10/21/93

Diane Heim, RII

I have enclosed a contractor report and related background information that should be filed in the docket file for Union Carbide Chemicals and Plastics Company, license number 47-00260-02, docket number 30-6652.

This information involves a report of radioactive scrap metal which turned out to be NORM contamination of some old piping. You may want to file this with the decommissioning information.

John Pelchat was the Region II contact for this.

Kevin Ramsey, IMOB
301-504-2534.

A-109

30-06652
47-00260-02

CHASE ENVIRONMENTAL GROUP, INC.
environmental engineering and consulting

CHARACTERIZATION OF NORM WASTE MATERIAL

FOR:

UNION CARBIDE CHEMICALS AND PLASTICS COMPANY SPECIALTY CHEMICALS DIVISION

AT:

SOUTH CHARLESTON WEST VIRGNIA

JULY 26, 1993

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1.0 PURPOSE

On July 8, 1993, staff from CHASE Environmental Group (CEG) performed a Waste Characterization study for waste material contaminated with Naturally Occurring Radioactive Material (NORM) stored at the South Charleston Union Carbide Facility. Work to be performed was in accordance with CEG quotation for work sent to Mr. Bob Oxley, dated May 27, 1993 and Union Carbide Puchase Order #0511-362751. The NORM waste material to be characterized was scrap metal and piping from the SVR Unit Brine Cooling System. The source of the contamination was described by Union Carbide staff as scale deposits and corrosion products contained on the inside of piping and other system equipment. According to information provided by Union Carbide staff to CEG, the source of the contamination appears to be a byproduct from the utilization of the brine solution.

After arriving at the South Charleston Facility on July 8, 1993, Union Carbide staff requested that CEG also characterize potential NORM waste material being stored at another location at the South Charleston Union Carbide Facility. This NORM waste material also consisted of scrap metal and piping. This material was also described as having originated from the SVR Unit Brine Cooling System. This additional work was not requested in the CEG quotation for work dated May 27, 1993.

In addition,a sample of the brine solution used in the SVR Unit Brine System equipment, was taken by Union Carbide staff and sent to CEG. The brine solution sample was received by CEG on July 22, 1993 and was received by the Laboratory on July 23, 1993.

2.0 SUMMARY OF WORK

CEG staff arrived at the Union Carbide facility at 8:10 A.M. and attended training and contractor orientation until 10:00 A.M.. CEG staff arrived at Location #1 (See Attachment F) at 10:15 A.M. and began on-site preparation. NORM waste material at Location #1 was being stored along with other equipment, scrap metal, piping, etc., which was not radioactive. Preliminary work involved an initial screening survey to determine the boundaries where radioactively contaminated material was located and to determine which areas needed to be included in the grid system for more detailed characterization.

While performing the initial screening survey, CEG staff determined that numerous pieces of equipment, pipe, conduit, tanks, etc. located within the pile of debri were not radioactively contaminated. The non-contaminated material was intermingled with the radioactively contaminated material. CEG staff directed Union Carbide equipment operators during the separation of the non-contaminated material from the contaminated material.

Upon completion of the segregation of the non-contaminated materials from the contaminated materials, CEG staff directed Union Carbide equipment operators in unstacking and positioning the contaminated material into a grid system to allow for proper characterization. The contaminated material was located or separated into two areas which are referred to as Location #1, Grid #1, and Location #1, Grid #2. The material in Location #1, Grid #2 consisted mainly of condenser tubing and small diameter piping. The material in Location #1, Grid #1 consisted of valves, flanges, and small pieces of piping. Each grid systems utilized ten (10) foot space intervals and were so designated by flags placed on the surface. Location #1, Grid #1 was 20 feet wide and 20 feet long. Location #1, Grid #2 was 30 feet long and 30 feet wide. A detailed sketch of these grids is contained in Attachments B and C. Photographs of the locations are provided in Attachment F.

After the two grid systems were established, a detailed survey was conducted for both Grids #1 and #2 of Location #1. This in-depth survey indicated that the remaining piping, valves, flanges, condenser tubing, and other pieces of metal were contaminated. (Few valves and flanges were removed from Grid #1. In addition, some of the soil/gravel in Grids #1 and #2 appeared to be contaminated. The soil/gravel contamination within Grid #2 appeared to be significant and widespread. The soil/gravel contamination appeared to have been caused by rainfall which transported the corrosion products from the piping, valves, etc., to the soil/gravel. Upon discovery of contamination in the soil/gravel, another screening survey was conducted in the areas surrounding both Grids #1 and #2 to determine whether contamination had been transported outside of these two

grid areas. The results of these surveys did not indicate any contamination outside of Grids #1 and #2.

The results of the survey taken in Location #1, Grid #1 are indicated on Attachment B. The results of the survey taken in Location #1, Grid #2 are indicated on Attachment C. The location of the highest survey reading in each 10 foot by 10 foot grid is indicated on the grids contained in Attachments B and C. Also indicated on the grids contained in Attachments B and C are the survey readings taken outside of Grids #1 and #2, Location #1. These results showed no indication of contamination outside of Grids #1 and #2, Location #1.

When the surveys of Location #1, Grids #1 and #2 were completed, a sampling protocol was established. Samples #1 and #2 were background samples of soil/gravel and were obtained from the locations indicated on Attachment B. Samples #3 and #4 were taken from Grid #2 and were soil/gravel samples of areas where survey readings as well as visual observation (rust colored soil/gravel) indicated contamination. Samples #5 and #6 were taken from Grid #1 and were composite samples of soil/gravel/pipe scale. Samples #7 and #8 were taken from Grid #2 and were also composite samples of soil/gravel/pipe scale.

