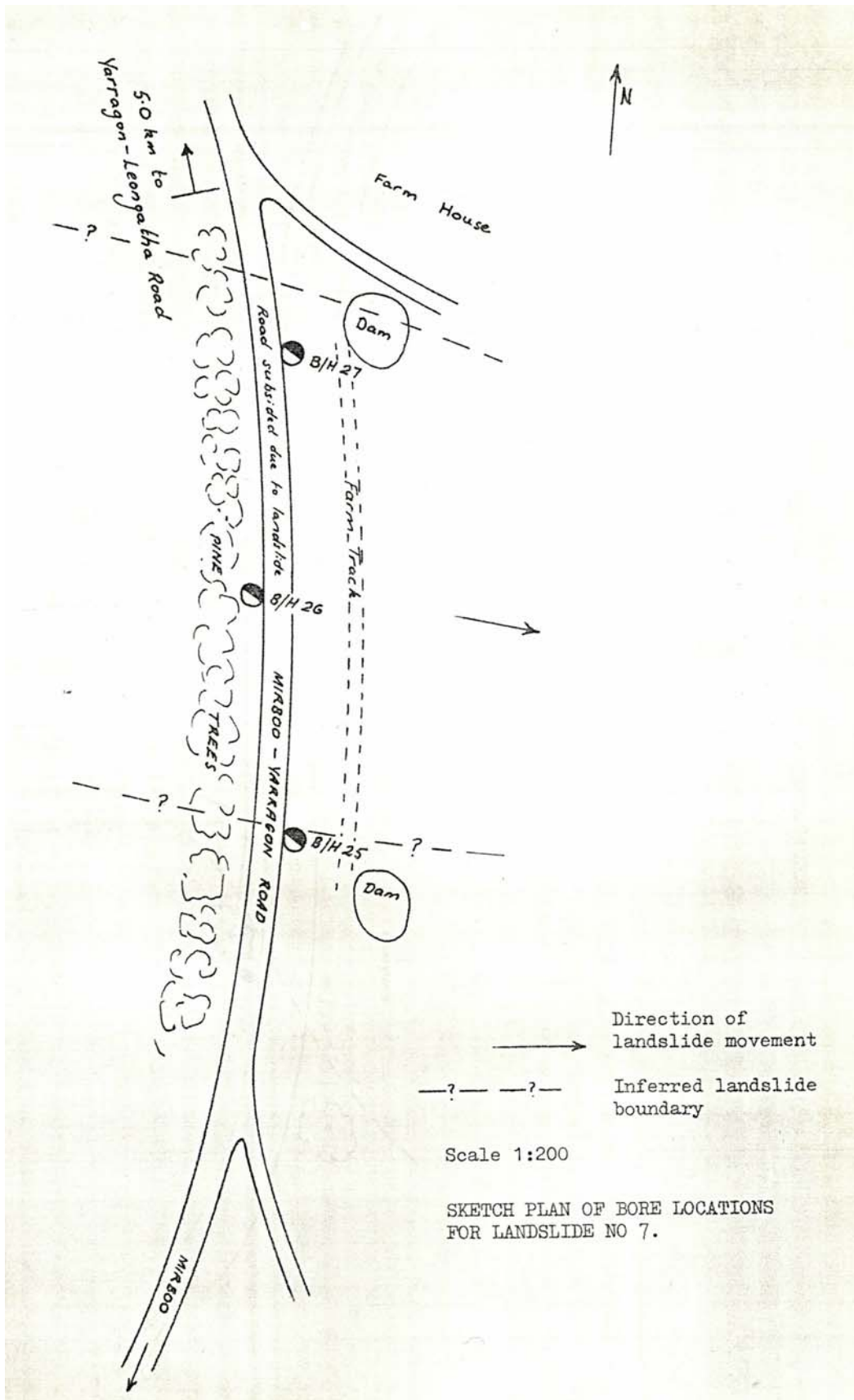


Appendix 4.1 – Sketch Plans of Bore Locations

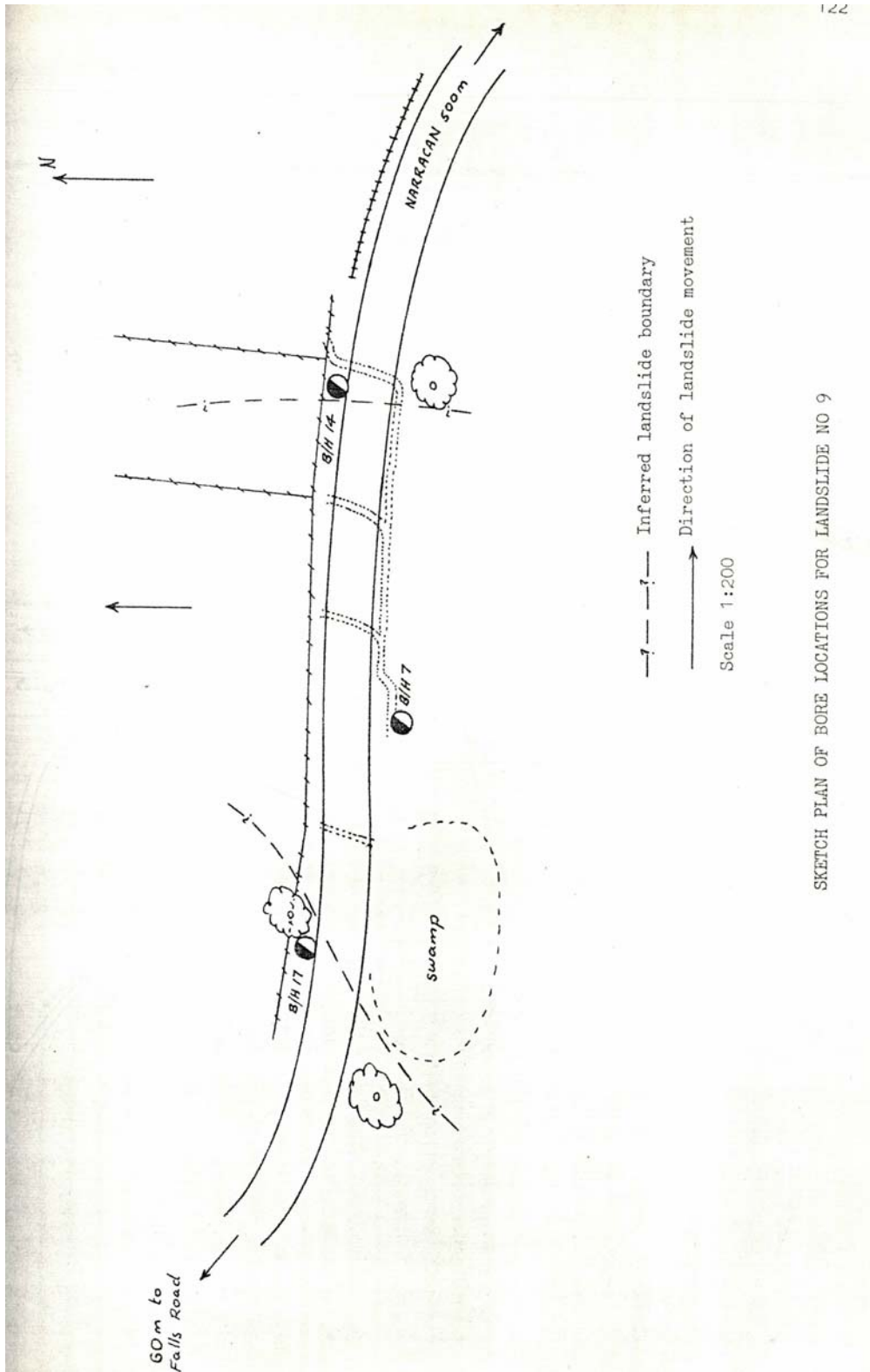
Sketch plans for bore locations for:

Landslide No. 7
Landslide No. 9
Landslide No. 10
Landslide No. 13
Landslide No. 15
Landslide No. 16
Landslide No. 17
Landslide No. 20
Klevans Landslide

