

LIMESTONE QUARRIES AT IDA BAY.Introduction -

The Australian Commonwealth Carbide Company Limited has for many years drawn its limestone supplies from quarries in the vicinity of Ida Bay, which is an inlet at the mouth of the Lune River and a part of Southport.

These quarries have been operated on behalf of the Company by contractors and have produced some 300,000 tons of limestone. Although the stone quarried would normally be described as high-grade, the quality has not always been satisfactory, and, in an effort to overcome this disability, three separate faces have been worked at different times. In each case the quarry was opened with the expectation that high values obtained from surface samples would persist, and, in each case, this expectation was not realized.

The present quarry is known as "Blaney's" and, like its predecessors, is yielding lower grade stone than was originally anticipated. This investigation has been carried out with the object of formulating a plan of working whereby stone of consistently high quality can be economically quarried over an extended period.

General Geology -

The limestones of Tasmania may be divided into three main geological age groups. These are the Lower Palaeozoic, the Permian and the Tertiary.

Permian and Tertiary limestones are usually of rather poor quality, but zones of high-grade material occur at intervals throughout the Lower Palaeozoic series. These limestones are found in the Gordon River district, the Florentine Valley, at Ida Bay, Junee, Railton, Melrose, Flowery Gully, Smithton, Quamby and Mole Creek.

The Gordon River limestones are clearly of Silurian age and stone of similar characteristics at the other localities has generally been regarded as Silurian also, but it is probable that some, at least, of the occurrences mentioned above should be classified as Ordovician.

At Ida Bay the limestone is largely unfossiliferous but isolated bands carry a typical Lower Palaeozoic marine shelly fauna, which includes various forms of Brachiopods, Gasteropods and Lamellibranchs. Polyzoan remains are common and there are occasional remnants of Nautiloids and Ammonoids that could be used for determinative purposes.

There is little doubt that the limestones of Ida Bay, Junee and the Florentine Valley belong to the same period, but no attempt has been made at detailed palaeontological correlation, as the precise association is of little economic significance, in view of the sporadic distribution of high quality zones. Criteria useful in locating and identifying such zones must be developed locally rather than regionally.

Limestone beds in the vicinity of the Ida Bay quarries extend over a vertical interval of more than 500 feet. The series is extensively intruded by dolerite sills and dykes of Mesozoic age, and the same rock apparently underlies the limestone through much of the area. The base of the series has not been observed but it passes upwards into a mudstone-limestone conglomerate containing rounded pebbles of quartz, above which

47

are normal mudstones and sandstones with occasional bands of impure limestone. There are zones in this formation carrying a profuse assemblage of Permian (or Permo-Carboniferous) Shelly fossils.

The base of the Permian beds above Blaney's quarry is about 900 feet above sea level, while at the Ida Bay Wharf, $3\frac{1}{2}$ miles north-easterly, the overlying Triassic coal-bearing series extends well below sea level.

This relative displacement cannot be accounted for by the prevailing low angles of dip, and is evidence of extensive block faulting that took place in connection with the doleritic intrusions. The sedimentary rocks now occur as isolated blocks separated by masses of dolerite.

The major faulting is of little importance in actual quarrying operations except in so far as it controls the disposition of the various areas of stone. Faulting of this nature in Tasmania is, however, almost invariably accompanied by numerous minor faults of small displacement. These are important at Ida Bay as they have frequently developed into solution channels, and ultimately into underground caves and water-courses, which are a definite obstacle to economical quarrying. Further comment on this aspect will be made when considering the present and prospective quarry sites.

The Ida Bay limestone is grey in colour, hard and compact, and, while generally fine in grain, carries isolated bands of coarsely crystalline stone. Veins, seams and blebs of white or smokey transparent calcite are common throughout.

The beds are frequently almost horizontal and dips rarely exceed seven or eight degrees. The individual strata on casual inspection appear to be persistent, but are actually quite lenticular and cannot normally be traced as distinctive units for more than a few hundred yards.

There is a definite association between depositional zones and quality of stone which should be used to the utmost in prospecting and evaluating the various areas. Unfortunately, this connection is complicated by depositional irregularities, principally in the form of sandy patches, which occur in beds of otherwise high purity. There are also post-depositional irregularities connected with faulting, solution channels, and proximity to the intrusive igneous rock. The last mentioned is less important than might be imagined as in this area, in common with most other parts of Tasmania, doleritic intrusions have produced remarkably little contact metamorphism.

Blaney's Quarry -

(a) Location. Blaney's Quarry is situated on Mining Lease No. 8461/M, 100 acres, in the County of Kent. The eastern edge of the quarry is close to the western boundary of the Ida Bay Caves Reserve, which lies within the lease, and is about midway along that boundary. The quarry is connected with a wharf on Ida Bay by $5\frac{1}{4}$ miles of 2 feet gauge railway.

(b) General Description. The quarry face forms an arc about 700 feet long in an east-west direction. The maximum height is about 150 feet and is too great for economical quarrying.

