S.A. Dept of Mines
Geological Survey
Exploration Services Division

RECORDS FILE COPY

21 APR 1972
BR

Second Report (Bolton Corr.)

Second Report

on

Gravimetric Investigations of the Eden - Burnside Fault Zone

by

R J Coppin

Exploration Geophysics Sect^{n}

Gravimetric Investigations of the Eden - Burnside Fault Zone.

3/4/64

Rept BK. No. 58/90

64 A 0.6

Section Copy

DEPARTMENT OF MINES
SOUTH AUSTRALIA

RB 58/90

Second Report

on

GRAVIMETRIC INVESTIGATION OF THE EDEN-BURNSIDE FAULT ZONE

by

R. J. Coppin ✓
EXPLORATION GEOPHYSICS SECTION

CONTENTS

PLAN REFERENCE

Figure	Title	Reference	Scale
1	Locality Plan	64-217	1" rep. 1 mile
2.	Gravity Profiles lines 1-5	64-179	
3	Gravity Profile (Cross Road)	L64-61	
4	Gravity Profile Lines 6, 5, 4, - 64	64-218	
5	Gravity Profiles Lines 3, 2, 1 - 64	64-219	

Rept. Bk. No. 58/90
G.S. No. 2839
D.M. 1568/59

3rd April, 1964.

DEPARTMENT OF MINES
SOUTH AUSTRALIA

Second Report

on

GRAVIMETRIC INVESTIGATION OF THE EDEN-BURNSIDE FAULT ZONE

ABSTRACT

Further gravity traverses across the Eden-Burnside fault zone show pronounced anomalies due to faulting in the Proterozoic basement. The results thus obtained agree well with the structure derived solely from geological considerations, and have enabled the zone to be delineated with some accuracy from Burnside to Brighton.

1. INTRODUCTION

In 1948 W.G. Fenner made the first systematic measurements of gravity in the Adelaide area. Previous pendulum observations made by E.C. Bullard (1937) and C. Kerr Grant (1938) had shown the possibility of delineating the major faults associated with the formation of the Mount Lofty Ranges, by detecting the gravity anomalies associated with them.

This early work of Fenner and Kerr Grant using widely spaced stations succeeded in broadly locating a major fault zone in the Glen Osmond and later, Burnside areas. In 1960 I.A. Mumme located what he called the Eden Fault Zone, in the Glen Osmond, Beaumont and Rosslyn Park areas. In 1963 C.H. Baget and B.G. Risely located a fault zone in the Bedford Park area, adjacent to the new university site. The results of all these earlier surveys show pronounced anomalies due to the large density contrast between Tertiary and the denser PreCambrian rocks.

In the first months of 1963 it was decided to attempt to trace the fault zone found at Bedford Park, to the south and north. Subsequently traverses were made along Morphett Road, Brighton-Seacliff Beach front to the south, and Goodwood, Unley

and Fullarton Roads to the north. In January 1964 seven further traverses were made along

Cross Road
Greenhill Road
Montacute Road
Gorge Road
Grand Junction Road
Tea Tree Gully Road

in an attempt to trace the Eden-Burnside fault zone to the north.

A further traverse was made along Brighton Road in an attempt to clarify the structure in that area.

2. SURVEY DETAILS

After an initial survey to find suitable sites some twelve traverses were recommended.

(a) Location of traverses

Line 1: Brighton - Seacliff Beach Traverse

Start: Corner of Downing Street and Esplanade North Brighton, and extending 2000' to the north and 13,000' to the south.

Finish: At the northern wall of the most southerly block of toilets at Kingston Park.

Stations at 200' intervals.

Line 2: Morphett Road

Start: Oaklands railway station and extending 3,000' along Morphett Road to the north, and 10,600' along Morphett Road to the south.

Finish: 10,600' south of Oaklands railway station along Morphett Road - approximately 100' south of the corner of Morphett Road and Wookata Crescent.

Line 3: Goodwood Road

Start: At the corner of Goodwood Road and Morgan Avenue Dawe Park extending 9,200' south along Goodwood Rd.

Finish: Near the corner of Buena Vista drive and Largs Parade Centennial Park.

Line 4: Unley Road

Start: At the corner of Unley Road and Cross Road and extending 9,400' south along Unley Road.

Finish: At the point where the Direct continuation of Unley Road - Belair Road meets the abutment of the higher level of the Belair Road.

Line 5: Fullarton Road

Start: At the corner of Fullarton Road and Fisher St. extending 9,400' south along Fullarton Road.

Finish: At most southerly point of Fullarton Road, in the tipping area of the Mitcham rubbish dump.

Line 1-64: Brighton Road

Start: S.E. corner of Dinsdale Avenue (Brighton Oval) and Brighton Road extending 11,000' south along Brighton Road and Ocean Boulevarde.

Finish: At the Maring Golf Clubhouse on Ocean Boulevarde.

Line 2-64: Greenhill Road

Start: N.E. Corner of Greenhill Road and Portrush Road - 7,800' east along Greenhill Road.

Finish: N.W. Corner of Hallett Road and Greenhill Road.

Line 3-64: Montacute Road

Start: BP Service station on N.E. corner of Montacute Road and Lower North-East Road - 13,000' east along Montacute Road.

Finish: 1800' East of right angle dog-leg in Montacute Road - at beginning of trees.

Line 4-64: Gorge Road

Start: A reserve and church on the N.E. corner of Gorge Road and Lower North-East Road - 13,000' east along Gorge Road.

Finish: Some 3,400' east along dirt road running directly towards the hills - finishing slightly before Wild Flower Sanctuary.

