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13.2.9 Tin workings

NZAA Site No. D49/82

G.R. 127 287

This is a small area of workings at the confluence of Smiths Creek and one of its tributaries. The worked area measures 25 m × 15 m, and consists of a single paddock with a tailrace leading out into Smiths Creek (Fig. 55). The tailrace is largely revetted, and much of the sluiced area has been piled with tailings. Some cut timber can still be found piled above the north face of the workings, where it was placed after being cleared prior to mining.

In the area of the workings there is a timber sluice box in remarkably good condition (Fig. 56). It measures 10 ft 5 in long, 10 in high and 12 in wide, and is constructed from 7/8-in-thick boards. A pick head has been placed inside the box.

This site was situated on Section 7, Block VIII Pegasus District (Application 45), which was held in 1890 by Alex Glennie.

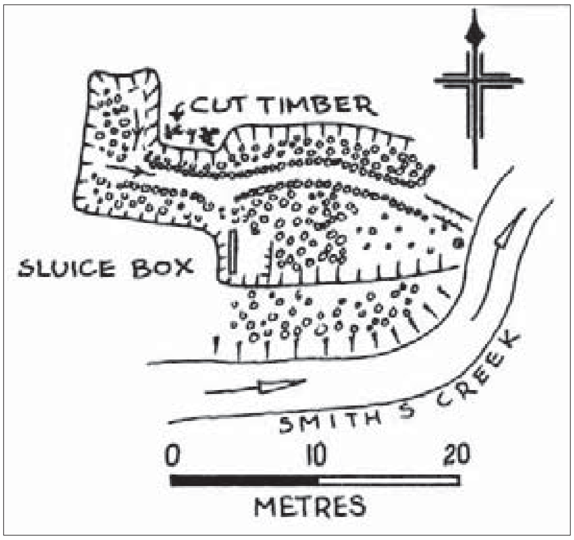

Figure 55. Tin workings beside Smiths Creek. Site D49/82.

Figure 56. Wooden Sluice box in tin workings, Site D49/82.

13.2.10 Tin workings, hut site

NZAA Site No. D49/83

G.R. 128 287

This is a very large area of worked ground, measuring 130 m × 35 m, with a further sluice gully on the eastern side measuring 30 m × 10 m (Figs 57, 58, 59). The workings run alongside Smiths Creek, and another sluice gully (D49/84) is to on the opposite side of the creek.

The workings are becoming quite overgrown, with some very well established manuka bush covering areas on the south-eastern side. Numerous tailraces lead out to Smiths Creek, several of them carefully revetted. It appears that the site was worked progressively from the eastern end back upstream towards the west. A series of low scarps within the workings may indicate paddocks which have been partially backfilled with tailings. One hut site was recorded within the workings.

The sluice gully to the east was fed by a water race which runs along the back of the main worked area, and passes across a specially-built aqueduct across the tailrace for an area of worked ground.

This site was situated on Section 7, Block VIII Pegasus District (Application 45), which was held in 1890 by Alex Glennie.

A photo of these workings is shown in Howard (1940: facing p. 304). This was taken by G.J. Williams, possibly in about 1932 (his paper on the tin deposits was published in 1933, see References). The vegetation growth in the past 70 years is noticeable (although not as much as one would expect), but there has been almost no other change. Some of the boulders present in the 1932 photograph can still be identified (Fig. 59).

13.2.11 Tin workings

NZAA Site No. D49/84

G.R. 129 288

A long thin sluice gully situated on the true left of Smiths Creek, across and slightly downstream of D49/83 (Fig. 57). The gully is 70 m long, but never more than 7 m wide. It runs parallel to the creek, and tailings have been piled on the intermediate strip of ground.

The gully was fed from a water race that ran from further up Smiths Creek.

This site was situated on Section 7, Block VIII Pegasus District (Application 45), which was held in 1890 by Alex Glennie.