The dip of the beds is generally westerly and varies from two degrees to about eight degrees. This variation in dip is due to minor faulting and to slumping connected with solution channels.

The beds are continuous along the face and can be matched from point to point, although the connection is not always obvious on account of the lenticular shapes and also because the partings are strongly marked in some places and obscure in others.

In addition to the bedding planes, two sets of vertical joints are developed. These are not quite constant in direction but one set tends to parallel the principal direction of minor faulting and the other is approximately at right angles to that direction.

Both joints and bedding planes are open in parts of the quarry and tight in other parts. In general the system is quite favourable to economical quarrying and well adapted to selective methods. Maximum advantage is not at present being taken of these natural quarrying directions, particularly in regard to blasting practice.

The quarry is marred by a mass of broken stone and clay in the centre of the face. This has resulted from slumping into a series of caves at the base of the face, and from slight movement along the "yellow wall", an almost vertical travertine faced east-west solution channel which extends for 360 feet along the present face.

Caves and minor cavities along this wall carry residual clay, and in places stalactitic growths have developed. There are also massive waterworn boulders of dolerite imbedded in the clay, indicating that powerful stream action has occurred at some time in the past, and suggesting strongly that these caves have been connected with the Ida Bay Caves to the east. The limestone surface above the quarry is also traversed by open fissures which indicate that the cave system extends into the area to be worked.

The effect of this as regards the immediate position in the quarry is that there is a mass of several thousands of cubic yards of useless material composed largely of clay and massive limestone blocks in the centre of the quarry. This will be difficult and expensive to remove without adequate mechanical aid.

As regards the future of the quarry, all indications suggest that further occurrences of this nature will be encountered, and it is essential that provision be made to deal with them in such a manner that the cost of producing clean stone will not be unreasonably increased.

A thick band of poor stone occurs along the base of the face and forms a lower limit to the quarry. This band rises in the direction in which the face is advancing and its presence was not anticipated at the time the quarry was commenced. Efforts were previously made to keep the quarry floor, to a wheeling grade, but this involved dumping large quantities of stone and the present contractor is developing a new floor with the same dip as the strata.

(c) Future of the Quarry. The quarry is limited as regards expansion in an easterly direction by the Ida Bay Caves reserve. A gully between the quarry and the caves may mask a major fault line, as beds to the west of this gully dip westerly, while those to the east dip easterly.

The western edge of the quarry abuts on a massive belt of dolerite which extends northerly, while in a southerly direction for about 300 feet the limestone is broken up by stream and solution channels and cavities, and appears to be unsuited to economical quarrying.

49

The future of the quarry, therefore, lies in advancing the high central and eastern portions of the face in a southerly direction. This advance would yield approximately 360,000 tons of stone per 100 feet, of which some 66% can be regarded as probable useful material.

Until some concise knowledge of the grade of stone to be won in this advance is obtained, no recommendation can be made as to whether Blaney's quarry should be persevered with as a main supply source of limestone.

The necessary information can be gained only by core drilling at relatively close intervals, and it is essential that correlation be maintained between bore samples and bedding so that the relative disposition of favourable and unfavourable bands will be available for the formulation of a scheme of selective quarrying.

Blaney's quarry cannot be described as an ideal one and its prospects of improvement are not particularly bright. Nevertheless, it is an established source of supply and much high grade stone is exposed along its face. It will, therefore, be wise, before turning to other apparently more favourable sites, to definitely classify the quarry in terms of the cost and grade of the next half million tons of stone ahead of the face. Diamond drilling to this end is recommended as the immediate step to be taken in planning for the future of Ida Bay limestone.

(d) Quality of the Limestone. The question of the quality of the limestone exposed in Blaney's quarry is complicated by conflicting evidence.

The stone was originally regarded as high-grade and in a report dated 8th February, 1926, P. E. Nye, from his own sampling, calculated an average grade of 94.91% CaCO_3 , and indicated that selected material could be obtained at up to 95.60% CaCO_3 . These samples, however, represented only 40 feet at the base of the face which is now 150 feet high.

The Company carried out a considerable amount of face sampling in 1930, the calculated overall grade being 94.8% CaCO_3 . The face at this time was much higher than when sampled by Nye, and it is noticeable that consistently high values were obtained from the lower beds, whereas the upper beds were of lower average grade and showed wide and apparently anomalous variations of grade from point to point as sampled.

Unfortunately, these samples were not representative of the whole thickness of the various beds concerned, and so cannot be used to calculate weighted averages. The average value indicated for the lower five beds is 96.9% CaCO_3 , while the corresponding figure for the upper eleven beds is 93.7% CaCO_3 . It is felt that some reservation must be placed on the unqualified acceptance of results from this type of sampling, but there was a creditable density of sample localities and two important conclusions may safely be drawn. These are, firstly, that the lower beds were of appreciably higher quality than the upper ones, and, secondly, that there was no deterioration in the quality of the lower beds as the quarry face advanced from the position where Nye's samples were taken to its position at the time of the 1930 sampling.

