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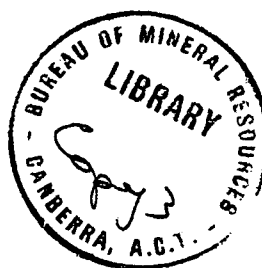
DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

RECORD No. 1965/59

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SEISMIC INVESTIGATIONS
OF OBSERVATORY SITES
NEAR ALICE SPRINGS,
NORTHERN TERRITORY 1962
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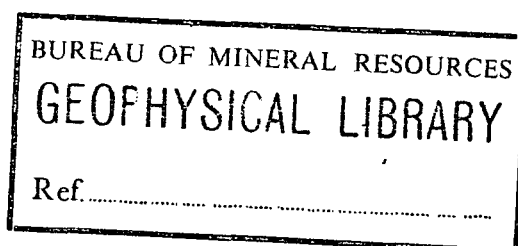
by

B.F. JONES

RESTRICTED

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SUMMARY

Seismic refraction investigations were made at five sites in the vicinity of Alice Springs, Northern Territory, by the Bureau of Mineral Resources in August 1962. This work was done, at the request of the Bureau of Mineral Resources Observatory Group, to select the most suitable site for a seismological observatory. In view of the desirable features for such a site - a bedrock having a high seismic velocity and a bedrock at shallow depth - a site about three miles west of Alice Springs is recommended as the most suitable; the bedrock material has a velocity of 17,800 ft/s and the thickness of overburden is less than 20 ft.

1. INTRODUCTION

On the 30th and 31st of August 1962, during the period that the Bureau of Mineral Resources seismic party No. 2 was based in Alice Springs making final preparations for the 1962 Giles-Carnegie survey, some seismic shallow-refraction work was done in the area to investigate the suitability of several proposed seismological observatory sites. The work was done at the request of the Observatory Group of the Bureau of Mineral Resources.

A seismological observatory site requires a solid rock foundation on which to house the seismological instruments. The physical criteria to be used in the selection of the site were:

- (a) bedrock having a high seismic velocity
- (b) bedrock at shallow depth

Five possible sites, all on Precambrian outcrops, were investigated. Their positions are shown in Plate 1.

2. FIELD WORK

A shallow-refraction profiling technique was used, geophone spreads of 1160 ft being laid out as shown in Plate 2. A Carey drill was used to drill shallow holes of about 7 to 8 ft deep at distances of 10 ft and 100 ft from the ends of the spreads and in line with the spreads. Five-pound charges of explosive were used for most of the seismic shots.

The geophone positions were levelled at each site to an arbitrary elevation datum; the shot-points 100 ft from the northern or eastern ends of the spreads were given an elevation of 100 feet. Permanent, metal-stake markers are positioned at the shot-points 100 feet from the ends of the spreads.

3. RESULTS

Site 1

Records obtained at this site were satisfactory and gave an accurate value of 17,800 ft/s for the seismic velocity of the bedrock. The velocity of the overburden was about 8000 ft/s. The thickness of overburden under the geophone spread ranged from about 25 to 50 ft.

Site 2

At this site, the high-velocity refractor was approximately 130 ft deep, so that the two-way coverage for this layer extended over only five geophones at the centre of the spread. The high velocity was measured as 21,000 ft/s and the average velocity of the material above the high-velocity refractor was about 6200 ft/s. The geophone spread at this site was 50 ft longer than the normal spread, one of the 50-ft intervals being made 100 ft.

Site 3

The depth to the high-velocity refractor at this site ranged between 25 ft and 40 ft. The velocity of this refractor was 17,200 ft/s. The overburden velocity was about 7000 ft/s.

