



Carolina Power & Light Company

Brunswick Steam Electric Plant
P. O. Box 10429
Southport, NC 28461-0429

February 29, 1984

FILE: B09-13510C
SERIAL: BSEP/84-0494

Mr. James P. O'Reilly, Administrator
U. S. Nuclear Regulatory Commission
Region II, Suite 3100
101 Marietta Street N.W.
Atlanta, GA 30303

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NOS. 1 AND 2
DOCKET NOS. 50-325 AND 50-324
LICENSE NOS. DPR-71 AND DPR-62

FOLLOW-UP REPORT ON NONROUTINE ENVIRONMENTAL RADIOLOGICAL EVENTS (2-SR-84-2)

Dear Mr. O'Reilly:

The Brunswick Steam Electric Plant's Environmental Radiological Monitoring Program detected Co-60 in the bottom sediments near the plant discharge weir (SD-34) in January 1982. In September 1982, Co-60 was detected in bottom sediments collected in the stilling basin at the Caswell Beach ocean discharge station. At this time, an investigation was started to determine the causes of the increased activity and determine if trends in the activity levels could be predicted. The sampling frequency was increased from semiannually to monthly to aid this investigation.

The results of the increased sampling program have been reported to the USNRC in nonroutine reports: five in 1982, twelve in 1983, and one in 1984. The attached investigation report summarizes the findings of the special sampling program which was completed with the January 1984 sample.

Very truly yours,

C. R. Dietz, General Manager
Brunswick Steam Electric Plant

AHC/dgr/LETDR1

cc: Mr. R. C. DeYoung
NRC Document Control Desk

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An Investigation of Radioactivity Observed in Brunswick Discharge Canal Sediments

The BSEP environmental radiation surveillance program first identified radionuclides in the discharge canal sediments at the discharge weir in January of 1982. In September of 1982, radionuclides were also identified in sediments from the stilling pond (SD-33), a basin at the end of the discharge canal where the discharge pumps take suction to pump water to the Atlantic Ocean (Figure 1). The normal sediment sampling frequency specified in the technical specification was increased to monthly in order to more closely monitor the plant's impact on the environment. An investigation was also initiated at this time in an effort to determine the cause of the increased sediment radioactivity. This report summarizes the findings of the special sampling program and investigation conducted in 1982 and 1983.

Description

Co-60, Cs-137, and Mn-54 were identified in the sediment samples. These radionuclides are typically found in low-level liquid releases from a nuclear reactor. Of the radionuclides observed, only Co-60 was present in sufficient concentration to require special reports to the NRC. The data was reported within thirty days following the analysis if it met a technical specification significance test as measured against a control intake canal sample. Historical data for Co-60 found in stilling pond sediments is presented in Figure 2. This presentation gives the appearance of a sudden increase in Co-60 concentration indicative of a significant change in the system.

The stilling pond is an owner-controlled area; and public fishing, boating, and other potential exposure pathways are controlled and generally not permitted for safety and operational concerns. Sediment and fish samples are also taken in the ocean in the vicinity where the cooling water is released. These samples represent a viable dose-to-man pathway adjacent to and downstream of the stilling pond. This confirms that the presence of 0.4 to 11.4 pCi/gm of Co-60 in stilling pond sediments does not represent a hazard to the public at this time.

The BSEP technical specification was amended in January of 1984 consistent with NUREG 0473, Draft, and NUREG 0133. Discharge canal bottom sediment sampling is no longer required in the new technical specification because the sediment is outside the normal dose-to-man pathway. The investigation reviewed, through December of 1983, the BSEP liquid waste release history, sediment sampling history, canal flow records, changes in the morphology of the canal, and other factors which might conceivably effect the radiological nature of the sediment. This report evaluates each of the factors in search of a cause for the shift in the data.

