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October 27, 1982

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: Byron Station Units 1 and 2
Essential Service Water
Pipeline ⁴⁵⁴ ⁴⁵⁵
NRC Docket Nos. 50-~~373~~ and 50-~~374~~

- References (a): June 1, 1982 letter from B. J. Youngblood
to L. O. DelGeorge.
- (b): July 20, 1982 letter from T. R. Tramm to
H. R. Denton.
- (c): July 29, 1982 letter from B. J. Youngblood
to L. O. DelGeorge.

Dear Mr. Denton:

This is to provide additional information regarding the
support of Byron Station's buried essential service water pipeline.
This information was requested by the NRC in reference (a) and should
enable closure of Outstanding Item 1 in the Byron SER.

Attachment A to this letter addresses the six requests
contained in reference (a). It summarizes the recent confirmatory
geotechnical investigations which are documented in the enclosed
report. Acceptance criteria for this work were established in
references (a), (b), and (c).

The findings of the recent investigations can be summarized as
follows:

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1. Soil samples were collected from four borings in Area 11
during the installation of groundwater monitoring piezo-
meters. The results of laboratory testing and evaluation of
the soil samples from these four borings indicate that all
anticipated pipeline settlement for both the static and
dynamic cases are less than predicted.
 2. The results of the consolidation tests show that the soil
profile encountered is preconsolidated to loads well in excess
of the existing overburden. This is in agreement with
previous investigations as documented in the FSAR.

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3. The results of drilling four vertical and four angle borings to document the conditions of the foundation soils and rock below the ESW pipeline confirmed the adequacy and stability of the bedrock below the ESW pipeline and satisfies the acceptance criteria given by the NRC.
4. In view of the current subsurface investigations, no unexpected subsurface soil conditions were encountered and our interpretation of the general subsurface profile and soil properties remains unchanged.

In general, this effort has confirmed our previous conclusion regarding the adequacy of the essential service water pipeline. Please direct further questions regarding this matter to this office.

One signed original and fifteen copies of this letter and the enclosures are provided for your review.

Very truly yours,



T. R. Tramm
Nuclear Licensing Administrator

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Attachment

Enclosure: "Report, Confirmatory Geotechnical Investigations, ESW Pipeline Corridor, Byron Station Units 1 and 2, Commonwealth Edison Company," September 30, 1982.

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ATTACHMENT A

Additional Subsurface Information

Byron Station

Essential Service Water Pipeline

Staff Requirements

- (1) At least four slanted borings should be drilled at the site, two borings at area 9 and two borings at area 11. These borings should be drilled at an angle about 45° from the vertical with a penetration of about 80 ft into rock. The advancement of the borings should be in a direction that will directly cross the two major joint trends in area 9 and 11. A double-tube core barrel with bottom discharge bit should be used for core recovery. All information pertinent to core recovery (bit rotation speed, drilling rod pressure, rate of advancement and bit condition) should be recorded. If, during the drilling operation, dropping of rods in excess of 1 ft in 5 ft of penetration and coincident loss of significant drilling fluid occur, in situ observations methods or additional slanted borings should be used to determine the nature, geometry, and spacing of these anomalies. When joints are encountered, the infill materials should be sampled, and their source identified.
- (3) If the above slanted borings in area 9 and 11 find that the joint conditions might adversely affect the support of the pipe- line, as determined in accordance to staff's acceptance criteria (Enclosure 2), additional slanted borings should be drilled at area 12 to determine the rock and the joint conditions there.

Response

The field investigation was performed between August 9, 1982, and August 20, 1982. An NRC representative, Dr. J.T. Chen, was onsite August 16, 17, and 18 to observe the drilling and sampling. A complete description of the methods and results of the investigation is presented in the September 30, 1982, report titled, "Confirmatory Geotechnical Investigations, ESW Pipeline Corridor", to be included in the FSAR as Attachment 2.5J. A summary of the report conclusions are:

- a. Areas of Concern 9 and 11 are located at intersections of the ESW pipeline corridor with northwest trending joint sets.