In 1943-44 the Company had four bores put down along the face and a fifth 130 feet back from the face. These bores, numbered 1 to 5, showed average values of 91.6, 92.4, 90.3, 91.1 and 90.2 per cent CaCO_3 respectively.

Bores Nos. 2, 3 and 4 penetrated the lower beds which averaged 91.5, 91.2 and 92.5 per cent CaCO₃ respectively. The comparison of results for these beds is:-

Nye	- 1926	..	..	94.91%	CaCO ₃
Company	- 1930	..	..	96.9%	"
Bores	- 1943-4	..	..	91.7%	"

The horizontal interval between Nye's sampling and the boring is less than 200 feet, and the Company's samples represent an intermediate position between the two.

In addition to the above discrepancy the bores differ from the Company's sampling in that they show very little difference in average values between the upper and lower beds.

There can be no doubt that the bore results are the most reliable of the three as regards bulk average values, but, unfortunately, the cores were analysed in arbitrary sections of 6 feet lengths, and no attempt was made at correlation with the beds exposed in the quarry face. This has made the work much less valuable from the aspect of estimating the improvement in grade that could be obtained by rejecting portions of the stone.

It is recommended that in future boring the cores be divided, as nearly as is practicable, into sections representing individual beds. The physical characteristics of each section should also be carefully recorded to assist in classification.

Variations of two or three per cent from point to point in an individual bed are to be expected, but it is believed, nevertheless, that each bed tends to retain its characteristics over an appreciable area, and, that where sudden variations of 10 per cent or more occur in limited sections, there is usually visual evidence to explain why this should be so. There are instances in the present quarry face of sandy patches of restricted dimension in otherwise high quality beds, and also of holocrystalline areas in poor quality beds. In cases of this type a physical description would serve to explain the apparent anomaly.

On the existing evidence it would be unwise to attempt to predict the grade of stone that could reasonably be won from Blaney's quarry. It is suggested, however, that while an improvement on the average grade of the bores (91.1% CaCO₃) should be practicable, the bulk average of 94.8% CaCO₃ indicated by the 1930 sampling is not likely to be realized.

If boring is carried out as recommended, it is proposed to submit a cost-grade estimate based on whatever schemes of selection are shown to be economically practicable.

The conclusion reached may merely be that erratic values, the excessively high face and the prospect of encountering numerous solution cavities, make the selection of a new quarry site desirable, but even in this event the work will have been justified as its cost will be small compared with that of persevering with an unsatisfactory quarry.

The nature of the results obtained, particularly as regards consistency, will determine the amount of boring necessary. As a guide to the probable cost involved, it may be stated that there is a reasonable anticipation that eight holes, aggregating 1,200 feet, would enable a recommendation on the future of the quarry to be made with confidence, and would also provide satisfactory working data concerning 500,000 tons of limestone.

57

(e) Quarrying Methods. The following is a brief description of the present quarrying practice.

Stone is broken in the face by blasting in "bulled" holes of 20 feet maximum depth using Quarrying Monobel or A.N. "50" Gelignite. Two jack-hammer type machines are employed almost continuously in this work. Compressed air is delivered from an automatically controlled Broomwade portable compressor-receiver set powered by a 27 horse-power Lister Diesel engine, which burns distillate fuel. The whole unit is mounted on a wheeled chassis and is both efficient and economical.

Criticism of this phase of the operations is concerned with the fact that the face is worked as a whole, no attempt being made to isolate low-grade beds or patches of stone. It is also considered that by studying the natural partings in the stone, in relation to the position of the charge, more effective blasting could be achieved using less explosive and producing less fragmentation.

With these reservations it is considered that the contractor is handling the face quite capably and is doing all that could be expected under contract conditions to develop safe and productive working sections.

Before a section is fired the rails on the quarry floor are removed to prevent damage by falling stone. After blasting and barring-down, spallers commence breaking up the larger lumps, and the stone to be shipped, in pieces of from about 5 pounds to 100 pounds weight, is stacked in heaps until a sufficient clearing is made for the rails to be re-laid.

Box cars from the railway are then towed up the 1 in 25 slope of the quarry floor by a tractor and placed for loading by hand. The loaded cars are returned to the railway in twos or threes by the tractor which alternately pushes and checks them as they skid down the grade with wheels spragged. The whole operation is hard on both men and vehicles.

It has not yet been found practicable to haul the railway cars round the "yellow corner" and into the eastern half of the quarry. Stone in this section is loaded instead into 1-ton side-tipping trucks and pushed by hand into a crude set of bins, from which it is loaded into the railway cars partly by hand and partly by gravity.

In clearing up spalls, small stone and clay, and in keeping the quarry floor flat, much use is made of a petrol driven 6-cylinder Cletrac tractor type front-end loader. This unit is also sometimes used for loading stone but generally functions as a bulldozer rather than as a loader. It would undoubtedly be a very useful accessory to many types of quarrying operations, but the job in question is so much beyond its capacity that maintenance and operating costs are very high.

From this description it will be realized that the handling methods employed are neither efficient nor economical. It may be stated confidently that in quarries of this type, where large quantities of waste material have to be disposed of, hand working is definitely uneconomic under present day labour conditions.