At approximately 4:00 P.M., Union Carbide staff notified CEG staff that there was another location at the Union Carbide facility where potential NORM material was being stored. All characterization work was completed for Location #1, Grids #1 and #2, at approximately 4:30 P.M.

At approximately 4:45 P.M., CEG staff arrived at Location #2 and began initial screening of the new location to determine the boundaries where radioactively contaminated material was located and thus determine which areas needed to be included in the grid system. A third grid (Grid #1) system was established for Location #2. This grid system also utilized ten (10) foot space intervals and were so designated by flags placed on the surface. Location #2, Grid #1 was 40 feet long and 20 feet wide.

While performing the initial screening survey at Location #2, CEG staff determined that the majority of the material was contaminated. The few pieces of non-contaminated material were removed from the area and marked with green fluorescent paint.

After the grid system was established, a detailed survey was conducted for Location #2,Grid #1. This detailed survey indicated that all of the piping was radioactively contaminated. In addition, some of the soil/gravel in Location #2, Grid #1 was also radioactively contaminated. This soil/gravel contamination also appears the have been caused by rainfall which transported the corrosion products from the piping to the soil/ gravel. When this soil/gravel contamination was discovered, another survey was conducted on the outside of Location #2,Grid #1, to determine whether contamination had been carried outside of this grid area. The results of this survey did not indicate any radioactive contamination outside of Location #2, Grid #1.

The survey results for Location #2, Grid #1 are indicated on Attachment D. The location of the highest survey reading for each 10 foot by 10 foot grid is indicated on the grids contained in Attachment D. Also indicated in the grid contained in Attachment D are the survey readings taken outside of the grid. These survey results indicated no contamination outside of Location #2, Grid #1..

When the surveys of Location #2, Grid #1 were completed, the sampling protocol was established. Sample #9 was a background sample of soil/gravel and was obtained in the location as indicated on Attachment D. Sample #10 was taken from Location #2, Grid #1 and was soil/gravel samples of areas where survey readings as well as visual observation (rust colored soil/gravel) indicated contamination. Samples #11 and #12 were taken from Grid #1, Location #2 and were composite samples of soil/gravel/pipe scale.

CEG staff completed the characterization work at approximately 7:45 P.M. All samples were labeled and packaged for transport to the Laboratory for analysis. All surveys were conducted using Ludlum Model 3 survey meters with Ludlum Model 44-9 Alpha-Beta-Gamma Detector probes. All CEG personnel, equipment and materials were surveyed prior to leaving the South Charleston Union Carbide facility and were not contaminated.

3.0 DISCUSSION OF ANALYTICAL RESULTS

The results from the analysis of samples taken as described in Section 2.0 are listed in Attachment E. These samples were analyzed via Gamma Spectroscopy (GE(LI)) for Naturally Occurring isotopes.

The following is a correlation of the samples taken to Attachments B, C, and D:

Sample #1	Background sample (Soil/Gravel) taken southeast of Grid #1, Location #1
Sample #2	Background sample (Soil/Gravel) taken southwest of Grid #2, Location #1
Sample #3	Soil/Gravel sample taken from area C,B-1,2, Grid #2, Location #1
Sample #4	Soil/Gravel sample taken from area B,C-3,4, Grid #2, Locations #1
Sample #5	Composite Soil/Gravel/Pipe Scale sample taken from areas A,B,C-2,3, Grid #1, Location #1
Sample #6	Composite Soil/Gravel/Pipe Scale sample taken from areas A,B,C-1,2, Grid #1, Location #1
Sample #7	Composite Soil/Gravel/Pipe Scale sample taken from areas C,D-2,3, and A,B,C,D-1,2, Grid #2, Location #1
Sample #8	Composite Soil/Gravel/Pipe Scale sample taken from areas A,B-2,3, and A,B,C,D-3,4, Grid #2, Location #1.
Sample #9	Background sample (Soil/Gravel) taken northwest of Grid #1, Location #2
Sample #10	Soil/Gravel sample taken from area A,B-3,4, Grid #1, Location #2
Sample #11	Composite Soil/Gravel/Pipe Scale sample taken from area A,B-3,4,5, Grid #1, Location #2.
Sample #12	Composite Soil/Gravel/Pipe Scale sample taken from area B,C-1,2,3, Grid #1, Location #2.
Sample #13	Brine Solution sample provided to CEG by Union Carbide staff.

Samples #1 and #2, are Background samples for Location #1. These sample results show activity ranges of 2.64-7.16 pCi/gram for Potassium-40 (K-40), 1.03-2.15 pCi/gram for Radium-226 (Ra-226), 0.2-1.19 pCi/gram for Actinium-228 (Ac-228), <1.0 pCi/gram for Thorium-234 (Th-234), 0.07-0.35 pCi/gram for Thallium-208 (Tl-208), 0.18-1.4 pCi/gram for Lead-212 (Pb-212), 0.57-1.53 for Bismuth-214 (Bi-214), and 0.7-1.83 pCi/gram for Lead-214 (Pb-214). These sample analysis results for Samples #1 and #2 indicate background levels which are within normal ranges for activity levels for this part of the country. For example, the average Potassium-40 (K-40) activity concentration in the United States is 10.8 pCi/gram for soils and 23 pCi/gram for rocks.(National Council on Radiation Protection and Measurements Report No. 94, December 30, 1987)

Samples #3 and #4, which are Soil/Gravel samples from Grid #2, Location #1, show elevated activity levels as compared to the background samples (Samples #1 and #2) for

the general area. For example, Sample #3 has a Radium-226 (Ra-226) activity of 48.1 pCi/gram. The activity levels for these two samples, as well as the survey readings, indicate that some of the soil/gravel in Grid #2, Location #1 will need to be either processed to remove the radioactive contamination or disposed of at a radioactive waste disposal facility.

