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Tasmania Department Of Mines — Report 1992/15

Examination of land at Louden Street, South Hobart

by B. D. Weldon

Abstract

Steep land in Louden Street, South Hobart is underlain by Triassic age siltstone and sandstone sediments and Jurassic age dolerite. The bedrock occurs at variable depth and is overlain by clayey soils which are sandy or gravelly in places. Development of the land for domestic purposes is considered possible provided all structures have footings keyed into competent bedrock, and all excavations and fills are properly designed, engineered and constructed.

INTRODUCTION

The owner of land in Louden Street, South Hobart requested an assessment of the property with regard to potential housing development. The property encompasses four building allotments. The land is steep and has been largely cleared of natural vegetation. A series of test pits were recommended to assess subsurface conditions.

GEOLOGY

Jurassic age dolerite crops out in road cuttings on the upslope side of Louden Street opposite the property under consideration. Triassic age siltstone and sandstone crops out in road cuttings towards the end of Louden Street; and Triassic age sandstone crops out in cliffs between Syme and Tara Streets southeast of the property under consideration. The soils exposed near Louden Street are doleritic but show traces of sand.

TEST PITS

Six test pits were excavated by a Kubota KH-151 tracked mini-excavator at the approximate locations shown schematically in Figure 1. The engineering logs are presented in Appendix 1.

The test pits indicate that bedrock was encountered at 1.5, 1.1, 1.9, 2.0, 2.0, and 0.9 m depth in test pits 1 to 6 respectively. The bedrock is variably weathered from highly – extremely weathered in test pit 6, where it has soil-like properties; to slightly–moderately weathered in test pit 1, where it is competent rock. The bedding in the Triassic age sediments is variable but usually with a shallow dip component out of the slope.

The weathered bedrock is overlain by firm to hard clayey soil layers, some with sand and gravel. Near Louden Street, these soil layers are derived largely from the weathering of dolerite. Further downslope, the soil usually consists of an upper layer derived from the weathering and erosion of dolerite, underlain by soil layers derived from the weathering of siltstone and sandstone. An intrusion of dolerite occurs between 2.0 and 2.4 m depth in test pit 5. A firm to stiff, silty clay layer occurs between 0.7 and 0.8 m depth in this pit. This layer contains lumps of charcoal. It appears to be the original topsoil which has been buried by fill, perhaps at the time of constructing Louden Street.

ASSESSMENT

The property is covered by predominantly clayey soils which vary considerably in thickness. Some sandy and gravelly soils are present. In places these have the potential to act as aquifers (i.e. a conduit for groundwater) which could soften the clayey soil layers and lead to a reduction in their strength. For this reason, cautious development of the site is advocated.

Any permanent excavation should be retained by a properly designed, engineered and constructed retaining wall which is properly drained. Areas where permanent filling is to be placed should be properly prepared by removing the topsoil and placing the filling in layers onto benches cut along the slope. The fill should be placed in layers which are properly compacted to achieve maximum density. If wet or poorly drained areas are encountered where fill is to be placed, the materials in these areas should be removed, drains provided and more competent fill materials imported if necessary.

As previously mentioned, the bedrock has a dip component out of the slope and for this reason all structures on the property should have their foundations keyed into competent bedrock rather than resting on the surface of the bedrock.

Pole-frame style housing, with poles keyed into the bedrock, appears to be most appropriate for this steep property.

CONCLUSIONS

This rather steep property is underlain by sandstone and dolerite bedrock. The depth to bedrock varies considerably, with the bedrock occuring between 0.9 and 2.0 m depth in the test pits excavated. The weathering state of the bedrock exposed by the test pits also varied considerably from

extremely weathered, soil-like materials to slightly weathered, jointed and bedded, competent rock.

The materials overlying the bedrock are generally considered to have sufficient bearing capacity for domestic buildings. However the steep slope, the presence of materials which are potential aquifers, combined with the presence of clayey materials which could be softened by the addition of water, and the component of dip in the bedrock out of the slope, all necessitate a cautious approach to development of the property. All structures should have footings keyed into the bedrock. All excavations should be retained by a properly designed, engineered, constructed and drained retaining wall. All fillings should be placed on properly prepared ground and properly compacted. Under-drainage of fills may be necessary.

Provided the precautions mentioned above are strictly adhered to, development of the property in the vicinity of the area investigated by test pitting should not result in a change to the present stability of the slope. The property is large, covering four building allotments, and obviously if during development, either in the vicinity of the test pits or elsewhere on the property, subsurface conditions vary considerably from those derived from this assessment, a re-examination will be necessary.

