U. S. DEPARTMENT OF THE INTERIOR

PROTOTYPE OIL SHALE LEASING PROGRAM

TRACT C-b

QUARTERLY REPORT #3

(Through May 31, 1975)

Submitted to:

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CORE ASSAY DATA

All assays of cores for oil, sodium, and alumina have been completed for the vertical holes drilled to date. Final reports are made in this Quarterly Report #3. Quarterly Report #1 and Quarterly Report #2 contain descriptions of assay methodology and thus it will not be repeated here. Table II B-59 lists core assay data by the quarterly report in which it can be found.

ALL ASSAY DATA ARE CLASSIFIED AS CONFIDENTIAL BY THE LESSEE.

TABLE II B-59
REPORTED CORE ASSAY DATA

	Oil	Sodium	Alumina
AT-1a	1	1	1
SG-1	3	3	3
SG-6	3	3	3
SG-8	3	3	3
SG-9	2	2	2
SG-10	1	1	1
SG-11	3	3	3
SG-17	3	3	3
SG-18	1 Revised 3	3	3
SG-19	1	3	3
SG-20	3	3	3
SG-21	3	3	3

NUMBERS REFER TO QUARTERLY REPORT IN WHICH ASSAY WAS REPORTED.

Trace Element Analysis

II B-13 CORE AND CUTTINGS - TRACE ELEMENT ANALYSIS

In the following pages, trace element analyses required by the lessor are presented in histogram form for coreholes AT-1a1, SG-8, SG-9 and SG-10. These elements are antimony (Sb), arsenic (As), boron (B), cadmium (Cd), fluorine (F), mercury (Hg), and selenium (Se). Very little data have been published covering trace elements in the study area. For the most part, it is not known how these elements are tied up in the rock and thus, their reaction as the rock weathers is unknown. However, research by the United States Geological Survey suggests that the high carbonate content of the oil shale host rock will help tie up the trace element as the rock oxidizes. Because the elements discussed herein do not occur in significant amounts in the surface waters of the basin, it is assumed that their release to the environment through weathering is insignificant.

Selenium shows two maxima; one at a depth of about 600 feet, and the other at a depth of 800 feet in the SG-9. These two zones correlate into SG-8, but are not present in AT-1A1. Moderately high values of selenium occur in the mine zone in SG-10 and in other scattered zones below this point. There appears to be no reason for its distribution as neither SG-9 or SG-8 show similar build-ups. Selenium levels are usually less than 0.2 milligrams/liter in the groundwater system. This is well below Public Health standards.

Fluoride seems to gradually increase from the ground surface down to the mine zone, then more or less level off below that point. Fluorine is normally tied up in the minerals cryolite and fluorite. Fluoride is normally found in the subsurface waters and may reach concentrations of as much as 45 mg/l in some of the highly saline waters. Normally, it seldom exceeds 20 mg/l throughout the remainder of the section.

Arsenic, again, like fluorine, gradually increases with depth approaching near maximum concentration in the Mahogany mine zone. There is a very good correlation between the richness of the oil shale and the arsenic content. Arsenic levels in the groundwater system are usually less than 0.1 milligrams/liter (which is well below the Public Health standards); therefore, it appears to be chemically bonded with the kerogen and is not soluble in the ground water.

Antimony appears to be slightly higher in the mine zone than elsewhere. There is also a fair correlation between the richness of the shale and antimony content; however, this correlation is not as strong as it is for arsenic.

Boron distribution shows no particular correlation with depth, richness or stratigraphic zone. This is unusual as the marlstones contain one of the most unusual suites of boro-silicate minerals found anywhere. Boron levels are usually less than 3.0milligrams/liter in the groundwater system but can range as high as 47 milligrams/liter in some highly saline water zones.

Cadmium normally occurs below 0.5 ppm except through the mine zone on SG-9. This element is also found in the groundwater system, but below levels of 0.01 milligrams/liter, which is the established Public Health standard.

Mercury levels are normally less than 0.5 ppm except for the mine zone in SG-9 and SG-10. There seems to be no correlation between depth or shale richness and mercury content. It appears mercury is not mobile in the ground water system since the mercury content of ground water under Tract C-b is below 0.001 milligrams/liter.

