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Westinghouse
Electric Corporation

Westinghouse Building
Gateway Center
Pittsburgh Pennsylvania 15222

July 20, 1992

Mr. John D. Kinneman, Chief
Site Decommissioning Management
Plan Task Force
USNRC Region 1 Office
Mail Control 115432
475 Allendale Road
King of Prussia, PA 19406-1415

Subject: Additional Information Regarding Bloomfield, NJ Facility

Dear Mr. Kinneman:

Your letter dated June 18, 1992 contained thirteen (13) items requesting additional information necessary for your office to complete its review for final NRC clearance relative to the radiological cleanup of Buildings 1-6 at our closed Bloomfield, NJ lamp manufacturing facility. Following are our responses to your requests by item:

1. Request:

In your September 23, 1991 response to our letter of April 29, 1991, you provided two tables of results of analyses of ground water samples. Please provide a map or diagram of the locations of the monitoring wells from which these samples were obtained, the dates the samples were obtained and the depth where each of the samples was obtained.

Response:

Ground water samples from 2 overburden (regolith) and 7 bedrock wells at the Bloomfield site collected on May 23, 1990 were analyzed for radioactivity and select radionuclides. The results of this testing are given in the enclosed Table 11. In addition, samples from

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production wells P-2, P-3, and P-4 were collected on March 11, 1986 and analyzed for gross alpha activity, total uranium activity, and total uranium concentration. These data are presented in Table 1.

The locations of all these wells are shown in the enclosed Figure 2. Wells construction data indicating the depths from which these ground water samples were collected are given in the enclosed Table 6.

2. Request:

In your September 23, 1991 letter reporting ground water analyses results, the first of the two tables indicates a gross alpha concentration of 37 ± 11 pCi/L and a gross beta concentration of 92 ± 14 pCi/L for the sample obtained from location CC-3. Please explain the implication of these results as they relate to the potential for ground water contamination.

Response:

The table contained in our September 23, 1991 letter indicates a gross alpha concentration of 37 ± 11 pCi/L and a gross beta concentration of 92 ± 14pCi/L for sample designated CC3. As shown in that table, sample CC3 was also analyzed for the following: any gamma emitting radionuclide via gamma spectroscopy, Ra-226, Ra-228, Th-232, U-234, U-235, U-238 and total uranium. The results of these additional analyses were negative. All analysis results were within the detection limits of the analytical method and within applicable criteria. Please note that analyses specific to the radionuclides of interest at the Bloomfield site (natural thorium and natural uranium) were performed, with no positive results. Also, the gross alpha activity reported is only slightly above the NRC limit for gross alpha activity in water in unrestricted areas (30 pCi/L). The gross beta activity was well within the Maximum Permissable Concentration (MPC) for unrestricted areas (3,000 pCi/L).

Westinghouse is unable to explain the reported elevated gross alpha and gross beta results. However, the absence of specific radionuclide activity suggests the gross activity measurements may be suspect. Several possiblities exist, such as cross-contamination of the gross activity sample, spurious backgrounds in the counter, and the presence of radionuclides unrelated to Westinghouse activities and not analyzed.

Additional sampling performed in 1986 (Table 1) showed total uranium activities to be less than MPC for water in unrestricted areas, and gross alpha activity less than recommended EPA limits for drinking water.

3. Request:

Your September 23, 1991 letter discusses a new ground water sampling program to meet the State of New Jersey requirements. Please describe the sampling locations, the type and frequency of analyses and the date that this program will be initiated.

Response:

Westinghouse is currently negotiating future ground water monitoring requirements with the New Jersey Department of Environmental Protection and Energy (NJDEPE). In its proposed cleanup plan submitted to the NJDEPE on June 18, 1992, Westinghouse proposed to monitor wells P-1, P-3, CC-4, CC-4s and CC-5d.[1] The specific procedures and analytical protocols for this monitoring, including the evaluation of radioactivity and radionuclides, have not yet been established with the NJDEPE.

