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# DEPARTMENT OF NATIONAL RESOURCES

# BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS



Record 1978/24

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## Geological notes on proposed Sullivans Creek to Commonwealth Avenue pumping station sewer augmentation and possible extension to King Edward Terrace, Canberra, A.C.T.

by

G.A.M. HENDERSON

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CONTENTS

PLATES

1. Plan showing geological data near pipeline routes
2. Geological sections along route options.

## INTRODUCTION

The following geological notes on the proposed augmentation of the sewer pipeline from Sullivans Creek to Commonwealth Avenue pumping station and its possible extension to King Edward Terrace were prepared at the request of the National Capital Development Commission for the use of their consultant, Scott and Furphy Engineers Pty Ltd. The section north of the pumping station involves the investigation of three alternative routes, all of which would require a combination of tunnelling and trenching (see Plate 1 for route options). Data on rock conditions have been obtained from inspections of excavations by BMR geologists and from reports on drilling for foundation investigation of building sites, and for other purposes.

## LITHOLOGY AND WEATHERING

Three rock units along a strip adjacent to the pipeline routes have been recognized on the basis of lithology and weathering characteristics. Weathering profiles do not include fault zones, where deeper weathering can be expected (see "Faults" below).

### MUDSTONE AND SHALE - SHALLOW WEATHERED ($Smc_1$)

A broad zone of shallow weathered mudstone and shale extends from City Hill across the western part of London Circuit to Sullivans Creek (see Plate 1). The rock generally shows little or no bedding and is of fairly uniform composition except for calcareous veins and lenses. Fresh or slightly weathered rock may be found in places within 1 m of the surface and generally at depths of less than 5 or 6 m. Moderately weathered rock overlies the slightly weathered rock and passes up into highly to completely weathered rock and soil at depths of about 1 to 3 m. The fresh rock is moderately hard and strong.

### SHALE, MUDSTONE, SILTSTONE AND SANDSTONE - DEEPLY WEATHERED ($Smc_2$)

Deeply weathered shale, mudstone, siltstone and fine-grained sandstone underlie areas to the southwest and north of City Hill. The rock ranges in composition from well-bedded siltstone and fine-grained sandstone to poorly-bedded shale and mudstone. The depth to fresh or

slightly weathered rock generally exceeds 6 m and, in places, moderately and highly weathered rock has been encountered in drillholes at depths exceeding 15 m. Except in areas within 10 or 20 m of the boundary with unit $Smc_1$ soft, weak rock can be expected in most places to at least 10 m depth.

COARSE TUFF ($Smc_3$)

Extremely weathered coarse tuff has been mapped in two excavations close to the Lakeside Hotel. The rock is thought to be a bed dipping in a general northeast direction within unit $Smc_2$. The rock has not been observed below a depth of 3 m but experience of similar thin beds elsewhere indicates that it is probably highly to extremely weathered to more than 10 m depth.

## OVERBURDEN

### ALLUVIUM

Alluvial deposits consisting of sand, gravel, and clay occur at several places. The alluvium on the western side of Sullivans Creek near Gould Street is about 4.5 m thick in drill hole DD158 (BMR stratigraphic hole). Gravel and coarse sand of variable thickness to 4.5 m was revealed in excavations and drilling at the site of the School of Music. Clayey gravel up to 3 m thick was mapped in part of the excavations for the Lakeside Hotel.

A drillhole (hole 10, Appendix 1, Plate A2-4) at the northern end of Commonwealth Avenue Bridge indicates sandy gravel overlain by silty sand between RL546 and 551 m.

### FILL

Fill ranging to about 7 m thick forms the northern abutments of Commonwealth Avenue Bridge and overlies alluvium of the old Molonglo river bed near the sewer pumping station (Appendix 1, Plate A2-2). Fill of variable thickness is associated with the road system at the intersection of Commonwealth Avenue, London Circuit and Parkes Way.

# GEOLOGICAL STRUCTURES

## CLEAVAGE

All rocks in the area except for some of the siltstone and fine-grained sandstone show noticeable cleavage which strikes approximately north and dips at about 70° to 75° to the east. Cleavage is particularly well-developed in some of the shallow weathered shale and mudstone and causes the rock to break into platy fragments.

## JOINTS

Orientations of joints have been measured in several excavations. Prominent closely spaced joints striking 062° and dipping at about 75° southeast are prominent in mudstone beneath the CML building at Darwin Place and joints of similar orientation are common around City Hill. However the excavations for the Lakeside Hotel showed joints of widely varying orientations and no obvious preferred orientations, although the number of joints measured was not sufficient to give a statistically meaningful analysis. In all excavations mapped, closely spaced joints subparallel to cleavage are present where cleavage is developed and joints parallel to bedding are common. The attitude of bedding varies from place to place as indicated on the plan.

## FAULTS AND SHEARED ZONES

No major faults of large displacement are known in the area. However minor faults with sheared zones up to 3.5 m wide have been observed in some excavations with associated zones of deeper rock weathering and decomposition. The faults are commonly steeply dipping and strike sub-parallel to cleavage or are of low angle with variable strike. Weathering is locally deeper and more severe above the planes of low-angle faults, where they approach the surface, than elsewhere. Two faults at Darwin Place possibly intersect the pipeline routes as shown on the plan. Some small low-angle thrust faults have also been observed in excavations. None of the faults have been active in recent geological time.

## HYDROGEOLOGY

It is expected that the invert levels of all the proposed routes would be up to a few metres below the water table. Standing water was measured at a depth of 2.4 m in drill hole DD8 (see accompanying log). This hole was put down in 1969 during investigations for the proposed North Molonglo Outfall Sewer, and is on the route of Option 3 between manholes 2 and 3B. In another hole for the same project, DD9 - near the Hotel Acton, standing water was at 1.5 m depth. Towards the northern end of the pipeline routes water seepage was noted at a depth of 6.0 m about 100 m east of the intersection of Marcus Clarke Street and Rudd Street in a trench for the Ballumbir Street to Barry Drive sewer project (see Goldsmith, 1975). However in the section of trench along Marcus Clarke Street north of Rudd Street the trench was dry to a depth of 5 m. No water was encountered to a depth of 9 m below Canberra House (Plate 1). The drillholes at the School of Music were also dry to 7.5 m, the maximum depth drilled. Rates of seepage into the proposed tunnel and trench are expected to be small in most places where excavation is in rock. Water-pressure testing of drillholes 8 and 9 showed extremely low permeabilities in the moderately to highly weathered siltstone ($Smc_2$) where joints are probably sealed with clay (see accompanying logs). No significant variation in groundwater inflows can be expected between the three route options.