Several operators of limestone quarries have persisted with methods of hand working in the belief that in this way, only, could a sufficient degree of selectivity be obtained. In cases in which the stone is badly contorted or broken, or is intruded by veins of quartz or ferrous minerals, this may be true but, at Ida Bay, the beds are flat, massive and relatively undisturbed. They are so situated that an effective type of selection can be accomplished by the rejection of beds or parts

52

beds in the face. These sections can then be quarried individually and sent straight to the dump. Rejection in this manner can be carried out by a trained person, whereas it is not practicable to maintain a crew of hand loaders with the knowledge and inclination to produce an output of uniformly high quality.

The quality of the stone to be shipped is closely related to the proportion of the total bulk that can be dumped without upsetting the economic balance of the operation. This factor, together with the necessity for disposing of large quantities of slumped material and of providing large quantities of ballast and filling for the railway, makes the establishment of power shovel operation the most important feature of the quarry re-organization.

It is strongly recommended that the whole scheme of quarrying be adapted to the use of a $1\frac{1}{2}$ or $1\frac{1}{4}$ cubic yards capacity boom and dipper type shovel. Electric operation is preferred but Diesel or steam power could be quite satisfactory.

The Goliath Cement Company, at Railton, carries out the whole of its limestone quarrying with a $2\frac{1}{2}$ cubic yards capacity electric shovel. This is a bulk quarrying operation, but a high degree of selectivity can also be achieved as is demonstrated at Lillydale by the David Mitchell Estate. This organization employs an electric shovel to quarry limestone, various portions of which are used for lime burning, agricultural limestone, building stone and road metal. The selection is made partly at the shovel and partly during the crushing stages.

At Ida Bay it is proposed that the power shovel be used for the whole of the loading operations. As the floor of the quarry is usually wet and clayey, this will result in a certain amount of mud and small stone being loaded with the large stone. The following sequence of operations is recommended to eliminate this and other disabilities:-

1. Reduction of fragmentation in primary blasting.
2. Increased use of secondary blasting to eliminate spalling on the quarry floor.
3. Loading by power shovel to existing or similar side-tipping trucks. Rails can be kept well clear of quarry face and need not be removed during blasting as is present practice. Motor trucks could effectively replace the rail trucks but their employment would increase the capital outlay unnecessarily.
4. Gravitation of loaded trucks on a 1 in 90 track to grizzly bars. Empty trucks to be returned in rakes by tractor or horse.
5. Trucks to be hand tipped on to grizzly bars attended by one or two spallers as required to work the stone through.
6. Stone from grizzly delivered by gravity feed to jaw crusher.
7. Jaw-crusher delivery by gravity feed to inclined trommel fitted at upper end with central sparge pipe carrying high pressure water for washing, and at lower end with sizing screen. A small offtake weir on Mystery Creek could supply water with 150 feet of effective head by a pipe-line approximately half a mile long.
8. Trommel oversize by gravity feed or elevator to railway loading bins.
9. Trommel undersize by gravity feed or elevator to railway ballast bins or stock pile.

This type of handling has definite advantages in that it reduces both the total manpower and the proportion of manpower exposed to the weather. It is believed that the quarrying can be converted to a substantially all-weather operation.

Another important feature is that after attrition, washing, and sizing in the trommel, the stone will be cleaner than can be produced at present and will arrive at Electrona ready for burning without further handling.

Precise details of the layout cannot be worked out until a decision is made as to whether Blaney's quarry is to remain the main source of supply, and as to which section of stone in the quarry is to be worked. The scheme can, however, be adapted to any set of circumstances that will arise at Ida Bay, and the acquisition of a suitable power shovel as a first step can be proceeded with at any time. This unit would be justified in the quarry even under the existing set-up and its employment would materially reduce the cost of the proposed railway reconstruction works.

(f) Stores and Maintenance. At present there is no provision at the quarry for stores or for the maintenance of plant. A broken hammer handle may cause a man to be absent for an hour or more from his job because he has first to find something that will do for a new handle, then remove the broken part from the hammer head without the aid of a fire or a drill, and then fit the new, or reconditioned, handle without even a rasp.

This state of affairs is most unsatisfactory under hand working conditions, and with mechanization would be even more so. It is, therefore, recommended that a store be established at the quarry for the orderly housing of quarry tools, jack-hammer parts, spares for mechanical equipment, railway track materials, locomotive and waggon brake and other spares, all tools that are not in regular service, and bulk supplies of materials regularly consumed such as petrol and oil. The issue of stores should be made on an authority docket system balanced against a half-yearly stocktaking. Local experience has already shown that certain types of goods do not remain on the job unless rigidly supervised.

The larger portion of the magazine building could be used as a store, and there is a man on the job for whom the offices of storeman, timekeeper and caretaker could be suitably combined.