Sketch Plan of Bore Locations for Landslide No. 7

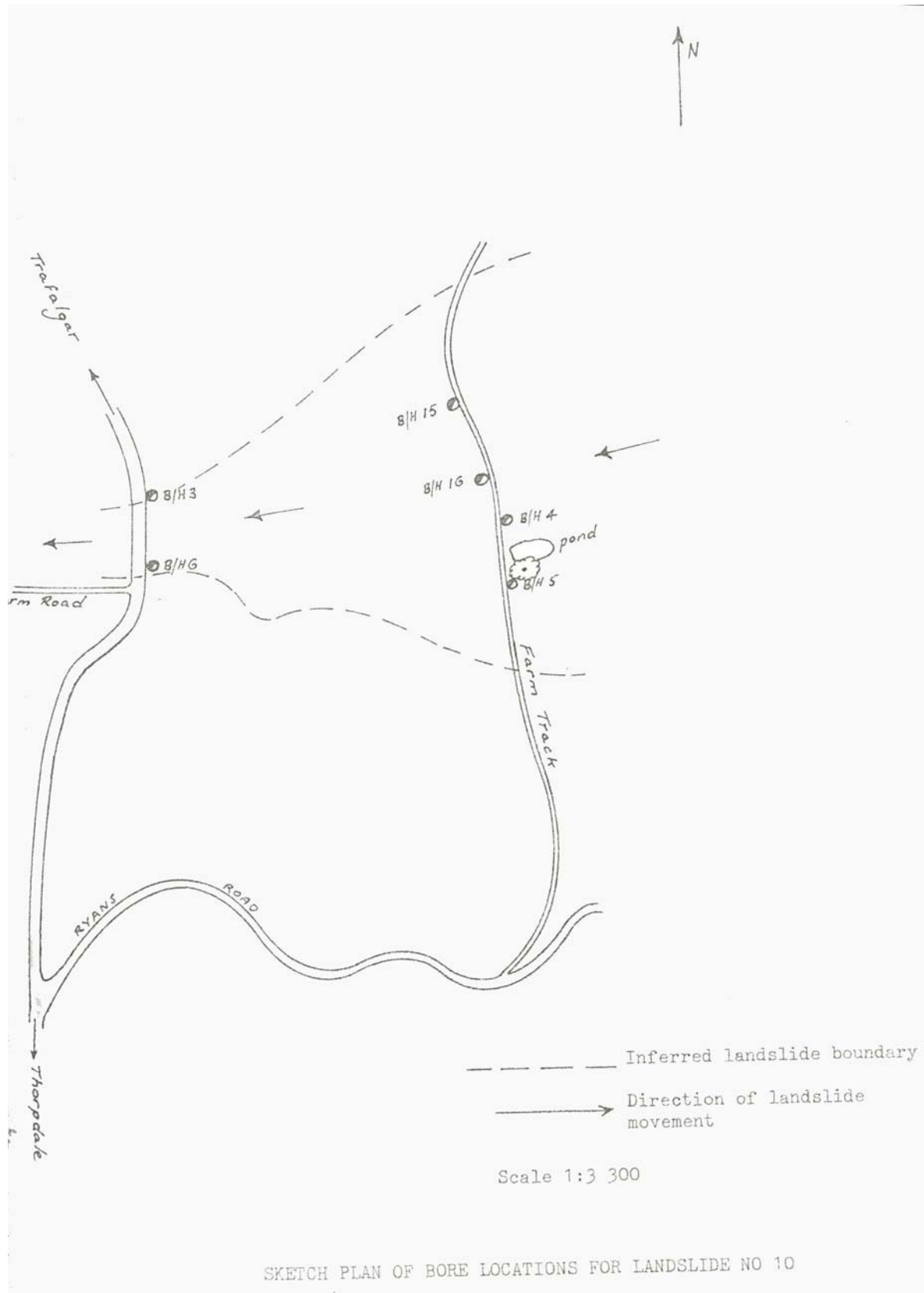


Sketch Plan of Bore Locations for Landslide No. 9

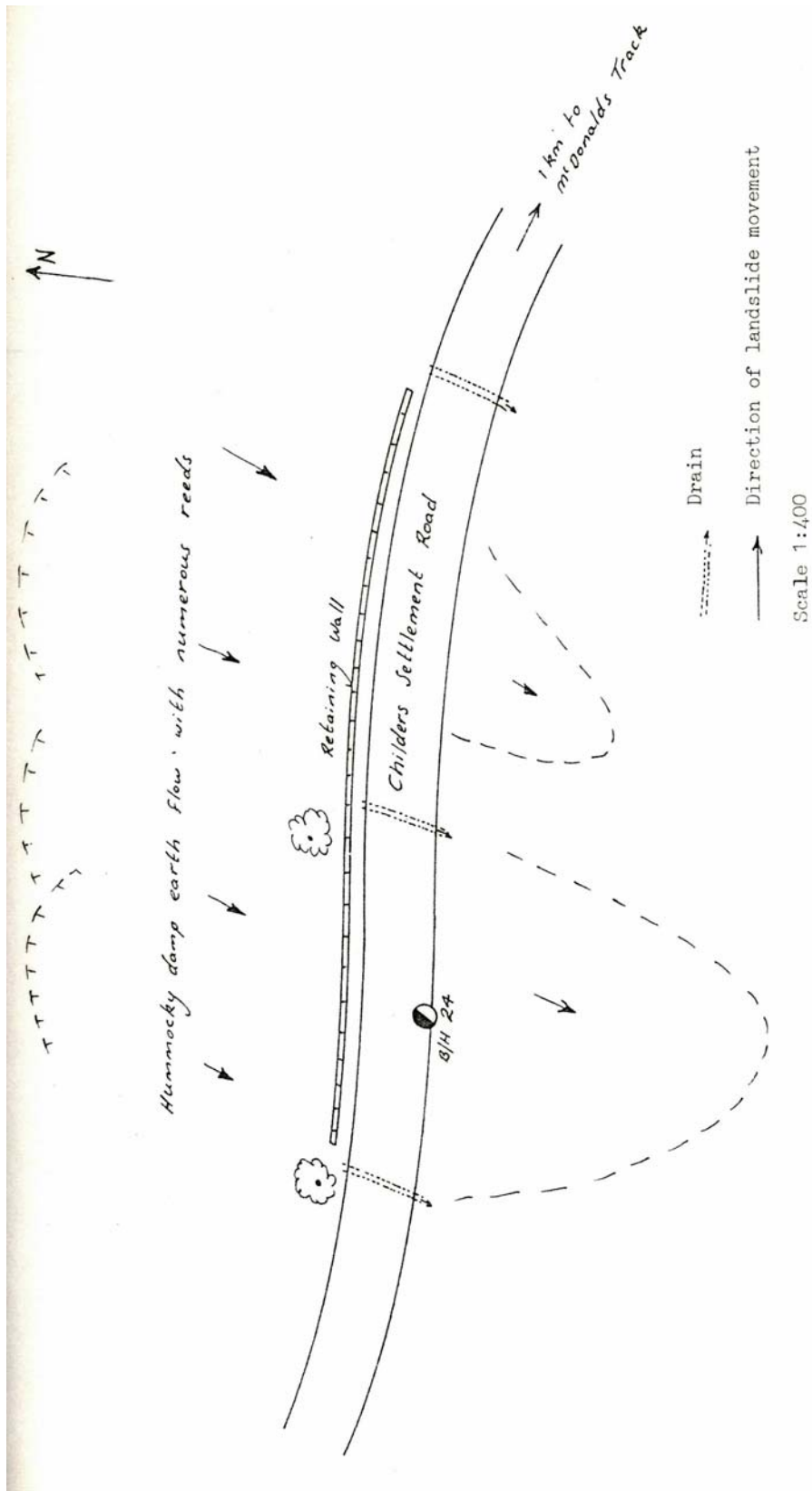


SKETCH PLAN OF BORE LOCATIONS FOR LANDSLIDE NO 9

Sketch Plan of Bore Locations for Landslide No. 10

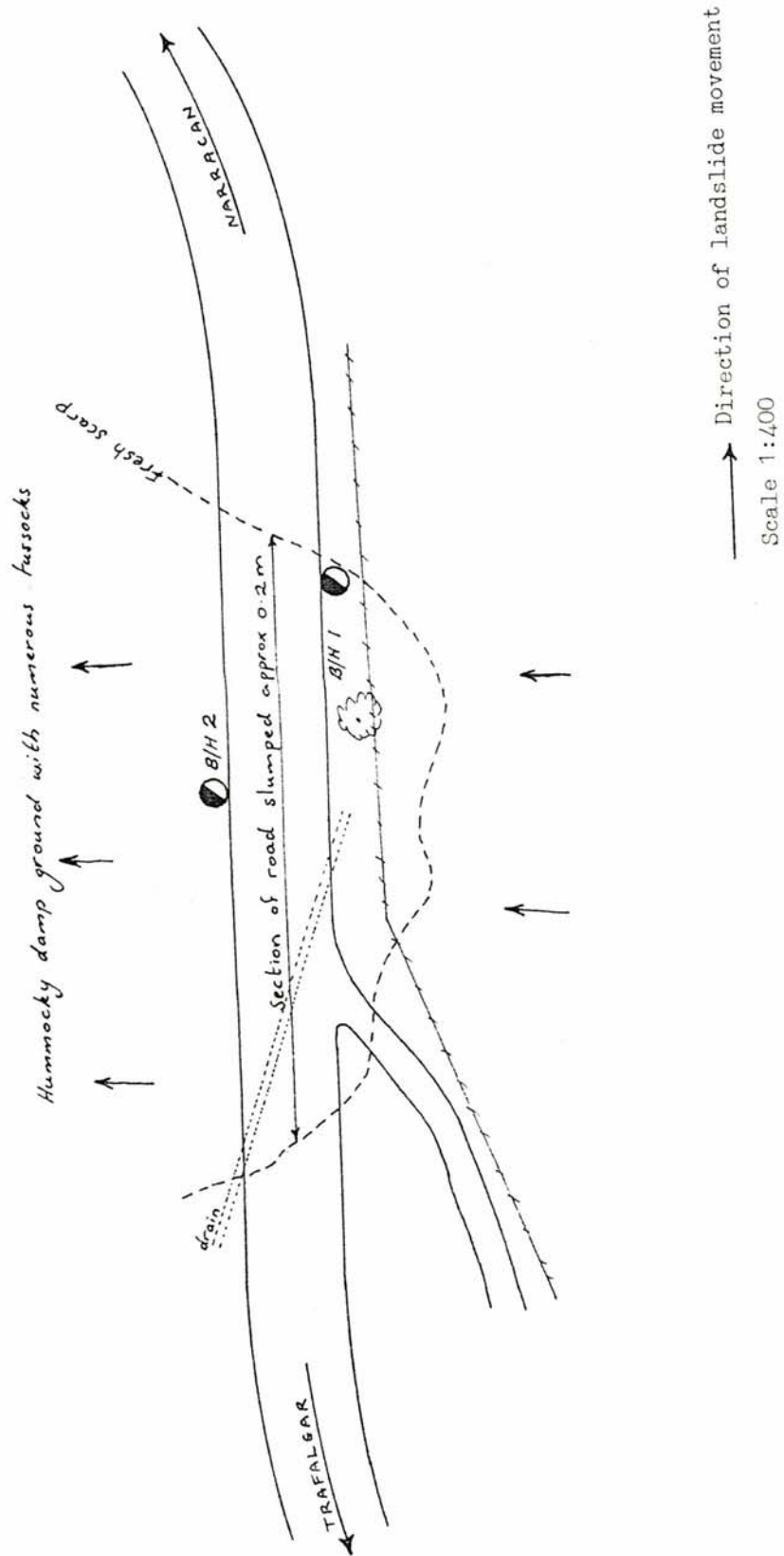


Sketch Plan of Bore Locations for Landslide No. 13



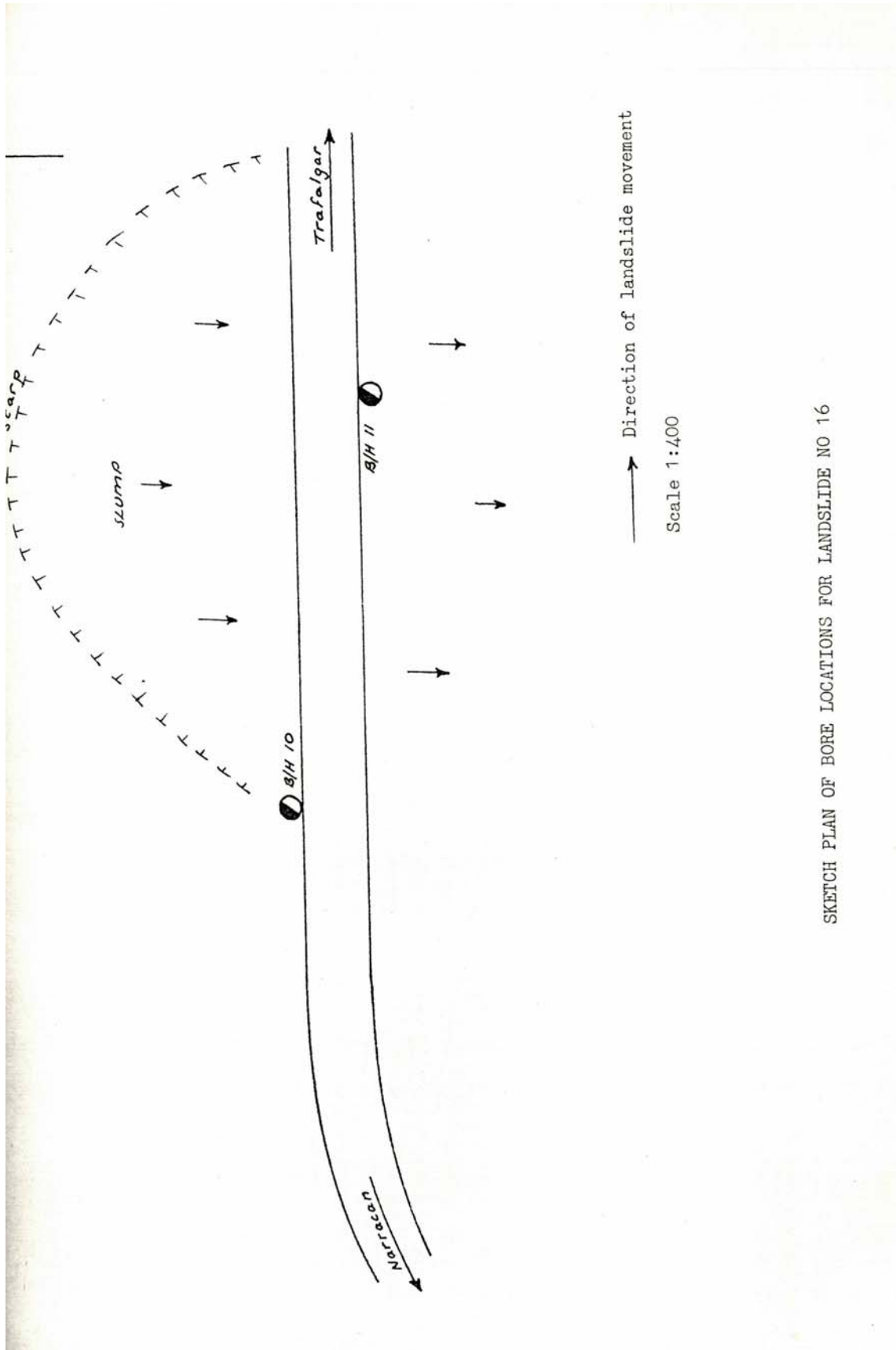
SKETCH PLAN OF BORE LOCATION FOR LANDSLIDE NO 13

Sketch Plan of Bore Locations for Landslide No. 15



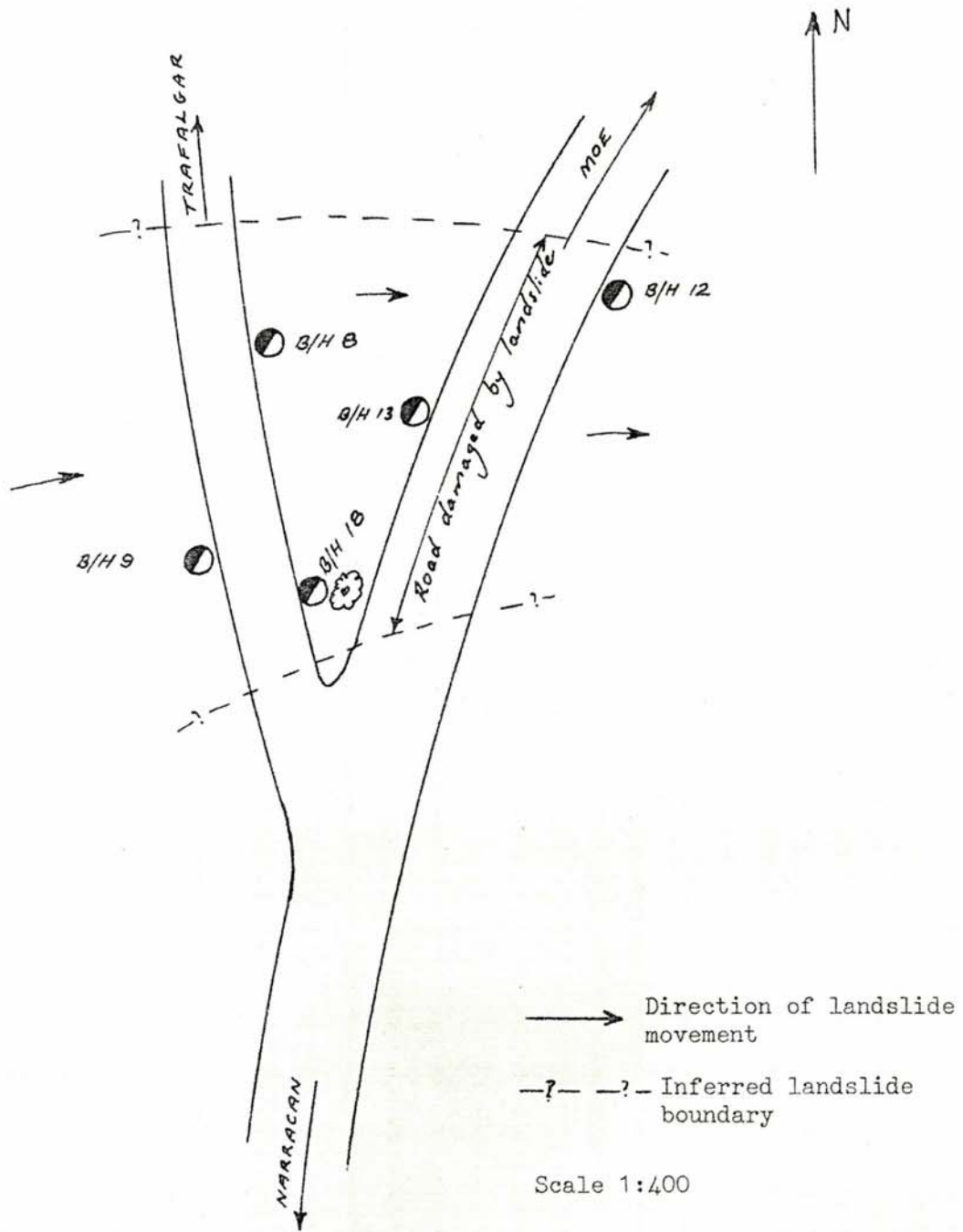
SKETCH PLAN OF BORE LOCATIONS FOR LANDSLIDE NO 15

Sketch Plan of Bore Locations for Landslide No. 16



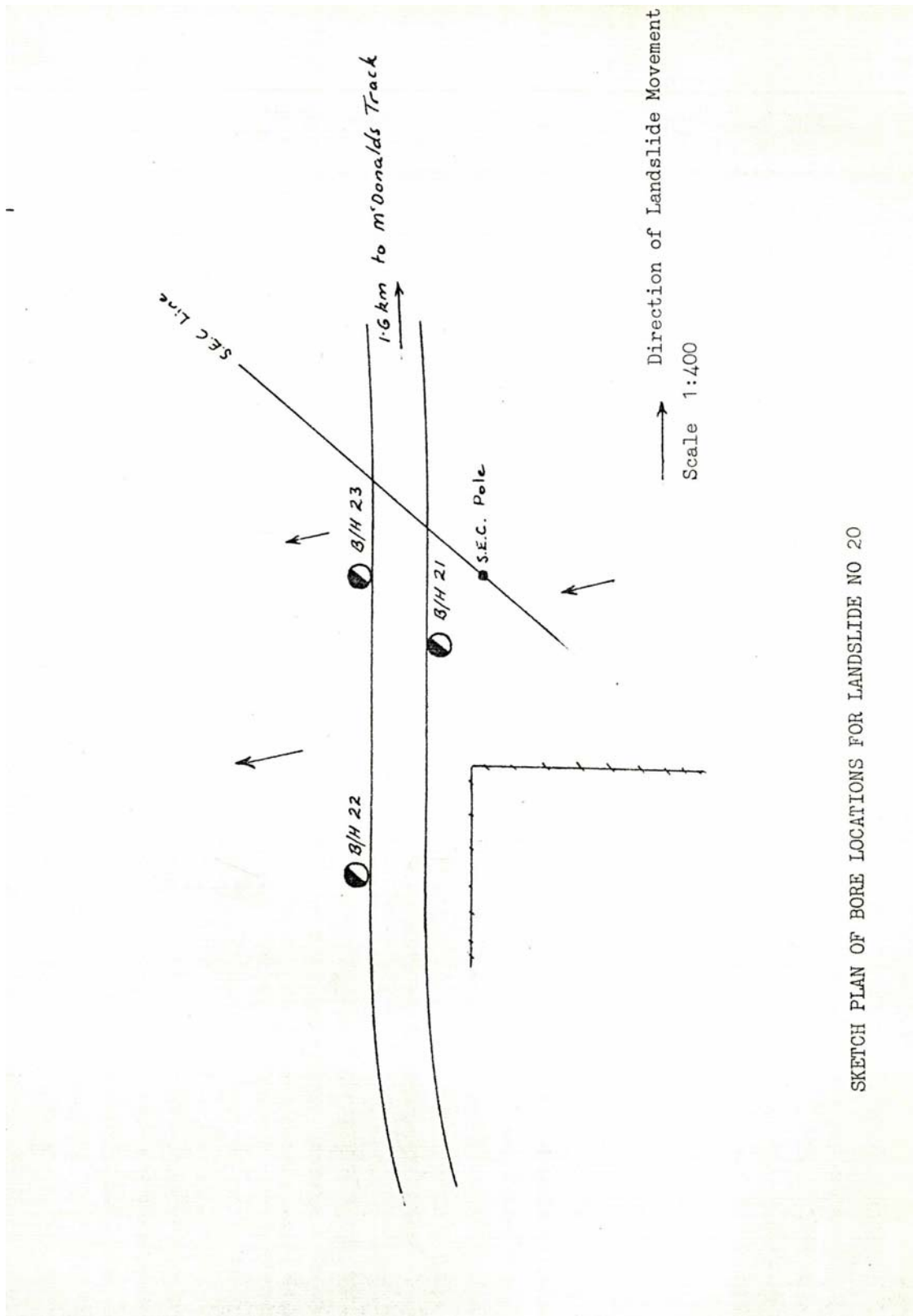
SKETCH PLAN OF BORE LOCATIONS FOR LANDSLIDE NO 16

Sketch Plan of Bore Locations for Landslide No. 17



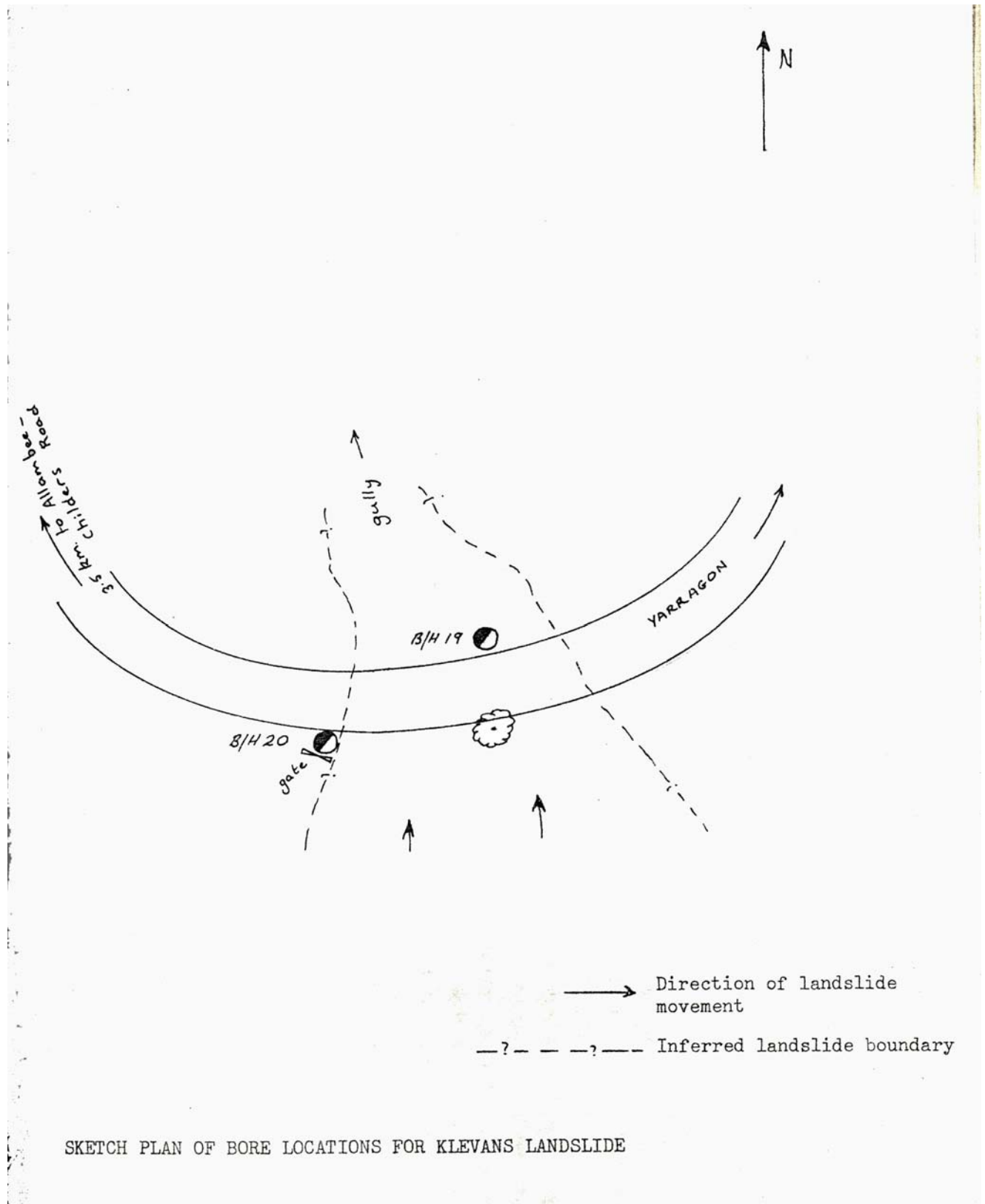
SKETCH PLAN OF BORE LOCATIONS FOR LANDSLIDE NO 17

Sketch Plan of Bore Locations for Landslide No. 20



SKETCH PLAN OF BORE LOCATIONS FOR LANDSLIDE NO 20

Sketch Plan of Bore Locations for Klevans Landslide



Bore No. 1 (Moe 57)

Location: Landslide No. 15, Trafalgar – Narracan Road

Depth below surface in metres	Soil Description	Unified soil Classification	Stratigraphy
0-0.20	Fill, coarse road gravel	Fill	
0.20-1.25	Firm sandy <u>silty clay</u> , red, brown and grey mottled, moist (near plastic limit), minor fine angular quartz sand, medium to high plasticity.	CH	Slipped Childers Formation
0.25-4.60	Stiff, <u>silty clay</u> and fissile, friable <u>clayey silt</u> , pale brown with minor yellow-brown and grey zones, medium to low plasticity, natural moisture content below plastic limit. Dark brown to black <u>carbonaceous seams</u> up to 2 cm thick are present at 3.8 m, 4.0 m and 4.5 m. The original rock fabric and sub-horizontal bedding (containing fossil plant fragments) are still discernible. 100% core recovery was obtained, but the core crumbled on removal from the split tube sampler	CL, CH, ML, MH	In-situ Lower Cretaceous
4.60-6.05	Fissile, friable, hard, <u>clayey silt</u> , pale grey with minor pale brown zones, relatively dry (< plastic limit). Lamellar (< 1 cm), sub-horizontal bedding planes frequently contain fossil plant fragments	MH	
6.05	End of bore		

Notes:

1. Core samples from 0.20-1.25 m, 2.30-2.70 m and 5.30-5.70 m were selected for soil testing.
2. No groundwater encountered during drilling, but after 3 days, slow seepage from unknown depth(s) within the bore produced a water level at 5.85 m from the surface.

Bore No. 2 (Moe 58)

Location: Landslide No. 15, Trafalgar-Narracan Road

Depth below surface in metres	Soil Description	Unified soil Classification	Stratigraphy
0-0.30	Fill, coarse road gravel	Fill	Slipped Childers Formation
0.30-5.35	Firm – stiff, sandy <u>silty clay</u> , red brown and grey mottled, sand content decreases with depth, sand is fine grained angular quartz, medium to high plasticity, moisture content near plastic limit	CH	
