COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF
NATIONAL DEVELOPMENT

BUREAU OF MINERAL
RESOURCES, GEOLOGY
AND GEOPHYSICS

Record 1972/2

GOOGONG DAMSITE SPILLWAY, SEISMIC REFRACTION SURVEY 1971

by

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ILLUSTRATIONS

SUMMARY

A seismic refraction survey was carried out on the proposed spillway of the Googong damsite to determine the nature of the bedrock and the overlying material; particular attention was given to locating possible shear zones.

The depth of weathering is generally less than 40 ft and bedrock velocity varies between 13,000 ft/sec and 19,000 ft/sec. No shear zones were detected by this work although one low velocity region may exist. It is unlikely that shear zones less than 10 ft wide would be detected.

1. INTRODUCTION

Approximately 4000 ft of seismic refraction work was carried out in May 1971 at the Googong Damsite on the Queanbeyan river (Fig. 1). Access to the area is by a good gravel road but vehicle movement in the area is in general restricted to the ridges and rough bulldozed tracks (four-wheel drive vehicles only). Seismic work was undertaken along five traverses designated T1, T2, T3, T4, and T5 (Fig. 2) which covered the general area of the proposed spillway for the dam. Previous work in this area includes two seismic surveys (Kirton & Wiebenga, 1962 - C.G.G., 1970), and about twenty holes drilled to depths of up to 150 ft. Cores are available for all these holes. The detailed geology has been mapped by J. Saltet (1971) of the Geological Branch of the Bureau of Mineral Resources.

The survey was carried out by a party comprising F.J. Taylor (party leader), G.R. Pettifer (geophysicist), and M.J. Dickson (technical assistant). The term bedrock used in this report refers to the deepest refractor detected and the term overburden refers to the soil, alluvium, and weathered rock above the refractor.

2. GEOLOGY

The geology of the region and in particular the damsite is reported by Saltet (1971). His report deals with the feasibility of a dam on the Queanbeyan River near Googong Homestead. A brief summary of the geology is given here. Figure 3 shows the geology in the immediate area.

The geology of the site is complex but well established. The local rock consists of vertical beds of metasediments and dacite of Middle Silurian age. The dacite is intruded by the Googong Granite of Siluro-Devonian age. The proposed spillway consists of exposed granite in the lower part and dacite in the upper part. Both rock types are fresh to moderately weathered, and soil cover is generally very thin or non-existent. Metasediments are not present in the lower part of the spillway area covered by this seismic work but three different types are present in the vicinity of the damsite. These are sandstone, slate, and limestone.

3. METHODS AND EQUIPMENT

The seismic results presented in this report were obtained using 24-channel SIE PSU 19 refraction equipment with TIC 20Hz geophones. The "reciprocal geophone" method (Heiland, 1946) was used with a geophone

spacing of 10 ft. The layout of traverses is shown in Figure 2, together with the location of drill holes and the traverse lines of C.G.G. (1970).

4. RESULTS

Three groups of velocities were observed:

1000 - 1200 ft/sec - surface soil.

3000 - 7000 ft/sec - rock in various stages of weathering

13000 - 19000 ft/sec - fresh rock (granite and dacite)

The depth to bedrock is less than 40 ft on all traverses and is as small as 10 ft down near the river on T1. The recording of the 3000 - 7000 ft/sec velocities was not always pronounced because this layer is apparently very thin and because bedrock is very shallow. In some areas, signal from this layer is recorded as first arrivals on only one or two geophones so the velocity determination of this layer is not always reliable.

The cross-sections of all traverses are shown in Figures 4 and 5. There are no distinct velocity anomalies apparent in these sections but a low-velocity region may exist on traverse T1 in the vicinity of the station - 50.

This low-velocity measurement occurs over only four geophones and must be considered doubtful because the time discrepancies measured are relatively small. The depth to bedrock shown in these sections is generally smaller than that shown for fresh rock in drill holes in the area. This may indicate that the velocity is that of those cores labelled "slightly weathered".