In the report on the railway it has been recommended that heavier locomotives be employed in conjunction with steel hopper-type trucks. It is also recommended that quarrying, loading and discharge be mechanized. To date, there has been no proper provision for maintenance of rolling stock, track or quarry equipment. As new material is provided it will be necessary to introduce an efficient maintenance organization, and it is recommended that a workshop be constructed to service both quarrying and transport materials and rolling stock.

It will probably be necessary to employ a welder and a Diesel or electrical mechanic. These men can be kept fully employed on routine maintenance and ordinary repairs which will be fairly heavy on such items as quarry tracks, tip-trucks, elevators, screens and possibly aerial equipment.

54

One member of the existing locomotive crew is a steam-fitter and engineer, and can be employed on maintenance and repairs as well as on driving. With bin loading and discharge, and with increased engine power, it will be practicable to carry out the haulage programme in four shifts per week. On the fifth day the crew can be employed in servicing and cleaning the locomotive and hopper trucks. With new rolling stock systematically examined and serviced in this way maintenance costs can be kept to a very low figure.

(g) Power Installations. Power installations at both quarry and wharf could be most effectively carried out by the employment of power from the hydro-electric system.

Power lines are, at present, being erected to serve Southport (Hythe) and the Commission could probably be induced to extend them to Lune River. The Company would then be faced with the cost of approximately four miles of power-line to the quarry and one mile to the wharf.

In view of the undoubted advantages of electrical operation for the power shovel, crusher, trommel, elevators, winches etc., due consideration should be given to this proposal before purchasing units adapted to Diesel or other power.

(h) The Contract System. The contract system of quarry operation at present in force has several defects, the most serious being that the contractor is concerned with getting a maximum quantity of stone at minimum cost, while the Company is concerned more particularly with receiving stone of the highest possible quality.

Another weakness is that when major difficulties are encountered in the quarry, such as the present mass of waste known as the "yellow corner", the contractor cannot afford to handle thousands of tons of non-paying material, and is forced to either isolate the section to the general detriment of the quarry, as he is doing in this case, or to make a special arrangement with the Company. Arrangements of this nature are difficult because the quantity of waste to be moved cannot easily be established, and it is to be expected that the contractor will exploit the position as far as he can.

Both quarrying and transport contractors have shown very little interest in caring for the Company's property, and the Company could not be recommended to provide first-class mechanical equipment for use under the existing system.

It has been recommended unreservedly that mechanization be introduced to improve the quality of the stone shipped and, at the same time, reduce the cost. Advantages will also accrue in the matter of continuity of output, and in reducing the proportion of unskilled, low-paid labour to a minimum. It is felt, however, that to achieve these aims, supervision and organization of a far higher order than can be expected under the contract system will be necessary.

(i) Summary. Elaney's quarry has serious defects in that the face is so high that it should be split into benches, and in the necessity for handling present and prospective masses of slumped limestone and clay waste.

The quality of the limestone ahead of the face is problematic and diamond drilling is recommended to determine this point. This should be the first step in providing for the future development of limestone in the district.

55

The present method of man-handling stone on a sloping quarry floor is considered to be most uneconomic, and a scheme is outlined for substituting mechanical handling. This provides for improved selectivity, and for a more reliable supply of cheaper, cleaner stone.

Importance is attached to the institution of all-weather working at the quarry, to the establishment of a properly equipped store, and to the setting up of an efficient maintenance system for all mechanical units.

Newlands (4M) Area -

(a) Location. The Newlands, or $4\frac{1}{2}$ -Mile, area is situated on Lease Application No. 14M/45, 96 acres, and Lease Application No. 15M/45, 80 acres. The Ida Bay Railway traverses the northern, or lower, edge of the area, and the Lune Timber Tramway flanks the southern, or upper edge. To the west it abuts on the Ida Bay Caves Reserve, and to the east on the dolerite of the Sugar Loaf. Access is most easily gained through a valley which runs southerly from 4M-24ch. on the railway.

(b) General Description. The area may be described as the precipitous northern flank of a range running westerly from the Sugar Loaf. The limestone beds extend without a break up this flank to a height of about 500 feet above the railway, where they pass unconformably into Permian mudstones and sandstones with thin beds of limestone. The main limestone formation also outcrops on the southern flank of the range, but these beds have not been examined and are beyond the reach of existing transport facilities.

The quantity of limestone within the lease applications is very great, and could be expected to exceed a hundred million tons. The desirability of exploiting stone in this area is, therefore, governed by the factors of accessibility and quality rather than of total quantity.

The limestone is of the same general character, both physically and chemically, as that exposed at Blaney's quarry. The dip varies from 5 to 8 degrees in an easterly to south-easterly direction, as compared with a dip of similar amount in a westerly to south-westerly direction at Blaney's quarry.

On account of the dense vegetation, the rugged terrain, and the lenticular shape of the beds, it has not been found practicable to establish a definite connection between this area and Blaney's quarry, but it is most probable that the depositional zone represented by Blaney's quarry occurs along the main face of the Newlands area also.

(c) Quality of the Limestone. During the present investigation more than 90 samples were cut in the area. These were channel samples, or representative top to bottom chippings adjusted in weight proportion so as to resemble channel samples as closely as practicable.