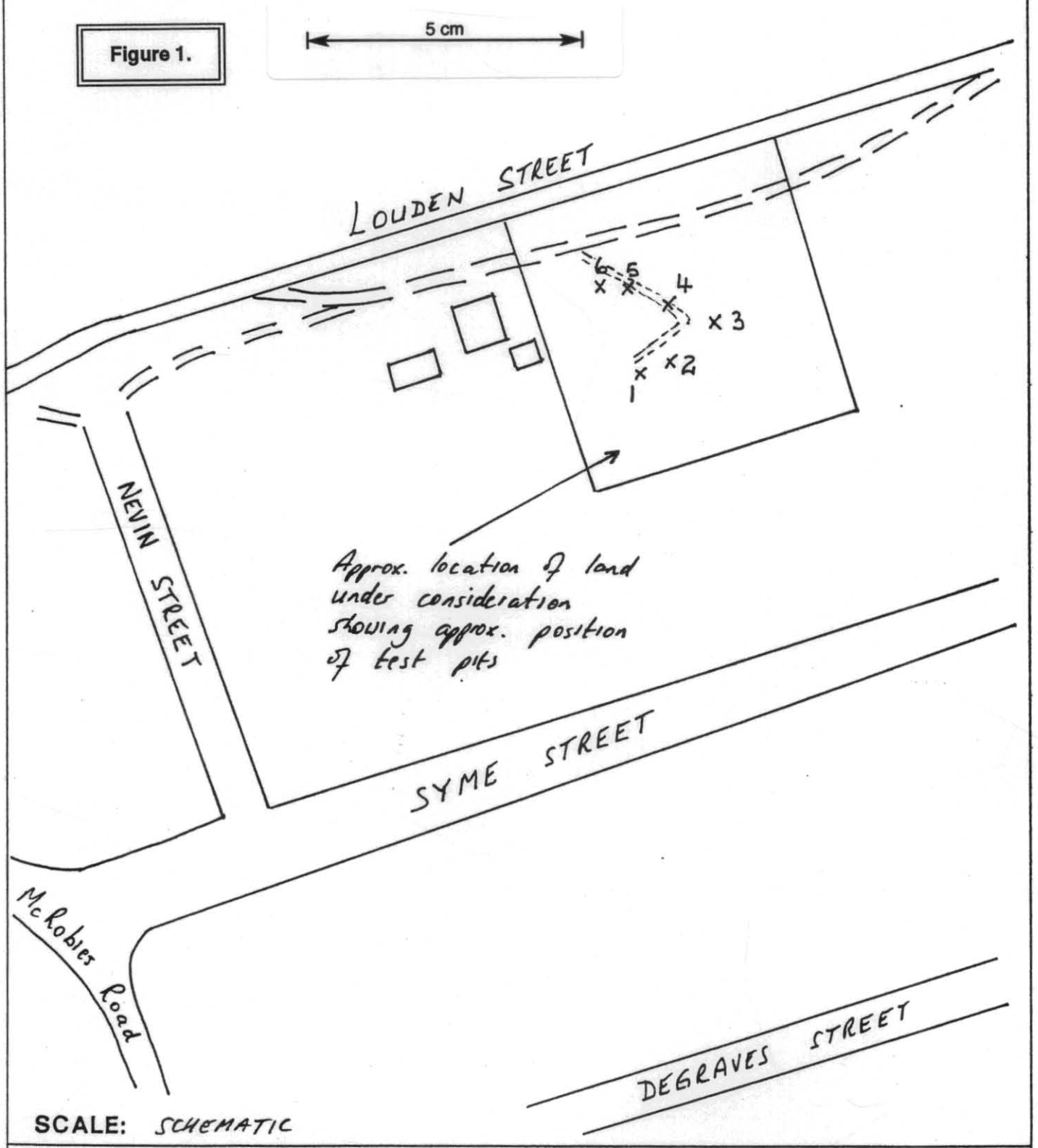
[27 May 1992]

TASMANIA DEPARTMENT OF MINES

SITE PLAN

OWNER: C RIDGEWAY STREET/ROAD: LOUDEN ST GEOLOGIST: SDW
SUBURB: STH HOBART TOWN/CITY: DATE:

Figure 1.



