Department of Lands

Hume and Hovell Walking Track

Archaeological Investigations, Burra Creek, Tumbarumba

a report prepared by

J. H. Winston-Gregson

ACCESS ARCHAEOLOGY PTY LTD

Part One

March, 1987

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ARCHAEOLOGICAL INVESTIGATIONS BURRA CREEK TUMBARUMBA

PART ONE

1987

JH WINSTON-GREGSON
ACCESS ARCHAEOLOGY PTY LTD

Report to the Crown Lands Office

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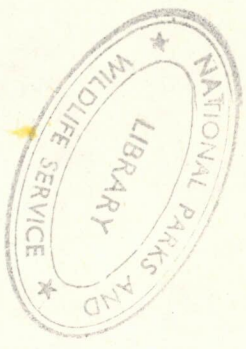

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1 Preface

1.1 Acknowledgement

1.1.1 Instructions for this research were issued in 1985. The Project Manager was Mr Stewart Moar, site co-ordination was arranged by Mr Ray Mullins.

1.1.2 The fact that the project has taken over a year to complete is a credit to the client as the report has been considerably delayed by accident and by illness. In addition, there is reason to suspect that substantive information about the Burra goldfield has been concealed (or never recorded) so that archival sources had to be approached repeatedly from different query bases. Fortunately, local interest in the project was fostered by actual involvement in the formation of the walking track and this carried through to a willingness to talk about the Burra. Messrs. Gordon Scott and Barry McClelland have been particularly generous with their time and private historical collections.

1.2 Introduction

1.2.1 The structure of this report enlarges on the requirements of the Brief reproduced below in Section 2. The specific questions posed by the Brief are addressed in Section 5 which is effectively a summary of the larger intervening discussion in Sections 3 and 4. Recommendations conclude the text. The site reports, artefact records and the plates are bound separately from the text for more convenient reference. There is a comprehensive photographic record reproduced either directly with the relevant site or artefact record or else with those plates that are grouped by topic. The text incorporates a number of computer graphics introduced to illustrate particular points. The maps sought by the Brief - on which the graphics are based- are hand drawn to an appropriate scale and are supplied under separate cover.

1.2.2 Both metric and imperial values are used in this report as may be appropriate to their context; the pedantry that would convert all values to metric can be quite misleading. The people under study thought in, and were guided by, imperial values : pounds, tons and acres were essential concepts in their 'cultural baggage'. Thus in 1861 a free selector was entitled to one square mile at one pound per acre; to replace this with 259 hectares at $4.94¢ per ha. reduces a cultural statement to gibberish. Gold weights, it should be noted, eg 10 oz [32 gm], are in *troy* ounces.

2. Context

2.1 The Research Background

2.1.1 The archaeological investigations were instigated as part of the Hume and Hovell Walking Track Bicentennial Project. Part of the route taken by the Track near Tumbarumba follows the course of the Burra Creek. It was proposed that an integral part of the development of this section of the track would be the interpretation of the remaining evidence of the gold mining activities that occurred along the creek during the latter part of the last century and the early part of this century[1].

2.1.2 The Brief comprised four parts:

(i) Historical Research and Documentation to identify the significance of the mining and to establish:
- (a) periods during which the mining occurred
- (b) value of gold won
- (c) type, extent and nature of workings
- (d) numbers of men involved and size of settlement during the mining periods
- (e) type of structures that would have existed and if possible, locations
- (f) impact of mining activity on local communities and subsequent patterns of settlement
- (g) location of reference material and information sources.

(ii) Field Investigation

(iii) Documentation of Field Investigation
- (a) site plan
- (b) photographic record identifying points of particular interest
- (c) heritage inventory on CLO cards

(iv) Report and Recommendations.

2.1.3 A summary of the historical research, including reproductions of early photographs, has been provided separately as the core of a public pamphlet. Similarly, material has been contributed to the design of a permanent display at Burra Creek.

2.1.4 The findings of the research have been discussed on several occasions with the Project Manager as the investigation progressed. It is intended that there should not be any awkward surprises in the report.

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[1] CLO ref HO 85 R24 63A/7. SMP/LMP

2.2 The Research Area

2.2.1 The area nominated in the Brief is a ribbon varying in width up to 400 metres, centred on the Burra Creek. The ribbon stretches north east from the confluence of Burra and Tumbarumba Creeks almost to the parish boundary. The straight linear distance is some eleven kilometres; on the ground, following the windings of the creek, it is closer to twenty kilometres. In practice, since the miners were not confined to a ribbon, the survey was broadened in places to over two kilometres.

2.2.2 The creek enters the study area (see Figure 1) at the north east as two branches (West & East Burra Creeks) flowing between steep ridges : Pound Ridge, Middle Ridge, Big Hill Ridge. Below the confluence, Burra Creek flows at the base of Pound Ridge along the western edge of the valley with a shallow slip-off slope rising to the base of Big Hill Ridge. At its broadest point, midway along the valley where the ridges dip slightly and Pound Ridge becomes less abrupt, the valley floor is little more than one kilometre wide. The valley constricts quickly so that the final kilometre of the creek is in a gorge. For the greater part of its length in the valley, the creek falls only 90 metres in a straight linear distance of over nine kilometres to a waterfall near the start of the gorge. A series of rock bars, the shallow gradient (averaging perhaps less than 1:150 along the actual course) and a high rainfall (forty inches per annum) created natural swamps along the course of the creek. The swamps were the initial target of the miners.

3. Historical Research

3.1 Farmers and Miners

3.1.1 Three interests can be seen competing in the Burra Valley in the historic period : farming, mining, and wood-cutting. Historically, the passage of Hume and Hovell was a single event that left no mark; it cannot be said without challenge that the explorers even put Burra on the map[2]. The prehistory and protohistory (the contact period) for the district are almost without publication but were not a part of the research brief. Wood-cutting occurred along Pound Ridge and the Cumberland Plateau (Martin, 1985:25, states there was a water powered sawmill on West Burra Creek as late as 1916) but has left no remains near the Walking Track in the valley save the extensive loss of timber.

3.1.2 The farmers arrived first. An eddy of the great pastoral wave of the 1820's and 1830's duly ruffled the Burra Creek and Robert 'Merchant' Campbell (of Duntroon ACT and Campbell's Wharf Sydney) claimed 40000 acres at"Boro"[3]. The claim appears to have lapsed after 1848 when Mr TH Jones took up the Burra squatting run of 21,000 acres (8400 ha roughly bounded by Pound Ridge, Paddy's River and Tumbarumba Creek) with an estimated carrying capacity of 400 cattle. The Squatting Map of 1853[4] shows this Run Number198 recently transferred to Mr William Bartholomew who sought pre-emptive purchase of 160 acres (64 ha) around his homestead in 1859. Bartholomew's purchase was adopted eventually in 1894, as Portion 1 on the Parish map[5]. The homestead stood some 200 metres south of the modern road bridge over Burra Creek; the remains of a chimney, a yard and a line of fruit trees may be seen beneath the modern powerline on the east bank (site WW6-22, see Figure 2). As far as is known, this is the earliest site in the valley, although the standing remains (particularly the yards) may reflect a re-occupation of the site after the main homestead was moved north of the road.

3.1.3 In 1859 the road across the valley to and from Tumbarumba bent south of its present line to pass Bartholomew's door. By this time mining had become an issue of regional interest. The Reverend Clarke passed through the district in 1851 and with his customary enthusiasm declared everything in sight to be gold bearing "The whole of this region is auriferous. I cannot say what may be the ultimate result of multiplied

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[2]Martin 1985 (b), citing Andrews 1981, who refers to Benson 1970, Carnegie 1973, Graham & Watson 1974, but this seems more disputatious than substantive.

[3]NSW Government Gazette, 1848

[4]AONSW map 139

[5]portion plan 104-1457

labours ...."[6]. Commissioner Lockhart formally reported gold in the Tumbarumba Creek in 1855[7]. Minerals were known by then to be in the Snowy Mountains so it is no surprise to see that after the Tumbarumba road passes Bartholomew's homestead on the plan of 1859, it forks, with a branch to Lobb's Hole where copper was being mined. Lobb's Hole became the last staging point on the west road to the gold rush at Kiandra in 1860 - 1861.

3.1.4 At the time of Bartholomew's pre-emptive purchase the creek and its valley had a quite different appearance from today. The valley floor was timbered. Portion 1 was "Lightly timbered with stringy bark, box & gum"[8] and on the slopes there was forest. The creek was effectively a drain wriggling between swamps[9], its bed generally some two to three metres higher than at present approaching even five metres higher at points like the tunnel where a substantial dyke has been cut. Two portion plans drawn in 1875 show a hut in a fenced clearing belonging to Bartholomew on Portion 13[10] and a house valued at 100 pounds on Portion 10[11] in the name of Mary Maginnity. The hut site (WW6-9) is now a stockyard and shack but remnants of fencing and a dam can be seen. Mrs Maginnity is believed to have been the widow of Police Sergeant Maginnity who was shot by the bushranger Morgan near Coppabella in 1864. The site of Mrs Maginnity's house is clearly seen in the open modern landscape as a clump of exotic trees approximately four kilometres along East Burra Creek road (site WW6-6).

3.1.5 Bartholomew was but a short pace in front of the competition. The Crown Lands Alienation Act 1861 as amended, became fully operative for free selection at Burra in 1875. Within two years the valley floor east of the creek was divided into various applications for Conditional Purchase and by 1880 the western slopes also were taken. Fourteen names cover the margins of the creek (plus Bartholomew and Mrs Maginnity's two acres). By an odd quirk, a simple analysis of agricultural land dealings provides a picture of the mining activity.

3.1.6 The first recorded mining enterprises in the Burra Creek were the Burra Gold & Tin Mining Co. (1874) and the Upper Burra Gold Sluicing Co. (1875). Both were part owned and managed by Mr N.N. Gitchell. There is no reason to believe that there was no activity between 1855 and 1874. The

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[6]Clarke 1860:207

[7]Votes & Proceedings of the Legislative Assembly

[8]annotation to portion plan

[9]An alternative name for the valley was "Shaking Bog", Andrews 1920:155

[10]portion plan 257-1522

[11]portion plan 256-1522, the value implies a very substantial dwelling.

creek was surrounded by active workings like Kiandra and Laurel Hill, the Tumbarumba Goldfield was proclaimed in 1866 and there is a reference to an 1873 mining plan of Burra valley[12]. Willis claims that 1328 oz of gold were washed from the Burra Creek prior to 1875[13]. It is unfortunate that no good records survive before 1874 (and precious few afterward) but it will be noted that fourteen independent farming families is more than a small, uncleared, valley could be expected to support. The following Table represents the original application for each portion adjacent to Burra Creek.