The bedrock velocities measured indicated that slightly lower velocities exist in the northeastern corner of the area surveyed. However, all velocities are quite high and indicate that the rock has not been weakened by jointing or partial weathering. Shear zones were not detected but it is unlikely that small shear zones (less than 10 ft in width) would be detected by this seismic work. An analysis of all recorded times along T4 shows that dacite has an average velocity of 14,500 ft/sec while granite has an average velocity of 16,000 ft/sec.

Appendix A gives the laboratory measurements of velocity on core specimens from holes 11 and 20 (Fig. 2).

For the weathered region, the measured velocity as obtained in the field is much less than that obtained in laboratory analysis of cores. This fact indicates that the core samples from the overburden are not representative of the overall material. The fact that cores of a certain minimum length are required for the laboratory measurement of velocities means that only the strongest cores are selected for measurement. The field and laboratory measurements combined suggest that the overburden consists of isolated boulders of relatively fresh rock sited in moderately weathered material. Velocity measurements from cores obtained at depths confirm the results of the seismic work in that the bedrock has a very high velocity.

5. CONCLUSIONS

Bedrock velocities measured indicate that the rock has not suffered from extensive jointing or deep weathering. Only one area shows a possibility of weakening through jointing or weathering. This is the low-velocity zone shown on T1.

6. REFERENCES

C.G.G. CONTRACT REPORT, 1970 - Seismic Investigation at Googong Damsite, Belconnen and Fyshwick.

HEILAND, C.A., 1946 - Geophysical Prospecting. New York, Prentice Hall.

KIRTON, M., & WIEBANGA, W.A., 1962 - Googong Damsites, Seismic Refraction Survey N.S.W., 1962. Bur. Miner. Resour. Aust. Rec. 1957/89 (unpubl.).

SALTET, J., 1971 - Geological Investigations of Googong Damsite. Bur. Miner. Resour. Aust. Rec. (in prep.).