4. Request:

In your September 23, 1991 letter you indicate that Westinghouse Electric Company believes there is little risk of radiological contamination of ground water at this time. Please estimate the quantity of radioactive material remaining on the site and provide a brief analysis indicating why this material causes minimal risk to ground water.

Response:

For the portion of the Bloomfield site containing Building 1 through 6, all surface soils have been decontaminated to levels sufficient to meet the guidelines for residual concentrations of thorium and uranium wastes in soil, as published in the USNRC Branch Technical Position, 1981. Contaminated soils and materials resulting from leaking pipes and drains was removed down to clearance levels at all identified locations. Since these facilities meet the NRC criteria

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[1] Because of concerns for cross-contamination between deep and shallow aquifers, Westinghouse proposes to close Wells P-1 and P-3 below a depth of about 100 feet.

for unrestricted release, any residual contamination presents a minimal risk to ground water. Westinghouse has no way to accurately estimate the quantity of radioactive material remaining on site, since all soils and materials exceeding release criteria have been removed, and no additional surveying was required or has been performed.

5. Request:

Describe briefly what current knowledge and understanding you have for the hydrology of the area.

Response:

Westinghouse has undertaken extensive investigations of hydrogeologic conditions at the Bloomfield site. The following is a brief summary of the findings of these studies.

A shallow zone of saturation exists within the unconsolidated materials present above bedrock in the southwestern portion of the Bloomfield site in the vicinity of the former underground storage tanks. The presence of shallow ground water in this area is primarily the result of recharge from precipitation that infiltrates through the unpaved ground surface in the immediate area. The shallow, unconsolidated materials may also serve as a discharge zone for the underlying shallow bedrock aquifer.

The shallow perched water discharges in a radial pattern along the concrete retaining wall along the west side of this area, paralleling the western property line. To some degree this retaining wall impedes horizontal flow to the west (except at locations where the wall is cracked and seeps form), so that the preferential flow direction is parallel to the wall. In the northern portion of this area, flow appears to be more to the north, in the southern portion, flow is generally to the south.

The shallow perched water in the southwestern portion of the Bloomfield site does not provide a usable source of water to any downgradient locations, and this shallow saturated zone does not appear to discharge to the underlying bedrock aquifer.

The bedrock underlying the Bloomfield facility is comprised of shales, siltstone, and very fine sandstones of the Brunswick Formation. The bedrock strike is at

N 45° to 55° E, with a northwest dip at 6 to 8 degrees. Ground water flow is primarily along bedding planes with strong strike-parallel anisotropy.

The site and regional hydrogeologic information evidence an upper bedrock aquifer that extends downward to a depth of approximately 100 to 150 feed in southwestern portion of the Bloomfield site in the vicinity of production wells P-1 and P-3. A "no yield" zone determined in the packer testing program defines the aquitard at the base of this upper aquifer. This packer test data interpretation is corroborated by the results of the geophysical logging. The temperature logs for wells P-1 and P-3 suggest little vertical flow. In area of P-1 and P-3, very shallow (less than about 25 feet into the rock) fracturing in the Brunswick may be somewhat choked by weathering by-products. At depths greater than about 300 feet, formation yeild most likely decrease because of the effect of overburden pressure closing the fractures.

The shallow bedrock zone is recharged primarily by local (upgradient) infiltrating rainfall. By extrapolating the 6 to 8 degree dip of the rock, the recharge zone for the shallow bedrock aquifer in the vicinity of wells P-1 and P-3 is estimated to encompass nearly the entire Bloomfield site.

6. Request:

Your September 23, 1991 response to the questions on ground water in our April 17, 1991 letter did not completely answer our concerns regarding the potential for contamination of ground water with radioactive materials during site operations. Prior to remediation of contaminated areas, to what extent and for how long was radioactive material in a form and location or otherwise available to contaminate ground water?

Response:

Both uranium and thorium were used at the Bloomfield site. Uranium was used to support the U.S. Government's Manhattan Project in the 1940's. Limited use for metallurgical studies for lamp development and storage extended into the early 1950's, when all uranium use was terminated.