13.2.12 Diversion race around waterfall

NZAA Site No. D49/85

G.R. 130 286

This is a 35-m-long diversion channel cut into the bedrock that diverted Smiths Stream around a waterfall (Fig. 60), presumably to allow the plunge pool to be worked. The race leads off on the true left of the stream 25 m above the waterfall. It discharged over a rock face, to ultimately run back into the stream below the waterfall pool. Some evidence of working can be found around the pool; namely,

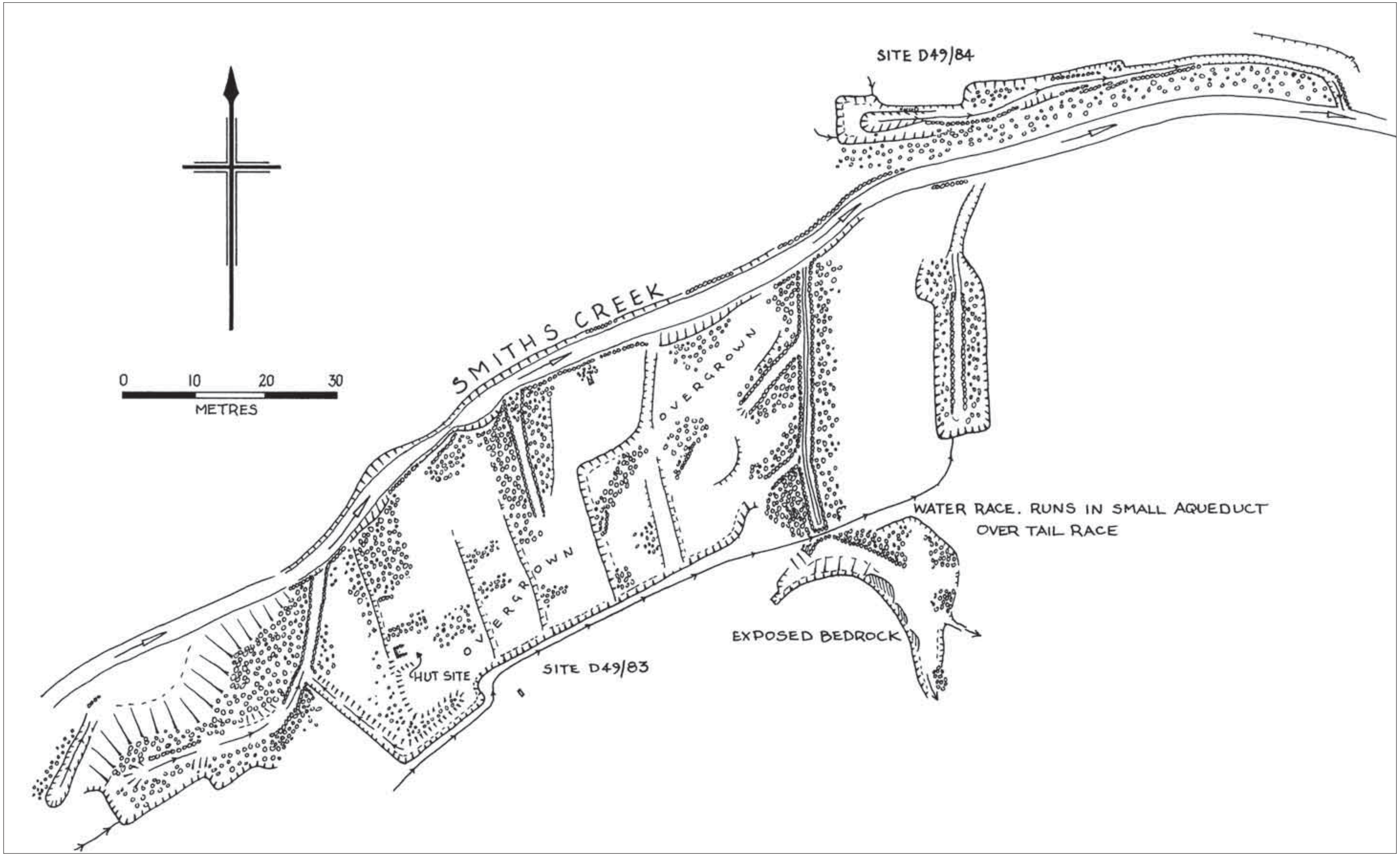

Figure 57. Extensive tin workings on Smiths Creek. Sites D49/83, 84.

