

## 15. Examination of a landslide at Beauty Point

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The area involved is included in the zone of mass movement described in previous reports (Jennings, 1964 and Jennings, 1971). Properties numbered 78 to 90 Flinders Street were examined on 10 November, 1969. Other properties on both sides of Flinders Street are affected to a lesser extent.

### DESCRIPTION OF THE SLIP

The writer has had the opportunity to examine four other landslips in detail recently in the Tamar Valley. All have taken place in the plastic clays and sands of the Tertiary Launceston Beds, and all show features that are seen in the present Beauty Point slip, between Flinders Street and Kemps Parade.

The slope of the ground is of the order of  $12^{\circ}$ – $14^{\circ}$  and is convex. The houses are built on the flatter upper portion and the gardens fall steeply to the sea-shore road. The area has previously been affected by slips, so that the surface before the present movements was not a simple one.

The deformation of the ground is characteristic of Tamar Valley slips. The upper end of the slip is at about the level of Flinders Street and is somewhat ill-defined. It may be indicated by the small crack which has been repaired along the centreline of the road, but otherwise the road is little affected. The flatter part of the slope occupied by the road and footpaths has acted as a temporary barrier to movement although it should be noted that uphill from the road the property at 83 Flinders Street, which is on a steeper slope has moved in a slip which appears to be independent of that affecting the houses on the lower side of the road.

Further down the slope from Flinders Street, it is apparent that deformation has been principally a stretching of the ground in a direction tangential to or a little steeper than the slope. This has affected the houses by opening gaps in the lower corners of rooms and is most obvious in concrete paths laid directly down the slope. Cracks in the soil are no longer obvious but the concrete shows that the elongation is 5% to 10% of the ground under the houses.

In the steep back gardens of the houses in the centre of the slip area (numbers 80 to 86) tensional deformation gives way to predominantly vertical movement as the tangential movement passes into an area of steeper slopes. The slope is here 'stepped' in slices up to 60 cm high but generally about 30 cm. The stepping is caused when the tangential movement causes the surface soil to slide over the convex slope into a steeper region where it is less supported, and therefore drops under its own weight. A feature which is common in Tamar Valley slips but is otherwise rare in that occasional slices are squeezed upward. Surface run-off and sullage water readily collects between the slices and if not drained can maintain and even re-start movement. Water was present in some places where the slip was examined.

Further down the slope the mode of deformation changes again, and becomes a very steep bulge which at its lower limit either overturns the turf completely or breaks the surface allowing the plastic clay inside to flow stiffly down slope, around and between the trees and fence posts. Any originally upright object such as a tree or post is tilted downhill, and the whole mode of movement of the toe of the slip is demonstrated very clearly by the remains of flights of concrete or stone steps. It is noteworthy that the deeper rooted objects such as large trees are but little disturbed by the clay movement, while surface objects such as posts or slabs are tilted or overturned.

At no point has the slip reached the shore road, and the road itself has not been involved in any way, except that water from the slip has flowed on to it and still maintains permanent pools in hollows.

## CONCLUSIONS

The slip shows few of the characteristics of a classic rotational slip (Terzaghi and Peck, 1968) and appears to be a form of slip and has been described as a slow earth flow (Eckel, E.B. (ed.), 1958). Features are present that make the Tamar Valley type slip distinctly different from any that have been described elsewhere. It appears, but remains to be proved, that the material in movement does not extend to any great depth and that it moves as a blanket over a surface which is more or less parallel to the original surface of the ground. This would explain why tangential tension predominates in the upper part of the slip for the blanket of material stretches under its own weight. The toe end piles up as it encounters friction at the foot of the slope. The clays are very absorbent and little liquid water is available to flow from the mass except near the toe where it may be squeezed out by compression. Mud springs are sometimes seen but are not present in the Beauty Point slip.

The blanket slide nature of the Lawrence Vale landslip in Launceston was recently observed during the construction of remedial drains but even here is only indicated and should not be taken as proved. Both this and the Beauty Point slip have many features in common.

Sloping ground and the presence of water are necessary for the initiation of landslips in unconsolidated clays. The presence of clays and of a slope are virtually immutable but the presence of water is at least partially under control. The winter rainfall has been above average in the central north of the State in 1968 and 1969 and this may account in some way for the several slips, but a potent factor has been the local drainage practices. Stormwater soakways and septic tank soakways introduce large quantities of water into the ground continually and this, when added to the natural rainfall may be sufficient to initiate slipping.

In summary, the Beauty Point landslip of this report appears to be of a shallow blanket slide type, and has been caused by the access of surface water partly due to unsound drainage methods and partly to abundant natural rainfall.

