

1981/13. Production of crushed basalt, dolerite, and limestone in the Hobart and Launceston areas, 1960-1980.

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Abstract

Trends in the production of crushed basalt, dolerite, and limestone in the Hobart and Launceston areas for the period 1960-1980 are investigated.

The identified resources of basalt and dolerite in these areas is compared with the estimated future growth in production of crushed basalt and dolerite, to enable the identified resources to be expressed in years.

INTRODUCTION

Production statistics for crushed rock are kept in the Department of Mines and reported in the Annual Report of the Director of Mines under the heading Construction Materials, Crushed and Broken Stone. Crushed and broken stone is defined as any inorganic material which is processed to a saleable commodity by either crushing and/or screening. The crushed and broken stone production statistics are divided into basalt, dolerite, limestone, and other stone; the categories basalt, dolerite, and limestone were selected for study because:

- (1) The main producers of crushed rock in the Hobart and Launceston areas operate quarries in these rock types and;
- (2) The production statistics relating to these categories are more reliable for predicting trends in production/consumption than the data relating to the category of 'other stone'.

During the period investigated, the number of producers of crushed basalt and dolerite in the Hobart area has decreased from approximately six to the current three major producers; namely Hobart Blue Metal Industries (dolerite) at Leslie Vale, Pioneer Quarries Tasmania (dolerite) at Flagstaff Gully, and the Readymix Group (Tas) (basalt) at Bridgewater. In the Launceston area the number of producers of crushed basalt and dolerite has remained approximately constant during the twenty-one year period, with the current major producers being Brambles Industrial Services (dolerite) at Western Junction, Launceston Quarries (dolerite) at Mowbray, and Talisker Blue Metals (dolerite) at Breadalbane.

G.J. Weilly and Sons Pty Ltd has been the main producer of crushed limestone in the Hobart area for the entire period. Crushed limestone has not been produced in the Launceston area during the period. Crushed rock is used predominantly in the construction of roads and in the manufacture of concrete.

PRODUCTION TRENDS 1960-1980

The production of crushed basalt, dolerite, and limestone is shown in Table 1 and in Figure 1. It should be noted that these figures are probably slightly conservative as a result of the conversion factor used in converting tonneages of broken rock to volumes of broken rock (in cubic metres). Although most quarry operators report their production on a volume

5 cm

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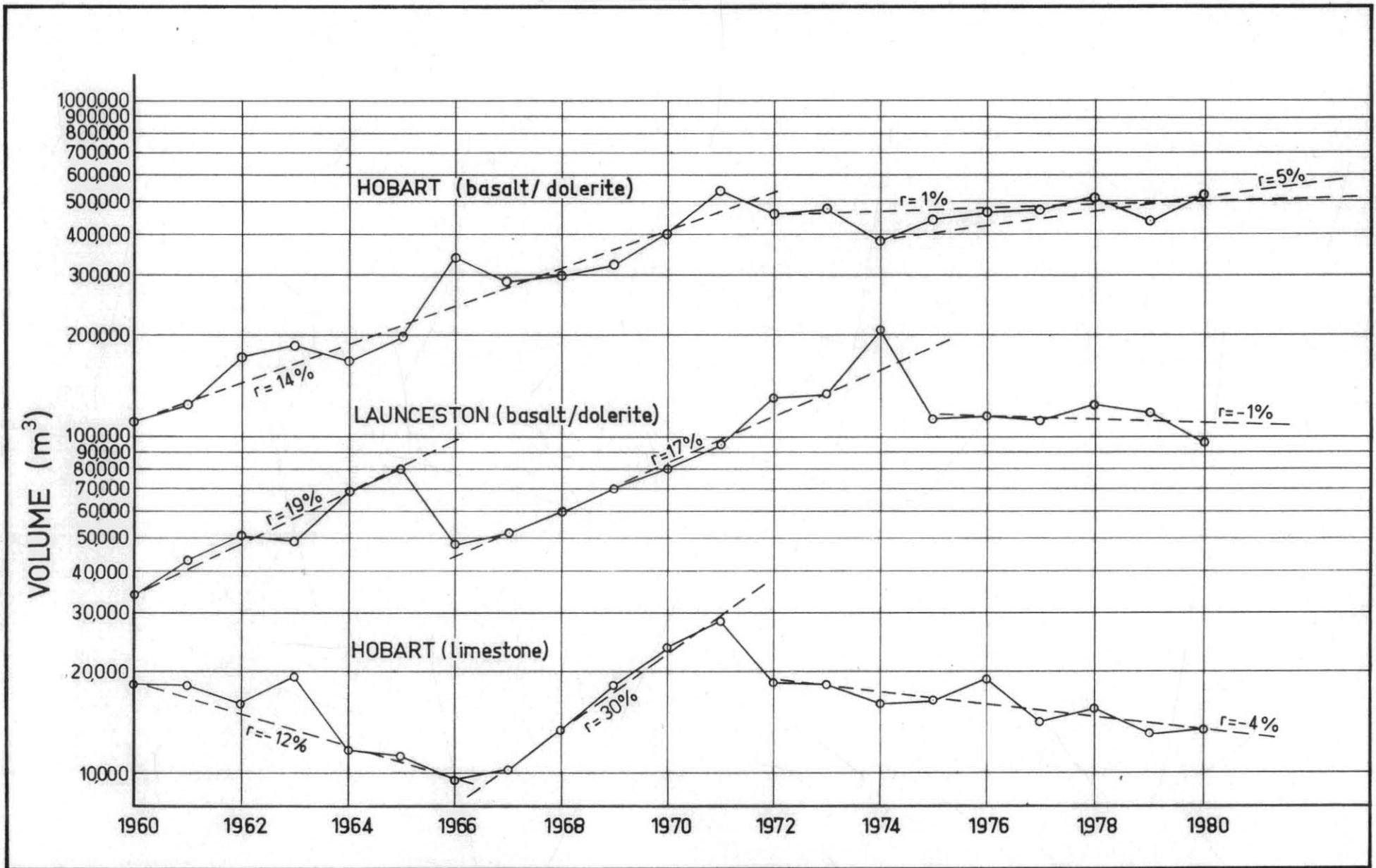