0.35-6.55	Stiff, <u>fine sandy silty clay</u> and fissile, friable sandy clayey silt, pale brown with minor yellow-brown and grey zones, medium plasticity, moisture content near plastic limit, original rock fabric and sub-horizontal bedding discernible.	CH and MH	In-situ Lower Cretaceous
6.35-7.35	Fissile, friable, hard, <u>fine sandy clayey silt</u> , pale grey with minor pale brown zones, moisture content near plastic limit, lamellar (< 1 cm) sub-horizontal bedding planes frequently containing fossil plant fragments	MH	
7.35	End of bore		

Notes:

1. Core sample from 2.50-3.05 m selected for soil testing
2. Samples from 3.10 m and 5.08 m selected for x-ray analysis
3. Groundwater entered the bore at 4.80 m.

Bore No. 3 (Moe 59)

Location: Landslide No. 10, Trafalgar-Thorpdale Road, near Ryans Road

Depth below surface in metres	Soil Description	Unified soil Classification	Stratigraphy
0-1.60	Firm to stiff, <u>silty clay</u> , pale brown moist (near plastic limit); AND, compact, <u>silty fine sand</u> , white moist; AND compact clayey silty sand, pale brown-grey, moist. All have low plasticity.	CL, SM and SC	Slipped (?) Childers Formation
1.60-2.35	Stiff, <u>clay</u> , pale grey, medium to high plasticity, moisture content ~ plastic limit, several thin (<2 mm) black carbonaceous seams are present	CH	
2.35-2.88	Compact, <u>clayey silty fine-medium sand</u> , pale grey and white, saturated occasional rounded quartz gravel particles up to 4 cm across occur.	SC	
2.88-3.72	Very stiff, <u>silty clay</u> , grey, fissured, moisture content near plastic limit, a few thin (<2 mm) carbonaceous seams, samples sheared along planes of preferred weakness due to over-driving the sampler. Slight fine sand content.	CH	
3.72-5.10	Stiff, <u>clayey silty sand</u> , minor gravel content, red-brown and yellow-brown, moisture content near plastic limit, ferruginized seam of coarse sand at 4.60-4.70 m.	SM	
5.10-5.64	Stiff, <u>clayey silt</u> , grey and brown, friable, fossil plant fragments present.	CL	
5.64-6.20	Hard, <u>clayey silt</u> , pale brown and grey, fissile, friable, low moisture content, completely weathered mudstone.	MH	

Notes:

1. Core samples from 1.20-1.60 m, 2.43-3.00 m, 2.90-3.35 m, 4.00-4.50 m and 5.70-6.20 m.
2. Sample from 1.85-3.50 m selected for palynological examination
3. Groundwater encountered at 2.43 m.

Bore No. 4 (Moe 60)

Location: Landslide No. 10, Trafalgar-Thorpdale Road, in farm off Ryans Road

Depth below surface in metres	Soil Description	Unified soil Classification	Stratigraphy
0-0.09	Clay topsoil		
0.09-2.30	Firm, <u>clay</u> , chocolate brown, friable, medium to high plasticity, moisture content ~ plastic limit.	CH	Slipped Tertiary Older Volcanics
2.30-4.90	Stiff, <u>clay</u> , yellow brown and grey mottled, medium to high plasticity, moisture content ~ plastic limit, friable sections, original basalt texture discernable in some sections	CH	