Inflows could be slightly greater in the less weathered mudstone ($Smc_1$) which will be found to be open-jointed in places and which could also possibly contain dissolved calcite veins. Water inflows can also be expected from small faults. For example a flow of about 0.25 cubic metres per hour was recorded from a small fault in the foundations of Electricity House east of City Hill in rock similar to $Smc_1$.

Alluvial deposits containing permeable gravel will be encountered along Sullivans Creek north of manhole 12, and in the vicinity of manhole 1. Some difficulty may be experienced in keeping excavations dry in these areas.

## NOTES ON PROPOSED ALTERNATIVE ROUTES

The interpreted profile of overburden and weathered rock has been plotted on the longitudinal sections of the three options for the route of the pipeline (Plate 2).

From the subsurface data available it is expected that generally similar conditions would be encountered in each of the options. Assuming that a tunnel would be excavated where the invert is at a depth greater than 7 to 8 m, the three route options can each be divided into three sections. They are (1) a southern section of shallow tunnel or deep trench in moderately to highly weathered rock, (2) a middle section of tunnel in slightly weathered or fresh rock, and (3) a northern section of trench in which hard slightly weathered rock will be encountered in the bottom of the trench. Approximate chainages on Option 1 would be - southern section 0-800 m, middle section 800-1800 m, and northern section 1800-2205 m.

A zone of weathered rock at depth may possibly be encountered in the central section of Option 2 between manholes 7A and 8A. Deep weathering was revealed in some auger holes on the northeastern side of University Avenue about 100 m northwest of manhole 8A and it is possible that this deeply weathered zone extends to the south across the pipeline route. The rock conditions under the Canberra School of Music building vary. On the north-eastern side a patch of slightly weathered grey mudstone was revealed in foundation excavations but the remainder of the excavation was in moderately to highly weathered siltstone. Channels of alluvium up to 4.5 m thick are present, and alluvium of lesser thickness covers the entire site, but it is unlikely that the alluvium extends down to tunnel level near the building.

Table 1 below shows the approximate lengths at invert level of the various states of rock weathering, for each route option.

TABLE I STATES OF WEATHERING AT PIPELINE INVERT LEVEL

| OPTION | FRESH TO SLIGHTLY WEATHERED | MODERATELY WEATHERED | HIGHLY TO EXTREMELY WEATHERED |
|---|---|---|---|
| 1 | 1330 m | 410 m | 250 m |
| 2 | 1225 m | 470 m | 250 m |
| 3 | 1675 m | 260 m | 235 m |

The length of pipeline that would be in alluvium or fill would be about 215 m for each option.

Assuming the whole route is tunnelled, except for the shallow section north of Barry Drive, option 3 appears to offer the greatest length of most favourable tunnelling conditions, which would be in fresh or slightly weathered rock. However, it should be noted that the boundary between the shallow and deeply weathered rock formations is sub-parallel to route option 3 to the east of the Lakeside Hotel, and the rock may be more weathered than has been indicated on the section on Plate 2.

## INFLUENCE OF CONSTRUCTION WORK ON ADJACENT BUILDINGS

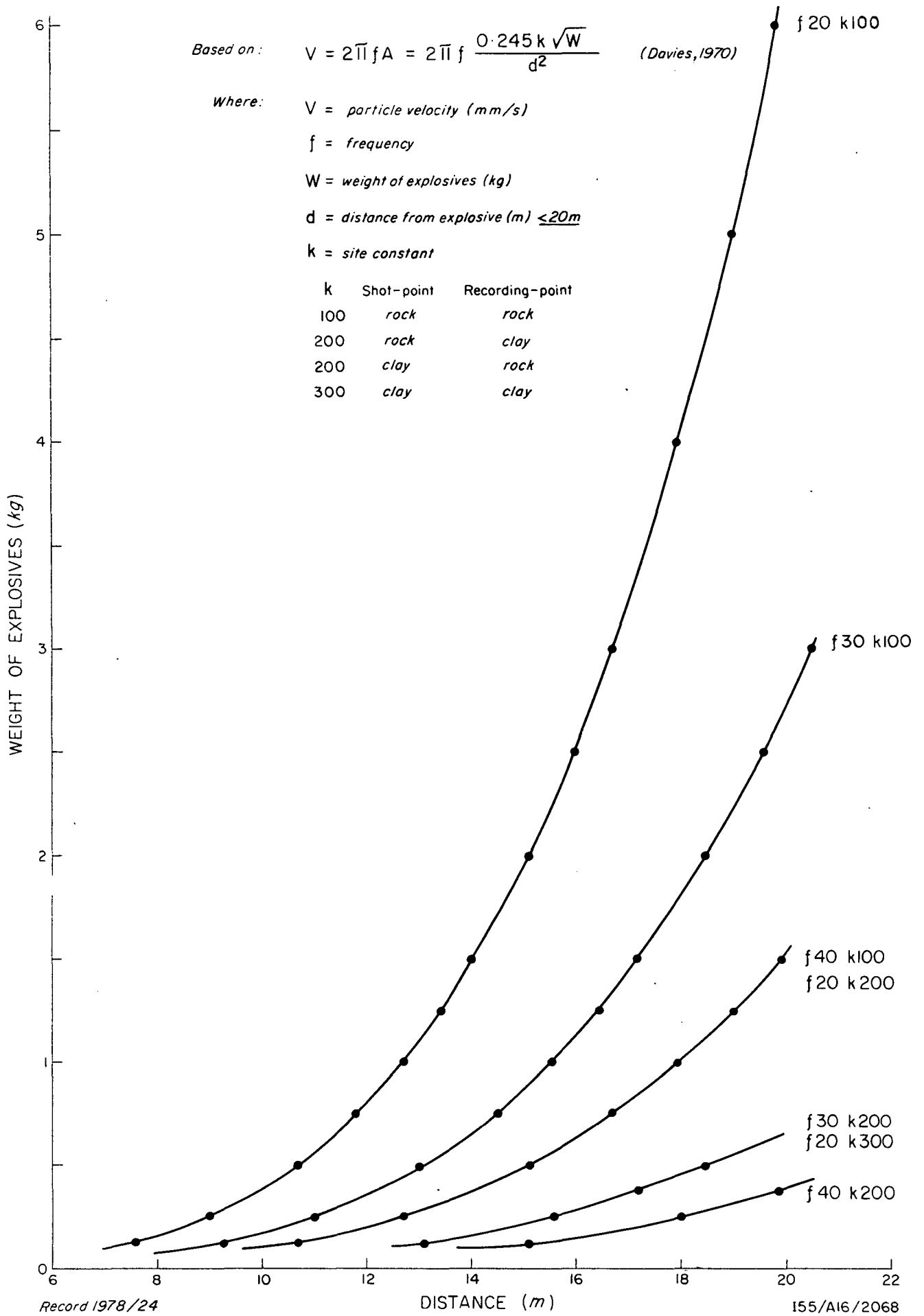
The Canberra School of Music building is very close to the routes of Options 1 and 2. Settlement of the building foundations could occur during tunnel excavation unless preventive measures are taken, especially if the rock is deeply weathered. The amount of explosive which can safely be used in excavations close to buildings depends on the nature of the rock or soil, and it can be determined by vibration testing in which small charges are exploded in a drill hole and the resulting vibrations recorded at a given distance. An illustration of the type of result obtained for differing rock and soil conditions is shown on the accompanying graphs (Fig. 1), derived from Davies (1970).

