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Inglis River valley sand and gravel deposits — a preliminary report

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Location

The sand and gravel deposits discussed in this report occupy an area of about 15 km^2 in the valley of the Inglis River southwest of Wynyard. The deposits are found from Flowerdale in the north to Calder in the south, predominantly on the eastern side of the valley. Over most of this area the deposit is uneconomic to work, the most suitable locations for exploration being the tops of spurs jutting into the valley. Access is by a series of small gravel roads leading westwards from the Wynyard–Calder main road.

Economic importance

Huge reserves of gravel occur in the area and these have been the main source of road gravel for the Burnie and Wynyard municipalities. More important are the patches of clean, unstained gravel which due to the lack of clay material form the only large, naturally occurring source of concrete sand and gravel in northwest Tasmania. As such, this material is regularly transported over an area from Queenstown in the south to Smithton in the west and Devonport in the east. Although crushed and broken stone becomes competitive with the gravel towards Devonport, there is no substitute for the Inglis Valley sand which is therefore at a premium. Pure sand is rare even in this area and is now more or less worked out, but installation of a large screening plant and plans for a washing plant will ensure supplies for the immediate future at least.

Geology

The most remarkable feature of these sand and gravel deposits is their high degree of mineralogical maturity. The materials consist almost entirely of quartz, quartzite and quartz mica schist pebbles in a quartz sand matrix, with material of clay composition restricted either to very rare, thin beds of micaceous shale or the tops of well developed graded sequences.

Texture

Sieved samples show that the whole range of sizes is present from cobble to coarse silt, although individual samples generally exhibit a bimodal distribution. This may be interpreted as a result of the combination, in variable proportions, of two essentially separate size populations. One population has a peak in the pebble fraction and represents the products of physical weathering of the source rocks. These are all well rounded but have a low degree of sphericity. The second population has a peak in the coarse and medium sand fractions and represents the accumulation of material resulting from abrasion during the transport of the first population. This finer material is more angular but also shows a higher degree of sphericity than the coarser population.

In the extreme case, when only one size population is represented, the resulting sediment may be a clean gravel or pure sand, but the vast majority of sediments are pebbly sand or sandy gravel, and these have a very high sorting coefficient. In general, the coarser-sized population predominates so that sandy gravel is the most common sediment, and pure sand the rarest.

Structures

Bedding is always prominent, ranging in thickness from 150 mm to 3.6 m, although most beds are between 600 mm and 1.8 m thick. The dip is generally close to horizontal. Internal structures are ubiquitous in all but the coarsest, massive conglomerates. Lamination is well picked out by strings of pebbles in the finer matrix. Graded bedding is also frequent, and many of the thicker beds fine up from cobbles at the base to silt at the top. Cross bedding and cross lamination are frequently seen and imbrication is present in the coarser beds. The general effect is one of extreme variability in both horizontal and vertical directions, such that even the most experienced sand and gravel operators find it impossible to predict the nature of sediments even a couple of feet behind a working face.

Succession

The deposits occupy a previously eroded river valley cut into Precambrian Keith Metamorphics (mainly silicic schist and phyllite) and Permian Wynyard Tillite. Where the contact is seen, the base of the sequence is always a dark brown to black peaty siltstone, 0.6 to 1.2 m thick, and this passes up into sand and gravel.

The coarsest gravel, with individual pebbles up to 230 mm diameter, is seen in the proximal, southernmost deposits. The distal, northerly, deposits are pebbly sand with coarser horizons. There is no smooth variation from south to north, and pockets of sand and conglomerate can occur in a random manner over the whole area.

Depositional environment

In the Tertiary, a river had cut a valley in a position very similar to that of the present day Inglis Valley. At some stage degrading activity halted, due to a rise in sea level relative to the land surface along this coastal edge of Bass Strait, and there was an accompanying rejuvenation of the drainage system. The river then began to aggrade, and built up a thick sequence of sand and gravel until the whole area was covered by late Tertiary flood basalt.