4.90-7.10	Firm to stiff, <u>clay</u> , brown, medium to high plasticity, moisture content > plastic limit	MH	
7.10-8.10	Stiff-hard, <u>clay</u> , yellow, brown and grey mottled, medium to high plasticity, moist, friable, original basalt texture is discernable.	CH	
8.10-8.16	Highly weathered basalt.		
8.16	End of bore		

Notes:

1. Core sample from 5.25-5.85 m selected for soil testing
2. The soil has been described as clay, rather than silty or sandy clay because the sand and silt content consists of felspar grains which are completely weathered to clay and therefore allows the soil to behave in a cohesive fashion.
3. Sample from 5.90 m selected for x-ray analysis.
4. Groundwater encountered during drilling, but level not recorded.

Bore No. 4 (Moe 61)

Location: Landslide No. 10, Trafalgar-Thorpdale Road, in farm off Ryans Road

Depth below surface in metres	Soil Description	Unified soil Classification	Stratigraphy
0-1.50	Topsoil: dark brown <u>silty clay</u> , friable, moist, occasional angular quartz grains.	CL	Slipped Childers Formation
1.50-2.66	Stiff, <u>silty clay</u> , brown and grey mottled, friable, moist (> plastic limit), occasional limonite nodules up to 1 cm across.	CH	Slipped/In-situ? Tertiary Older Volcanics
2.66-8.67	Firm to stiff, <u>silty clay</u> , brown, grey and yellow showing original basalt texture, sand sized grains of completely weathered feldspar are common, friable, moisture content ~ plastic limit, high plasticity; soft, plastic clay zones occur at 3.45-3.80 m, 6.00-6.30 m and 8.30-8.40 m	CH	
8.67	End of bore		

Notes:

1. Core samples from 2.16-2.66 m, 4.40-4.90 m and 6.80-7.40 m selected for soil testing.
2. The soil has been described as clay rather than sandy clay or clayey sand, because the sand content consists of feldspar grains which are completely weathered to clay and therefore allows the soil to behave like a cohesive soil.
3. Sample from 6.0 m selected for x-ray analysis.
4. Groundwater encountered at 5.11 m. Sample taken for chemical analysis.

Bore No. 6 (Moe 62)

Location: Landslide No. 10, Trafalgar-Thorpdale Road, near Ryans Road

Depth below surface in metres	Soil Description	Unified soil Classification	Stratigraphy
0-1.80	Firm-stiff, <u>silty clay</u> , red-brown, high plasticity, moisture content exceeds plastic limit, small percentage of quartz sand, clay appears to be of basaltic origin	CH	Slipped Childers Formation
1.80-5.72	Stiff, <u>clay</u> , grey, yellow-brown and red-brown mottled, medium to high plasticity, small percentage of limonite sand particles, decomposed basalt present, moisture content exceeds plastic limit.	CH	In-situ? Tertiary Older Volcanics
5.72	End of bore		

Notes:

1. Core sample from 4.30-4.90 m selected for soil testing.
2. The soil is described as clay rather than silty sandy clay, because the sand and silt consists of completely weathered felspar which allows the soil to behave in a purely cohesive fashion.
3. Groundwater presence not recorded.