TABLE ONE : LAND APPLICATIONS ALONG BURRA CREEK

PORTION	APPLICANT	YEAR	PORTION	APPLICANT	YEAR
1	Bartholomew	1859	65	Bradley	1880
10	Maginnity	1875	66	McMullen	1879
11	Cashman	1875	67	McMullen	1879
12	Cashman	1875	68	McMullen	1879
13	Bartholomew	1875	69	McMullen	1879
14	Bartholomew	1875	70	McMullen	1879
20	Cashman	1875	71	McMullen	1879
21	Cashman	1875	76	Griffiths	1880
26	McGlynn	1877	77	McGlynn	1880
27	McGlynn	1879	78	McMullen	1879
29	Gitchell	1877	80	Burns	1880
28	Gillies	1877	87	Burns	1882
30	Donnelly	1877	95	Griffiths	1882
31	Burns	1877	101	Gottschalk	1879
32	McGlynn	1877	102	Donnelly	1884
33	Nicholls	1877	108	Groongal Pastoral	1911
34	Halton	1877			
35	Halton	1877			
37	Gitchell	1877			
49	Mate	1880			
57	Cashman	1876			
63	Griffiths	1886			
64	Griffiths	1880			

3.1.6 There are sixteen names. Five can be discounted as being neither free selector nor miner : Thomas Mate of Tarcutta, Mrs Maginnity, Groongal Pastoral Company, Bartholomew and Donnelly -who acquired

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[12]273/3390, annotation on portion plan 681-1522; also 'Lease 73.398' annotation on portion plan 847-1522

[13]Willis, 1972:Table 8

Bartholomew's Special Purchase of Portion 1 in 1877[14]. A sixth, Gottschalk, had no residence in the valley; portion 101 formed the eastern tip of his smallholding which he subsequently sold to TH Mate & Co. The remaining ten applicants had each at least one dwelling on his holding : Burns and McGlynn had two huts, McMullen had three (two of them "old" in 1880). Interestingly, two of the buildings are marked as "Miner's Residence"[15] in 1879.

3.1.7 There are two ways of further dividing the remaining ten applicants. Firstly, there is the succesful pursuit of title. On the cadastral evidence, only McMullen achieved freehold. He took up over 1046 acres (c418 ha) along the west bank of the creek as Improvement Leases in 1879, he also selected land on Boggy Creek and on neighbouring Paddy's River. This is not the mark of a free selector (nor a miner), McMullen was a major landholder. Secondly, there is modification of the landscape and nucleation of the holding[16]. There was a delay of up to two years between an application for land in the Burra valley and survey of the land. During the interregnum a genuine selector could achieve substantial progress in ringing, clearing and fencing.

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[14]Portion 30, conditionally purchased by Donnelly in 1877, is where the Burra homestead now stands (plan 687-1522).

[15]Portion 26, 1879, plan 689-1522; Portion 57, 1879, plan 684-1522

[16]Purchase under the 1861 Act was subject to a number of conditions, primarily residence (at least when the Inspectors called) and improvements. A 'dummy' or other false selector who did not intend to complete the purchase is typified at the level of analysis presented here, by a five or ten pound hut and some ring barking. For more detailed discrimination in the region see Buxton 1967, Winston-Gregson 1985.

TABLE TWO : SELECTED IMPROVEMENTS

APPLICANT	PORTION	RING	CLEAR	FENCE	HUT	TIME
Bradley	65	-	4	6	25	5
Burns	31	20	30	-	20	13
	80	-	-	-	20	16
	87	-	-	-	-	3
Cashman	57	-	50	100	20	25
Gillies	28	8	30	60	15	22
Gitchell	29	20	50	120	500	24
	37	7	-	20	-	22
Griffiths	63	3	-	70	-	13
	64	-	5	5	30	5
	76	-	-	-	-	2
	95	-	-	29	-	20
Halton	34	25	30	8	10	25
	35	20	-	60	-	21
McGlynn	26	2	50	5	20	19
	27	-	-	-	-	1
	32	10	-	-	20	16
	77	-	-	-	-	3
Nicholls	33	9	40	-	10	25

note, values are in pounds except TIME which is the months elapsed between selection and survey.

3.1.8 Each applicant is credited with some amount of ringing and clearing and each has some form of accommodation but there are anomalies. Bradley for example has invested twenty five pounds in a "cottage" and has enclosed a half acre of garden but has no cultivation paddock nor yards nor bounds to control any stock on his selection. While obviously committed to living in the valley he has clearly not been supporting himself by farming his 490 acres (196 ha). Halton on the other hand, is content with a ten pound hut but in the space of two years has created a 550 acre (220 ha) working property. Halton can be accepted as a genuine free selector. The status of Burns, Griffiths, McGlynn and Nicholls is more ambivalent. Nicholls selected 100 acres (40 ha) beside the Tumbarumba road at the creek crossing. After two years he is still in possession but has made no structural improvements other than a small hut near the road. Significantly, there is no fence nor any cultivation. Nicholls may well have been running a small store or a grog-shop. The selections of Burns and McGlynn have in common that they are scattered about the valley and do not form integrated holdings. In addition, Burns and McGlynn have a similar pattern of investment : both own two huts, each one valued at twenty pounds and each on separate blocks; both have achieved an amount of ringing and clearing but neither has any cultivation and between them they muster five pounds worth of fences.

Apparently their selections are not functioning properties[17] and the census of 1891 shows McGlynn resident in Tumbarumba and Burns in the mining community of Boggy Creek. Griffiths would follow the same pattern (a thirty pound house and eight pounds worth of ringing and clearing) except for one hundred and four pounds of fences. Although at least sixty five pounds worth of fence relates to the Burra run (captured by Griffiths' portion alignment), the remainder is his own construction (mostly cheap sapling fences to restrain stock). Consequently, since his selections form a discrete unit[18], Griffiths was probably a genuine free selector although by 1891 he was not residing in the valley and may have been one of the two 'Thos. Griffiths' residing in Tumbarumba.

3.1.9 Cashman, Gillies and Gitchell remain from Table Two. It is unlikely that these applicants were responsible for the improvements noted on their selections. The portions encapsulate a homestead complex (five hundred pounds in value plus outbuildings) with approximately 100 acres (40 ha) of cultivation paddocks in a cleared and fenced enclosure of about six hundred acres (c240 ha) in the widest part of the valley. The location, type and size of the improvements suggest that this was the core of the Burra Run, yet the portion lines ignore the fence lines and the distribution of improvements (the boundary between portions 28 and 29 goes straight through the homestead buildings). The homestead was obviously irrelevant to the applicant's selection criteria so presumably had been abandoned. It is not known how this came about[19] but it is worth noting that the present Burra homestead, beside the road on Portion 30, was so new in 1879 that although valued structurally at six hundred pounds, it had only one shed and the surrounding land was neither cleared nor fenced except for a small "House Paddock"[20]. Gitchell was a mining proprietor, not a grazier (see 3.1.6 above). The irrelevance of the developed homestead to his purposes is painfully demonstrated by its disappearance : the ground where the buildings stood has literally gone

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[17]Burns' hut on portion 31 stood beside one of the main Burra Creek swamps; the site is now Grassmere homestead, the name of which recalls the setting of the original selection.

[18]except Portion 63, his first selection; this trapped the valuable fence and may have been an exercise in 'peacocking' to raise capital by selling his interest in the land back to the Burra Run for the value of the captured improvement. Alternatively he may have 'dummied' the portion on behalf of the run owner.

[19]Andrews 1920:155 states that in 1871 the run title passed to Bear, Morgan & Morgan; "In 1889 it was still held by TH Bear". This suggests that the title was mortgaged and in the late 1870's Bear *et al* either began to break up the property or failed to inhibit free selection. The 1891 census shows Hugh Bear living in the Burra valley.

[20]plan 687-1522

down the mine[21]. Gillies selected the adjoining portion (including part of the homestead group) on the same day as Gitchell; he did not complete the purchase, selected no other land along the creek and was probably a dummy for Gitchell. Cashman's transactions are more complex but are equally localised and ultimately void. A hut on his land is marked "miner's residence"[22] but this may be misleading. Cashman is the only person of all those listed in Table One who was still resident during the 1891 census. His household in 1891 comprised seven males and four females (the largest group in the valley) which indicates a sedentary lifestyle and may have included hired help. Since Cashman occurs nowhere in the mining records, it is likely that he was a genuine farmer.

3.1.10 It is now possible to postulate the occupation of at least the principal male members of the community engaged in land dealings in the late 1870's.

TABLE THREE : ATTRIBUTED OCCUPATION

Bartholomew	grazier	Gitchell	miner
Bradley	selector/miner	Griffiths	selector
Burns	selector/miner	Halton	selector
Cashman	selector	McGlynn	selector/miner
Donnelly	grazier	McMullen	grazier
Gillies	dummy/miner	Nicholls	storekeeper

The category 'selector/miner' indicates that the individual probably engaged in both occupations as the occasion arose. The Burra was not a 'rush', it was a field that produced steadily for many years with the leases in the hands of a few capitalists like Gitchell. It would have been convenient to live close to the workface and the selections of Bradley, Burns and McGlynn although scattered about the valley, apparently correlate with the distribution of workings active at the time of selection. McGlynn's hut is marked in 1879 as being a miner's residence[23]. Given that alluvial mining is subject to the caprice of streamflow it made sense for regular employees to retain a smallholding to fall back on when temporarily laid-off. The Tumbarumba Division Mining Registrar, H.M. Langford, noted in this regard "..consequently miners have had to suspend work until a more favourable season, and in the meantime turn their attention to agricultural and other matters"[24].

3.2 A Summary of Mining

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[21] the process was completed by Heinecke about 1935, only the outline of a hut and a flowerbed, site WW6-5, remain on an abandoned tump.

[22] plan 684-1522

[23] plan 689-1522

[24] Dept. Mines Annual Report 1879:130

3.2.1 It is apparent from the preceding section that mining was well represented in the Burra comunity by 1880. Mining took place in the valley before the formation of Gitchell's Burra Gold and Tin Mining Company in 1874 but presumably not to any great extent. The Inspector of Mines W.H.J.Slee reported in 1876 :

> "The Tumbarumba Gold-field consists of large alluvial valleys and high mountain ranges with granite, slate, basalt, sandstone, and diorite formation; the valleys or flats have nearly all proved auriferous and some of them very rich, but are now nearly deserted by the individual miner although there is no doubt that large deposits of gold are still laying undisturbed in these rich but partially worked valleys, but what the individual miner could not accomplish is easily done by capital and good management .."[25]

Slee goes on to portray Gitchell as the innovator of large enterprise in the neighbouring Mannus and Burra Creeks (with an expended capital of six thousand pounds over two years in the Burra valley alone) so it is reasonable to infer that the Burra Creek had been thoroughly prospected but not largely mined before 1874. One site is characteristic of the early phase of individual mining. The southernmost site on Burra Creek (site WW6-26) is a gravel deposit on the east bank in a sharp bend a few metres above the main waterfall. A small race fed the workings from a weir four hundred metres upstream. The site is a maze of tiny alleys between piles of river gravel. Water from the race flowed across a table (in this case probably a long-tom) into which wash dirt was dumped. Waste from the table was tipped over the sides, making the mounds of gravel. When the adjacent mounds became too high for convenience, the table was moved a couple of yards and the process repeated. Each alley formed by the mounds is thus an image of the table.