Deposition from a braided river is attested by the rapid variation in type of deposit vertically and horizontally. Control of sediment laid down at any one point was by the local competence of the stream and in a braided system this varies enormously. Graded beds represent areas of gradual stagnation, while cross bedding shows change in the situation of channels in the valley bottom.

Origin of the material

The exact provenance of the sand and gravel is not known for certain. The occurrence of quartzite and siliceous schist in the sediment, together with the reported occurrence of topaz, zircon and beryl therein, indicates an ultimate origin from a regionally metamorphosed terrain. The origin of the gravel may be:

- Precambrian metamorphic rocks;
- Flowerdale Sandstone;
- Glacial material derived from Precambrian metamorphic rocks;
- A combination of some or all of the above.

A. B. Gulline considers the Flowerdale Sandstone as the most likely source rock. Its present outcrop is very restricted, but some may be overlain by Tertiary basalt and the original area covered may have been considerably larger than that now seen. The high mineralogical maturity of the sand and gravel could be taken as support for the theory of its being twice reworked material.

Post-depositional changes

When basalt flows covered the gravel, silicification occurred within the top horizons. This effect seems to be concentrated in the coarser horizons, so that coarse gravel is welded into quite competent conglomerate, which cannot be easily broken down and is thus left untouched by sand and gravel operators.

The basalt eventually weathered to an iron-rich lateritic soil at the surface, and water percolating downwards has carried clay decomposition products into the sand and gravel. Individual grains are stained red and clay material is deposited within the open framework. Staining and clay deposition may occur either in irregular patches, marking areas where vertical movement of water was concentrated or, on a much larger scale, over huge, tabular volumes whose flat upper surfaces represent the position of former water tables.

Present outcrop pattern

An attempt has been made to show the original long profile of the deposit (fig. 1). This shows the deposit as being of fairly constant thickness (about 60 m) from south to north, but with a base at 180 m above sea level in the south sloping down asymptotically to 30 m a.s.l. in the north. The cross profile is a typical valley-fill shape, approximating a letter D lying on its side (fig. 2) and increasing in width towards the north. The effect of the Inglis River and its lateral tributaries has been to remove most of the Tertiary rocks from this area, leaving only a veneer of sand and gravel overlain by basalt to the west of the river, in a strip attenuated to the south, and irregular in shape as it follows the present spur-valley surface configuration. To the west of the river, sand and gravel is now only seen in one large patch in the extreme north (fig. 3).

Exploitation

Authority to extract sand and gravel

The Lands and Surveys Department issues leases for areas of Crown land of up to 10 acres (4 ha) extent to anyone requesting permission to work sand and gravel. Royalties are paid on the monthly production figures, but lack of any supervision in the field means the system relies on the operators' integrity, and there is no doubt that abuse of the system is common. The main area where leases have been issued is the Calder Road pits where the policy has been to allocate half acre (0.2 ha) blocks in most cases. Other leases have been issued in an area astride Pages Road and also in an area adjacent to but east of the Wynyard–Calder road opposite the junction with Pages Road.

Police stations may allocate special leases to anyone wishing to take a very small amount of sand and gravel from Crown land, for example enough to concrete a driveway. These are insignificant in relation to total production and are not further discussed.

