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10 CFR 20.2002

September 25, 2001
2130-01-20147

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

Subject: Response To Request For Additional Information - 10 CFR 20.2002 Request For Approval Of Disposal Of Dredged Material

Oyster Creek Generating Station (Oyster Creek)
Facility Operating License No. DPR-16
NRC Docket No. 50-219

This letter provides additional information in response to NRC Request for Additional Information (RAI) dated May 29, 2001, regarding the Oyster Creek 10 CFR 20.2002 application submitted for NRC review on December 29, 2000. Enclosure 1 to this letter provides an itemized response to each of the NRC RAI questions as discussed with NRC staff in a conference call on July 17, 2001.

No new regulatory commitments are established by this submittal. If additional information is needed, please contact David J. Distel at (610) 765-5517.

Very truly yours,

Michael P. Gallagher
Director, Licensing & Regulatory Affairs
Mid-Atlantic Regional Operating Group

Enclosure

cc: H. J. Miller, USNRC Administrator, Region I
H. N. Pastis, USNRC Senior Project Manager
L. A. Dudes, USNRC Senior Resident Inspector
File No. 99175

A001

ENCLOSURE 1

OYSTER CREEK GENERATING STATION

RESPONSE TO NRC REQUEST FOR ADDITIONAL INFORMATION - 10 CFR 20.2002 REQUEST FOR APPROVAL OF DISPOSAL OF DREDGED MATERIAL

1. **NRC Question**

10 CFR 20.2002(a) requires a description of the waste containing licensed material to include:

- physical and chemical properties important for the risk evaluation
- the proposed manner and conditions of waste disposal

Please provide information regarding the physical and chemical properties of the waste containing licensed material at the current time. Specifically, provide the following information:

a. Current radiological characterization (survey data) of the waste containing material to provide a means of comparing the 1996 radiological characterization given for the aquatic sediment prior to the 1997 dredging.

Response

The 1997 dredge material consists primarily of silt and clay with some fine to coarse sand. An independent contractor (The Richard Stockton College of New Jersey Coastal Research Center) on June 17th and 18th, 1996 conducted the sampling project with additional sampling on July 10, 1996. The sampling project consisted of nine sites within the region of the South Branch of the Forked River planned for dredging. Sampling was performed in accordance with sampling procedures approved by the Land Use Regulation Program, New Jersey Department of Environmental Protection (NJ DEP). The objective of the sampling program was to obtain surface water samples, continuous core for sediment analysis, large core samples for radiological analysis, and an additional continuous core for sediment stratigraphy. Chemical and radiological analyses were performed on the nine sediment samples. Details of the sample project may be reviewed in the prepared report dated July 16, 1996, "GPU Nuclear Corp. Sediment Sampling Program in Forked River, New Jersey." Each sample location was described with physical and chemical properties. These details appear not to be important for the radiological risk evaluation. For example, site 9 was described as; the sediment type was mud for the length of core, but the sequence started with light gray very fine sandy silt, typical of uplands floodplain surfaces today. Next in the sequence was a deposit of Atlantic White Cedar peat 0.75 feet thick. This was followed by a typical salt marsh deposit with silt heavily embedded with Spartina alterniflora roots. The marsh deposit was covered with 0.67 feet of root-free dark gray silt, then the post-dredging layer of black muck which has produced the need to dredge these sites. There were no plants seen on the bottom at any site in this study except green algae, which are seasonal during warm weather.

Information regarding the proposed manner and conditions of waste disposal are described below, understanding that the licensed material was already in place prior to the 10 CFR 20.2002 request for approval of disposal procedures.

In 1978 Oyster Creek Generating Station (OCGS) dredged the intake canal (Forked River) and discharge canal (Oyster Creek). This was accomplished hydraulically with the dredged material disposed on an area (see attached map, Attachment 1) of approximately 17.5 acres. The dredged material consisted of fine and course sand with some silt and clay. As a result of the operation of OCGS, the dredged material contained low level licensed radioactive material. OCGS released effluents containing fission and activation products from 1969 to 1974. These effluents contained fission and activation products totaling 45 curies (see Attachment 5), and in 1978 isotopic analysis of silt samples at 5 locations in and around the intake and discharge canals indicated positive Co-60 and Cs-137. Therefore appropriate measures were taken to insure that the dredged material was contained. Since the licensed material had been discharged in accordance with the OC license and accounted for in OCGS semiannual reports *Radioactive Effluent Releases,* no additional action were taken. The disposal area was not located in wetlands and is characterized as generally level land of 14 to 18 feet elevation. As previously described in the original request, the 17.5 acre disposal area is located on approximately 600 acres known as Finninger Farm. This property is owned by the licensee and lies directly east of the Oyster Creek Generating Station's Controlled Area (see map, Attachment 1). The 600 acres were and are in various stages of field succession with mixed annual grasses being dominant vegetation. Prior to dredging, the area was cleared of vegetation and dikes/embankments were constructed around the areas to confine and retain the dredged material. Weirs and a spillway were constructed to allow the dredged water to drain off after settling of the dredged solid material. The plan assumed silt in the dredged material would form a seal in the base of the disposal area to prevent the intrusion of dredged water into the groundwater. After sufficient de-watering, the embankment material was used to cover the dredged material, graded and leveled to a height approximately 2 to 3 feet above existing grade. The area was re-vegetated and remained in the above state until some time in 1984.

In 1984 OCGS constructed a new dredging retention basin utilizing the existing 17.5-acre disposal area and material. The cover soil and the 1978 dredge material were used to construct embankments. In February 1984 a Radiation Dose Assessment Report was written to demonstrate the low resultant dose expected from disturbance of the 1978 dredge disposal area. Once the embankments were formed the settling basin was graded with the average elevation from 15 to 16 feet (see large fold out map dated 1985). It was assumed that the remaining silt from the 1978 dredge project might act as a retardant to the penetration of dredge water into the ground. The basin was divided into two settling areas along its east-west axis by a central dike. An internal weir box at the west end connected the two areas. In June 1984 approximately 30,000 cubic yards were hydraulically dredged from the Forked River (intake canal) and the mixture of water and sediment was at a ratio of 7:1. This volume was approximately one half of the proposed project due to difficulties in obtaining permission to occupy certain riparian lands outside the State's control. The material dredged consisted primarily of silt and clay with some fine to coarse sand. The material was pumped into the northeast corner of the basin and flowed through the internal weir box from one settling area to the other. The volume was not great enough to require de-watering through the outlet structure. The de-watering occurred over a six-week period. At this time the retention basin remained uncovered and was considered as an active/open retention basin, while waiting to complete the proposed dredging project. The embankments were vegetated and over time local vegetation started growing in the settling areas. The retention basin remained in this condition until 1997.

