CP&L

Carolina Power & Light Company

January 19, 1979

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
United States Nuclear Regulatory Commission
Washington, D. C. 20555

SHEARON HARRIS NUCLEAR POWER PLANT, UNIT NOS. 1, 2, 3, AND 4
DOCKET NOS. 50-400, 50-401, 50-402, AND 50-403
GEOLOGICAL FEATURE AT THE WEST WALL OF THE MAIN DAM DIVERSION CONDUIT

Dear Mr. Denton:

In response to your staff's request dated November 29, 1978, concerning additional work required on the schist-granite contact at Station 2+55 in the main dam diversion conduit wall, field and laboratory studies were undertaken to address the following points:

I. A field analysis of structures along and across the contact was conducted to define the nature of the contact mesoscopically. (This part of the study was to include analysis of folding and any other existing deformational features along and across the contact.)

II. A laboratory analysis was conducted of thin sections cut from specimens taken across the contact to define the nature of the contact microscopically. Minimal data required were identification of key minerals, and determination of the time of formation and the timing of last deformation of the key minerals.

This report presents the data obtained from the field and laboratory studies which bear upon definition of the nature of the schist-granite contact.

I. Field Analysis

All structures observed in the field that bear a direct relationship to the schist-granite contact are ductile deformation features and hence the result of relatively deep-seated, non-brittle type failure conditions. Any movement accompanying this ductile deformation would have been a ductile-type response closely related to the folding and metamorphic histories. Results of the field analysis of this contact may be summarized as follows:

1. Only ductile deformation is apparent at or along the contact. There is no mesoscopic evidence for brittle failure in the granitic rock, only a strong foliation developed in response to ductile deformation and/or movements. There are no distortions of schistosity in the schist on the mesoscopic scale which could be equated with a response to brittle deformation (i.e., faulting) at or along the contact.

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2. The contact itself is not planar but irregular. The planar appearance of the contact on the map (Figure 1) is a function of the map scale and not inaccuracies in the mapping. Lithologic units are not truncated at this contact, which represents only the boundary between lithogically distinctive rock and layers of schist.

3. The micaceous layer at the contact is not unique. Layers of similar composition are found in the schistose zone alternating with sandy schist and granitic material in bands which are parallel to compositional layering in the zone. (The micaceous unit at the contact pinches and swells to indicate a response to ductile deformation.)

4. Fractures do not cross the thick schistose zone in the diversion conduit wall because of the ductility contrast between the schistose zone and the surrounding granitic rock. (Mapping of the diversion conduit floor indicates that fractures do cross the schist where it is thinner.) See "Main Dam Plan Geologic Map of Diversion Conduit Sta 2+50 to 4+05" (Figure 2A of the report submitted to you on November 27, 1978, concerning the same schistose zone.)

5. "Fissility" of the granitic material at the contact is the result of weathering of the foliated granitic rock.

6. Clayey material along the contact, in the schist, and around granitic boudins is the result of weathering of potassium feldspar, and is not fault gouge material.

II. Laboratory Thin Section Analysis

Four specimens were collected for preparation of thin sections as indicated on the attached map of the diversion conduit wall (Figure 1). These four specimens were labeled as follows:

#SHMD-P1-weakly foliated granite away from the contact
#SHMD-P2-strongly foliated granite at the contact
#SHMD-P3-micaceous schist at the contact
#SHMD-P4-sandy schist away from the contact

The specimens were collected specifically to make possible the preparation of thin sections for investigation of mineralogy and microscopic deformational textures at and near the granite-schist contact. Thin sections were cut perpendicular to the foliation surface in order to provide the best orientation for observing microscopic deformational textures.

A. Sections SHMD-P1 and P2

These sections from the granitic material showed that the key constituent minerals are quartz, feldspar, and biotite. Textures and mineralogy suggest that these minerals are of igneous origin, although they probably have been affected by regional metamorphism.

Section SHMD-P1 indicates that the granitic rock away from the contact is weakly foliated and contains quartz grains which are weakly strained as illustrated by undulatory extinction. The quartz grains show no elongation, crushing or grinding. Most of the few existing microcracks are healed, and the quartz-feldspar grains are characterized by interlocking grain boundaries of the type similar to that commonly noted in igneous intrusive rocks (Figure 2).