Note: On all traverses previously described readings were taken at 200' intervals.

Line 5-64: Grand Junction Road

Start: At the NE corner of Reservoir Road and Grand Junction Road - 10,000' east along Grand Junction Road.

Finish: Approximately 50' below the geological feature known as the gun emplacement.

Line 6-64 Tea Tree Gully Road

Start: Outside of Modbury Hotel on the N.E. side of road following the road east for 15,200'.

Finish: Approximately 1200' east along the road from the Tea Tree Gully Hotel.

Note: Readings on Lines 5-64, 6-64 were taken at 400' intervals.

Line 7-64: Cross Road - Anzac Highway

Start: S.E. corner of Cross Road - Glen Osmond Road, extending 40,400' along Cross Road and Anzac Highway.

Finish: Some 800' east of Glenelg Esplanade.

Note: Readings on Line 7-64 were made at 800' intervals.

(b) Reduction of Results

As no reading at a station of known absolute gravity value was made, all readings obtained merely represent fluctuations of gravity above an arbitrary datum. All twelve traverses have been "Tied" together and are hence mutually consistent. These traverses have been corrected so as to be consistent with the previous work carried out at Bedford Park by C.H. Bagot and B.G. Risely. No attempt was made to connect these results with the earlier surveys of I.A. Mumme and C. Kerr Grant. In order to assist in correlating this work with any future surveys the station ACSI established by the Bureau of Mineral Resources at the Kensington Gardens Walker Scout Hall was tied to the 1963 and 1964 traverses. This station (see Department of Mines minute dated 5/2/64 in DM 11/59) was found to have a reduced level of 472.0 feet (Datum: LWOST Port Adelaide less than 100 Feet) and a relative gravity value of 342.9 gravity units.

After correction for diurnal drift, the field results were adjusted for latitude and elevation. The datum LWOST Port Adelaide less than 100' was used to obtain the height of stations. An elevation correction of 0.6 gravity units per foot was used for all results. This correction factor corresponds to an average rock density of 2.67 gm/cc. It is probable that this density is too high in the actual basin and consequently the elevation correction is too low, however, this error should not mask any anomalies of the magnitude being sought. Using this correction on the northern lines has the effect of introducing a slight regional gradient which causes a decrease of readings towards the Adelaide Hills. This gradient does not remove any anomalies

but merely changes their graphical orientation.

3. RESULTS AND INTERPRETATION

Of the twelve traverses made, six show pronounced anomalies associated with marginal faulting in Adelaide system rocks. These anomalies were detected on Brighton, Goodwood, Unley, Fullarton, Cross and Greenhill Roads (see gravity profiles), and are caused by the density difference between the Tertiary sediments in the basin and the more consolidated PreCambrian rocks of the Adelaide System. It can be seen that these large anomalies were detected only in the Southern margin of the basin, i.e. in areas south of Burnside.

It is thought that to the north of Burnside the Tertiary sediments gradually thin; being thinnest under the Tea-Tree Gully traverses. In this northern area the Eden-Burnside Fault Zone seems to consist of several splinter blocks; each block tilting at a low angle to the South-East i.e. towards the Adelaide Hills. This tendency for northern splinter blocks to tilt seems to be greatest in the Tea-Tree Gully area; and decreases to the south. Theoretical plots on the Gorge Road traverse show the possible existence of two or more splinter blocks each tilting at a low angle towards the Adelaide Hills, and each separated by faults of small throw (100-300'); (rather than the previous concept of a single fault). Bore hole data on this traverse shows fluctuations in basement of small magnitude, that can be reconciled with the concept of tilting splinter blocks. This tilting of the blocks towards the hills explains the tendency of the gravity anomalies to dip to the East.

To the South of Montacute Road, the Eden-Burnside Fault zone narrows considerably and appears to consist of one major fault The throw of this fault increases to the South-West along its strike, and varies from approximately 200-300' in the Magill Area, 600' in Cross Road Fullarton - Goodwood Road Area, to some 1200' in the vicinity of Brighton. Consequently it can be seen that

the basement has an apparent dip to the south-west and marginal tertiary sediments are therefore deepest in the southern areas. The general tendency over the basin is for the fault blocks to dip South-East with their deepest portion being to the South-West. It is possible that small splinter blocks also exist to the south; but have not been detected due to the small throw of the faults forming them, and the large thickness of Tertiary cover.

Theoretical profiles computed over possible sections show that the fault is probably vertical or near vertical and may be located with an accuracy of $\pm$ 200'. The accuracy of delineator of the fault zone is limited by the masking of relatively thick recent sediments, and by the possible occurrence of outwash gravels of relatively high density on the down throw side of the fault.

To the north the fault detected is found closest to the scarp i.e. at Burnside and Glen Osmond, Fullarton and Unley. To the south near Bedford Park the fault is found farthest from the scarp; this is the area in which the scarp has the least relief. It is probable that in this area the scarp has migrated southwards, aided by the less resistant nature of the outcropping rocks. This considerable migration has possibly caused the formation of large alluvial fans. It is probable that compacted gravels of relatively high density are masking the fault on the Morphett Road traverse. In this localised area there is also no abrupt break in slope from scarp to basin.

At the southern extremity of the area traversed, the fault is thought to swing rapidly to the south-west. In the Kingston Park area it probably strikes almost exactly parallel to the beach (see locality plan). Thus the Brighton - Seacliff beach traverse instead of showing the largest anomaly as expected, shows only a gradual slope. This can be explained by having the traverse almost exactly parallel to the fault.

It is possible that a further fault or faults exist in the Adelaide system between the fault detected and the scarp.