FIGURE II B-15
TRACE ELEMENT STUDY
ANTIMONY HISTOGRAM

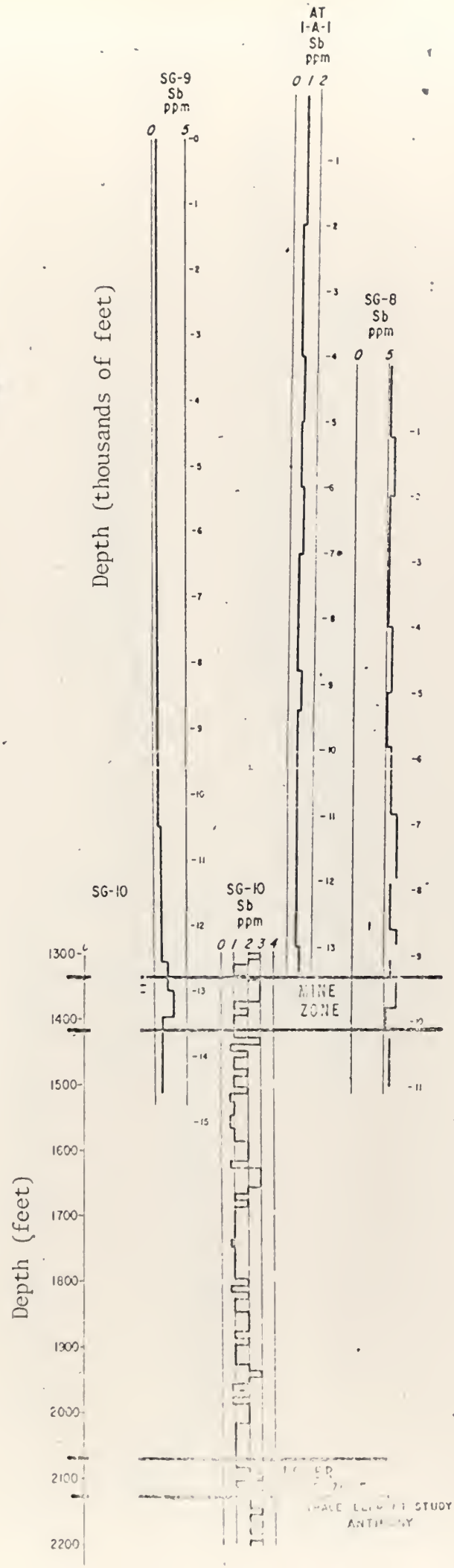


FIGURE II B-16
TRACE ELEMENT STUDY
ARSENIC HISTOGRAM