Figure 58. Tin workings at Site D49/83, looking north. *Photo: P. Petchey.*

Figure 59. A view across Site D49/83 from the western end, looking to the east. This is a very similar view to that published in Howard (1940: facing p. 304). A granite outcrop typical of the area is in the distance. *Photo: P. Petchey.*

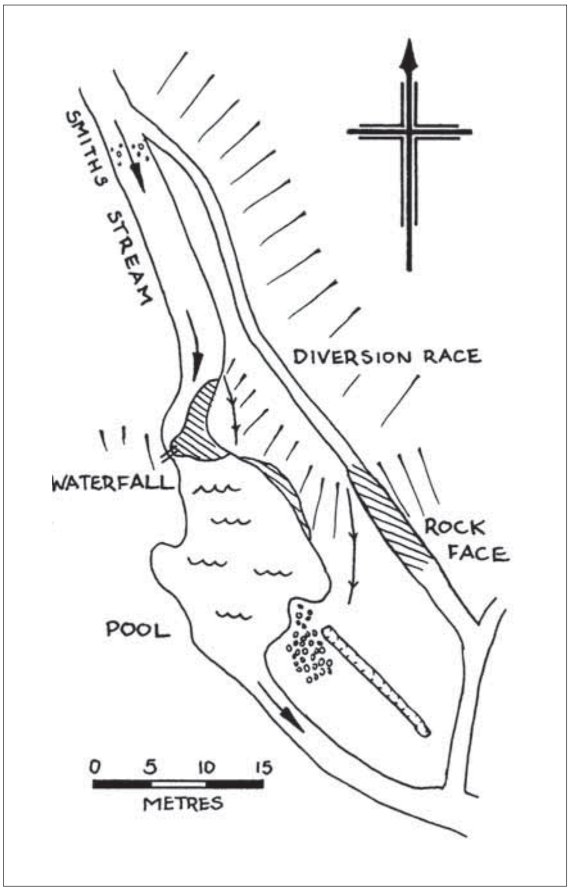

Figure 60. Diversion race around waterfall in Smiths Stream. Site D49/85.

a pile of tailings and a cut channel. When Smiths Stream is running high, the diversion channel still carries water.

This site was situated on Section 7, Block VIII Pegasus District (Application 45), which was held in 1890 by Alex Glennie.

13.2.13 Small sluice pit

NZAA Site No. D49/86

G.R. 130 288

This is a small sluice pit measuring 5 m × 5 m, with a 35-m-long tailrace that fed into Smiths Stream (Fig. 61). A prospect pit is located beside the main pit.

This site was situated on Section 7, Block VIII Pegasus District (Application 45), which was held in 1890 by Alex Glennie.

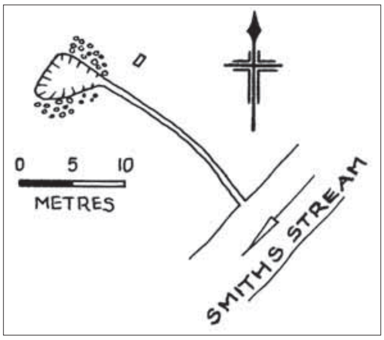

Figure 61. Small sluice gully beside Smiths Stream. Site D49/86.

13.2.14 Water race

NZAA Site No. D49/87

G.R. 130 288

This water race, on the true left side of Smiths Stream, runs above the diversion race (D49/86) by the waterfall. It was apparently carried (or intended to be carried) across a side gully in a timber trestle (foundation holes can be found), and then continued along above Smiths Stream. However, it ends abruptly, suggesting that it was never finished. There is a small set of workings (D49/88) below the race end, but they are on the opposite bank (true right) and were fed from another race.

The 1951 aerial photograph of the area (Run 1888/numbers 19, 20) shows the race quite distinctly, suggesting that it may have been recently cut. This raises the possibility that it was cut by Ted Carrington, but never actually finished. This late date of construction is supported by evidence in the bush in the gully that had to be crossed. Cut branches are clearly visible on live trees, which would be unlikely if the race dated to 1888–89.