3.2.2 Nathan Niles Gitchell irrupted into what Slee called the "present drowsiness" of Tumbarumba[26]. Through his Mannus Creek Gold Sluicing Company, he was one of the first miners in New South Wales to experiment with dynamite as a blasting agent instead of black powder. The initial firings must have terrified his contemporaries, although the modern imagination sees something like a Mack Sennett production as jagged lumps of granite hurtled into into the surrounding paddocks where they lie today. As the blasting progressed through some eight hundred

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[25]Dept Mines Annual report 1876:123

[26]Willis 1972:39 calls him "Mr NN Gitchell"; the 1879 plan of Parish portion 29 (685-1522) says "Nathan Niles Gitchell"; Martin 1985:22 calls him "David Nathaniel Gitchell"; presumably one of the three is a contraction and/or a corruption and oral tradition has it also that the miner Mitchell was Gitchell's alias "because of the gold smuggling"!

metres of rock Gitchell became more economical in the use of explosive but his nascent engineering skills were still no match for his enthusiasm. He bored through an intervening spur, beginning at both ends of the projected tunnel. When Slee reported in 1876, the tunnel on Mannus Creek was near to completion; it was discovered later that the two halves did not meet in the middle and a kink had to be introduced!

3.2.3 The Burra Creek underwent three phases of mining after its exploration. The first, on claims noted between 1873 and 1880, was dominated by Gitchell who concentrated his work for 1500 metres up and down stream from the Tumbarumba road and for a similar distance around the confluence of East and West Burra Creeks. The intervening space (see Figure 3) was exploited in the second phase by a variety of people in the 1890's. The third phase, 1909 - 1943, is dominated by the Heinecke family who, with others, reworked some earlier claims and worked heavily a small affluent of Burra Creek rising on Pound Ridge.

TABLE FOUR : MINING CHRONOLOGY PHASE ONE 1872-1880

YEAR	SOURCE	NOTE
1872	Willis:1[27]	Burra Creek proclaimed southerly extension to Tumbarumba Gold Field 4 August
1873	pp681-1522	GML17 & 18 at Angels Flat and below road bridge[28]
	pp847-1522	GML8 (lease 73.398) and GML9 at West/East Creek confluence also leased by Gitchell
1874	Willis:41	Burra Gold & Tin Mining Co formed (NN Gitchell)
1875	Willis:41	Upper Burra Gold Sluicing Co formed (NN Gitchell);
	pp(various)	between 1875 & 1879 Gitchell begins working all his leases[29]
	MAR:93[30]	'Upper Burra' starts "extensive works"
1876	MAR:123	'Burra Gold' and 'Upper Burra' cut long flood and tail races, and are ready for work
1877	MAR:160	insufficient rain to sustain sluicing
1879	portion plans	large areas marked 'old abandoned ground' held by Wilson, J. Josephson[31] along upper Burra
	MAR:130	insufficient rain to sustain sluicing, races dry
1880	Willis:41	Burra Sluicing Co. [formerly Burra Gold & Tin] formed (NN Gitchell)

3.2.4 The sources provide a reasonably coherent picture. The portion plans in particular, which come at the end of this phase of documentation, give substance to the mention of "extensive works". They greatly augment the scanty surviving records of the Mines Department. Collectively, the Portion Plans delineate three dams with sundry "workings" and races in a slice of time between 1875 and 1882. They also delineate, by inference, the areas that are not being worked at that period. Evidently the Burra Gold & Tin Mining Company of 1874 worked the ground centred on the Tumbarumba road while the Upper Burra Gold Sluicing Company was formed in 1875 to exploit the swamps around the East / West Burra Creeks confluence. Gitchell's companies (including Mannus Creek) were described in 1876 as "The only extensive alluvial mining works going on in this Division ... These claims have cost on an average £8000 each to open up and put in proper working order, and

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[27]Willis, JL. 1972:1

[28]portion plan 681-1522 citing Mines Plan 73/3390 [GML = Gold Mining Lease]

[29]derived from portion plans along the creek margin, there seem not to be any surviving GML documents.

[30]NSW Department of Mines Annual Report page 93

[31]685-1522, 689-1522, Josephson's name is superimposed on Gitchell so presumably he was connected with the Upper Burra Gold Sluicing Co.

although they consist of partially of [sic] worked and abandoned ground, yet they return good dividends on the outlay."[32] The amalgamated claim of the 'Upper Burra' included the old ground held by Josephson[33] (and possibly Wilson), as well as abandoned ground held by Gitchell. There is no record of abandoned workings held by 'Burra Gold & Tin' but the distribution of numerous small races on the west bank immediately south of the Tumbarumba road indicate earlier workings of a small scale.

3.2.5 The Mines Department archive has little to say about Burra Creek between 1879 and 1890 but there was certainly activity. Gitchell combined his Burra operations into the Burra Sluicing Company in 1880 and presumably found the move profitable since he abandoned his investment on the Mannus Creek in 1882[34]. South of the Tumbarumba road he was working immediately north of what is called now 'the Tunnel'[35]. Thus in 1881 "The Burra Creek Company still carry on their extensive works with very satisfactory results"[36] and in 1884 "The only important works at this place [ie the Tumbarumba & Germanton Division] are those of the Burra Gold Sluicing Company, which has steadily worked throughout the year with rather more encouraging results than heretofore. A few other claims up the same creek have been worked and have about paid wages"[37]. The identity of the "few other claims" is unknown but there are some very substantial workings on East Burra Creek immediately north of the study area (see Burra Creek Mining Sites map sheet 1) that would date to this time or earlier. Gitchell remained lucky, "The sluicing at the Burra Company property has paid moderately well, and at all the other sluicing places in this division scarcely wages has rewarded the miners' labour"[38], although the final entry for the decade records a perennial problem "The Burra Sluicing Company had not sufficient water during the early part of the year, and their return was only moderate"[39].

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[32]MAR 1876:101

[33]GML 8, 9, adjoining parish portions 29 & 37 which surely is why Gitchell 'selected' those portions in 1879, see 3.1.9 above.

[34]Willis 1972:47

[35]Portion Plans 694 & 897-1522

[36]Mines Department Annual Report 1881:74

[37]op cit 1884:83

[38]op cit 1885:78

[39]op cit 1886:77

TABLE FIVE : MINING CHRONOLOGY PHASE TWO 1890 - 1901

YEAR	SOURCE	NOTE
1890	MAR:95	Burra Co. "at dead work nearly all the year"
1891	MAR:105	Burra Co. still at dead work; Newman's ground "vigourously worked for the last four months"
1892	T1975-7[40]	J Speirs & Co in possession of MT1,2,3
	T2983	RD Matthews in possession of MT6
1896	MAR:31	Burra Sluicing Co. still "The principal mine"
1897	MAR:37	"exceptionally dry"
	G1253[41]	Bennett & Co lease GL2
	G12532	GT Heinecke & RD Matthews lease GL3
	G12976	M Donovan leases GL6 (formerly Speirs' MT1)
1898	MAR:38	dry seasons persist
	T1975-7	Speirs abandons his Mining Tenements
	T3185	L Mitchell in possession of MT5 (covers Matthews' MT6 and GL3)
1899	MAR:33	alluvial mining "again considerably retarded" by lack of rain;
	parish map	Tumbarumba Gold Field redefined, proclaimed 15 July
1900	T3376	A Daly takes MT13
	G14490	JC Walsh *et al* lease GL9 (formerly part GL6, MT1,2)
1901	MAR:26	"quantity of gold is keeping well up to average"
	G14490	GL9 declared void
	T3488	W Russel takes MT7 amalgamating all Phase 2 claims
	MAR:26	Burra Sluicing Co. installs new plant.

3.2.6 It can be seen that while the Annual Reports are persistently pessimistic during the 1890's, the miners were very active. Gitchell's 'Burra Co' spent two years digging and dynamiting new races ("shooting a bar") and although no production figures are available for the rest of the decade the investment obviously paid for itself since the company remained in business as "the principal mine". The vacant ground between the Burra Co's leases was worked at first by Newman then by Speirs. Their gold returns are unrecorded but clearly the ground sustained the promise presaged by the Mining Warden[42] because there is a constant theme of re-pegging claims. 1899 saw the introduction of pump dredging at WW6-27.

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[40]Mines Department plan nos T1975, T1976, T1977 [an MT is a Mining Tenement]

[41]Mines Department plan no G12531 [a GL is a Gold Lease]

[42]"The yield is expected to be good in proportion to the work -stripping to the depth of the wash being an average of 17 feet" (c5 metres); JF Makinson, Mines Department Annual Report, 1891:105

3.2.7 The flurry of entrepreneurs was halted abruptly in 1901 when Russel amalgamated all of the 1890's claims into the 'Burra Creek Sluicing Claim' on behalf of Gitchell's Burra Sluicing Company. The only exception was Daly's MT13. This was an 'Extended Alluvial Claim' over Wilson's 1879 dam site on East Burra Creek. Although the papers are lost (plan T3335) it is evident from the remains in the field that Daly's primary claim excavated the east bank of the Creek 150 metres south of the present crossing. Because a Mining Tenement necessitated residence, it is possible that Daly temporarily re-occupied the Miner's Residence marked there in 1879[43] (site WW6-2) since no other hut site has been found[44].

3.2.8 1901 marks an important change. Burra Creek achieved three entries in the Mines Department Annual Report :

> "The Burra Sluicing Company has extended the area of its holding and made arrangements for the erection of a large plant which it is expected will enable 9 acres [3.6ha] per annum to be treated." 1901:26

> "The Burra Sluicing Company has a hydraulic plant at work on the Burra Creek in this Division.
> The claim is an old-established one, and has been worked by means of a tail race for a number of years. Since the present Company purchased the property, a sluicing plant, valued at £2000, has been erected, and a water race cut for a distance of 13 miles."[21km] 1901:36

> "On the Burra Creek Messrs. Hedley and others are also installing a sand-pump and Pelton wheel". 1901:87

Mr Hedley receives no other mention in surviving records of the study area. A full page photograph of the Burra Sluicing Company's plant was included in the Annual Report and is reproduced as Plate 19. The plant was equipped with a california pump[45] that markedly deepened the mining base. The plant helped to create a new valley floor two kilometres long and varying up to 400 metres wide, centred on what is now Grassmere homestead. Production figures are few[46] but the plant

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[43]Portion Plan 689-1522

[44]the 1891 census shows Austin Daly's residence (3 male; 3 female) at Bridge Street in Tumbarumba.