## EXTENSION OF PIPELINE SOUTH TO KING EDWARD TERRACE

The geological conditions along the line of Commonwealth Avenue Bridge are shown in plan and section on Plates A2-2 and A2-4 from Gardner (1969). Alluvium ranging in thickness to about 10 m covers bedrock which consists of deeply weathered siltstone, mudstone and claystone north of Pier 1. Gardner reports shallow weathered calcareous mudstone and limestone south of Pier 1. Two drill holes, DD3 and DD4 were put down for a weir site investigation at the former Lennox Crossing (see accompanying logs). Drill hole DD4 penetrated calcareous mudstone and limestone with cavities. A seismic refraction survey of the area between DD3 and DD4 indicated a zone of deep weathering as shown on Plate A2-2. Weathered rock extending to a maximum of 36 m depth is indicated beneath 4.5-9.5 m of alluvium. The eastern ends of seismic traverses west of DD4 indicate unweathered rock probably calcareous mudstone at relatively shallow depth (10-16.5 m) beneath alluvium 4.5-9.5 m thick. The rock is probably similar to that along the bridge axis south of Pier 1. A possible major fault is indicated by very deep weathering in Hole 5 at Pier 2. Gardner interprets it as a low angle

FIG. 1

# PLOT OF WEIGHT OF EXPLOSIVES VS DISTANCE FROM SHOT-POINT TO RECORDING SITE <20m FOR MAXIMUM PARTICLE VELOCITY OF 19·1 mm/s (0·75 in/s)

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thrust fault striking north and northwest and passing through the deeply weathered zone around drill hole DD3. Other possible fault or sheared zones with accompanying deep weathering are indicated in the seismic traverses north of Pier 1.

In assessing the option of tunnelling to the south of the Commonwealth Avenue Pumping Station the possibility of cavernous limestone beneath the bed of Lake Burley Griffin and to the south of the lake must be allowed for. Large inflows of water into a tunnel through cavernous limestone would present serious problems because recharge of water in the limestone, even in the area south of Lake Burley Griffin, is expected to come direct from the lake. An investigation to locate cavernous limestone would require numerous drillholes, and detailed geological investigation, and it is doubtful if it would be possible to guarantee that all limestone had been located.

## CONCLUSIONS

1. Option 3 promises the greatest length of most favourable tunnelling conditions. Option 3 also avoids problems in excavating close to the Canberra School of Music building, and the zone of possible deep weathering between manholes 7A and 8A on Option 2 would not be intercepted.
2. Groundwater inflows are expected to be slight along most of the pipeline route, with no significant variation in inflows between any of the three route options.
3. The possible extension of the pipeline south from the Commonwealth Avenue Pumping Station would need to be investigated thoroughly to determine the extent of cavernous limestone. Limestone with cavities could present serious difficulties with large inflows of groundwater into a tunnel.

## REFERENCES

BUREAU OF MINERAL RESOURCES: Project file 1978/101 (Restricted)

DAVIES, J.V., 1970 - Experience from blasting 12ft dia Mersey pilot tunnel. Ground vibrations from tunnel blasting. Tunnels and tunnelling, May 1970.

GARDNER, D.E., 1969 - Geology of the central area of Canberra, A.C.T. Bur. Miner. Resour. Aust. Rec. 1969/11.

GARDNER, D.E., 1974 - Geological observations at several construction sites, at Canberra (northside) and Phillip, A.C.T. 1967-68. Bur. Miner. Resour. Aust. 1974/13.

GOLDSMITH, R.C.M., 1975 - Canberra City sewer augmentation, Ballumbir Street to Barry Drive: geological observations during construction. Bur. Miner. Resour. Aust. Rec. 1975/107.

HENDERSON, G.A.M., 1970 - North Molonglo outfall sewer, A.C.T. geological report on detailed investigation 1969. Bur. Miner. Resour. Aust. Rec. 1970/61.

# APPENDIX 1

## EXTRACTS FROM OTHER REPORTS

Diamond-drill hole logs

DD3

DD4

DD8

DD9

Plate A2-2 Commonwealth Avenue Bridge Site exploratory drilling based on seismic refraction survey.

Plate A2-4 Commonwealth Avenue Bridge Site geological sections.

Plate A2-5 Commonwealth Avenue Bridge Site bored cylinder foundations.

BUREAU OF MINERAL RESOURCES, GEOLOGY & GEOPHYSICS

GEOLOGICAL LOG OF DRILL HOLE

PROJECT ACTON WEIR SITE

LOCATION AS SHOWN ON PLATE A2-2

ANGLE FROM HORIZONTAL (θ) 90° DIRECTION

COORDINATES R.L. OF COLLAR 559.3m

HOLE NO DD3

SHEET 1 OF 1

| Rock Type and Degree of Weathering | Description Lithology, colour, strength, etc. | Depth and size of Core | Structures Joints, veins, seams, fault, etc. |
|---|---|---|---|
| Aeolian | Sand | 0.6m | |
| Lacustrine | Sand and sandy clay | 3.0m | |
| | Buff clay | 3.4m | |
| | Sand and gravel in clay matrix | 4.6m | |
| | Cemented gravel | 5.5m | |
| | Silty shale and siltstone; weathered, in part decomposed and plastic | 10.1m | Structure obscured by crushing and weathering<br>Flatly dipping fractures coated with limonite |
| | | | END OF HOLE |

Casing | Graphic Log | Lift and % core recovery | Fracture Log (0 6 12 18+) | RQD | Structural Log | Water Level

Drill type MINDRILL

Feed

Core barrel type

Driller V. HILTUNEN

Commenced

Completed 1/10/58

Logged by D.E. GARDNER

M(Pf) 221

Notes

*Fracture Log* – Number of fractures per 25cm of core. Zones of core loss blacked in.

*Bedding & Joint Planes* – Angles are measured relative to a plane normal to the core axis.

*Water Level Measurements* – ▼ Level when hole in progress at specified depth. ▽ Level in completed hole on specified date.