- b. The joints encountered in the four angle borings are tight (closed) and no voids (open joints) were encountered within the upper 50 feet (vertical) of the bedrock.
- c. Some joint sets contained highly fractured zones, but there was no noticeable increase in bedrock solution activity and no voids encountered.
- d. The investigation confirmed that solution features were developed by differential solutioning along joints and that collapse of the bedrock due to solution phenomena is not possible. (See FSAR attachment 2.5 I for a complete discussion of solution features along the pipeline).

The results of the investigation confirmed the adequacy and stability of the bedrock below the ESW pipeline.

Staff Requirements

- (2) The applicant should establish the maximum unsupported span for the as-built pipeline and its limiting differential settlement values.

Response

The supported pipeline has been designed for a limiting differential settlement of 10 inches over 100 lineal feet. This considers both the encased and unencased portions of the pipeline. The maximum differential settlement expected is 0.2 inches over 100 lineal feet.

Staff Requirements

- (4) At Area 11, two soil borings, about 50' apart, should be drilled in the vicinity of Sta. 48 + 20N, where differential settlement is of concern, to secure undisturbed soil samples from the organic clayey silt layer and the underlying silty clay layer. These undisturbed samples should be subjected to laboratory testing to determine their compression and consolidation properties.
- (5) At Area 12, between Sta. 40 + 50N and Sta. 45 + 20N, where settlements are of concern, soil borings should be drilled at about 50 foot spacing. Two of these borings should use continuous sampling technique to verify the subsurface profile. All other borings (about 6) should use the Standard Penetration Test Procedure (ASTM D-1586). Undisturbed samples should be obtained from the organic silt and silty clay layers for laboratory consolidation tests. The compacted fill above the pipeline needs no sampling.
- (6) The differential settlements along the uncased pipeline should be determined and their effects on the pipeline should be evaluated from the information obtained from the exploration and testing program outlined in (3) through (5).

Response

During March and April 1982 additional soil samples were collected from 4 borings in Area 11 during the installation of groundwater monitoring piezometers. The results of laboratory testing and evaluation of the soil samples from these 4 borings indicate all anticipated pipeline settlements for both the static and dynamic cases are less than predicted in response to FSAR Question 241.6. It is our interpretation that the soil profile encountered in Area 11 is representative of the soil profile in Area 12. Therefore, the results of the sampling and testing program are applicable to area 12. Details of the investigation are presented in the Dames and Moore report dated September 30, 1982.

The boring logs are presented on Figures A-2.1 through A-2.4. The samples were tested for classification purposes, and consolidation tests were performed on undisturbed clay, silt, and clayey and silty sand samples. The results of the laboratory tests are presented in the boring logs and Figures A-3.1 through A-3.4 and A-4 and summarized in Table 1. All 4 piezometers when measured have been dry from time of installation to the most recent measurement on September 21, 1982. This indicates the groundwater level is below elevation 810 feet (MSL) in Area 11 for this period.

The results of the consolidation tests show that the soil profile encountered is preconsolidated to loads well in excess of the existing overburden. This is in agreement with consolidation tests on similar soils from the plant site area presented in FSAR Figures 2.5-53 through 2.5-55.

The results of the pipeline settlement evaluation are presented in Table 2. The analyses show a maximum total settlement of 0.5 inches and a maximum differential settlement of 0.2 inches over a distance of 100 feet in Area 11. In Area 12, the maximum total settlement was calculated to be 0.4 inches, and the maximum differential settlement was calculated to be 0.2 inches over a distance of 100 feet. These settlements are in agreement with those previously estimated in response to FSAR questions (see FSAR Question and Response 241.6).

In view of the current subsurface investigations along the pipeline which included continuous sampling, no unexpected subsurface soil conditions have been encountered, and our interpretation of the general subsurface profile and soil properties along the pipeline remains unchanged.