The fault found is the marginal fault of the Adelaide basin and has been detected due to the density across it; however, it is not known whether it is the major fault producing the Western scarp of the Adelaide Hills. It is possible that a further fault (Eden Fault?) of considerable throw exists to the East of this known fault, but has not been detected due to the lack of density contrast across it.

James J. Hussain
for R. J. Coppin
Geophysics Cadet

RJC:AGK
3/4/64

REFERENCES

(1) Geological Survey South Aust. Bull. 27 "Geology and Underground Water Resources of the Adelaide Plains Area" K.R. Miles + Appendix II by C. Kerr Grant.

(2) Mining Review 113 "Gravimetric Investigations - Eden Fault Zone" Glen Osmond, Beaumont and Rosslyn Park Areas, pp. 82-85 (I.A. Mumme).

(3) Dept. of Mines unpublished report DM 2156/62 "A note on a Geophysical Survey of the Eden-Burnside Fault Zone in the Bedford Park Area" (C.H. Bagot and B.G. Risely)

(4) Geophysics Vol XXVI No. 1 February, 1961 P.16. (M.F. Kane and L.C. Pakiser).

YATALA

ONKAPARINGA

ADELAIDE

NOARLUNGA

LINE 1

LINE 1-G4

LINE 2

LINE 2-G4

LINE 3

LINE 3-G4

LINE 4

LINE 4-G4

LINE 5

LINE 5-G4

LINE 7-G4

LINE G-G4

Gravity Sta
A.S.C.I

LEGEND

Current Gravity traverse — — — —

Previous Gravity traverse .....