Sampling in this manner should not exaggerate the average value of the stone. In certain cases there may even be a tendency to depreciate the average value, because the sample is composed of stone taken from just beneath the weathered surface skin and may contain an abnormally high percentage of silica. For this reason it is difficult to estimate the degree of reliance that can be placed on the results, but the method is regarded as the closest practicable approach to diamond drilling, and, in aggregate, should give a fair representation of the position.

Sampling was limited to areas suitable for working and the general conclusion to be drawn is that bulk quarrying should yield limestone averaging 92.5% to 93.0% CaCO₃, and that the quarrying of selected bands would enable stone to be produced at a grade of 95% to 96% CaCO₃.

The results are set out in detail in the accompanying schedule of samples. Within the individual runs there was no overlapping of samples, and no gaps occurred except where stated. Apparent diversions from this, as shown in the vertical interval column, are due to the dip of the beds.

The "Eastern Run" covers a series of beds situated close to the railway near the 4 1/4 mile peg. It commences 26 feet above rail level and extends easterly. There is a band of low grade stone from 46 feet to 56 feet above rail level, but above this the stone is uniformly good as far as sampled, the result being:-

Eastern Run - R.L. 464' to 538'6".
Sample Nos. - 25/45 to 37/45 and 79/45 to 85/45.
Vertical Interval - 74'6".
Sampled - 69'6" in 20 samples (Cap 5'0").
Weighted Average Grade - 93.0% CaCO₃.

The "Check Eastern Run" covers the same series of beds but commences at rail level and extends south-easterly. Exposures were poor on this run and the samples are not so reliable. The band of poor stone, on account of the dip, was met at a lower altitude and extended from 39 feet to 50 feet above rail level. The summarized result for stone above this is:-

Check Eastern Run - R.L. 454' to 553'6".
Sample Nos. - 94/45 to 106/45.
Vertical Interval - 99'6".
Sampled - 66'6" in 13 samples (Cap 21'6").
Weighted Average grade - 91.9% CaCO₃ (92.4% CaCO₃ rejecting No. 101/45)

The eastern section of the area on this evidence could be expected to yield 92.5% CaCO₃ stone by bulk mining methods as compared with 91.1% CaCO₃ indicated by the bores at Blaney's quarry. There are also advantages in that transport and railway re-conditioning would be reduced by 1 mile, and that the stone is situated at an ideal height above the railway for mechanical handling and bin loading. Other factors such as the dip of the beds, prospective face height, and waste disposal are favourable so that it would be a very easy area to open up.

Preliminary development should consist of scrubbing the area, determining the degree to which the limestone has been transgressed by dolerite on the eastern flank, and putting down four or five bores, each of 100 feet or less depth, to check the grade indicated by surface sampling. There would be no major difficulties associated with any of this work.

From the foregoing it will be realized that the eastern area is regarded as a useful block of good average grade stone well adapted to economical exploitation. The principal attribute of the area, however, is that it is ideally situated to form a base quarry from which sections of the main valley wall could be worked. It could form a reliable bulk supply source of cheap average grade stone, while its crusher, washing plant, and loading bins could also handle a possibly intermittent supply of high grade, but more expensive, stone from the main wall.

57

Sampling on the main wall extended from R.L. 455'6" to R.L. 663'0". The band of poor stone below the eastern area was met between 58'6" and 70'0" above rail level, that is between R.L. 466'6" and R.L. 478'0". The next hundred feet of stone includes the beds sampled in the eastern area and the results obtained were consistent with those of the eastern runs, the details being:-

Western Run - R.L. 478' - 580'
Sample Nos. - 43/45 to 56/45
Vertical Interval - 102'
Sampled - 78' in 14 samples (Cap about 18'6").
Weighted Average Grade - 92.5% CaCO₃.

The next 52'6" of limestone includes a band of coarsely crystalline texture represented by samples Nos. 62/45, A/45, B/45 and Baynton's White 15. This band varies from 3 feet to 6 feet wide with an average value of more than 96% CaCO₃. The whole section is of good quality, the summarised result being:-

Western Run - R.L. 580' - 632'6"
Sample Nos. - 57/45 to 68/45
Vertical Interval - 52'6"
Sampled - 46' in 12 samples (Cap 5'0").
Weighted Average Grade - 93.0% CaCO₃.

Above this there is 24'6" of high grade stone which gave the following result:-

Western Run - R.L. 619' - 643'6"
Sample Nos. - 69/45 to 74/45
Vertical Interval - 24'6"
Sampled - 24'6" in 6 samples (Cap nil).
Weighted Average Grade - 95.5% CaCO₃.

The next 15'6" sampled showed the normal bulk average grade of 92.5% CaCO₃, and above this there is about 250 feet of beds which have not been sampled.

(d) Development. The possibilities of producing high grade stone from the main valley wall are almost unlimited, but prospecting and production would both be accompanied by difficulties not met in the other areas.

It would be very difficult to get a drilling plant into suitable positions, and drilling water would have to be pumped a considerable distance.