Samples #5 and #6, which are Composite samples (Soil/Gravel/Pipe Scale) from Grid #1, Location #1, show significantly elevated activity levels as compared to both the background samples for the general area (Samples #1 and #2) and the Soil/Gravel samples (Samples #3 and #4). For example, Sample #6 has a Radium-226 (Ra-226) activity of 659 pCi/gram (Radium-226 is a daughter of Uranium-238). Sample #6 has an Actinium-228 (Ac-228) activity of 12.3 pCi/gram (Actinium-228 is a daughter of Thorium-232). The activity levels for these two samples, as well as the survey readings, indicate that all of the Pipe will need to be either processed to remove the radioactive contamination or all of the material will need to be disposed of at a radioactive waste disposal facility.

Samples #7 and #8, which are Composite samples (Soil/Gravel/Pipe Scale) from Grid #2, Location #1, also show significantly elevated activity levels as compared to both the background samples for the general area (Samples #1 and #2) and the Soil/Gravel samples (Samples #3 and #4). For example, Sample #8 has a radium-226 (Ra-226) activity of 879 pCi/gram (Radium-226 is a daughter of Uranium-238). Sample #8 has an Actinium-228 (Ac-228) activity of 17.8 pCi/gram (Actinium-228 is a daughter of Thorium-232). The activity levels for these two samples, as well as the survey readings, indicate that all of the Pipe will need to be either processed to remove the radioactive contamination or all of the material will need to be disposed of at a radioactive waste disposal facility.

Sample #9, is a Background sample for Location #2. These sample results show activities of 3.87 pCi/gram for Potassium-40 (K-40), 0.92 pCi/gram for Radium-226 (Ra-226), 0.22 pCi/gram for Actinium-228 (Ac-228), <0.4 pCi/gram for Thorium-234 (Th-234), 0.07 pCi/gram for Thallium-208 (Tl-208), 0.20 pCi/gram for Lead-212 (Pb-212), 0.29 for Bismuth-214 (Bi-214), and 0.45 pCi/gram for Lead-214 (Pb-214). These sample analysis results for Sample #9 also indicate background levels which are within normal ranges for activity levels for this part of the country (National Council on Radiation Protection and Measurements Report No. 94, December 30, 1987).

Sample #10, which is a Soil/Gravel sample from Grid #1, Location #2, shows significantly elevated activity levels as compared to the background sample (Sample #9) and the Soil/Gravel samples (Samples #3 and #4) taken in Location #1. For example, Sample #10 has a radium-226 (Ra-226) activity of 201 pCi/gram (Radium-226 is a daughter of Uranium-238). Sample #10 has an Actinium-228 (Ac-228) activity of 4.01 pCi/gram (Actinium-228 is a daughter of Thorium-232). The activity level for this sample, as well as survey readings, indicate that some of the soil/gravel in Grid #1,

Location #2 will need to be either processed to remove the radioactive contamination or disposed of at a radioactive waste disposal facility.

Samples #11 and #12, which are Composite samples (Soil/Gravel/Pipe Scale) from Grid #1, Location #2, also show significantly elevated activity levels as compared to the background sample for the general area (Sample #9) and the Soil/Gravel samples (Samples #3 and #4) taken in Location #1. For example, Sample #12 has a radium-226 (Ra-226) activity of 599 pCi/gram (Radium-226 is a daughter of Uranium-238). Sample #12 has an Actinium-228 (Ac-228) activity of 14.4 pCi/gram (Actinium-228 is a daughter of Thorium-232). The activity levels for these two samples, as well as the survey readings, indicate that all of the Pipe will need to be either processed to remove the radioactive contamination or all of the material will need to be disposed of at a radioactive waste disposal facility.

Sample #13 is a sample of the Brine Solution which was taken by Union Carbide staff and sent to CEG. The Brine Solution sample was also analyzed via Gamma Spectroscopy (GE(LI)). The activity values are given in pCi/liter as compared to pCi/gram. For example, Lead-214 (Pb-214) has a concentration of 70.0 pCi/liter. As this was a liquid sample, the activity ranges reported for Radium-226 (Ra-226), Actinium-228 (Ac-228), and Thorium-234 (Th-234) are wider than those for the other samples. A longer period of time would be necessary to allow daughter ingrowth to obtain narrower activity ranges for these isotopes for the Brine Solution sample. Thus, further analysis would be required to quantify more exact activity concentrations for the Brine Solution. The Primary Drinking Water Standards have an activity concentration limit of 5 pCi/liter. However, from the rough sample #13 analysis results, it appears possible that the Brine Solution, upon concentration via the SVR Unit Brine System, is the source of the radioactive contamination.

In addition to the samples which were taken, it was also noted that a portion of the radioactively contaminated piping was encased with lead. This piping was located only in area A-B:1-2 in Grid #2 of Location #1.

In summary, the samples were analyzed for Naturally Occurring isotopes using Gamma Spectroscopy (GE(LI)). From the analysis results it is clear that the Uranium (U-238)and Thorium (Th-232) series are present as is evidenced by the presence of several of the associated daughters. The high activities for the Uranium series daughters (Bi-214, Pb-214, and Ra-226) as compared to the Thorium series daughters (Tl-208, Pb-212, and Ac-228) indicates that the principal radioactive contamination is from Radium-226 (Ra-226) which comes from the Uranium (U-238) series. However, some of the radioactive contamination also comes from the Thorium (Th-232) series. The fact that Bi-214, Pb-214 and Ra-226 activity concentrations are so much higher than the Th-234 activity concentrations (Th-234 decays directly from U-238) indicates that the Ra-226 has been separated (perhaps through chemical separation or concentration) from its parent (U-238). Pb-214 and Bi-214 are decay products of Ra-226. It appears that the Ra-226 and other isotopes have been concentrated by the SVR Unit Brine System.