Site 4

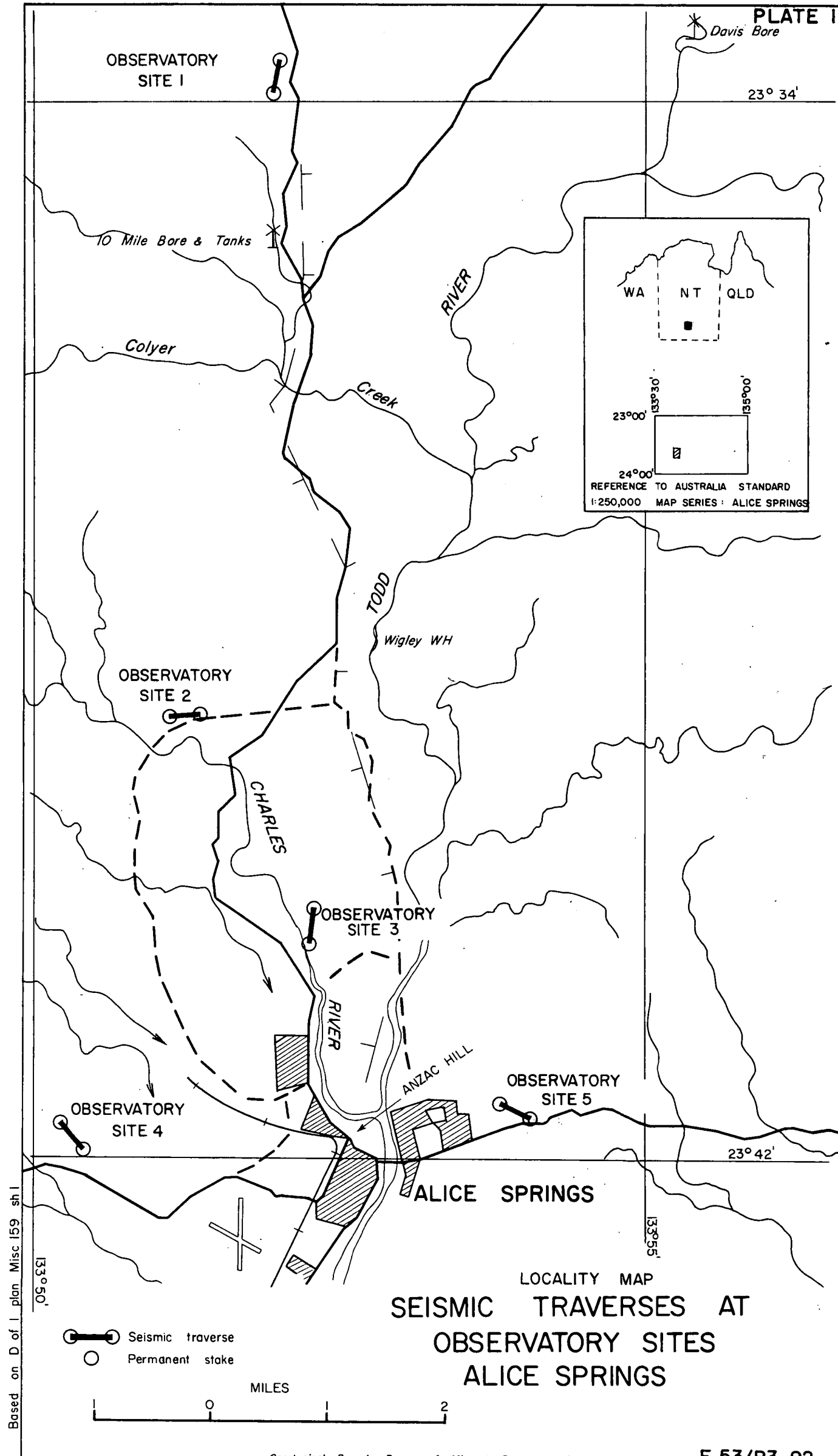
The records obtained at this site were excellent. The high-velocity refractor (17,800 ft/s) varied in depth from 15 to 35 ft. The overburden velocity was about 5000 ft/s.