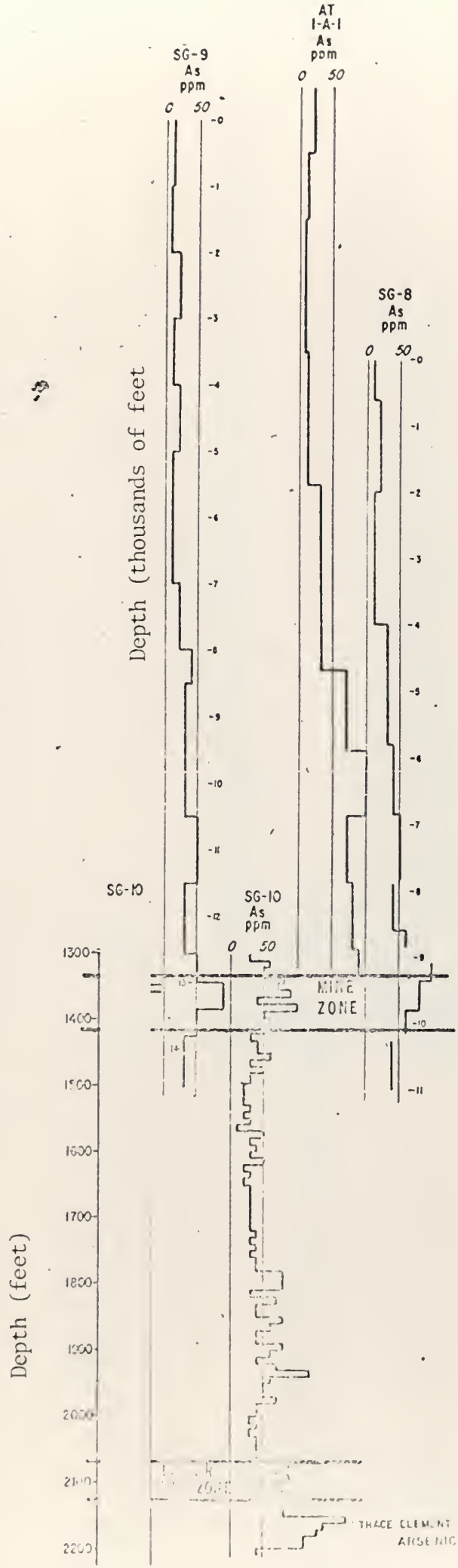


FIGURE II B-17
TRACE ELEMENT STUDY
BORON HISTOGRAM

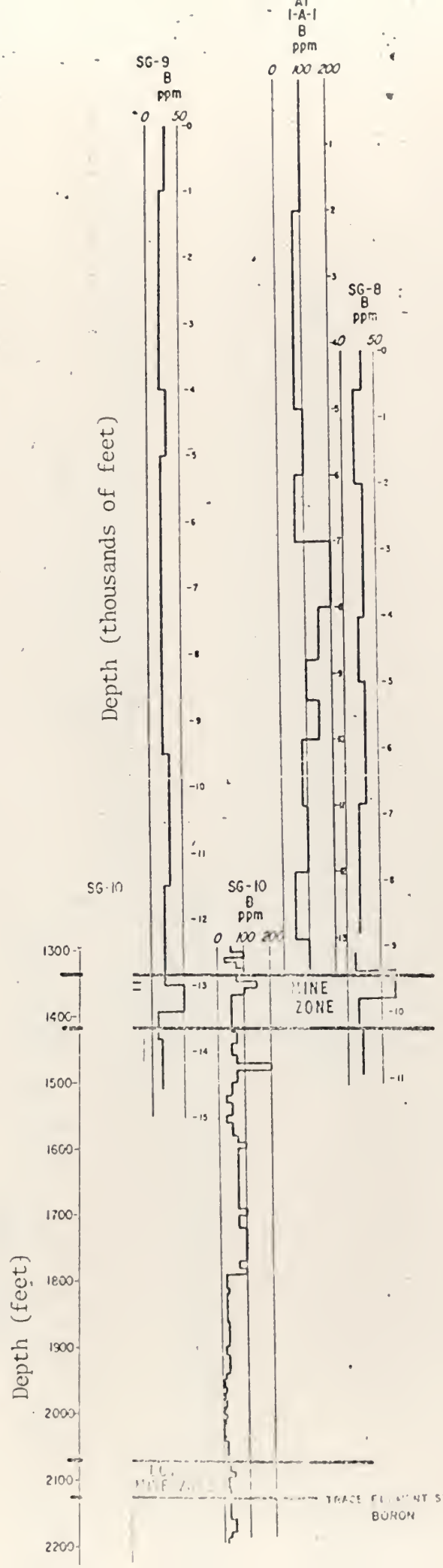
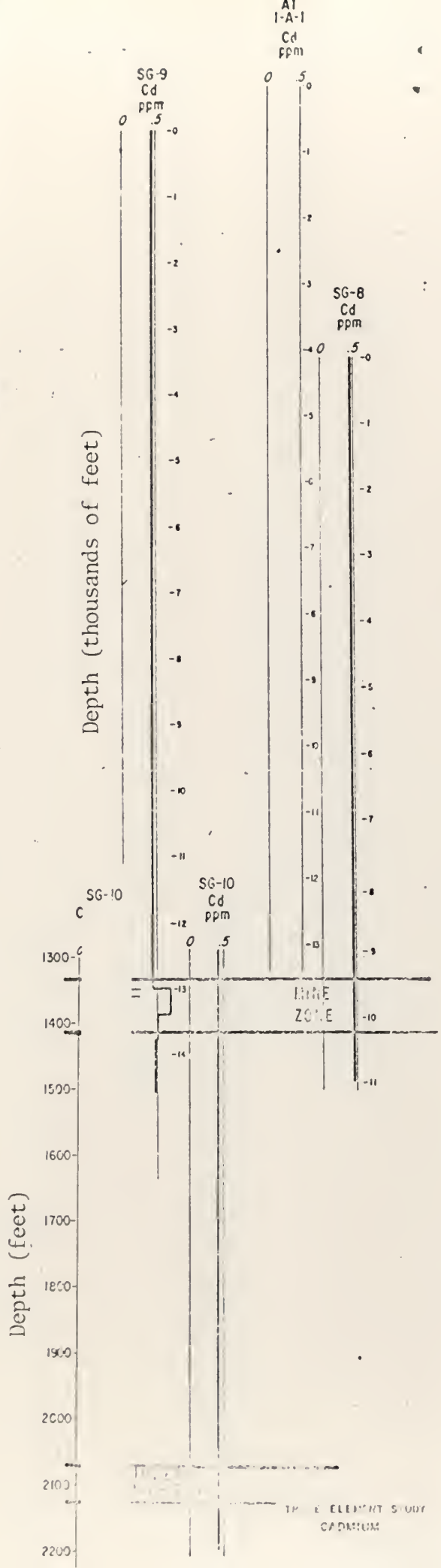