Figure 1. Production of crushed and broken basalt, dolerite, and limestone, Hobart and Launceston areas.

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basis, some submit reports in tonnes, which are then converted to cubic metres by multiplying by a factor of 0.50.

According to Berkman and Ryall (1976) the bulking factors for the expansion of basalt and limestone are both 75%, which allows calculation of conversion factors (tonnes to cubic metres) of 0.58 and 0.65 respectively. Assuming dolerite has a similar *in situ* density and percentage expansion after excavation to basalt, the masses of crushed basalt/dolerite have, on occasions, been converted to a crushed volume (cubic metres) by a factor which is approximately 14% lower than the actual volume.

Hobart area

Production of crushed basalt and dolerite in the Hobart area shows greater departures from a constant growth pattern than for the Launceston area, presumably reflecting a greater number and variety of projects utilising these crushed rock products.

However, two broad growth patterns are apparent in Figure 1:

- (a) 1960-1971: a positive average annual growth of 14%
- (b) (i) 1972-1980: a positive average annual growth of 1%
- (ii) 1974-1980: a positive average annual growth of 5%

Production of crushed limestone in the Hobart area shows three distinct trends (fig. 1):

- (a) 1960-1966: a negative average annual growth of 12%
- (b) 1967-1971: a positive average annual growth of 30%
- (c) 1972-1980: a negative average annual growth of 4%

Launceston area

Production of crushed basalt and dolerite in the Launceston area shows three distinct growth trends (fig. 1):

- (a) 1960-1965: a positive average annual growth of 19%
- (b) 1966-1974: a positive average annual growth of 17%
- (c) 1975-1980: a negative average annual growth of 1%

Comments

Periods of constant growth in production appear as straight lines when the production is plotted on a logarithmic scale; constant growth curves were fitted to the data shown in Figure 1 using the compound interest formula

$$P_n = P(1 + r/100)^n$$

- where P_n is the production in the year n,
- P is the production in the base year,
- r is the growth rate
- n is the number of years