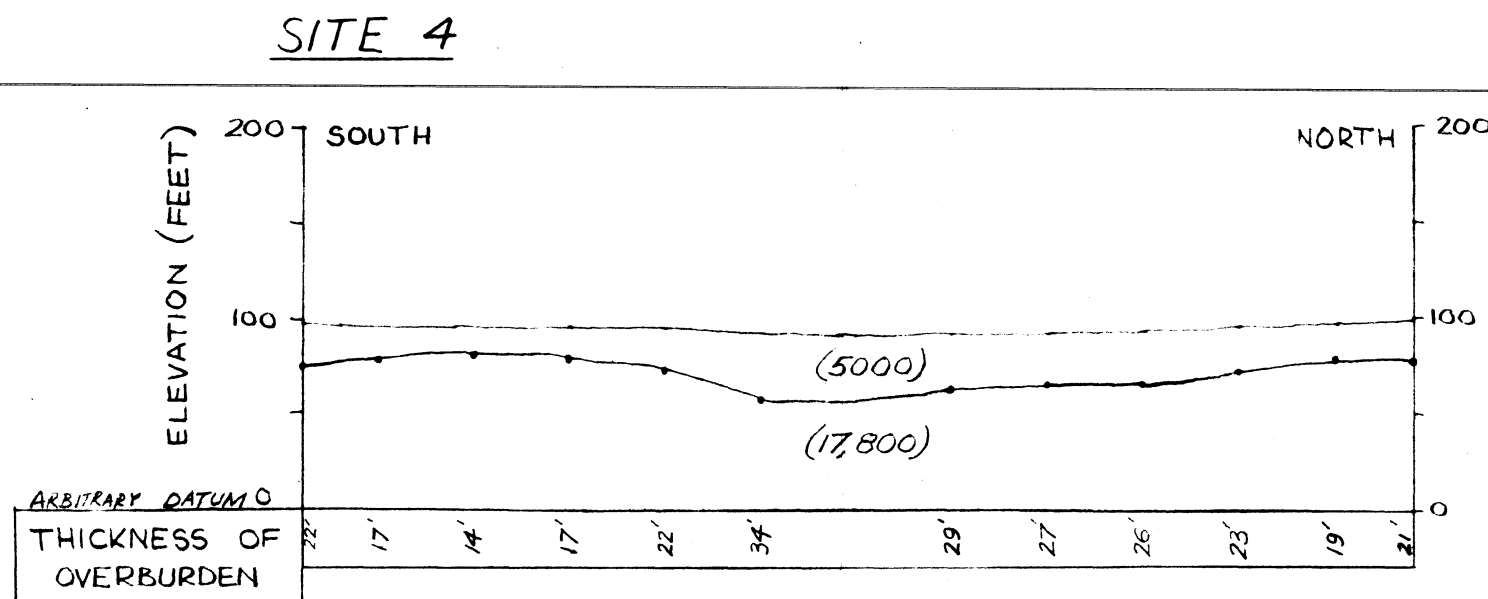
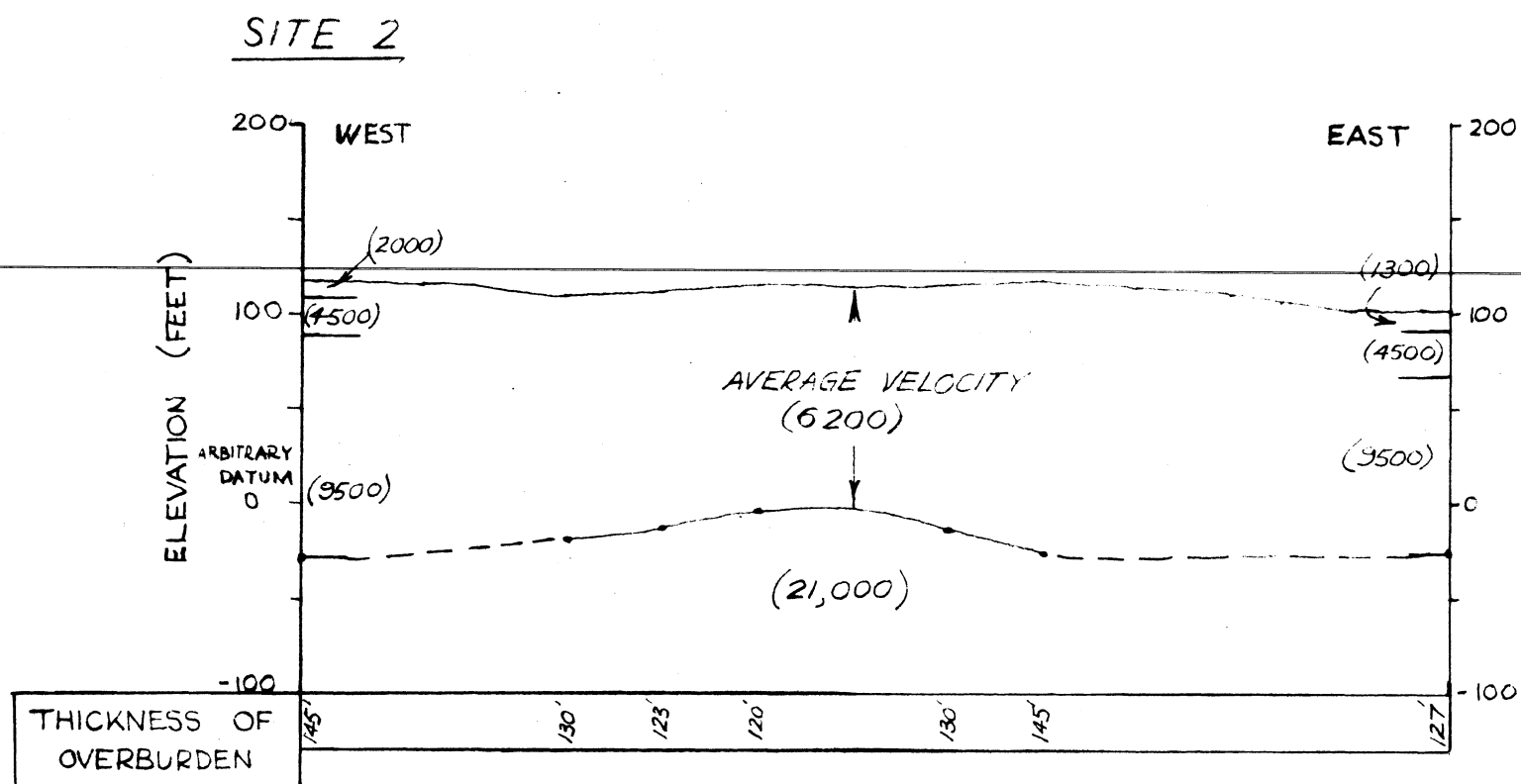