FIGURE II B-18
TRACE ELEMENT STUDY
CADMIUM HISTOGRAM



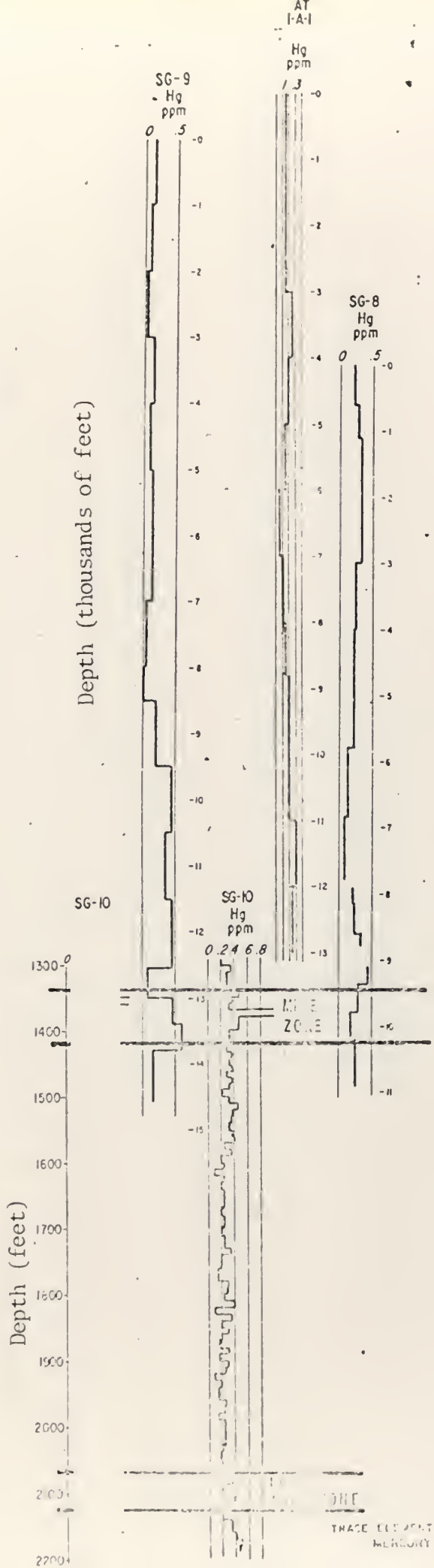


FIGURE II B-20
TRACE ELEMENT STUDY
MERCURY HISTOGRAM

FIGURE II B-19
TRACE ELEMENT STUDY
FLUORIDE HISTOGRAM

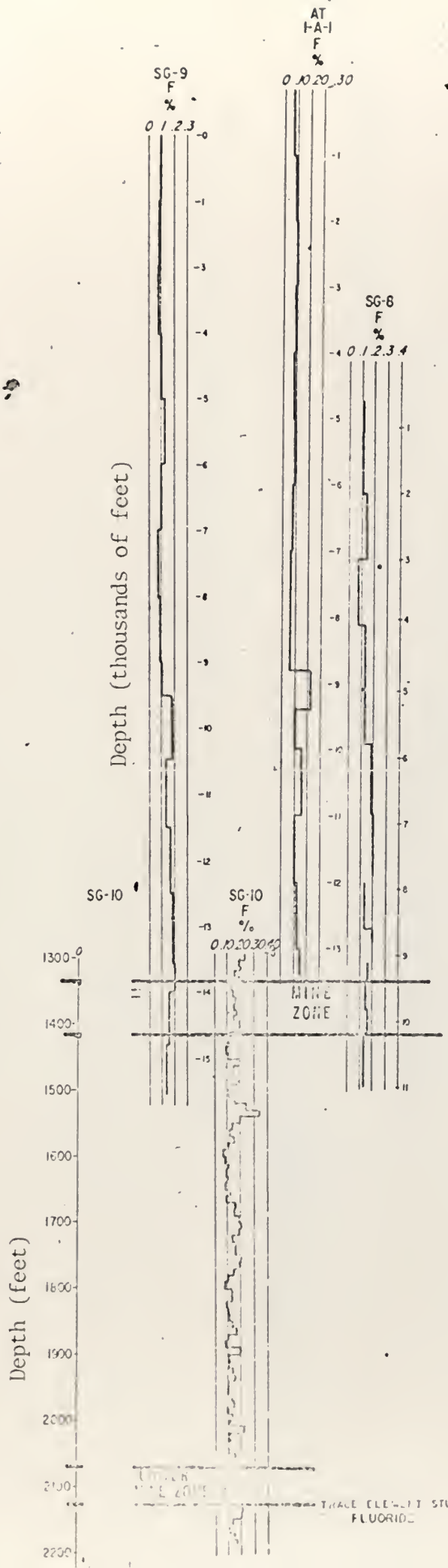


FIGURE II B-21
TRACE ELEMENT STUDY
SELENIUM HISTOGRAM