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2. The quarrying of road-making material in the Burnie district.

V.M. Threader

The principal source of road-making material in the Burnie district is a quartzite and slate sequence extracted from quarries at Round Hill on the Bass Highway on the eastern approach to the township of Burnie.

Objections have been raised to the continued use of these quarries owing to their unsightliness and the purpose of this study is to investigate proposals for their closure and the development of alternative sites.

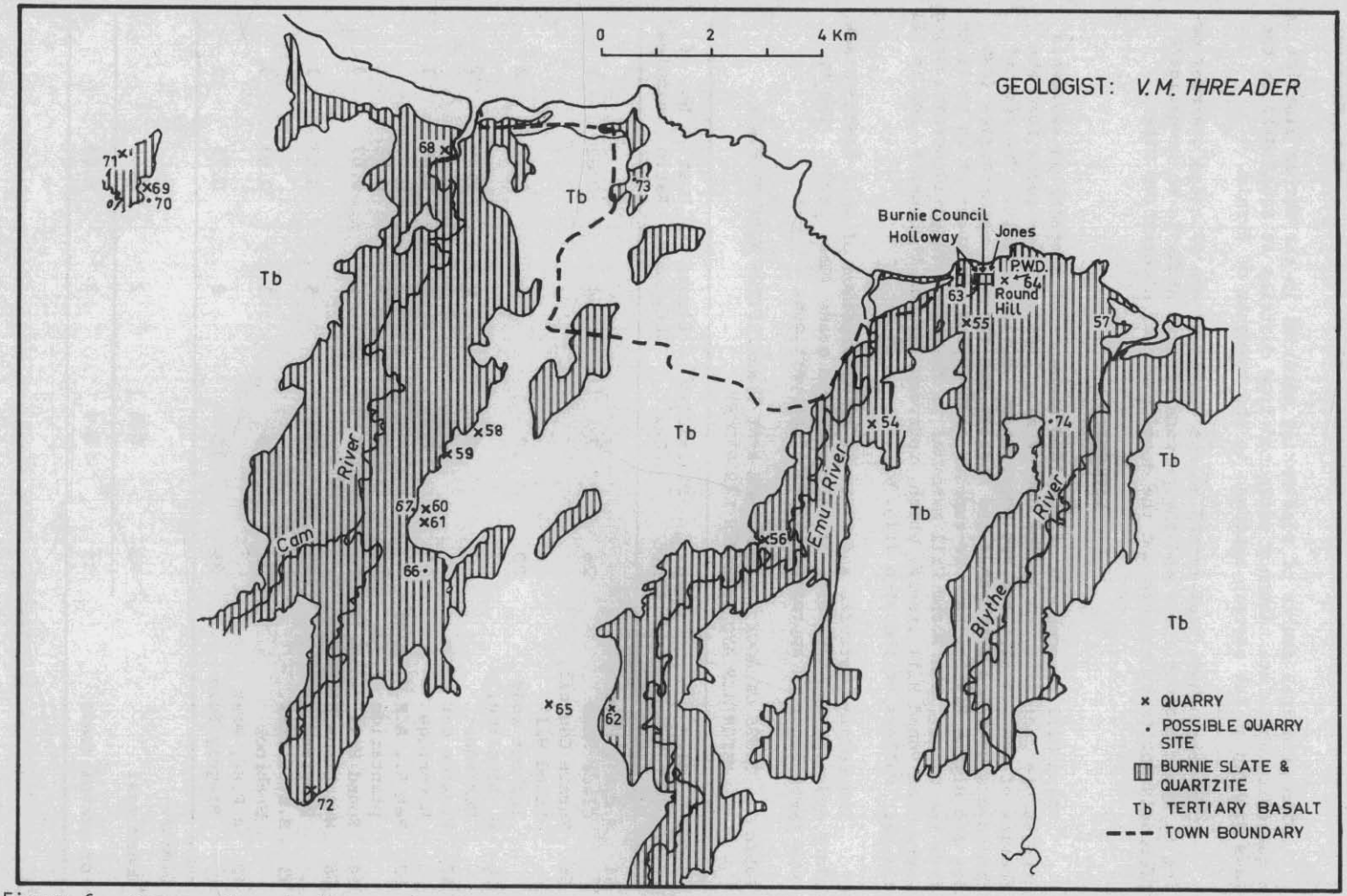
GEOLOGY

Round Hill is composed of a folded sequence of Precambrian sediments (the Burnie Quartzite and Slate; Gee *et al.*, 1968). These rocks form the bedrock of the district and are overlain by Tertiary basalt. The present drainage system has penetrated the basalt, and the main watercourses (Cam, Emu and Blythe Rivers) have re-exposed bedrock for distances of up to 12 km from the coast. The Round Hill material is therefore very widespread, being exposed on Round Hill itself, which protrudes through the basalt, and in all the main valleys of the area (fig. 6).