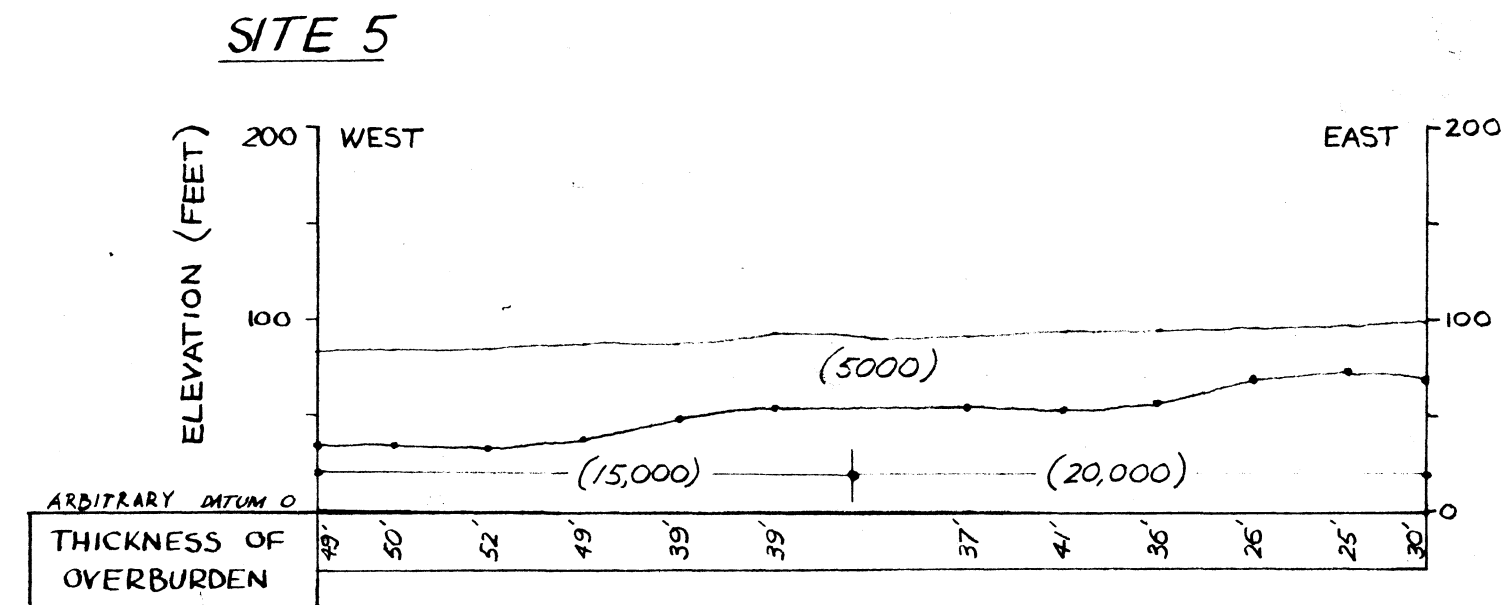