Eden - Burnside fault zone — — —

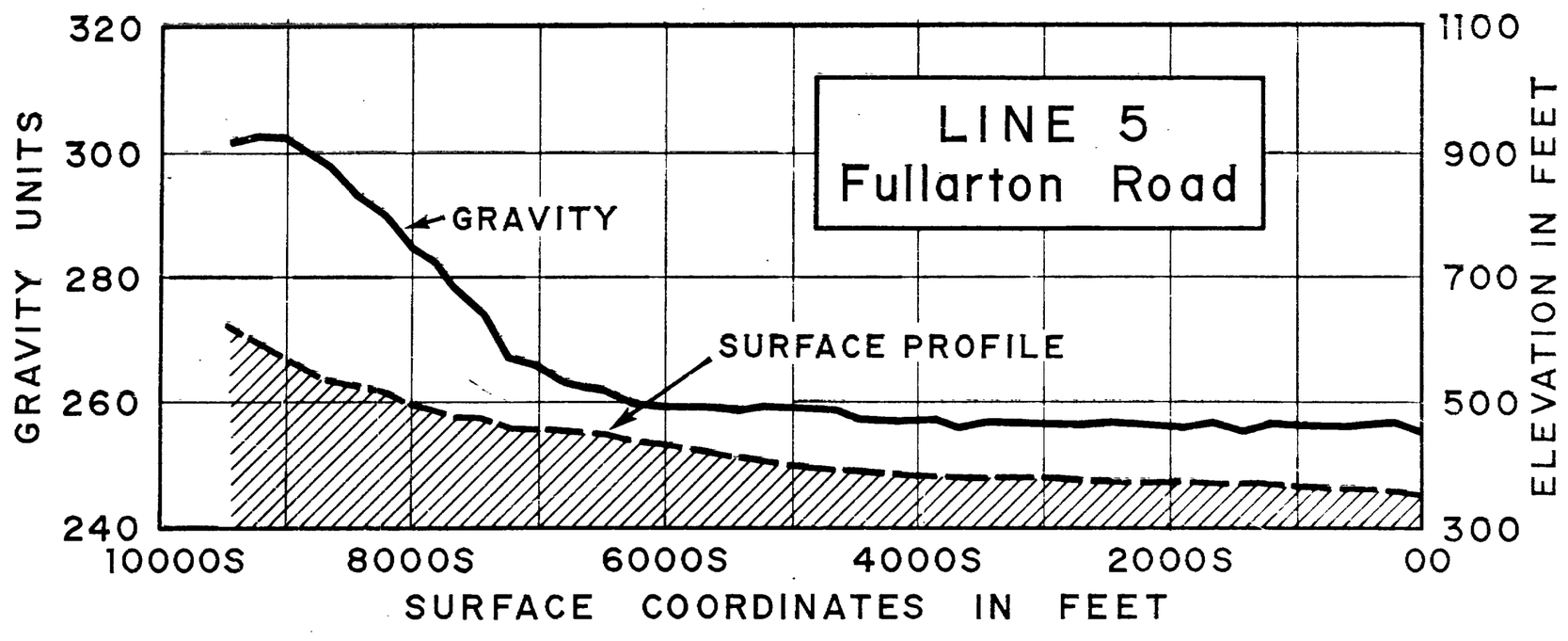
S. A. DEPARTMENT OF MINES

