Investigation of timber mill sites near Scottsdale

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Abstract

New locations for timber mills and timber yards owned by G. & K. French Pty Ltd at Scottsdale and Ling Siding have to be found in the near future. A new type of mill saw recently installed at Ling Siding requires good foundations, preferably with the machine bed founded on competent rock. However the machine had to be founded on Tertiary clay underlain by deeply weathered decomposed granodiorite and foundation engineers cannot guarantee the machine bed foundation beyond five years. It was proposed to move both mills to a site on Allens Road, but foundation conditions similar to Ling Siding are indicated by resistivity and seismic investigations. Allens Road is situated near the Jetsonville lead, a buried valley on the western margin of the Scottsdale Tertiary basin.

Granodiorite areas west of Scottsdale, outside the Scottsdale Tertiary basin area, have been suggested as more likely to give bedrock close to the ground surface.

INTRODUCTION

G. & K. French's timber mill and yard has to be relocated from the centre of Scottsdale township. French's other mill, a pine and breaking-down mill, is located at Ling Siding [EQ459407] 3.5 km east of Scottsdale on the Tasman Highway and North Eastern railway line. This site is situated on Tertiary sediments which are likely to give foundation problems with new heavy milling machinery now being installed at this mill. A new complex is to be developed to replace both the Scottsdale and Ling Siding mills in the near future and the proposed site was at Allens Road [EQ390499], 3.5 km north-west of Jetsonville on the Bridport-Scottsdale road.

PREVIOUS INVESTIGATIONS AT LING SIDING

A new high speed, multi-blade breaking-down saw is being installed at the Ling Siding mill. This type of saw requires very stable foundations, preferably with the concrete machine bed founded on competent rock. As a previous groundwater investigation had been undertaken by the Department of Mines at the Ling Siding site (Moore, 1974*a*), the writer was asked to advise on the foundation conditions likely to be encountered.

From the groundwater seismic refraction survey, it was known that a north-south trending Tertiary lead or buried valley was situated at Ling Siding and that this valley connected the Tertiary sediments of the Scottsdale basin to the north with the smaller McKenzie River basin to the south. It was known that the valley was located on the eastern boundary of the mill site and it was suspected that it began to rise near the building in which the new machinery was to be installed. The anticipated depth of the Tertiary sediments was calculated at 7-14 m, with a thick zone of decomposed granite up to a calculated maximum thickness of 21 m. Therefore no bedrock foundation was likely. The resistivity survey also indicated a thin surface layer of grit and coarse sand underlain by clay.

A near-surface cemented zone or hard pan reported to have been encountered by a back hoe when investigating the foundations in the mill yard is thought to be a thin shallow iron pan, a cemented layer separating gravel from the underlying clay. No silcrete or ferricrete outcrops were observed in the vicinity of Ling Siding when the area was mapped.

It was recommended that drilling be undertaken and that the services of a reputable foundation engineer be sought to design a suitable raft foundation for the machine.

A hole was augered next to the building as close as possible to where the machine was to be located. This hole encountered up to 10 m of brown and buff clay and sandy clay. Only a thin superficial surface layer of cemented gravel was encountered. The clay was probably Tertiary in age; the decomposed granite layer was not reached. Water was encountered at approximately 10 m. A large concrete slab foundation was designed and built, but because of the incompetent Tertiary sediments it cannot be guaranteed to remain stable beyond five years. Therefore the Ling Siding site is not a viable long-term alternative site for the Scottsdale mill.

ALLENS ROAD SITE

An alternative site was available to G. & K. French along the southern side of Allens Road; this would be suitable as long as the depth to the granodiorite bedrock was shallow. The area had been regionally mapped as Tertiary sediment with a capping layer of ferricrete and basalt on the flat-topped ridge at the eastern end of Allens Road, (Marshall *et al.* 1965).