SCALE: SCHEMATIC

- Convex break of slope (profile form:)
- Concave break in slope (profile form:)
- Ridge crest
- Gully
- Suitable area for building
- Suitable area for septic outfall
- 16° Slope angle and direction

4/10

APPENDIX 1

Engineering logs of excavations

5/10

5 cm

DEPARTMENT OF MINES

ENGINEERING LOG - EXCAVATION

excavation no: 1

sheet 1 of 1

project **C RIDGEWAY** location **LOUDEN ST - SOUTH HOBART**

co-ordinates

R.L.

excavation dimensions

exposure type **TEST PIT**

equipment **KUBOTA KH-151**

operator

pit commenced **15-5-92**

pit completed **15-5-92**

logged by **B WELDON**

checked by

penetration 1 2 3	support	water	notes samples, tests	metres R.L. / depth	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components	moisture condition	consistency density index	hand penetrometer kPa (25 50 100 200 400)	structure, geology
	NIL			0.40		CH	CLAY: dark brown, silty, organic topsoil; roots, rootlets; high plasticity, moisture content greater than plastic limit.	M	F		
				0.90		CH	CLAY: light brown - fawn, high plasticity, moisture content greater than plastic limit, roots, rootlets	M	F-St		
				1.50		GC	GRAVELLY CLAY: light brown - fawn - orange, high plasticity, moisture content near plastic limit; medium to coarse size, sub-angular siltstone gravel; becoming CLAYEY GRAVEL with depth.	M	St		
				2.00			SILTSTONE: brown, moderately weathered siltstone; variably jointed.				Clay infill on sub-vertical and sub-horizontal defects (bedding planes and joints)
				2.20			SANDSTONE: brown-grey, slightly to moderately weathered, fine grained sandstone.				Bedding: 218/18, 173/11, 182/18

6/10

5 cm

DEPARTMENT OF MINES

ENGINEERING LOG - EXCAVATION

excavation no: 2

sheet 1 of 1

project **C RIDGEWAY** location **LOUDEN ST - SOUTH HOBART**

co-ordinates

R.L.

excavation dimensions

exposure type **TEST PIT**

equipment **KUBOTA KH-151**

operator

pit commenced **15-5-92**

pit completed **15-5-92**

logged by **B WELDON**

checked by

penetration 1 2 3	support	water	notes samples, tests	metres R.L. / depth	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components	moisture condition	consistency density index	hand penetrometer kPa (25 50 100 200 400)	structure, geology
	NIL			0.20		CH	CLAY: dark brown - black, high plasticity, organic clay with roots and rootlets. Moisture content greater than plastic limit, some fine - medium size gravel.	M	F		
				0.40		CH	CLAY: medium brown, high plasticity clay; MC >> PL; some fine - medium size, sub-angular siltstone and dolerite gravel.	M	St		
				0.90		SC	SANDY CLAY: light brown - fawn - orange, medium to high plasticity; moisture content greater than plastic limit (MC > PL); some fine - medium size, sub-angular siltstone gravel; sandy fines becoming more dominant with depth.	M	St		
				1.10		SC	SANDY CLAY - CLAYEY SAND: light brown - fawn, medium plasticity; MC > PL; boulders of highly weathered, sub-angular sandstone to 200mm diameter.	M	St-VSt		
				1.30			SILTSTONE: brown, moderately weathered, jointed siltstone bedrock.				Bedding: 136/06

7/10

5 cm

DEPARTMENT OF MINES

ENGINEERING LOG - EXCAVATION

excavation no: 3

sheet 1 of 1

project **C RIDGEWAY** location **LOUDEN ST - SOUTH HOBART**

co-ordinates

R.L.

excavation dimensions

exposure type **TEST PIT**

equipment **KUBOTA KH-151**

operator

pit commenced **15-5-92**

pit completed **15-5-92**

logged by **B WELDON**

checked by

penetration 1 2 3	support	water	notes samples, tests	metres R.L. / depth	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components	moisture condition	consistency density index	hand penetrometer kPa (25 50 100 200 400)	structure, geology
	NIL			0.30		CH	CLAY: dark brown - black, high plasticity organic clay; moisture content much greater than plastic limit; roots, rootlets.	M	F-St		
				0.60		CH	CLAY: dark brown, high plasticity; moisture content less than plastic limit; roots, rootlets	M	St-VSt		
				1.00		CH	CLAY: dark brown - light brown, high plasticity; moisture content greater than plastic limit; some sub-angular dolerite boulders to 300 mm diameter.	M	St		
				1.90		SC	SANDY CLAY: light brown - fawn, medium plasticity; moisture content greater than plastic limit; fine sand, slightly cemented in places (possibly highly to extremely weathered siltstone/sandstone boulder remnants).	M	VSt		
				2.20			SILTSTONE: brown - dark brown, closely bedded.				