The Burnie Quartzite and Slate is an alternation of well-bedded black slaty mudstone and quartzite of silt and sand grade (Gee, 1977). The two rock types occur in approximately equal proportions.

Table 1. TESTS ON ROCK SAMPLES FROM NINE QUARRY SITES MADE BY P.W.D. MATERIALS AND RESEARCH LABORATORY

	Site	Liquid Limit	Plasticity Index	Linear Shrinkage	Dust Ratio	No. of samples
54	A.F.H., Fern Glade Road	26	7	4	0.62	1
55	Burnie Council, Round Hill lookout road	29	10	4	0.71	1
56	W. Singline, Cascades	0	0	0	0.56	2
57	Tioxide car park, Heybridge	29	8	6	0.58	1
62	Pet R., A.F.H. pine plantation	44	19	9	0.78	1
64	Round Hill	23	7	5	0.69	4
68	Murchison Highway, Somerset	29	10	5	0.57	1
71	S.E. Dicker, Seabrook	32	9	3	0.63	1
72	A.F.H., West Ridgely Road	35	15	8	0.75	1
Limits:						
Under seal		25	0-6	2	0.66	
For gravel roads		35	4-9	3	0.66	



5 cm

Figure 6. *Quarry sites in the Burnie district.*

ROCK QUALITY

Sizing analyses and related tests have been carried out on material from nine localities (table 1). The grain size distributions of the samples are given as cumulative frequency curves and for comparison, the N.A.A.S.R.A. standard curves for limits of coarse aggregate are also shown (fig. 7). The curves show that most samples contain excessive amounts of both oversize and undersize particles although if the oversize was crushed to pass the 76 mm screen it would improve both ends of the grading curves.

Sampling was restricted to existing quarries owing to the difficulty in obtaining representative material in thickly vegetated, undisturbed areas. Only one sample was taken at seven of the nine localities. The samples were made as representative as possible but cannot be taken as a true statistical mean of material exposed in the entire quarry face. It is surprising therefore that the analyses are in such close agreement which suggests a remarkable uniformity of grade.

The results of other tests carried out by the Public Works Department (P.W.D.) Materials and Research Laboratory are given in Table 1. The liquid limit, plasticity index and linear shrinkage are determined by the nature and amount of the 'fines' content of the aggregate; and affect the stability of the material when used for road construction. The dust ratio gives some measure of the compaction of the aggregate as it indicates the slope of the grading curve. The results usually tend to be near the upper limits and in general the material is of marginal quality.

USE AND PRODUCTION

Aggregate of this grading and composition is used as a base course in road construction. Round Hill material has been used extensively in Burnie and district for over half a century by the Municipal Council, the P.W.D. and private contractors. Production figures are difficult to obtain because in the past, the output by various companies and departments has been grouped with their other activities in other areas. Output from Round Hill is irregular, as rock is quarried on demand and then only during the summer months. The combined average annual production from Round Hill during the period 1970-1975 is estimated at 17 000 m^3 (table 2).

Table 2. PRODUCTION OF ROAD-MAKING MATERIAL AT ROUND HILL

Year	Production (m^3)	
	P.W.D.	Holloways
1970	22 615	
1971	-	
1972	6 255	
1973	1 201	
1974	18 182	
1975 (Jan-Oct.)	27 209	
Average (1970-1975)	12 577	4000

FUTURE PRODUCTION

In order to introduce some degree of stability to the quarrying industry and to enable it to meet the needs of road works in the Burnie district, it will be necessary to ascertain the quantities of road material needed and where they would be required. Round Hill is ideally situated to supply