In 1997 as a continuation of the 1984-dredging project the existing retention basin was inspected and improved where needed. The embankment's original vegetative cover had been replaced by local species. This growth also had extended throughout the interior of the basin. Only the large woody vegetation (tree and shrubs) was removed, expecting the remaining vegetation to serve as a filtering mechanism trapping sediment. An independent contractor (The Richard Stockton College of New Jersey Coastal Research Center) on June 17th and 18th, 1996 conducted the sampling project with additional sampling on July 10, 1996. The sampling project consisted of nine sites within the region of the South Branch of the Forked River planned for dredging. Sampling was performed in accordance with sampling procedures approved by the Land Use Regulation Program, New Jersey Department of Environmental Protection (NJ DEP). The objective of the sampling program was to obtain surface water samples, continuous core for sediment analysis, large core samples for radiological analysis, and an additional continuous core for sediment stratigraphy. Chemical and radiological analyses were performed on the nine sediment samples. The radiological sample results from the nine locations (see Attachment 2) ranged from <LLD to 0.088 pCi/g Co-60 and <LLD to 0.270 pCi/g Cs-137. In 1997 prior to starting the dredging project, samples were taken from the retention basin. The basin was broken down into a grid pattern and 54 sample locations were selected, with 11 of the locations being on the embankment (see Attachment 3). Samples were obtained at 0'-3', 3'-6', and 6'-9' depths. The results indicate that only 1 sample (C12 @ 0'-3') had positive Co-60 at 0.075 pCi/g. All the samples indicating Cs-137 were within the expected range for the area or what is considered background (see Attachment 6). OCGS Radiological Environmental Monitoring Program (REMP) has indicated Cs-137 concentration background soil samples from 1987 –1997 as ranging from 0.075 pCi/g to 0.280 pCi/g. No additional radiological samples have been taken to compare the 1996 dredge area samples to current retention basin material. The samples of the intended dredge area were taken to characterize what level of radioactive material was to be disposed of in the basin.

2. **NRC Question**

Complete information regarding the manner and conditions of waste disposal were not provided. Please provide the following information:

a. Was the dredged material uniformly distributed over the entire 17.5 acre dewatering basin site?

b. Please describe the manner in which the 50,000 cubic yards from the 1997 dredging was used to provide a 1-3 foot thick cover for the previous 100,000 and 30,000 cubic yard disposals, as this was used as a justification for not including radionuclide concentrations from materials dredged in 1978 and 1984 in the dose evaluation.

c. The intent regarding the use of topsoil on the dewatering basin is unclear. Please clarify whether topsoil is or is not going to be reapplied to the dewatering basin in the future.

Response

Items a & b: The dredged material in the 1984 and 1997 project was pumped into the northeast corner of the retention basin. The material flowed west in the northern settling area, with the solid material settling out as it flowed west towards the internal weir box. The volume and flow caused the material to pass through the internal weir box and began to flow back towards the east within the southern settling area. Attachment 4 is a photograph of the area taken sometime after the 1997-dredging project showing that the 1997 dredged material did not fill the basin. The southeast corner indicates old vegetation growth. The remainder of the basin had not yet re-vegetated at the time of the photograph. The dredge material is uniformly distributed in a declining slope. It is estimated that the material is approximately 3' deep near the east end of the northern settling area and continues to evenly slope to the east end of the southern settling area. It would be expected that the material would feather out at the end and blend with the bottom of the basin. Since in 1984 approximately 30,000 cubic yards were introduced into the basin and in 1997 50,000 cubic yards were pumped into the basin utilizing the same dredging techniques, OCGS approximated the 1984 dredge material was uniformly covered with 1 to 3 foot thick 1997 dredged material. The 1997 material covered the 1984 material although it would not have provided the 1 to 3 feet covering for a small section of the basin bottom or the embankments. The embankments were made with the 1978 dredged material mixed with the soil used to cover the original dredging project in 1978, thus this material was not covered with the 1997 material. The embankments did not indicate any radioactivity above soil background for Cs-137 and <LLD for Co-60. Therefore, it can be assumed that the activity identified in the remaining samples within the basin were a result of the 1984 dredging project. See response to Question 4 for additional information.

Item c: Currently no topsoil has been applied to the retention basin to cover the dredged material. The topsoil would only be applied at the time of retention basin final closing for soil erosion and sediment control purposes. The embankments are currently vegetated and no erosion issues have been identified. A decision will be made concerning the future use of the retention basin. If a determination is made that the basin retains sufficient capacity to accommodate future dredging activities, a revised 10 CFR 20.2002 application will be submitted.

3. **NRC Question**

10 CFR 20.2002(b) requires an analysis and evaluation of pertinent information on the nature of the environment.

Please provide information regarding the presence or absence of groundwater on the 17.5 acre dewatering basin site. If groundwater is present, please provide justification that the assumptions made for calculation of the NRC's default Derived Concentration Guideline Levels (DCGLs) regarding the vertical saturated hydraulic conductivity (that it is greater than the infiltration rate) and the default value for the infiltration rate for the resident farmer scenario (0.2525 m/year) are applicable to the Finninger farm dewatering basin site.

Response

To protect the groundwater, the site for the retention basin was selected because its location was an area where the natural flow of groundwater is from the higher ground in the west towards the down gradient location of the retention basin consisting of coastal wetlands, Oyster Creek, and Barnegat Bay. Of direct interest for the retention basin and surrounding area are three stratigraphic units: The Cape May, Cohansey, and Kirkwood Formations. The Cape May and Cohansey formations are unconfined aquifers, while an artesian aquifer exists in the Kirkwood formations. A clay layer separates the Kirkwood from the Cohansey. The clay layer acts as a confining layer. Water supplies in the surrounding area are derived from deep wells. These wells penetrate at least one clay boundary to preclude salt-water intrusion or leachate from the many septic tanks in the surrounding area. Drinking water supplies are from local municipal wells at depths of 239' to 360'. These wells along with several sampling wells are part of the OCGS's Radiological Environmental Monitoring Program. The communities bordering the 600-acre property where the basin is sited are supplied with drinking water that is piped from these municipal wells and are outside the influence of the retention basin. The groundwater influenced by the retention basin and the 600-acres around the basin flows to the southeast towards Barnegat Bay and Oyster Creek. There are no water supply wells located on the 600-acres. There is no impact on drinking water resources from the retention basin.

For the generic use of the code, a set of default values for the hydraulic conductivity is defined as 10 m/yr. for the contaminated and unsaturated zones and 100 m/yr. for the saturated zone. These values represent the approximate condition of an anisotropic sedimentary soil material; that is silt, loess, or silty sand, in which the vertical component of the hydraulic conductivity is one order of magnitude lower than the horizontal component. The default approximations reasonably represent the dredged material and the need for site-specific estimation did not warrant in-situ measurements or laboratory methods to justify using different assumptions.

4. **NRC Question**

Use of the NRC's default DCGLs are applicable to uniformly distributed soil surface contamination (e.g., 15-30 cm). Please provide data which demonstrates that the total volume of dredged material disposed of in 1978, 1984, and 1997, in the Finninger Farm dewatering basin meets this criteria.

Response

The dredged material consisted of sediment that contained low levels of radioactive material that had been properly permitted and released from Oyster Creek Generating Station's effluent discharge. This sediment was hydraulically pumped to the basin. The sediment was mixed with water at a ratio of 7:1 and then allowed to dry. This would cause the already disperse radioactive material to further mix with the sediment, causing a homogeneous material. Attachment 2 shows the sampling results of the 1997 dredged material and indicates that no elevated levels or areas were a concern. The 1997 dredge material also represented the highest levels of radioactivity. Use of the default DCGLs is applicable to the retention basin since no significantly higher level of radioactive material is likely to be subsurface. The historical radiological information (see Attachment 3) indicates the Cs-137 at or below the 1997 data and only 1 positive Co-60 sample about the same level as the 1997 samples. A historical assessment indicated that there was no likelihood of substantial subsurface residual radioactivity and additional surveys were not needed. The subsurface residual radioactivity would only need to be considered if the concentration is likely to change due to the assumption that the subsurface radioactivity may be excavated some day and that mixing of the residual radioactivity will occur during excavation. The average concentration is not expected to change with any assumed mixing.