It is possible that Carrington cut this race with the intention of using the flow of Smiths Stream for his power generation, using the pelton wheel and dynamo that are still to be found on the site of his nearby hut (D49/77).

13.2.15 Tin workings

NZAA Site No. D49/88

G.R. 131 286

This is a small area of workings on the true right bank of Smiths Creek (Fig. 62). A narrow, 12-m-long cut has been made into the bank, and an area downstream of this worked, with tailings piled up on either side of a tail race. This site was situated on Section 7, Block VIII Pegasus District (Application 45), which was held in 1890 by Alex Glennie.

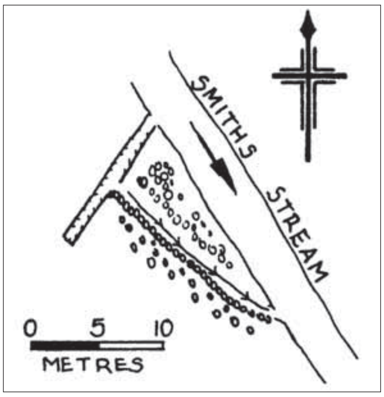

Figure 62. Small set of tin workings beside Smiths Stream, Site D49/88.

13.2.16 Tin workings

NZAA Site No. D49/89

G.R. 131 285

An area of shallow workings, measuring 30 m × 30 m (Fig. 63). The soil and gravel has been washed off the bedrock, which is exposed in much of the site. There is also evidence of an extensive and well-formed iron pan, numerous pieces of this being found scattered about. Two tail races lead out to Smiths Stream.

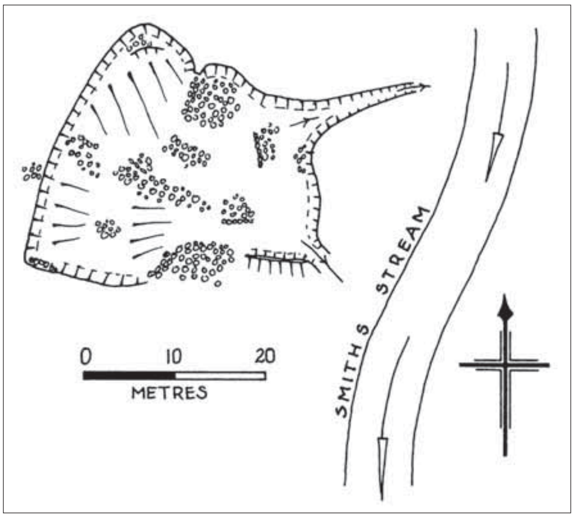

Figure 63. Shallow tin workings beside Smiths Stream, Site D49/89.

This site was situated on Section 7, Block VIII Pegasus District (Application 45), which was held in 1890 by Alex Glennie.

14. Discussion

The archaeological sites described above constitute the Pegasus tin field. It is certain that many features remain unrecorded, as the thick scrub and bush and the rough terrain makes searching for archaeological evidence difficult. Good historical descriptions exist for some sites that were never actually located during the survey, such as Hendersons mine drive on the west side of the Tin Range. Conversely, several significant mining sites were recorded that were outside the claimed areas, such as the streamworks on Scollays Flat (D49/93) and the ground sluicing high on the east flank of the Tin Range (D49/69).

What was recorded during the survey was a former mining field in a quite remarkable state of preservation. Although most of the tin workings are becoming overgrown, with some now difficult to see even when one is standing beside them, there has been little physical damage to any of the sites. Tailings heaps are just as they were stacked over 110 years ago, while tailraces remain open for their entire lengths. In Central Otago, where cattle and sheep have been run since before the gold rushes, most alluvial mining sites have been slowly but steadily degraded. There it is rare to find a site where everything is as it was when mining ceased. The Pegasus tin field is, therefore, an extremely important historic mining landscape, a true snapshot in time.