Naturally Occurring Radioactive Material tends to become concentrated via chemical processes in scale. Scale is "...a secondary deposit of mainly inorganic chemical compounds caused by the presence or flow of fluids in a system at least partially man-made..." (Vetter, 1976). It appears that the formation of scale in the SVR Unit Brine System resulted in the concentration of the Radium-226 which is present in the Brine Solution. The following information is quoted from a document which discusses a similar process occurring with petroleum piping scale. "This material is classified as technologically enhanced natural radioactivity - naturally occurring sources of radioactivity that would not occur without some human-inspired endeaver no intentionally designed to produce radiation. The dominant radioactive element is Ra-226" (Characterization of Radioactive Petroleum Piping Scale with an Evaluation of Subsequent Land Contamination).

4.0 CONCLUSION

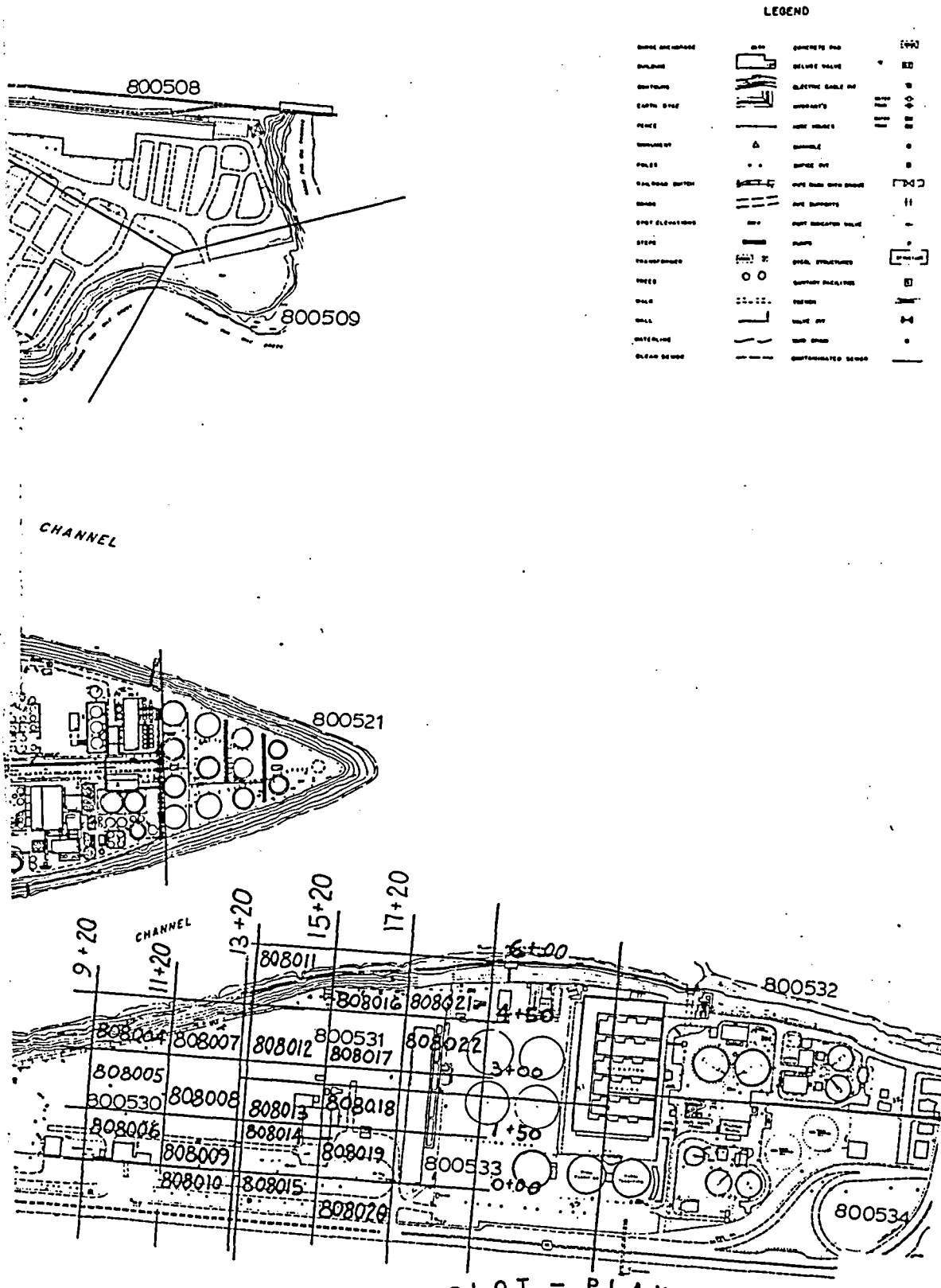
On July 8, 1993, CEG staff performed a characterization of waste material (piping, valves, scrap metal, etc) suspected of being Naturally Occurring Radioactive Material. Work to be performed was as outlined in CEG quotation for work dated May 27, 1993. In addition to the work performed under above-referenced CEG quotation for work, another location was characteized by CEG staff where waste material suspected of being Naturally Occurring Radioactive Material was being stored.

Screening, Preliminary, and Detailed surveys were performed at each of the locations where the waste material was being stored. Non-radioactive material was removed from both locations prior to characterization. Grids were established for each area where contamination was found. Background, Soil, and Pipe Scale samples were taken in each of the grided areas.