The height of any quarry face would increase rapidly, and uniformly high grade stone could not be expected to prevail over any great vertical interval. Actual working would involve either long, shallow quarries, or else the employment of a series of benches. A subsidiary haulage system would also be necessary.

It is for these reasons that the development of the area in conjunction with a base quarry, subject to none of these disadvantages, has been suggested. Any likely loading point on the face could be serviced by a self-acting unsupported aerial from the base quarry. The span would vary from 500 feet to 750 feet.

In this way it would be practicable to produce high grade stone, whenever desirable, from selected loading points on the face and this could be either blended with the base quarry output or shipped as a special grade.

If production be contemplated, it is recommended that the area be scrubbed, and that a series of bulk samples be obtained in the zone between R.L. 580'0" and R.L. 643'6". These samples should be obtained by boring and firing the various exposed faces and then breaking out 50-lb. samples of representative clean stone.

38

In view of the difficulty and expense that would attend diamond drilling in the area, and also because any quarries opened would essentially be shallow and work stone close to present exposures, this method is preferred to the more normal systematic boring recommended for other areas.

This work, and the drilling recommended in the base quarry area, should be accompanied by a detailed topographic survey of the whole valley. The Company would then be able, at any time that it might become desirable, to lay out works which would provide for a pre-determined grade and volume of output.

(e) Summary. The Newlands area may be divided into two sections. The eastern, or base quarry area offers advantages in the way of cheap and reliable production. The stone is of average grade. The western, or main wall, section contains large quantities of high grade stone which would require selective mining, and which could reach the railway only by means of a subsidiary haulage system.

It is considered that, by the joint operation of the two sections, an economic balance could be obtained between quality and cost, and that a reliable output of good quality limestone could be maintained.

Diamond drilling, bulk sampling, and detailed topographic surveying in these areas are recommended as a prelude to production in the near future, or alternatively as a means of establishing a proved reserve to meet the possible expansion of the Company's requirements.

Bob's Basin Area -

The Bob's Basin area commences about 500 feet south westerly from the centre of the face of Blaney's Quarry. The beds exposed in Bob's Basin are the upper beds of Blaney's Quarry.

A limited sampling run suggests that the bulk average grade should be in the vicinity of 92.5% CaCO₃, but previous sampling has indicated an average grade of 94.7% CaCO₃. The matter of a report on the area is, therefore, deferred until check sampling can be carried out.

To develop the Bob's Basin area it would be necessary to make a short, but rather difficult extension of the railway. Otherwise, operating conditions would be fairly favourable, with the reservation that solution cavities would almost certainly be encountered.

Generally, it is thought unlikely that the economic balance would weigh in favour of opening up Bob's Basin instead of persevering with Blaney's quarry, but no recommendation regarding diamond drilling will be made until the results of the check sampling are known.

Quarries at 3M.55Ch.

The old quarries at 3M.55Ch. on the railway were abandoned because of a sudden rise in the silica content. Prior to this, good stone had been obtained and P.B. Nye, in his report of 8th February, 1926, estimated the average grade as 94.65% CaCO₃.

These quarries are very conveniently situated and show impressive, unbroken faces. Spalling is said to have been difficult, but with mechanical handling and crushing on the site this would not be important.

59

Consideration could be given to drilling two or three holes ahead of the faces to determine whether the incursion of silica persists, or whether the stone reverts to its former satisfactory grade.

No work has been done in the area during this investigation, but some attention could be devoted to preliminary sampling if drilling results in the other areas prove disappointing.

D. Dickerson

EXTENSION OFFICER.

4th September, 1945,

Department of Mines,
HOBART.

SCHEDULE OF SAMPLES
NEWLANDS (4M.) AREA.

Sample No.	Vertical Interval	% CaCO ₃	Previous Samples	Note
17/45	434'0" - 438'6"	91.0		Eastern Ru
18/45	438'6" - 441'9"	94.6		"
19/45	441'9" - 445'0"	93.5		"
20/45	445'0" - 450'0"	93.2		"
21/45	450'0" - 454'3"	93.2		"
22/45	454'3" - 458'0"	86.2		"
23/45	458'0" - 460'0"	84.6		"
	Gap 2'0"			
24/45	460'0" - 464'0"	77.5		"
25/45	464'0" - 468'0"	90.2		"
26/45	468'0" - 470'6"	94.6		"
	Gap 1'0"			
27/45	471'6" - 474'0"	89.9		"
28/45	474'0" - 476'6"	96.0		"
	Gap 1'0"			
79/45	477'6" - 482'0"	95.3		"
	Gap 1'0"			
29/45	483'0" - 486'6"	92.5		"
30/45	486'6" - 491'0"	92.5		"
31/45	491'0" - 497'0"	94.2		"
32/45	497'0" - 500'3"	94.2		"
33/45	500'3" - 502'6"	95.0		"
	Gap 1'0"			
34/45	503'6" - 506'6"	94.2		"
	Gap 1'0"			
35/45	507'6" - 510'0"	92.0		"
36/45	510'0" - 515'6"	92.0		"
37/45	515'6" - 519'0"	94.2		"
80/45	519'0" - 521'0"	90.6		"
81/45	521'0" - 524'0"	94.7		"
82/45	524'0" - 527'6"	91.5		"