Thorium was used in two processes; studies on emission mixtures, and manufacture of thoriated tungsten wire for

consumer products. Emission mixture studies ended in the early 1970's, but production of thoriated tungsten was continued until 1985.

These materials were not stored or used, in Buildings 1 through 6, at locations or in processes which would have made them available to contaminate ground water under normal circumstances. The only way material could have contaminated ground water was via spills onto soils or from leaking pipes or drains into soils. Surveys indicate that uranium was transferred from railroad cars to the loading docks of Buildings 3 and 4, resulting in some spillage along the railroad spur. An underground pipe in Building 6 was found to have leaked. In both cases, contamination extended only two to three feet in soils, indicating limited migration and minimal probability of ground water contamination. The railroad spillage would have occurred 40 to 50 years ago and Building 6 pipe leaks 10-20 years ago. All contaminated soils have been remediated.

7. Request:

In your September 23, 1991 letter you state that radiation readings above ambient background were confirmed for the Building 3, 4 and 5 Loading Dock, but that none of the measured values exceeded the uranium release criteria. Therefore, no additional remediation was performed in this area. However, in a December 27, 1990 letter from Canberra to ORAU, both thorium and uranium were reported contaminants for this area. The total contamination limits for thorium and uranium are 1,000 and 5,000 dpm/100 cm^2, respectively. For areas where more than one contaminant exists, each with a different contamination limit, you must apply the most conservative limit. Alternatively, you may determine (measure) the actual contamination value for each contaminant, divide the measured value by the appropriate limit and add the fractions. To satisfy the release criteria under this latter method, the resultant sum of the fractions must be less than or equal to unity. The contamination limit for uranium may only be utilized in this case if uranium is the only contaminant present. Please review the data for this area, apply the appropriate contamination limit and report the results of your review. You may need to perform additional remediation in this area if the applicable limits are not met.

Response:

Based upon knowledge of past operations, it is possible both uranium and thorium could have been handled on the loading dock of Buildings 3, 4 and 5. However, following the ORAU survey, our contractor performed in situ gamma spectroscopy with a portable NaI(TI) detector and multichannel analyzer (MCA). The only contaminant identified at the loading dock location was U-238. Analysis of concrete samples taken from this location by ORAU identified only U-238. Based on these observations, it was concluded that the only residual present on the loading dock is U-238, and that application of the uranium release criteria is appropriate. Using this criteria, residual contamination levels on the loading dock are within release limits.

8. Request:

In our letter of April 29, 1991 we expressed our concern that the survey performed by ORAU identified contaminated areas not previously identified. In response to our concerns, you stated that your contractors have performed additional surveys. Please estimate the fraction of the facility that has been surveyed.

Response:

Following the ORAU survey, our contractor initiated a survey program designed to confirm ORAU findings and to address additional areas which had previously been only scanned during a walk through survey. The additional surveys were intended to provide continuous measurements with large area floor monitors. It is estimated that greater than 90% of all floor areas have been surveyed in this manner.

9. Request:

From your survey performed in 1990 and the survey performed by ORAU, it appears that there may be some residual licensed materials remaining in the piping leading to the sump between Building 3 and Building 4. Please provide an estimate of the licensed material remaining and the impact of this remaining material.

Response:

The ORAU survey reports levels of 1300 dpm/100 cm^2 beta

activity inside the pipe, which extends from the inside wall of Building 3 to a sump. The interior surface area for a two meter long, eight centimeter diameter, pipe is 10,000 cm^2. Assuming uniform interior contamination at measured levels, the pipe content is estimated at 0.05 µCi. The pipe has been flushed, and a water sample taken during flushing showed no elevated activity. A water sample collected by ORAU showed no activity above detection limits. The contamination levels reported by ORAU are well within uranium limits and only slightly above thorium limits. Since the pipe is disconnected and set in concrete, and the contamination is fixed inside the pipe and very near or below release criteria, it was concluded that the remaining material presents no hazard.

10. Request:

Describe the instrumentation and survey methodology utilized by your contractor(s) for surveys of both remediated and non-remediated areas conducted after the March 1991 ORAU survey.

