NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

TECHNICAL LETTER NASA-90

# ADDITIONAL INFRARED SPECTRAL EMITTANCE MEASUREMENTS OF ROCKS FROM THE MONO CRATERS REGION, CALIFORNIA

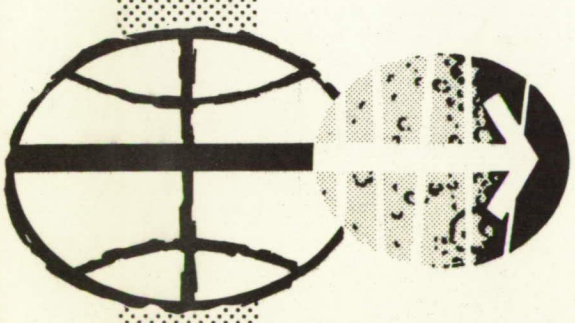
By

D. L. Daniels
U.S. Geological Survey
Washington, D.C.



October 1967

Prepared by the U.S. Geological Survey for the National Aeronautics and Space Administration (NASA) under Work Order No. T-65754



MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WASHINGTON, D.C. 20242

Interagency Report
NASA-90
October 1967

Dr. Peter C. Badgley
Program Chief,
Earth Resources Survey
Code SAR - NASA Headquarters
Washington, D. C. 20546

Dear Peter:

Transmitted herewith is one copy of:

INTERAGENCY REPORT NASA-90

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by

D. L. Daniels

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Sincerely yours,

William A. Fischer
Research Coordinator
Earth Orbiter Program

*Work performed under Work Order No. T-65754
**U.S. Geological Survey, Washington, D.C.

UNITED STATES

DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

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# Additional Infrared Spectral Emittance Measurements of Rocks from the Mono Craters Region, California

by

D. L. Daniels

## INTRODUCTION

The objective of the work presented here is to supplement the infrared spectral emittance measurements given in a previous Technical Letter (Daniels, 1966). A new collection of field samples was obtained* from the Mono Craters region for spectral emittance measurements in the 700 to 1300 $cm^{-1}$ region. The samples are keyed to the geologic symbols on the map prepared by Friedman (1966).

The new measurements (1) cover a more complete suite of igneous and pyroclastic rocks of the region and (2) include spectral comparisons between the natural weathered surface and a freshly sawed surface from the same rock.

The experimental techniques used in this work are described by Daniels (1966). A slight improvement in the signal to noise ratio was achieved by averaging the digitized values of three spectra for each sample.

The samples are described in Table 1. The location of each sample is indicated in the table and on the map.

* Collected by J. D. Friedman, G. W. Greene, S. J. Gawarecki, R. M. Turner

## REFERENCES

Daniels, D. L., 1966, Infrared spectral emittances of rocks from the Pisgah Crater and Mono Craters Areas, California: U. S. Geol. Survey Technical Letter NASA-13.

Friedman, J. D., 1966, Geologic map of the Mono Craters area, California: U. S. Geol. Survey Technical Letter NASA-12.

Table 1. - Sample Descriptions

| Sample no. | Geol. map symbol | Description |
|---|---|---|
| D-65-2 | Qyrc | Rhyolite pumice - dark, frothy, glass; low density; large bubbles. Large, broad coulee - central section of crater chain. |
| G-66-15B | Qrb | Pumiceous rhyolite - gray, blocky, fine-frothy glass denser than D-65-2; buff weathered surface. Small, cone-shaped satellite crater - near northern end of crater chain. |
| D-65-1 | Qyrc | Pumiceous rhyolite - gray, frothy, glass with medium-sized pores; intermediate between D-65-2 and G-66-15B. Large, broad coulee in central section of crater chain. |
| S-66-1 | Qyrt | Pumiceous rhyolite - gray, fibrous-textured glass; similar to G-66-15B. Large circular tholoid - near northern end of crater chain. |
| G-66-20A | Qor | Porphyritic rhyolite - feldspar phenocrysts set in vesicular glass - "older" rhyolite from tholoid in Devil's Punchbowl. |
| S-66-5 | Qb | Cemented rhyolite sand - rhyolite beach sand (similar to D-65-3) lightly cemented with calcareous lake salts. South Shore Mono Lake. |
| D-65-3 | Qb | Rhyolite sand - unconsolidated, well-sorted, rhyolitic beach sand - mostly grains of obsidian, some pumice. South Shore Mono Lake. |
| G-66-4B | Qbt | Bishop Tuff - tan, low density, crystal-lithic tuff; uppermost unit. Aeolian Buttes. |
| F-66-4 | Qbt | Bishop Tuff - gray-tan, dense, crystal-lithic tuff; middle-welded unit. Aeolian Buttes. |