Survey and sample analysis results indicate that the waste materials are contaminated with Naturally Occurring Radioactive Material. In addition, some of the radioactive material from the piping appears to have been transported to the ground via rain and has resulted in some soil/gravel becoming contaminated with Naturally Occurring Radioactive Material.

The Union Carbide waste materials characterized herein are confirmed to contain significant concentrations of NORM. The waste material should be covered to prevent precipitation from spreading contamination to other areas and roped off to ensure that employees do not come into contact with the waste material. The following information is quoted from a document which discusses some health and safety concerns related to scale contaminated witb NORM. "For personnel working with radioactive scale, normal radiological practices should be followed. Respiratory protection should be worn in dusty conditions. No eating, drinking, or smoking should be allowed in the areas where scale or scale bearing pipe is handled. Good personnel hygiene is necessary. Most important, employee knowledge of the hazards associated with the material (scale) is essential" (Characterization of Radioactive Petroleum Piping Scale with an Evaluation of Subsequent Land Contamination).

ATTACHMENT A



PLOT PLAN

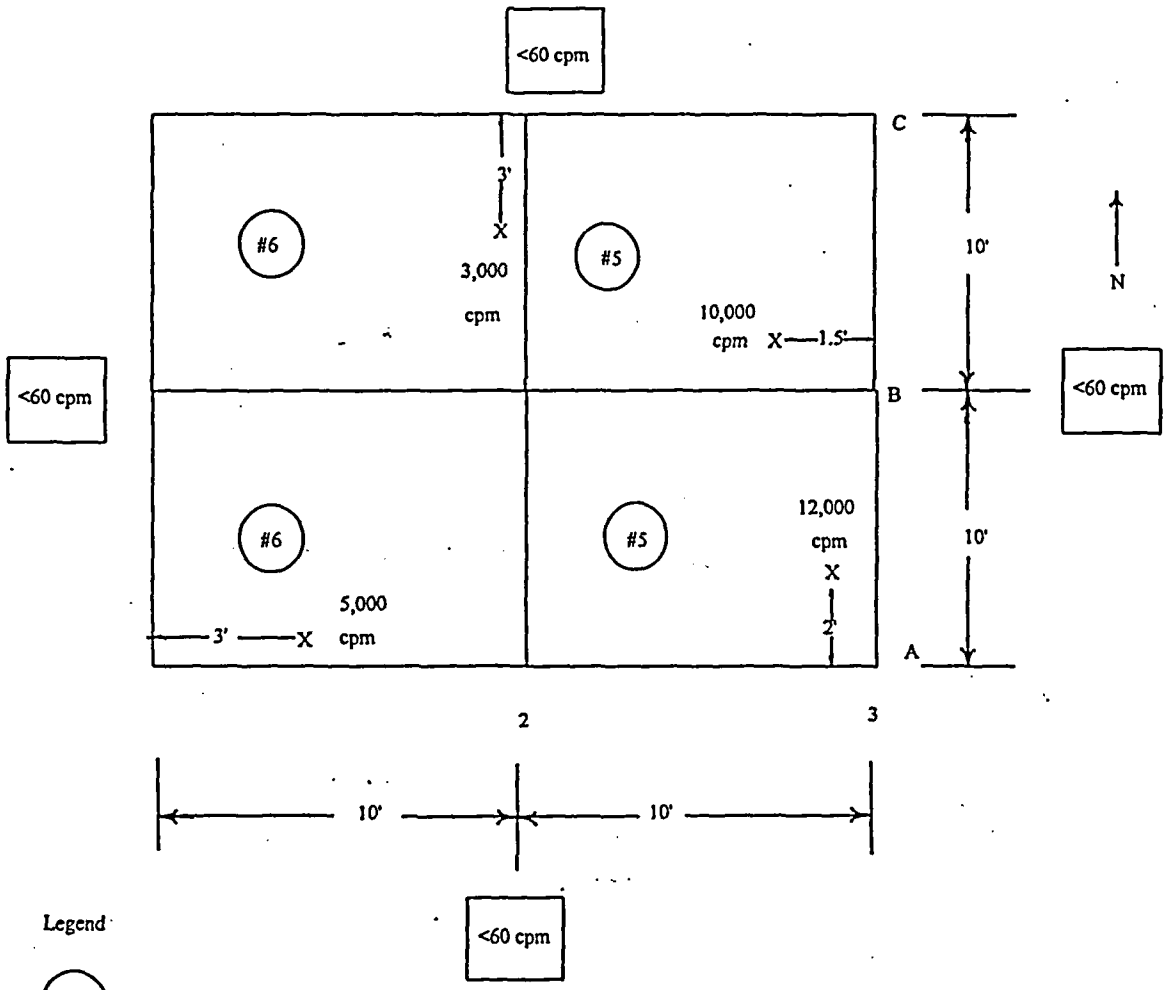