Response:

Total surface activity was measured with portable alpha and beta survey instruments. Removable activity was measured by wiping surfaces and counting the wipes on a gas flow proportional counter. The following instruments were used to survey both remediated and non-remediated areas:

Ludlum Model 239-1F Gas Proportional
Floor Monitor (550 cm_2)

Ludlum Model 12 Count Ratemeter with
Model 44-9 Pancake GM tube
Model 43-5 Alpha Scintillation Detector
Model 43-20 Proportional Detector (160 cm^2)

Johnson GSM-5 Ratemeter with
PPA-2 Pancake GM tube
GSP-2A NaI(TI) Detector

Canberra Model 2404 Multi Sample
Changer Gas Flow Proportional
Counter (for wipe counting)

Canberra System 100 PC Based
Multichannel Analysis System with
HPG3 Detector (for lab analyses)

Canberra Series 10 Plus Portable
Multichannel Analyzer with
NaI(TI) Detector

11. Request:

Confirm that the survey methodology and instrumentation used by your contractor(s) in their 1990 and 1991 surveys were comparable to the methodology and instrumentation used by ORAU.

Response:

The survey instruments and methodology used by our contractors was comparable to those used by ORAU. Survey results have been shown to be comparable when direct comparisons could be made during the ORAU site survey.

12. Request:

Describe briefly the extent of the remediation performed in the reservoir area. To what depth was soil removed. Confirm that the samples taken to a depth of 15 centimeters in the remediated areas included those locations where actual excavation was performed.

Response:

Contaminated soils in the reservoir area were identified with portable survey instruments, primarily the NaI(TI) scintillation detector. Soils were excavated until no readings above background could be detected. At that point, confirmatory soil samples were collected, in excavated locations, to a depth of 15 centimeters. Samples were counted on the high resolution gamma spectroscopy system. Excavated soils were boxed and shipped for disposal. Approximately 50 cu. ft. of soil was removed. Excavation proceeded to depths of from two to four feet in remediated areas.

13. Request:

In response to item 5 of our letter dated April 17, 1991 you indicate that there is no reason to believe there may be offsite tailings present and that initial surveys that you conducted confirm no radioactivity. Please briefly describe the scope of these offsite measurements (i.e., how far outside the fence line measurements were made) and the instrumentation used for these surveys.

Response:

In 1986 an off-site survey was performed by a contractor. This survey consisted of walkover measurements with NaI(TI) scintillation detectors (2 inch by 2 inch) and count rate meters. Measurements were made from the fenceline to distances of 20 to 30 feet where possible. No levels above natural background were detected.

We hope that this information will enable the NRC to complete its review and provide radiological clearance for the Buildings 1-6 portion of our facility very soon. Please contact the undersigned if you have any questions with regard to the information provided.

Sincerely,

C. W. Bickerstaff

C. W. Bickerstaff, Manager
Industrial Hygiene and
Materials Transportation
Environmental Affairs

Table 11
Groundwater
Radioactive Analyses Results

Sample ID	Gross Alpha pCi/L	Gross Beta pCi/L	Gamma Spec. pCi/L	Radium 226 pCi/L	Radium 228 pCi/L
B1-D	<2	14±3	*	<0.6	<1
B1-S	3±2**	5±3	*	<0.6	<1
B1-A	<2	5±3	*	<0.6	<1
CC5-D	3±2**	4±3	*	<0.6	<1
CC5-S	<2	8±3	*	<0.6	<1
CC5-A	3±2**	18±6	*	<0.6	<1
CC1	5±3**	10±5	*	<0.6	<1
CC2	4±3**	5±3	*	<0.6	<1
CC3	37±11**	92±14	*	<0.6	<1
CC4	5±3**	7±5	*	<0.6	<1

