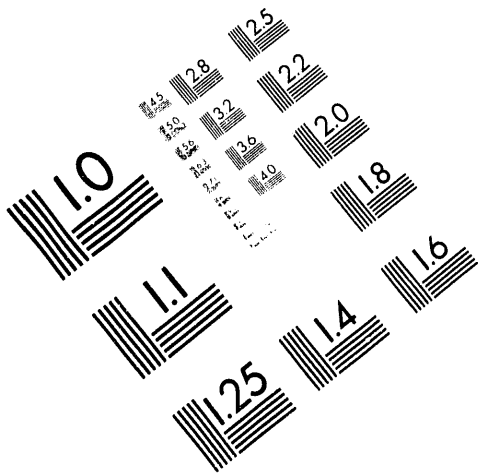

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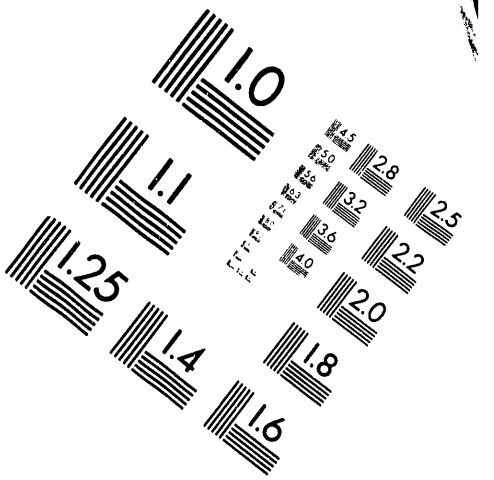

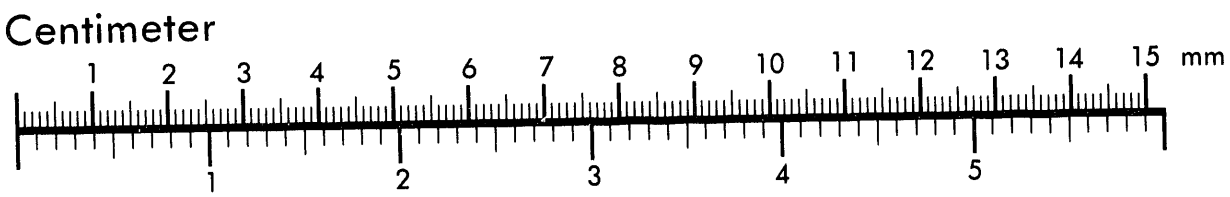

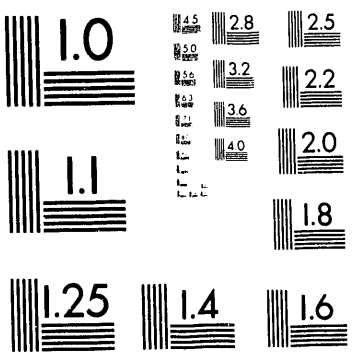

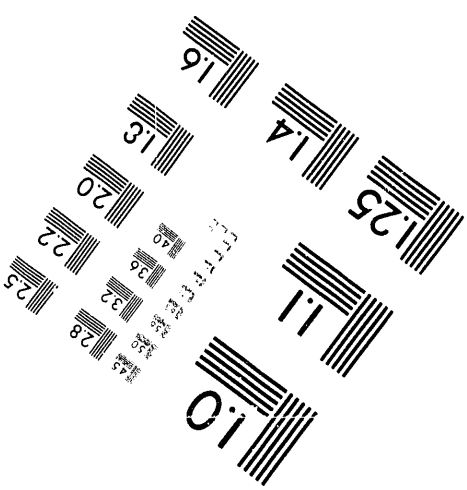

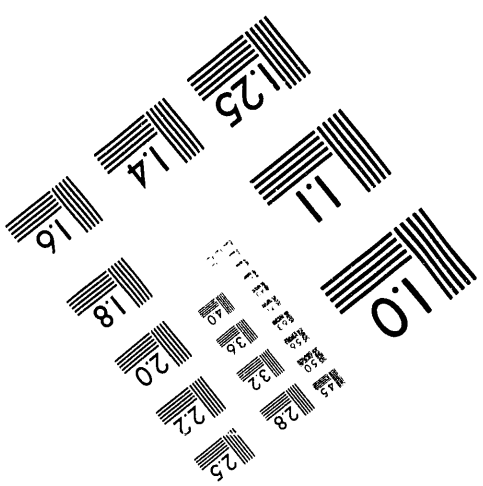

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RESULTS OF A BASEFLOW TRITIUM SURVEY OF SURFACE WATER IN GEORGIA ACROSS FROM THE SAVANNAH RIVER SITE (U)

by
R. L. Nichols

Westinghouse Savannah River Company
Savannah River Site
Aiken, South Carolina 29808