Checked by

Core Photograph Negative No.

| Depth(m) | Black & White | Colour |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |

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BUREAU OF MINERAL RESOURCES, GEOLOGY & GEOPHYSICS

# GEOLOGICAL LOG OF DRILL HOLE

PROJECT ACTON WEIR SITE

LOCATION AS SHOWN ON PLATE A2-2

ANGLE FROM HORIZONTAL (θ) 90° DIRECTION

COORDINATES R.L. OF COLLAR 559.3m

HOLE NO DD4

SHEET 1 OF 1

| Rock Type and Degree of Weathering | Description Lithology, colour, strength, etc. | Depth | Structures Joints, veins, seams, fault, etc. |
|---|---|---|---|
| Aeolian | Loose fine sand and sandy clay | 1.6m | |
| Lacustrine | Pale brown and grey clay | | |
| | clayey sand | 4.4m | |
| | Sand and gravel in clay matrix | 6.1m | |
| Interbedded mudstone (decomposed) and impure limestone (with solution cavities) | Decomposed pale brown mudstone | | |
| | fragments of limestone | | |
| | Limestone bands at 9.1 and 9.4m | 9.4m | |
| | Nearly all cavernous; a small amount of buff-brown plastic clay recovered | | Complete water loss |
| | Black impure limestone | 11.25m | Fractures dip approximately 30°; bedding dips at 30°; core hard and compact |
| | | 12.75m | END OF HOLE |

Fracture Log: 0 6 12 18+

Drill type MUNDRILL

Feed

Core barrel type

Driller J. ALLIS

Commenced

Completed 10/10/58

Logged by D.E. GARDNER

M(Pf) 221

Notes

*Fracture Log* – Number of fractures per 25cm of core. Zones of core loss blacked in.

*Bedding & Joint Planes* – Angles are measured relative to a plane normal to the core axis.

*Water Level Measurements* – ▼ Level when hole in progress at specified depth. ▽ Level in completed hole on specified date.

Checked by

Core Photograph Negative No.

| Depth(m) | Black & White | Colour |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |

155/A16/2025

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BUREAU OF MINERAL RESOURCES, GEOLOGY & GEOPHYSICS

# GEOLOGICAL LOG OF DRILL HOLE

PROJECT NORTH MOLONGLO OUTFALL SEWER

LOCATION BETWEEN COMMONWEALTH AVE & BARRINE DRIVE

ANGLE FROM HORIZONTAL (θ) 90° DIRECTION

COORDINATES R.L. OF COLLAR 561.8 m

HOLE NO DD8

SHEET 1 OF 1

| Rock Type and Degree of Weathering | Description Lithology, colour, strength; etc. | Casing | Graphic Log | Lift and % core recovery | Depth and size of Core | Fracture Log (0 6 12 18+) | RQD | Structural Log | Structures Joints, veins, seams, fault, etc. | Permeability in lugeons* | Water Level |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Black soil and pale brown clay | | | 100% 100% 100% | NX casing 1.5m | | | | | | |
| Siltstone, highly weathered | Pale yellow-brown, soft, weak rock, much decomposed to clay. Max. core length 10cm | | | 100% 100% 100% 100% 100% 100% 100% 100% 100% 100% 100% 100% 100% 100% | NMLC 5.0m 10.0m 15.2m | 184 throughout | | | Bedding at 35° Bedding at 40° | NOT TESTED 3 0 0 | 2.4m ▽ 1/7/69 |
| PROPOSED ↑ INVERT LEVEL OF SULLIVANS CREEK TO C.A.P.S SEWER | | | | | | | | | | | |
| | | | | | | | | | END OF HOLE | | |

Drill type E1000 MINDRILL
Feed HYDRAULIC
Core barrel type NMLC
Driller M. DZIWULSKI
Commenced 26/6/69
Completed 1/7/69
Logged by G.A.M. HENDERSON
M(Pf) 221

Notes

*Fracture Log* – Number of fractures per 25cm of core. Zones of core loss blacked in.

*Bedding & Joint Planes* – Angles are measured relative to a plane normal to the core axis.

*Water Level Measurements* – ▼ Level when hole in progress at specified depth. ▽ Level in completed hole on specified date.

* Permeability calculated from water pressure testing

Checked by

Core Photograph Negative No.

| Depth(m) | Black & White | Colour |
|---|---|---|
| | | |
| | | |
| | | |
| | | |

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# GEOLOGICAL LOG OF DRILL HOLE

PROJECT NORTH MOLONGLO OUTFALL SEWER

LOCATION NEAR HOTEL ACTON

ANGLE FROM HORIZONTAL (θ) 90° DIRECTION

COORDINATES R.L. OF COLLAR 558.8 m

HOLE NO DD9

SHEET 1 OF 1

| Rock Type and Degree of Weathering | Description Lithology, colour, strength, etc. | Casing | Graphic Log | Lift and % core recovery | Depth and size of Core | Fracture Log (0 6 12 18+) | RQD | Structural Log | Structures Joints, veins, seams, fault, etc. | Permeability in lugeons* | Water Level |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Dark brown clayey soil | | | 100% 100% 100% | 1.5m | | | | | NOT TESTED | ▽ 4/7/69 |
| | Yellow-brown clay and siltstone fragments | | | 100% 100% | 2.9m | | | | | | |
| Siltstone, moderately weathered | Yellow-brown, soft, moderately weak rock. Max core length 25cm, most core lengths 5-15cm | | | 100% 100% 100% 100% 100% 100% 100% | 5.0m 10.0m 14.9m | | | | Yellow-brown clay<br>Broken zone<br>Broken zone<br>Broken zone<br>Broken zone<br>Bedding at 35°<br>Broken zone | <1<br>0<br>0 | |
| | | | | | | | | | END OF HOLE | | |

Drill type E1000 MINDRILL
Feed HYDRAULIC
Core barrel type NMLC
Driller M. OZIWULSKI
Commenced 2/7/69
Completed 4/7/69
Logged by G.R.M. HENDERSON
M(Pf) 221

Notes

*Fracture Log* – Number of fractures per 25cm of core. Zones of core loss blacked in.

*Bedding & Joint Planes* – Angles are measured relative to a plane normal to the core axis.

*Water Level Measurements* – ▼ Level when hole in progress at specified depth. ▽ Level in completed hole on specified date.

