LAUNCESTON URBAN MAPPING PROJECT
TASMANIAN GEOLOGICAL SURVEY
MINERAL RESOURCES TASMANIA

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LAUNCESTON - ENGINEERING GEOLOGY LEGEND

MINERAL RESOURCES TASMANIA
Tasmania
DEPARTMENT of INFRASTRUCTURE ENERGY and RESOURCES

Era	Unit Description		Soil Description	Unified Soil Classification		Soil Thickness (m)	Atterberg Limits								Emerson No			Strength Parameters					Consistency	Hazards	Hydrological Conditions	Potential Economic Resources
							Liquid Limit %			Plasticity Index		Linear Shrinkage %														
				Major	Minor		n	Range	75%	Range	75%	n	Range	75%	n	Range	75%	n	c (kPa)	75%	phi (degrees)	75%				
POORLY LITHIFIED ROCKS AND DEPOSITS																										
Quaternary	Undifferentiated alluvial, estuarine, slope and aeolian deposits		Clay, silt, sand and gravel mixtures	CH ML GC																						
	Foreshore and shallowly submerged estuarine deposits		Silt, mud, sand and gravel - loose	MH ML CH SC	GP GW SW																		VS - S	High settlement potential, landslip risk on embankments	Often saturated, submerged or reclaimed land with aquifer links to tidal water	Dredged silt-fill material
	Alluvial, estuarine, deltaic, and swamp deposits - along major water courses		Silt, mud, sand, gravel and organic layers	CH OH MH SC	GP GW SW CL - CH	5 - 30	22	33- 185	64- 157	22- 121	52- 107		9 - 29	18 - 27				21 8	3.4 - 60 0 - 23	9 - 55 0 - 52	0 - 21 5.6-21.5	3 - 8* 17- 21**	S - H	Flood prone, settlement potential high, landslip risk on embankments	Potential to flood locally, poor drainage, high water table	Clay and gravel fill material
	Undifferentiated alluvial estuarine and associated deposits		Silt, sand, gravel and mud																							
	Alluvium associated with minor streams		Silty sandy clay, gravel, mud, organic layers	CL - CH	OH GC SC	1.5 - 3	4	43- 104		24 - 81			11 - 25		2	5								Flood prone, erosion prone, stream bank collapse, high settlement potential	Potential to flood, shallow water table, gravel, sand, silt aquifers locally	Clay and possibly gravel fill material
	Low terrace and fan deposits - estuarine and major valleys		Clayey gravel, gravelly clay, silty and sandy clay	CH SC GC	SW GW CL - CH	1 - 5	6	37- 123		14 - 92			7 - 23		3	1		9	9 - 120	40 - 85	2 - 10	4 - 9*	F - VSt	Subject to waterlogging	Potential for poor drainage on flat land	Clay and possibly gravel fill material
	Aeolian sand, localised slope deposits of sand		Sandy clay, clayey sand	SC CH	SW ML CL - CH	0.5 - 3		25- 123	37 - 87	4- 108	17 - 60		11- 26		1	1?							VS - F	Erosion prone, landslip	Well drained on slopes	Sand (probably poor quality), clayey sand
	Talus and slope deposits derived from Cainozoic sediments		Sandy silty clay, boulders	CH	ML - MH SC GW GP		6	62- 150		40- 118			16 - 28											Landslip, reactive soil, erodible	Irregular aquifers, variable drainage conditions, surface ponding	Gravel and clayey gravel fill material
	Talus and slope deposits derived from basalt and dolerite		Boulders of basalt and dolerite in clayey gravel matrix	CH GC MH	ML - MH GP	1 - 10 rarely 20	17	67- 174	88- 157	41- 137			15 - 29	20 - 28	1	5								Landslip, boulder instability, reactive soil	Irregular aquifers variable drainage, surface ponding	Gravel and clayey gravel fill material
Quaternary? - Tertiary?	Terrace deposits of major streams 10-70m above local base level		Sandy silty clay, silty clayey sand, sandy gravel, cobbles boulders	CH SC GC	ML SW GW CL - CH	1 - 10		33- 185	44- 153	11- 152	32- 123		4 - 30	15 - 27	4	2 - 6	6	19	48 - 480	69 - 165	0 - 26	0 - 13*	S - VSt	Landslip risk at terrace edge, reactive soils, low cohesion silt soils	Variable drainage, gravel, sand silt aquifers	Gravel, sand silt and clay fill material
	Sub terrace soil (not depicted on map)		Clay, sandy clay, clayey sand	CH			48	33- 185	64- 157	10- 152	36- 137	48	4 - 32	15 - 27												
Tertiary	Ferricrete, laterite, bauxite zones cemented and soft layers locally		Clay to gravelly clay, gravel, silt	CH GC	ML GP CL - CH CL	2 - 7	14	65- 138	72- 137	31- 108	35 - 93	14	14 - 26	15 - 26									S - F dense	Reactive soil	Good surface drainage on slopes. Impeded subsurface drainage	Bauxite, ferruginous gravel, soft stone, kaolinite
			Associated clay horizons (not depicted on map)				38	64- 168	74- 145	44- 134	48- 109	31	14 - 27	16 - 25												
	Thick fluvio-lacustrine deposits, mudstone and sandstone, overconsolidated (not including dolerite derived sandstone)		Clay, silt, sand and gravel mixtures, organic layers	CH SC		10- 200	295	25- 460	63- 148	3 - 413	16-115	295	2 - 32	15 - 26	50	1 - 6	5 - 6	59 25	0 - 27 15 -192	2 - 13 18- 140	7 - 30 3 - 30	10-22*** 4 - 23*	F - VSt	Landslip, reactive soil, low cohesion silt soils	Generally poor subsurface drainage. Sandstone beds may have low permeability. Some highly permeable quartz sand beds, springs. Variable salinity	Ceramic clay, clay fill, smectite, lignite, brown coal, groundwater