A document prepared for:

at
from thru

DOE Contract No. **DE-AC09-89SR18035**

DISCLAIMER

Results of a Baseflow Tritium Survey of Surface Water in Georgia Across from the Savannah River Site (U)

WSRC-RP-93-411

March 3, 1993

R. L. Nichols
Westinghouse Savannah River Company
Savannah River Site
Aiken, SC 29801

ABSTRACT: In October 1991 the Georgia Department of Natural Resources (GDNR) issued a press release notifying the public that tritum had been measured in elevated levels (1,200 - 1,500 pCi/l) in water samples collected from drinking water wells in Georgia across from the Savannah River Site in Aiken Co. South Carolina. None of the elevated results were above the Primary Drinking Water Standard for tritium of 20,000 pCi/l. The GDNR intiated 2 surveys to determine the source and extent of elevated tritium: 1) baseflow survey of surface water quality, and 2) well evaluation program. Results from the 2 surveys indicate that the tritium measured in groundwater wells in Georgia is not the result of a groundwater flow from South Carolina under the Savannah River and into Georgia. Atmospheric transport and consequent rainout and infiltration has resulted in an increase of tritum in the water-table aquifer in the vicinity. Water samples collected from drinking water wells believed to have been installed in the aquifer beneath the water-table aquifer were actually from the shallower water-table aquifer. Water samples collected from the wells contain the amount of tritium expected for the water-table aquifer in the sample area. The measured tritium levels in the well samples and baseflow samples do not exceed Primary Drinking Water Standards. Tritium levels in the water-table in Georgia will decline as the atmospheric releases from SRS decline, tritium undergoes natural decay, and infiltration water with less tritum flushes through the subsurface.

This document was prepared in connection with work under the U. S. Department of Energy (Contract DE-AC09-89SR18035)

BACKGROUND

The Georgia Department of Natural Resources (GDNR) routinely samples water supplies throughout the state of Georgia. Samples collected from several wells in the vicinity of Plant Vogtle during July and August of 1991 were reported to have *elevated* levels of tritium. The wells with elevated tritum were reported to be constructed with intakes in the first aquifer beneath the water-table aquifer. In October of 1991 the GDNR issued a press release notifing the public of the new findings. Initially, GDNR personnel believed the most likely pathway for tritium to reach Georgia groundwater was by flow of groundwater from the Savannah River Site (SRS) beneath the Savannah River and into Georgia. Subsequently, the State of Georgia solicited

the Department of Energy for funding to investigate the areal extent of elevated tritium levels and to determine the source of the tritium.

Following the GDNR press release, SRS issued a statement, indicating that, based on limited information, SRS believed the tritium was derived from the infiltration of rainwater into the water-table aquifer. The values reported by GDNR, 1,200 - 1,500 pCi/l (Appendix A), are within the range commmonly measured in rainfall and shallow groundwater in the vicinity of the SRS and are well below the Primary Drinking Water Standard (PDWS) of 20,000 pCi/l.

METHODS

Two surveys were undertaken to evaluate the source of the tritium: 1)a baseflow survey, and 2) a well evaluation program. The GDNR conducted a baseflow survey of the tritium concentration of surface water in Georgia across the Savannah River from SRS.

Water in gaining streams is derived from direct runoff of precipitation and baseflow or groundwater drainage. After several days or weeks have passed since the last rainfall and all of the runoff has passed through the system, water in secondary and intermittent streams is derived primarily from baseflow contributed by the water-table aquifer. Fifty three samples were collected and sent the Environmental Radiation Laboratory at the Georgia Institute of Technology for tritium analysis. Figure 1 illustrates the baseflow sample locations. Analysis of samples collected during the baseflow period were used to determine the quality of water in the water-table aquifer.

The GDNR and the United States Geological Survey (USGS) collaborated on the program to evaluate the well construction practices that were used to construct the suspect wells. The wells were logged with geophysical tools to determine the total depth, screen zone, length of surface casing, and quality of seal, as appropriate.