5. **NRC Question**

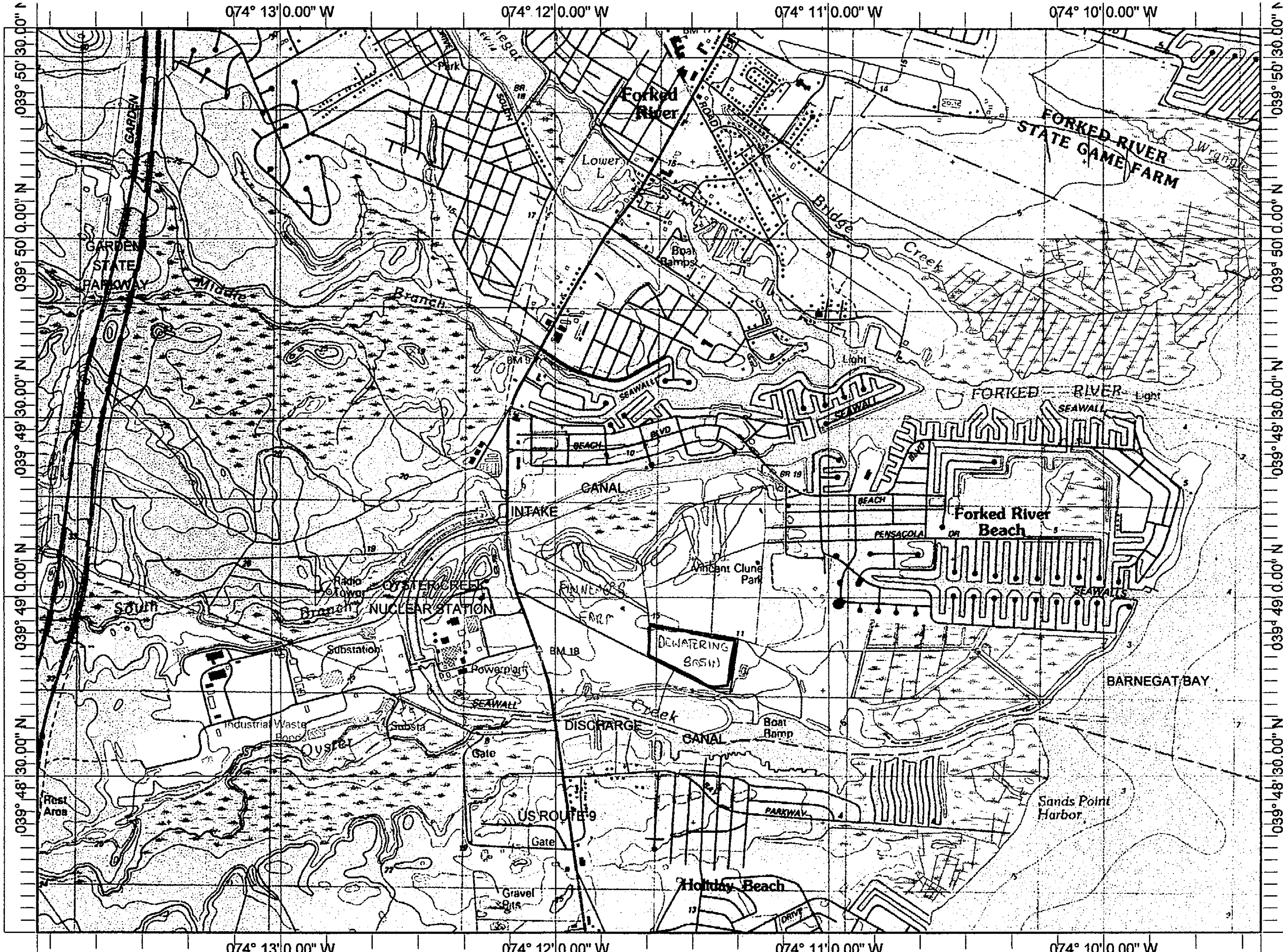
10 CFR 20.2002(c) requires the nature and location of other potentially affected licensed and unlicensed facilities be included in the application.

Please confirm there are no licensed or unlicensed facilities that potentially may be affected by the disposal of the dredged material.

Response

The 17.5-acre retention basin is located on a 600-acre parcel of land with no industry or residences. The basin was positioned at a minimum of 1000 feet from any industry or resident outside the 600-acre parcel. The basin is also located in close proximity of the Oyster Creek Generating Station, which monitors the area under the REMP annually. Continuous air sampling is provided at the perimeter of the basin. These air samplers have never detected any Co-60 or Cs-137 activity. There are no licensed or unlicensed facilities that potentially may be affected by the disposal of the dredged material. Therefore, this site-specific application has no significant radiological impact on any surrounding licensed or unlicensed facilities.

Attachment 1



Name: FORKED RIVER
Date: 11/14/98
Scale: 1 inch equals 2222 feet

Location: 039° 49' 19.4" N 074° 11' 39.3" W
Caption: OYSTER CREEK NUCLEAR GENERATING STATION

OYSTER CREEK DREDGING PROJECT - 1997

SEDIMENT SAMPLE GAMMA ISOTOPIC RESULTS

Sample Number	Station	Co-60 pCi/Kg (dry)	Cs-137 pCi/Kg (dry)
OCDREDG0196	1	42 +/- 22	220 +/- 30
OCDREDG0296	2	< LLD	< LLD
OCDREDG0396	3	60 +/- 29	250 +/- 30
OCDREDG0496	4	66 +/- 20	260 +/- 40
OCDREDG0596	5	74 +/- 24	240 +/- 30
OCDREDG0696	6	46 +/- 18	180 +/- 20
OCDREDG0796	7	79 +/- 29	250 +/- 30
OCDREDG0896	8	88 +/- 27	170 +/- 30
OCDREDG0996	9	83 +/- 24	270 +/- 30

Note 1: Sediment Samples collected June 17-18, 1996.