8/10

DEPARTMENT OF MINES

5 cm

excavation no: 4

sheet 1 of 1

ENGINEERING LOG - EXCAVATION

project **C RIDGEWAY** location **LOUDEN ST - SOUTH HOBART**

co-ordinates

R.L.

excavation dimensions

exposure type **TEST PIT**

equipment **KUBOTA KH-151**

operator

pit commenced **15-5-92**

pit completed **15-5-92**

logged by **B WELDON**

checked by

penetration 1 2 3	support	water	notes samples, tests	metres R.L. / depth	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components	moisture condition	consistency density index	hand penetrometer kPa (25 50 100 200 400)	structure, geology
	NIL			0.15		CL-CH	SILTY CLAY: dark brown - black, medium plasticity; MC >> PL	M	St		
				0.30		CH	CLAY: dark brown, high plasaticity; MC >> PL; some fine-med size gravel.	M	VSt		
				0.70		CH	CLAY: brown, medium plasticity; MC near PL; sandy in places; some fine - medium size dolerite and siltstone gravel; roots, rootlets	M	H		
				1.20		SC	SANDY CLAY: light brown - fawn, medium - high plasticity; MC >> PL; fine grained sand; roots, rootlets.	M	St-VSt		
				2.00		GC	CLAYEY GRAVEL: light brown - fawn - light grey, medium - high plasticity; fine - medium size, sub-angular siltstone and sandstone gravel.	M	H		
				2.30			SILTSTONE: brown - grey, some fine grained sandstone.				

9/10

5 cm

DEPARTMENT OF MINES

ENGINEERING LOG - EXCAVATION

excavation no: 5

sheet 1 of 1

project **C RIDGEWAY** location **LOUDEN ST - SOUTH HOBART**

co-ordinates

R.L.

excavation dimensions

exposure type **TEST PIT**

equipment **KUBOTA KH-151**

operator

pit commenced **15-5-92**

pit completed **15-5-92**

logged by **B WELDON**

checked by

penetration 1 2 3	support	water	notes samples, tests	metres R.L. / depth	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components	moisture condition	consistency density index	hand penetrometer kPa (25 50 100 200 400)	structure, geology
	NIL			0.15		CL-CH	SILTY CLAY: dark brown - black, medium plasticity; MC > PL; roots, rootlets	M	St		? FILL ? top 0.7m appears to be old fill materials.
				0.30		CH	CLAY: dark brown, high plasticity; MC near PL; some fine size gravel	M	St		
				0.70		SC	SANDY CLAY: light brown, medium plasticity; moisture content near plastic limit; fine size sand.	M	St		
				0.80		CL-CH	SILTY CLAY: dark brown - black, organics, charcoal; some gravel	M	F-St		
				1.20		GC	GRAVELLY CLAY: dark brown - red, medium plasticity; moisture content near plastic limit; some fine - medium size, sub-angular, moderately weathered dolerite gravel.	M	VSt		
				2.00		SC	SANDY CLAY: light brown - orange - yellow, medium plasticity; moisture content greater than plastic limit; fine size sand.	M	VSt		
				2.40			DOLERITE: orange - brown, closely jointed, fine grained, variably weathered dolerite intrusion				
				2.90			SILTSTONE: yellow - brown, highly to extremely weathered (in places to a CLAYEY SAND) siltstone; some sandstone, partially indurated.				

10/10

5 cm

DEPARTMENT OF MINES

ENGINEERING LOG - EXCAVATION

excavation no: 6

sheet 1 of 1

project **C RIDGEWAY** location **LOUDEN ST - SOUTH HOBART**

co-ordinates

R.L.

excavation dimensions

exposure type **TEST PIT**

equipment **KUBOTA KH-151**

operator

pit commenced **15-5-92**

pit completed **15-5-92**

logged by **B WELDON**

checked by

penetration 1 2 3	support	water	notes samples, tests	metres R.L. / depth	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components	moisture condition	consistency density index	hand penetrometer kPa 25 50 100 200 400	structure, geology
	NIL			0.10		CL-CH	SILTY CLAY: black, medium plasticity; MC near PL; doleritic	M	F-St		
				0.40		CL-CH	SILTY CLAY: dark grey, medium - low plasticity; moisture content near plastic limit; organics - charcoal, roots, rootlets; some fine - medium size, sub-angular, moderately weathered dolerite gravel.	M	St		
				0.90		CH	CLAY: light brown - fawn, medium - high plasticity; moisture content near plastic limit; some medium size, sub-angular, moderately weathered dolerite gravel.	M	St-VSt		
				1.50		SC	SANDY CLAY: light brown - fawn, medium plasticity; moisture content near plastic limit; friable, in-situ weathered siltstone and sandstone, indurated in places.	M	VSt		