SOUTH · CHARLESTON · PLANT

UNION CARBIDE CORPORATION

KEY. SHEET OF SEWER SYSTEM 800500

ATTACHMENT B

Sample Locations
Union Carbide Soil Characterization
Location 1 Grid 1
7/8/93



Legend

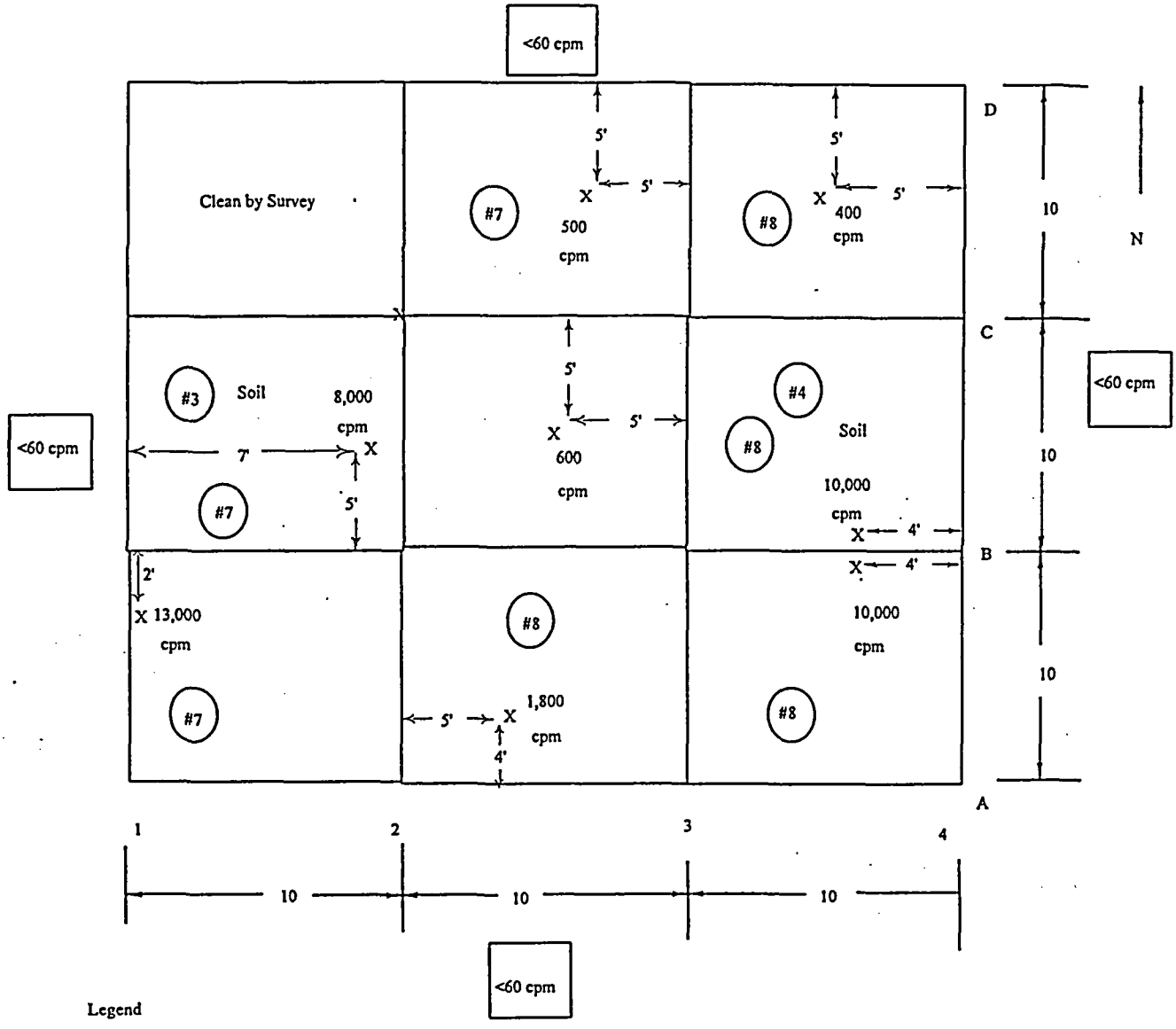
#6 Location of samples

5,000 cpm X Location of highest reading

<60 cpm Background location

ATTACHMENT C

Sample Locations
Union Carbide Soil Characterization
Location 1 Grid 2
7/8/93

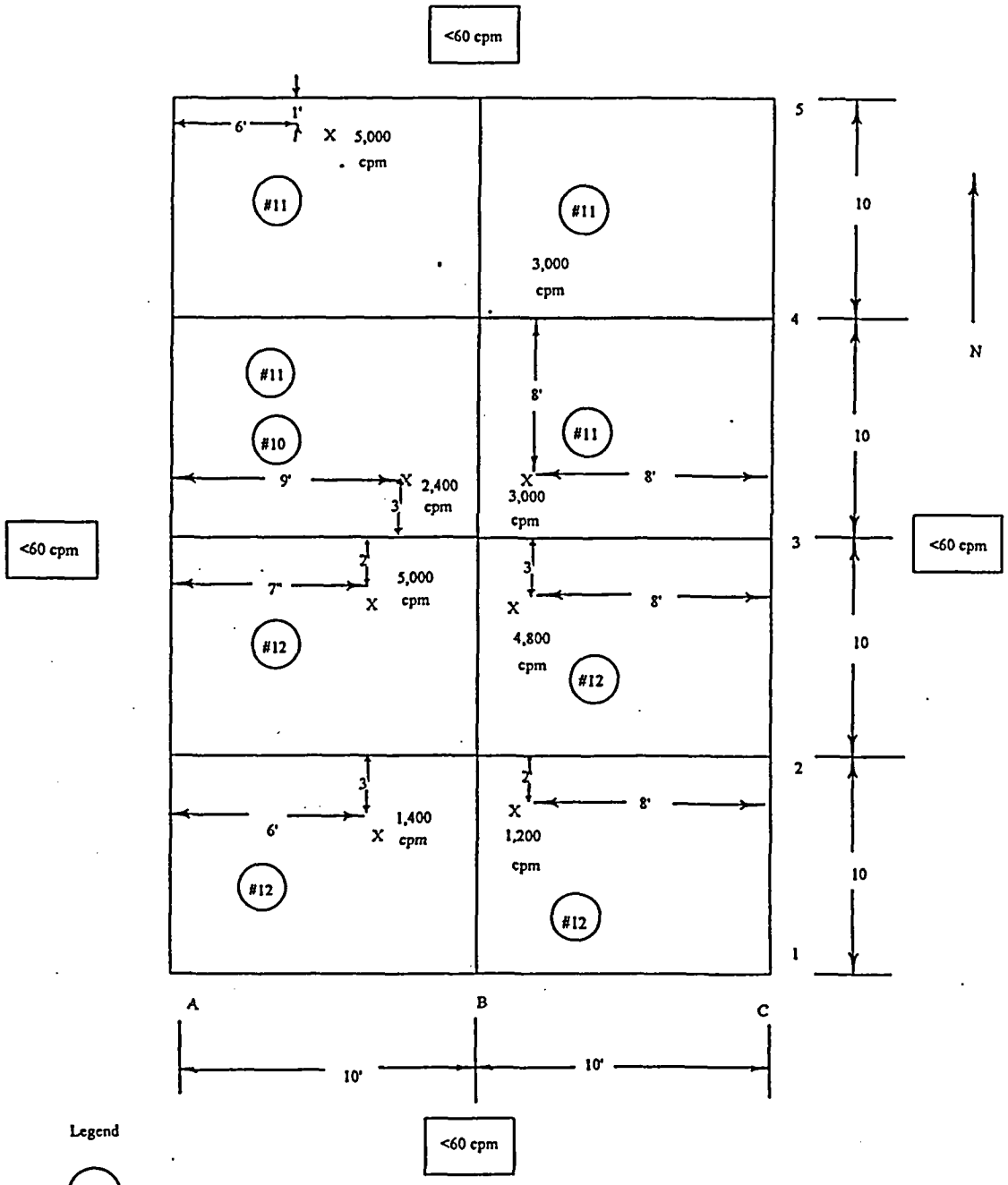


Legend

#7	Location of samples
3,000 cpm	Location of highest reading
<60 cpm	Background Levels

ATTACHMENT D

Sample Locations
Union Carbide Soil Characterization
Location 2 Grid 1
7/8/93



Legend

#6	Location of samples
5,000 cpm	Location of highest reading
<60 cpm	Location of Background

ATTACHMENT E

REPORT OF ANALYSIS

RUN DATE 07/20/93

WORK ORDER NUMBER	CUSTOMER P.O. NUMBER	DATE RECEIVED	DELIVERY DATE	PAGE
3-2405		07/13/93	07/21/93	1

STEVE MARSHALL
CHASE ENVIRONMENTAL GROUP INC
109 DAVENTRY LANE SUITE 300
LOUISVILLE KY 40223

S O L I D S

SAMPLE NUMBER	CUSTOMER'S IDENTIFICATION	STA NUM	COLLECTION-DATE START DATE	START TIME	STOP DATE	STOP TIME	NUCLIDE	ACTIVITY (PCI/GM DRY)	NUCL-UNIT-% U/M *	MID-COUNT TIME DATE	MID-COUNT TIME TIME	VOLUME - UNITS ASH-WGHT-% *	LAB.
19610	SE CNTM AR 30X20SG		07/08	1525			K-40	7.16+-0.72E 00		07/17			4
							TL-208	3.53+-0.52E-01		07/17			4
							PB-212	1.40+-0.14E 00		07/17			4