Note 2: 1996 Radiological Environmental Monitoring Program Background
Sediment Sample Results:
Co-60 - < LLD
Cs-137 - 17 to 39 pCi/kg (dry); Mean = 25.6 pCi/kg (dry)

GPU Nuclear Corporatioı
Oyster Creek Nuclear Generating Statio
Dredged Material Retention Basin (Upland Confined Retention Basiı
Core Samples Collected in August 199'

Cesium-137 Analysis Results - pCi/Kg (dry
Cs-137 Concentrations in REMP Background Soil Samples (1987 - 1994): 280 pCi/Kg (dry) to 75 pCi/Kg (dry) (18/18

0'-3' 3'-6' 6'-9'	A1	A2	A3 < 30 < 30 < 50	A4	A5	A6 <20 53 +/- 21 190 +/- 30	A7	A8	A9 < 30 < 50 25 +/- 16	A10	A11	A12 < 50 79 +/- 24 < 16	A13	A14	
0'-3' 3'-6' 6'-9'	B1	B2 < 30 43 +/- 18 < 40	B3	B4 < 20	B5	B6	B7 43 +/- 32	B8 < 70	B9	B10	B11 140 +/- 60	B12 77 +/- 56	B13 < 60	B14	B15
0'-3' 3'-6' 6'-9'	C1	C2	C3 < 40	C4 < 40 34 +/- 12 35 +/- 16	C5 < 30	C6 < 30	C7 < 40	C8 35 +/- 24	C9 < 20	C10 36 +/- 15	C11 110 +/- 30	C12 200 +/- 60	C13 < 80	C14 190 +/- 60	C15 < 30 < 30 41 +/- 29
0'-3' 3'-6' 6'-9'	D1	D2	D3 < 30	D4 < 20	D5	D6	D7 190 +/- 60 170 +/- 30 33 +/- 21	D8 72 +/- 20	D9 42 +/- 21	D10 150 +/- 40 120 +/- 30 59 +/- 29	D11 59 +/- 28	D12	D13 28 +/- 20	D14	D15
0'-3' 3'-6' 6'-9'	E1	E2 26 +/- 14 56 +/- 20 37 +/- 20	E3	E4 < 30	E5 64 +/- 27	E6	E7 91 +/- 42	E8	E9 < 30	E10 < 50	E11 37 +/- 24	E12 < 40	E13 < 30 < 60 150 /- 50	E14	E15
	0'-3' 3'-6' 6'-9'	F2	F3	F4 38 +/- 17 < 50 < 40	F5	F6 77 +/- 45	F7 < 30	F8	F9 < 30	F10	F11 < 20	F12 < 40	F13	F14	F15 < 20 27 +/- 16 < 30
				0'-3' 3'-6' 6'-9'	G5	G6	G7 < 20 < 30 53 +/- 21	G8	G9	G10	G11 < 20	G12 < 20	G13 36 +/- 17	G14	G15
							0'-3' 3'-6' 6'-9'	H8	H9	H10 23 +/- 17 < 70 < 70	H11	H12	H13 < 60 < 19 40 +/- 18	H14	

Douglas R Weigle
30 Sep 97

GPU Nuclear Corporatio
Oyster Creek Nuclear Generating Statio
Dredged Material Retention Basin (Upland Confined Retention Basi
Core Samples Collected in August 199

Cobalt-60 Analysis Results - pCi/Kg (dry
Note: Co-60 was only detected in Sector C12. All other sectors were < LL
Co-60 Concentrations in REMP Background Soil Samples (1987 - 1994): All Samples < LLD (18/1

Row	Depth	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	0'-3'	A1	A2	A3 < 30	A4	A5	A6 < 20	A7	A8	A9 < 17	A10	A11	A12 < 40	A13	A14	
A	3'-6'			< 20			< 20			< 40			< 30			
A	6'-9'			< 40			< 30			< 30			< 18			
B	0'-3'	B1	B2 < 20	B3	B4 < 20	B5	B6	B7 < 30	B8 < 60	B9	B10	B11 < 70	B12 < 60	B13 < 60	B14	B15
B	3'-6'		< 20													
B	6'-9'		< 30													
C	0'-3'	C1	C2	C3 < 60	C4 < 20	C5 < 30	C6 < 16	C7 < 30	C8 < 30	C9 < 20	C10 < 20	C11 < 50	C12 75 +/- 37	C13 < 90	C14 < 80	C15 < 20
C	3'-6'				< 18											< 19
C	6'-9'				< 30											< 20
D	0'-3'	D1	D2	D3 < 30	D4 < 20	D5	D6	D7 < 80	D8 < 20	D9 < 20	D10 < 50	D11 < 30	D12	D13 < 30	D14	D15
D	3'-6'							< 40			< 40					
D	6'-9'							< 20			< 30					
E	0'-3'	E1	E2 < 20	E3	E4 < 30	E5 < 20	E6	E7 < 60	E8	E9 < 30	E10 < 40	E11 < 20	E12 < 40	E13 < 20	E14	E15
E	3'-6'		< 20											< 60		
E	6'-9'		< 20											< 60		
F	0'-3'		F2	F3	F4 < 30	F5	F6 < 70	F7 < 30	F8	F9 < 20	F10	F11 < 13	F12 < 30	F13	F14	F15 < 19
F	3'-6'				< 50											< 20
F	6'-9'				< 50											< 18
G	0'-3'					G5	G6	G7 < 30	G8	G9	G10	G11 < 30	G12 < 20	G13 < 20	G14	G15
G	3'-6'							< 20								
G	6'-9'							< 15								
H	0'-3'								H8	H9	H10 < 20	H11	H12	H13 < 60	H14	
H	3'-6'										< 60			< 18		
H	6'-9'										< 80			< 19		

Douglas R Weigle
30 Sep 97

Dredged Materials Retention Basin (Upland Confined Disposal Facility)

Core Sampling in August 1997

Analysis Results from the Environmental Radioactivity Laborator

Location	Collection Date	Collection Time	Analysis Results Nuclide				Units
A3 (0'-3')	13 Aug 97	08 50	K-40	990	+/-	330	pCi/Kg (dry)
			Ra-226	530	+/-	320	pCi/Kg (dry)
			Th-232	340	+/-	70	pCi/Kg (dry)
A3 (3'-6')	13 Aug 97	09 00	K-40	690	+/-	240	pCi/Kg (dry)
			Th-232	250	+/-	90	pCi/Kg (dry)
A3 (6'-9')	13 Aug 97	09 10	Th-232	320	+/-	150	pCi/Kg (dry)
A6 (0'-3')	13 Aug 97	08 20	K-40	1200	+/-	200	pCi/Kg (dry)
			Th-232	310	+/-	60	pCi/Kg (dry)
A6 (3'-6')	13 Aug 97	08 30	K-40	1700	+/-	300	pCi/Kg (dry)
			Cs-137	53	+/-	21	pCi/Kg (dry)
			Ra-226	620	+/-	450	pCi/Kg (dry)
			Th-232	320	+/-	80	pCi/Kg (dry)
A6 (6'-9')	13 Aug 97	08 40	K-40	2700	+/-	400	pCi/Kg (dry)
			Cs-137	190	+/-	30	pCi/Kg (dry)
			Th-232	350	+/-	100	pCi/Kg (dry)
A9 (0'-3')	12 Aug 97	16 35	K-40	970	+/-	330	pCi/Kg (dry)
			Ra-226	1100	+/-	400	pCi/Kg (dry)
			Th-232	300	+/-	90	pCi/Kg (dry)
A9 (3'-6')	12 Aug 97	16 45	K-40	1200	+/-	500	pCi/Kg (dry)
			Th-232	290	+/-	140	pCi/Kg (dry)
A9 (6'-9')	12 Aug 97	16 55	K-40	2200	+/-	300	pCi/Kg (dry)
			Cs-137	25	+/-	16	pCi/Kg (dry)
			Ra-226	1500	+/-	600	pCi/Kg (dry)
			Th-232	330	+/-	90	pCi/Kg (dry)
A12 (0'-3')	12 Aug 97	15 30	Ra-226	1400	+/-	600	pCi/Kg (dry)
			Th-232	260	+/-	130	pCi/Kg (dry)

