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Writer's Direct Dial Number

February 27, 1981
LL2-81-0025

TMI Program Office
Attn: Mr. Lake Barrett, Deputy Director
U. S. Nuclear Regulatory Commission
c/o Three Mile Island Nuclear Station
Middletown, Pennsylvania 17057

Dear Sir:

Three Mile Island Nuclear Station, Unit 2 (TMI-2)
Operating License No. DPR-73
Docket No. 50-320
Cork Seal Contamination Report

As referenced in our transmittal to you dated January 19, 1981, independent off-site analyses have been performed in conjunction with on-site analyses to identify the source of the contamination found in the cork material used as expansion joints between the Reactor Building and adjacent buildings. This letter transmits the results of the off-site analyses (see attached table from Science Applications, Inc.)

Evaluation of the data from the on-site and off-site analyses indicates that the Reactor Building is not the source of cork seal contamination. Further, the evaluation indicates that the seal injection valve cubicle is the most probable source. The evidence which supports these conculusions is:

1. Isotopic Ratios in Samples of the Cork Seal, the Primary System Water, and the Reactor Building Sump Water

   The following table shows the ratio of Cesium-137 to Cerium-144 and the ratio of Cesium-137 to Strontium-90 measured in samples of the cork seal, the primary system water, and the reactor building sump water.

Sample	Cesium-137/ Stontium-90	Cesium-137/ Cerium-144
Cork Seal	17	126
Primary System Water	0.93	115
Reactor Building Sump Water	63	90,000

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Since the cork seal ratios approximate the primary system water ratios, particularly for the Cesium-137 and Cerium-144 ratio data where the cork seal and primary system water ratios are virtually the same (126 vs. 115) and a factor of 900 less than the reactor building sump water ratio, we would expect the source of cork seal contamination to be from primary system water.

2. Low Solubility Isotopic Concentration Gradient in the Cork Seal

The following table shows gamma analysis data for boring samples taken from the cork seal between the Control & Service Building and the Air Intake Tunnel (location EW-3 on the attached drawing). These are the only boring samples where the low solubility Ce-144 was measured. The cerium was either masked by the cesium or not measured in the other boring samples.

Date	Sample Number	Cork Sample Location	Cs-137 (Total Curies)	Ce-144 (Total Curies)
11/27/80	52982	Top of seal	2.9 E-2	2.3 E-4
12/08/80	53441	Top to 6 inches	7.7 E-2	3.5 E-3
12/08/80	53440	6 to 12 inches	2.7 E-2	1.4 E-3
12/08/80	53439	12 to 18 inches	1.1 E-2	5.3 E-4
12/08/80	53438	18 to 24 inches	1.4 E-2	5.4 E-4
12/08/80	53437	24 to 30 inches	4.7 E-3	Below Detectable Limit

Sample 52982 was one of the initial samples taken. The remaining samples were taken from increasing depths into the cork seal and contained approximately the same volume. Therefore, the concentration of the low solubility Cerium-144 decreases with increasing depth into the cork seal which shows that the source of contamination was from the top.

In addition, contact readings on the cork seals show that radiation levels decrease with increasing distance from the seal injection cubicle, e.g., approximately 700 mR/hr outside the cubicle to approximately 25 mR/hr at the doorway from the Control & Service Building to the Air Intake Tunnel. General area radiation levels also decrease with increasing distance from the cubicle, e.g., 3-10 R/hr in the cubicle, 5 mR/hr outside the cubicle, and 0.2 mR/hr at the doorway between the Control & Service Building and the Air Intake Tunnel.

The foregoing indicates that the seal injection cubicle is the most probable source of the cork seal contamination.

3. Identification of Primary Coolant Leakage in the Seal Injection Cubicle

During the decontamination of the 281' elevation of the Auxiliary Building in the fall of 1979, it became apparent that a leak existed in the seal injection cubicle. This leak was later identified as a primary coolant leaking through faulty valves in the seal injection system. During the fall of 1980, while performing a make-up system flush, leakage from the seal injection system collected on the floor due to a plug in the cubicle drain. Attempts to decontaminate the cubicle by water sprinkling also contributed to the transport of this water out of the cubicle.

The cork seal contamination was first discovered in the late fall of 1980. The above chronology of events and, in particular, the timing of the seal injection cubicle decontamination effort, are consistent with other evidence leading to the conclusion that RCS leakage into the seal injection cubicle is the most probable source of cork seal contamination.

Conclusion

The data and the sequence of events given above, indicates that the contamination found in the cork seals is not the result of containment sump leakage. The most probable cause is the transport of RCS leakage to the cork seals during the seal injection cubicle decontamination effort.