	Sample #1						BI-214	1.53+-0.15E 00		07/17			4
							PB-214	1.83+-0.18E 00		07/17			4
							RA-226	2.15+-0.68E 00		07/17			4
							AC-228	1.19+-0.22E 00		07/17			4
							TH-234	L.T. 1. E 00		07/17			4
19611	SW CNTM AR30X100SG		07/08	1535			K-40	2.64+-0.48E 00		07/17			4
							TL-208	7.10+-3.07E-02		07/17			4
							PB-212	1.83+-0.42E-01		07/17			4
	Sample #2						BI-214	5.72+-0.73E-01		07/17			4
							PB-214	7.01+-0.82E-01		07/17			4
							RA-226	1.03+-0.58E 00		07/17			4
							AC-228	L.T. 2. E-01		07/17			4
							TH-234	L.T. 6. E-01		07/17			4
19612	LC1GRD20D BC12 SG		07/08	1550			K-40	2.60+-0.91E 00		07/17			4
							TL-208	5.32+-0.86E-01		07/17			4
							PB-212	1.33+-0.13E 00		07/17			4
	Sample #3						BI-214	4.39+-0.44E 01		07/17			4
							PB-214	4.99+-0.50E 01		07/17			4
							RA-226	4.81+-0.48E 01		07/17			4
							AC-228	9.71+-3.71E-01		07/17			4
							TH-234	L.T. 2. E 00		07/17			4
19613	LC1GRD20D BC34 SG		07/08	1555			K-40	3.41+-0.72E 00		07/17			4
							TL-208	2.79+-0.66E-01		07/17			4
							PB-212	8.08+-0.91E-01		07/17			4
	Sample #4						BI-214	4.21+-0.42E 00		07/17			4
							PB-214	5.15+-0.52E 00		07/17			4
							RA-226	5.39+-0.10E 00		07/17			4

REPORT OF ANALYSIS

RUN DATE 07/20/93

WORK ORDER NUMBER	CUSTOMER P.O. NUMBER	DATE RECEIVED	DELIVERY DATE	PAGE
3-2605		07/13/93	07/21/93	2

STEVE MARSHALL
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LOUISVILLE KY 40223