Although the trends in production of crushed basalt/dolerite and

Table 1. PRODUCTION OF CRUSHED AND BROKEN BASALT, DOLERITE, AND LIMESTONE

Year	Hobart				Launceston		
	Basalt (m ³)	Dolerite (m ³)	Total (m ³)	Limestone (m ³)	Basalt (m ³)	Dolerite (m ³)	Total (m ³)
1960	-	110 940	110 940	18 742	-	34 316	34 316
1961	4 972	120 105	125 077	18 263	-	43 665	43 665
1962	15 887	157 359	173 246	16 340	-	51 028	51 028
1963	24 264	163 817	188 081	19 647	-	48 948	48 948
1964	16 822	152 645	169 467	11 828	-	69 208	69 208
1965	16 803	182 374	199 177	11 226	-	80 118	80 118
1966	17 105	323 995	341 100	9 627	-	47 840	47 840
1967	8 647	281 188	289 835	10 242	-	52 112	52 112
1968	11 844	289 048	300 892	13 562	-	61 302	61 302
1969	11 376	318 234	329 610	18 348	-	70 616	70 616
1970	77 247	328 278	405 525	23 869	-	80 453	80 453
1971	61 352	479 728	541 080	28 769	8 804	86 269	95 073
1972	76 115	385 884	461 999	18 708	77 253	53 138	130 391
1973	72 424	403 033	475 457	18 478	58 590	74 864	133 454
1974	97 311	285 507	382 818	16 121	81 347	123 199	204 546
1975	165 867	280 180	446 047	16 575	49 961	63 856	113 817
1976	148 306	318 579	466 885	19 038	58 140	57 178	115 318
1977	165 521	309 840	475 361	14 389	47 056	64 790	111 846
1978	228 511	289 079	517 590	15 743	49 165	76 793	125 958
1979	225 081	215 152	440 233	13 092	38 923	79 001	117 924
1980	274 500	250 947	525 447	13 757	37 221	59 330	96 551

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limestone in the Hobart area are appreciably different in detail, they share a common peak in 1971 whereas the growth trend for the production of crushed basalt/dolerite in the Launceston area peaked in 1974. Prior to 1971 (Hobart) and 1974 (Launceston) the quarry industry, with respect to crushed basalt/dolerite, grew steadily at 14-15% per year. Subsequent production has markedly decreased, particularly in the Launceston area where it appears to have declined at 1% per year, although this may be a zero growth curve.

The Hobart area has experienced a much reduced growth of 1-5% per year. Production of crushed limestone shows a steady decline since 1971 at approximately 4% per year.

IDENTIFIED RESOURCES OF BASALT AND DOLERITE

Table 2 details the identified resources of basalt and dolerite in the Hobart and Launceston areas.

Table 2. *BASALT AND DOLERITE RESOURCES, HOBART AND LAUNCESTON*

Operator	Quarry	Material	Identified resources (x 10 ⁶ m ³)	
			<i>In situ</i>	Broken*
<i>Hobart district</i>				
Hobart Blue Metal Industries	Leslie Vale	Dolerite	12	21
Pioneer Quarries Tasmania	Flagstaff Gully	Dolerite	17	30
Readymix Group (Tas)	Bridgewater	Basalt	18	<u>31.5</u>
			Total	<u>82.5</u>
<i>Launceston district</i>				
Brambles Industrial Services	Western Junction	Dolerite	?	?
Launceston Quarries	Mowbray	Dolerite	0.86	1.5
Launceston Quarries	Lilydale	Dolerite	130**	227.5
Talisker Blue Metals	Breadalbane	Dolerite	330	<u>577.5</u>
			Total	806.5

* *In situ* resource converted to broken using a factor of 1.75

** Volume to a depth of 50 m.

These figures have been estimated mainly from information given by the operating companies; the Bridgewater basalt resource probably has the status of a measured ore reserve, and the Breadalbane dolerite resource was estimated by V.M. Threader (pers. comm.). With the exception of the Bridgewater resource figures, the remaining figures have indicated to inferred ore status. No data is available for the identified resource of limestone in the Hobart area.

No consideration has been given to the category of undiscovered resources of basalt and dolerite, although the work by Leaman (1975) represents an attempt to assess these resources.

ESTIMATION OF FUTURE PRODUCTION OF CRUSHED BASALT AND DOLERITE

Projection of the 1980 (calendar year) production figures for crushed basalt/dolerite at growth rates compatible with current trends (fig. 1) enables estimates to be made of the identified resources (Table 2) in terms of years.

Hobart area

For positive average annual growth rates of 1% and 5% on the 1980 production of 525 000 m³, the identified resource of basalt/dolerite is adequate to meet demand for approximately 95 and 45 years respectively. A 10% growth rate would deplete the identified resource of basalt/dolerite in approximately 30 years.