* Permeability calculated from water pressure testing

Checked by

Core Photograph Negative No.

| Depth(m) | Black & White | Colour |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |

I55/A16/668a

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PLATE A2-2

# COMMONWEALTH AVENUE BRIDGE SITE EXPLORATORY DRILLING BASED ON SEISMIC REFRACTION SURVEY

SCALE OF FEET
100 0 100 200 300

Based on Gardner, 1958, Drawing No. A.C.I 28-3 and Hawkins and Stocklin Record 1957/34 Drawing Nos C263-5, C263-4

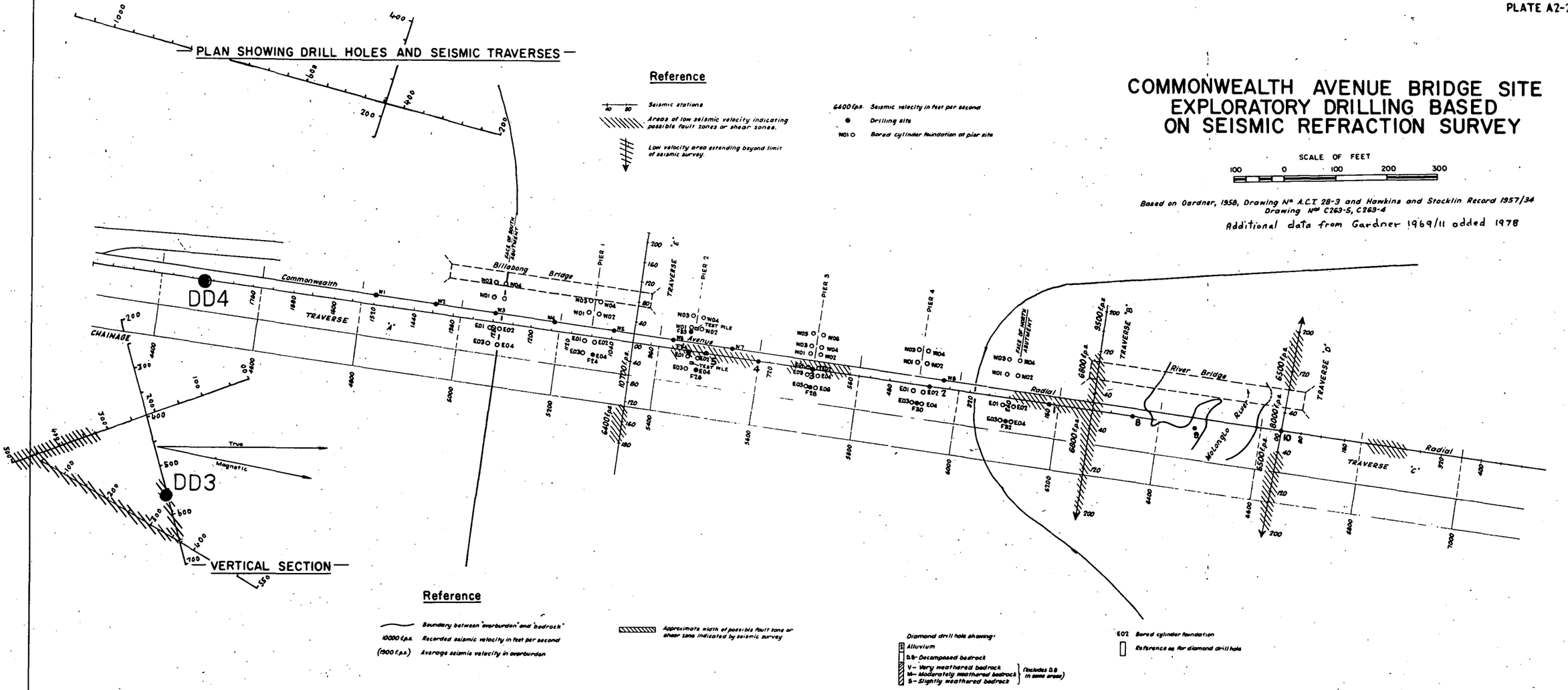
Additional data from Gardner 1969/11 added 1978

## PLAN SHOWING DRILL HOLES AND SEISMIC TRAVERSES

## VERTICAL SECTION

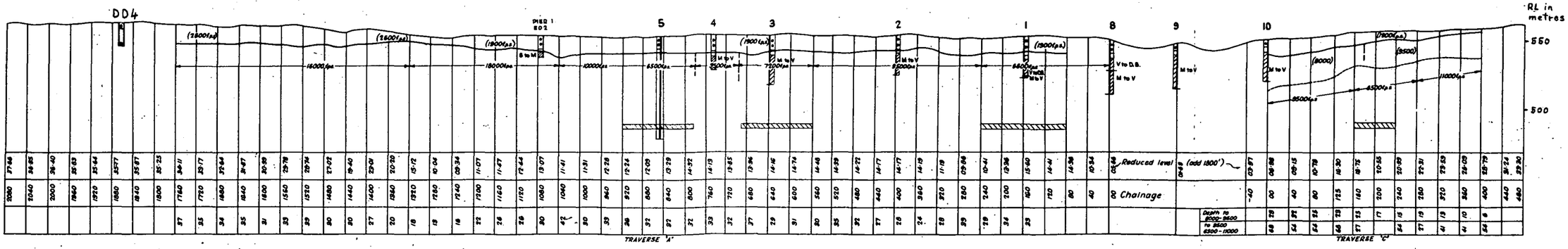
### Reference

- Seismic stations
- Areas of low seismic velocity indicating possible fault zones or shear zones.
- Low velocity area extending beyond limit of seismic survey.
- 6400fps. Seismic velocity in feet per second
- Drilling sits
- W01 O Bored cylinder foundation at pier site




### Reference

- Boundary between "overburden" and "bedrock"
- 10000 f.p.s. Recorded seismic velocity in feet per second
- (1900 f.p.s.) Average seismic velocity in overburden
- Approximate width of possible fault zone or shear zone indicated by seismic survey
- Diamond drill hole showing:
  - Alluvium
  - D.B- Decomposed bedrock
  - V – Very weathered bedrock
  - M– Moderately weathered bedrock } (includes D.B in some areas)
  - S – Slightly weathered bedrock
- EO2 Bored cylinder foundation
- Reference as for diamond drill hole




Record 1969/11 and 1978/24

155/A16/550

PLATE A2-4

# COMMONWEALTH AVENUE BRIDGE SITE

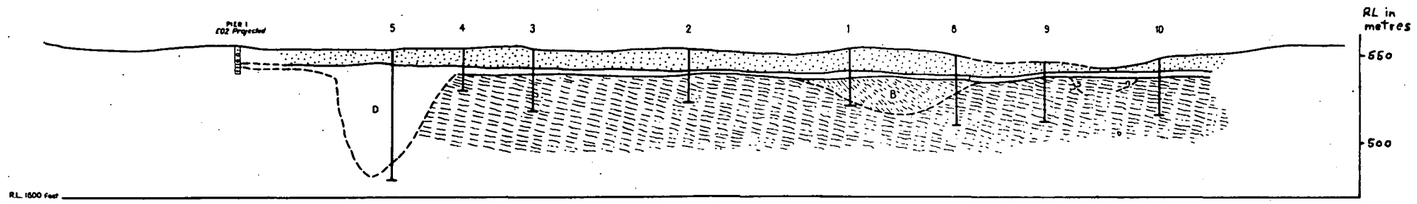
# GEOLOGICAL SECTIONS

(From Gardner 1958, Drawing N°s A.C.T. 28-2, 28-3)