Bore No. 7 (Moe 63)

Location: Landslide No. 9, Narracan Connection Road, 0.5 km west of Narracan

Depth below surface in metres	Soil Description	Unified soil Classification	Stratigraphy
0-0.30	Topsoil		
0.30-4.85	Stiff, red-brown and minor grey, <u>clay</u> , medium-high plasticity, moisture content exceeds plastic limit, basaltic clay.	CH	Slipped Tertiary Older Volcanics
4.85-5.05	Stiff, mottled red-brown and grey, <u>clay</u> , medium plasticity, high moisture content	CH	
5.05-7.92	Compact, grey and white <u>silty sand</u> , <u>sandy silt</u> and <u>clayey silt</u> , very low plasticity, saturated.	SM and MH	In-situ? Childers Formation
7.92	End of bore		

Notes:

1. Core samples from 4.30-4.85 m, 5.45-6.30 m and 7.00-7.50 m and undisturbed sample from 3.34-3.80 m taken for soil testing.
2. Groundwater encountered at 4.5 m during drilling then rose to a static level of 6.30 m.

Bore No. 8 (Moe 64)

Location: Landslide No. 17, Trafalgar-Coalville Road, adjacent to junction with Narracan-Moe Road

Depth below surface in metres	Soil Description	Unified soil Classification	Stratigraphy
0-0.30	Clay topsoil		
0.30-1.60	Firm-stiff, <u>clay</u> , brown, red-brown and yellow mottled, medium to high plasticity, fissured, basaltic clay.	CH	Slipped Tertiary Older Volcanics
1.60-1.90	Stiff, <u>clay</u> , red-brown, high plasticity, basaltic clay.	CH	
1.90	End of bore.		

Notes:

1. Further penetration of augers prevented by basalt floater.
2. Groundwater not encountered during drilling, but rose to 1.0 m next day

Bore No. 9 (Moe 65)

Location: Landslide No. 17, Trafalgar-Coalville Road adjacent to junction with Narracan-Moe Road

Depth below surface in metres	Soil Description	Unified soil Classification	Stratigraphy
0-0.30	Clay topsoil	CH	Slipped/in-situ Tertiary Older Volcanics
0.30-6.70	Firm, <u>clay</u> , brown completely weathered basalt showing original rock texture, highly weathered rock kernels varying in size from 1 cm to 10 cm or more are common, moist, medium to high plasticity.		
6.70	End of bore		

Notes:

1. Core sample from 3.35-3.60 m and undisturbed sample from 6.25-6.70 m taken for soil testing
2. Groundwater encountered at 2.8 m, then rose to ground level

Bore No. 10 (Moe 66)

Location: Landslide No. 16, Trafalgar-Coalville Road

Depth below surface in metres	Soil Description	Unified soil Classification	Stratigraphy
0-1.85	Firm-stiff, slightly <u>sandy clay</u> , brown, medium plasticity, moisture content ~ plastic limit, angular to subrounded quartz sand.	CL	Slipped? Childers Formation
1.85-3.10	Soft, <u>sandy clay</u> , brown, medium to low plasticity, saturated, angular-rounded quartz sand and rounded quartz gravel up to 2 cm across	CL	
3.10-4.10	Compact, <u>clayey coarse sand</u> , slightly plastic, small percentage of rounded quartz gravel and pebbles up to 5 cm, moist.	SC	
4.10	End of bore.		

Notes:

1. Core sample from 1.65-1.83 m selected for soil testing.
2. Groundwater not encountered

Bore No. 11 (Moe 67)

Location: Landslide No. 16, Trafalgar-Coalville Road

Depth below surface in metres	Soil Description	Unified soil Classification	Stratigraphy
0-1.10	Loose, <u>slightly coarse sand</u> , grey, moist, non-plastic	SM	In-situ? Childers Formation
1.10-1.80	Compact, <u>slightly coarse sand</u> , banded brown and yellow-brown, non-plastic	SM	
1.80-2.50	Compact, <u>silty sandy gravel</u> , grey rounded quartz gravel, non-plastic	GM	
2.50-3.38	Compact, <u>clayey sandy gravel</u> , reddish brown, rounded quartz gravel, slight plasticity.	GC	
3.38	End of bore		

Notes:

1. SPT test carried out at 2.5 m(23 blows/0.3 metres)
2. Groundwater encountered at 1.8 m.

Bore No. 12 – not drilled.

Bore No. 13 (Moe 69)

Location: Landslide No. 17, Narracan-Moe Road near junction with Trafalgar-Coalville Road

Depth below surface in metres	Soil Description	Unified soil Classification	Stratigraphy
0-3.05	Firm, <u>sandy clay</u> , dark red brown, medium plasticity, saturated, sand consists of medium to coarse quartz grains, occasional rounded quartz gravel particles.	CL	Slipped Childers Formation
3.05	End of bore		

Notes:

1. Core sample from 2.50-2.70 m selected for soil testing
2. Groundwater encountered at 3.0 m.

Bore No. 14 (Moe 70)

Location: Landslide No. 9, Narracan Connection Road, 0.5 km west of Narracan

Depth below surface in metres	Soil Description	Unified soil Classification	Stratigraphy
0-0.30	Brown clay topsoil	CH	Slipped Tertiary Older Volcanics
0.30-4.00	Firm <u>clay</u> , brown & buff speckled, medium to high plasticity, moisture content > plastic limit, occasional limonite nodules and soft black non-organic concretions up to 1 cm across		
4.00-5.45	Stiff to very stiff, <u>silty clay</u> , grading to <u>clayey fine sandy silt</u> with depth, pale grey and minor pale brown, medium to low plasticity, moist	CL and ML	In-situ? Childers Formation
5.45	End of bore		

Notes:

1. Core samples from 3.20-3.35 m and 4.80-5.00 m and undisturbed samples from 4.10-4.55 m and 5.00-5.45 m taken for soil testing.
2. Samples from 3.0 m and 5.0 m selected for x-ray analysis.
3. Groundwater encountered at 1.35 m and settled to a static level of 4.40 m.

Bore No. 15 (Moe 71)

Location: Landslide No. 10, Trafalgar-Thorpdale Road, in farm off Ryans Road

Depth below surface in metres	Soil Description	Unified soil Classification	Stratigraphy
0-3.95	Soft to firm, <u>clay</u> , brown and grey, original basalt texture clearly evident, medium to high plasticity, saturated, some ferruginized zones and a few limonite coated joints	CH	Slipped Tertiary Older Volcanics
3.95-4.05	Loose, <u>coarse sand</u> , brown, saturated	SW	Slipped? Childers Formation
4.05-4.75	Soft, <u>clayey silt</u> , yellow brown, medium to high plasticity, very moist	MH	
4.75-5.15	Soft, <u>silty clay</u> , grey, medium-high plasticity, very moist, carbonaceous	CH	
5.15-5.90	Firm to stiff, <u>silty clay</u> , grey and brown, medium to low plasticity, finely laminated, fissile, sub-horizontal bedding, moist	CL	In-situ Lower Cretaceous
5.90	End of bore		

Notes:

1. Core samples from 3.05-3.35 m, 4.20-4.50 m and 5.60-5.90 m, and undisturbed sample from 4.50-4.87 m taken for soil testing
2. Sample from 4.50 m selected for x-ray analysis
3. Groundwater at 0.30 m the next day
4. The surface of rupture occurs within and on the clay silt/silty clay strata between 4.05 and 5.15 m

Bore No. 16 (Moe 72)

Location: Landslide No. 10, Trafalgar-Thorpdale Road, in farm off Ryans Road

Depth below surface in metres	Soil Description	Unified soil Classification	Stratigraphy
0-0.30	Clay topsoil		
0.30-2.70	Firm, <u>clay</u> , brown and red-brown, medium to high plasticity, moisture content \geq plastic liquid, partly friable, quartz is absent. Striated from 0.30-1.82 m, speckled from 1.82-2.70 m.	CH	Slipped Tertiary Older Volcanics
2.70-2.85	Firm, <u>clay</u> topsoil, dark brown.		
2.85-4.10	Firm-stiff, <u>clay</u> , red-brown and grey mottled, medium to high plasticity, moisture content \sim liquid limit, partly friable, quartz grains absent.	CH	In-situ? Tertiary Older Volcanics
4.10-6.07	Stiff, <u>clay</u> , speckled pale brown and grey, medium-high plasticity, moist, friable, basaltic texture present, soft black non-organic concretions up to 2 cm across occur between 5.00 and 6.07 m.		

Notes:

1. Core samples from 1.60-1.82 m and 4.7-4.9 m, and undisturbed samples from 4.10-4.50 m and 5.62-6.07 m taken for soil testing.
2. Sample from 5.0 m selected for x-ray analysis.
3. Groundwater at 2.6 m the next day.

Bore No. 17 (Moe 73)

Location: Landslide No. 9, Narracan Connection Road, 0.5 m west of Narracan

Depth below surface in metres	Soil Description	Unified soil Classification	Stratigraphy
0-0.30	Brown <u>clay</u> topsoil		Slipped ⁽⁴⁾ Tertiary Older Volcanics
0.30-1.85	Stiff, <u>clay</u> , dark brown, moderately friable, moisture content < plastic limit, plant roots present. Basaltic clay.	CH	
1.85-2.60	Stiff to very stiff, <u>clay</u> , dark brown, moderately friable, moisture content ~ plastic limit. Basaltic clay.	CH	
2.60-7.15	Very stiff, <u>clay</u> , dark red-brown and minor grey, moisture content \geq plastic limit. Basaltic clay.	CH	
7.15	End of bore		

Notes:

1. Core sample from 6.10-6.25 m and undisturbed sample from 4.10-4.55 m taken for soil testing.
2. Sample from 6.40 m selected for x-ray analysis.
3. Groundwater level at 6.10 m at completion of drilling.
4. Confirmed by the detection of quartz in the mineralogical examination.

Bore No. 18 (Moe 74)

Location: Landslide No. 17, Trafalgar-Coalville Road adjacent to junction with Narracan-Moe Road.

Depth below surface in metres	Soil Description	Unified soil Classification	Stratigraphy
0-0.30	Sandy <u>clay</u> topsoil		Slipped Childers Formation
0.30-2.40	Firm, <u>sandy clay</u> , dark brown, moist, medium plasticity, occasional pieces of weathered basalt up to 2 cm across.	CL	
2.40-5.60	Firm to stiff, <u>clay</u> , brown and grey, medium to high plasticity, moist, occasional pieces of weathered basalt up to 5 cm across and limonite nodules up to 5 mm across.	CH	In-situ? Tertiary Older Volcanics
5.60	End of bore		

Notes:

1. Core samples from 1.68-1.90 m and 3.20-3.35 m, and undisturbed sample from 3.35-3.80 m taken for soil testing.
2. Sample from 2.0 m selected for x-ray analysis.
3. Groundwater level measured at 1.50 m.

Bore No. 19 (Moe 75)

Location: Klevans Landslide: Yarragon-Leongatha Road

Depth below surface in metres	Soil Description	Unified soil Classification	Stratigraphy
0-0.30	Brown and grey <u>silty clay</u> topsoil with particle of highly weathered mudstone	CL	Slipped Lower Cretaceous
0.30-2.27	Highly weathered brown and grey <u>mudstone</u> with some completely weathered <u>clay</u> zones. The rock core is fragmented. A few fossil plant impressions occur. Limonite stained joints are common.		
2.27	End of bore, further core drilling prevented by highly to moderately weathered rock.		