Given the good state of preservation and accepting that this study had, as its primary aim, the identification and recording of the Pegasus tin field, rather than its detailed interpretation, it is still possible to, firstly, make a number of comments about the mining technology that was employed and, secondly, begin to examine critically some of the assumptions that have been made about the Pegasus tin rush.

14.1 TIN MINING TECHNOLOGY IN THE PEGASUS TIN FIELD

The Pegasus tin field was largely an alluvial and eluvial mining field, rather than a hard-rock field. Although some attempts to locate and mine the underground tin lodes in the Tin Range were made (notably Professor Black's drive, Site D49/44), the tin deposits were (as discussed in the introduction) the result of millennia of erosion and deposition, and no rich lodes ever existed. The archaeological evidence recorded during this survey was overwhelmingly of alluvial mining.

The workings that were examined could be placed in a number of categories based on the mining technology that was apparently used:

1 Simple pits dug for prospecting purposes
2 Stream workings
3 Ground sluicing
4 Hydraulic sluicing

14.1.1 Prospect pits

Most prospect pits measured approximately 4 ft × 2 ft in plan, a hole size just large enough for a man to stand in and shovel. Their purpose was simply to determine the likely presence and depth of tin deposits, and as such their depth varies. Surviving examples more than 5 ft (1.5 m) deep were found, although many have gradually become filled with accumulated debris over the years.

Prospect pits are distributed widely over the entire tin field area, and are commonly found along the floors of stream valleys. As they are typically small, many (most) would not have been observed during the survey.

14.1.2 Stream workings

Stream workings included the simplest form of mining, whereby the stream gravels were simply washed in a pan or sluice box to recover the tin ore. At its most basic, this type of operation would leave little or no archaeological evidence, as the first freshet in the stream would remove the evidence.

Where slightly more work was carried out, such as the redirection of the stream to allow the banks to be worked, or the moving of rocks out of the stream bed to allow it to be worked more easily, archaeological evidence has sometimes survived. Site D49/36 in Healeys Creek consists of rocks that have been piled up along the centre of the stream bed for some distance, presumably to allow the bed to be worked by hand.

At a more complex level again, large-scale stream diversion works were sometimes carried out to channel streams and allow significant areas of the old bed and banks to be worked. This type of site is found at D49/93 on Scollays Flat, where Scollays Creek now runs in an artificial channel for 130 m, representing a great deal of hard work. At these larger, more complex sites, the differentiation between stream working and ground sluicing becomes blurred, as D49/93 contains numerous ground sluicing gullies, as well as the artificial stream channel, and the two approaches can be regarded as on a continuum. Once the stream has been diverted, and water is introduced to do work, the operations can be regarded as ground sluicing.

14.1.3 Ground sluicing

Ground sluicing was probably the most efficient form of mining that could be carried out on alluvial sites that required almost no equipment other than digging implements. What was required was a water supply above the ore deposits that were to be worked, and a tailrace that fell away from them. Digging the supply water race (or head race) from a nearby stream, and the tail race to another stream (or the same one lower down) could account for a great deal of labour, before mining even began.

Once a supply of water was laid on, mining proceeded by directing the water over a scarp, using the flow, together with picks and shovels, to break up the ground. The broken material would be washed down the tail race, over the tin-saving riffles, where the heavy tin ore would settle out, while the lighter sediments and gravels would be washed away. Heavy cobbles and rocks would be stacked by hand on already-worked ground, creating the piles of tailings that are a typical feature of alluvial mining sites.

While the basic approach was always the same, there were a number of different ways in which an area of ground could be worked, depending on a number of factors, such as the depth of the payable ground, the distribution of the ore, the topography, or even the preferences of the miners. The method of working chosen is indicated by the location of the head and tail races, the final shape of the worked area and the pattern of tailings left behind. An analysis of alluvial tailings types in the Central Otago goldfields by Ritchie (1981: 51–69) identified a number of distinct forms of tailing sites associated with alluvial gold mining, which are comparable to patterns of tailings in the tin mining sites in the Pegasus tin field. Variations on his Type 4 (box tailings), Type 6 (amorphous tailings) and Type 9a (sluicing scars) can be found in the tin field.