## SECTION (natural scale)

0 100 200 Feet

SOUTH NORTH



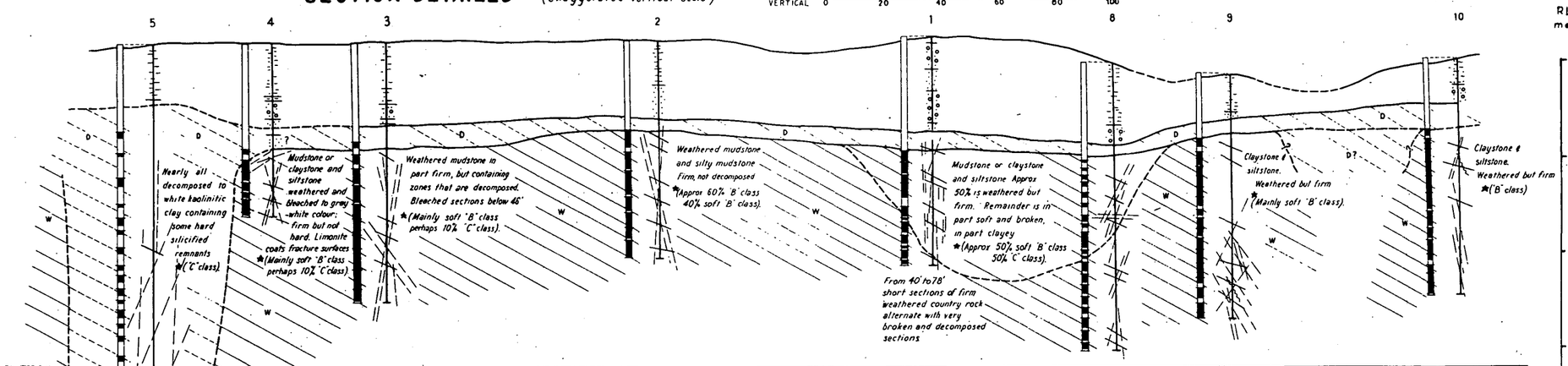

### Reference

- Alluvium (organic silt, sand, gravel)
- D — Plastic clay resulting from weathering and decomposition of the bedrock in situ
- W — Weathered but firm claystone, silty claystone and siltstone.
- B — Firm weathered siltstone etc (▭), containing bands and pockets of plastic clay.
- Calcareous mudstone or claystone.

## SECTION DETAILED (exaggerated vertical scale)

HORIZONTAL 0 50 100 150 200 250 Feet
VERTICAL 0 20 40 60 80 100

SOUTH NORTH




### Reference

RL in metres

550
540
530
520
510
500

- Silt and organic silt
- Sand
- Gravel
- } Alluvium
- D — Claystone & siltstone decomposed to plastic clay
- W — Claystone & siltstone, weathered, but retaining considerable strength and hardness.
- Geological boundary, position accurate.
- Geological boundary, position approximate.
- 10 — Drill hole: Percussion drilled through alluvium and decomposed bedrock; diamond drilled through weathered bedrock.
- Length drilled. Core recovery shown in black.

Diagrammatic Presentation of Structure

- Bedding
- Fractures & joints
- Shearing

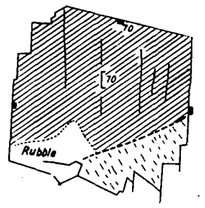
★ Rock materials classification used by Dept of Works, Canberra A.C.T.

Following is a summary of the classifications:-

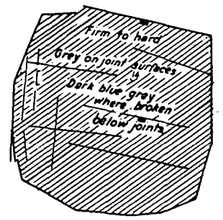
| Class | Description |
|---|---|
| A | Hard igneous, volcanic and sedimentary rock |
| B | Shale, jointed mudstone; weathered rocks not disintegrated |
| C | Soil, clay, sand, gravel: disintegrated weathered rock. |

## PIER No.1 SITE E04

PLAN AT 24' BELOW COLLAR OF CASING



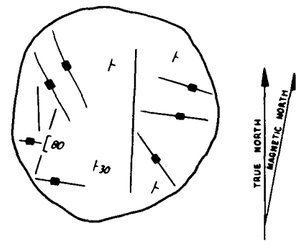

PLAN AT 31' BELOW COLLAR OF CASING




## PIER No. 4 SITE E02

Hole cased to 28 feet below collar
Surface of bedrock at 26 feet below collar

PLAN AT 38 FEET BELOW COLLAR CASING




## SKETCH PLANS OF BOTTOMS OF EXCAVATIONS

- Firm to hard, blue-grey calcareous mudstone
- Pale-grey and blue-grey clay (decomposed mudstone)
- Even-bedded siltstone, fine sandstone and silty mudstone, in part laminated; partly weathered; blue-grey and pink; firm to hard.
- Approximate strike and dip direction of bedding
- 70 Strike and dip of joint
- Vertical joint
- 80 Strike and dip of clevage