Notes:

1. Groundwater not encountered.

Bore No. 20 (Moe 76)

Location: Klevans Landslide: Yarragon-Leongatha Road

Depth below surface in metres	Soil Description	Unified soil Classification	Stratigraphy
0-2.60	Stiff, brown and grey silty <u>clay</u> with up to 30% angular highly weathered mudstone particles mainly of coarse grave size, low plasticity, moisture content < plastic limit	CL	Slipped Lower Cretaceous
2.60-3.05	Highly weathered brown and grey fissile <u>mudstone</u> .		In-situ Lower Cretaceous
3.05	End of bore.		

Notes:

1. Sample from 1.90 m selected for x-ray analysis.
2. Groundwater not encountered.

Bore No. 21 (Moe 77)

Location: Landslide No. 20, Allambee-Thorpdale Road

Depth below surface in metres	Soil Description	Unified soil Classification	Stratigraphy
0-1.05	Fill, soil and road gravel	CH	Fill
1.05-6.25	Stiff, <u>clay</u> , pale grey and brown with a few red-brown-yellow and grey mottled zones. Occasional quartz grains up to 3 mm across occur. Carbonaceous zone at 5.35-5.46 m. Lignite filled joints dipping at 35° occur at 5.80 and 6.10 m. Medium to high plasticity. Clay appears to be pure kaolinite.		In-situ? Childers Formation
6.25-6.70	Compact, clayey silty fine sand, pale brown and yellow brown. Moist, medium plasticity.		
6.70	End of bore.		

Notes:

1. Soil core from 3.05-3.35 m and undisturbed samples from 4.87-5.32 m and 6.25-6.70 m taken for soil testing.
2. Sample from 5.35 m selected for x-ray analysis.
3. Sample from 5.32-5.46 m submitted for palynological examination – no spores were found.
4. Groundwater not encountered.

Bore No. 22 (Warragul 14)

Location: Landslide No. 20, Allambee-Thorpdale Road

Depth below surface in metres	Soil Description	Unified soil Classification	Stratigraphy
0-1.05	Fill and topsoil		Fill
1.05-5.90	Stiff, <u>clay</u> and <u>silty clay</u> , pale grey, red-brown and yellow-brown mottled. Medium to high plasticity. Occasional grains of quartz sand. Ligonite filled joint dipping at 45° is present at 4.90 m. Moisture content approximately at plastic limit. Fissured. Occasional carbonaceous concretions up to 2 cm across.	CH	In-situ, Childers Formation
5.90-7.70	Compact, <u>silty very fine sand</u> and stiff <u>sandy clayey silt</u> , pale grey and brown mottled, moist, low plasticity.	ML	
7.70-8.67	Compact, <u>silty very fine sand</u> , pale grey. Non plastic, moist.	SM	
8.67	End of bore.		

Notes:

1. Soil core from 4.15-4.30, 6.85-7.15 and 8.67-8.83 m and undisturbed samples from 3.35-3.80 m and 3.80-4.25 m taken for soil testing.
2. Sample from 4.30 m selected for x-ray analysis.
3. Groundwater not encountered.

Bore No. 23 (Warragul 15)

Location: Landslide No. 20, Allambee-Thorpdale Road

Depth below surface in metres	Soil Description	Unified soil Classification	Stratigraphy
0-1.73	Fill and clay topsoil		Fill
1.73-8.00	Stiff to very stiff, <u>clay and silty clay</u> , predominantly pale grey with some red-brown, yellow and grey mottled zones, medium to high plasticity, occasional angular quartz grains up to 3 mm across, clay appears to be pure kaolinite, fissured.	CH	In-situ? Childers Formation
8.00-8.67	Compact, <u>clayey sandy silt</u> , pale grey, low plasticity, moist	ML	
8.67-9.80	Compact, <u>silty fine sand</u> , mottled red, brown, yellow & grey, low plasticity, moist	SM	
9.80-10.17	Stiff, <u>sandy silty clay</u> , red, brown and grey, medium plasticity	CL	
10.17	End of bore		

Notes:

1. Soil core from 9.40-9.65 m and undisturbed samples from 2.12-2.57 m and 7.15-7.60 m taken for soil testing.
2. Groundwater not encountered.

Bore No. 24 (Allambee East 5)

Location: Landslide No. 13, Childers Settlement Road, 1½ km W from McDonald's Track

Depth below surface in metres	Soil Description	Unified soil Classification	Stratigraphy
0-1.05	Fill, soil, sand and rock gravel		Fill
1.05-1.97	Compact <u>sandy clayey silt</u> , brown and grey mottled. Sand consists of sub-rounded quartz grains, predominantly of medium size, but fine and coarse sized sand particles are also present. Medium moisture content.	SC	Slipped Childers Formation
1.97-9.11	Dense, friable <u>clayey silty sand</u> and stiff <u>sandy silty clay</u> , pale brown. Sand consists of angular very fine quartz particles. Occasional rounded quartz particles up to 1 cm across occur. Root veinlets are common. The sandy silty clay is fissured, moist and of medium plasticity.	SC, CL	In-situ Childers Formation
9.11	End of bore.		

Notes:

1. Soil cores from 1.20-1.45 m and 6.25-.55 m and undisturbed sample from 8.67-9.11 m taken for soil testing.
2. Sample from 3.00 m selected for x-ray analysis.
3. Static groundwater at ground level.

Bore No. 25 (Allambee East 6)

Location: Landslide No. 7, Mirboo-Yarragon Road

Depth below surface in metres	Soil Description	Unified soil Classification	Stratigraphy
0-1.05	Fill, soil and road gravel		
1.05-1.82	Firm, <u>silty clay</u> , brown, minor very fine sand content. Medium to low plasticity, natural moisture content \geq plastic limit	CL	In-situ/Slipped Lower Cretaceous
1.82-2.30	Stiff, <u>silty clay</u> , dark grey and brown, minor fine sand content. Some carbonaceous matter present. Medium plasticity. Natural moisture content \sim plastic limit.	CL	
2.30-4.10	Stiff, <u>silty clay</u> , brown, minor fine sand content. Medium plasticity. Natural moisture content \sim plastic limit.	CL	
4.10-5.70	Firm-stiff, <u>silty, sandy clay</u> , brown & grey. Friable in parts. Sand content is very fine to fine grained. Moist, medium plasticity.	CL	
5.70-6.25	Completely weathered <u>mudstone</u> . Pale brown & grey, fragmented. Fossil plant fragments common.		
6.25	End of bore.		

Notes:

1. Soil core from 1.65-1.82 m and undisturbed sample from 4.10-4.55 m taken for soil testing.
2. Groundwater level recorded at 1.50 m. Sample taken for chemical analysis.

Bore No.26 (Allambee East 7)

Location: Landslide No. 7, Mirboo-Yarragon Road

Depth below surface in metres	Soil Description	Unified soil Classification	Stratigraphy
0-1.05	Fill; soil and road gravel		Fill
1.05-4.57	Very compact, friable, silty very fine sand and silty fine sand, pale brown and grey, low plasticity. Relatively dry (< plastic limit). Limonite stained in places especially on discontinuities. Minor clay content (<10%). Lamellar (<1 cm) sub-horizontal bedding plane are common.	SM	In-situ? Lower Cretaceous
4.57	End of bore		

Notes:

1. Core samples from 1.15-1.40 m and 2.57-2.82 m were selected for soil testing.
2. Groundwater not encountered.

Bore No. 27 (Allambee East, 8)

Location: Landslide No. 7, Mirboo-Yarragon Road

Depth below surface in metres	Soil Description	Unified soil Classification	Stratigraphy
0-2.50	Fill, compact clay, sand and crushed rock		Fill
2.50-4.10	Stiff <u>silty clay</u> and friable <u>clayey silt</u> , containing angular pieces of highly weathered siltstone, brown, some ferruginised zones, low plasticity, moist	CL and MH	Slipped Lower Cretaceous
4.10-6.40	Fissile, friable, hard, <u>clayey silt</u> , pale grey and brown, relatively dry (<plastic limit). Lamellar (<1 cm) of sub-horizontal bedding planes	ML	In-situ Lower Cretaceous
6.40	End of bore.		

Notes:

1. Core samples from 4.87-5.12 and 6.25-6.50 m, selected for soil testing.
2. Sample from 5.62 m selected for x-ray analysis.
3. Groundwater not encountered.

Appendix 4.3 – Soil Consistency Grades & Relatively Density of Sands and Silts

SOIL CONSISTENCY GRADES

Consistency	Field Identification
Very soft	Easily penetrated several inches with fist.
Soft	Easily penetrated several inches with thumb
Firm	Penetrated by thumb with moderate effort
Stiff	Indented but not penetrated by thumb
Very stiff	Easily indented with thumb nail
Hard	Only grooved with thumb nail

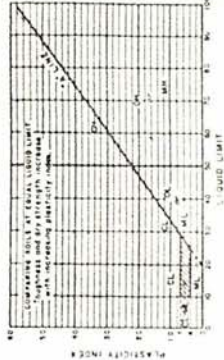
RELATIVE DENSITY OF SANDS & SILTS

Relative Density	Standard Penetration Test (Blows per 0.3 metre)
Very loose	0-4
Loose	4-10
Medium (compact)	10-30
Dense	30-50
Very dense	Over 50