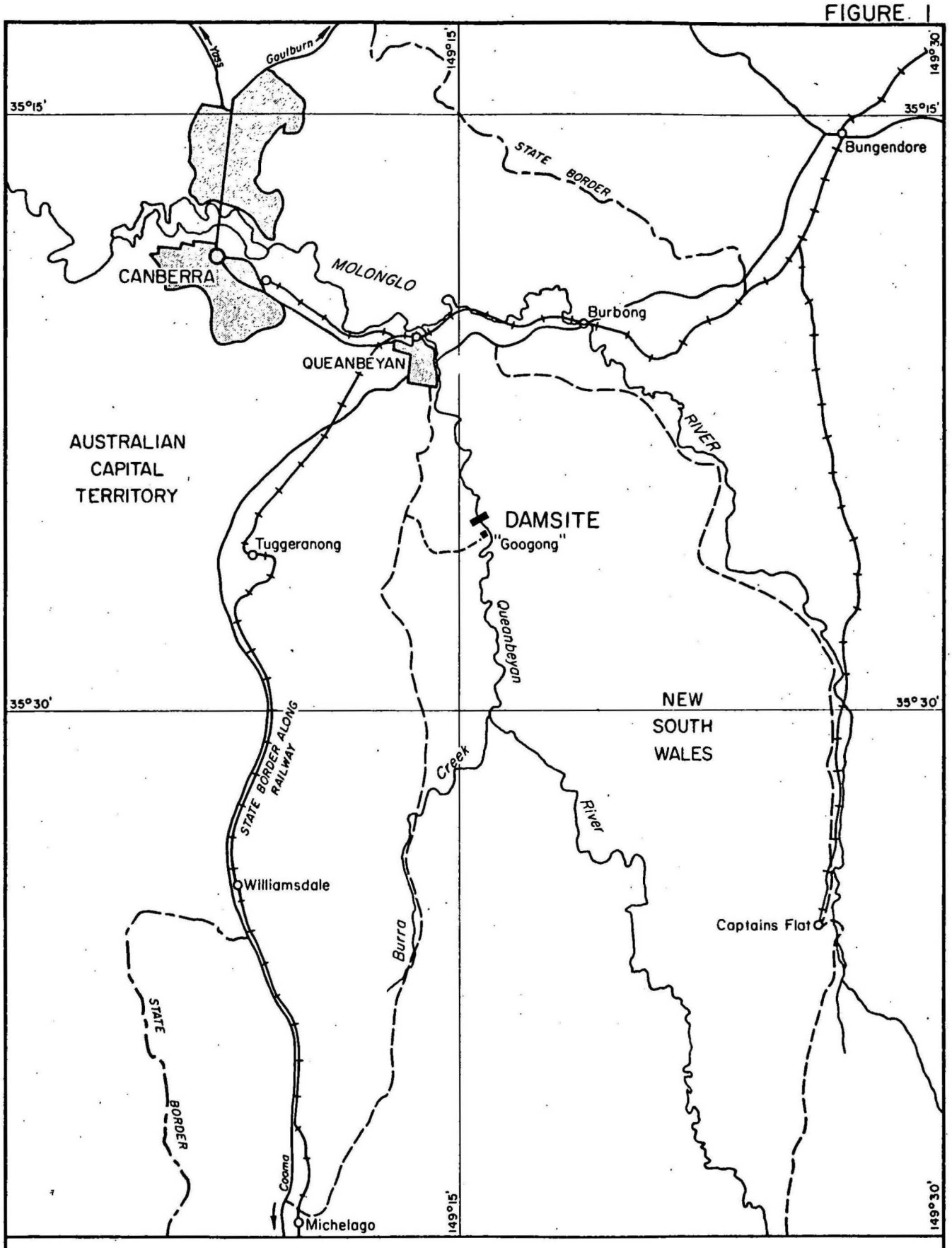
APPENDIX A

VELOCITY MEASUREMENTS ON CORES

GOOGONG DAMSITE

Lab. No.	Drill Hole	Depth (ft)	Geological Description	Specific Gravity	Max. Velocity (ft/sec)	Min. Velocity along Diam. (ft/sec)	Axial Velocity (ft/sec)
71/126	11	4.5	Dacite M.W.	-	13,450	10,300	11,860
71/127A	11	29.6	Dacite M.W.	-	17,500	13,600	14,800
71/127B	11	29.7	Dacite M.W.	2.62	17,500	14,620	15,600
71/128	11	54.5	Dacite S.W.	2.63	16,900	15,300	16,040
71/129	11	114.0	Dacite F.	2.77	21,300	18,050	18,500
71/130	11	78.0	Dacite F.	-	18,600	18,000	18,400
71/131	20	8.0	Granite M.W.	2.64	14,000	12,200	13,800
71/132	20	38.5	Granite S.W.	2.65	17,500	16,100	16,100
71/133	20	67.0	Granite F.	2.69	19,000	17,100	18,000
71/134	20	98.0	Granite F.	2.69	20,900	18,200	10,400