# COMMONWEALTH AVENUE BRIDGE SITE

### BORED CYLINDER FOUNDATIONS

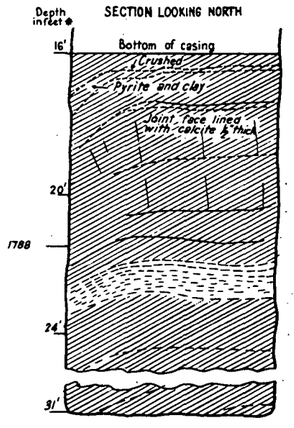
From Gardner 1961

SCALE

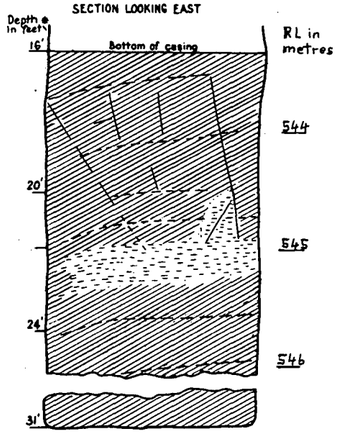
0 4 8 FEET

## PIER No.1 SITE E04

SECTION LOOKING NORTH

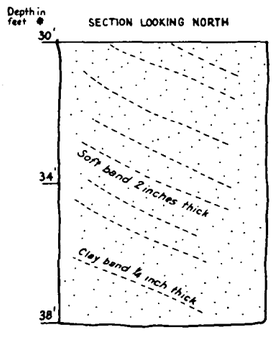



SECTION LOOKING EAST

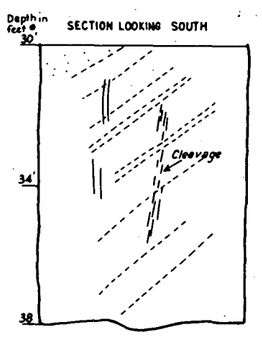



## PIER No. 4 SITE E02

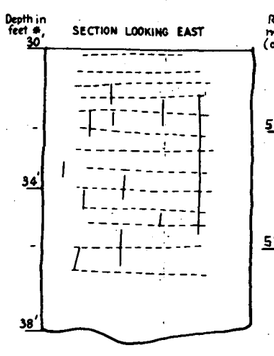
SECTION LOOKING NORTH




SECTION LOOKING SOUTH



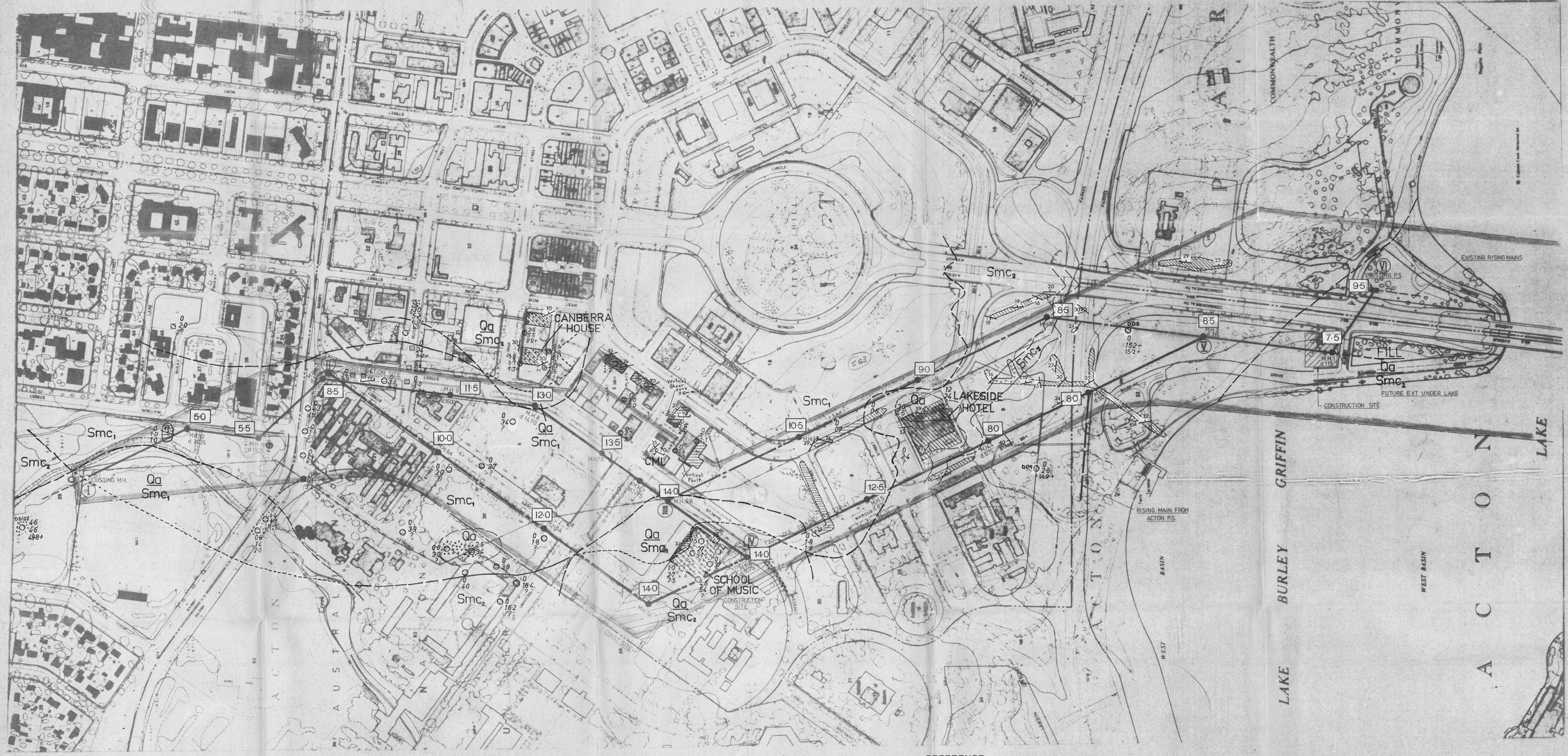

SECTION LOOKING EAST




## SKETCH SECTIONS OF WALLS NEAR BOTTOMS OF EXCAVATIONS

- Firm to hard, blue-grey calcareous mudstone
- Pale-grey and blue-grey clay (decomposed mudstone)
- Even bedded siltstone, fine sandstone and silty mudstone, as in reference for plan.
- Trace of bedding
- Trace of joint
- Depth in feet * Approximate depth below collar of casing

PLATE 1




TN MN

OPTION 1 ROUTE I - II - III - IV - V - VI

OPTION 2 ROUTE I - II - IV - V - VI

OPTION 3 ROUTE I - II - III - V - VI

# PLAN SHOWING GEOLOGICAL DATA NEAR PIPELINE ROUTES

REFERENCE

- Qa — Alluvium - gravel, sand and clay
- $Smc_1$ — Mudstone, shale - shallow weathered
- $Smc_2$ — Shale, mudstone, siltstone & minor sandstone - deeply weathered
- $Smc_3$ — Coarse tuff - deeply weathered
- Geological boundary, position accurate
- Geological boundary, position approximate
- Dip and str. of bedding
- Dip and strike of cleavage
- Excavation
- Drill hole
- DDB — Diamond drill hole
- 06 / 14 / 55 — Profile from drill hole or excavation showing depth of alluvium (0·6), depth to base of highly weathered rock (1·4), and depth to slightly weathered rock (5·5).
- 80 — Depth to invert at manhole

CAMP SCOTT FURPHY PTY. LTD.
CONSULTING ENGINEERS
390 ST. KILDA ROAD, MELBOURNE, VICTORIA 3004
TELEPHONE (03) 267 2800
AND AT CANBERRA, SYDNEY, PERTH, HOBART AND LAUNCESTON