Table 1. - Sample Descriptions (cont.)

| Sample no. | Geol. map symbol | |
|---|---|---|
| G-66-5B | Ka | Quartz monzonite - biotite bearing, medium-grained. Aeolian Buttes |
| S-66-3B | Qam | Andesite - banded andesite with large feldspar phenocrysts, red oxidized basalt-fragments, glassy groundmass. Dome of andesite flows - near northern end of crater chain. |
| S-66-3C | Qam | Andesite - gray, banded, andesite; large feldspar phenocrysts, dark basalt fragments, glassy groundmass. Natural surface slightly glossy - same location as S-66-3B. |
| F-66-6,7 | Qjlb | Basalt - black, vesicular, plagioclase basalt. North of June Lake Junction, west of U.S. Highway 395. |
| S-66-4 | Qjlb | Basalt - red, oxidized flow of vesicular, plagioclase basalt. Edge of broad flow in Pumice Valley. |

FIG. 1

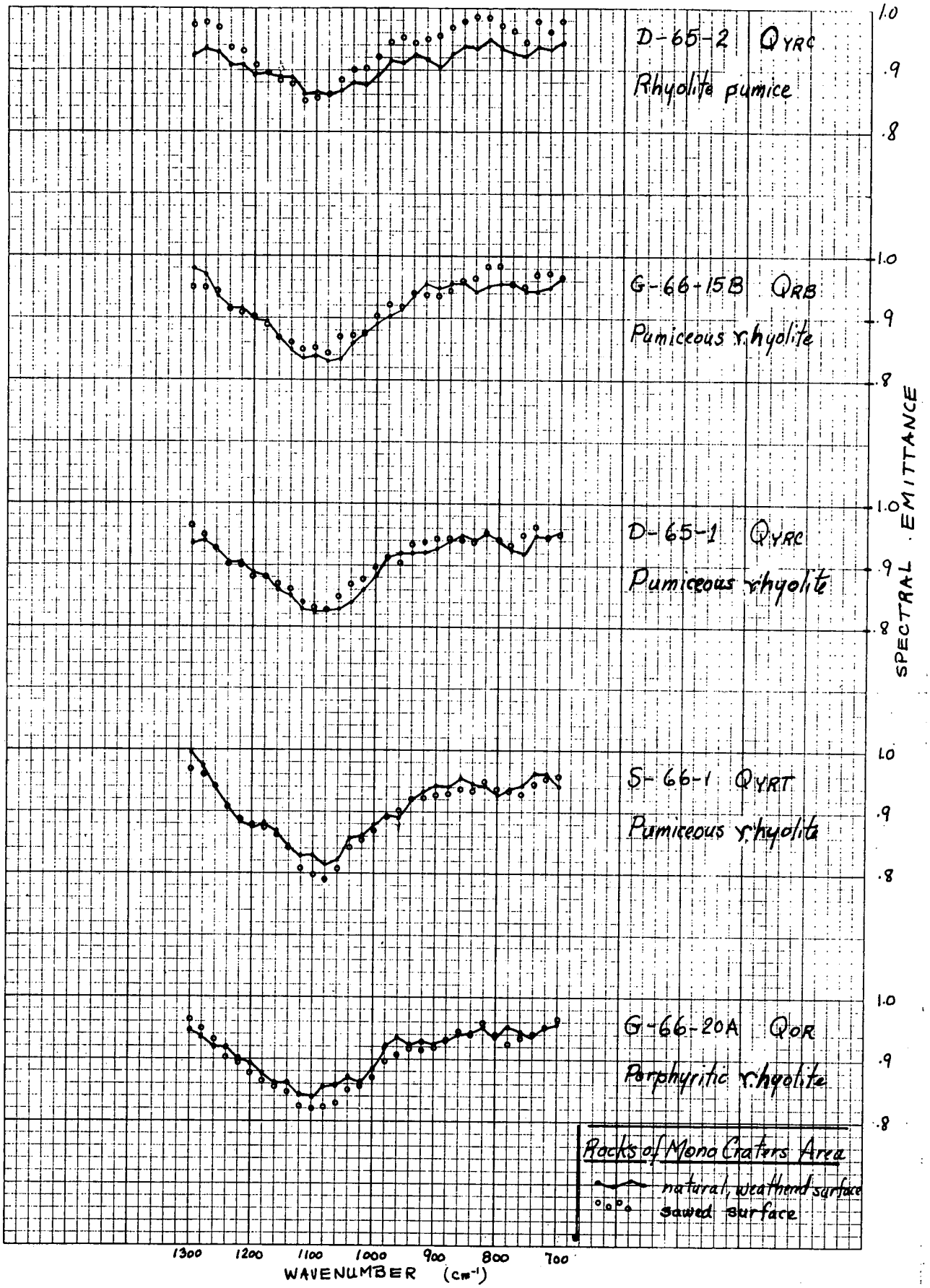

D-65-2 QYRC
Rhyolite pumice
G-66-15B QRB
Pumiceous r.hyolite
D-65-1 QYRC
Pumiceous r.hyolite
S-66-1 QYRT
Pumiceous r.hyolite
G-66-20A QOR
Porphyritic r.hyolite
1.0
.9
.8
SPECTRAL EMITTANCE
1300
1200
1100
1000
900
800
700
WAVENUMBER (cm⁻¹)
Rocks of Mono Craters Area
natural, weathered surface
sawed surface