	Lignite and carbonaceous mudstone (not depicted on map)		Lignite and carbonaceous mudstone	Pt OH	CH	0.5 - 2	9	99- 169	104-140	56- 132	56-108	9	17 - 26	17 - 22				8	42- 371	79- 234	0 - 34	0- 24***			Often water bearing	
	Interbedded siliceous sand-stone, conglomerate and mudstone		Silty, sandy and gravelly clay, cemented gravel	CH M - MH SC GC	GP	0.5- 10	8	64- 168	66- 115	44- 134	46 - 86	8	15 - 27	16 - 25										Reactive soil may occur locally	Some beds highly perm-eable. Surface often well drained, potential for springs	Siliceous gravel, minor ferruginous gravel
POORLY LITHIFIED TO CEMENTED UNITS																										
Tertiary	Dolerite conglomerate		Gravelly clay, gravel, cemented gravel, silty sandy clay	GC GW CH	SC MH ML MH	0.5 - 2+	14	37- 176	70- 162	19- 143	36- 128	14	16 - 27	18 - 26									VSt - H	Reactive soil where weathering is deep	Low to moderate permea-bility. Sloping ground well drained	Clayey gravel, building fill, zeolites
	Sandstone derived from dolerite weathering (not depicted on map)		Sandy clay, clayey sand				31	43-137	62- 105	21- 105	31- 72	31	10 - 28	15 - 24												
LITHIFIED AND IGNEOUS ROCK UNITS																										
Triassic	Quartz sandstone, shaly siltstone		Sandy clay, clayey sand	SC CL - CH	SP	1-3																		Some potential for highly reactive soil, and tunnel erosion	Fractured bedrock aquifers, variable permeability but generally moderate to high	Building stone, sandstone rock fill, groundwater potential
Permian	Sandy clayey siltstone, medium bedded		Silty clay and gravel	CL - CH	ML MH SC	0 - 6																		Moderate potential for reactive soil	Fractured bedrock aquifers, variable permeability but generally moderate to high	Wall stone, possible ceramic clay, groundwater potential
Tertiary	Basalt and weathered basalt		Clay, boulder clay	CH	GC SC	0 - 10																		Very high reactive soil potential, landslip risk near plateau edge	Fractured bedrock aquifers, variable permeability but generally moderate to high	Clay, gravel, rock mixtures, crushed rock aggregate, groundwater potential
Jurassic	Dolerite and weathered dolerite		Clay, boulders	CH	SC GC GW	0 - 10	52	43- 153	65- 129	15- 123	38- 103	55	3 - 33	15 - 28				10	2 - 12	3 - 8	9 - 23	12-20***		High potential for reactive soils	Fractured bedrock aquifers, permeability variable but generally low to moderate	Crushed rock aggregate, clay and rock fill, friable weathered rock, gravel, building stone, some groundwater potential
	Dolerite bedrock not generally exposed at surface		Clay, boulders	CH	SC GC	2 - 7																		Reactive soil potential, landslip on steep slopes	Poor surface drainage, soil may contain perm-eable zones	
	Dolerite bedrock not generally exposed at surface except for boulders in residual clay		Clay, boulders	CH	SC GC	1 - 10																		Differential settle-ment in clay and boulder areas, landslip and boulder movement on very steep slopes	Low permeablility for boulder clay material	
	Shallow in situ unweathered dolerite rock, weathered rock exposed, boulders		Clay, bouldery silty clay	CH	boulders GC	< 1.5																		Reactive soil may occur locally	Generally well drained, springs possible on lower slopes	
	Extensive in situ unweathered dolerite rock exposed		Clay, bouldery silty clay	CH	SC GC	< 1.5																		Rock falls on very steep slopes, cliffs	Generally well drained, springs possible on lower slopes	
	Variations in soil types developed on all dolerite units (not depicted on map)		Top 1.0m	CH		0 - 1	22	71- 153	91- 132	42- 108	64-103	27	18 - 33	23 - 29												
			Dark grey brown soil	CH	CL - CH	1 - 1.5	21	72- 140	90- 132	42- 108	64-103	19	18 - 29	23 - 27												
			Yellow brown soil	CH	CL - CH	1.5 - 10	17	43- 135	67- 125	17- 103	39 - 99	17	3 - 33	16 - 28												
			Red and pallid kaolinite soil	CH MH	ML - MH	3 - 7	11	44- 138	49- 126	15- 108	16 - 53	12	10 - 26	13 - 21												
UNDIFFERENTIATED UNITS																										
Cainozoic-Permian	Cainozoic sediments and soils on sedimentary and igneous rocks		Silty sandy gravelly clay	CH SC	GC ML boulders			45-212		4- 178														Landslip and erosion prone, reactive soil		
			Red clay (not depicted on map)				17	62-147	75- 138	31- 114	39- 107		13 - 26	14 - 24												
Cainozoic	Unconsolidated to slightly indurated sedimentary deposits		Sandy clay and clayey sand, gravel	CH SC	GC ML																					
Recent	Reclaimed land and fill material		Very variable e.g. silt, clay boulders, rubble, wood																					Settlement potential, loading of slopes could induce landslips		