[45]see below, The Mining Technology

[46]Willis 1972:42 Table 8 says 18000 cubic yards; MAR 1904:29 says 180,000 cubic yards which accords with the power of the plant. If MAR is correct, the plant's productivity is unremarkable but the 1904 output in gold alone exceeded the original capital outlay.

seems to have been effective because in 1904 it treated only 18,000 cubic yards (roughly one tenth of its nominal capacity) but it nearly doubled the gold and tin that had been extracted in 1901 by previous methods from 50,000 cubic yards. In 1907 the plant, having given "Excellent results", ran out of swamp to mine. The following year, after thirty five years in the Burra valley, Gitchell closed down his operation.

3.2.9 Phase three introduced some new people, new technologies and new locations :

TABLE SIX : MINING CHRONOLOGY PHASE THREE 1905 - 1943

YEAR	SOURCE	NOTE
1905	MAR:26	Heinecke's patent jet elevator erected on Burra Creek
1909	G17770[47]	L Mitchell leases GL10
	G17771	WH Addey leases GL11 (lapses 1910)
	P2722	L&P Mitchell lease PGL12
	P2723	J Cunningham leases PGL13
1912	Willis:55[48]	Groongal Pastoral Company acquires Mitchell and Cunningham leases
1913	Willis:55	MD Bennett acquires Groongal leases
1915	G193375	CB Heinecke leases GL8 "for Gold Reefing"
	P3863	CB Heinecke leases PGL14 "for Gold Reefing"
	P3864	CB Heinecke leases PGL15 "for Gold Reefing"
1916	P4000	MD Bennett leases PGL6 (water race)
	P3985	FF Heinecke leases PGL7
	P3986	CB Heinecke leases PGL8
	P3987	CB Heinecke leases PGL10 "for Dam Site"
	P3924	CB Heinecke leases PGL11
	P3954	CB Heinecke leases PGL16
	P3925	FF Heinecke leases PGL17
	P3988	CB Heinecke leases PGL18
	G19483	CB Heinecke leases GL5
1917	P4186	CB Heinecke leases PGL4 "for Gold Reefing"
1918	P4187	CB Heinecke leases PGL5 "for Gold Reefing"
	P4000	Bennett surrenders leases, PGL6 acquired by NF Mair
1923	as above	Heineckes surrender all leases between 1923 and 1925 except PGL7 (renewed 1924), PGL10 (cancelled

[47]Mines Department plan number G17770

[48]Willis 1972:55

1924), PGL11 (cancelled 1925), PGL18 (cancelled 1932)

1931 P3985 CJ Woodhouse acquires leases to PGL7, 18
1932 P3988 Woodhouse leases refused and cancelled
P6986 J Lucas leases PGL1 (water race) (refused 1934)
P6945 W McLachlan leases PGL22 (cancelled 1935)
1935 P7666 BH Heinecke & HS Tratman lease PGL2
1938 P7666 PGL2 cancelled
1943 P8850 A Minchin leases PGL3 (shaft)

The first decade of Phase Three saw an important shift in technology. George Heinecke patented[49] an improved hydraulic jet elevator[50] that represented an almost quantum leap in the throughput of washdirt. Heinecke occurs as a Burra leaseholder in 1897 with RD Matthews (GL3) whose leases were transferred to L Mitchell in 1898. The Mines Department Annual report of 1905 records that Heinecke immediately installed a jet elevator at his leases on Tumbarumba Creek and "..a similar plant is being erected on Burra Creek"[51]. In the latter case, it is reasonable to assume that the same parties were involved, certainly by 1909 Mitchell was busy using an elevator on PGL12 to create the small canyon (site WW6-18) that the Walking Trail threads some 700 metres north of Angel Flat.

3.2.10 The new elevator made workable previously unattractive ground. Mitchell and Cunningham's leases formed the foot of Pound Ridge, ie the western boundary of the former swamp sluiced away by Gitchell. When Addey's neighbouring lease was cancelled, Mitchell had it re-pegged within 48 hours[52]. After three years Mitchell and Cunningham sold out to the Groongal Pastoral Company (Messrs. George Mair, James Mair and Somerville Livingstone-Learmonth). This marks a significant change in the valley. Between 1903 and 1908 the Groongal Pastoral Company acquired freehold to all land selected along the Creek, ie all blocks listed in Table 1 above. Consequently, by 1908 there is a definitive end to the selectors and selector/miners (coincident also with the closure of the Burra Sluicing Company) and the whole valley is once more in the hands of a single pastoral concern[53]. Indeed in 1912 the Company even took over the active mining leases and although they were passed to MD

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[49]Patent No.4583/05 of 14 November 1905

[50]see below, The Mining Technology

[51]MAR 1905:26

[52]Mines Department plan G17771

[53]it is possible that monolithic pastoralism was re-asserted earlier through the agency of McMullen who took over at least one portion in 1884 from Donnelly, the 1879 purchaser of Burra Homestead.

Bennett in 1913, he relinquished them in 1918 to NF Mair whose lease of the water race PGL6 (site WW6-4) remained valid until 1934[54].

3.2.11 The period up to the First World War is the last throw for the miners of the 1890's. Mitchell, for example, who first appears in the Burra in 1898 sold out in 1912 and Bennett, who began on GL2 two hundred metres north of Grassmere in 1897, finished six hundred metres south of Grassmere in 1918 -twenty years was enough.

3.2.12 The Heinecke family had had an interest in the Burra valley for some years before their major incursion of 1915, although their principal activity had been along Tumbarumba Creek -particularly the Union Jack Mine. The claims of 1915 flank a small watercourse some six hundred metres southwest of Grassmere homestead, on the 640 metre contour of the lower slope of Pound Ridge immediately above the old claims of Gitchell, Mitchell and Cunningham. This is outside the designated research area but it is too important to ignore. Charles Heinecke's first claims were for *gold reefing*, not gold sluicing or dredging. He sank a shaft in PGL14 (site WW6-15) and crushed the ore with a five head stamper on PGL15 (site WW6-14). The stamper was water driven by a pipe from the water race PGL6[55]. Willis (1972:38) states "Heineckes reef was discovered by C.B. Heinecke during sluicing operations on Burra Creek in 1916" (sic). It is worth quoting the Mines Department Annual Reports for this period :

> "M D Bennett treated 6,751 cubic yards [5615 cu m] of material with a jet elevator at Burra Creek for a return of 10oz [32 gm] of gold valued at £42." 1914:30
>
> "C B Heinecke raised and treated a considerable quantity of washdirt from the area held by him at Burra Creek, by means of a jet elevator. The gold won totalled 107oz [3.3 kg], valued at £396. The plant is valued at £1000, and five men were employed." 1915:28
>
> "The best results were obtained by M D Bennett, who raised and treated 11,000 cubic yards [9149 cu m] of

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[54]after the race ceased to be a mining concern it is believed to have powered a shearing shed that stands where the race crosses the West Burra road. If substantiated, this would be a very unusual piece of technology.

[55]race, pipes, bits of pelton wheel and battery supports are extant; in 1918 NF Mair took over PGL6 from the Heineckes' old associate Bennett; Willis (1972:38) notes that Mair worked Heinecke's Reef that year.

> washdirt for a yield of 99oz [3.1 kg] of gold valued at £389. Six men were employed and the machinery and plant is valued at £700." 1916:26
>
> "C B Heinecke raised and treated 500 tons [492 t] of stone from his mine at Burra for a yield of 167oz [5.2 kg] of gold, valued at £651. Work was commenced in May, 1916, and it is stated that so far as operations have progressed, the results of the crushings were satisfactory." 1916:14

With the decline of the Cherry Hill, Laurel Hill and Billabong leads, Burra Creek had become the best mineral prospect in the Division (albeit a frog of modest dimensions in a shrinking pond).

3.2.13 The artefacts noted above, a safety cage, a crucible hearth and two trolleys[56] all testify to there having been a reef worked by shaft but the mine no longer exists. As can be seen from Table Six the Heineckes leased a block of adjoining claims around the reef and worked them until 1923 when most were relinquished. Some of these were sluicing claims and when the shaft became uneconomic the ground through which it had been dug was treated as washdirt and simply sluiced onto the elevator tables. Willis (1972:56) states of the sluicing "The plant owned by G. Heinecke on Tumbarumba Creek was moved to Burra Creek in 1915. It ceased operations in the same year after obtaining 107 oz [3.3 kg] of gold valued at $792 [£396]." This is misleading. It is quite probable that Charles Heinecke was using George Heinecke's plant in 1915 (see MAR 1915:28 quoted above) but sluicing was not abandoned. It began in 1905 and an elevator remained in use until at least 1930. There are regular entries in the Mines Department Annual Reports that correlate with the PGL's noted in Table Six and with remains in the field. There were two jet elevators on neighbouring claims in 1915 - Bennett's (which had been introduced by Mitchell in 1905) and Heinecke's. One was removed to Kiandra (date unknown, probably Bennett's plant after 1918) the other was removed to Mannus Creek after the Mannus Creek Gold Mining Company (CJ Woodhouse) bought out the Heineckes in 1931.

3.2.14 Fossickers rights of entry were maintained over most of the Phase Three mines during the 1930's and there were sporadic attempts at working parts of the Burra Creek that had been overlooked. BH Heinecke and HS Tratman worked PGL2 in upper Burra for at least two years "sluicing operations were also carried out on the top end of Burra Creek"[57] in the last known operation of its type. Thereafter there was

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[56] WW6-A9 to A14

[57] MAR 1936:53

only alluvial fossicking until Minchin opened a shaft on top of Pound Ridge as a continuation of Heinecke's Reef. The site is a kilometre from the Walking Trail. Several shafts were sunk, beginning in 1943 and perhaps continuing into the 1950's. The lease remained in force until 1963[58] but no production figures are known.