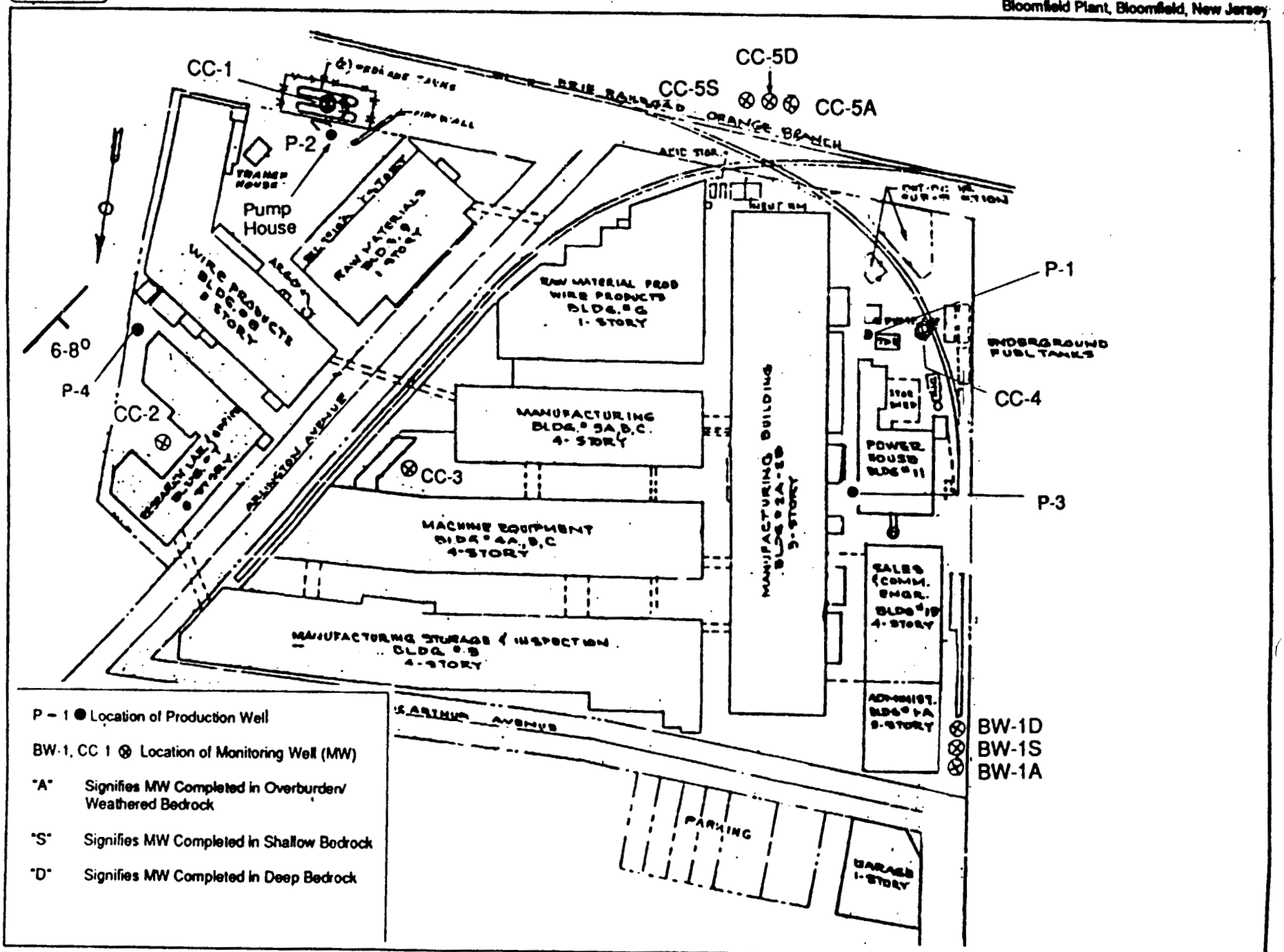
* No man-made nuclides detected.
** Laboratory indicates high statistical variation due to large amounts of solids.