THIS LEGEND IS OF A GENERAL NATURE ONLY AND DOES NOT REMOVE THE NEED FOR SPECIFIC SITE INVESTIGATIONS

^ 75% This is the range of values with the upper and lower 12.5% of the sample population excluded.

STRENGTH TESTS

* Triaxial tests:- quick undrained
** Triaxial tests with pore-pressure measurements
*** Shear box tests:- slow, drained, residual parameters

SOIL THICKNESS

`Soil' is used in the engineering sense i.e. material that is easily excavated.

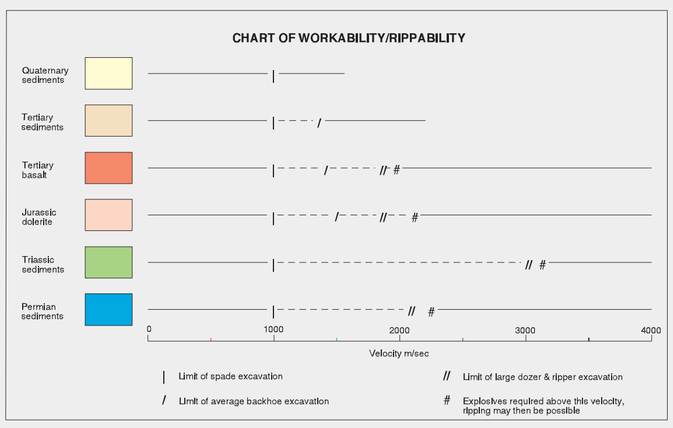
HAZARDS

In addition to those listed possible damage from earthquakes occurring offshore should be considered. The effect of earthquakes occurring between late last century and the middle of this century centred off Flinders Island had enhanced effects in the Launceston area as a result of the geology. Effects are greatest where there are thick poorly consolidated sediments. For further information refer to a recent micro-seismic zoning study undertaken by the Australian Geological Survey Organisation, reference:

Michael-Leiba, M., June 1995. Microtremor survey and seismic microzonation Launceston, Tasmania for Launceston City Council. Australian Geological Survey Organisation.

CONSISTENCY CODES

CODE	CONSISTENCY	kPa
VS	Very soft	< 25
S	Soft	25 - 50
St	Firm	50 - 100
S	Stiff	100 - 200
Vst	Very stiff	200 - 400
H	Hard	> 400



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Field work for the study was carried out by Project Geologist S. M. Forsyth, Mineral Resources Tasmania between 1991 and 1993.

Reference this legend as: Forsyth, S.M., 1996, Geology Map, Launceston Area, Urban Engineering Geology Series, Tasmanian Geological Survey.

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WARNING: INKS ARE LIGHT SENSITIVE