Plant Releases

A review of the Co-60 released by the plant in liquid effluents to the discharge canal revealed that increased quantities of Co-60 were being released beginning in the third quarter of 1981 and continuing through 1982. Figure 3 presents the history of Co-60 releases from 1977 until the second quarter of 1983. The peak activity of Co-60 during 1982 is due to major decontamination operations performed on plant systems during this period. All releases were well within the limitations specified in the technical specifications.

It is important to note that similar cobalt releases in 1977 and 1979 did not effect a similar accumulation of cobalt in the sediment. Sampling techniques used at that time may have obscured the detection of the cobalt.

A review of the plant liquid release history for abnormal releases was also conducted by corporate personnel. No abnormal releases were identified.

Cooling Water

In January 1981 the NPDES permit (NC0007064) required the plant to minimize the flow of cooling water in the canal system. Extended plant outages also reduced the flow maintained in the discharge canal. Figure 4 represents the average monthly flow in the canal system over the period. Although low flow in the canal existed intermittently previous to 1982 when sediments did not appear to accumulate greater quantities of cobalt, the period from 1982 through 1983 is a continuous low flow period where flow did not exceed 2000 cfs due to the Company's commitment to flow minimization.

It is possible that high flow rates in the past scoured the pump basin of fine sediments and organics which tend to attract and hold the cobalt ions. In the absence of high flow, more of the sediments may be left to accumulate in the stilling pond basin. It is not possible at this time to measure the significance of this phenomenon, but it is perceived to be a contributing factor in the Co-60 accumulation.

Sampling Technique

Prior to the initial observation of the Co-60 in the sediments at SD-33, sediments were drawn using a Ponar bottom sampler. Beginning in the third quarter of 1982, sediment sampling was performed using a mud dredge. Later evaluation has indicated that the mud dredge tends to collect samples containing greater quantities of Co-60 than does the Ponar. This is related to the difference in the mechanisms by which the respective samplers acquire their samples. The Ponar bites a sample using weighted jaws. The mud dredge peels a sample as it digs into the bottom. Testing indicates that the difference may be as much as a factor of two. Figure 5 compares the collection differences of the two dredges.

Character of the Sediment

The physical appearance of the sediment collected at SD-33 has changed over the years. Prior to 1981, Counting Room technicians observed that sediments from SD-33 had the appearance of sand. Currently the material looks like black muck containing mostly fine silt particles and a high fraction of organic material. This latter material may have a greater capacity to scavenge and hold multivalent ions. It is postulated that this gradual accumulation of silt at this sampling location would cause the collection efficiency of the sediment for cobalt to increase over the sites' sampling history. Thus, following previous periods of similar cobalt releases from plant operations, sediment concentrations of cobalt would not likely increase to the concentrations currently observed.