Appendix 4.4 – Unified Soil Classification Chart

Appendix 4.4

UNIFIED SOIL CLASSIFICATION INCLUDING IDENTIFICATION AND DESCRIPTION										
FIELD IDENTIFICATION PROCEDURES			GROUP SYMBOLS	TYPICAL NAMES		INFORMATION REQUIRED FOR DESCRIBING SOILS		LABORATORY CLASSIFICATION CRITERIA		
<p>(Excluding particles larger than 3 inches and testing fractions on estimated weights)</p> <p>Wide range in grain size and substantial amounts of intermediate particle sizes</p> <p>Predominantly one size or a range of sizes with some intermediate sizes missing</p> <p>Two plastic fines (for identification procedures see CL below)</p> <p>Plastic fines (for identification procedures see CL below)</p> <p>Wide range in grain sizes and substantial amounts of all intermediate particle sizes</p> <p>Predominantly one size or a range of sizes with some intermediate sizes missing</p> <p>Non-plastic fines (for identification procedures see ML below)</p> <p>Plastic fines (for identification procedures see CL below)</p>			GW GP GM GC SW SP SM SC	Well graded sands, gravel-sand mixtures, silty and fine Poorly graded sands, gravel-sand mixtures, little or no fines Silty gravels, poorly graded gravel-sand-silt mixtures Clayey gravels, poorly graded gravel-sand-clay mixtures Well graded sands, gravelly sands, little or no fines Poorly graded sands, gravelly sands, little or no fines Silty sands, poorly graded sand-silt mixtures Clayey sands, poorly graded sand-clay mixtures	Give typical name, indicate approximate upper and lower plastic limits, and maximum size of coarse grains, color, percent organic matter, and pertinent descriptive information, and symbol in parentheses. For undisturbed soils add information on structure, porosity, degree of consolidation, permeability, moisture conditions and drainage characteristics. EXAMPLE: Silty sand, gravelly, about 20% hard angular gravel particles, in maximum size, rounded and subangular sand grains, coarse to fine, about 15% non-plastic fines with low dry strength, well-compacted and moist in place, silty sand, (SW)	<p>Use grain size curve in identifying the fraction given under this identification</p> <p>Determine percentage of gravel and sand from grain size curve (fraction smaller than No. 200 sieve size) coarse gravel and sand (fraction smaller than No. 40 sieve size)</p> <p>Less than 5% 5 to 12% 12 to 20% 20 to 35% 35 to 50% 50 to 60% 60 to 75% 75 to 85% 85 to 95% 95 to 100%</p> <p>Not meeting all gradation requirements for SW Above "X" line with PI less than 4 and 7 Not meeting all gradation requirements for SW Above "X" line with PI less than 4 and 7 Not meeting all gradation requirements for SW Above "X" line with PI less than 4 and 7</p>	<p>Use grain size curve in identifying the fraction given under this identification</p> <p>Determine percentage of gravel and sand from grain size curve (fraction smaller than No. 200 sieve size) coarse gravel and sand (fraction smaller than No. 40 sieve size)</p> <p>Less than 5% 5 to 12% 12 to 20% 20 to 35% 35 to 50% 50 to 60% 60 to 75% 75 to 85% 85 to 95% 95 to 100%</p> <p>Not meeting all gradation requirements for SW Above "X" line with PI less than 4 and 7 Not meeting all gradation requirements for SW Above "X" line with PI less than 4 and 7 Not meeting all gradation requirements for SW Above "X" line with PI less than 4 and 7</p>			
<p>(The No. 200 sieve size is about the smallest particle visible to the naked eye)</p> <p>More than half of material is larger than No. 200 sieve size</p> <p>More than half of coarse fraction is finer than No. 40 sieve size</p> <p>(For visual classification, the size may be used as equivalent to the No. 4 sieve size)</p>			<p>IDENTIFICATION PROCEDURES ON FRACTION SMALLER THAN NO. 40 SIEVE SIZE</p> <p>None to slight</p> <p>Medium to high</p> <p>Slight to medium</p> <p>Slight to medium</p> <p>High to very high</p> <p>Medium to high</p>	<p>None to slight</p> <p>Quick to slow</p> <p>None to very slow</p> <p>Slow</p> <p>Slow to none</p> <p>None</p> <p>None to very slow</p>	<p>None</p> <p>None</p> <p>Slight</p> <p>Slight to medium</p> <p>High</p> <p>Slight to medium</p>	<p>ML CL OL MH CH OH</p>	<p>Inorganic silts and very fine sands, rock flour, silty or clayey fine sands with slight plasticity Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays Organic silts and organic silt-clays of low plasticity Inorganic silty, micaceous or aluminaceous fine sandy or silty soils, elastic silts Inorganic clays of high plasticity, fat clays Organic clays of medium to high plasticity</p>	<p>Give typical name, indicate degree and character of plasticity, amount and maximum size of coarse grains, color in wet condition, odor, if any, local or geologic name, and other pertinent descriptive information, and symbol in parentheses. For undisturbed soils add information on structure, porosity, consistency, moisture and drainage conditions. EXAMPLE: Clayey silt, brown, slightly plastic, 20% non-plastic fines, 15% fines, firm and dry in place, (MH)</p>	<p>Use grain size curve in identifying the fraction given under this identification</p> <p>Determine percentage of gravel and sand from grain size curve (fraction smaller than No. 200 sieve size) coarse gravel and sand (fraction smaller than No. 40 sieve size)</p> <p>Less than 5% 5 to 12% 12 to 20% 20 to 35% 35 to 50% 50 to 60% 60 to 75% 75 to 85% 85 to 95% 95 to 100%</p> <p>Not meeting all gradation requirements for SW Above "X" line with PI less than 4 and 7 Not meeting all gradation requirements for SW Above "X" line with PI less than 4 and 7 Not meeting all gradation requirements for SW Above "X" line with PI less than 4 and 7</p>	<p>Use grain size curve in identifying the fraction given under this identification</p> <p>Determine percentage of gravel and sand from grain size curve (fraction smaller than No. 200 sieve size) coarse gravel and sand (fraction smaller than No. 40 sieve size)</p> <p>Less than 5% 5 to 12% 12 to 20% 20 to 35% 35 to 50% 50 to 60% 60 to 75% 75 to 85% 85 to 95% 95 to 100%</p> <p>Not meeting all gradation requirements for SW Above "X" line with PI less than 4 and 7 Not meeting all gradation requirements for SW Above "X" line with PI less than 4 and 7 Not meeting all gradation requirements for SW Above "X" line with PI less than 4 and 7</p>
<p>More than half of material is larger than No. 200 sieve size</p> <p>More than half of coarse fraction is finer than No. 40 sieve size</p> <p>(For visual classification, the size may be used as equivalent to the No. 4 sieve size)</p>			<p>IDENTIFICATION PROCEDURES ON FRACTION SMALLER THAN NO. 40 SIEVE SIZE</p> <p>None to slight</p> <p>Medium to high</p> <p>Slight to medium</p> <p>Slight to medium</p> <p>High to very high</p> <p>Medium to high</p>	<p>None to slight</p> <p>Quick to slow</p> <p>None to very slow</p> <p>Slow</p> <p>Slow to none</p> <p>None</p> <p>None to very slow</p>	<p>None</p> <p>None</p> <p>Slight</p> <p>Slight to medium</p> <p>High</p> <p>Slight to medium</p>	<p>ML CL OL MH CH OH</p>	<p>Inorganic silts and very fine sands, rock flour, silty or clayey fine sands with slight plasticity Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays Organic silts and organic silt-clays of low plasticity Inorganic silty, micaceous or aluminaceous fine sandy or silty soils, elastic silts Inorganic clays of high plasticity, fat clays Organic clays of medium to high plasticity</p>	<p>Give typical name, indicate degree and character of plasticity, amount and maximum size of coarse grains, color in wet condition, odor, if any, local or geologic name, and other pertinent descriptive information, and symbol in parentheses. For undisturbed soils add information on structure, porosity, consistency, moisture and drainage conditions. EXAMPLE: Clayey silt, brown, slightly plastic, 20% non-plastic fines, 15% fines, firm and dry in place, (MH)</p>	<p>Use grain size curve in identifying the fraction given under this identification</p> <p>Determine percentage of gravel and sand from grain size curve (fraction smaller than No. 200 sieve size) coarse gravel and sand (fraction smaller than No. 40 sieve size)</p> <p>Less than 5% 5 to 12% 12 to 20% 20 to 35% 35 to 50% 50 to 60% 60 to 75% 75 to 85% 85 to 95% 95 to 100%</p> <p>Not meeting all gradation requirements for SW Above "X" line with PI less than 4 and 7 Not meeting all gradation requirements for SW Above "X" line with PI less than 4 and 7 Not meeting all gradation requirements for SW Above "X" line with PI less than 4 and 7</p>	<p>Use grain size curve in identifying the fraction given under this identification</p> <p>Determine percentage of gravel and sand from grain size curve (fraction smaller than No. 200 sieve size) coarse gravel and sand (fraction smaller than No. 40 sieve size)</p> <p>Less than 5% 5 to 12% 12 to 20% 20 to 35% 35 to 50% 50 to 60% 60 to 75% 75 to 85% 85 to 95% 95 to 100%</p> <p>Not meeting all gradation requirements for SW Above "X" line with PI less than 4 and 7 Not meeting all gradation requirements for SW Above "X" line with PI less than 4 and 7 Not meeting all gradation requirements for SW Above "X" line with PI less than 4 and 7</p>
<p>More than half of material is larger than No. 200 sieve size</p> <p>More than half of coarse fraction is finer than No. 40 sieve size</p> <p>(For visual classification, the size may be used as equivalent to the No. 4 sieve size)</p>			<p>IDENTIFICATION PROCEDURES ON FRACTION SMALLER THAN NO. 40 SIEVE SIZE</p> <p>None to slight</p> <p>Medium to high</p> <p>Slight to medium</p> <p>Slight to medium</p> <p>High to very high</p> <p>Medium to high</p>	<p>None to slight</p> <p>Quick to slow</p> <p>None to very slow</p> <p>Slow</p> <p>Slow to none</p> <p>None</p> <p>None to very slow</p>	<p>None</p> <p>None</p> <p>Slight</p> <p>Slight to medium</p> <p>High</p> <p>Slight to medium</p>	<p>ML CL OL MH CH OH</p>	<p>Inorganic silts and very fine sands, rock flour, silty or clayey fine sands with slight plasticity Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays Organic silts and organic silt-clays of low plasticity Inorganic silty, micaceous or aluminaceous fine sandy or silty soils, elastic silts Inorganic clays of high plasticity, fat clays Organic clays of medium to high plasticity</p>	<p>Give typical name, indicate degree and character of plasticity, amount and maximum size of coarse grains, color in wet condition, odor, if any, local or geologic name, and other pertinent descriptive information, and symbol in parentheses. For undisturbed soils add information on structure, porosity, consistency, moisture and drainage conditions. EXAMPLE: Clayey silt, brown, slightly plastic, 20% non-plastic fines, 15% fines, firm and dry in place, (MH)</p>	<p>Use grain size curve in identifying the fraction given under this identification</p> <p>Determine percentage of gravel and sand from grain size curve (fraction smaller than No. 200 sieve size) coarse gravel and sand (fraction smaller than No. 40 sieve size)</p> <p>Less than 5% 5 to 12% 12 to 20% 20 to 35% 35 to 50% 50 to 60% 60 to 75% 75 to 85% 85 to 95% 95 to 100%</p> <p>Not meeting all gradation requirements for SW Above "X" line with PI less than 4 and 7 Not meeting all gradation requirements for SW Above "X" line with PI less than 4 and 7 Not meeting all gradation requirements for SW Above "X" line with PI less than 4 and 7</p>	<p>Use grain size curve in identifying the fraction given under this identification</p> <p>Determine percentage of gravel and sand from grain size curve (fraction smaller than No. 200 sieve size) coarse gravel and sand (fraction smaller than No. 40 sieve size)</p> <p>Less than 5% 5 to 12% 12 to 20% 20 to 35% 35 to 50% 50 to 60% 60 to 75% 75 to 85% 85 to 95% 95 to 100%</p> <p>Not meeting all gradation requirements for SW Above "X" line with PI less than 4 and 7 Not meeting all gradation requirements for SW Above "X" line with PI less than 4 and 7 Not meeting all gradation requirements for SW Above "X" line with PI less than 4 and 7</p>



Appendix 5.1 – Soil Classification Test Result Sheets

SOIL CLASSIFICATION TESTS RESULTS FOR:

- particle size distribution
- liquid limit
- plastic limit
- plasticity index
- in-situ moisture content

This appendix is included only in the copy of the report held by the Geological Survey Library.