Section SHMD-P2 indicates that the rock at the contact contains elongated quartz veins alternating in micro-layers with feldspar-biotite. Quartz grains are not crushed, granulated, or sheared and microcracks in the quartz are scarce and commonly healed when present. Quartz grains appear slightly more strained here than farther from the contact as evidenced by the increased development of undulatory extinction. The fabric observed is that which is characteristic of granitic rocks which have been deformed under deep-seated, ductile conditions. The microscopic textures reinforce the mesoscopic observations of the definite lack of brittle failure (i.e., faulting) along the contact. These textures bear out the ductile nature of the fabric developed in the granitic rock at this contact (Figure 3).

B. Sections SHMD-P3 and P4

These sections from the schistose zone showed that the key constituent mineral within the micaceous schist and sandy schist is mica with varying amounts of quartz and feldspar. The key minerals are the result of mineral growth under thermal conditions accompanying regional metamorphism.

There are no microscopic textures to suggest distortion of schistosity related to brittle deformation (i.e., faulting) along the granite-schist contact. The microscopic fabric observed is a normal metamorphic foliation marked by planar alignment of mica, quartz, and feldspar (Figure 4). The texture of Section SHMD-P3 is similar to that shown for Section SHMD-P4. The weathered nature of specimen SHMD-P3 made it impossible to acquire a suitable photomicrograph of the thin section which was cut from SHMD-P3.

Based on the above information and the information submitted to you previously, the schistose zone located at station 2+55 of the main dam diversion conduit wall cannot be described as a "capable" fault as the term is defined by 10CFR100, Appendix A.

Yours very truly,

M. A. McDuffie

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Senior Vice President
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RGB/mf
Attachments For FIGURES SEE RPTS

cc: Mr. James P. O'Reilly

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Section SHMD-P2 indicates that the rock at the contact contains elongated quartz veins alternating in micro-layers with feldspar-biotite. Quartz grains are not crushed, granulated, or sheared and microcracks in the quartz are scarce and commonly healed when present. Quartz grains appear slightly more strained here than farther from the contact as evidenced by the increased development of undulatory extinction. The fabric observed is that which is characteristic of granitic rocks which have been deformed under deep-seated, ductile conditions. The microscopic textures reinforce the mesoscopic observations of the definite lack of brittle failure (i.e., faulting) along the contact. These textures bear out the ductile nature of the fabric developed in the granitic rock at this contact (Figure 3).

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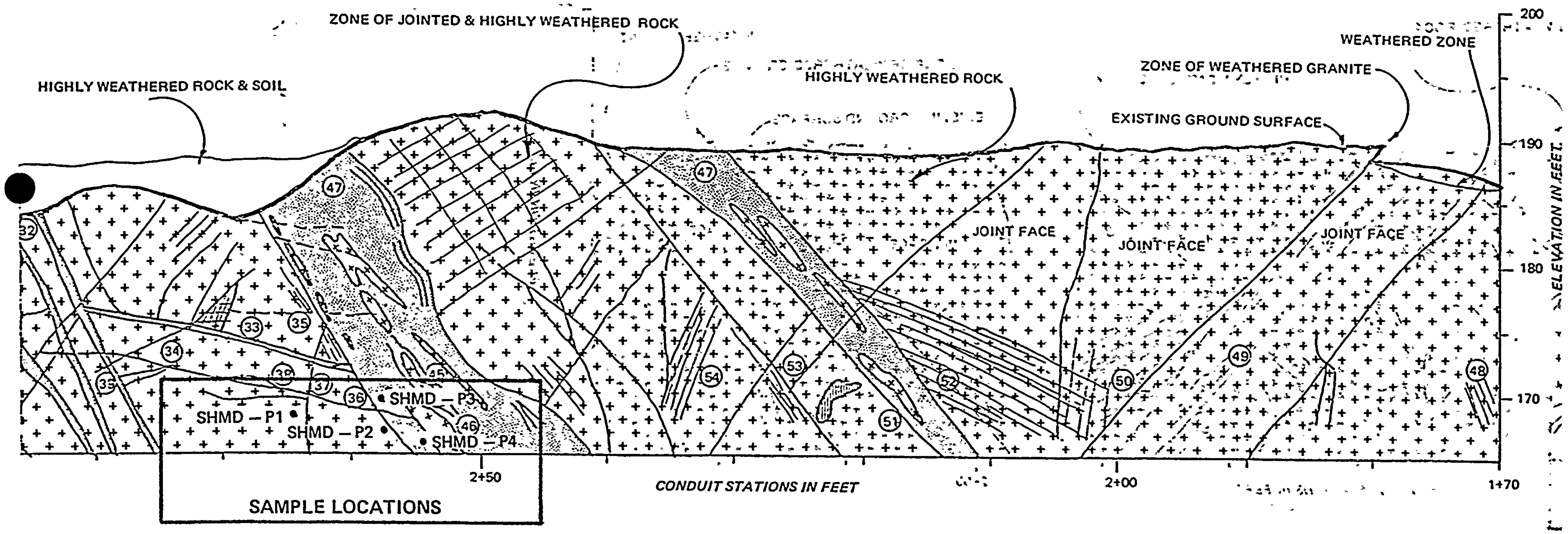
LIST OF FIGURES



