

Stability of land owned by the Roman Catholic Church, Preservation Bay, Penguin.

W.L. Matthews

Land owned by the Roman Catholic Church at Preservation Bay has been examined from a stability aspect in 1964 (Matthews, 1964) and again in 1971 (Elmer, 1971). As an aid to determining the feasibility of a proposed subdivision of the land, it was suggested that some test pits be dug with a back hoe.

GEOLOGY AND RELIEF

The geology of the area has been described in previous reports. At least two Tertiary basalt flows are separated by Tertiary beds of gravel, sand and clay. Around the foreshore at Preservation Bay are recent sediments consisting mainly of sand.

The recent sediments underlie a narrow flat forming a marine terrace. Behind this terrace the land surface rises fairly gently at first at most locations but steepens to slopes which have angles up to about 30°. These steeper slopes rise to a level of about 250-300 ft above sea level and then the land surface flattens again.

LAND STABILITY

The report of 1964 outlined three zones in the Preservation Bay area:

- (1) A zone of active slips where development should be restricted.
- (2) A zone where instability could develop if certain precautions are not taken.
- (3) A zone which could be activated by excessive removal of material from the toe area and poor drainage practices in the heel area. Otherwise this zone should remain stable.

Active slips occur around the face of the steeper sloping land and are extending back in a southerly direction to involve the flatter land on top of the slope. This process of eating back will probably be a continuing feature.

Seepages are a common feature around the steep slopes and one large seepage or group of seepages that collect around the centre of the boundary of Lots 6 and 7 deliver several thousand gallons per hour. Much greater flows can be expected after heavy rain, there being little rain for several months previous to the inspection.

The prevalence of active and recently active slips around the face of the steep slopes indicates that any attempt to develop these areas would be extremely risky as further movements can be expected. A zone in front of the steeper areas should also be regarded as having some risk of being affected by slips developing on the steep slopes. A small flat area occurs on the south of Lots 3 and 4. This is a very narrow area and part of it could be affected by the backward movement of slips that are likely to occur in the future. Probably only the rear 150 ft of Lot 4 could be regarded as having a reasonable chance of being unaffected by future slips. Taking the steep slopes and a zone in front of them into consideration, there are definite risks in developing any part of Lots 1, 2 and 3 and only a small part of Lot 4 could be developed without undue risk.

TEST PITS

The gentler sloping land in front of the steep slopes were regarded as being possibly suitable for subdivision and it was in this area that the test pits were sited to examine the underlying material. On the northern part of Lots 5 and 6 are slightly steeper sloping zones, the angle being some $7\frac{1}{2}$ - 10° and 10° - 15° respectively. These areas have been marked on the accompanying plan (fig. 1).

The materials encountered in the test pits are given below.

Test Pit 1

Depth (ft)	Description
0-1	Soil.
1-3	Brown clay with basalt boulders.
3-9	Grey and brown clay with some basalt boulders up to 1 ft 6 in (clay slightly damp).

Test Pit 2

Depth (ft)	Description
0-1	Soil.
1-5	Brown clay with occasional small unweathered basalt fragments.
5-10	Brown clay with a crumb structure showing many slip surfaces. Possibly some <i>in situ</i> basalt (clay is damp).

Test Pit 3

Depth (ft)	Description
0-2	Soil.
2-10	Brown and grey crumbly clay, often with very occasional unweathered pieces of basalt. Slip surfaces in clay towards bottom of hole (much of section is damp clay).

Test Pit 4

Depth (ft)	Description
0-1.5	Soil.
1.5-9.5	Grey and brown clay with a crumb structure and very occasional small unweathered fragments of basalt (small springs of water at about 5 ft from the surface).

Test Pit 5

Depth (ft)	Description
0-1	Soil.
1-10	Weathered <i>in situ</i> basalt(?) with a crumbly structure in clay areas near the bottom of hole (moist at bottom of hole).

Test Pit 6

Depth (ft)	Description
0-1	Soil.
1-5	Brown crumbly clay.
5-10	Grey and brown plastic clay with occasional un-weathered basalt fragments (water entering about 3 in from bottom).

All the holes struck clay with some weathered basalt. The clay is derived from weathering of the basalt and some of it has accumulated as a result of slip material from the steeper slopes extending on to the lower sloping areas and also from *in situ* weathering of the basalt. In most of the pits the basalt has been so altered that there is no recognisable basalt texture remaining in the clay. Test Pit 5 encountered material which is less weathered and some texture remains. The slightly less weathered nature of the basalt in this area could account partly for steeper slopes in the vicinity of Pit 5. Numerous small slip planes can be seen in some of the clay. It is likely that these formed as a result of compaction following the deep weathering of the basalt although it is also possible that some are associated with old slips.

With poor drainage and excavation practices it is possible that slips could develop on the two relatively steep areas marked on the plan. These steeper areas are on Lots 5 and 6 and to be reasonably safe from the effects of any instability that could develop, it is suggested that development be restricted in these areas.