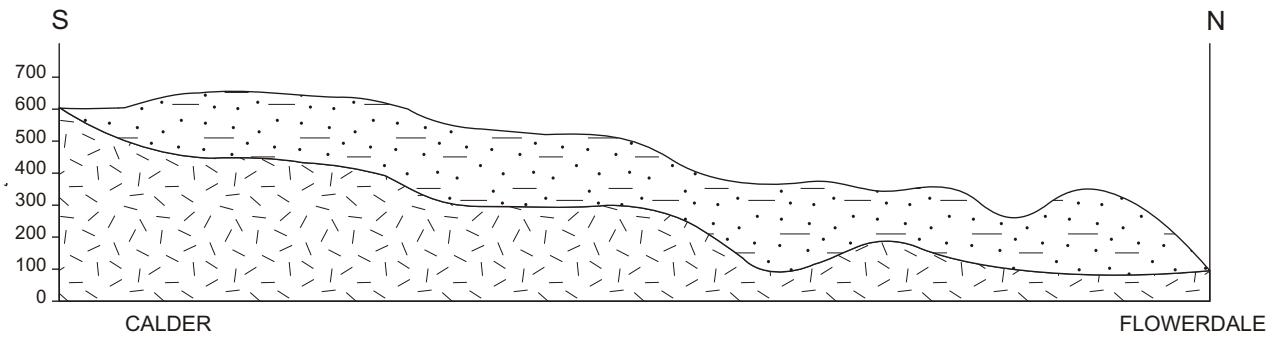


Figure 1. *Longitudinal section*

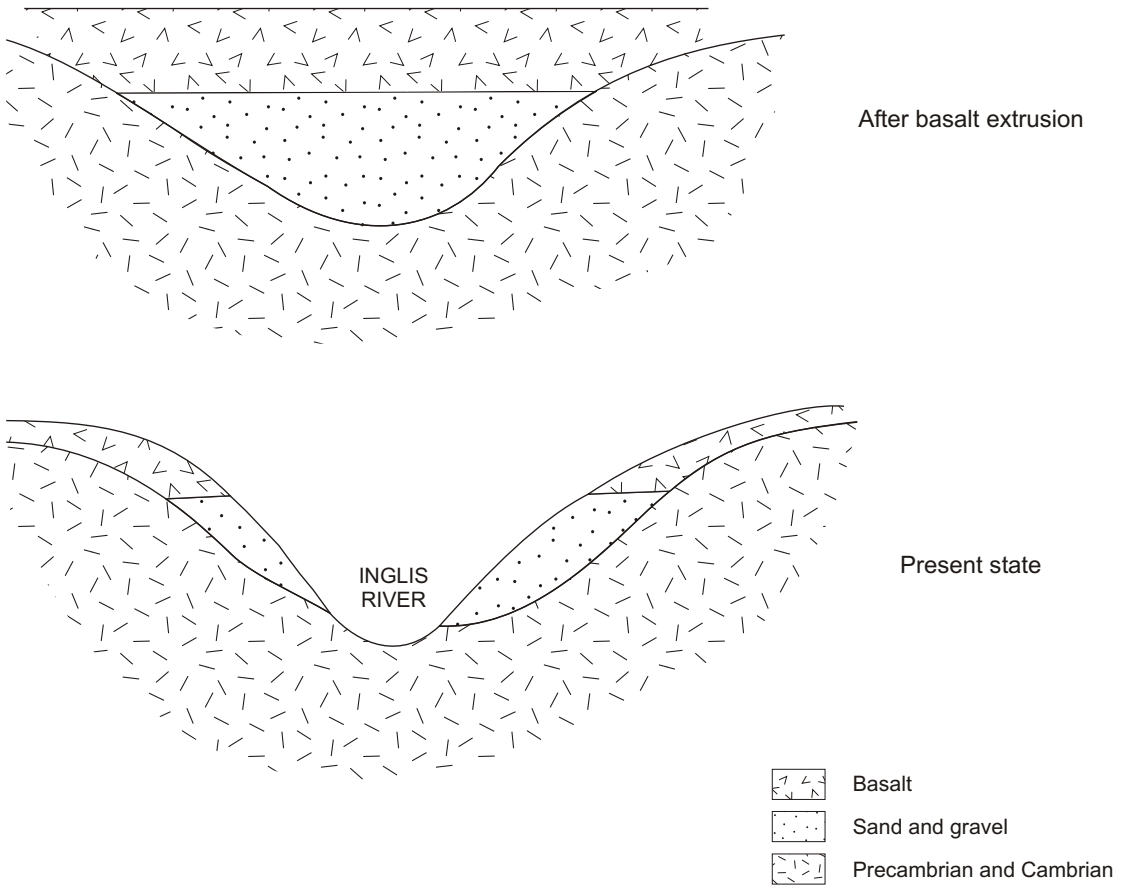
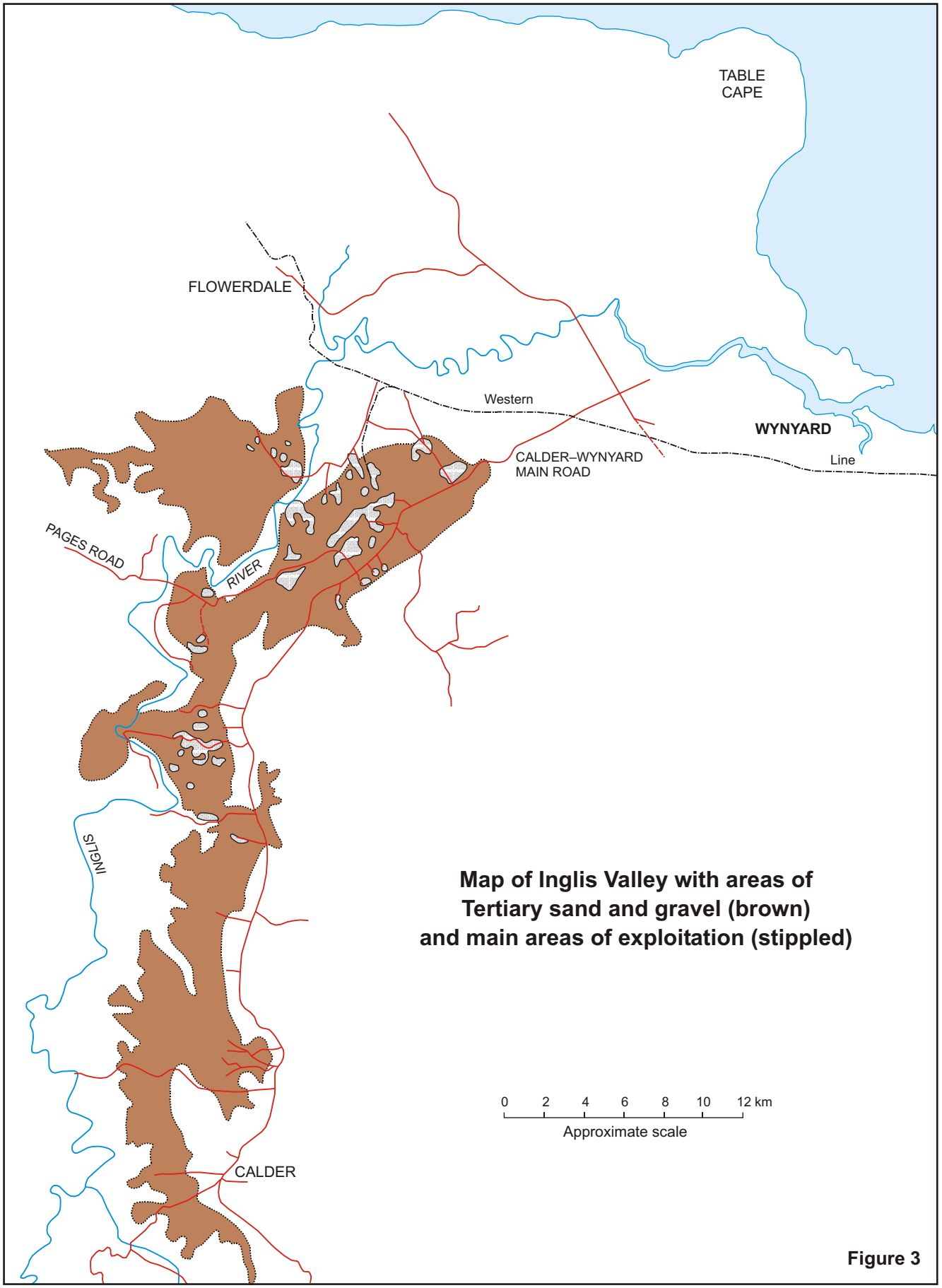


Figure 2. *Transverse section*



Map of Inglis Valley with areas of Tertiary sand and gravel (brown) and main areas of exploitation (stippled)

Figure 3

The Department of Mines issues mining leases covering both Crown and private land. The Department stipulates any conditions and supervises extraction. Most of the Crown land in the Inglis Valley containing reserves of sand and gravel and not covered by Lands Department leases has now been pegged. This occurs to the south of the Calder Road pits and covers about 400 ha. Only a very small part of the private land on which extraction has been or is being pursued is covered by a mining lease. The majority of landowners appear to believe that they may use their own ground without anyone's approval or supervision.