Appendix 5.2 – X-Ray Diffraction Analyses

Bore No/ Depth (m)	Landslide No.	Stratigraphy	Clay Mineral Constituents				Other Major and (Minor) Mineral Constituents
			Dominant or Co- dominant	Sub-dominant (>20%)	Accessory (5-20%)	Trace (<5%)	
2/3.10	15	Childers Formation	Kaolinite with halloysite admixed			Mica/illite	Quartz (goethite) (hematite?)
2/5.80	15	Lower Cretaceous	Montmorillonite*		Kaolinite	Mica/illite	Quartz (Na feldspar) (alunite?) (goethite) (hematite?) (goethite)
4/5.90	10	Tertiary Older Volcanics	Kaolinite with halloysite admixed	Hydrated halloysite			
5/6.00	10	Tertiary Older Volcanics	Kaolinite with halloysite admixed	Hydrated halloysite montmorillonite			
14/3.00	9	Tertiary Older Volcanics	Halloysite (dehydrated- metahalloysite) montmorillonite*				(K feldspar)
14/5.00	9	Childers Formation	Kaolinite	Illite- montmorillonite (regularly mixed layers)			Quartz
15/4.50	10	Childers Formation	Kaolinite	Mica/illite	Illite- montmorillonite (randomly mixed layers)		Quartz
16/5.00	10	Tertiary Older Volcanics	Kaolinite with halloysite admixed	Hydrated halloysite	Randomly layered mixed clays		(goethite)
17/6.40	9	Tertiary Older Volcanics	Kaolinite with halloysite admixed	Randomly layered mixed clays			(goethite) (quartz) (hematite?)

Bore No/ Depth (m)	Landslide No.	Stratigraphy	Clay Mineral Constituents				Other Major and (Minor) Mineral Constituents
			Dominant or Co- dominant	Sub-dominant (>20%)	Accessory (5-20%)	Trace (<5%)	
18/2.00	17	Childers Formation	Kaolinite with halloysite admixed	Randomly layered mixed clays			(goethite) (hematite?) (quartz) (K feldspar) (dolomite?) (anatase?)
20/1.90	Klevans	Lower Cretaceous	Montmorillonite*		Kaolinite	Mica/illite	Quartz (Na feldspar)
21/5.33	20	Childers Formation	Kaolinite Randomly layered mixed clays	Mica/illite			Quartz
22/4.30	20	Childers Formation	Layered montmorillonite- vermiculite-illite?	Kaolinite	Illite- montmorillonite* (randomly mixed layers)	Mica/illite	Quartz (alunite?) (anatase?)
27/5.62	7	Lower Cretaceous	Montmorillonite*		Mica/illite	Kaolinite Chlorite	Quartz Na feldspar (alunite?)

* Inhibited montmorillonite: Inert interlayered material such as gibbsite or brucite present

MINERALOGY OF 15 SOIL SAMPLES

1. Introduction

A batch of fifteen samples received from the Victorian Department of Minerals & Energy (Mr J Brumley) were soils from various depths (up to 6.4 m) from thirteen boreholes. They were to be examined by X-ray diffraction methods to determine their clay and non-clay mineralogies, according to AMDEL Code MC2. This consists of a diffractometric examination of the bulk sample, plus the separation of a -2μ 'clay' fraction and the examination of samples prepared from this fraction.

2. Procedure

The samples, which were damp, were removed from their plastic bags and air-dried at room temperature. Sub-samples were taken, ground finely by hand, and used to prepare X-ray diffractometer traces which were interpreted by standard procedures.

Further weighed sub-samples were taken and dispersed in water with the aid of deflocculants and an electric blender, and allowed sediment to produce -2μ sized 'clay fraction' material by the pipette method. The resulting dispersions were examined in a plummet balance to determine their solids contents, and were then used to produce oriented clay preparations on ceramic plates. Two plates were prepared per sample, both being saturated with Mg^{++} ions and one in addition being treated with glycerol. When air-dry, these were examined in the diffractometer. Various additional diagnostic examinations were carried out as required, including examination of the glycerol-free hot ($130^{\circ}C$) and after heating for 1 hour at $550^{\circ}C$.

3. Results

The results are given in Table 1, which lists the following:

- (a) The mineralogy of the total sample, as derived from XRD scan of the bulk material, with supporting evidence as available. The minerals found are listed in approximate order of decreasing abundance, using the semi-quantitative abbreviations given. Coverage of clay minerals may be incomplete, and for the full clay mineralogy the section on the clay fraction (c) should always be consulted. This section (a) should be used for information on non-clay minerals, and to give a general idea of the proportions and make-up.
- (b) The proportion of the sample found to separate into the -2μ size fraction, as determined by plummet balance. The figure obtained may be variable according to the pre-treatment and dispersion conditions used.
- (c) The mineralogy of the -2μ fraction, given in the same way as (a).

4. Remarks

In general, the minerals are typical of those in soils in that they are poorly crystalline and poorly defined, and the interpretation is consequently sometimes difficult.

Goethite and hematite are invariably very poorly crystalline and give XRD patterns difficult to identify. In general, the reported presence of these minerals corresponds well with those samples identifiable as iron-bearing from their colour.

Kaolinite and halloysite. The two closely-related minerals are widely present. It is difficult to identify moderate amounts of metahalloysite in the presence of kaolinite; hence they are often reported together as K/H in the table where there are indications of the presence of halloysite. If halloysite identification is of great importance in these or other instances the use of electron microscopy is recommended. In some cases hydrated halloysite, which has a 10\AA rather than a 7\AA basal spacing, has been definitely detected and is reported separately.

Montmorillonite (smectite). In some cases this has been reported as 'inhibited'. This refers to the presence of inert interlayer material, probably gibbsitic or brucitic, which inhibits the collapse of the clay layers when the Mg-saturated clay is heated to low temperatures (e.g. $110-150^{\circ}C$). The inhibited montmorillonites reported here collapse to about 13.5\AA (from 15\AA) at such temperatures, instead of to a more usual spacing of about $12-12.5\text{\AA}$. Heating to 550° promoted a fully collapse to about 10\AA . This is unlikely to be of practical importance, but is reported for completeness.

Interstratified materials. Various types of interstratified or ‘mixed-layer’ clays are reported, as listed in the mineral key. The material found in BH22 4.30 m appears to be very unusual, and may consist of a 3-component interstratification. It is tentatively identified as a montmorillonite-vermiculite-illite.

Mineral Key

AL	Alunite
An	Anatase
C	Chlorite
Dol	Dolomite
F	Na feldspar
F’	K feldspar
G	Goethite, very poorly crystalline
H	Halloysite, dehydrated (metahalloysite)
HH	Hydrated halloysite
Hm	Hematite, very poorly crystalline
K	Kaolinite
K/H	Kaolinite with probable or definite admixed halloysite
M	Mica/illite
(M-Mo) _{ran}	Illite-montmorillonite mixed-layer clay, more or less randomly interstratified
(M-Mo) _{reg}	Illite-montmorillonite mixed-layer clay, more or less regularly interstratified
ML	(Sample BH22) – mixed-layer clay of complicated type, possibly montmorillonite-vermiculite-illite
Mo	Montmorillonite (smectite)
Mo’	‘Inhibited’ montmorillonite – see text
Q	Quartz
RI	Randomly-interstratified clay material of indeterminate type. Likely to contain montmorillonite.

Semi-quantitative abbreviations

These are defined as follows:

D =	Dominant. Used for the component apparently most abundant, regardless of its probable percentage level.
CD =	Co-dominant. Used for two (or more) predominating components, both or all of which are judged to be present in roughly equal amounts.
SD =	Sub-dominant. The next most abundant component(s) providing its percentage level is judged above about 20.
A =	Accessory. Components judged to be present between the levels of roughly 5 and 20%.
Tr =	Trace. Components judged to be below about 5%.

Table 1 – Bulk and -2µm mineralogies of 15 soils

Sample	BH2	3.10m	BH2	5.80m	BH4	5.90m	BH5	6.0m	BH14	3.0m	BH14	5.00m	BH15	4.50m	BH16	5.0m	BH17	6.40m
Bulk Mineralogy	K/H Q G Hm? M	D SD A A Tr	Mo Q F K M Al?	D A-SD A A Tr Tr	K/H G Hm?	D A A	K/H HH G Mo	D SD A A	H Mo F'	D SD Tr	Q K M Mo?	D SD A A	Q K M	D SD SD	K/H HH G	D SD A	K/H G Hm? Q	D A A A
<u>-2 µm fract.</u> % of total	62		20		50		20		24		36		28		19		73	
Mineralogy	K/H G M Q	D A Tr Tr	Mo' K Q M	D Tr-A Tr-A Tr	K/H HH G	D SD A	K/H HH Mo G	D SD SD A	H Mo'	CD CD	K (M-Mo)reg Mo M Q	D SD A A Tr	K M (M-Mo)ran Q	D A-SD A Tr	K/H HH RI	D SD A	K/H RI G	D SD A
Sample	BH18	2.0m	BH20	1.90m	BH21	5.33m	BH22	4.30m	BH24	3.00m	BH27	5.62m						
Bulk Mineralogy	K/H Q Hm? F' Dol? Ana?	D SD A Tr Tr Tr	Mo Q F M K	D SD A Tr Tr	K Q M	D SD A	K ML M Al? Ana?	CD CD A-SD Tr Tr Tr	Q K M C? F	D SD A Tr Tr	Mo Q F Al?	CD CD A-SD Tr-A Tr Tr						
<u>-2 µm fract.</u> % of total	37		30		75		67		45		18							
Mineralogy	K/H RI G Q	D SD A Tr	Mo' Q K M F	D A-SD A Tr-A Tr	K RI M Q	CD CD A-SD A	ML K M Q	D SD Tr Tr	K (M-Mo)ran M Q	D A A Tr-A	Mo' M Q K C F	D A Tr Tr Tr Tr						

Mineral Key (see separate page)

Appendix 7.1 – Recommended Laboratory Soil Testing

TELEPHONE
345 1844

TELEGRAMS
MIMELB PARKVILLE



University of Melbourne

DEPARTMENT OF CIVIL ENGINEERING

Parkville, Victoria 3052

7th June, 1978

Mr John Neilson,
Department of Minerals and Energy,
Mines Department,
151 Flinders Street,
MELBOURNE.

Dear John,

I would like to submit a quotation for specialized testing of samples of clay soil from the Narracan land slip material.

We have allowed for careful sample preparation, reconsolidation to an isotropic mean insitu stress condition, undrained triaxial testing with pore pressure measurement at extremely slow strain rates to establish the peak failure strength and to investigate whether there is any substantial reduction in strength in the post peak behaviour. Automatic recording equipment will be used to continuously monitor the sample performances.

Specialized testing for residual strength such as ringshear-torsion or repeated direct shear to large strains has not been allowed for in this quotation but may be required if a substantial variation between peak and residual strengths is indicated.

For each consolidated undrained test to large strains - \$460-00 each.

Yours sincerely,

A handwritten signature in dark ink, appearing to read 'P.J. Hoadley', with a long horizontal stroke extending to the right.

P.J. Hoadley
Senior Lecturer in Civil Engineering