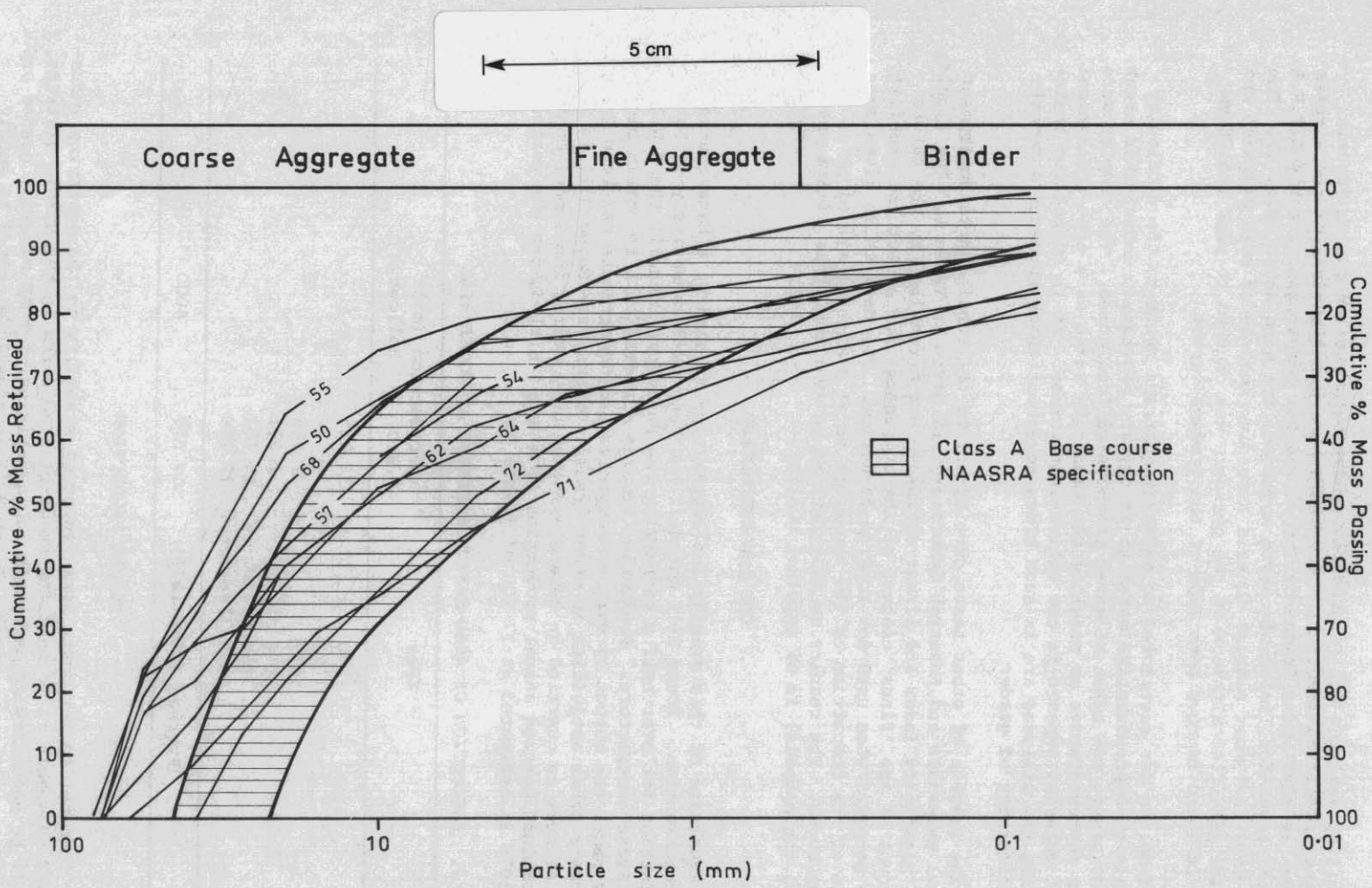


Figure 7. *Grading curves for road-making materials for the Burnie district. (P.W.D. Reports A5699, WR2135, U765).*

material for such planned road works as the widening of Marine Terrace and the construction of connector roads to the proposed Burnie by-pass. It is not well situated to supply material for road works for the by-pass itself which could be located more than 5 km from the coast and 200 m higher in elevation, nor for road works in new subdivisions south of the Three Mile Line Road where Burnie is now expanding. It is both environmentally and economically undesirable to transport road-making material over long distances through developed areas and up or down steep grades and quarrying at Round Hill should therefore continue at least for another twenty years to allow planned projects to be completed and new quarry sites to be developed to serve the southern district of Burnie. P.W.D. requirements over the next twenty years are likely to amount to 700 000 m^3 or 35 000 m^3 per annum (information supplied by the District Engineer, North-west Division, P.W.D.). This is more than double the average annual production during the past five years and if Holloway's production is included, the total would be approximately 40 000 m^3. On this basis, four million cubic metres of road-making aggregate should be reserved to supply the industry for the next 100 years and if a 5% annual increase in production occurred, the output would double every fifteen years. More accurate data are needed to make reliable predictions of quarry production but the foregoing should indicate the necessity of establishing reserves of material in suitable areas.

ALTERNATIVE MATERIAL

Rounded quartz gravel occurs in the Inglis River valley between Calder and Flowerdale but does not extend further east than the Seabrook Creek area. This is river gravel and contains no 'binder', it is used extensively for concrete-making in Burnie, but only locally for road-making.

Decomposed zones in basalt which are not suitable for crushing for concrete-making or for use as a road-sealing aggregate could be stockpiled and treated separately either by crushing, screening, or both, to provide an alternative road-making material or for blending with Round Hill type material to improve its properties. Such a practice could result in higher material costs but other advantages may outweigh this. Testing by the P.W.D. Materials and Research Laboratory is required before an evaluation could be made.

