NRC PDR

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

The Honorable Lawrence Coughlin
United States House of
Representatives
Washington, D.C. 20515

Dear Congressman Coughlin:

This letter is in response to your December 31, 1979 request for information regarding "cracks in the foundation rocks" for the reactor buildings at the Limerick Generating Station (Limerick facility). The cracks that your letter mentions are actually ancient faults that were discovered during the excavation of foundations for the Limerick Facility. In April 1979, one of your constituents, Mr. Frank Romano, questioned whether blasting in a quarry adjacent to the Limerick site could have adverse effects on the Limerick facility. In particular, Mr. Romano is convinced that the blasting will cause new differential movement along the faults. While we had no information that new differential movement had occurred, we agreed to investigate the matter. The December 18, 1979 meeting with Philadelphia Electric Company (PECO) was held to gather information relative to this investigation. In order to give you a complete report on this matter, provided below are the background and current status of our investigation of the quarry blasting and its potential effects on the Limerick facility. Also enclosed is a recent letter we have sent to Mr. Romano regarding the purpose and conduct of the December 18, 1979 meeting with PECO.

The geology of the Limerick site was initially investigated as part of the Atomic Energy Commission (AEC) Regulatory Staff's (NRC's predecessor) review of Philadelphia Electric Company's (PECO) construction permit application for the Limerick facility. The geology and seismology portion of this review briefly considered quarry blasting but concentrated on a more severe condition, that of defining a postulated earthquake to serve as the design basis for safety structures, systems, and components in the Limerick facility. During the construction permit review, PECO stated that it had monitored a blast in the quarry and found the peak particle velocity at 4000 feet from the blast to be 0.03 inches per second. This velocity is much lower than the peak ground velocities assumed for the safe shutdown and operating basis earthquakes. (The location of the reactor buildings is about 3600 feet from the closest edge of the quarry at this time.) A Safety Evaluation Report was issued in November 1971 and recommended issuance of a construction permit.

Later, during excavation for the reactor buildings, old geologic faults were discovered in the rock foundations. A geologic investigation was performed and was concluded in late 1974. The geological investigation included (1) field

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work performed by PECO's geotechnical consultants, (2) an independent review of these results by a committee of collegiate geologists who were familiar with the geological formations that contained the faults, and (3) a review of these two efforts by the AEC Regulatory Staff. This investigation concluded that differential movement along the fault zones had ceased 150 to 200 million years ago. It is important to note that operation of the quarry had been underway for about 40 years when this review was conducted.

In April 1979, Mr. Romano sent the NRC a letter questioning whether the quarry blasting would adversely affect the structures at the Limerick facility. In particular he stressed that the blasting could cause new differential movement along the faults under the reactor building foundations. In addition to the past evaluations on the faults and on the blasting it was concluded in a "Director's Decision Under 10 CFR 2.206" that further investigation should be done. A copy of this Director's Decision was forwarded to you on October 12, 1979 in response to an earlier inquiry.

Since the "Director's Decision" was issued, we and our consultant, the U.S. Geological Survey have reviewed the documents related to the geology of the Limerick site and the faults in the excavation. In addition, separate meetings were held with the operators of the Pottstown Trap-Rock Quarry and PECO on December 18, 1979. With the excellent cooperation of the operators of the quarry, we obtained important information on the blasting methods being used. Blasts are performed in the quarry approximately 10 times per year. Monitoring records taken by the quarry's seismological consultants during previous blasts at the quarry were available for our inspection. These records indicated peak particle velocities well below the levels imposed by the State of Pennsylvania and the Occupational Safety and Health Administration that assure protection against damage from blasting.

In the afternoon meeting with PECO, PECO presented seismograph recordings that it had taken of quarry blasts. These measurements were taken on PECO property at much greater distances from the blasting than the quarry's recordings. These measurements also supported the conclusion that velocities at the Limerick facility were very low and not damaging. We also asked PECO what monitoring records were available on blasting during rock excavation operations at the Limerick facility. This led to a discussion of the precautions PECO had taken to protect uncured concrete from blast vibrations. PECO stated that it used a procedure which considered concrete curing time, size of the blast, and distance between the blast and the concrete. The maximum velocity acceptable for fresh concrete was conservatively chosen to be 0.1 inches per second and increased with increasing age of concrete.

This construction control is checked by NRC's Office of Inspection and Enforcement and similar precautionary procedures to protect recently placed concrete have been found acceptable at other plant sites. Therefore we conclude that Mr. Romano's concern on the effects of blasting on uncured concrete does not have any merit.

During the meeting we asked PECO to provide us with (1) copies of the records of quarry blasts that it had recorded and presented in the meeting, (2) a map showing the locations of all seismic Category I structures relative to quarry property lines, (3) records from several blasts performed during rock excavation at the site, and (4) a comparison of the response spectra from the postulated operating basis earthquake used in the design of the Limerick facility with a response spectra developed from blast monitoring records.

The first three items were provided by PECO in a letter dated January 15, 1980; PECO stated that the last item would be provided in March, 1980. The balance of our investigation on the effects of quarry blasting will concentrate on reviewing this information and the data collected from the Pottstown Trap-Rock Quarry.

We trust that the information that has been provided is responsive to your inquiry.

Sincerely,

William J. Dircks
Acting Executive Director for Operations

Enclosure:
Letter dated 1/28/80 to
Mr. F. R. Romano