Sincerely,

G K Hovey

G. K. Hovey
Vice-President and
Director, TMI-2

GKH:JJB:djb

Attachment

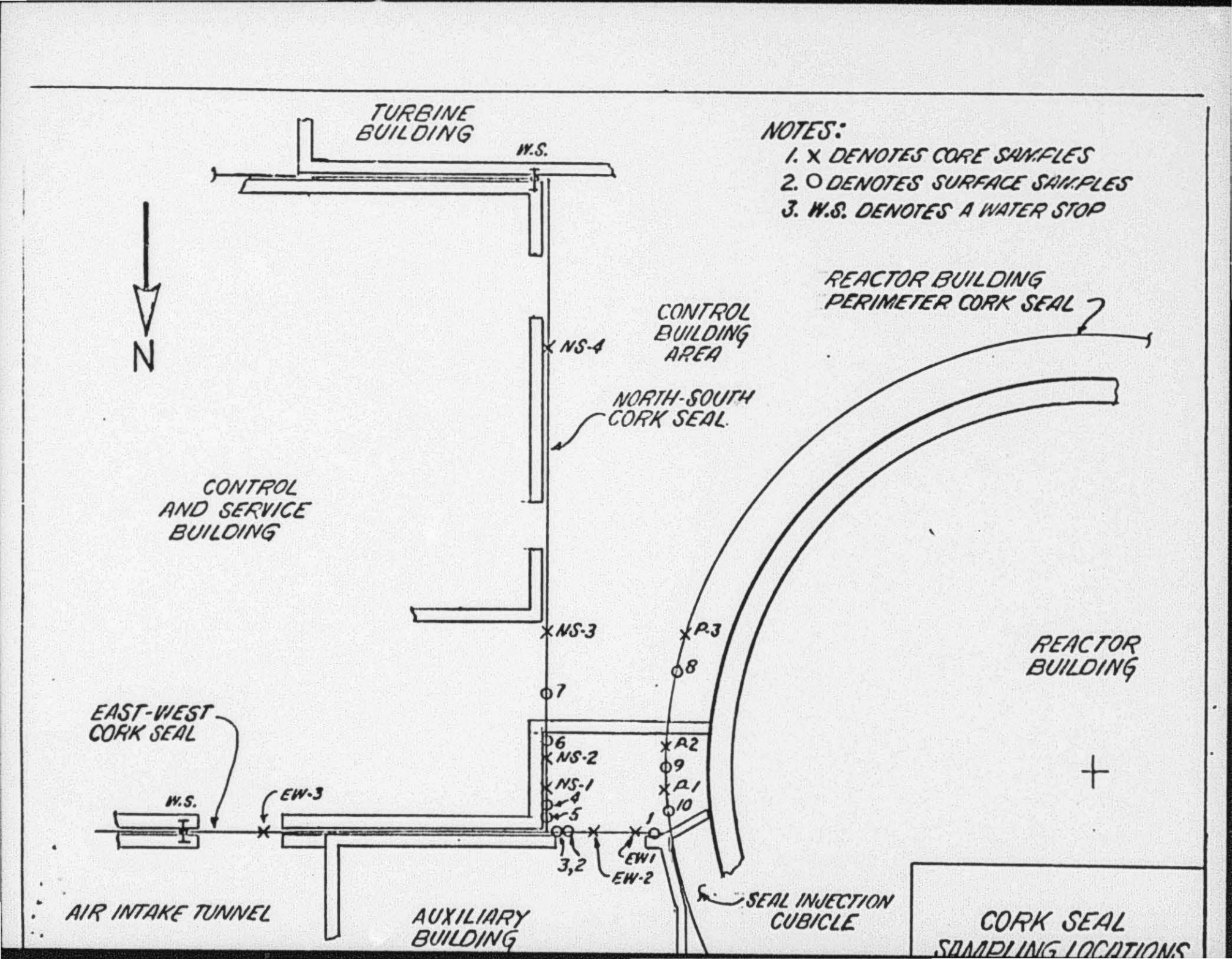
cc: Dr. B. J. Snyder, Program Director-TMI Office

Science Applications, Inc.

Concentrations of ^{137}Cs and ^{90}Sr in T-H Expansion Joint Material (cork)

Sample Identification No.	^{137}Cs	^{90}Sr	$^{137}Cs/^{90}Sr$
9053 - P1 #10	9.3±0.5(-2)	7.5±0.4(-4)	124±9
9054 - P1 #11	2.9±0.2(-2)	2.0±0.1(-3)	14.5±1.2
9056 - NS1 #11	2.6±0.2(-1)	4.8±0.3(-2)	5.4±0.5
9057 - EW1 #10	9.6±0.5(-1)	1.5±0.1(-1)	6.4±0.5
9058 - EW1 #11	3.1±0.2(0)	9.7±0.5(-2)	32.0±2.6
9059 - EW2 #10	1.4±0.1(-1)	6.3±0.3(-3)	22.2±1.9
9060 - EW2 #11	4.6±0.3(-1)	2.4±0.1(-2)	19.2±1.5

* A separate aliquot of cork sample was taken for ^{90}Sr determination. The data appears to indicate that the activities are not homogeneous throughout the sample. Confirmation of this theory will be accomplished by repeating ^{90}Sr determination on #9053 and #9058 after first analyzing for ^{137}Cs content of the sample aliquot.


TURBINE BUILDING
W.S.
NOTES:
1. X DENOTES CORE SAMPLES
2. O DENOTES SURFACE SAMPLES
3. W.S. DENOTES A WATER STOP
N
REACTOR BUILDING PERIMETER CORK SEAL
CONTROL BUILDING AREA
NS-4
NORTH-SOUTH CORK SEAL
CONTROL AND SERVICE BUILDING
NS-3
P-3
8
REACTOR BUILDING
7
EAST-WEST CORK SEAL
6
NS-2
A2
9
NS-1
A1
10
4
5
1
W.S.
EW-3
3,2
EW-1
EW-2
SEAL INJECTION CUBICLE
AIR INTAKE TUNNEL
AUXILIARY BUILDING
CORK SEAL SAMPLING LOCATIONS