[58]Mines Department plan P8850

4. The Mining Technology

4.1 Context

4.1.1 Three broad categories are represented in the Burra valley : sluicing, dredging and shaft. The valley has some technological significance in that it is possible to recognise important innovations. It is necessary to be aware of the nature of the gold deposit. This was not a field of hard gold locked in quartz veins deep in granite. Nor, although it was 'free' gold, did it lie as nuggets on or near the surface of the soil. The gold occurred in slope wash deposits that were trapped by rock bars to form swamps along the major watercourse. The source of the gold was never found and was almost certainly a series of small reefs like Heinecke's that became exposed on the ridges and had eroded to the valley floor in a previous era. When the reefs were consumed by erosion the supply dried up, so that payable gold does not occur generally in the upper soil strata of the valley floor nor in the active stream bed. Nobody would have made a fortune here with a panning dish although two have been found (WW6-A1 and at site WW6-10). Newman and Party were mining at a depth of seventeen feet (over five metres)[59] along the creek bed and the field remains indicate that this was a common depth. It is possible to mine such deposits by shaft and drive (as was attempted on Tumbarumba Creek) but it pays poorly unless the deposit is rich, also alluvial soils present serious problems of stability and water ingress. Open-cut is far more effective. In the Burra valley it was finely executed, using water not as waste to be pumped away but as the cutting agent, as the motive agent of the wash dirt, and as the washing agent that separated gold and tin from the debitage.

4.2 Sluicing

4.2.1 'Sluicing' is like 'Alluvial Mining', a vague term that covers many techniques. 'Sluice', in fact, has a number of meanings as both verb and noun. The simplest sluicing arrangement is that described in paragraph 3.2.1 above, where the superficial deposit near the head of a waterfall was shovelled into a cradle to be washed (sluiced). Water was supplied by a small headrace with a fall (head) of about a metre -any greater pressure would have washed away the gold as well as the debitage. The site (WW6-26) demonstrates the basic relationship of headrace and table (in this case probably a long-tom[60]), but a separate agency (a miner and

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[59]Department of Mines Annual Report 1891:105

[60]a 'long-tom' sluice box combines three descending components : a narrow puddling trough where the wash dirt is placed to remove light elements, a sieve to remove coarse elements, a riffle board where the minerals precipitate. Stones etc are removed from the sieve manually; gravity and water turbulence do the rest.

his shovel) is cutting out the wash dirt and supplying it to the table. The characteristic feature is the small scale. The bulk of the deposit in both depth and width is abandoned since there is a finite limit to what can be accomplished economically by hand and the bulk of the water is wasted. Only a small amount of water is tapped, the rest is uncontrolled and is a threat because it can flood the mine either by overflow or by seepage, which again sets a finite limit to extraction.

4.2.2 The next stage sees the single table extended into a string of tables called a Tail Race. The tables differ from a dolly, or cradle, in that they are static ie not rocked by hand. Bars, or ripples, across the surface of the table disrupt the water flow to separate and trap the gold particles. Increasing the number of tables requires a greater volume of washing water and thus a larger head race but not necessarily a greater head since that could produce undesirable pressure and turbulence across the tables. If a raised bench, or terrace, is being mined the tail race can be mounted out of the creek but that does not apply generally to the Burra valley where the gold lay deep in swamps eloquently described by Surveyor Brown as "Burra Creek Sludge"[61].

4.2.3 Nathaniel Gitchell launched the Burra into a more powerful system that used a flood race to feed the tail race. As the name suggests, a flood race mimics the action of a natural flood by using a body of water to cut out the wash dirt and sweep it onto the tables. The system requires three descending components : the head water, the mineral deposit, the tables. The base of the mineral deposit determines the lowest cutting point of the head water and -most importantly- the top of the first table. A fundamental principle of hydraulic sluicing is that contrary to shaft mining, which in simple terms commonly starts at the top of the ore and works down, the processing plant ie the tables, is below the mineral body so that hydraulic sluicing must start at the bottom and work upward. An hydraulic sluice mine therefore starts at the lowest point of the deposit and progresses upstream.

4.2.4 There are two other engineering requirements. Firstly, the flood race needs to be controlled to produce a consistent cutting action. If stream-flow is large, or irregular, a by-pass is used to keep excess water from the work face, so that the flood race may continue beyond the work face and discharge beneath the tables, being 'tapped' higher up to supply the cutting agent[62]. Generally, a dam like site WW6-21 sustains the supply to the flood race. Secondly, the tail race should descend in a

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[61] Crown Lands Office plan 860-1522 dated 1880

[62] If the cutting stream is directed through a nozzle, a lesser volume than normal stream-flow is needed and the bulk of water may be channelled through the by-pass.

ratio no steeper than 1:12 or the gold may not precipitate. Because of the volume of material to be processed, the result is a long trough across the landscape.

4.2.5 The gold deposits in the swamps were well below the level of Burra Creek. Therefore it was not possible to use the natural creek bed as the tail race, consequently Gitchell had to spend many thousands of pounds blasting a tail race through the granite that dammed the swamps on each of his leases. Site WW6-23 is part of the original tail race of the Burra Gold and Tin Mining Company which includes a tunnel -more spectacular than a channel but the same principle. The Inspector of Mines, Mr W Slee described Gitchell's original operation :

> "The Burra Gold and Tin Mining Company, Mr. Gitchell manager and part proprietor, has only a few shareholders (Victorians), capital expended, £6000. This company's property is situated about 5 miles S.E. of Tumbarumba township. The company have cut a tail race fully 1,200 yards [1100m] and boxes 4 feet wide by 2 1/2 feet deep [1200mm x 760mm] are laid the whole length of this tail race. Several hundred yards in length, by an average depth of 15 feet [c200m x 4.5m], had to be blasted; there is also a flood race 1,500 yards long [c1400m], running into the creek below the boxes. The company has already obtained 1,520 ounces of gold [48.86 kg], but at present there is not sufficient water for sluicing operations on such a large scale; they have a flat 3 miles in length and from 80 to 200 yards wide [4800m x 73 to 182m] before them. There is at present opened about 100 yards [c90m] and I tried several prospects on a shovel and obtained as high as 6 grains, but saw fully 1 1/2 dwt. [c2 gm] to the dish taken in my presence. The thickness of the auriferous strata is about 1 foot [c300mm] (sample of which I took for the purpose of sending to the Department of Mines), and overlaid by about 8 feet [c2.4m] of sandy loam, easily washed away. The whole of this flat represented a worthless swamp before the tailrace was brought up to drain the water. The flat has been well prospected by the company and they will have from 10 to 15 years work before them with almost a certainty of large returns for their capital invested.
>
> In addition to the gold, about 1 1/2 ton of tin per acre is obtainable.
>
> The Upper Burra Gold Sluicing Company (Mr. Gitchell, manager and part proprietor) has three shareholders; this

> property is situated about 6 miles due east from Tumbarumba township. Everything here is ready for working when sufficient water comes; a tailrace about 680 yards [c620m] has been cut, fully half of which is through solid granite. Capital expended about £3,500. The flat to be ground sluiced is fully 2 miles long by from 80 to 150 yards wide [3200m x 85 to 137m], with very good prospects. Boxes 3 feet wide and 2 1/2 feet deep [900mm x 760mm] have been laid the whole length of the tailrace. There is also a floodrace of 680 yards [620m]. The prospects of this company are really good, as in addition to the gold about 2 tons of tin per acre is obtained."
>
> Department of Mines, Annual Report 1876:123

The Upper Burra tail race rock cut (site WW6-28) and the parallel flood race void at site WW6-7. The tail race continues as an earth banked channel to a short rock cutting in a cleft below site WW6-10.

4.2.6 The characteristic marks of this form of mining are the obvious trough of the tail race, a sprawling hole (often filled by later tailings), a flood race, and a dam. The excess discharge into the tail race trough, beneath the tables, carries off the waste gravel dumped during processing. As the mine progresses upstream the tail race and the hole elongate but the flood race and taps are progressively consumed, except for isolated remnants. If the mineral deposit persists, even the original dam will be sluiced away. An 1897 plan of mine MT6 shows Gitchell's 1876 dam (site WW6-21) overtaken by workings and breached by RD Matthew's tail race[63]. The progress of the mine does not elongate the tables and tail race indefinitely. Rather, the tables are periodically brought up to the work face and the far end of the race is abandoned. Upstream of the rock bars, as the overburden was sluiced away, the race was extended into the revealed bed of the swamp so that for much of its length eg at Angel's Flat, the Burra Creek now flows in a channel cut through soft earth faced with stone to prevent collapse.

4.2.7 Because of the cutting medium, flood race mining leaves a rather ragged hole, or a series of rough trenches along the valley floor such as at the head of the Upper Burra rock cut (see map sheets 2 and 3). An improved method pipes the water through a monitor (a nozzle) that directs a jet against a work face higher than the tables. The jet is directed at the base of the wall which is mined away by being undercut. This produces both a vertical element in the remains and, because the cutting medium is easily directed, leaves tumps of sterile soil that were

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[63]NSW Dept Mines plan T2983. Both the dam and the characteristically artificial creek bed are extant beside the Walking Track.

not worth mining. The technique appears to have been used in the worked ground around the Tunnel and is therefore an early introduction to the Burra field.

4.2.8 The vertical relationship between the mineral deposit and the tables put a heavy capital burden on the miner in the Burra Valley, which would have deterred competition. In addition, Gitchell displayed some skill in staking his leases at the head and foot of the valley. Anyone attempting to establish a mine in the intervening swamp would have to contend with the waterborne tailings from the Upper Burra mine as well as having to devote a large part of their lease to the tail race -with the added complication that the foot of the tail race could not be lower than the natural creek bed where it entered Gitchell's next lease or a lake would form in the mine. A small operation like Newman & Party in 1891 could dig a pit and manually cradle or sluice the wash dirt in the creek but a large operation was precluded. The solution was to wait until Gitchell had worked his way to the head of the lower claim (which must have occurred by 1891 when a flurry of claims was lodged around Grassmere) or to mine by dredge.

4.3 Dredging

4.3.1 Plates 15 to 17 illustrate the basic form of dredging. A flood race (usually piped from a dam) powers a monitor that hoses out a pit then undercuts the pit walls. Wash dirt is sucked from a sump in the pit by a centrifugal pump, normally spun by a turbine like a Pelton Wheel that is powered by a head race. Coarse seiving occurs in the pit and only the finer material is pumped up to the tables. The works area is thus quite compact and the bulk of the processing occurs at ground level so that the stream bed can perform as by-pass and tailings dump. The characteristic remnant is a steep-sided pit fed by a race. There are six of these south of the Tumbarumba road mixed with earlier water channels, indicating that Gitchell's old ground was reworked although there are no records. Pump dredging began in New South Wales in 1899[64] and in June of that year MD Bennett registered GL7 specifically to mine for alluvial gold by dredging. The site must therefore be one of the first of its type in the State. The remains (site WW6-27) are very clear. Artefacts WW6-A3, A4, A5, A7, also represent the technology. Another mention at the Burra is Hedley & Party in 1901 (Table Six above) who may have been reworking Gitchell's old ground since no separate registration survives in their name.