FIGURE 1



GOOGONG DAMSITE
LOCALITY MAP

KILOMETRES 5 0 5 10 15 20 25 KILOMETRES

MILES 5 0 5 10 15 MILES

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FIGURE 2

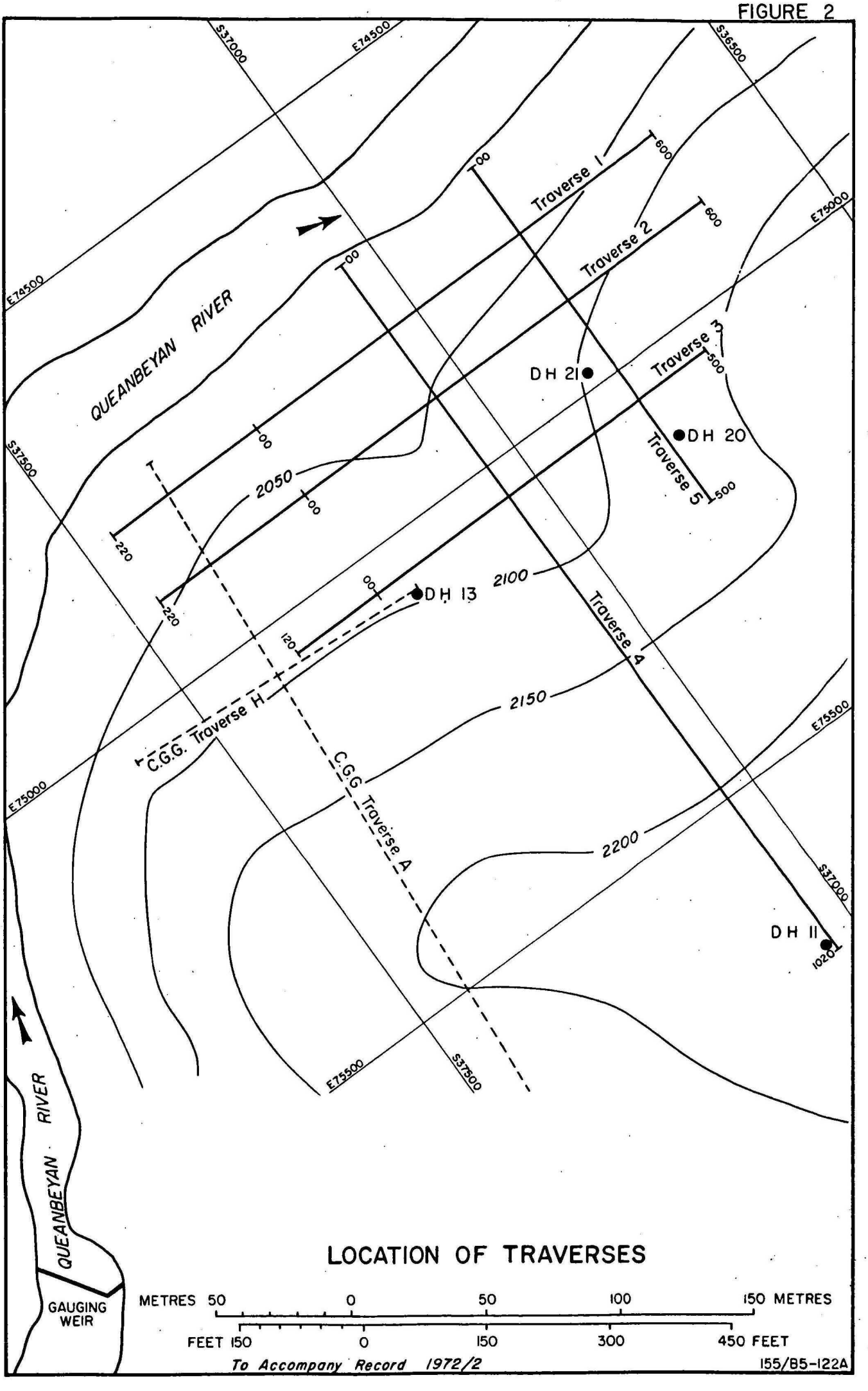
S37000
E74500
S36500
E75000
Traverse 1
Traverse 2
Traverse 3
Traverse 4
Traverse 5
600
500
00
QUEANBEYAN RIVER
DH 21
DH 20
DH 13
DH 11
1020
2050
2100
2150
2200
220
120
C.G.G. Traverse H
C.G.G. Traverse A
E75500
S37500
QUEANBEYAN RIVER
GAUGING WEIR
LOCATION OF TRAVERSES
METRES 50 0 50 100 150 METRES
FEET 150 0 150 300 450 FEET
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FIGURE 3

