

TR17-134-136

31. Marine seismic surveys, Triabunna.

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At the request of Gutteridge, Haskins and Davey consulting engineers to Fish Protein Concentrates (Tas.) Pty Ltd, Triabunna, a marine refraction seismic survey was undertaken in the area of the proposed wharf embankment adjacent to the Triabunna slipyard (seismic survey 1). A single spread was set out along the centre line of the proposed embankment up to 180 m from the shore.

After completion of the wharf embankment Gutteridge, Haskins and Davey on behalf of the same company, requested a further marine refraction seismic survey of their proposed wharf area (seismic spread 2). Three spreads were fired from this embankment covering the proposed wharf and caisson area. An additional fan spread was also fired (fig. 34).

The aim of the fan spread was to determine if the massive unweathered dolerite now exposed over approximately three-quarters of the quarry face, from which the material for the embankment was taken, underlies the proposed wharf area. Also, to determine if the area of deeply weathered and soft dolerite exposed in the western section of the quarry, was likely to be present as a zone in the wharf area.

SURVEY DETAILS

Seismic survey 1

Shot points were located at 30 m from either end of the geophone cable, two near the centre of the cable and one offset 45 m from the shore end of the cable. Shots were fired on the bay floor or at controlled depths in the water. The seismic velocities recorded were as follows:

Material	Velocity (m/s)
Water	1450
Silt	1800-2000 (max.)
Rock	6500-7000

Seismic survey 2

All shots were fired from the wharf embankment where the geophone cable was anchored. The other end of the cable was kept in position by a boat. On firing, the boat moved away and the cable was left to drift for a short period of time, but the geophone position shown in Figure 34 is considered reasonably accurate. In the fan and E-W spreads, the buoy, the position of which was known, was also used to anchor the geophone cable. The geophone interval was 15 m, but this interval was considered too great for the area investigated. No attempt was made to loop the cable and shorten this geophone distance because the cable would have been too difficult to tow and probably would have become entangled with boulders from the embankment.

Shots were fired in the middle and at both ends, at varying distances, for the two N-S spreads and the E-W spread. Two shots were fired in the fan spread off the edge of the embankment. In the shallow water at the northern end of the embankment, the shots were laid on the sea floor and in the deeper water, floated at a controlled depth.

After completion of the marine seismic survey, a 61 m E-W seismic spread was undertaken from the weathered zone exposed in the western end of

the quarry and slipway road. A Bison signal enhancement seismograph, Model 1570B, was used with readings taken at 1.5, 3 and 6 m intervals from both ends of the spread. This survey was undertaken to estimate the velocities of the weathered dolerite and the depth of weathering.

The seismic velocities recorded were as follows:

Spread	Layer	Velocity (m/s)
1	Surface	1300
	Bottom	5500-7000
2	Surface	1000-1070
	Bottom	4600-6100
3	Surface	1000-1070
	Bottom	4600-5500
Fan	Surface	1300
	Bottom	6100
Quarry	Surface	1000
	Bottom	4000-6000

GEOLOGICAL INTERPRETATION

Seismic survey 1

The very high velocity recorded for rock beneath the bay suggests that the dolerite extends seaward and is massive and unweathered. The overlying silt has a varying thickness and although complete details cannot be given beyond 60 m from the shore, the silt appears to thicken seaward to a maximum of about 6 m, approximately 90-100 m offshore. At 150 m offshore, the thickness appears to be of the order of 4-5 m. The velocities quoted for the bay floor silt material are maxima since it is difficult to determine the true velocity in the conditions prevailing in the region of this spread. The true velocity is probably about 1600 m/s.

There are also zones on the bay floor where the silt cover is very thin, for example, within the first 60 m from the shore and also at 170 m offshore. This feature could be due to either rising of the rock interface or windows in the silt cover.

Seismic survey 2

The upper layer of the marine spread with a velocity of 1000 m/s, is a combination of water and water saturated mud and silt. With the exception of two shots fired on the southern and eastern ends in Spreads 1 and 3 in deep water, an intermediate layer was recorded. This intermediate layer, with a velocity of 2000-2200 m/s, was recorded on one geophone. It possibly represents a sediment layer, less water saturated than in other areas, between the slow surface layer of 1000 m/s and the fast bottom layer of 4600-7000 m/s.

For the remainder of the shots, the upper layer has a calculated thickness of 6-9 m with a water depth varying from 1.5-7 m. The silts and muds do not appear to exceed 5 m and probably average less than 2 m in thickness.

The uniformly high velocities for the lower layer indicate that the area is underlain by dolerite. There is no evidence of weathering to any great depth or large weathered patches in the dolerite sea floor. The dolerite would be very similar in character to that exposed in the quarry face and on the shore platform.

The upper layer of the quarry spread, with a velocity of 1000 m/s, is considered to be the thin soil, clay and rubble layer capping the dolerite which is exposed in the cutting leading to the quarry. The depth of this surface layer was calculated to be 0.3-0.6 m.

The weathered and horizontally jointed dolerite gave an average velocity of 4000 m/s for the eastern end of the spread, but velocities of 6000 m/s were recorded for the western end of the spread. The interface of the two layers has a slope to the west and a shallowing to the east. The western velocity has a stepped profile generally associated with well jointed dolerite.

The spread confirms the appearance of this weathered dolerite as a deeper but locally more restricted zone associated with the concave section of the hill. No weathering occurs in the dolerite exposed in the shore platform area and in the thin zone exposed along the crest of the hill as seen in the quarry.