Besides private exploitation, both the Public Works Department and Transport Commission have had areas reserved for them on Crown land. The Wynyard Hospital was granted a timber reserve which it now uses as a sand and gravel pit, selling on a royalty basis to the PWD.

The distribution of Crown land, private land and areas covered by Lands Department and mining leases in the Inglis Valley is shown in Figure 4.

History of extraction

Information on the development of sand and gravel extraction comes from various sources. The Lands Department records of its issued leases is very patchy and pre-1966 information is in the archives and difficult to obtain. Mining leases are all well recorded except that production figures are not available for individual leases; a company or person with several leases combines production figures before submission to the Department of Mines. The best way to obtain information is to talk to some of the people who have worked in this area for years, and especially helpful in this way have been Messrs L. V. Brown, W. Margetts, P. M. Voss and H. K. Fielding.

It must be noted that whilst the private operators are concerned solely with the extraction of clean, white sand and gravel for use in concrete, cement and brick production, the Transport Commission — when they were operating — and the PWD at present, both extracted red gravel as well as white for road base and ballast.

Gravel of this type supports only a poor native vegetation and is useless for agriculture, so most of the deposit has remained Crown land whilst the surrounding areas have been purchased for farming; this has had the effect of severely restricting access to the deposit. First production occurred on private property where this extended onto the fringes of the sand and gravel, generally in the north and northeast, the closest areas to the coastal market, and where the Wynyard–Calder road actually cuts across the Tertiary deposits. No records of production are available but derelict pits scattered over this area are the earliest excavations known. At this time the Transport Commission ballast reserve and PWD gravel reserve were created.

The first recorded issue of a Lands Department lease is 1947, and several were issued in the next few years on the two suitable areas easily accessible to private operators, namely in the Wynyard Hospital Forest Reserve astride Pages Road, and adjacent to the Calder–Wynyard road in the Oldina forest area.