There are several examples in the Pegasus tin field where long, thin sluice gullies have been created by working back into an area of high ground, such as sites D49/58 and D49/63 on the Peagsus Creek flats. Some tailings have been piled inside the workings, but not in any discernible pattern. This can be compared to Ritchie's Type 9a sluicing scars.

A variation on this is where a broad expanse of ground has been worked back into the higher ground, such as the very large set of tailings beside the Surveyors Track at site D49/49. In this site ridges of tailings were created as the ground was worked across the site; as one area was worked out and work on another adjacent area begun, tailings would be piled back into the worked-out area and its length of tailrace. The main tailrace would be kept open, but the point at which it was fed would change as the working area migrated. This is a variation of Ritchie's Type 4 Box Tailings.

A further variation on this was where a broad expanse of ground was worked adjacent to a stream, where there was no need for a single large tailrace, but simply short discrete races which fed directly into the stream itself. A set of workings of this type is at D49/83 on Smiths Creek on the eastern side of the Tin Range.

Various combinations or variations of the above approaches could be tried, at any scale. What is visible today at any single site only reflects the final stage of work; a large site may only reflect more work over a longer period, not necessarily different approaches, when compared with a small site.

14.1.4 Hydraulic sluicing

Hydraulic sluicing utilised a pressurised jet of water from a monitor to break up the alluvial deposits and wash them down the tailraces, where the heavier tin would be separated from the lighter tailings. Again, heavy rocks and cobbles would be stacked by hand back into already worked ground.

Although hydraulic sluicing operations were more efficient than ground sluicing, and able to mine deeper and harder deposits, they were also far more expensive to set up. A high-level water race would be required, with a pipeline feed to the workings, as a pressurised water supply was essential. As well as the supply pipeline, other equipment such as monitors, control valves and movable pipes would also be required, all of which required large capital expenditure.

The Stewart Island Tin and Wolfram Lodes Limited made the investment in all of this plant, as is well documented, and as is evidenced by the amount of equipment that was abandoned on site when the company failed in 1917. All of the main elements of a hydraulic mining operation are to be found on site D49/41—a main pipeline, two main valves, two monitors, extra pipes, riffles in the tailrace. The main dam (D49/38, constructed to supply water at a high level) is intact and still holds water.

It is interesting to note that at least one hydraulic mining operation was established during the initial tin rush, this being Professor Black's claim in Healeys Creek, which was visited by H.A. Gordon in 1890. Unfortunately, the water supply was insufficient both in pressure and quantity to work the ground (Gordon 1890: 95). This site was not located during the survey.

While not commercially successful in any of the Pegasus tin field sites, hydraulic sluicing was a very effective form of alluvial mining elsewhere, and there were dozens of gold mines that used this technology in the Otago goldfields. The failure of the Pegasus tin field was due to a lack of tin, rather than a problem with the technique.

14.1.5 Origins of the mining technology used in the Pegasus tin field

There are two areas of historic mining that may usefully be compared with the Pegasus tin field sites—the Cornish tin fields in England, and the Central Otago gold fields (Figs 64, 65, 66). As the mining technology employed in the Pegasus tin field was obviously imported from elsewhere, it makes sense to look at these two locations for clues as to the origin of this technology.

Cornish tin fields were, for centuries, one of the world's most important sources of tin. Until the fourteenth and fifteenth centuries, alluvial and eluvial tin deposits were mined by 'streamers' (alluvial tin miners, as opposed to 'miners', who mined the lodes). Once the easily-won deposits became exhausted, attention began to be turned to the tin lodes, both by open cast workings and underground mining (Herring & Rose 2001: 47). The alluvial streamworks thus generally date to the fifteenth century or earlier. Numerous examples of streamworks remain on the open moors (Fig. 64), and archaeological interpretation of these suggests that ground sluicing mining methods were employed. Water was brought to the workings in a race (there termed a 'leat'), the ground broken up, and the tailings stacked in the worked ground. There were a number of different types of stream working, each reflecting different techniques, dependent on the nature of the deposit, the topography and the preferences of the men involved (Newman 1998: 16).

Continue to next file: Part 10