FIG. 2

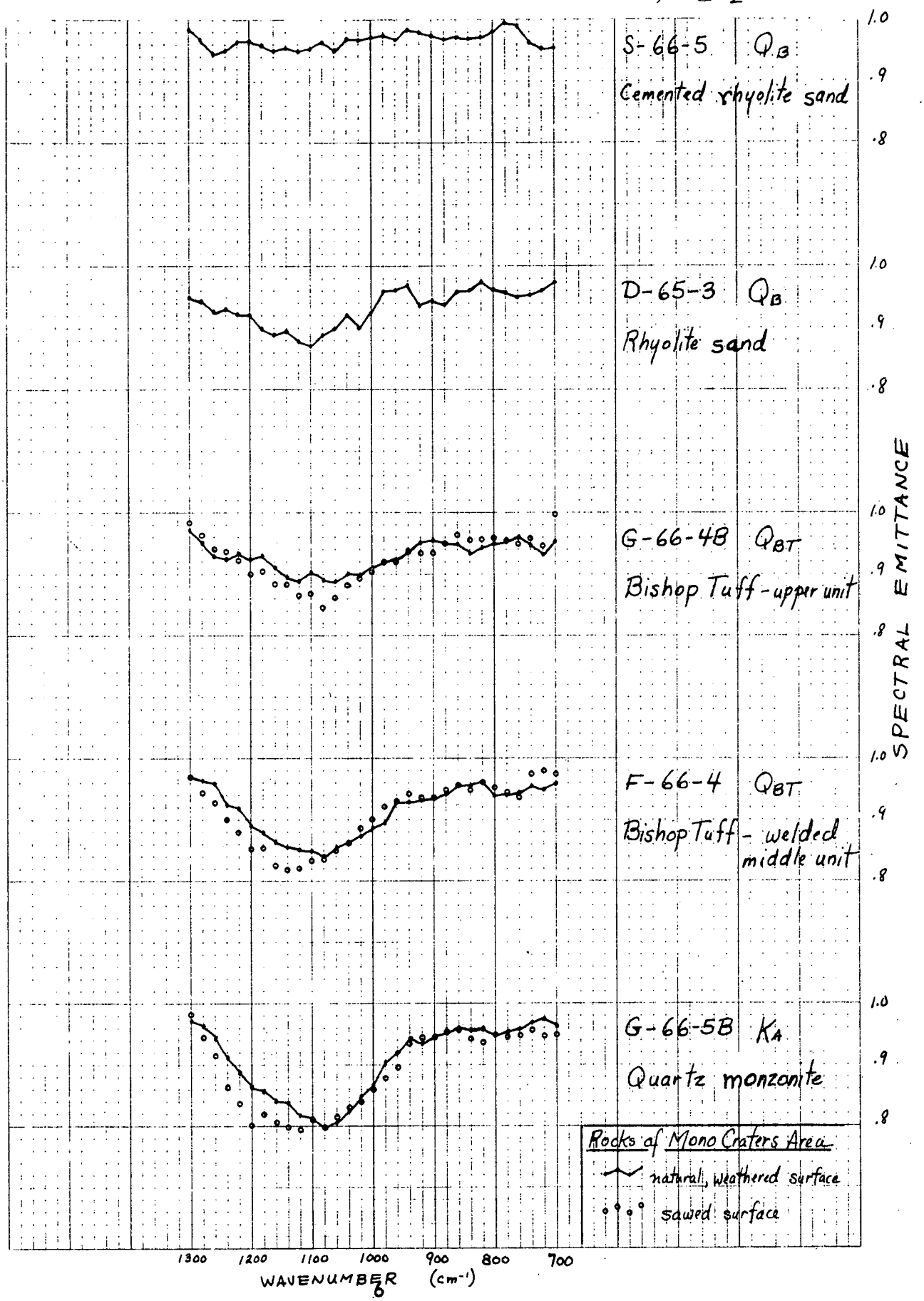
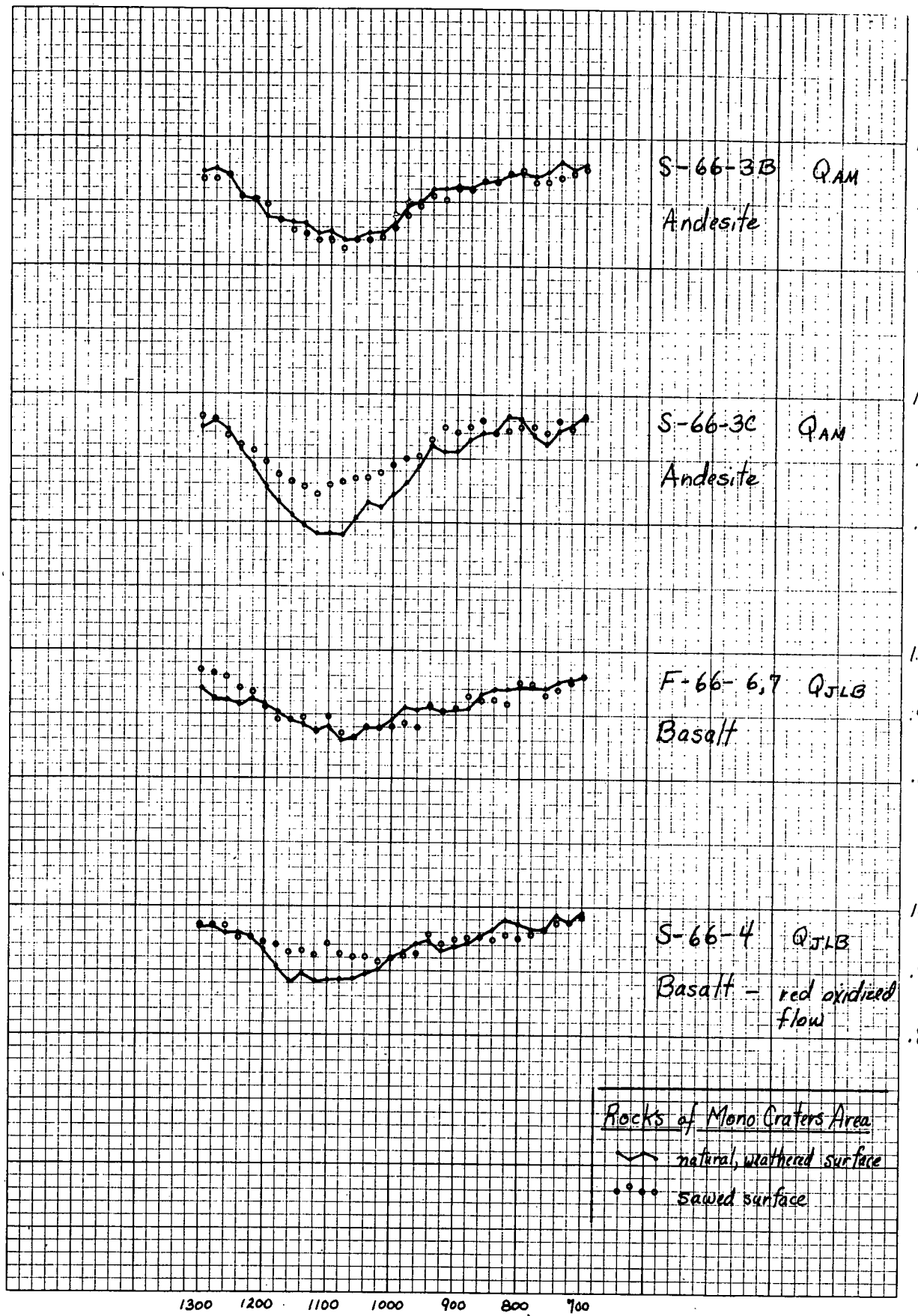

S-66-5 $Q_B$
Cemented rhyolite sand
D-65-3 $Q_B$
Rhyolite sand
G-66-48 $Q_{BT}$
Bishop Tuff - upper unit
F-66-4 $Q_{BT}$
Bishop Tuff - welded middle unit
G-66-5B $K_A$
Quartz monzonite
1.0
.9
.8
SPECTRAL EMITTANCE
Rocks of Mono Craters Area
natural, weathered surface
sawed surface
1300
1200
1100
1000
900
800
700
WAVENUMBER (cm⁻¹)