RESULTS

Baseflow

Tritium concentrations in the baseflow samples ranged from 500 ± 100 to 1900 ± 100 pCi/l. Higher concentrations were detected from the northern half of the study area, figure 1. The aerial distribution pattern of tritium in the baseflow samples is similar to distribution of tritium in rainfall samples in Murphy et. al. 1991. Tritium levels in the baseflow samples are slightly lower than the levels in rainfall due to the natural decay of tritum that occured as the rainfall infiltrated down to the water-table and was transported to the streams by groundwater flow in the water-table aquifer. Elevated tritum levels in shallow groundwater and surface water in Georgia are the result of atmospheric transport from the SRS follwed by subsequent rainout.

Well Survey

Results of the geophysical survey of wells with elevated tritium indicate that none of the wells identified as having elevated tritium levels were as deep as reported on

the well data sheet submitted to the GDNR. Well water collected from each of the wells was actually from the water-table aquifer and not from the underlying aquifer as reported. The tritium levels measured in the wells are in the range aniticipated for the water-table aquifer and coincide with the baseflow data.

CONCLUSIONS

Tritium measured in groundwater wells in Georgia is not the result of a groundwater flow from South Carolina under the Savannah River and into Georgia. Atmospheric transport and consequent rainout and infiltration has resulted in an increase of tritum in the water-table aquifer in the vicinity. Water samples collected from wells believed to have been installed in the aquifer beneath the water-table aquifer were actually from the shallower water-table aquifer. Water samples collected from the wells contain the amount of tritium expected for the water-table aquifer in the sample area. The measured tritium levels in the well samples and baseflow samples do not exceed Primary Drinking Water Standards. Tritium levels in the water-table in Georgia will decline as the atmospheric releases from SRS decline, tritium undergoes natural decay, and infiltration water with less tritum flushes through the subsurface.

REFERENCES

Murphy, C. E., L. R. Bauer, D. W. Hayes, et al. 1991. *Tritium in the Savannah River Site Environment*, WSRC-RP-90-424-1, Westinghouse Savannah River Company, Savannah River Site, SC 29808.