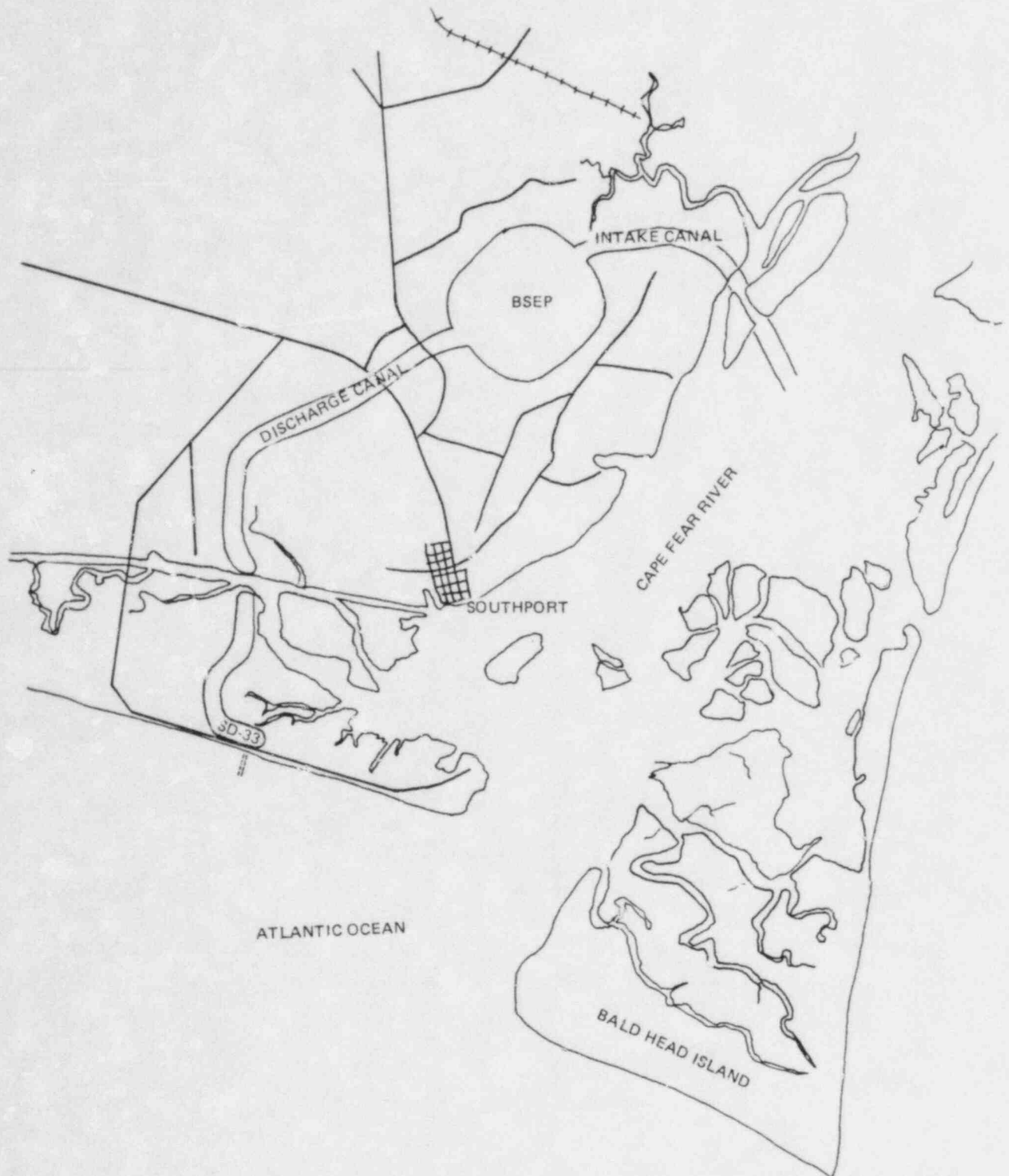
Summary and Conclusions

An increase in radioactivity, primarily as Co-60, has been observed in plant stilling pond sediment beginning in September of 1982. A review of the plant's liquid release history was performed and failed to identify any abnormal plant releases. It is therefore probable that the increase in radioactivity is due to a combination of factors which include: increased releases of Co-60 due to a general plant decontamination effort, a reduction in cooling water flow dictated by an NPDES flow minimization commitment, a change in the sediment sampling technique also occurring in September of 1982, and finally, the natural accumulation of organic rich silt in the stilling pond sediments.

Sediment and fish samples taken from the ocean near the cooling water discharge point are normal. Manmade isotopes including Co-60 have not been observed above minimum detectable activities. It is evident that significant transport of Co-60 from the stilling pond to the Atlantic Ocean is either not occurring or is insignificant after dilution and dispersion in the ocean. The stilling pond is an owner-controlled area; and public fishing, boating, or other potential exposure activity is controlled and generally not permitted for safety and operational concerns.

The BSEP technical specification was amended in January of 1984 consistent with NUREG 0473, Draft, and NUREG 0133. Discharge canal sediment sampling is no longer required because these sediments are outside the normal dose-to-man pathways. Sediment sampling was required prior to January 1984 and the frequency was increased to monthly in September of 1982 following the discovery of radioactivity. The largest amount of radioactivity observed was 11.4 pCi/gm and Figure 2 indicates that the concentration is relatively stable. This activity in bottom sediment does not present a direct or indirect radiation hazard to man because of the small concentration and because a significant dose-to-man pathway does not exist. The special monthly sediment sampling program is discontinued. Future sampling, although not required, will be conducted as considered prudent to maintain the Company's knowledge of the plant's total impact on the environment. The results of any special sediment sampling will be included in the BSEP annual environmental report. The plant's impact on the food chain will continue to be monitored by sampling free-swimming fish, bottom feeding fish, and edible shellfish at the ocean discharge consistent with the present technical specification.