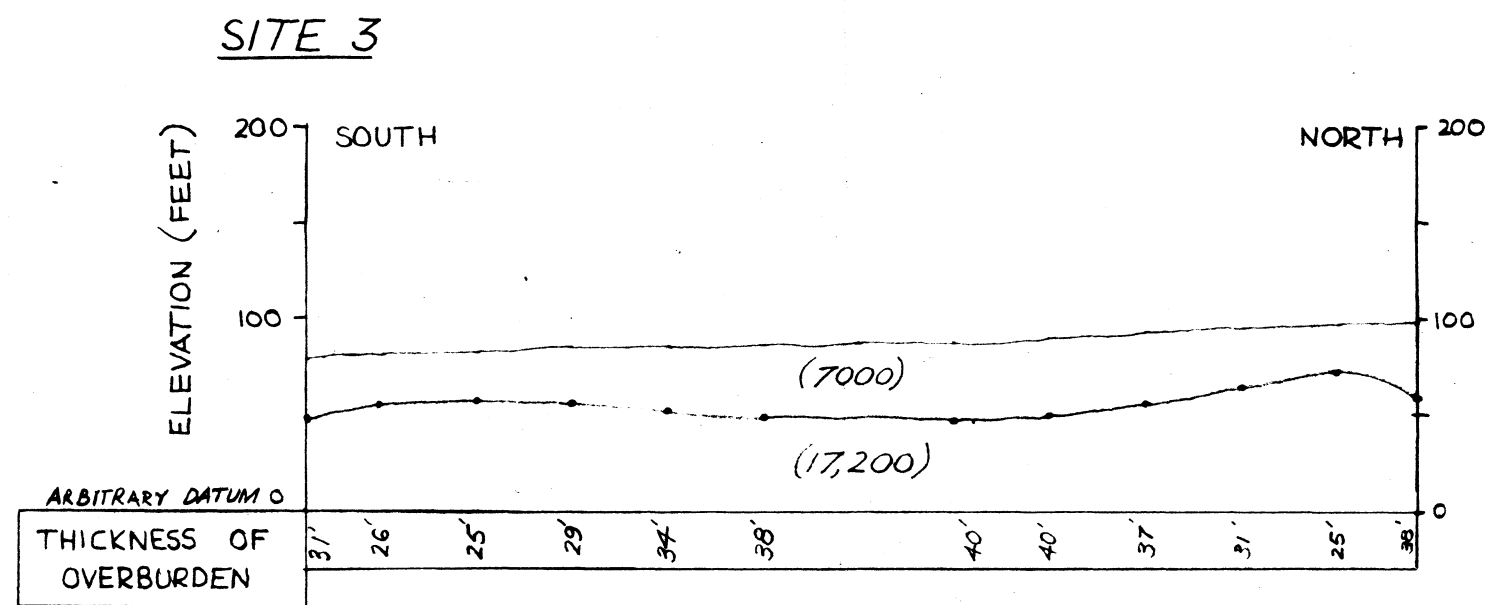
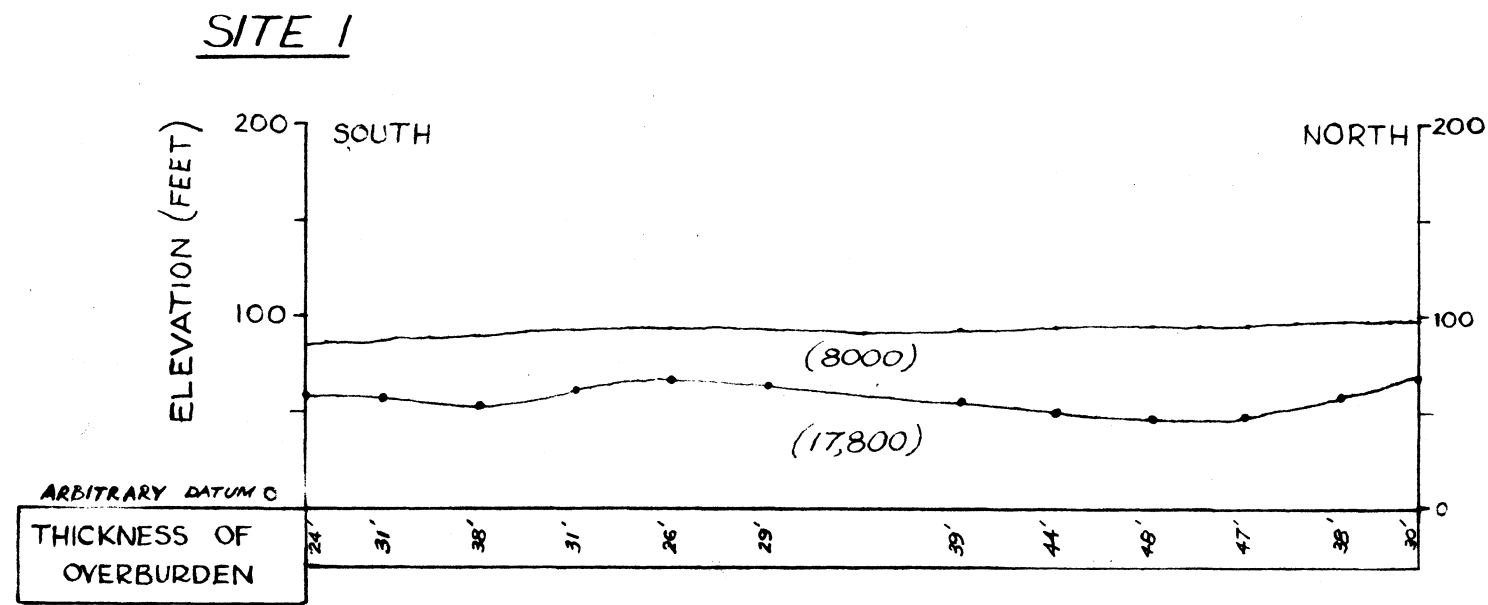
Site 5