A12 (3'-6')	12 Aug 97	15 45	K-40	3200	+/-	400	pCi/Kg (dry)
			Cs-137	79	+/-	24	pCi/Kg (dry)
			Ra-226	870	+/-	570	pCi/Kg (dry)
			Th-232	410	+/-	100	pCi/Kg (dry)
A12 (6'-9')	12 Aug 97	16 05	K-40	700	+/-	200	pCi/Kg (dry)
			Ra-226	530	+/-	390	pCi/Kg (dry)
			Th-232	350	+/-	70	pCi/Kg (dry)
B2 (0'-3')	13 Aug 97	09 15	Ra-226	680	+/-	380	pCi/Kg (dry)
			Th-232	190	+/-	80	pCi/Kg (dry)
B2 (3'-6')	13 Aug 97	09 25	K-40	2100	+/-	300	pCi/Kg (dry)
			Cs-137	43	+/-	18	pCi/Kg (dry)
			Ra-226	940	+/-	440	pCi/Kg (dry)
			Th-232	360	+/-	80	pCi/Kg (dry)
B2 (6'-9')	13 Aug 97	09 35	K-40	4100	+/-	600	pCi/Kg (dry)
			Th-232	370	+/-	180	pCi/Kg (dry)
B4 (0'-3')	12 Aug 97	13 55	K-40	2700	+/-	400	pCi/Kg (dry)
			Ra-226	1500	+/-	500	pCi/Kg (dry)
			Th-232	480	+/-	100	pCi/Kg (dry)
B7 (0'-3')	12 Aug 97	13 45	K-40	5500	+/-	600	pCi/Kg (dry)
			Cs-137	43	+/-	32	pCi/Kg (dry)
			Ra-226	1600	+/-	600	pCi/Kg (dry)
			Th-232	390	+/-	120	pCi/Kg (dry)
B8 (0'-3')	12 Aug 97	13 30	K-40	2200	+/-	700	pCi/Kg (dry)
B11 (0'-3')	12 Aug 97	13 15	K-40	12000	+/-	1000	pCi/Kg (dry)
			Cs-137	140	+/-	60	pCi/Kg (dry)
			Ra-226	2100	+/-	1100	pCi/Kg (dry)
			Th-232	780	+/-	190	pCi/Kg (dry)
B12 (0'-3')	12 Aug 97	11 55	K-40	3900	+/-	1100	pCi/Kg (dry)
			Cs-137	77	+/-	56	pCi/Kg (dry)
			Ra-226	1200	+/-	700	pCi/Kg (dry)
			Th-232	450	+/-	170	pCi/Kg (dry)
B13 (0'-3')	12 Aug 97	11 40	K-40	5500	+/-	800	pCi/Kg (dry)
			Ra-226	1300	+/-	700	pCi/Kg (dry)
			Th-232	610	+/-	170	pCi/Kg (dry)
C3 (0'-3')	12 Aug 97	14 10	Th-232	310	+/-	130	pCi/Kg (dry)

C4 (0'-3')	14 Aug 97	16 07	K-40	1800	+/-	400	pCi/Kg (dry)
			Th-232	280	+/-	100	pCi/Kg (dry)
C4 (3'-6')	14 Aug 97	16 15	K-40	1200	+/-	200	pCi/Kg (dry)
			Cs-137	34	+/-	12	pCi/Kg (dry)
			Ra-226	550	+/-	420	pCi/Kg (dry)
			Th-232	270	+/-	60	pCi/Kg (dry)
C4 (6'-9')	14 Aug 97	16 20	K-40	1800	+/-	300	pCi/Kg (dry)
			Cs-137	35	+/-	16	pCi/Kg (dry)
			Ra-226	900	+/-	400	pCi/Kg (dry)
			Th-232	350	+/-	70	pCi/Kg (dry)
C5 (0'-3')	12 Aug 97	14 25	K-40	630	+/-	210	pCi/Kg (dry)
			Ra-226	680	+/-	340	pCi/Kg (dry)
			Th-232	260	+/-	90	pCi/Kg (dry)
C6 (0'-3')	12 Aug 97	14 40	K-40	1200	+/-	300	pCi/Kg (dry)
			Ra-226	1100	+/-	400	pCi/Kg (dry)
			Th-232	340	+/-	70	pCi/Kg (dry)
C7 (0'-3')	12 Aug 97	14 55	K-40	1800	+/-	400	pCi/Kg (dry)
			Th-232	280	+/-	100	pCi/Kg (dry)
C8 (0'-3')	12 Aug 97	15 00	K-40	2800	+/-	400	pCi/Kg (dry)
			Cs-137	35	+/-	24	pCi/Kg (dry)
			Ra-226	800	+/-	390	pCi/Kg (dry)
			Th-232	310	+/-	80	pCi/Kg (dry)
C9 (0'-3')	12 aug 97	10 50	K-40	2000	+/-	300	pCi/Kg (dry)
			Ra-226	770	+/-	470	pCi/Kg (dry)
			Th-232	330	+/-	70	pCi/Kg (dry)
C10 (0'-3')	12 Aug 97	10 35	K-40	2500	+/-	400	pCi/Kg (dry)
			Cs-137	36	+/-	15	pCi/Kg (dry)
			Ra-226	850	+/-	410	pCi/Kg (dry)
			Th-232	380	+/-	70	pCi/Kg (dry)
C11 (0'-3')	12 Aug 97	10 15	K-40	7600	+/-	900	pCi/Kg (dry)
			Cs-137	110	+/-	30	pCi/Kg (dry)
			Ra-226	1200	+/-	600	pCi/Kg (dry)
			Th-232	560	+/-	170	pCi/Kg (dry)