Sample No.	Vertical Interval	% CaCO ₃	Previous Samples	Note
83/45	527'6" - 532'6"	88.8		"
84/45	532'6" - 535'6"	95.3		"
85/45	535'6" - 538'6"	93.8		"
86/45	407'0" - 413'0"	91.0	Baynton's Black I & II	Check Eastern Ru
87/45	413'0" - 419'0"	93.4	" " III	"
88/45	419'0" - 422'0"	92.8	" " IV & V	"
89/45	421'0" - 426'0"	92.4	" " VI	"
90/45	426'0" - 431'0"	82.3	" " VII & 8	"
	Gap 2'0"			
91/45	433'0" - 443'0"	91.0	" " 9,10, 11,12.	"
92/45	447'0" - 454'0"	88.4		"
93/45	454'0" - 458'0"	86.2		"
94/45	454'0" - 461'0"	91.2	" " 17,18, 19.	"
95/45	461'0" - 465'6"	90.8	" " 19	"
96/45	470'0" - 473'0"	89.5	" " 20	"
	Gap 4'6"			
97/45	477'6" - 481'0"	92.8		"
98/45	481'0" - 484'0"	93.0		"
	Gap 7'0"			
99/45	494'6" - 504'0"	93.6		"
	Gap 5'6"			
100/45	510'0" - 515'0"	90.4		"
101/45	515'0" - 520'0"	85.8		"
102/45	520'0" - 524'0"	92.8		"
103/45	524'0" - 529'6"	93.5		"
104/45	532'6" - 537'0"	93.0		"
	Gap 3'6"			
105/45	540'6" - 548'0"	93.0		"
	Gap 1'0"			

Sample No.	Vertical Interval	% CaCO ₃	Previous Samples	Note
106/45	549'0" - 553'6"	93.0		"
38/45	455'6" - 460'6"	93.0		Westerr Rur
39/45	460'6" - 462'0"	90.0		" "
40/45	462'0" - 466'6"	92.3		" "
41/45	466'6" - 468'0"	89.25		" "
	Gap 1'6"			
42/45	464'0" - 478'0"	89.0		" "
43/45	478'0" - 485'0"	91.2		" "
	Gap about 8'			
44/45	493'6" - 498'0"	90.4		" "
	Gap 3'0"			
45/45	501'0" - 504'0"	92.5		" "
46/45	504'0" - 507'0"	89.6		" "
47/45	507'0" - 513'6"	92.7		" "
	Gap 1'0"			
48/45	514'6" - 520'6"	93.9		" "
49/45	520'6" - 524'0"	93.7		" "
50/45	526'6" - 532'0"	94.3		" "
51/45	532'0" - 539'0"	91.5		" "
52/45	539'0" - 547'0"	93.3		" "
53/45	547'0" - 550'6"	94.7		" "
	Gap 6'6"			
54/45	559'0" - 567'0"	91.2		" "
55/45	567'6" - 574'6"	93.1		" "
56/45	574'6" - 580'0"	92.7		" "
57/45	580'0" - 584'0"	93.0		" "
58/45	584'0" - 588'6"	94.5		" "
	Gap 2'6"			
59/45	595'6" - 598'0"	92.0		" "
	Gap 2'6"			
60/45	598'0" - 602'0"	91.8		" "

Sample No.	Vertical Interval	% CaCO ₃	Previous Samples	Note
61/45	602'0" - 608'0"	93.5		Western Ru
62/45	608'0" - 611'0"	94.5	(A/45 96.5%, B/45 96.7%, Baynton's White 15, 89.7% (98.5%	" "
63/45	611'0" - 614'0"	93.2		" "
64/45	614'0" - 617'0"	92.2		" "
65/45	617'0" - 621'6"	94.4		" "
66/45	621'6" - 624'6"	93.4		" "
67/45	624'0" - 629'6"	92.2		" "
68/45	616'0" - 619'0"	90.0		" "
69/45	619'0" - 624'0"	94.9		" "
70/45	624'0" - 628'6"	97.0	Baynton's White 14, 96.4%	" "
71/45	628'6" - 634'0"	93.8		" "
72/45	634'0" - 636'0"	94.9		" "
73/45	636'0" - 640'0"	96.7	Baynton's White 13, 96.2%	" "
74/45	640'0" - 643'6"	96.0	Baynton's White 11, 94.0%	" "
	Gap 3'0"			
75/45	646'6" - 649'6"	89.7	Baynton's White 10, 83.2%	" "
76/45	649'6" - 653'0"	92.1	Baynton's White 9, 93.8%	" "
77/45	653'0" - 658'0"	94.3		" "
	Gap 1'0"			
78/45	659'0" - 663'0"	92.8	Baynton's White 8, 93.3%	" "
C/45		91.9	Baynton's White IIII, 98.0%	" "