FIG. 3


S-66-3B Q_AM
Andesite
S-66-3C Q_AM
Andesite
F-66-6,7 Q_JLB
Basalt
S-66-4 Q_JLB
Basalt – red oxidized flow
1.0
.9
.8
SPECTRAL EMITTANCE
Rocks of Mono Craters Area
natural, weathered surface
sawed surface
1300 1200 1100 1000 900 800 700
WAVENUMBER (cm⁻¹)

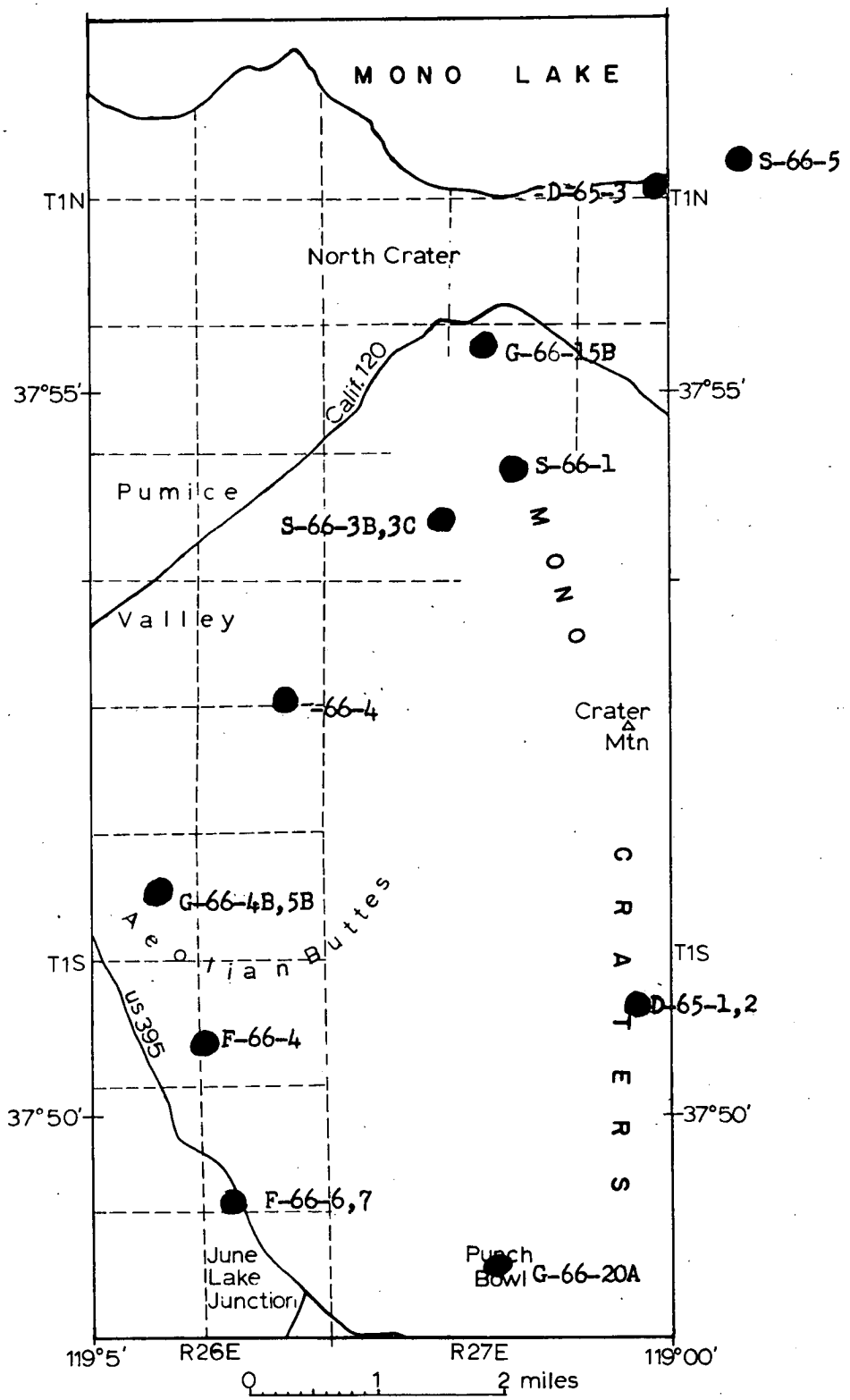



Fig. 4 Sample location map - Mono Craters area, Calif.