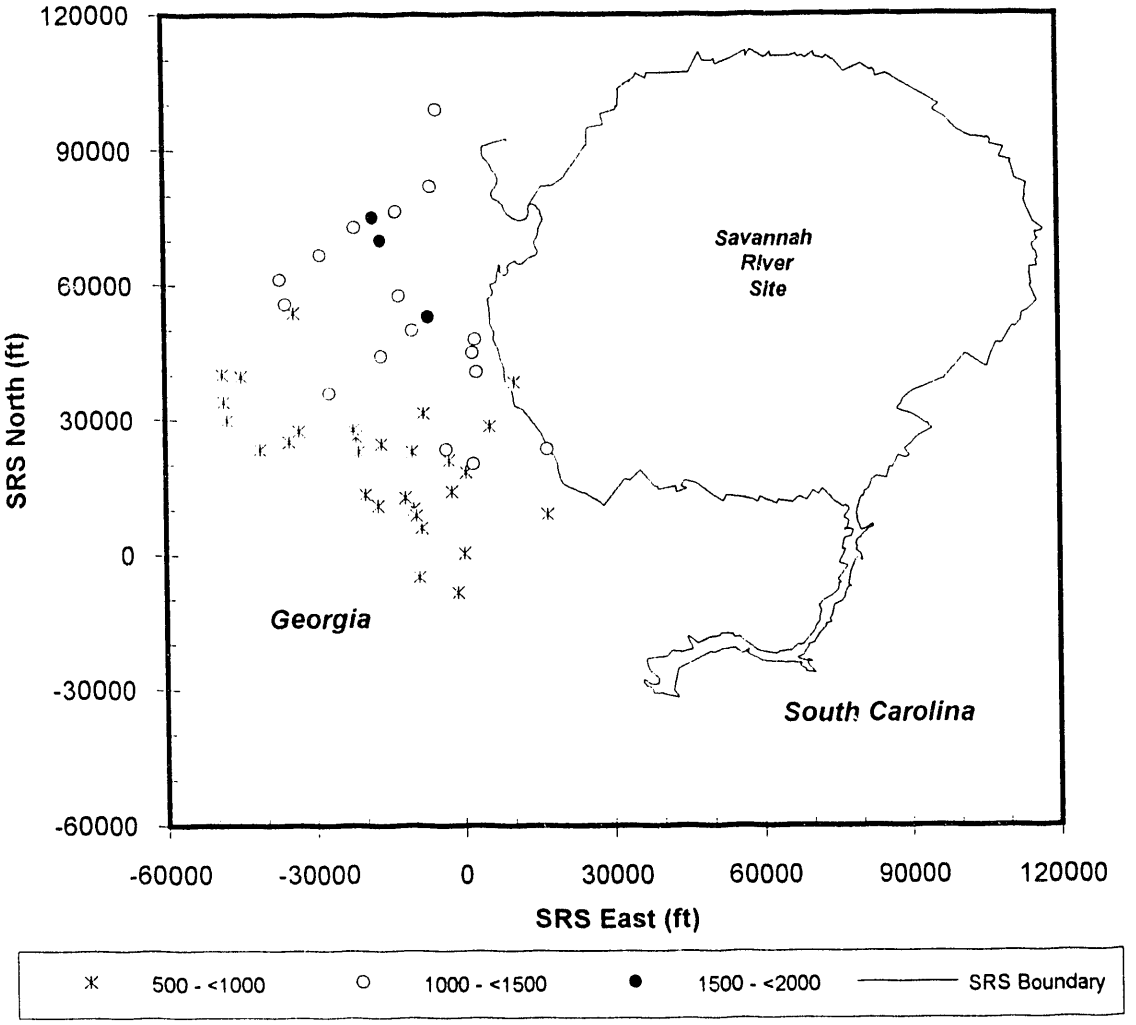

Figure 1: Location of baseflow sample locations and results of tritium analyses in Georgia Department of Natural Resources survey.

Appendix A

Results from

Georgia Department of Natural Resources

Baseflow Survey

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To :

From :

Subject :

Per your re[illegible]

Program co[illegible]

These sampl[illegible]

Georgia Insti[illegible]

with latitude [illegible]

Alexander, G[illegible]

If you have a[illegible]

Attachments [illegible]

JCH/jh

cc: Jim Setse[illegible]

Georgia Department of Natural Resources
205 Butler Street S.E., Floyd Towers East, Atlanta, Georgia 30334
Joe D. Tanner, Commissioner
Harold F. Reheis, Director
Environmental Protection Division

Surface Water Sample Collection for Geologic Survey
Under Quad **Date of Collection : 11/20/91**

Grid	Latitude[1]	Longitude[1]	^3H (pCi/l)
-1	N 33° 04.87 '	W 081° 52.08 '	1,100 ± 100
2	N 33° 04.80 '	W 081° 50.99 '	900 ± 100
1	N 33° 06.04 '	W 081° 52.56 '	1,300 ± 200
-1	N 33° 07.36 '	W 081° 52.18 '	1,100 ± 100
6	N 33° 05.48 '	W 081° 47.45 '	1,000 ± 100
-6	N 33° 06.70 '	W 081° 47.23 '	1,200 ± 100
5	N 33° 03.41 '	W 081° 47.86 '	1,100 ± 100
6	N 33° 03.03 '	W 081° 47.00 '	900 ± 100
7	N 33° 02.54 '	W 081° 45.89 '	600 ± 100
-7	N 33° 01.90 '	W 081° 45.60 '	600 ± 100
-	N 33° 00.86 '	W 081° 48.86 '	500 ± 100
-5	N 33° 01.56 '	W 081° 48.28 '	500 ± 100
-	N 32° 59.96 '	W 081° 49.13 '	600 ± 100
3	N 33° 00.50 '	W 081° 50.60 '	500 ± 100
3	N 33° 00.79 '	W 081° 51.35 '	600 ± 100
	N 33° 00.92 '	W 081° 52.24 '	700 ± 100
-1	N 33° 02.06 '	W 081° 52.20 '	600 ± 100
-2	N 33° 01.85 '	W 081° 51.41 '	700 ± 100

[illegible] measurements performed with Voyager *SportNav* handheld

[illegible], 4244 International Parkway, Suite 114, Atlanta, Georgia 30354 (404) 362-2675