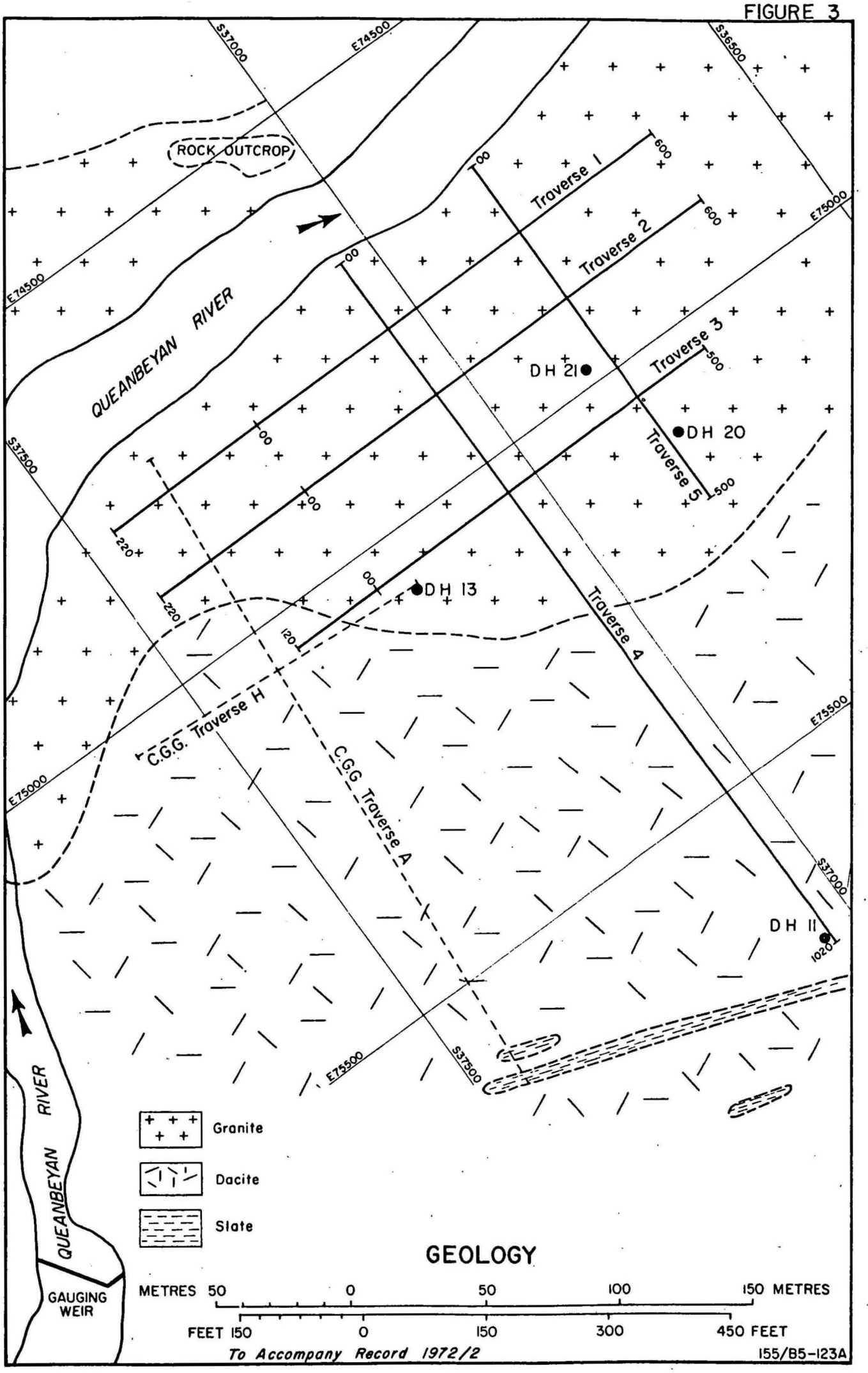
S37000
E74500
S36500
ROCK OUTCROP
Traverse 1
600
E75000
Traverse 2
600
E74500
QUEANBEYAN RIVER
Traverse 3
500
DH 21
DH 20
S37500
Traverse 5
500
220
220
DH 13
Traverse 4
120
C.G.G. Traverse H
C.G.G. Traverse A
E75000