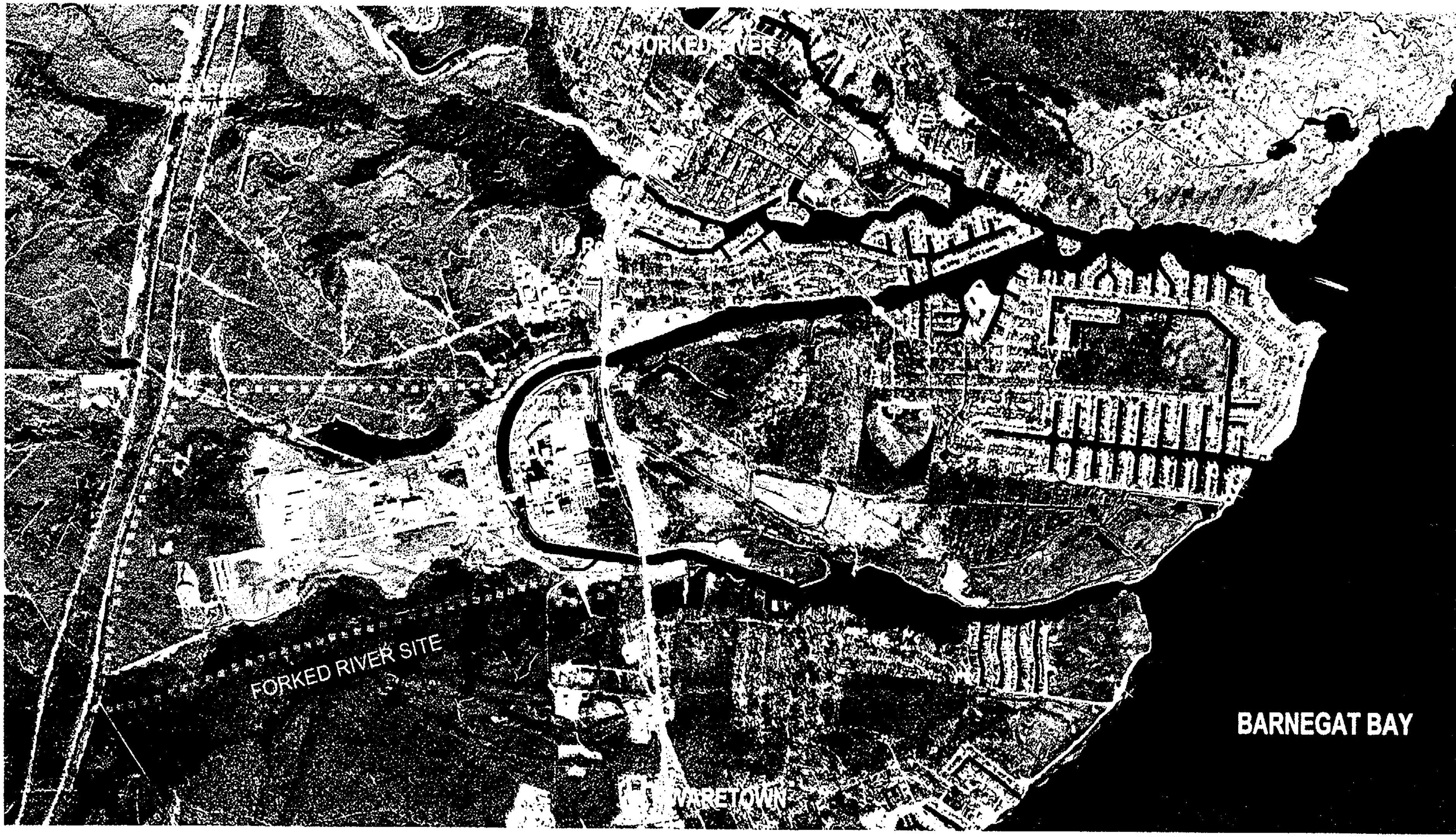
C12 (0'-3')	12 Aug 97	09 55	K-40	12000	+/-	1000	pCi/Kg (dry)
			Co-60	75	+/-	37	pCi/Kg (dry)
			Cs-137	200	+/-	60	pCi/Kg (dry)
			Ra-226	1700	+/-	900	pCi/Kg (dry)
			Th-232	860	+/-	200	pCi/Kg (dry)
C13 (0'-3')	12 Aug 97	09 45	K-40	7800	+/-	1300	pCi/Kg (dry)
			Th-232	720	+/-	300	pCi/Kg (dry)
C14 (0'-3')	12 Aug 97	09 15	K-40	17000	+/-	2000	pCi/Kg (dry)
			Cs-137	190	+/-	60	pCi/Kg (dry)
			Ra-226	2400	+/-	1300	pCi/Kg (dry)
			Th-232	750	+/-	300	pCi/Kg (dry)
C15 (0'-3')	14 Aug 97	09 39	K-40	1200	+/-	300	pCi/Kg (dry)
			Ra-226	480	+/-	350	pCi/Kg (dry)
			Th-232	180	+/-	80	pCi/Kg (dry)
C15 (3'-6')	14 Aug 97	09 45	K-40	1300	+/-	300	pCi/Kg (dry)
			Ra-226	890	+/-	490	pCi/Kg (dry)
			Th-232	270	+/-	90	pCi/Kg (dry)
C15 (6'-9')	14 Aug 97	09 55	K-40	720	+/-	250	pCi/Kg (dry)
			Cs-137	41	+/-	29	pCi/Kg (dry)
			Ra-226	1200	+/-	500	pCi/Kg (dry)
			Th-232	400	+/-	80	pCi/Kg (dry)
D3 (0'-3')	14 Aug 97	10 13	K-40	1200	+/-	400	pCi/Kg (dry)
			Ra-226	640	+/-	380	pCi/Kg (dry)
			Th-232	350	+/-	130	pCi/Kg (dry)
D4 (0'-3')	14 Aug 97	10 20	K-40	800	+/-	260	pCi/Kg (dry)
			Ra-226	1100	+/-	400	pCi/Kg (dry)
			Th-232	370	+/-	90	pCi/Kg (dry)
D7 (0'-3')	14 Aug 97	15 40	K-40	7000	+/-	1000	pCi/Kg (dry)
			Cs-137	190	+/-	60	pCi/Kg (dry)
			Th-232	520	+/-	200	pCi/Kg (dry)
D7 (3'-6')	14 Aug 97	15 50	K-40	7300	+/-	700	pCi/Kg (dry)
			Cs-137	170	+/-	30	pCi/Kg (dry)
			Th-232	560	+/-	160	pCi/Kg (dry)

D7 (6'-9')	14 Aug 97	16 00	K-40	2200	+/-	300	pCi/Kg (dry)
			Cs-137	33	+/-	21	pCi/Kg (dry)
			Ra-226	920	+/-	490	pCi/Kg (dry)
			Th-232	370	+/-	80	pCi/Kg (dry)
D8 (0'-3')	12 Aug 97	15 12	K-40	2500	+/-	300	pCi/Kg (dry)
			Cs-137	72	+/-	20	pCi/Kg (dry)
			Ra-226	610	+/-	370	pCi/Kg (dry)
			Th-232	280	+/-	80	pCi/Kg (dry)
D9 (0'-3')	12 Aug 97	10 55	K-40	2300	+/-	300	pCi/Kg (dry)
			Cs-137	42	+/-	21	pCi/Kg (dry)
			Ra-226	720	+/-	370	pCi/Kg (dry)
			Th-232	370	+/-	80	pCi/Kg (dry)
D10 (0'-3')	14 Aug 97	15 00	K-40	5600	+/-	600	pCi/Kg (dry)
			Cs-137	150	+/-	40	pCi/Kg (dry)
			Ra-226	970	+/-	560	pCi/Kg (dry)
			Th-232	370	+/-	130	pCi/Kg (dry)
D10 (3'-6')	14 Aug 97	15 15	K-40	5800	+/-	600	pCi/Kg (dry)
			Cs-137	120	+/-	30	pCi/Kg (dry)
			Ra-226	880	+/-	560	pCi/Kg (dry)
			Th-232	540	+/-	120	pCi/Kg (dry)
D10 (6'-9')	14 Aug 97	15 30	K-40	1000	+/-	300	pCi/Kg (dry)
			Cs-137	59	+/-	29	pCi/Kg (dry)
			Th-232	320	+/-	130	pCi/Kg (dry)
D11 (0'-3')	12 Aug 97	11 15	K-40	5700	+/-	700	pCi/Kg (dry)
			Cs-137	59	+/-	28	pCi/Kg (dry)
			Ra-226	1500	+/-	700	pCi/Kg (dry)
			Th-232	500	+/-	140	pCi/Kg (dry)
D13 (0'-3')	12 Aug 97	11 28	K-40	6300	+/-	600	pCi/Kg (dry)
			Cs-137	28	+/-	20	pCi/Kg (dry)
			Ra-226	1200	+/-	600	pCi/Kg (dry)
			Th-232	410	+/-	110	pCi/Kg (dry)
E2 (0'-3')	13 Aug 97	10 15	K-40	670	+/-	260	pCi/Kg (dry)
			Cs-137	26	+/-	14	pCi/Kg (dry)
			Ra-226	720	+/-	390	pCi/Kg (dry)
			Th-232	250	+/-	70	pCi/Kg (dry)