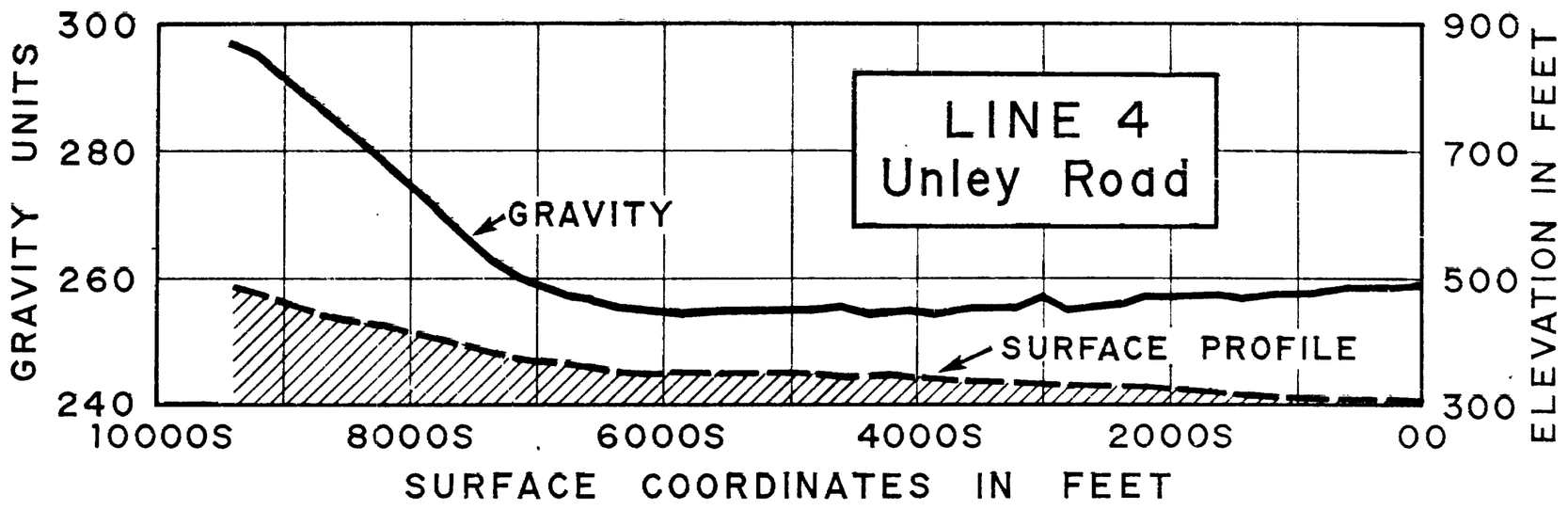
EDEN-BURNSIDE FAULT ZONE LOCALITY PLAN

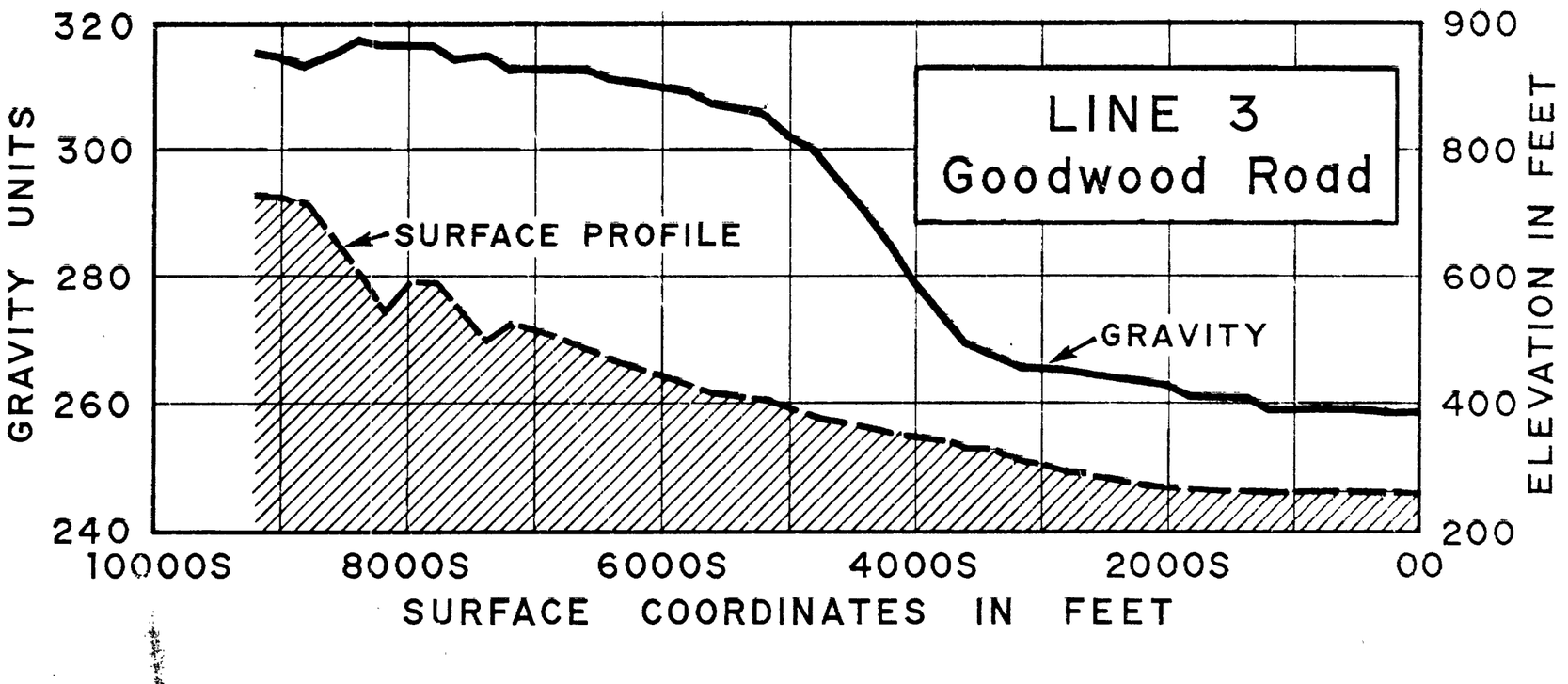
Scale: 1 Mile to 1"