Georgia Department of Natural Resources

205 Butler Street S.E., Floyd Towers East, Atlanta, Georgia 30334

Joe D. Tanner, Commissioner

Harold F. Reheis, Director

Environmental Protection Division

Special Surface Water Sample Collection for Geologic Survey

Map: Girard Quad **Date of Collection : 11/19/91**

Sample	Lab ID	Grid	Latitude	Longitude	^3H (pCi/l)
G-1	S 5427	A - 1	N 33° 07.42 '	W 081° 44.54 '	1,300 ± 100
G-2	S 5428	B - 2	N 33° 06.73 '	W 081° 43.77 '	1,100 ± 100
G-3	S 5429	C - 4	N 33° 05.51 '	W 081° 41.88 '	900 ± 100
G-4	S 5430	C - 6	N 33° 05.79 '	W 081° 39.64 '	1,000 ± 100
G-5	S 5431	E - 8	N 33° 04.24 '	W 081° 37.84 '	800 ± 100
G-6	S 5432	E - 4	N 33° 04.25 '	W 081° 41.61 '	1,100 ± 100
G-7	S 5433	F - 4	N 33° 03.62 '	W 081° 42.03 '	600 ± 100
G-8	S 5434	F - 3	N 33° 03.63 '	W 081° 42.55 '	800 ± 100
G-9	S 5435	E - 3	N 33° 04.18 '	W 081° 42.77 '	1,000 ± 100
G-10	S 5436	B - 3	N 33° 06.99 '	W 081° 42.52 '	400 ± 100
G-11	S 5437	E - 1	N 33° 04.56 '	W 081° 44.55 '	700 ± 100
G-12	S 5438	F - 2	N 33° 03.33 '	W 081° 43.78 '	700 ± 100
G-13	S 5439	F - 1	N 33° 03.12 '	W 081° 44.90 '	900 ± 100
G-14	S 5440	G - 4	N 33° 02.70 '	W 081° 42.02 '	600 ± 100
G-15	S 5441	I - 6	N 33° 00.96 '	W 081° 39.62 '	700 ± 100
G-16	S 5442	J - 7	N 33° 00.18 '	W 081° 39.13 '	500 ± 100
G-17	S 5443	J - 5	N 33° 00.00 '	W 081° 40.51 '	500 ± 100
G-18	S 5444	I - 4	N 33° 00.93 '	W 081° 42.03 '	600 ± 100
G-19	S 5445	H - 4	N 33° 01.45 '	W 081° 42.31 '	600 ± 100
G-20	S 5446	H - 1	N 33° 01.22 '	W 081° 44.42 '	600 ± 100
G-21	S 5447	H - 2	N 33° 01.18 '	W 081° 43.62 '	600 ± 100
G-22	S 5448	H - 3	N 33° 01.54 '	W 081° 42.46 '	500 ± 100
G-23	S 5449	G - 3	N 33° 02.04 '	W 081° 42.80 '	700 ± 100

Georgia Department of Natural Resources
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Environmental Protection Division

Special Surface Water Sample Collection for Geologic Survey
Map: Shell Bluff Landing Quad Date of Collection : 11/19/91

Sample	Lab ID	Grid	Latitude	Longitude	^3H (pCi/l)
SBL-1	S 5450	B - 2	N 33° 13.71 '	W 081° 51.78 '	✓ 1,000 ± 100
SBL-2	S 5451	C - 1	N 33° 13.01 '	W 081° 52.60 '	✓ 1,000 ± 100
SBL-3	S 5452	D - 3	N 33° 11.48 '	W 081° 49.91 '	✓ 1,300 ± 100
SBL-4	S 5453	E - 4	Unable to obtain reliable signal		✓ 1,900 ± 100
SBL-5	S 5454	F - 2	N 33° 10.23 '	W 081° 51.00 '	✓ 1,200 ± 100
SBL-6	S 5455	G - 2	N 33° 09.45 '	W 081° 50.95 '	✓ 1,800 ± 100
SBL-7	S 5456	H - 3	N 33° 08.74 '	W 081° 50.45 '	✓ 1,500 ± 100
SBL-8	S 5457	H - 2	N 33° 08.66 '	W 081° 51.54 '	✓ 1,000 ± 100
SBL-9	S 5458	I - 5	N 33° 07.57 '	W 081° 48.43 '	✓ 1,200 ± 100
SBL-10	S 5459	I - 6	N 33° 07.53 '	W 081° 46.75 '	✓ 1,400 ± 100
SBL-11	S 5460	I - 6	N 33° 07.54 '	W 081° 46.75 '	✓ 1,600 ± 100
SBL-12	S 5461	I - 8	N 33° 07.69 '	W 081° 45.10 '	✓ 1,400 ± 100

DATE FILMED

9/10/93

END