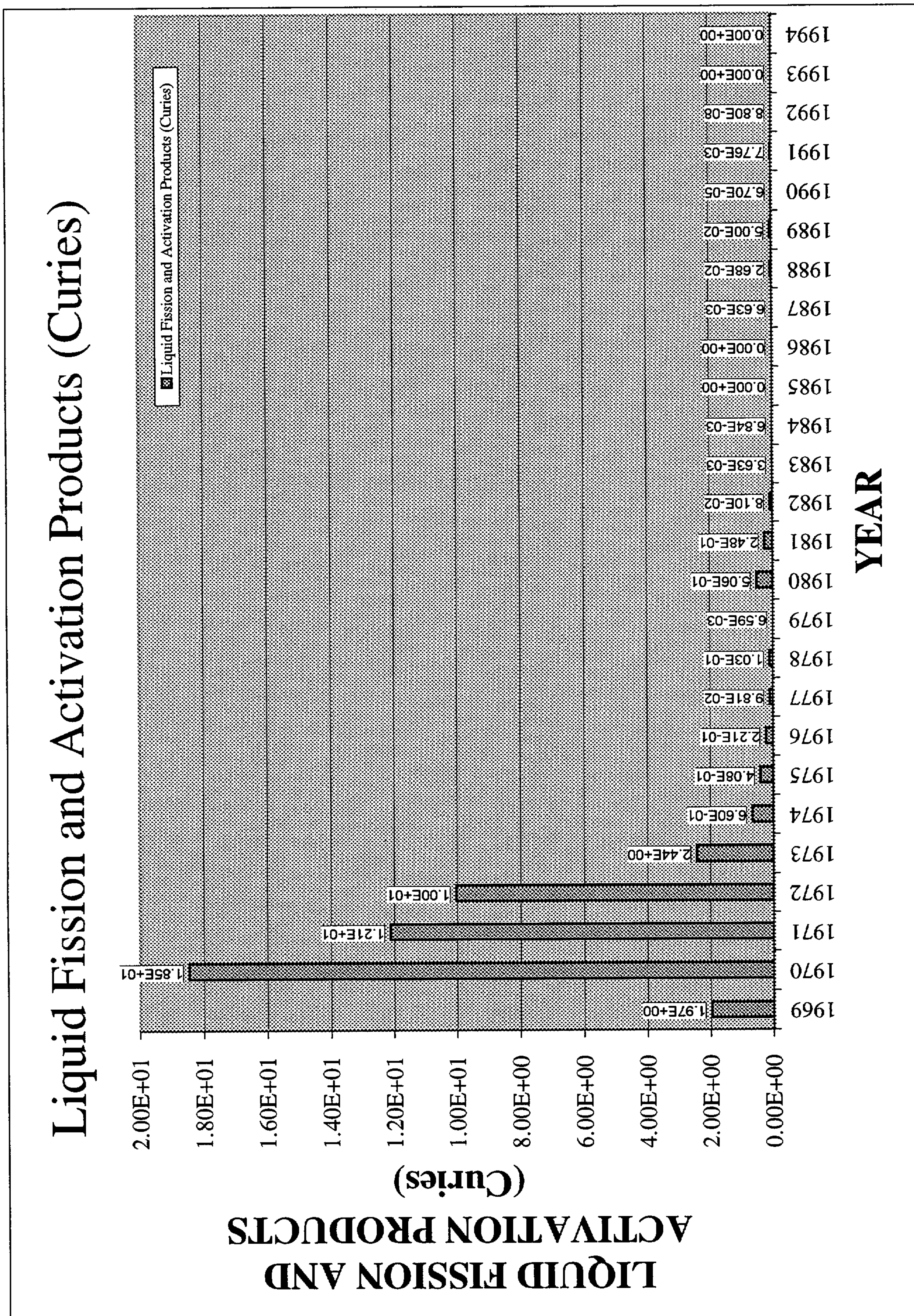
E2 (3'-6')	13 Aug 97	10 20	K-40	1100	+/-	200	pCi/Kg (dry)
			Cs-137	56	+/-	20	pCi/Kg (dry)
			Ra-226	670	+/-	460	pCi/Kg (dry)
			Th-232	330	+/-	80	pCi/Kg (dry)
E2 (6'-9')	13 Aug 97	10 25	K-40	1100	+/-	200	pCi/Kg (dry)
			Cs-137	37	+/-	20	pCi/Kg (dry)
			Ra-226	1000	+/-	400	pCi/Kg (dry)
			Th-232	290	+/-	60	pCi/Kg (dry)
E4 (0'-3')	14 Aug 97	10 27	K-40	760	+/-	320	pCi/Kg (dry)
			Th-232	260	+/-	90	pCi/Kg (dry)
E5 (0'-3')	14 Aug 97	10 38	K-40	1800	+/-	300	pCi/Kg (dry)
			Cs-137	64	+/-	27	pCi/Kg (dry)
			Ra-226	930	+/-	410	pCi/Kg (dry)
			Th-232	380	+/-	90	pCi/Kg (dry)
E7 (0'-3')	14 Aug 97	10 48	K-40	4600	+/-	800	pCi/Kg (dry)
			Cs-137	91	+/-	42	pCi/Kg (dry)
			Th-232	580	+/-	140	pCi/Kg (dry)
E9 (0'-3')	14 Aug 97	11 06	K-40	2700	+/-	500	pCi/Kg (dry)
			Ra-226	1000	+/-	500	pCi/Kg (dry)
			Th-232	350	+/-	140	pCi/Kg (dry)
E10 (0'-3')	14 Aug 97	11 14	K-40	2000	+/-	600	pCi/Kg (dry)
			Ra-226	920	+/-	680	pCi/Kg (dry)
			Th-232	390	+/-	120	pCi/Kg (dry)
E11 (0'-3')	14 Aug 97	11 22	K-40	5900	+/-	600	pCi/Kg (dry)
			Cs-137	37	+/-	24	pCi/Kg (dry)
			Ra-226	1100	+/-	500	pCi/Kg (dry)
			Th-232	540	+/-	110	pCi/Kg (dry)
E12 (0'-3')	14 Aug 97	11 43	K-40	2200	+/-	500	pCi/Kg (dry)
			Th-232	290	+/-	100	pCi/Kg (dry)
E13 (0'-3')	14 Aug 97	16 35	K-40	1500	+/-	300	pCi/Kg (dry)
			Th-232	350	+/-	80	pCi/Kg (dry)
E13 (3'-6')	14 Aug 97	16 40	H-3	20	+/-	12	pCi/Kg (wet)
			K-40	2600	+/-	800	pCi/Kg (dry)
			Ra-226	1300	+/-	800	pCi/Kg (dry)
			Th-232	370	+/-	160	pCi/Kg (dry)