EXPLANATION

- *Foliated Granite*
- *Mica Schist*
- *Hornblende–Mica Gneiss*
- *Hornblende-Mica Schist*
- *Quartz*
- *Joint, Fracture, Contact*
- SHMD – P1• *Sample Locations*

NOTE : Reference Section CAR 2167G – 6238 (FIGURE 2A) and Key (FIGURE 2B) sent with report of OCT. 17, 1978

0 5 10 20
SCALE IN FEET

CAROLINA POWER & LIGHT
SHEARON HARRIS NUCLEAR POWER PLANT

EBASCO SERVICES INCORPORATED

MAIN DAM
SAMPLE LOCATIONS: WEST WALL OF DIVERSION CONDUIT

FIGURE 1

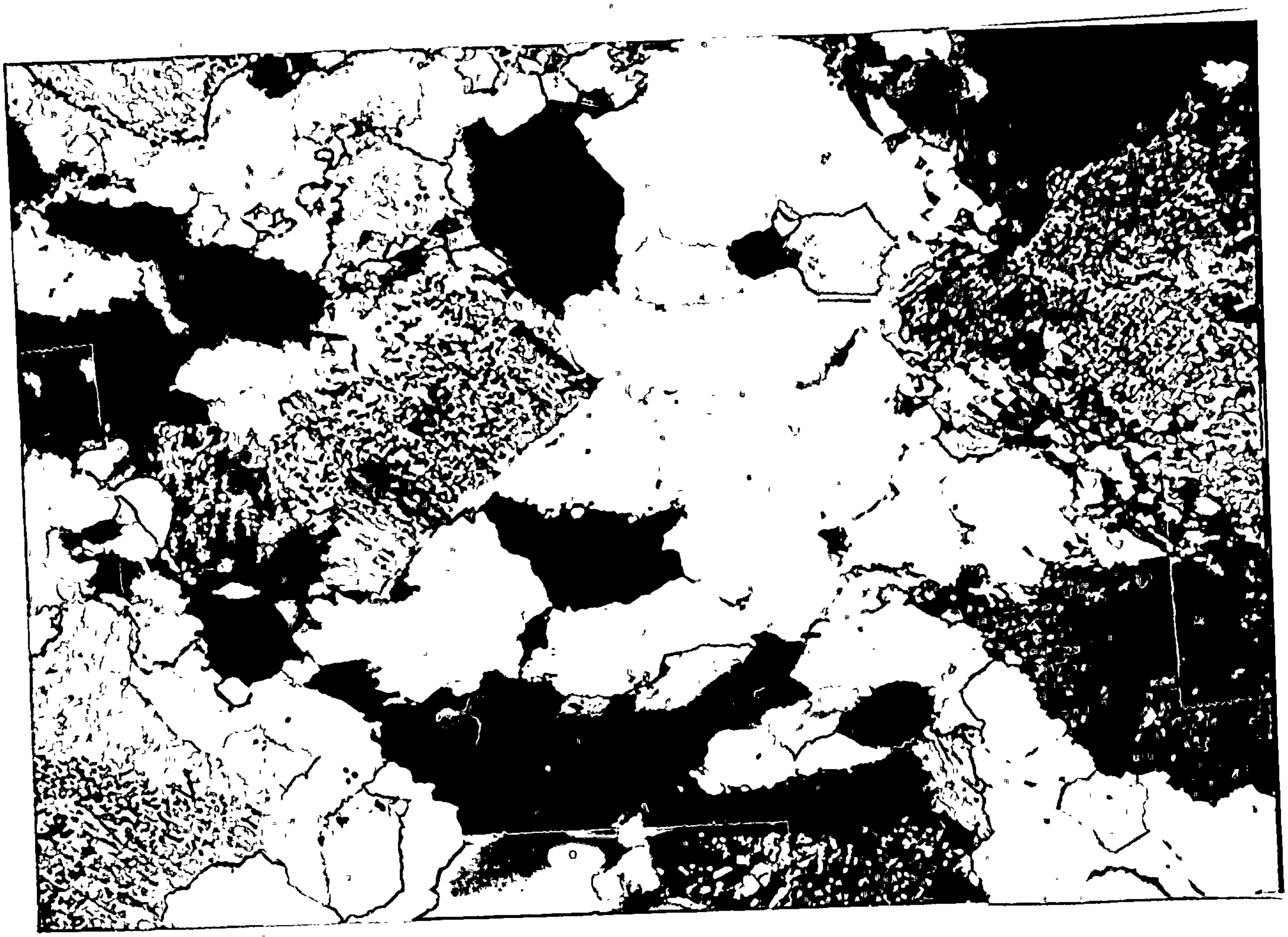


FIGURE 2