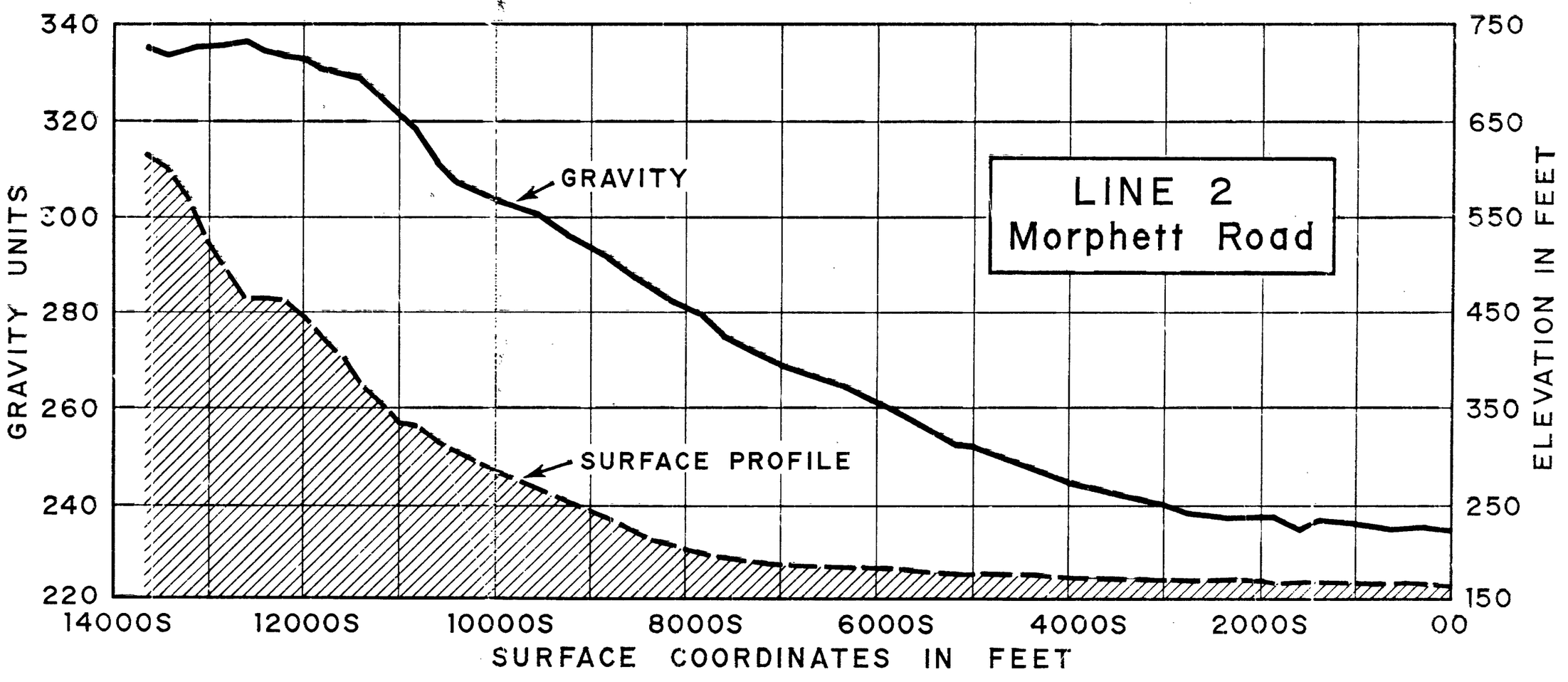
PLATE 1

G4-217
Ha 5/6+9
3-5-64









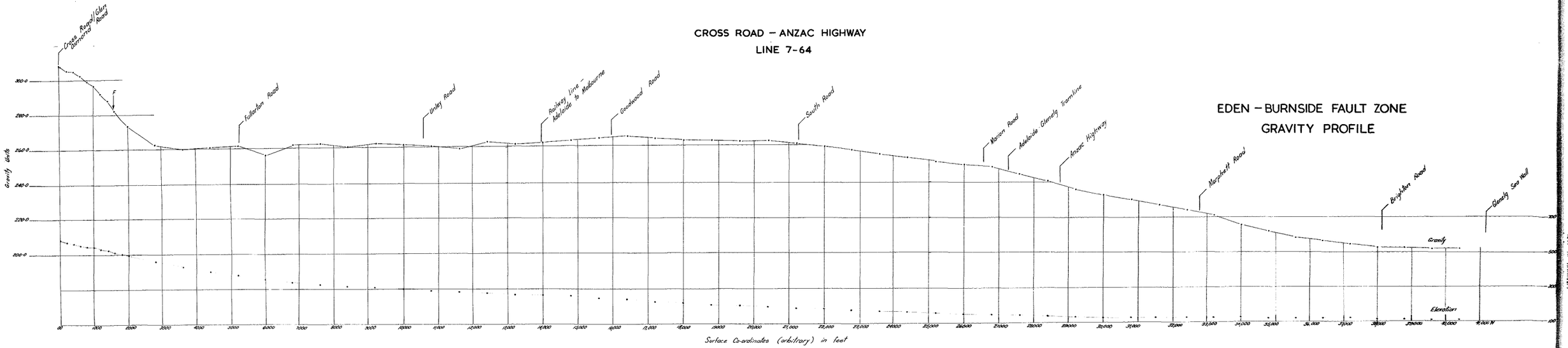
64-179

R. J. Coppin

S. A. Dept. of Mines

CROSS ROAD – ANZAC HIGHWAY

LINE 7-64



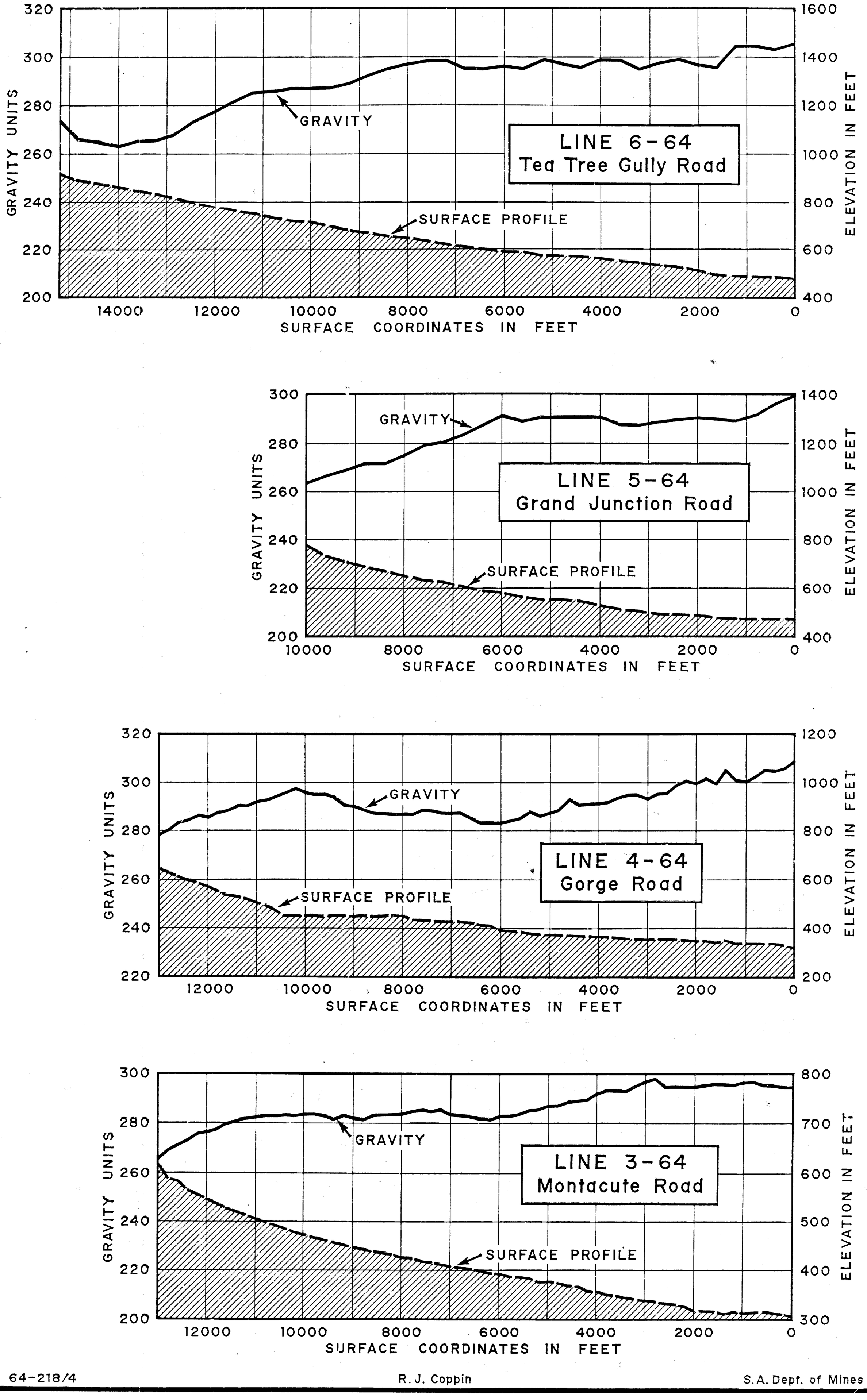
EDEN – BURNSIDE FAULT ZONE

GRAVITY PROFILE

To accompany a report by R.J. Coppin.

