MAR 29 1977

MEMORANDUM FOR: F. J. Miraglia, Technical Assistant, Division of Site Safety and Environmental Analysis

FROM: W. P. Gammill, Assistant Director for Site Technology, DSE

SUBJECT: PHILIPPINE PRELIMINARY SITE INVESTIGATION REPORT

As suggested in H. R. Denton's Feb. 16, 1977 memorandum, the Geosciences Branch has reviewed the subject report in accordance with the initial Site Examination Information (ISEI) review procedure. The Geosciences review is attached.

Original Signed by
W. P. Gammill

William P. Gammill, Assistant Director
for Site Technology
Division of Site Safety
and Environmental Analysis

Enclosure: As stated.

cc: w/o Encl.
S. Rusche
E. Case
J. Lafleur
R. Vollmer
D. Bunch
L. Hulman
J. Stepp
R. Hofmann
J. Kelleher
J. Greeves
H. Lefevre
L. Heller

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MEMORANDUM FOR: F.J. Miraglia, Technical Assistant, Division of Site Safety and Environmental Analysis

FROM: W.P. Gammill, Assistant Director for Site Technology, DSE

SUBJECT: PHILIPPINE PRELIMINARY SITE INVESTIGATION REPORT

As suggested in H.R. Denton's Feb. 16, 1977 memorandum, the Geosciences Branch has reviewed the subject report in accordance with the Initial Site Examination Information (ISEI) review procedure. The seismological review is attached.

William P. Gammill, Assistant Director
for Site Technology
Division of Site Safety
and Environmental Analysis

Enclosure: As stated.

cc: w/o Encl.
B. Rusche
E. Case
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2.6 GEOLOGY AND SEISMOLOGY

2.6.1 BASIC GEOLOGIC AND SEISMIC INFORMATION

2.6.1.1 Geologic Information

The Philippine Nuclear Power Plant, Unit No. 1, is located adjacent to the South China Sea at Napot Point on the southwest flank of a historically-inactive stratovolcano, Mt. Natib. Viable hazards to be considered at this location are consequently primarily volcanic-related. Although some discussion of the volcanic hazards has been presented in the Preliminary Site Investigation Report, the subject has not been thoroughly addressed. This shortcoming is acknowledged in the report and additional studies are being performed. As a suggestion, the following items might be considered upon further evaluation of the volcanic hazard:

a. Active Volcanoes - Apparently three active volcanoes - Taal, Mt. Banakao and Mt. San Cristobal - are within 101-142 km of the proposed site. Although most volcano-related hazards would not be considered due to the remoteness of the site from these sources, ash fall should be assessed. This hazard is currently being evaluated at two sites in the United States (Pebble Springs, Units 1 and 2, and Skagit, Units 1 and 2). The Pebble Springs site is nearly 200 km from the assumed source. Historical ashfalls, including thickness ranges, distance from the

source, and prevailing winds, are some of the parameters to be assessed.

b. Inactive Volcanoes - Even though Mt. Natib has no record of historic activity, it is likely that Mt. Natib, under current NRC practice, would be considered active, considering the proximity of Mt. Mariveles (21 km SE of the proposed site) and its relatively recent (geologically speaking) eruption of 4,000 ybp. Furthermore, volcanoes have been known to become active after long periods of quiescence. For example Mt. Mazama in the Cascade Range is believed to have passed through two periods of dormancy, the last of which may have been as long as 5,000 years just prior to the culminating series of eruptions 7,000 years BP (Shannon & Wilson, 1976 Report to Portland General Electric Co. Volcanic Hazards Study Pebble Springs Nuclear Plant Site). Our suggestion is that effort be directed toward determining the eruptive histories and types of ejecta and distances from the sources of the different types of ejecta of the two volcanoes - Mt. Natib and Mt. Mariveles - as a basis for deciding whether Mt. Natib should be considered inactive.

c. Mudflows - Two Mt. Natib mudflows have been mapped - one on the south flank and another on the southwest flank. The nearest flow is within two km of the proposed site. It would appear that this type of phenomenon may not be limited to eruptive periods and should be considered possible at any time. Additional rationale should be provided in the report demonstrating that the plant would not be affected if a large flow were to occur.

c. Ashfall - Documentation should be provided discounting an ashfall hazard originating from nearby, as well as distant, volcanoes.

In addition, the massive slide indirectly related to volcanism, the Mapalan block, requires further description. Neither the location, dimensions, current rate of movement, nor potential hazard to the proposed site are discussed thoroughly.

2.6.1.2 The development of seismic information is largely complete, but some added investigation into descriptions of historic earthquakes may be necessary for an adequate determination of maximum vibratory ground motion. Specifically, it is not clear from the Preliminary Site Investigation Report (PSIR) that the historic record was exhaustively examined. The PSIR, based largely on the catalog of Repetti, reports only minor effects were observed from local or nearby earthquakes of the 19th century. Isoseismals, however, drawn for some of those earthquakes by Jesuit observers at Manila and on which, to my knowledge, much of Repetti's data are either based or correlated, suggest that high intensities may have occurred on the Bataan Peninsula during historic time. Copies of these isoseismal maps are appended. If, in fact, these isoseismal estimates are erroneous, (see, for example, the estimates of events in 1872, 1877, 1879, 1882, etc.) arguments should be developed to discount them. Historic seismicity is a crucial source of information in determining the SSE and in this area some further investigation is needed.

2.6.3 [redacted] FAULTING

Faulting would appear to be difficult to detect in the geologic terrain within the site vicinity. Surface exposures, as indicated in Fig. 2.6.1-27, Outcrop Map Within 5 km Radius of Napot Point Site, appear to be confined, with the exception of the Labar, to the coastal area. Remote sensing would seem to be a useful tool in assessing the faulting regime. Considering the paucity of exposures within 5 km of the site it is difficult to envision what type of field investigations were conducted in the case of say, Linear Features 4, 10 and 11. Provide additional documentation (maps, trench logs, borings, etc.) of linear investigations within 5 km of the site.

Apparently additional studies are being conducted at the site as well as off-shore. These investigations should be particularly thorough considering the prevalance of Holocene faulting in the Philippines (see Fig. 2.6.1-5, Generalized Geology of the Site Region).

2.6.4 STABILITY OF SUBSURFACE MATERIALS

a. The reactor structure will be founded on the slightly weathered to fresh rock. This seems to be the best method to support Category I structures and components at this site. The PSAR should provide detailed discussions regarding excavation methods, to assure competent foundation support. This discussion should include structural fill requirements and specifications. Swell potential of backfill material should be addressed in the PSAR.

b. The PSAR should include information regarding the stability of all slopes, both natural and manmade, the failure of which could adversely affect the nuclear power plant. Reports and investigations of regional landslides should be presented and compared with the site geologic conditions.

c. The ultimate heat sink for the cooling water system should be described in the PSAR. This should include all water sources, including necessary retaining structures, and the canals or conduits connecting the sources with the nuclear power plant. Reservoir linings should be provided to limit seepage losses.