There was evidence of two high-velocity refractors at this site (15,000 ft/s and 20,000 ft/s), but it is not possible to deduce the relation between them. The 20,000-ft/s velocity was recorded over the eastern portion of the geophone spread, and the 15,000-ft/s velocity over the western portion. The overburden had a velocity of about 5000 ft/s and a thickness that ranged from 25 to 50 ft.

4. RECOMMENDATIONS

The seismic results indicate that Site 4 would be the most suitable location for a seismological observatory. The bedrock material has a velocity of 17,800 ft/s, and the thickness of overburden is less than 20 ft over most of the geophone spread. This site is about three miles from Alice Springs, just off the Alice Springs-Hermannsburg Mission road.

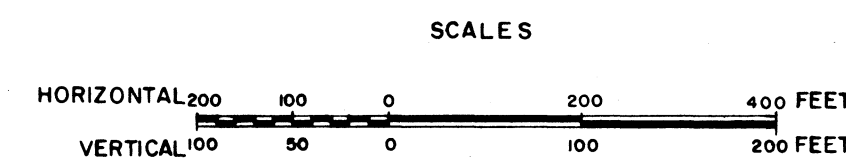




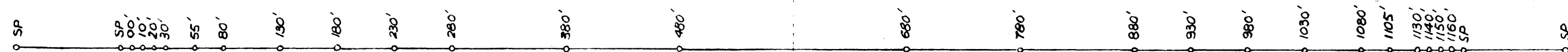
LEGEND

(8000) Seismic velocity (ft/s) in formation

—•— Bottom of overburden



PLAN OF
GEOPHONE LAYOUT



SEISMIC CROSS-SECTIONS
ALICE SPRINGS OBSERVATORY SITES