Table 11
Groundwater
Radioactive Analyses Results
Continued

Sample ID	Thorium 232 pCi/L	Uranium 234 pCi/L	Uranium 235 pCi/L	Uranium 238 pCi/L	Total Uranium pCi/L
B1-D	<0.6	<0.6	<0.6	<0.6	<0.001
B1-S	<0.6	<0.6	<0.6	<0.6	0.003
B1-A	<0.6	<0.6	<0.6	<0.6	0.004
CC5-D	<0.6	<0.6	<0.6	<0.6	0.004
CC5-S	<0.6	<0.6	<0.6	<0.6	<0.001
CC5-A	<0.6	<0.6	<0.6	<0.6	0.011
CC1	<0.6	<0.6	<0.6	<0.6	0.007
CC2	<0.6	<0.6	<0.6	<0.6	0.006
CC3	<0.6	<0.6	<0.6	<0.6	<0.001
CC4	<0.6	<0.6	<0.6	<0.6	<0.001

BCM

Westinghouse Electric Corp.
Bloomfield Plant, Bloomfield, New Jersey



BCM Project No. 00-6885-02

Figure 2
WELL LOCATION MAP

TABLE 1
Summary of Volatile and Radionuclide Analyses
Production Wells P-2, P-3, and P-4

Parameter		RESULTS OF WATER QUALITY ANALYSES					
		WELL P-2		WELL P-3		WELL P-4	
Sampling Date:	Units	1/24/86	3/11/86	1/24/86	3/11/86	1/24/86	3/11/86
Benzene	ug/l	-	-	-	5.0	-	-
1,1,1-Trichloroethane	ug/l	57.0	72.0	-	226.0	17.0	25.0
1,2-Dichloroethane	ug/l	-	-	-	5.0	-	5.0
1,1-Dichloroethane	ug/l	51.0	92.0	-	499.0	-	6.5
Chloroethane	ug/l	5.3	-	-	147.0	-	-
Trichloroethylene	ug/l	104.0	182.0	19.0	1916.0	43.0	103.0
1,1-Dichloroethylene	ug/l	26.0	38.0	-	124.0	-	-
trans-1,2-Dichloroethylene	ug/l	15.0	26.0	-	110.0	-	11.0
Carbon Tetrachloride	ug/l	-	-	-	22.0	-	-
Tetrachloroethylene	ug/l	14.0	28.0	-	-	25.0	-
Total Volatile Organics	ug/l	272.3	438.0	19.0	3054.0	85.0	150.5
		3/11/86		**3/11/86**		**3/11/86**	
Gross alpha	pCi/l	4.1 + 3.9		3.7 + 2.7		4.5 + 3.9	
Total U Activity	pCi/l	6.6 + 1.3		2.6 + 0.4		3.2 + 0.5	
Total Uranium	ug/l	10		4		5	

Note:
- Below Detection Limits

Table 6
Well Construction Specifications

Westinghouse Electric Corporation, Bloomfield, New Jersey

Well Identification	Diameter (Inches)	Depth of Casing (Bottom - feet)	Length of Open Borehole or Screened Interval (feet)	Total Depth (feet)	Construction Materials
Regolith Wells					
HOW-1	4	10	10 (.02 in. slot)	20	PVC
HOW-2	4	9	10 (.02 in. slot)	19	PVC
DTW-1	4	12	10 (.02 in. slot)	22	PVC
CC-5A	4	18	20 (.01 in. slot)	38	PVC
BW-1A	4	8	20 (.01 in. slot)	28	PVC
Bedrock Wells					
CC-1	6	18	39	57	Steel
CC-2	6	17	55	72	Steel
CC-3	6	18	43	61	Steel
CC-4	6	19	81	100	Steel
CC-4S	4	20	10 (.02 in. slot)	30	PVC
CC-5S	6	32	38	70	Steel
CC-5D	6	80	50	130	Steel
BW-1S	6	30	40	70	Steel
BW-1D	6	80	50	130	Steel
GTW-1	4	17	10 (.02 in. slot)	27	PVC
Production Wells					
P-1	10	15.5	486.5	502	Steel
P-2	10	17.6	436.4	454	Steel
P-3	10	16.4	376.6	393	Steel
P-4	10	17.7	420.3	438	Steel

Notes: -See Figure 2 for Well Locations
-See Reference List for Other Reports Related to these Wells