 1988 and 1995. Mostly these were small-scale operations using hydraulic excavators, employing 2-3 people and treating 50,000-100,000m<sup>3</sup> per annum. An exception was L & M Mining's operation in Redman Creek. The company mined creek beds, raised terraces and deep gravels in the bed of the Mokonui river, 5km west of Ross, from 1991-1995. A total of 1,080kg (34,700oz) were recovered from 1.85Mm<sup>3</sup> for an average recovered grade of 600 mg/m<sup>3</sup>.



*Kohinoor gold dredge pontoon uncovered by mining operations in the bed of the Mokonui River, south of Ross.*

Adapted from Cotton. R. J., Rose. R. V., 2006: The Ross Alluvial Goldfield, West Coast, South Island. Geology and Exploration of New Zealand Mineral Deposits. AIMM Monograph 25.