L64-6

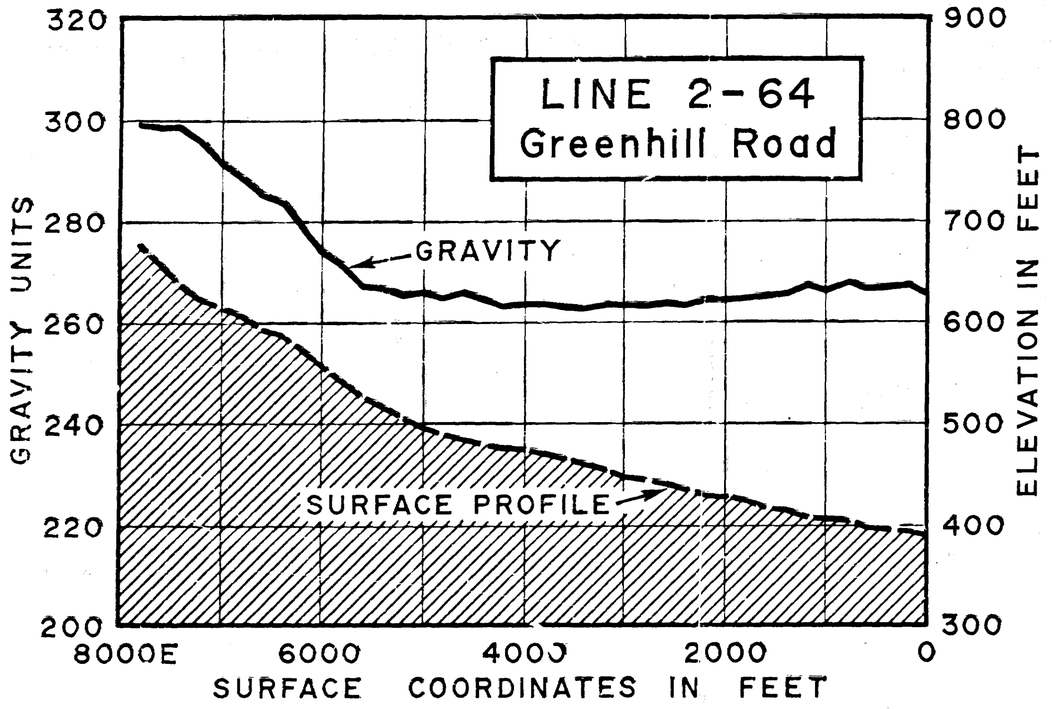
DATE 28-2-64

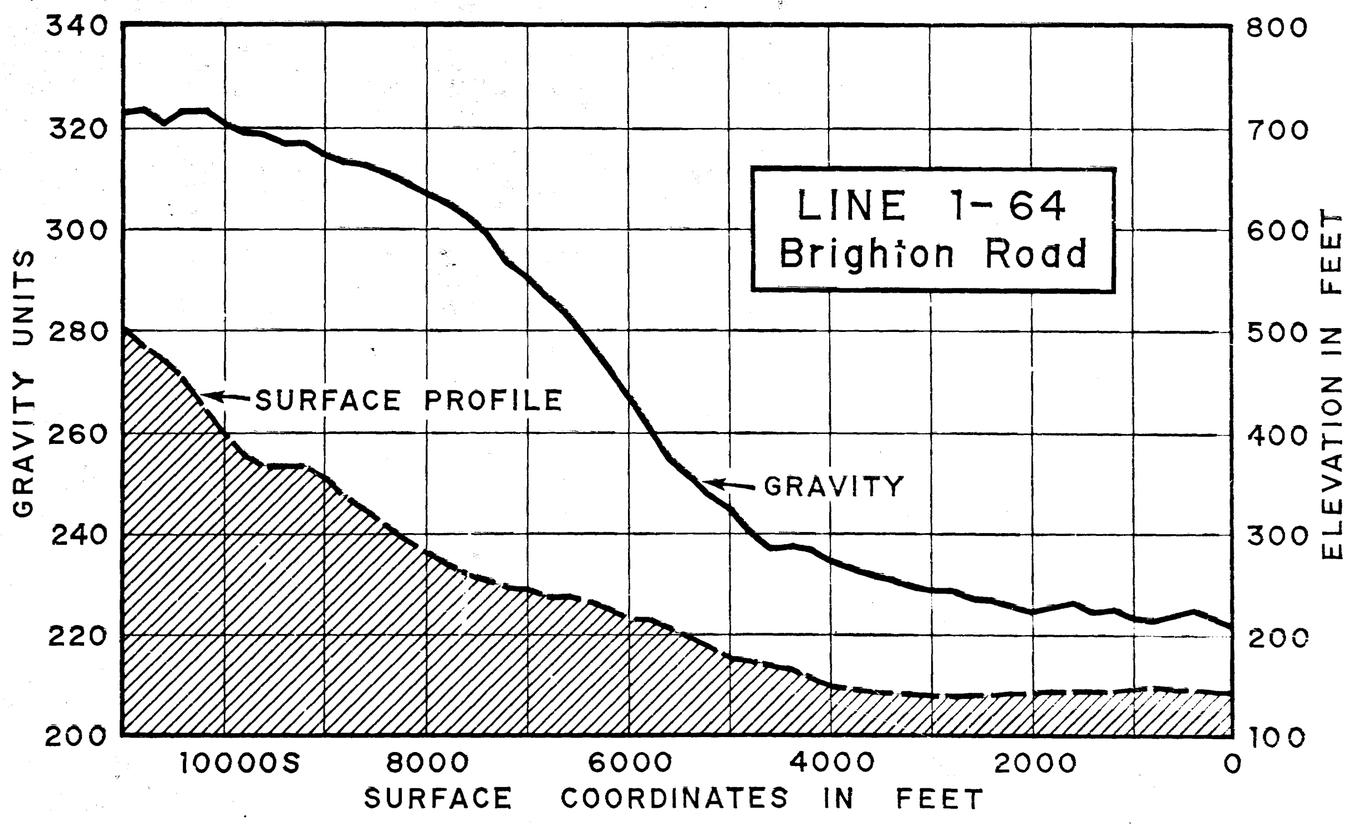


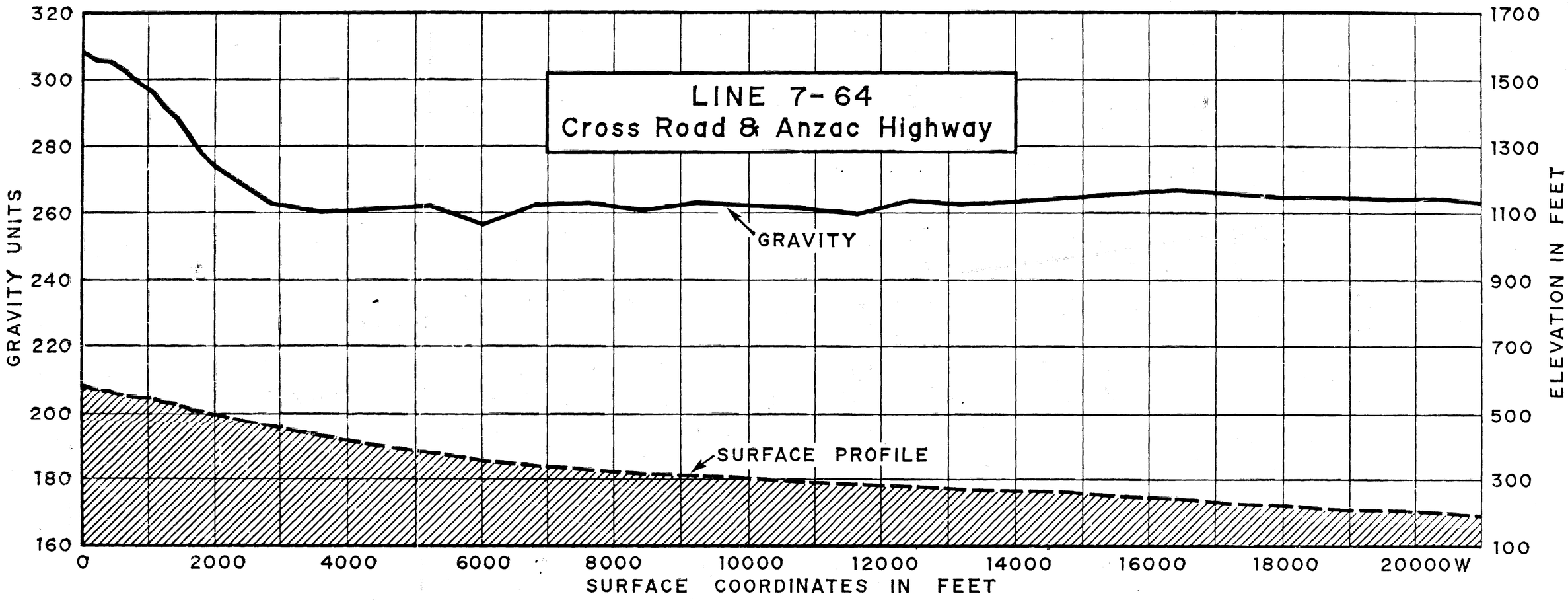