FIGURE 1



SAMPLE LOCATION

CASWELL PUMPING STATION
(STILLING POND)

FIGURE 2

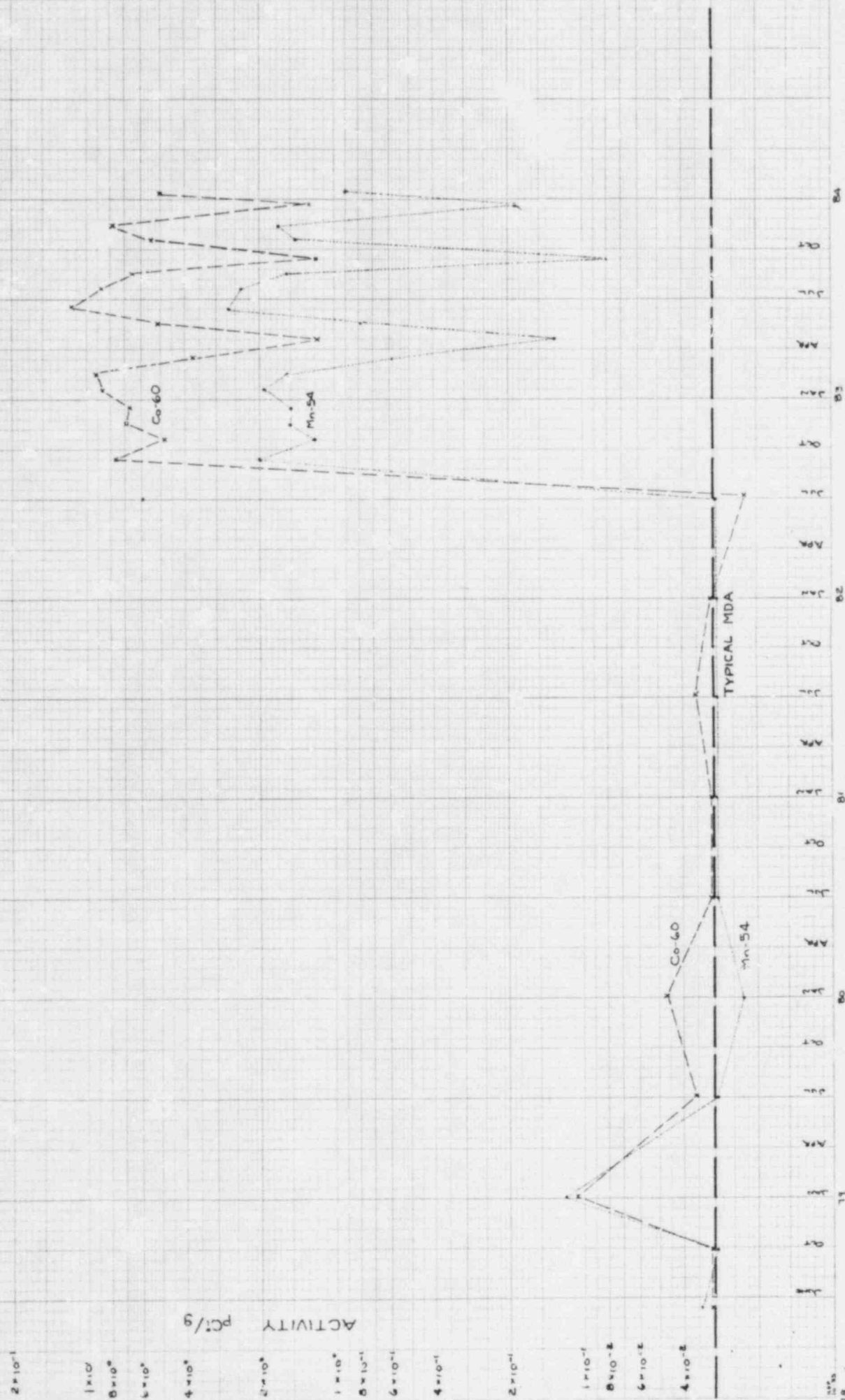


FIGURE 3

BSEP - COBALT - 60 RELEASED

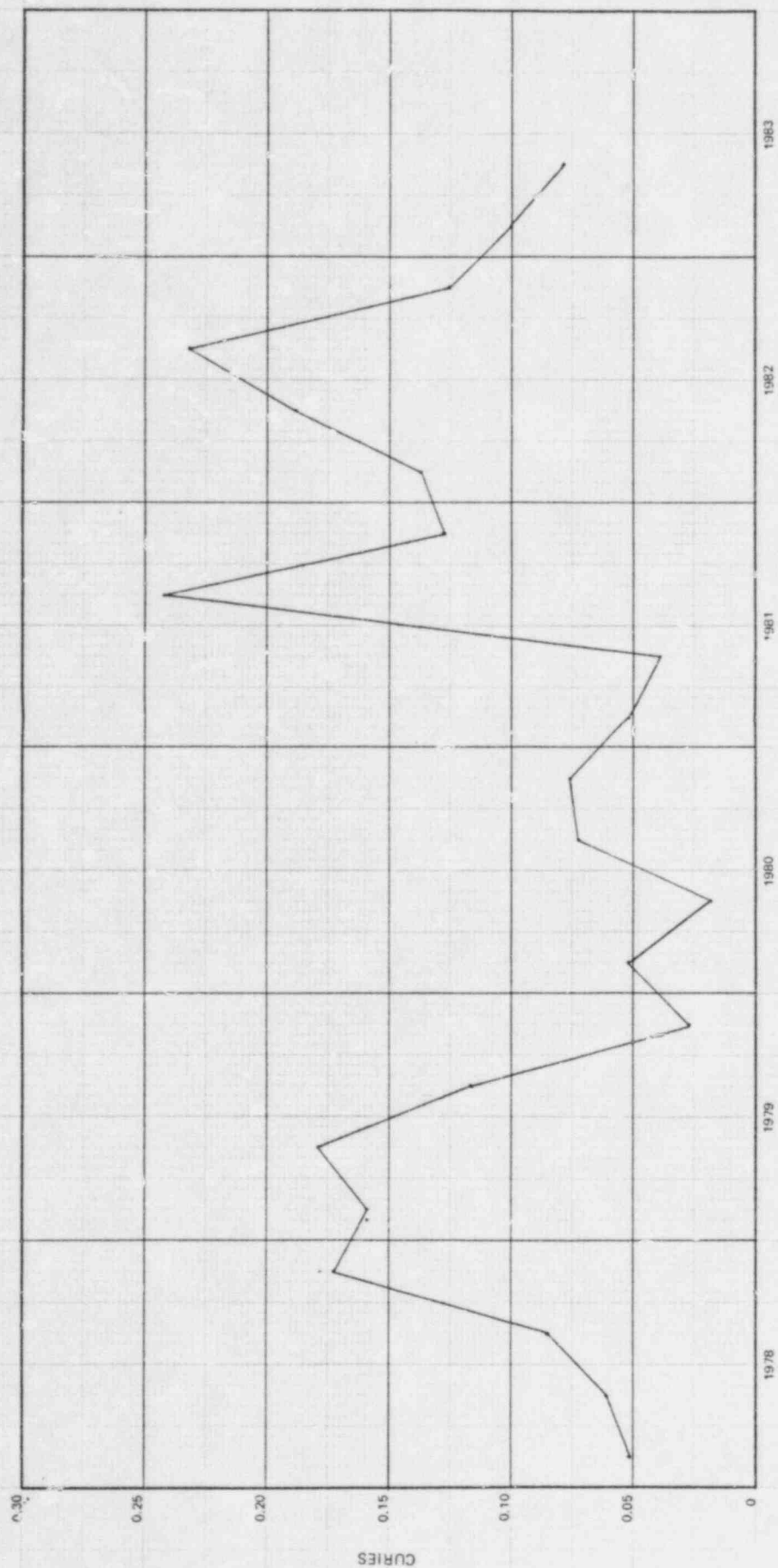