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[64]Willis 1972:53, but the distribution of artefacts WW6-A3, A4, A5, suggests that dredging may have been introduced to the Burra by Bennett and Donovan in 1897.

4.3.2 As far as can be ascertained, Gitchell did not use the plant described above. The man who introduced dynamite to New South Wales inevitably built something larger than a sand pump. Plate 19 shows Gitchell's plant newly erected at a cost of £2000 in 1901. Although the dredging principal of monitor and pump is unchanged, the application is more developed. The wash dirt is pumped to the top of a high trestle in the centre of the mine whence it runs by flume to the tables. This ensures that the tables are independent of the mineral level and can be mounted at any convenient place above stream level. It also means that the sump is as close as possible to the cutting face so that gold is not lost by redeposition. All motive water is directed by pipe and valve to increase the force and the degree of control. The remains of Gitchell's trestle, the supply races and the lines of gravel dumped from the tables can still be seen beside Burra Creek at site WW6-17.

4.3.3 George Heinecke's jet elevator of 1905 ingeniously combined the more efficient elements of all the above systems. It was entirely water driven. A monitor cut out the wash dirt which was sluiced onto tables that could be mounted on the bank of the cut or on a trestle or at the end of a flume. However there was no turbine and no centrifugal pump. Instead, as wash dirt drained into the sump it met a jet of water that carried it vertically through an expanding chamber[65] to the trestle head. Like any good idea the device was remarkably simple. The surviving example owned by Mr B McClelland of Tumbarumba comprises half a dozen simple castings, each of which can be lifted by a single labourer. There are no moving parts. Manufacturing, siting and maintenance costs are thus minimal[66]. A modification in 1908 introduced compressed air to the jet nozzle as well as to the up-take.

4.3.4 The jet elevator was light and simple so it has left no distinctive structural remains in the field. However, like Gitchell's dredge, it required a large amount of water at high pressure. The head races and pipe locations can be seen at site WW6-5 and at WW6-18, and when

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[65]technically, a conical up-take pipe, the principle being that lateral expansion at the pipe head reduces vertical resistance enabling a greater load to be lifted to a greater height. Heinecke claimed a lift of 30 feet [9m] with a 7 inch [178mm] jet. Compressed air in the up-take improved thrust and reduced friction. Note that the valve and collar diameter of WW6-A16 is around 150mm.

[66]"**A No.5 PLANT**, with 3 3/4-inch jet water supply, **costing £125**, is installed by the Burra G.M. Co. at Burra Creek, near Tumbarumba, N.S.W., raising **180 Cubic yards** per hour to a height of **50 feet**, with a water pressure of **185 feet**." undated advertisement reproduced in Martin 1985:23

Mitchell & Cunningham's plant was removed a pipeline valve (WW6-A16) was left in place.

4.4 Shaft

4.4.1 Charles Heinecke's shaft was sunk through clay onto a granite reef. The clay was subsequently sluiced away leaving the bedrock exposed (an interesting feature). The presence of an abandoned safety cage demonstrates that the mine was a vertical shaft. The open-cut sluicing has left little evidence of how the mine operated (obviously no overhead gear survived) but some two hundred metres downslope, on the far side of the open-cut, there are a small crucible hearth and two trolleys. There are also a machinery bed and head race pipe, turbine parts etc (site WW6-14) that must have been the site of Heinecke's water powered five head stamper.

4.5 Dynamite

4.5.1 As far as is known, Nathan Gitchell was the first miner to use the explosive dynamite in New South Wales. He introduced the explosive at Mannus and Burra Creeks in 1874. The experimental flavour of the remains is noted above.

5. Specific Queries

5.1 Periods of Mining

5.1.1 These are discussed at some length in Section 3.2 above. Figure 3 and the map sheet 'Burra Creek Mining Phases' show graphically the recorded periods and distribution of mining. There was a phase of undocumented activity before 1874 which is reflected in Burra Creek Mining Sites map sheets 1 and 5, also prospecting rights were retained over much of the Creek for about a decade after large scale mining ceased.

5.1.2 The preliminary period may have begun about 1855 when gold was first reported in the Tumbarumba district. Prospecting and mining would have been stimulated by traffic to the nearby Kiandra goldfield 1860-1861. The Tumbarumba Mining Registrar referred to "The mining mania which set in here in 1872 and 1873.." and cites the Burra Gold & Tin Mining Co. as having "survived the wreck"[67].

5.1.3 Phase One is marked by the beginning of recorded mining with the registration in 1874 of the Burra Gold & Tin Mining Company. The Company and miners like Josephson, held leases delineated by the documents of 1873 that are now lost. The earliest cartographic evidence shows leases dated 1875 around The Junction and near The Tunnel. Recorded production began in 1875.

5.1.4 Phase Two is a concentration of entrepreneurial activity on the swamp at Grassmere, through the 1890's.

5.1.5 Phase Three begins with the amalgamation into the hands of the Burra Sluicing Company in 1901 of the small workings of the previous phase, climaxes with the Heinecke mine 1915 -1923 then declines into isolated works and prospecting.

5.2 Value of Gold

5.2.1 The true value of production in gold -also in tin- is a matter of conjecture. In 1875 the Mining Registrar complained "I have no means of obtaining correctly the yield of gold from alluviums.." and so had no means of gauging production figures. The Burra mines admitted to producing 282 oz of gold that year but in the subsequent Annual Report (1876:124) the Inspector of Mines remarked "The general opinion expressed here is that most of the gold obtained from this district finds its way over the Borders to Victoria .... I am informed the extra price obtained is about 2s per oz."

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[67]MAR 1875:93

5.2.2 The records that have survived of the Burra Creek production are reproduced in Willis, 1972[68]. They total 7231.5 oz; being 440 oz from Heinecke's Reef, 883.5 oz from dredging, 5908 oz from sluicing. Willis' summary of operations is not complete since it derives only from Mines Department records and there are enormous gaps in the data base. There are no figures for Minchin's Reef, none for the intensive operations of the 1890's and only seven entries for the Burra Sluicing Company between 1875 and 1908. In the latter case, if the records are averaged over the full period (less those years when the company claimed there was no production) the output of this one company reaches a notional figure of 15,300 oz -more than double the recorded output of the entire Burra Creek. This may seem a figure of fantasy but note that among the anomalies in the records is the year 1898 when the Tumbarumba Division produced 1650oz of alluvial gold[69]. The Annual Report of that year noted dryly "It is evident that a considerable quantity of gold won in the Division is taken into the Colony of Victoria but owing to the manner in which the gold is exported it is impossible to give an estimate of the quantity."[70]. Only the Burra mines are known to have been worked on any scale in 1898 but they have no recorded output so that even the understatment of 1650 oz is missing from Willis' figures. If such absences and understatements are considered over a period of two decades the figure of 15,300 oz for the Burra Sluicing Company alone becomes a possibility. Similarly the Burra Sluicing Company is recorded as having produced less than 12 tons of tin 1875 - 1905. The actual production was estimated by a local expert in 1910 to have been 250 tons[71].

5.2.3 The scale of investment needs to be considered. The level of recorded return in the 1870's would scarcely have justified the estimated £8500 invested by Gitchell's companies in 1876 at the Burra (plus £9000 abandoned at Mannus to concentrate on the Burra) yet he remained on the Burra for another thirty years and there was no shortage of competition. Even in 1901 he could invest £2000 in machinery which gave "Excellent results". The amount of gold that went into merchants' tills, under the mattress and over the border will never be known.

5.3 Type, Extent and Nature of Workings

5.3.1 This is covered in some detail in Burra Creek Mining Sites map sheets 1 to 5 and in Section 4 above, which describes the technology of the mines. Burra Creek is remarkable for its technological innovation.

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[68]pages 38-43, 55-57; tables 7, 8, 9, 12, 18

[69]MAR 1898:57

[70]MAR 1898:38

[71]Carne, 1911:264

Firstly, the use of dynamite by Gitchell, secondly the introduction of pump dredging by Bennett and Donovan (and its development by Gitchell), thirdly Heinecke's Patent Jet Elevator. Recording sheets WW6-23, WW6-25, WW6-27, WW6-17, WW6-18 refer. In each case the Burra was at the forefront of mining in the State and offers the earliest known surviving examples (Gitchell's experimental blasting at Mannus and Heinecke's Union Jack Mine can no longer equal the pristine state of the contemporary Burra mines). The Jet Elevator was succesfully exported to the alluvial mines of Malaya[72]. Burra Creek is an important mining heritage locale.

5.4 Numbers of Men Involved

5.4.1 The employment in the mines has to be inferred from incidental sources since no company records have come to light. Section 3.1 above (Table Three) identifies five Burra residents as probable miners in the late 1870's. A contemporary source estimated that eight men would be needed to work each of Gitchell's two holdings[73]. This gives a minimum working population of sixteen in the seventies and eighties with five likely residents on site. The number could have increased in the nineties when several parties were mining at any one time (a total of seven is recorded over the decade). The 1891 Census (collected by JJ Donaldson who later started a mine on Tumbarumba Creek) shows 16 households (one empty that day) containing 35 males and 34 females. There were at least nine single males, six of them living alone, and seemingly eight married men with their families.

[72]Martin 1985:22
[73]MAR 1876:123-124

TABLE SEVEN : 1891 CENSUS EXTRACT

Householder	m	f
George Goode	3	
John McGregor	1	
John Humphries	1	
uninhabited		
Jeremiah Rohan	1	
William Paine	1	
Alexander Baillie	3	6
John Cashman	7	4
Frank Bradford	1	
Frederick Hussell	2	2
Walter Gaylard	2	6
James McLaughlin	4	5
William Murrell	3	5
Hugh Bear	3	3
William Fox	1	
Henry Jarvis	2	3
total 16 (15)	35	34

5.4.2 Gaylard and Hussell ran the Burra sawmill[74] and Bear seems to have owned Burra Station[75], but it is reasonable to infer at least that the single male households were engaged on the mines. Photographs of a pump dredge on Tumbarumba Creek (plate 16) show eight workers. There are fifteen adults grouped around Gitchell's california pump in 1901 (plate 23) a dozen of whom are apparently workers. Since both types of dredge were operating on Burra Creek at this time at least twenty people were engaged in the actual mining at the turn of the century. GT Heinecke's works at Tumbarumba employed 15 miners in 1900 (plate 24) and a similar number could have worked on Heinecke's Reef in the early 1900's after Gitchell's Burra Sluicing Company closed down. At the same time CB Heinecke employed 5 men on the Jet Elevator which eventually replaced work on his reef[76]. In addition MD Bennett employed 6 men on his Jet Elevator[77]. Employment therefore would have continued to be at least 20 in the early years of the First War. Thereafter mining declined quite rapidly, the final reference after a decade of prospecting being in 1936 when "..sluicing operations were also carried out on the top end of Burra Creek."[78] which was probably site WW6-5.