Photomicrograph illustrating interlocking boundaries of quartz and feldspar grains in Section SHMD—P1. Note that the mineral grains show no elongation, crushing, or grinding although the specimen is weakly foliated.

No. SHNPP Main Dam 12/78—1 12/20/78

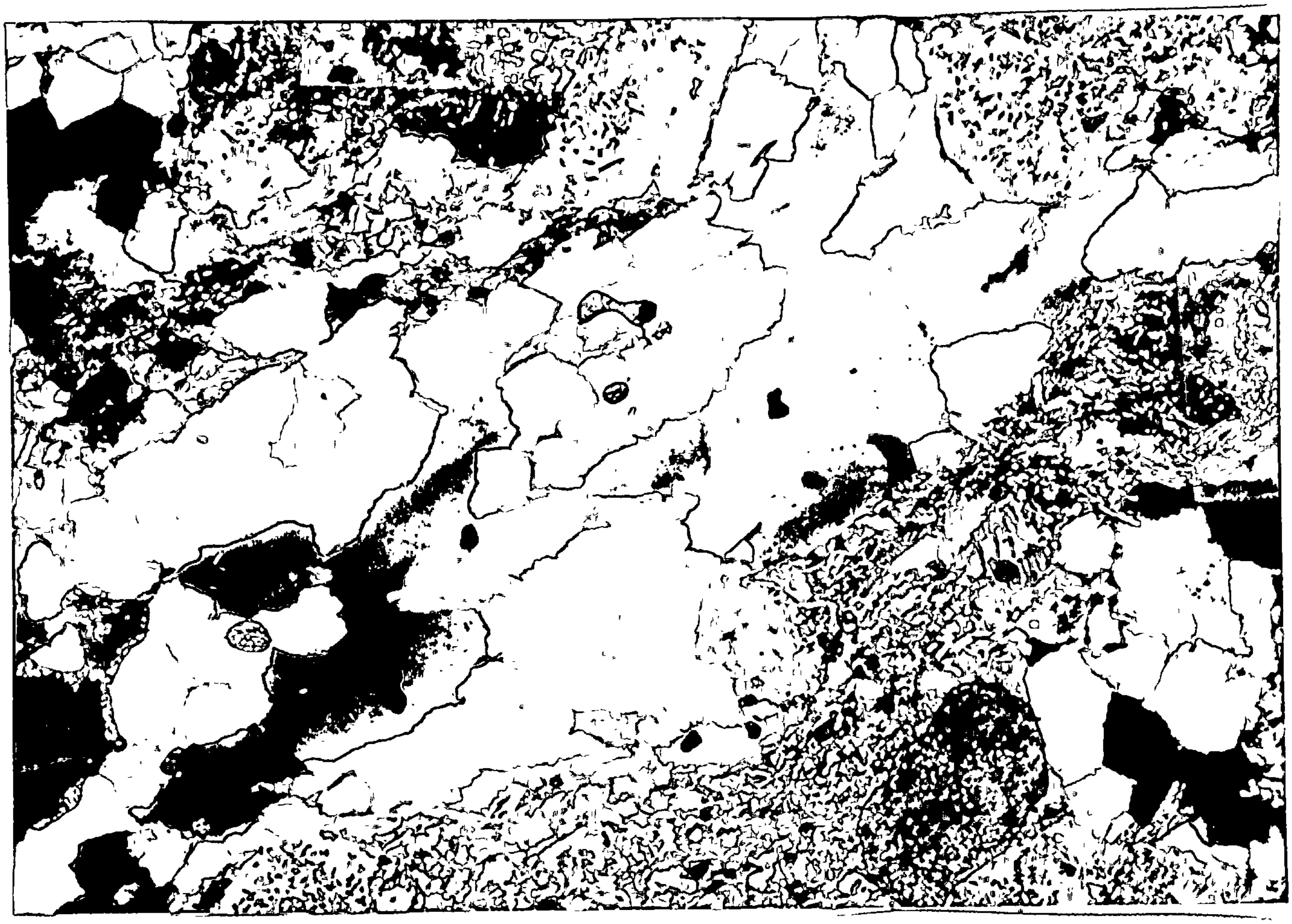


FIGURE 3

Photomicrograph illustrating elongated quartz with alternating micro-layers of feldspar-biotite on Section SHMD—P2. Only ductile deformation is indicated. The grains show no crushing or grinding characteristic of brittle deformation.