E75500
S37000
DH 11
1020
E75500
S37500
QUEANBEYAN RIVER
GAUGING WEIR
Granite
Dacite
Slate
GEOLOGY
METRES 50 0 50 100 150 METRES
FEET 150 0 150 300 450 FEET
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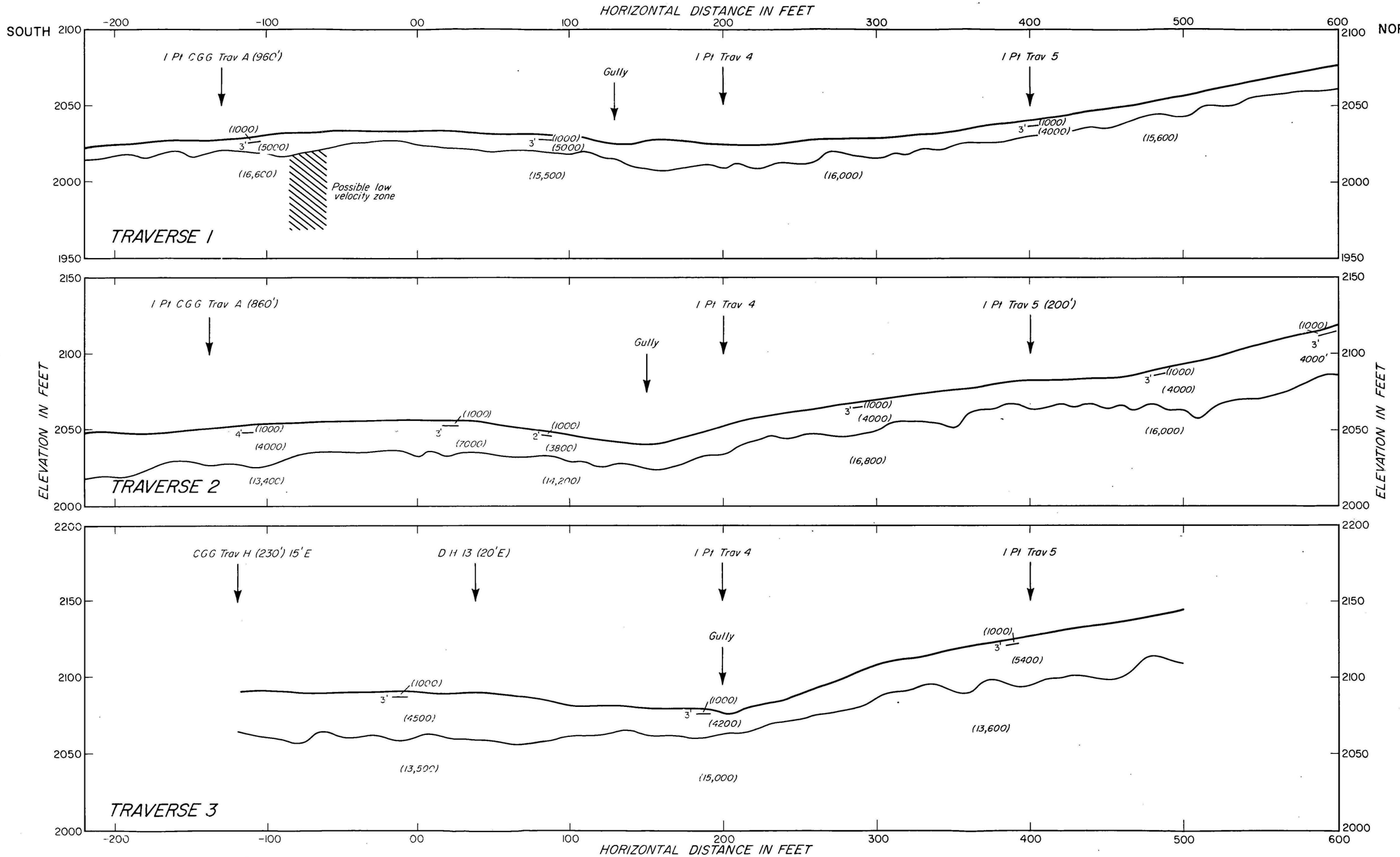
FIGURE 4