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[74]Roth, 1964:19; Martin, 1985:25; no other names from table seven appear here among Gaylard's employees and teamsters.

[75]Andrews, op cit.

[76]MAR 1915:28

[77]MAR 1916:26.

[78]MAR 1936:53

5.4.3 Burra Creek was not a rush. Fields like Kiandra that could gather 100,000 people in a matter of months were a phenomenon that passed as quickly as they came. The Burra worked steadily for half a century.

5.5 Type of Structures

5.5.1 Table Two above lists the residences adjacent to the Creek that are known from Lands Department records. The plan of GL9 (G14490) also shows a hut near site WW6-12.

TABLE EIGHT : DOCUMENTED RESIDENCES

owner	portion	year	note
McMullin	70	1880	replaced by WW6-11
" "	66	1880	WW6-24
" "	67	1880	not found
Burns	31	1879	now Grassmere
" "	80	1882	not found
Griffiths	64	1880	not found
Halton	34	1879	WW6-19
McGlynn	26	1879	WW6-2
" "	32	1879	now Camoo
Cashman	57	1889	WW6-7
Gillies	28	1879	WW6-5
Bartholomew	1	1859	WW6-22
" "	13	1875	WW6-9
Maginnity	10	1875	WW6-6
Nicholls	33	1879	not found
Bradley	65	1880	not found
Gitchell	29	1879	WW6-5
Donnelly	30	1879	now Burra
PGL 9	70	1900	WW6-12

5.5.2 Nineteen huts or residences were recorded between 1859 and 1900. With the exception of Burra homestead and the Maginnity house all of these buildings were timber: generally slab and bark with a stone chimney. Given the unrelenting nature of mining a surprising number survive as archaeologically visible sites. In addition, five unrecorded huts have been found (sites WW6-10, 11, 13, 16, 20). The best preserved of all the abandoned residences is WW6-20, attributed to the selector Peter Halton, which although collapsed has not been plundered and has the advantage of being close to the Walking Track.

5.5.3 The devices used in the mining at Burra are described generally in Section 4 above and those that survive as weirs, channels, races, dams and other earthworks are shown on map sheets 1 to 5 of 'Burra Creek Mining Sites'. Attention is drawn to the continuation of remains north of

the research area and also to site WW6-14 (stamper battery) and to the creek bed itself which for the greater part of its length to the Falls is an aggregation of tail races.

5.6 Impact of Mining on Local Communities

5.6.1 Because Burra Creek was a steady field rather than an episode there is no convenient 'hiccup' in the development of Tumbarumba to which it can be related. However it is clear that the two were connected closely. The growth of the timber industry -which remains a staple of the town- is attributed to the need of miners for wood fashioned for their tables (also for pitprops at reefs elsewhere in the region)[79]. Gaylard & Hussell's mill opened on the Burra in time for the activity of the 1890's and remained in production there until 1916, reflecting the mining phases.

5.6.2 There would have been a steady demand for clothing and boots. The 1891 Census records two fancy goods shops with sundry butchers and bakers but also four general stores, three saddlers and a bootmaker in the centre of Tumbarumba. The saddlers partly reflect Tumbarumba's role as a stop-over on the stock routes to the Snow Leases but leather was also an essential jointing material in alluvial mining. Metal working was also important. Picks and shovels were a constant need and the steel hydraulic lines that proliferated with the use of monitors were apparently rolled and rivetted in Tumbarumba[80]. As well, although major repairs to castings were beyond local resources (vide artefacts like WW6-A5), there was sufficient familiarity with cast machinery for GT Heinecke to patent his Jet Elevator as a series of castings in 1905.

5.6.3 In addition to service industries like haulage, there were social needs. By 1882 the population of Burra Creek and neighbouring Boggy Creek justified the creation of Greenwood School on the ridge of Big Hill. Initially a Provisional School ie having a minimum enrolment of 12 pupils, in 1885 it was elevated to Public School (initially a minimum enrolment 20 pupils) and remained as such until closure in 1911[81]. Because the agriculture and mining intensity within the school catchment was not capable of significant expansion the population matured and the school eventually was withdrawn coincident with the last few years of mining. It was an interesting statement of social dynamics that underlines the essentially sedentary nature of the occupation of the Burra valley.

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[79]Dunstan, 1936:44

[80]Mr B McClelland, pers com.

[81]Fletcher & Burnswoods, 1983:91

5.6.4 The 1891 Census further demonstrates the links between Burra Creek and Tumbarumba. Four of the five mine lease holders in Burra Creek who appear in the census are residents of the town (GT Heinecke lived on the outskirts at Back Creek)[82]. RD Matthews, for example, arrived in the town in 1867 and established himself as a storekeeper[83], in 1891 he lived at 27 Bridge Street and in 1892 opened a substantial mine near Grassmere, no doubt investing the proceeds of his shop. Austin Daly (site WW6-2) also lived in Bridge Street; Charles Heinecke lived on the Adelong Road and Percy Mitchell who used Heinecke's Patent Jet Elevator at Burra (site WW6-18), lived in Parade Street. Given that the population of the Burra Creek was also a farming community, it is certain that some of the day labourers at the mines lived in Tumbarumba as well as the mine owners.

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[82]there are some curious omissions from the census, like the miners Newman and Westley and most noticeably, Nathaniel Gitchell.

[83]Martin, 1985:32 and 37

6. RECOMMENDATIONS

6.1 Consideration should be given to nominating the Burra Creek to the Register of the National Estate because of the wide implications of three technological innovations (dynamite, pump dredging, the Jet Elevator) that are grouped here in the workings and because of the direct association at the Falls with one of the great exploring feats of colonial Australia.

6.1.1 Presentation of the Walking Track at Burra Creek between the Junction and WW6-26 may differ from other sections of the Track. The valley floor has been intensively mined, the creek itself has been lowered several metres and flows in a largely artificial channel. The swamps have gone leaving great holes threaded by the Track. The valley has been extensively cleared and sown to exotic pasture. The composition of tree populations on the slopes that have yet escaped the bulldozer and pinus radiata has been affected by sawmilling. This is essentially a man-made landscape. Presentation should recognise and elucidate the peculiar character of the valley.

6.1.2 There are several keys to succesful presentation:

.the public will achieve their own interpretation within a framework of examples;

.it is important to avoid concealing the scope and variety of the remains by their complexity. The morphology of the valley is an artefact. A single coherent presentation at the locations noted in 6.2 will accomplish a superior reading of the landscape than many little labels saying "race", "tailings"etc. It will be superior also to an attempted comprehensive display at Angel's Flat surrounded by wilderness;

. Angel's Flat should offer a general statement of meaning;

.physical remains could be linked to the natural environment. For example, the contrast could be drawn between lower slope regeneration on remnant soil at WW6-17 and the flat acres of tailings that support little more than sorrel. This both defines the site and interprets the landscape. At a basic level, races support a different vegetation from their surrounds; once grasped this simple fact can open sudden vistas of interpretation.

6.2 Discrete signage is desirable at key locations WW6-4 (earthern flood race at The Junction), WW6-7 (miner's hut and 1876 flood race & dynamited tail race), WW6-27 (1899 pump dredging), WW6-A4 (impeller), WW6-14 (stamper), WW6-15 (reef), WW6-17 (major dredge), WW6-18 (Heinecke's Patent Jet Elevator), WW6-20 (Halton's Hut), WW6-21 (1876 dam), WW6-22 (1859 hut), WW6-23 (dynamited tail race), WW6-25 (the Tunnel), WW6-26 (weir and tailings).

6.2.1 Signage should be explicit eg "Bennett & Donovan's mine of 1899. The earliest known example of pump dredging. Water race trenches lead to the excavation and lines of gravel on the flat by the creek mark where the gold separating tables stood. The race water hosed out the pits and drove a pump that lifted the wash dirt to the tables. Previous mines relied on gravity so had to fit their workings between the ore level and the creek bed."

6.2.2 A reproduction of Plates 15 to 17 at location WW6-27 would show this type of mine in action seen from the same perspective as a walker. Similarly Plate 19 of Gitchell's giant dredge (WW6-17) could be reproduced exactly at the position of the camera in 1901 and would greatly enhance the interpretative value of the site.

6.3 The programme of blackberry removal has considerably improved the quality and the extent of the archaeological findings. As the programme continues more material will come to light. The maps and site records should be kept up to date.

6.4 Passive management is all that is required by virtually all the sites and artefacts. There is no present need for expensive conservation works. There are a few small problems:

.site WW6-22 is being severely disturbed by stock and it is not beneficial for the remains generally in that area to be trampled by sheep and cattle;

.the earth cliffs at WW6-17 and WW6-18 may fall if walkers approach the edge;

.if access is encouraged to site WW6-20 there is a real risk of vandalism;

.some smaller artefacts eg WW6-A1 or A15, may be pilfered; a determined private collector with a 4wd could pilfer the impellers (note the trouble taken by "sporting divers" to take bits from wrecks and the market among tourist promoters for authentic mining and homestead artefacts).

The simplest approach to most of the above is to continue to foster a co-operative attitude among the adjoining landholders and to make periodic inspections. Pilferage, vandalism and accidental damage are controlled further by clearly relocating the Walking Track in a less sensitive part of the Reserve.

6.5 The Walking Track itself could benefit from the following:

.the Track could be realigned or a loop be introduced to incorporate WW6-13, 14, 15, 16, 17;

.because of the unnatural character of the landscape and the irregular disposition of vegetation the Walking Track is easy to lose, especially between WW6-18 and WW6-27. There are many turnings throughout its length that are easy to miss. More

frequent markers really are needed -and preferably of a more sympathetic nature than a star picket- without necessarily turning the Track into a suburban path;

.the cattle bars should be repositioned. At present they do not noticeably inhibit stock yet they are a nuisance to walkers because thay are too narrow to accept a back pack.