No. SHNPP Main Dam 12/78—2 12/20/78

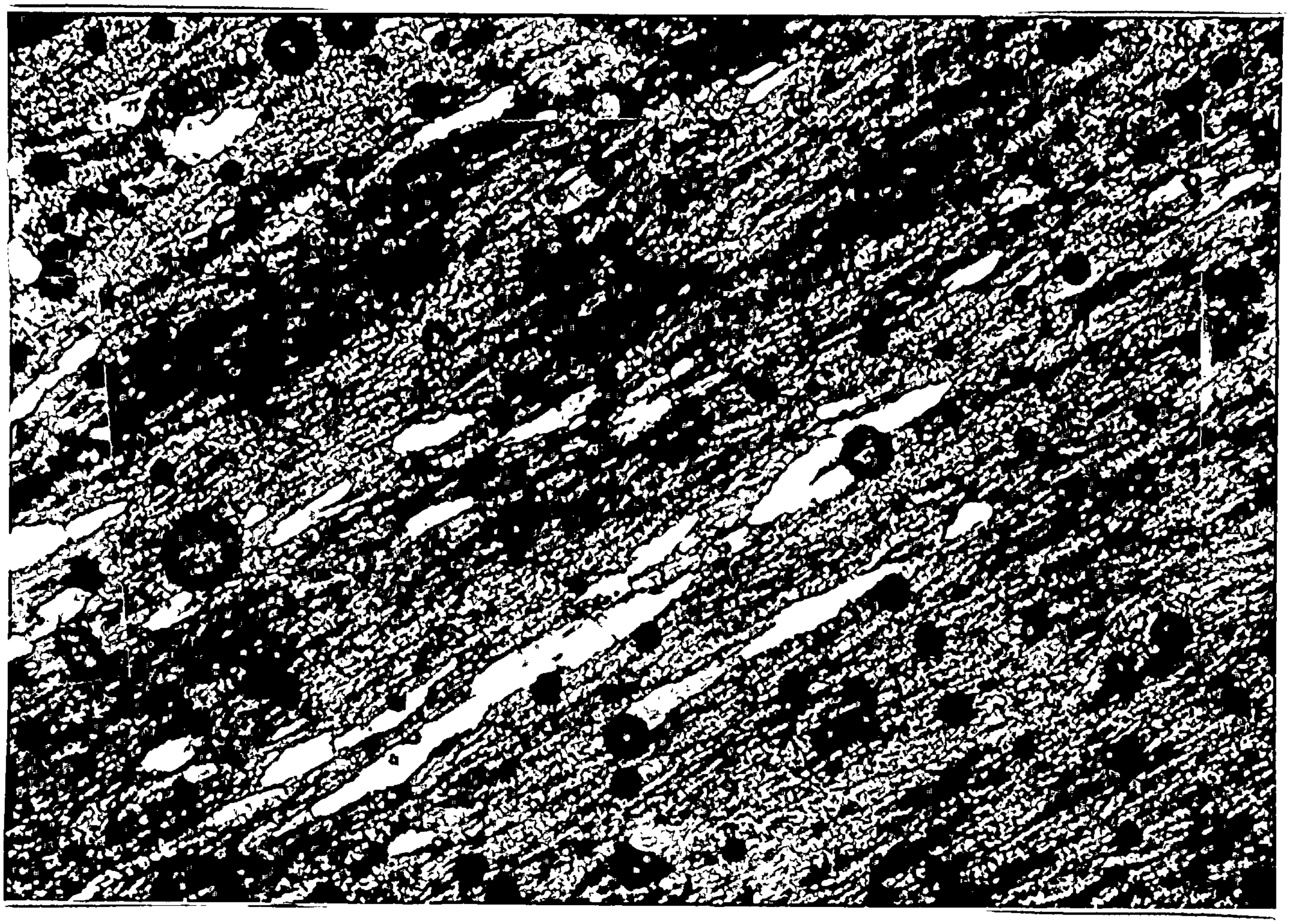


FIGURE 4

Photomicrograph illustrating the normal metamorphic foliation (marked by planar alignment of mica) developed in Section SHMD—P4.

No. SHNPP Main Dam 12/78—3 12/20/78

[illegible]

[illegible]

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