SCOTT & FURPHY CONSULTING GROUP

SCALE: 1:2500
PROJECT MANAGER
DESIGN T.C.C.
DRAWN C.L.
APPROVED DATE

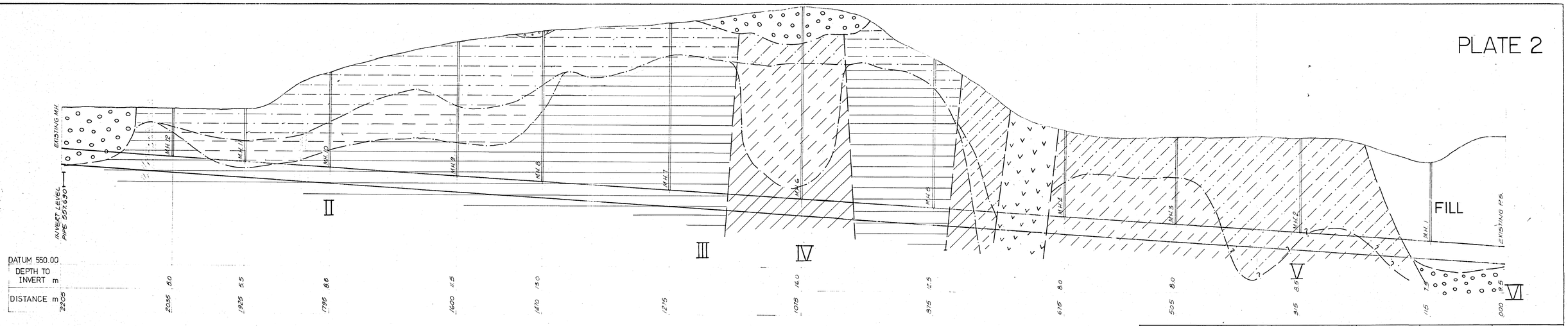
NATIONAL CAPITAL DEVELOPMENT COMMISSION

SULLIVAN'S CREEK TO C.A.P.S. SEWER AUGMENTATION
PRELIMINARY PLAN

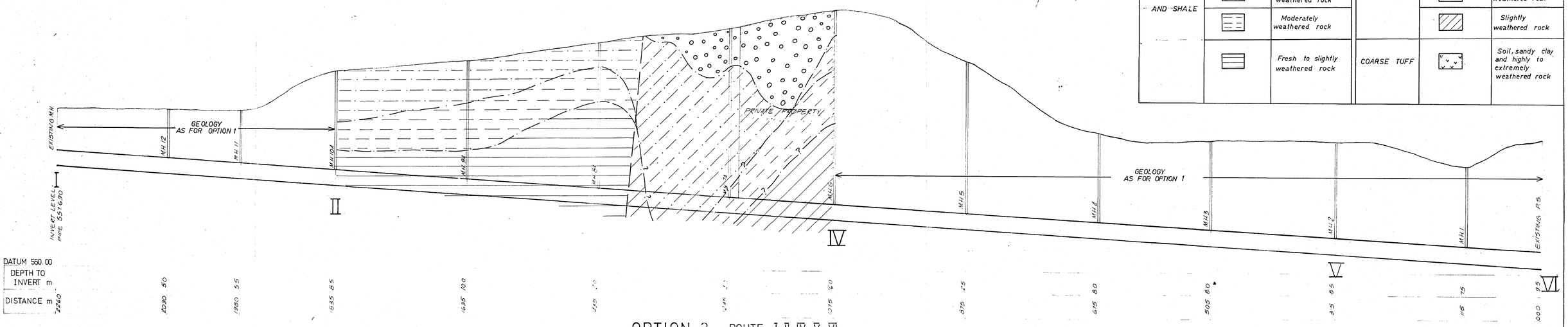
DRAWING No. 5272-1
I55/A16/2022

Record 1978/24

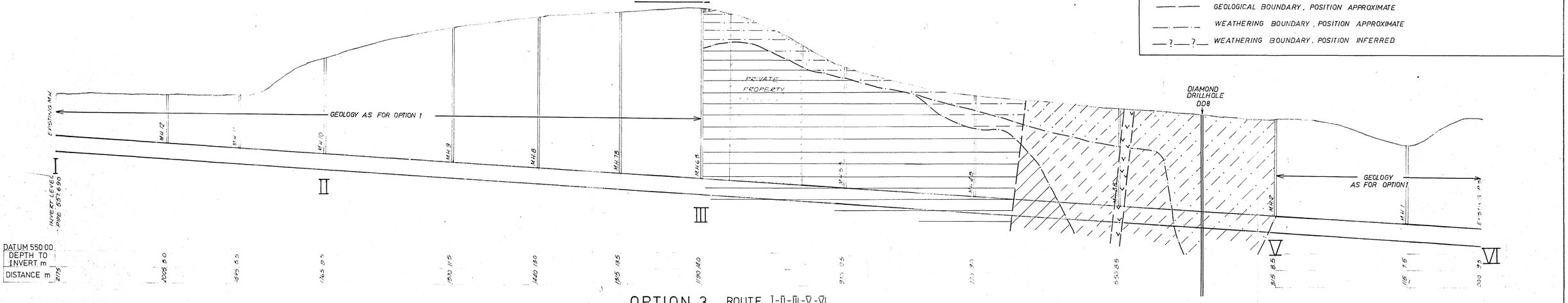
PLATE 2




## OPTION 1 ROUTE I-II-III-IV-V-VI




## OPTION 2 ROUTE I-II-IV-V-VI




## OPTION 3 ROUTE I-II-III-V-VI

| | | | | | |
|---|---|---|---|---|---|
| ALLUVIUM | | Gravel, sand and clay | SHALE, MUDSTONE, SILTSTONE AND MINOR SANDSTONE | | Soil, clay and highly to extremely weathered rock |
| MUDSTONE AND SHALE | | Soil, clay and highly to extremely weathered rock | | | Moderately weathered rock |
| | | Moderately weathered rock | | | Slightly weathered rock |
| | | Fresh to slightly weathered rock | COARSE TUFF | | Soil, sandy clay and highly to extremely weathered rock |

GEOLOGICAL BOUNDARY, POSITION APPROXIMATE

WEATHERING BOUNDARY, POSITION APPROXIMATE

WEATHERING BOUNDARY, POSITION INFERRED

| REVISION | DESCRIPTION | DATE |
|---|---|---|
| | | |

ORIENTATION

# GEOLOGICAL SECTIONS


SCOTT & FURPHY
CONSULTING ENGINEERS
ARGUS BUILDING
290 LA TROBE ST MELBOURNE VIC 3000
AND AT CANBERRA, HOBART AND LAUNCESTON


NATIONAL CAPITAL DEVELOPMENT COMMISSION

SULLIVAN'S CREEK TO C.A.P.S. SEWER AUGMENTATION

PRELIMINARY LONGITUDINAL SECTIONS

| | | | | |
|---|---|---|---|---|
| SCALES 1:125 VERT. 1:2500 HORIZ. | | | | DRAWING No. |
| DESIGN | T.C.C. | | APPROVED | 5272-2 |
| DRAWN | C.L. | | | |
| TRACED | | | DATE | I55/A16/2023 |

Record 1978/24