7. Sources

7.1 Graphic

County Selwyn Map of Squatting Runs, 1853, AONSW map 138-9

Crown Lands Office, Portion Plans, Parish Burra, County Selwyn

Department of Mineral Resources (NSW), Mining Lease Plans, Parish Burra, County Selwyn

Plates 17,19, 23, 24 reproduced from Department of Mineral Resources (NSW) Geological and Mining Musum photographic archive "Wagga Wagga"

Plates 15 and 16 reproduced from Mitchell Library Small Picture File "Tumbaraumba"

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1891 Census, District 49, Sub-district Tumbarumba (NLA microfilm)

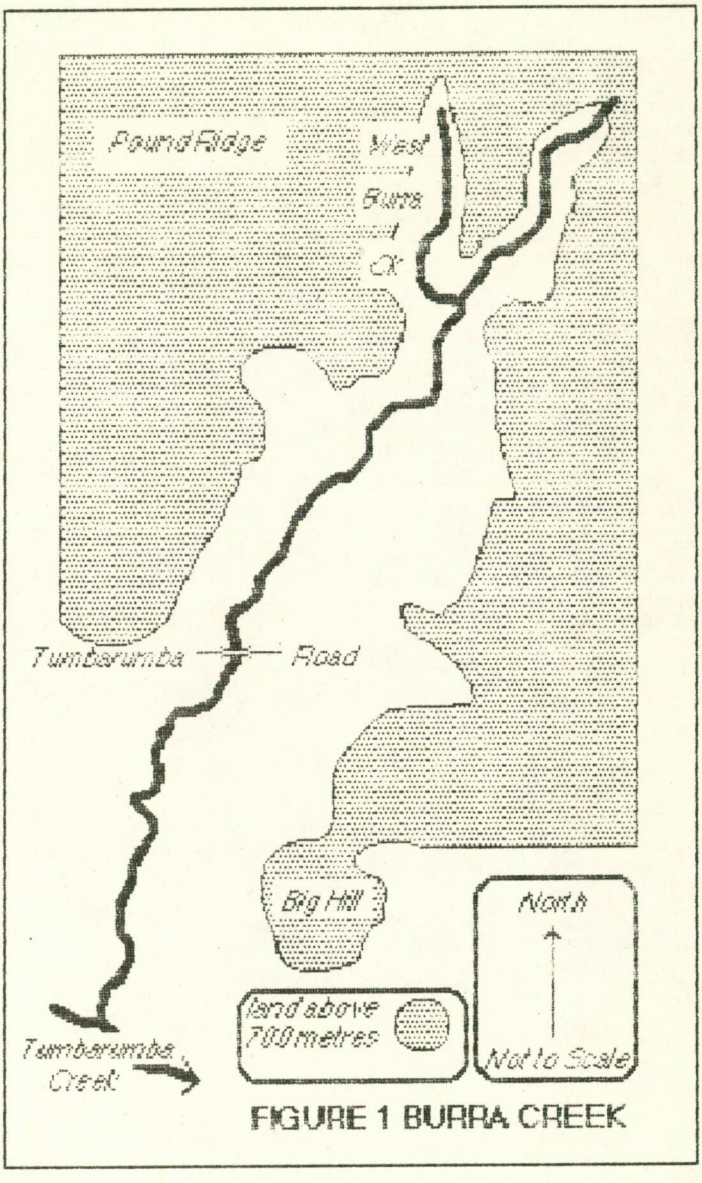

FIGURE 1 BURRA CREEK

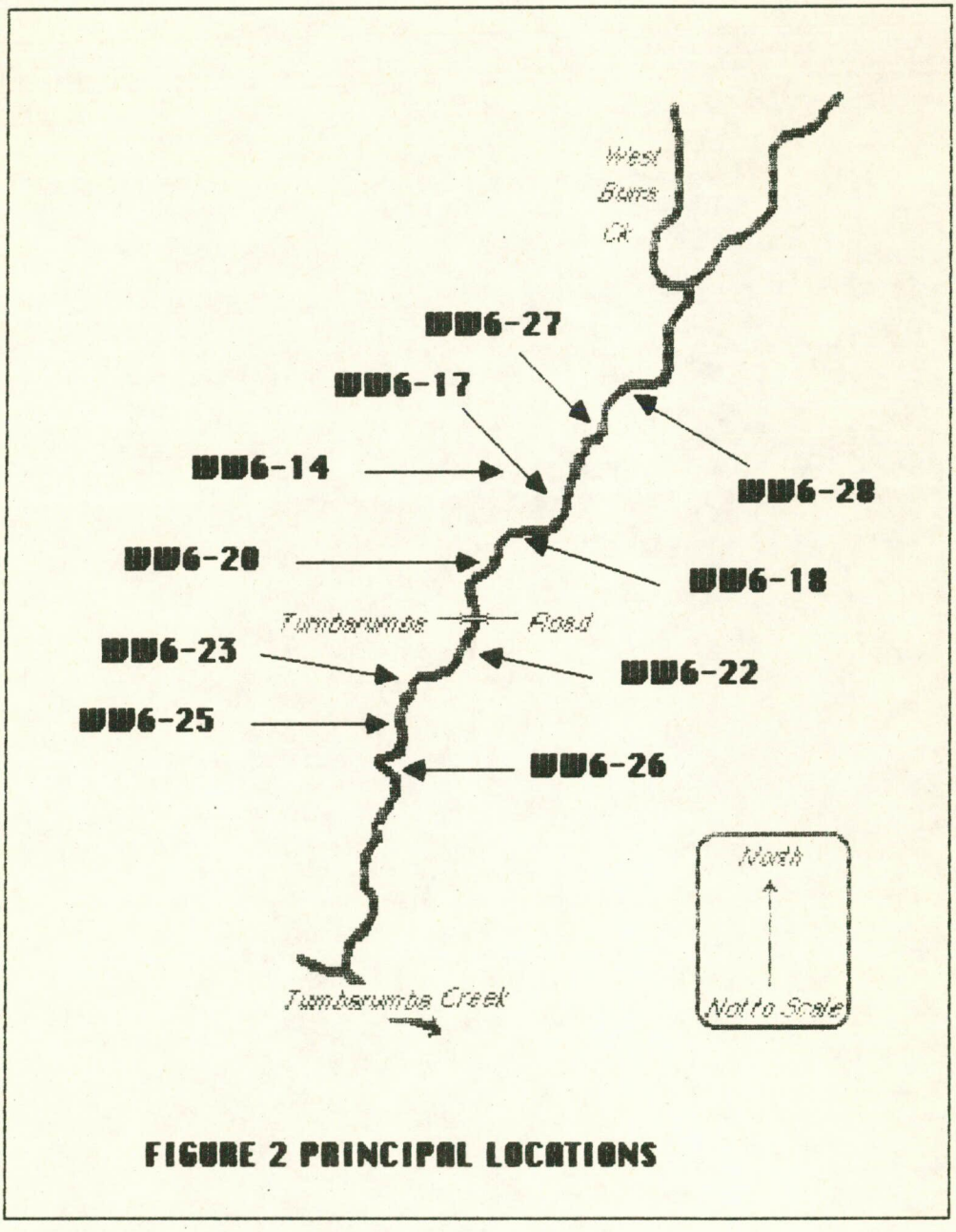

FIGURE 2 PRINCIPAL LOCATIONS

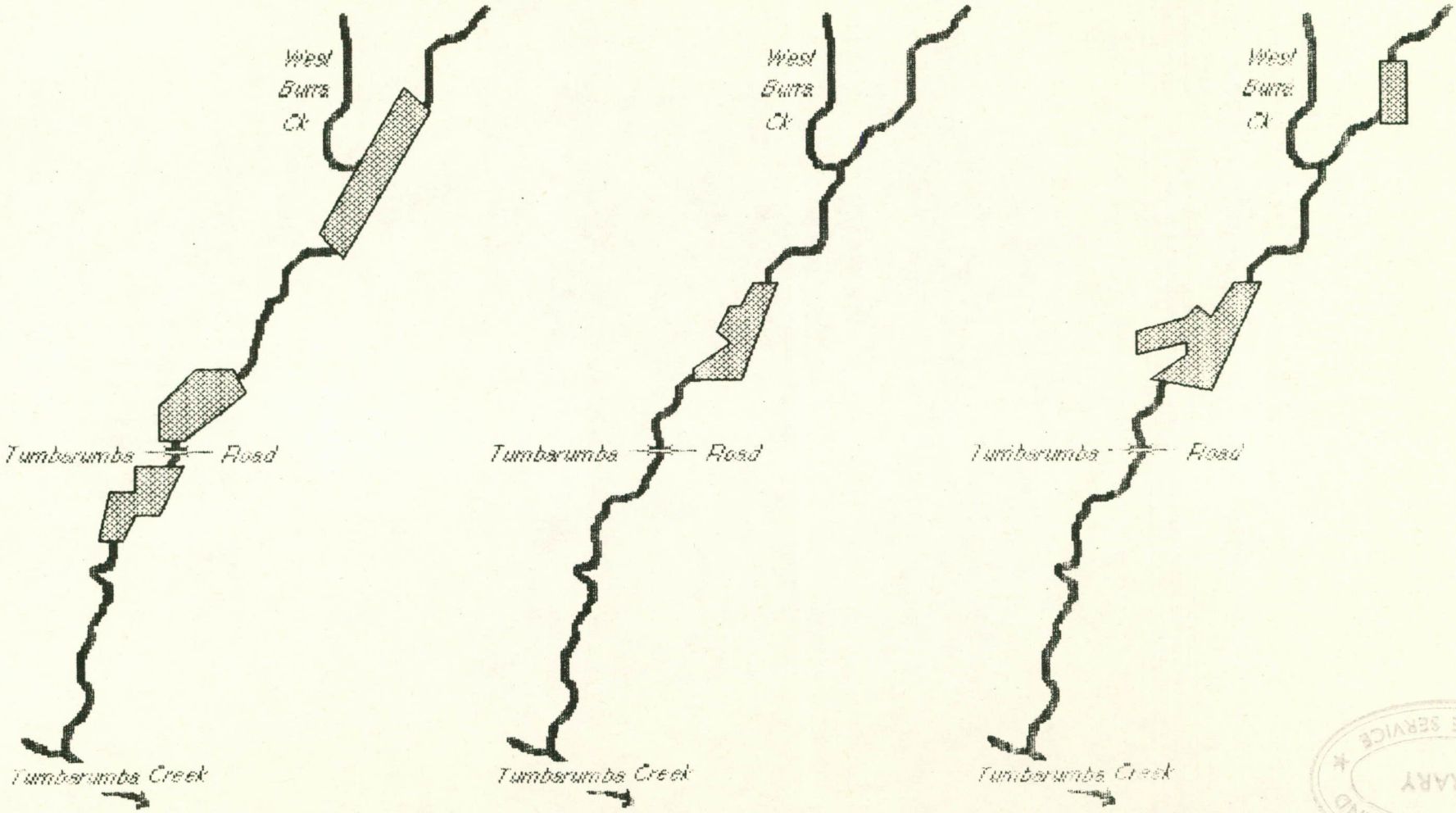

FIGURE 3 PRINCIPAL MINING PHASES

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