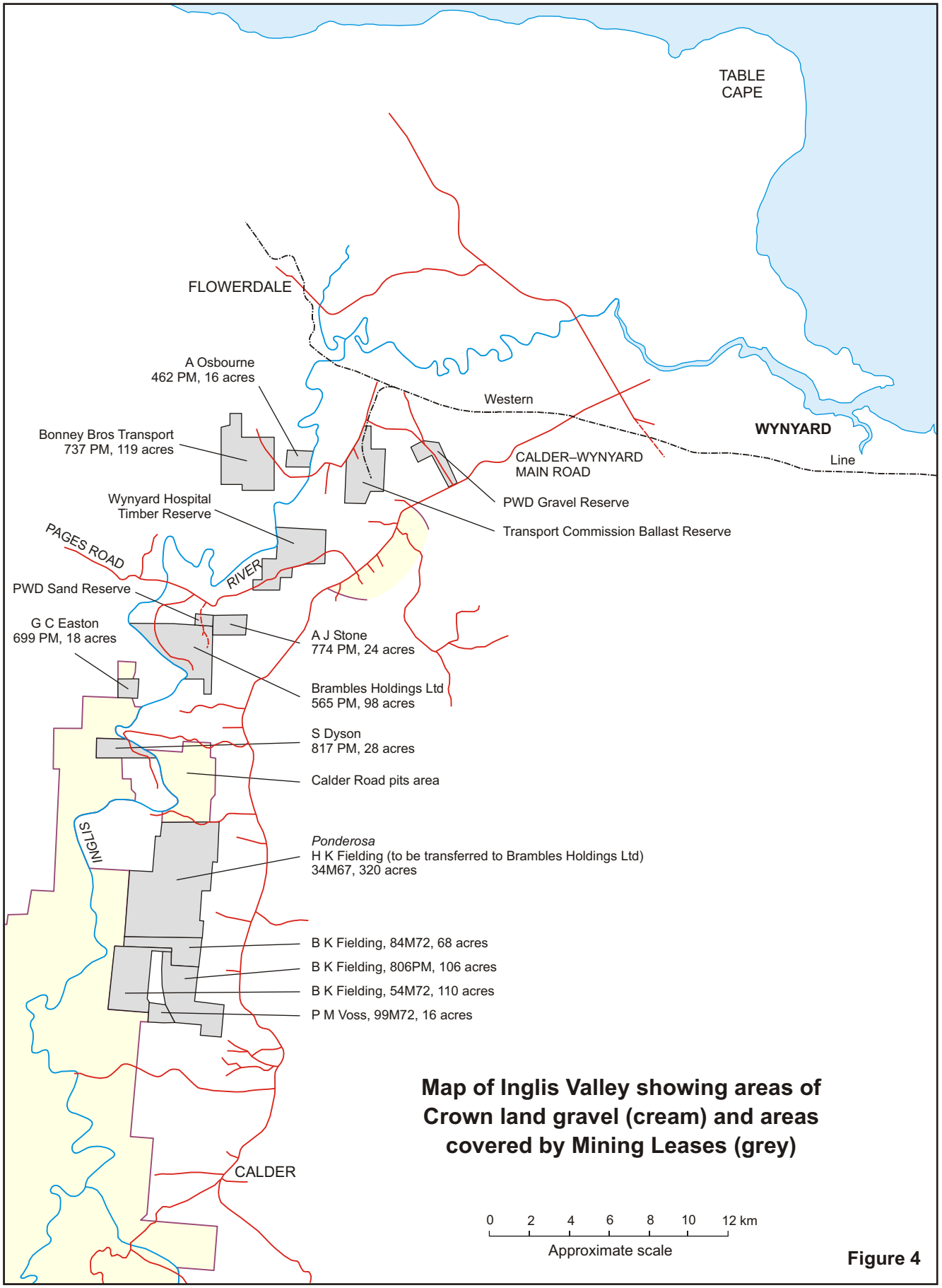
The large Calder Road pits area was opened in 1955 when a road was constructed through private property from the Calder–Wynyard road into Crown land towards the Inglis River. Until the late 1960s this area provided the bulk of concrete sand and gravel production, but at present most of the available material has been removed. The sandy gravel occurs here on a series of spurs, separated by east–west valleys, and the Lands Department issued ½ acre (0.2 ha) leases first on the largest and most accessible ridge, and then on ridges less easily reached. A network of gravel roads was built up by the operators, connecting the various pits with access roads through private land to the Calder–Wynyard road.

The method of working in this area is typical of exploitation over the whole area. The topsoil and any clayey gravel beneath, generally amounting to about one metre, are stripped off, working from the centre of the spurs and downslope. Thus it would be very expensive to replace this material if so required. The exposed gravel is then worked by front-end loader, either being put straight into lorries, or put through a primitive screen to separate coarse sand and finer material from gravel. Only the pure white material is removed and whenever stained gravel or the black peaty siltstone which marks the base of the Tertiary sequence is reached, the face is abandoned.

A combination of arbitrary distribution of ½ acre leases plus the tremendous variation in material present has meant that some leases provided large amounts of good concrete gravel, while others had virtually none at all. Any operator generally needed more than one pit to provide the range of material required by the market, generally sand and three grades of gravel.

Leasing these pits was a large number of small operators, who with one or two trucks would supply concrete sand and gravel straight to the construction sites in the area. Most were content to stay small, and just use up one lease area and then move to another. Several operators, by their initiative, grew appreciably larger than the rest, notably L. Bonney, K. Fielding, R. Jones and S. Holloway.