ALTERNATIVE SITES

In assessing alternative sites, no attempt has been made to quantify site, material and environmental aspects as was done for dolerite quarry sites in Hobart (Leaman, 1975). Distances, traffic and some environmental factors vary according to project, and material factors cannot be assessed without systematic sampling.

Table 3 lists sixteen sites; sites 56, 57, 66, 67, 70 and 74 are considered suitable quarrying areas and, with the exception of site 56, they are undeveloped. Any site selected for future use should first be systematically drilled, sampled and tested.

CONCLUSION

In the opinion of the writer, Round Hill quarries should continue to operate to supply road-making materials for existing construction and maintenance programmes and be phased out over a twenty year period, thus allowing concurrent rehabilitation.

New quarry sites should be investigated and developed in other areas.

Table 3. LIST OF QUARRY SITES

Site No.	Grid Reference	Locality	Owner	Tested	Remarks
54	DQ096504	Fern Glade Rd	A.F.H.	√	On roadside, clearly visible, adjacent to scenic reserve.
55	DQ113522	Lookout Rd, Round Hill	Burnie Council	√	On roadside, clearly visible, on road to scenic lookout, Round Hill.
56	DQ077483	Cascades Rd	W. Singline (lease applicant)	√	Screened from road but access adjacent to Cascades subdivision. Lease application refused. Good quality material.
57	DQ141521	Heybridge	Tioxide Aust. Pty Ltd	√	Adjacent to car park at factory, partially visible from road. Quality satisfactory.
62	DQ048451	Pet River pine plantation	A.F.H.	√	In pine plantation and used to maintain roads therein. Not a good material, high fines content.
63	DQ115529	Round Hill	L. Holloway	-	On Bass Highway, clearly visible from eastern approaches to Burnie and from W. Burnie across Emu Bay.
64	DQ119529	Round Hill (Other quarries on Round Hill are owned by the Burnie Council and R. Jones, but are not being worked at present.	P.W.D.	√	On Bass Highway, clearly visible from eastern approaches to Burnie and from W. Burnie across Emu Bay.
66	DQ013477	West Mooreville Rd	Alstergren	-	Suitable sites, well screened from road approx. 10 km from Burnie, 4 km from Ridgely.
67	DQ011487	West Mooreville Rd		-	Adjacent to Holloway's disused basalt quarry, which would provide a working and plant area, well screened from road.
68	DQ018552	Murchison Highway	P.W.D.	√	Disused pit on highway, clearly visible from road and residential area, needs rehabilitation.
69	CQ963546	Seabrook Rd		√	Disused quartz pebble deposit workings, unsystematic, eroding badly and site needs rehabilitation.
70	CQ964544	Seabrook Ck		-	Site accessible but concealed.
71	CQ963550	Coopers Lane	S.E. Dicker	√	Visible from road, quality marginal due to high lime content.
72	CQ995436	W. Ridgely Rd	A.F.H.	√	Clearly visible from road, quality as for 71.

Table 3. (continued)

Site No.	Grid Reference	Locality	Owner	Tested	Remarks
73	DQ051547	Cooee Creek	Brambles Holdings	-	Mining lease applied for, not granted due to proximity of Cooee, reserves limited.
74	DQ128505	Minna Road	Tioxide Aust. Pty Ltd	-	Land made available to Brambles Pty Ltd by Tioxide Pty Ltd. No information on quality available but the area is suitable for siting a quarry to provide material for the by-pass.

The Burnie Quartzite and Slate formation quarried at Round Hill is not a particularly high grade construction material nor is it confined to Round Hill. Numerous potential quarry sites can be found in the Cam, Emu and Blythe River valleys and some should be reserved immediately to meet future needs. The recommended procedure is:

(1) The working party currently studying the problem should first decide, on environmental and practical grounds, where quarries would be best sited.

(2) A geological evaluation and drilling programme should be made to investigate the sites and determine reserves.

(3) Reservations should be declared to cover quarrying areas and buffer zones to ensure continuity of production.

Quarry sites would be required to serve southern Burnie and others to supply the coastal area (as a replacement for Round Hill). Quarries at sites 57 or 73 (fig. 6) would be suitably placed to serve the coastal area of Burnie. As these two localities are east and west of Burnie there is some merit in developing both.

All quarry reserves require protection from expanding residential areas by appropriate zoning. In this regard the basalt quarries on the West Moorville Road, (sites 58, 59, 60 and 61) are successful operations and could also provide access to suitable sites for development of road-material quarries in the Round Hill type of material. It is also possible, as suggested earlier in this report, that decomposed basalt from these quarries could be used as a road construction material or blended with Round Hill type aggregate which could be extracted from the adjacent east bank of the Cam River. Any future planning of the district should contain provision for quarry reserves and buffer zones.

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