The numerous seepages that occur in the area should be drained so that the water is conducted away as quickly as possible and not allowed to percolate back into the soil. This in particular refers to the large seepage which has been dammed near the junction of Lots 6 and 7.

CONCLUSIONS

Because of the steepness and the presence of recent slips on the slopes, development of Lots 1, 2 and 3 is not recommended and only the southern part of Lot 4 should be developed.

There is some risk of instability developing on steeper areas of Lots 5 and 6 if poor drainage and excavation methods are used and development on these areas should be avoided.

Seepages should be drained if development of any part of the proposed subdivision proceeds.

REFERENCES

ELMER, S. 1971. Slope stability of Preservation Bay. *Unpubl. Rep. Dep. Mines Tasm.* 1971.

MATTHEWS, W.L. 1964. Geology of the Penguin area. *Tech. Rep. Dep. Mines Tasm.* 9:96-101.

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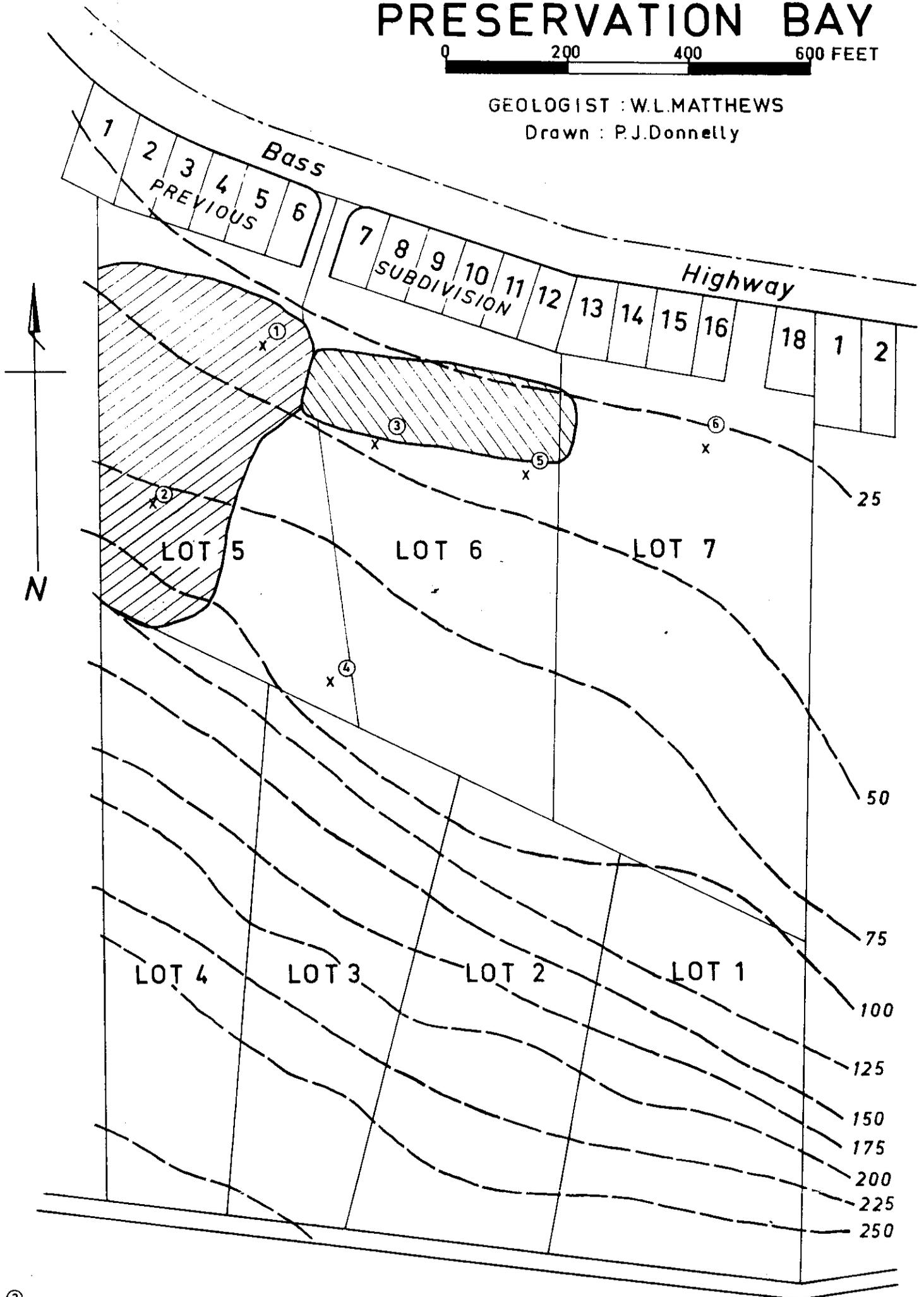
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PROPOSED SUBDIVISION PRESERVATION BAY

0 200 400 600 FEET

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- TEST PITS APPROXIMATE POSITION
- AREA WITH SLOPE OF ABOUT 7 1/2° - 10°
- AREA WITH SLOPE OF ABOUT 10° - 15°

Figure 1.