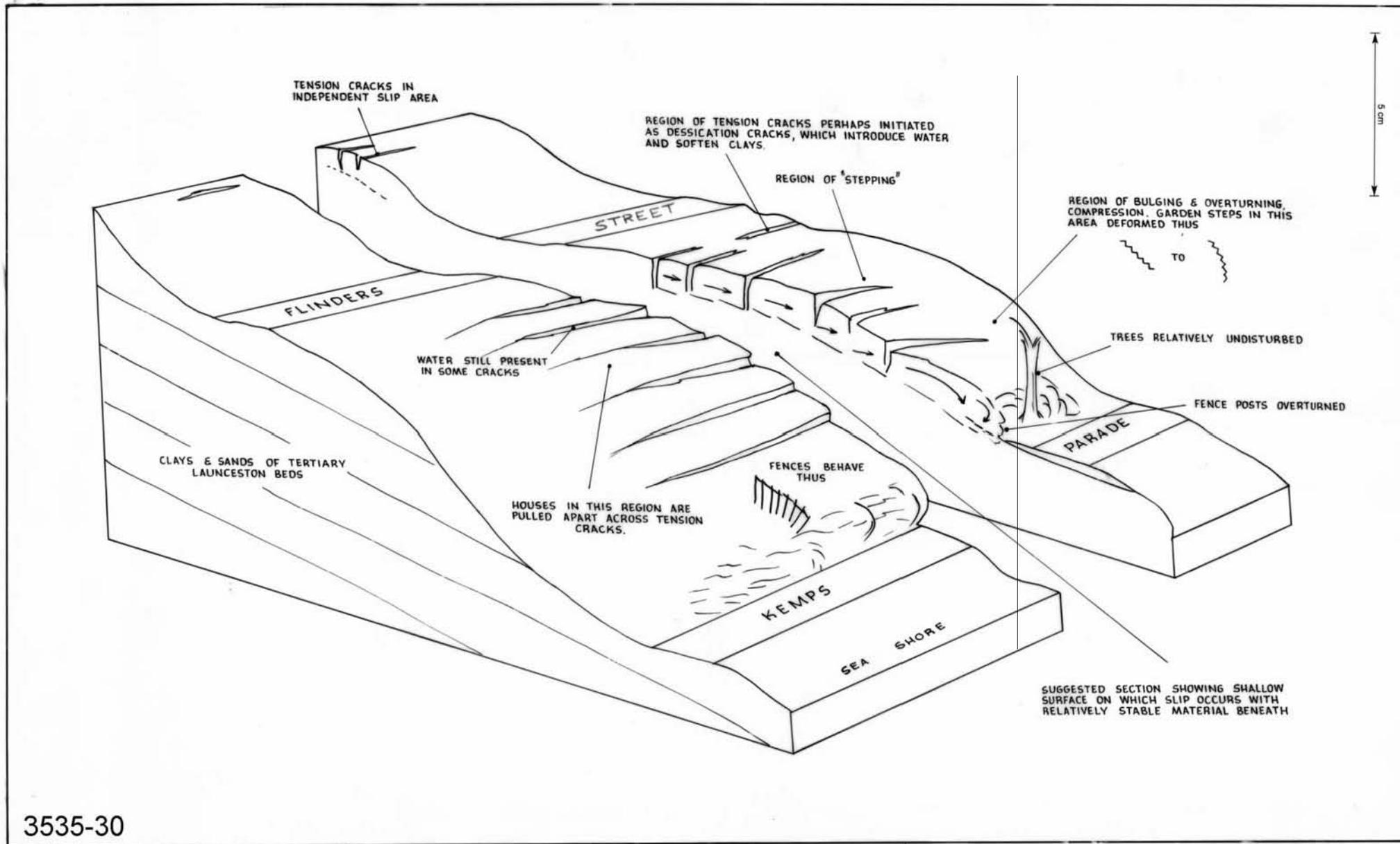
## RECOMMENDATIONS

The shallow blanket slide nature of the slip is as yet unproved, but if true means that remedial or palliative measures may be possible. It is therefore necessary to investigate the slip so as to reveal its true nature. Such discoveries as are made will be of use in future slips because of the essential similarity of many slips in the Tamar Valley. The investigation should consist of drilling, sampling and determination of soil mechanics properties.

At the same time immediate measures should be taken to prevent unnatural access of water to the area. This should include replacement of stormwater soakways by plastic pipes to carry the water clear of the slip, piping of septic tank effluent clear of the slip, sealing the stormwater ditches with bitumen or polythene to prevent water reaching the slip area and the eventual replacement of all pipes carrying water with pipes sufficiently flexible in themselves to accommodate inevitable small ground movements.

## REFERENCES

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