The introduction of ready-mix concrete plants signalled the end for the small operator. Ready-mix plants delivering straight to construction sites took over most of the retail trade so that the small operators were forced



Map of Inglis Valley showing areas of Crown land gravel (cream) and areas covered by Mining Leases (grey)

Figure 4

to supply the ready-mix operators, which included L. Bonney and R. Jones, and L. Bonney especially gained control of many small operators by initially loaning capital and plant.

The next development, as sand and gravel production began to drop off in the Calder Road pits, was the pegging of mining leases. H. K. Fielding started the rush in 1967 by obtaining 320 acres (130 ha) immediately to the south of the Calder Road pits on Crown land, and called the *Ponderosa*. He had already been granted a mining lease on private property in 1960 but obtaining such a large area of Crown land was unusual at that time.

The *Ponderosa*, worked efficiently and on a large scale, became the major sand and gravel supplier by 1970. Several other mining leases were granted on private land, notably to S. Dyson and Bonney Bros Transport. Brambles Holdings, an interstate concern mainly interested in transport, bought out Bonney's interests, after at one stage considering taking over R. Jones, and recently took over Fielding's interests. Brambles now controls a large share of the retail market and an even larger share of the sand and gravel production.

Fielding left Brambles and has recently applied for several more large mining leases on Crown land to the south of the *Ponderosa*, including all the remaining, untouched sand and gravel deposits. In the future, he will doubtless supply Jones, Dyson and Stone, operators of ready-mix concrete plants, in direct competition with Brambles, with these operators short of sand and gravel at present.

The present situation for concrete sand and gravel is thus one where the small operators have been virtually eliminated. Brambles has a major share of the market but may well be challenged by Fielding supplying Jones, Dyson and Stone. The major production is now from mining leases, mainly on Crown land. There is a shortage of sand, but Brambles currently overcomes this by using a large screening plant at the *Ponderosa*, although it has to stockpile large amounts of coarser material. Fielding claims that his new leases contain higher amounts of sand and this should ease the shortage. There is probably at least twenty years supply remaining.

There is no shortage of road gravel, although both Brambles and Fielding have stated their intention to install washing plants to turn road gravel into concrete sand and gravel. Dry screening can only separate material down to ¼", a very coarse sand, but a washing plant coupled to a screening system can give a wide variety of material down to much smaller grades, and would separate the more valuable sand from the gravel. It would thus be possible to go back over all the previously worked areas and recover much greater amounts of material. In this case reserves of concrete sand and gravel are sufficient to well beyond the end of the century.

The main consumers at present are the ready-mix plants located along the coast from Cooee to Devonport. Besser Bricks is a large consumer of sand, Humes of sand and gravel, and the various local councils and small builders all use material from this area.

Conservation aspects

Conservation can be considered in regard to the deposit itself, and the environment in general. The introduction of large-scale excavation, coupled with mechanical screening and washing, is a beneficial development, as it gives economies of scale and offers a wider range of products to the consumer. It also extracts the sand from the gravel where it is not necessarily required and allows reworking of derelict quarries which still contain huge reserves of what has previously been regarded as fit only for road gravel.

In terms of the environment, although there are some unsightly scars on the surface, it would not take long to return the area to its former state. The natural vegetation is only a very poor scrub, and provided the exhausted areas were smoothed out, regeneration would not take long. The method of removing the topsoil by pushing down into the creeks means it would be impracticable to replace this in most cases but this should not seriously affect at least a degree of regrowth. The area is suitable only for forestry or rough sheep pasture.

Recommendations for the future

(1) A map of private landownership should be constructed and owners should be informed of the necessity of holding a current mining lease wherever sand and gravel extraction occurs.

(2) Further issue of Lands Department leases should be stopped and present leases terminated as soon as possible. Control of extraction should be under one department, preferably the Department of Mines, which can supervise extraction, assess the needs of applicants for mining leases and issue leases over appropriate areas.

(3) Adequate reserves of gravel should be set aside for future PWD use. There is no shortage of road gravel, but at present the PWD is forced to buy thousands of metres of concrete gravel, often from operators on Crown land.

(4) A more accurate geological survey of the area should be made, using a widespread drilling operation, to determine reserves available.

[21 December 1972]