LEGEND

(15,600)	Seismic velocity in ft/s in the bedrock
5'	Depth to formation with different seismic velocity
1 Pt Trav	Traverse intersection point
~	Unweathered bedrock boundary

SEISMIC CROSS SECTIONS TRAVERSES 1,2 AND 3

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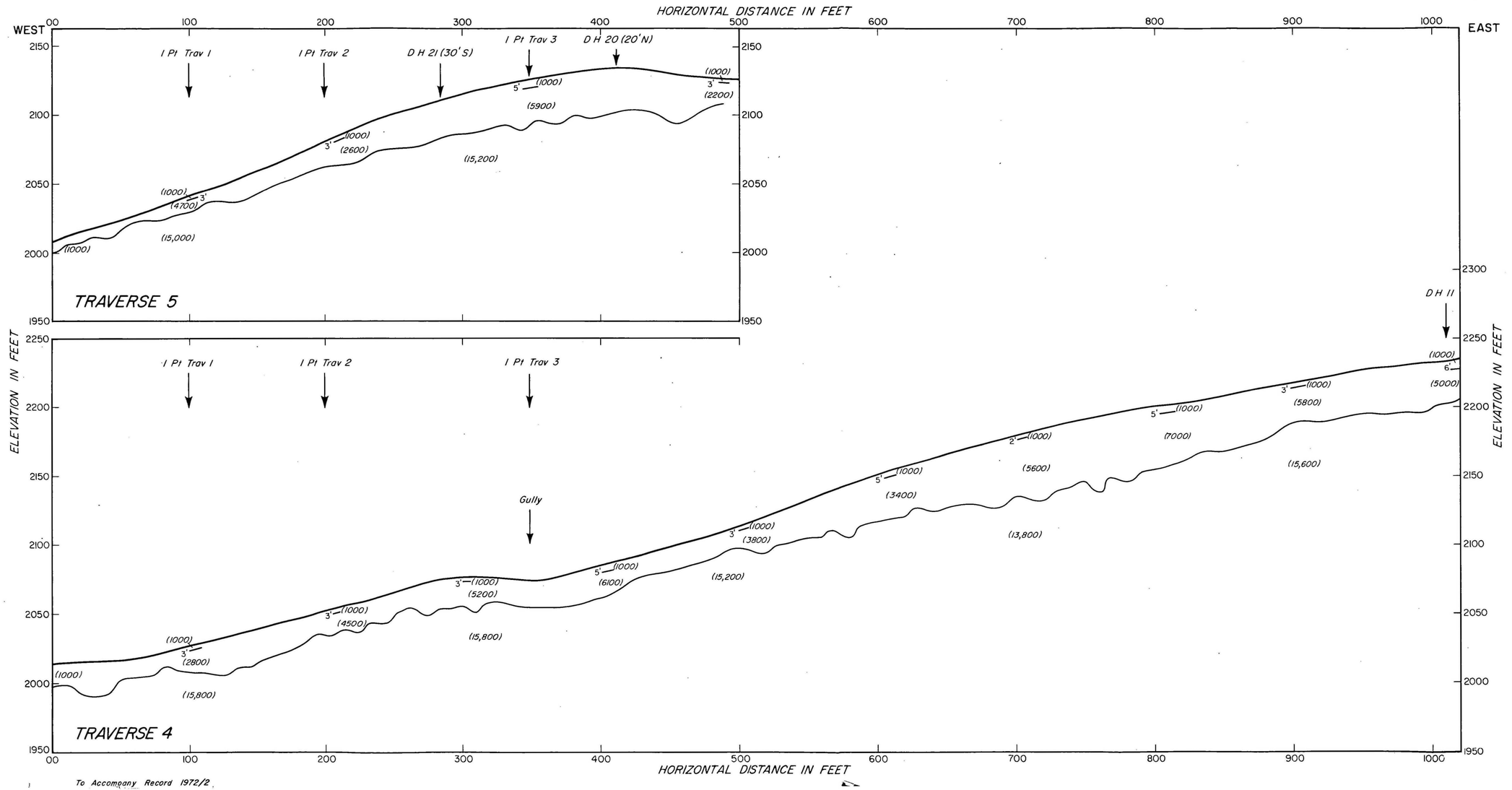
FIGURE 5



LEGEND

(15,600)	Seismic velocity in ft/s in the bedrock
5' ——	Depth to formation with different seismic velocity
1 Pt Trav	Traverse intersection point
~~	Unweathered bedrock boundary

SEISMIC CROSS SECTIONS
TRAVERSES 4 AND 5

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