64-218/4

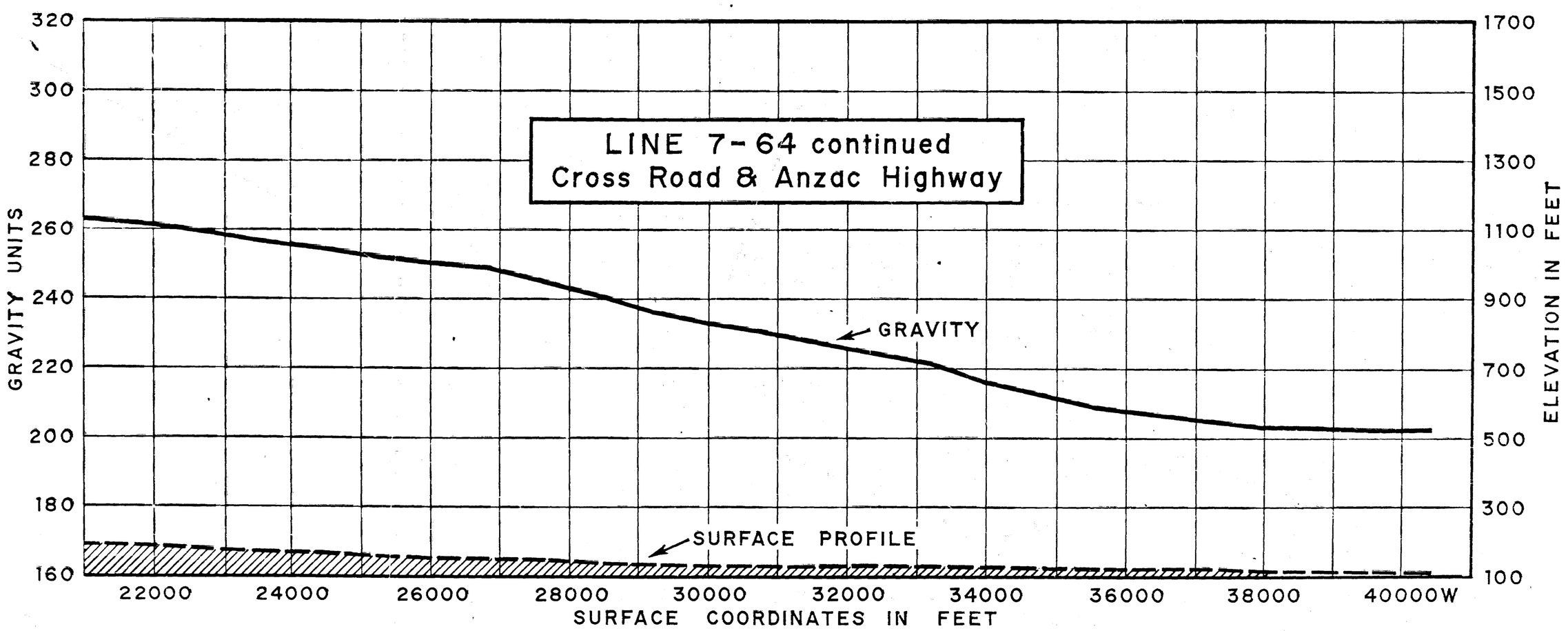
R.J. Coppin

S.A. Dept. of Mines









64-219/4

R. J. Coppin

S. A. Dept. of Mines