FIGURE 4

BSEP CIRCULATING WATER FLOW

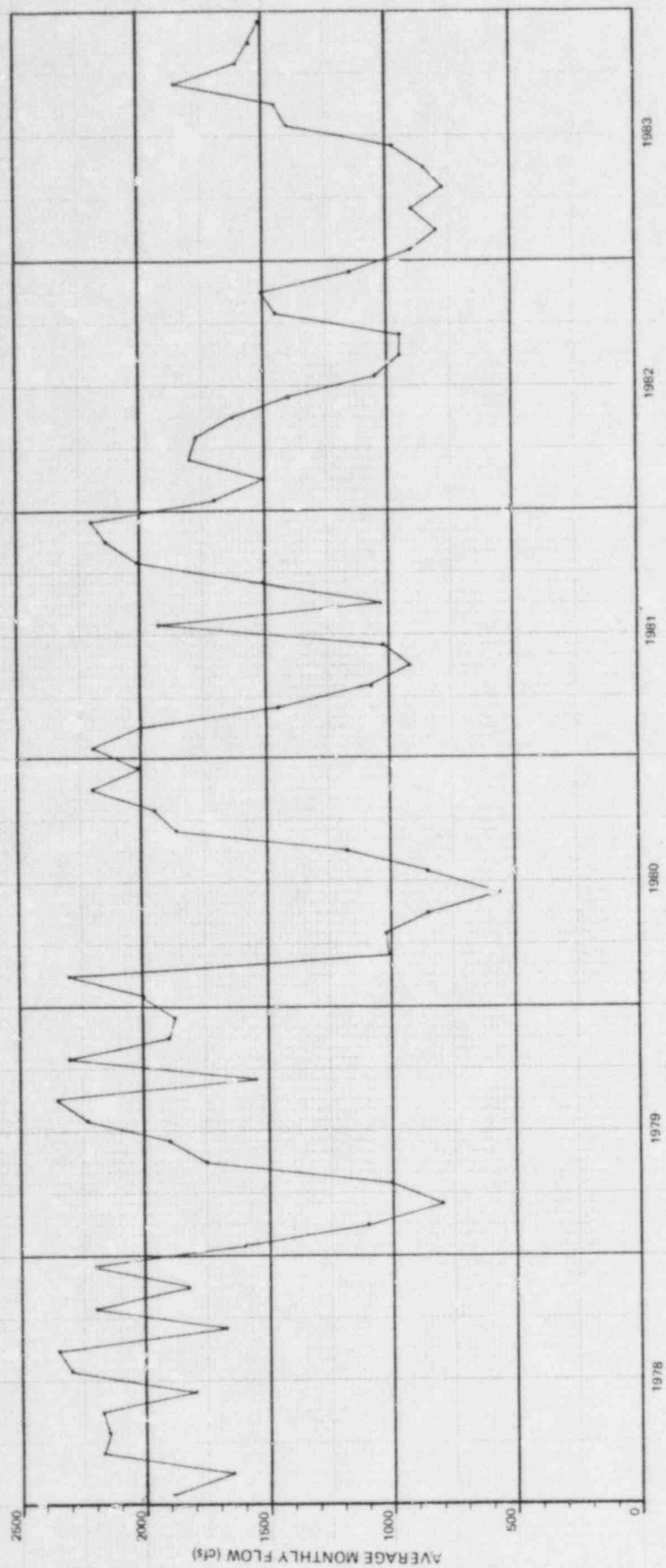