E13 (6'-9')	14 Aug 97	16 50	K-40	9500	+/-	1000	pCi/Kg (dry)
			Cs-137	150	+/-	50	pCi/Kg (dry)
			Ra-226	1400	+/-	700	pCi/Kg (dry)
			Th-232	730	+/-	170	pCi/Kg (dry)
F4 (0'-3')	14 Aug 97	08 35	K-40	1300	+/-	300	pCi/Kg (dry)
			Cs-137	38	+/-	17	pCi/Kg (dry)
			Ra-226	920	+/-	420	pCi/Kg (dry)
			Th-232	330	+/-	90	pCi/Kg (dry)
F4 (3'-6')	14 Aug 97	08 40	Ra-226	770	+/-	630	pCi/Kg (dry)
			Th-232	260	+/-	160	pCi/Kg (dry)
F4 (6'-9')	14 Aug 97	08 51		< LLD	+/-		pCi/Kg (dry)
F6 (0'-3')	14 Aug 97	13 22	K-40	3300	+/-	1000	pCi/Kg (dry)
			Cs-137	77	+/-	45	pCi/Kg (dry)
			Th-232	380	+/-	180	pCi/Kg (dry)
F7 (0'-3')	14 Aug 97	13 13	K-40	1100	+/-	300	pCi/Kg (dry)
			Ra-226	670	+/-	360	pCi/Kg (dry)
			Th-232	370	+/-	80	pCi/Kg (dry)
F9 (0'-3')	14 Aug 97	13 30	K-40	1700	+/-	300	pCi/Kg (dry)
			Th-232	330	+/-	80	pCi/Kg (dry)
F11 (0'-3')	14 Aug 97	13 40	K-40	2000	+/-	300	pCi/Kg (dry)
			Ra-226	990	+/-	430	pCi/Kg (dry)
			Th-232	410	+/-	80	pCi/Kg (dry)
F12 (0'-3')	14 Aug 97	13 47	K-40	1500	+/-	400	pCi/Kg (dry)
			Ra-226	980	+/-	480	pCi/Kg (dry)
			Th-232	340	+/-	110	pCi/Kg (dry)
F15 (0'-3')	14 Aug 97	09 07	K-40	1000	+/-	200	pCi/Kg (dry)
			Ra-226	690	+/-	380	pCi/Kg (dry)
			Th-232	330	+/-	70	pCi/Kg (dry)
F15 (3'-6')	14 Aug 97	09 15	K-40	1200	+/-	200	pCi/Kg (dry)
			Cs-137	27	+/-	16	pCi/Kg (dry)
			Ra-226	740	+/-	320	pCi/Kg (dry)
			Th-232	320	+/-	70	pCi/Kg (dry)
F15 (6'-9')	14 Aug 97	09 25	K-40	810	+/-	210	pCi/Kg (dry)
			Ra-226	440	+/-	400	pCi/Kg (dry)
			Th-232	280	+/-	70	pCi/Kg (dry)

G7 (0'-3')	13 Aug 97	10 50	K-40	1200	+/-	200	pCi/Kg (dry)
			Ra-226	1100	+/-	500	pCi/Kg (dry)
			Th-232	280	+/-	80	pCi/Kg (dry)
G7 (3'-6')	13 Aug 97	10 55	K-40	2000	+/-	300	pCi/Kg (dry)
			Ra-226	840	+/-	420	pCi/Kg (dry)
			Th-232	410	+/-	80	pCi/Kg (dry)
G7 (6'-9')	13 Aug 97	11 00	K-40	930	+/-	250	pCi/Kg (dry)
			Cs-137	53	+/-	21	pCi/Kg (dry)
			Ra-226	860	+/-	550	pCi/Kg (dry)
			Th-232	340	+/-	80	pCi/Kg (dry)
G11 (0'-3')	14 Aug 97	14 32	K-40	980	+/-	280	pCi/Kg (dry)
			Th-232	300	+/-	110	pCi/Kg (dry)
G12 (0'-3')	14 Aug 97	14 22	K-40	1800	+/-	300	pCi/Kg (dry)
			Ra-226	640	+/-	330	pCi/Kg (dry)
			Th-232	350	+/-	80	pCi/Kg (dry)
G13 (0'-3')	14 Aug 97	14 02	K-40	3700	+/-	500	pCi/Kg (dry)
			Cs-137	36	+/-	17	pCi/Kg (dry)
			Ra-226	940	+/-	490	pCi/Kg (dry)
			Th-232	450	+/-	90	pCi/Kg (dry)
H10 (0'-3')	13 Aug 97	11 30	K-40	3000	+/-	400	pCi/Kg (dry)
			Cs-137	23	+/-	17	pCi/Kg (dry)
			Ra-226	1100	+/-	400	pCi/Kg (dry)
			Th-232	410	+/-	80	pCi/Kg (dry)
H10 (3'-6')	13 Aug 97	11 40	K-40	3500	+/-	700	pCi/Kg (dry)
			Ra-226	1300	+/-	900	pCi/Kg (dry)
			Th-232	570	+/-	160	pCi/Kg (dry)
H10 (6'-9')	13 Aug 97	11 50	Ra-226	1700	+/-	800	pCi/Kg (dry)
			Th-232	390	+/-	210	pCi/Kg (dry)
H13 (0'-3')	13 Aug 97	13 15	K-40	5400	+/-	1000	pCi/Kg (dry)
			Th-232	580	+/-	150	pCi/Kg (dry)
H13 (3'-6')	13 Aug 97	13 30	K-40	770	+/-	260	pCi/Kg (dry)
			Ra-226	730	+/-	380	pCi/Kg (dry)
			Th-232	200	+/-	80	pCi/Kg (dry)
H13 (6'-9')	13 Aug 97	13 45	K-40	740	+/-	180	pCi/Kg (dry)
			Cs-137	40	+/-	18	pCi/Kg (dry)
			Ra-226	1300	+/-	500	pCi/Kg (dry)
			Th-232	400	+/-	70	pCi/Kg (dry)


FORKED RIVER SITE
WARETOWN
BARNEGAT BAY

Attachment 5



Previous REMP Soil Analytical Results

Station 35 - Northern Garden on the Finninger Farm
Station 36 - U-pick farm near Cookstown
Station 66 - Southern Garden near Discharge Canal

Cs - 137 Results (pCi/Kg (dry))

Year	Maximum	Minimum	
1994	160	99	Indicator Stations
	160	92	Background Stations
1993	200	130	Indicator stations
	100	100	Background Stations
1992	180	100	Indicator stations
	140	75	Background Stations
1991	150	43	Indicator Stations
	160	84	Background Stations
1990	180	69	Indicator Stations
	190	190	Background Stations
1989	201	71	Indicator Stations
	147	120	Background Stations
1988	238	153	Indicator Stations
	205	114	Background Stations
1987	400	49	Indicator Stations
	280	117	Background Stations)

Co-60 Results (pCi/Kg (dry))

Year	Maximum	Minimum	
1994	< LLD	< LLD	Indicator Stations
	< LLD	< LLD	Background Stations
1993	< LLD	< LLD	Indicator stations
	< LLD	< LLD	Background Stations
1992	< LLD	< LLD	Indicator stations
	< LLD	< LLD	Background Stations
1991	< LLD	< LLD	Indicator Stations
	< LLD	< LLD	Background Stations
1990	< LLD	< LLD	Indicator Stations
	< LLD	< LLD	Background Stations
1989	< LLD	< LLD	Indicator Stations
	< LLD	< LLD	Background Stations
1988	< LLD	< LLD	Indicator Stations
	< LLD	< LLD	Background Stations
1987	< LLD	< LLD	Indicator Stations
	< LLD	< LLD	Background Stations)

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