Launceston area

If the suspected zero growth rate persists, the identified resource of basalt/dolerite is sufficient to meet demand for several thousand years. However, it is reasonable to assume that the growth curve will have a positive gradient at some stage in the future, and accordingly growth rates of 1% and 5% were considered. For positive average annual growth rates of 1% and 5% on a rounded 1980 production figure of 100 000 m³, the identified resource of basalt/dolerite is adequate to meet demand for 400 and 120 years respectively.

COMMENT

Threader (1976) estimated a positive average annual growth trend of 9% in the production of crushed basalt, dolerite, and limestone for the Hobart area during the period 1963-1973. However, the use of data either side of this period shows (fig. 1) that the production of crushed basalt and dolerite is best approximated by a 14% growth curve. In addition, the production of crushed limestone has followed different growth curves for the 1960-1980 period, so that direct comparison of the data of Threader (1976) and that shown in Figure 1 is not feasible.

It is apparent from Table 2 that the Launceston area has a considerable identified resource of dolerite, a feature which is in contrast to the Hobart area which has only 10% of the Launceston identified resource. As advocated by Threader (1976) for the Hobart area, the quarry industry in the Launceston area has secured adequate resources of dolerite, particularly Launceston Quarries which has taken out an option over a potential dolerite quarry at Lilydale.

A 5% growth in the production of crushed basalt/dolerite in the Hobart area will exhaust the identified resource by the year 2025, and it would appear desirable to increase this identified resource by investigation of the sites proposed by Leaman (1975).

Leaman assessed thirty-five actual and potential basalt/dolerite quarry sites in the Hobart area on the basis of site, material, and environment considerations. However since Leaman made his study, two factors have occurred to slightly modify his order of priority east of the River Derwent, namely the improvement of the East Derwent Highway, and the construction (in progress) of a third bridge over the River Derwent in the vicinity of Risdon. Accordingly, it is recommended that the Craigow and Bourbon Creek (Grass Tree Hill area) sites be given top priority of investigation, with

the Dromedary, Risdon Brook, and Belbin Rivulet sites second priority. These five sites were estimated by Leaman (1975) to contain a total of approximately $40 \times 10^6 \text{ m}^3$ of *in situ* dolerite (approximately $70 \times 10^6 \text{ m}^3$ of broken dolerite).

The order of investigation should occur in the sequence:

- (1) Informing the various government and municipal authorities of the situation with respect to the identified resource and anticipated growth in production of crushed basalt/dolerite in the Hobart area, to enable integrated planning schemes to be enacted;
- (b) Informing the relevant sections of the quarrying industry in the State of the matters referred to in (1) above;
- (c) Pending the outcome of (1) and (2) above, the Tasmania Department of Mines should be prepared to undertake detailed material evaluation of these sites.

It is interesting to note that since Leaman's study, Hobart Blue Metal Industries have opened up a quarry at Leslie Vale which was assessed by Leaman (1975) as being marginal to substandard in status. This implies that by ignoring the factors relating to availability of services and employment patterns, a more reliable estimate of the status of a potential quarry site is obtained. If these factors are ignored, a re-appraisal of the Leaman ratings indicates several sites, predominantly east of the River Derwent, which superficially appear satisfactory. However, most of these sites can be shown to be unsatisfactory for either material or environment factors, leaving only the Backbone and Collinsvale sites as having potential for quarry development (*i.e.* a third priority rating).

CONCLUSIONS

- (1) Production of crushed basalt and dolerite in the two largest cities in Tasmania grew at an average annual rate of 14-15% from 1960 to 1971 (Hobart area) and to 1974 (Launceston area). Subsequently, production in these areas has grown at an average annual rate of 1-5% (Hobart area) and -1-0% (Launceston area).
- (2) For the Hobart area, the identified resource of basalt/dolerite appears adequate until the year 2025 (5% average annual growth), or the year 2075 (1% average annual growth).
- (3) For the Launceston area, the identified resource of dolerite appears adequate until the year 2100 (5% average annual growth), or until much later with a 1% average annual growth.
- (4) Only the Hobart area requires investigation of the potential dolerite quarry sites in the Grass Tree Hill area east of the River Derwent in accordance with the sequence outlined above.

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