This area had also been geophysically investigated early in the groundwater investigation of the Scottsdale Tertiary basin. A series of long resistivity soundings were undertaken in this region from the granodiorite cropping out in the road cutting below Gillespie's Mill [EQ372522] and in Hurst Creek [EQ370495] to the basalt capped areas of Jetsonville (Marshall *et al.* 1965). These probes were undertaken to delimit the western edge of the Scottsdale basin and gave the first indication that a deep lead or buried valley might be present near the western margin of the basin. On the evidence of these probes, a water bore (number 4, Scottsdale drilling programme 1970-73) was drilled to 79 m immediately north of Jetson's farm road [EQ400483]; this encountered Tertiary sediment without reaching basement. This hole was redrilled with a diamond drill in 1977 to check the lithology of the sediments in Jetson's lead. 104 m of Tertiary clay and sand were recorded before the granodiorite basement was reached.

The Allens Road resistivity probe was 580 m long and extended from an area of red soil with large basalt boulders at the eastern end of the road [EQ394500] west to where the road crosses a small tributary of Hurst Creek [EQ388497]. No basement was seen in this probe, as with the other probes in the area. The readings in the medium and greater depths were widely scattered and problems were met balancing the resistivity meter during this probe. As this was the only probe in the area where these difficulties were experienced, it was thought that the erratic readings may have been caused by a strong slope on the sediments because of a rapidly rising basement towards the west. Magnetometer readings over the area mapped as basalt indicate that the basalt is not a continuous layer, but rather a series of isolated basalt boulders exposed on the ground surface.

Because of the possibility of a steep slope with the granodiorite shallowing to the west, a refraction spread was fired along Allens Road between the tributary of Hurst Creek and the Bridport-Scottsdale road west of the resistivity probe. This spread was 200 m long between shot points and used 12 geophones with a 15 m spacing. Three velocity layers were present with V_0 = 800-1000 m/s, V_1 = 1600 m/s and V_2 = 5000-8000 m/s. The calculated depth of the V_0/V_1 interface at the western end was 9 m with the V_1/V_2 interface at 14-18 m. At the eastern end, the V_0/V_1 interface was at 13 m with the V_1/V_2 interface at 17-23 m; both interfaces sloped 3-4°

towards the east. The upper interface corresponds with the water table in the Tertiary sediments while the lower interface is the Tertiary sediments and unweathered granite boundary. The presence of a weathered and decomposed granite layer is anticipated at the western end of the spread because of the stepped velocity when fired from this end. These depths were far in excess of those desired for the foundations of the machinery envisaged being used in the new mill.

A hammer refraction seismic survey was undertaken to check if a local hard pan layer (silcrete or ferricrete) existed in the upper levels of the Tertiary sediments above the water table. This spread was situated at the western end of the geophone line of the previous seismic survey. The hammer distance increments used were 3 m and 6 m with two geophones. A thin surface layer 0.5 m thick with V_0 = 180 m/s overlay a 1.8 to 2.4 m thick layer with V_1 = 670-750 m/s and a third layer with V_2 = 915-1000 m/s; these are normal velocities for Tertiary sediments above the water table. There is no seismic evidence for any thick hard pan in the upper surface layer of the Tertiary sediments at the Allens Road site. If a hard pan is present, it is unlikely that it is continuous or thick enough to bear the proposed loads.

CONCLUSIONS

The sediments and foundation conditions at the Allens Road site are similar to those for the existing mill at Ling Siding. The depth to bedrock, unweathered granodiorite, is also going to be of a similar order except that the depth is likely to increase rapidly east of the tributary of Hurst Creek.

RECOMMENDATIONS

The Allens Road site is unsuitable for use in the new milling complex in which shallow rock foundations are a pre-requisite.

Because of the problems existing at the Ling Siding site with foundations and likely to occur at Allens Road, the new mill site should be chosen outside the confines of the Scottsdale Tertiary basin and its associated Tertiary sediment areas. Areas where granodiorite frequently crops out, such as at West Scottsdale and along the North Eastern Line from Lietinna to Nabowla, are more likely to have granodiorite close to ground surface. Rock in such areas would be more suitable for the heavy and vibrational loads to be imposed on it rather than the grit, sand and clay of the Tertiary sediments.

It should be stressed that even in areas where granodiorite is exposed, the site should be investigated by geophysics and, if considered necessary, by confirmatory drilling before it is purchased. Areas of very narrow but deep Tertiary sediment and thick, deeply weathered granodiorite have been found geophysically and confirmed by drilling in areas mapped as granodiorite at Blumont (Moore, 1974*b*).

REFERENCES

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