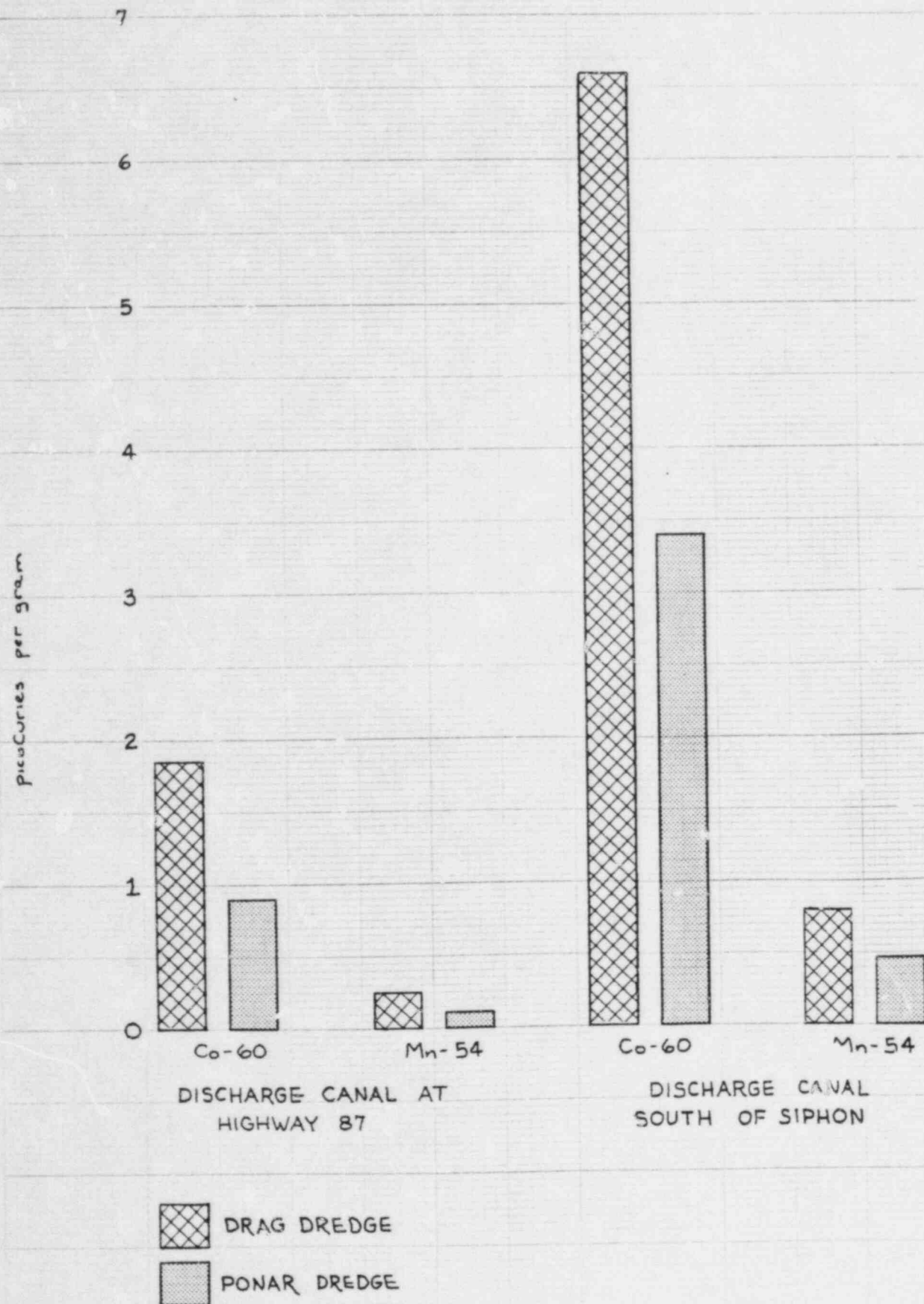


FIGURE 5



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