PHYSICAL INTERPRETATION

Seismic survey 1

The very high velocity recorded for rock beneath the bay suggests that the dolerite extends seaward and is massive and unweathered. The overlying silt has a varying thickness and although complete details cannot be given beyond 60 m from the shore, the silt appears to thicken seaward to a maximum of about 8 m, approximately 90-100 m offshore. At 150 m offshore, the thickness appears to be of the order of 4-5 m. The velocities quoted for the bay floor silt material are maxima since it is difficult to determine the true velocity in the conditions prevailing in the region of this spread. The true velocity is probably about 1800 m/s.

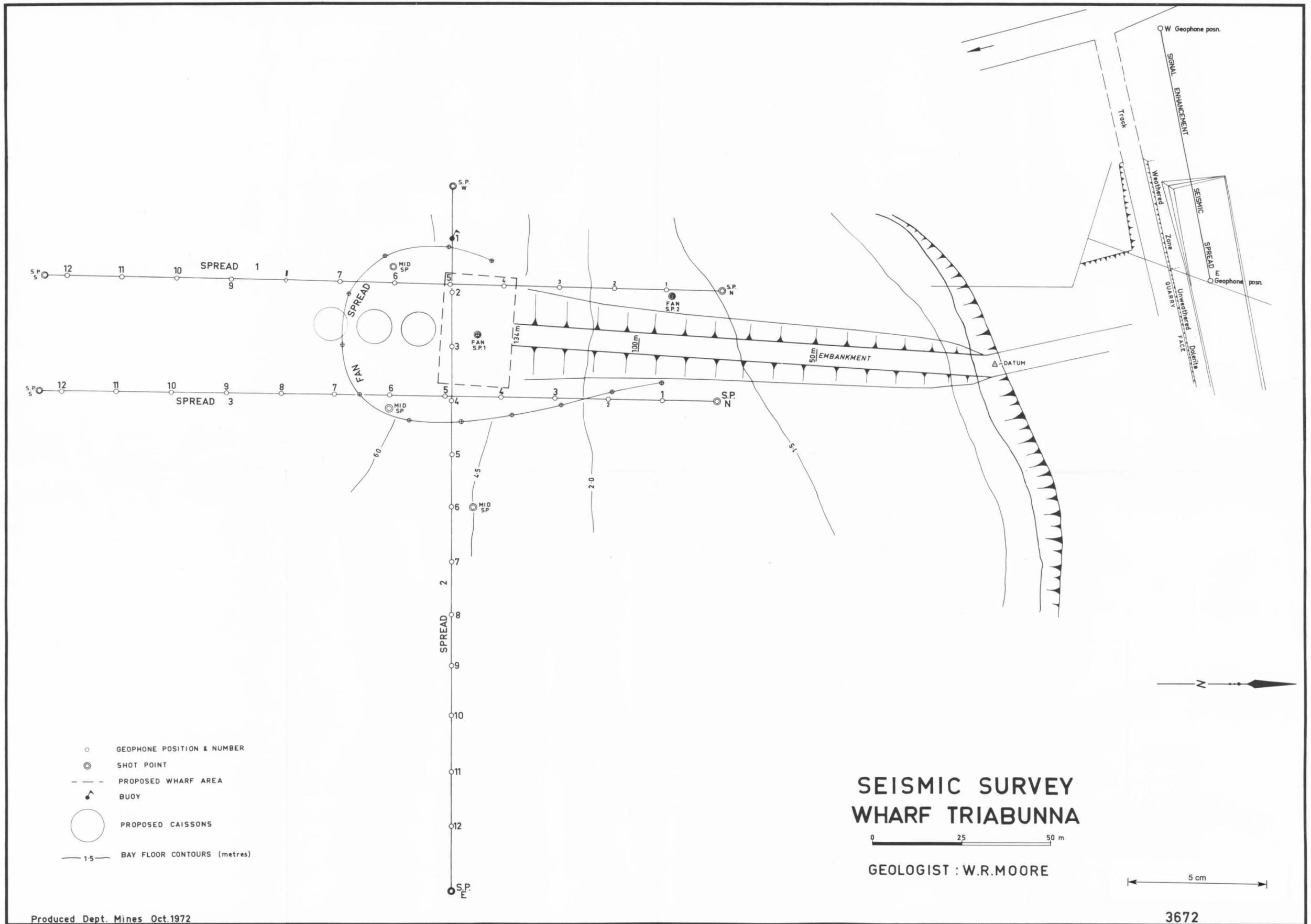
There are also zones on the bay floor where the silt cover is very thin. For example, within the first 50 m from the shore and also at 170 m offshore. This feature could be due to either being of the rock interface or windows in the silt cover.

Seismic survey 2

The upper layer of the marine spread with a velocity of 1000 m/s, is a combination of water and water saturated mud and silt. With the exception of two zones lined on the northern and eastern ends in spreads 1 and 2 in deep water, an intermediate layer was recorded. This intermediate layer with a velocity of 1000-1200 m/s, was recorded on one geophone. It possibly represents a sediment layer, less water saturated than in other areas, beneath the slow surface layer of 1000 m/s and the fast bottom layer of 4000-7000 m/s.

For the remainder of the spread, the upper layer has a calculated thickness of 0.3-0.6 m with a water depth varying from 1.5-2 m. The silt and mud do not appear to exceed 2 m and probably average less than 1 m in thickness.

The uniformly high velocities for the lower layer indicate that the area is underlain by dolerite. There is no evidence of weathering to any great depth or large weathered patches in the dolerite sea floor. The dolerite would be very similar in character to that exposed in the quarry face and on the shore platform.



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SEISMIC SURVEY WHARF TRIABUNNA

0 25 50 m

GEOLOGIST : W.R. MOORE

5 cm

3672

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Figure 34.