S O L I D S

SAMPLE NUMBER	CUSTOMER'S IDENTIFICATION	STA NUM	COLLECTION-DATE START DATE	START TIME	STOP DATE	STOP TIME	NUCLIDE	ACTIVITY (PCI/GM DRY)	NUCL-UNIT-% U/M *	MID-COUNT TIME DATE	MID-COUNT TIME TIME	VOLUME - UNITS ASH-WGHT-% *	LAB.
19613	LC1GRD20D BC34	SG	07/08	1555			AC-228	9.44+-2.49E-01		07/17			4
							TH-234	L.T. 1. E 00		07/17			4
Sample #4													
19614	LC1GRD1 ABC-23	SFV	07/08	1600			K-40	L.T. 7. E 00		07/17			4
							TL-208	4.26+-0.52E 00		07/17			4
							PB-212	1.39+-0.14E 00		07/17			4
Sample #5							BI-214	3.39+-0.34E 02		07/17			4
							PB-214	3.96+-0.40E 02		07/17			4
							RA-226	4.00+-0.40E 02		07/17			4
							AC-228	1.37+-0.24E 01		07/17			4
							TH-234	L.T. 1. E 01		07/17			4
19615	LC1GRD1 ABC-12	SSCFV	07/08	1605			K-40	L.T. 2. E 01		07/17			4
							TL-208	7.28+-0.13E 00		07/17			4
							PB-212	1.57+-0.16E 01		07/17			4
Sample #6							BI-214	5.54+-0.55E 02		07/17			4
							PB-214	6.46+-0.65E 02		07/17			4
							RA-226	6.59+-0.66E 02		07/17			4
							AC-228	1.23+-0.44E 01		07/17			4
							TH-234	L.T. 2. E 01		07/17			4
19616	LC1GRD2CD23ABCD12SSCP		07/08	1625			K-40	L.T. 1. E 01		07/17			4
							TL-208	7.22+-1.05E 00		07/17			4
							PB-212	1.95+-0.20E 01		07/17			4
Sample #7							BI-214	5.66+-0.57E 02		07/17			4
							PB-214	6.79+-0.68E 02		07/17			4
							RA-226	7.00+-0.70E 02		07/17			4
							AC-228	1.64+-0.40E 01		07/17			4
							TH-234	L.T. 2. E 01		07/17			4

REPORT OF ANALYSIS

RUN DATE 07/20/93

PAGE 3

WORK ORDER NUMBER	CUSTOMER P.O. NUMBER	DATE RECEIVED	DELIVERY DATE
3-2605		07/13/93	07/21/93

STEVE MARSHALL
CHASE ENVIRONMENTAL GROUP INC
109 DAVENTRY LANE SUITE 300
LOUISVILLE KY 40223

S O L I D S

SAMPLE NUMBER	CUSTOMER'S IDENTIFICATION	STA NUM	COLLECTION-DATE START DATE	START TIME	STOP DATE	STOP TIME	NUCLIDE	ACTIVITY (PCI/GM DRY)	NUCL-UNIT-% U/M *	MID-COUNT TIME DATE	MID-COUNT TIME TIME	VOLUME - UNITS ASH-WGHT-% *	LAB.
19617	LC1GRD2AB23ABCD34SSCP		07/08	1635			K-40	L.T. 1. E 01		07/17			4
							TL-208	8.14+-0.84E 00		07/17			4
							PB-212	2.65+-0.27E 01		07/17			4
	Sample #8						BI-214	7.29+-0.73E 02		07/17			4
							PB-214	8.70+-0.87E 02		07/17			4
							RA-226	8.79+-0.88E 02		07/17			4
							AC-228	1.78+-0.42E 01		07/17			4
							TH-234	L.T. 2. E 01		07/17			4
19618	LC2GRD1BKG NWCRNSGSN		07/08	1805			K-40	3.87+-0.39E 00		07/17			4
							TL-208	7.25+-2.02E-02		07/17			4
							PB-212	2.02+-0.29E-01		07/17			4
							BI-214	2.85+-0.49E-01		07/17			4
	Sample #9						PB-214	4.47+-0.51E-01		07/17			4
							RA-226	9.17+-4.07E-01		07/17			4
							AC-228	2.21+-0.80E-01		07/17			4
							TH-234	L.T. 4. E-01		07/17			4
19619	LC2GRD1 AB-34 SGSC		07/08	1820			K-40	L.T. 3. E 00		07/17			4
							TL-208	1.52+-0.17E 00		07/17			4
							PB-212	4.81+-0.48E 00		07/17			4
							BI-214	1.67+-0.17E 02		07/17			4
	Sample #10						PB-214	1.97+-0.20E 02		07/17			4
							RA-226	2.01+-0.20E 02		07/17			4
							AC-228	4.01+-0.76E 00		07/17			4
							TH-234	L.T. 5. E 00		07/17			4
19620	LC2GRD1 ABC-345 PSCG		07/08	1830			K-40	L.T. 1. E 01		07/17			4
							TL-208	6.87+-0.91E 00		07/17			4
							PB-212	2.09+-0.21E 01		07/17			4
							BI-214	4.98+-0.50E 02		07/17			4
	Sample #11						PB-214	5.64+-0.56E 02		07/17			4
							RA-226	5.67+-0.57E 02		07/17			4

REPORT OF ANALYSIS

RUN DATE 07/20/93

WORK ORDER NUMBER	CUSTOMER P.O. NUMBER	DATE RECEIVED	DELIVERY DATE	PAGE
3-2605		07/13/93	07/21/93	4

STEVE MARSHALL
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109 DAVENTRY LANE SUITE 300
LOUISVILLE KY 40223

SOLIDS

SAMPLE NUMBER	CUSTOMER'S IDENTIFICATION	STA NUM	COLLECTION-DATE START DATE	START TIME	STOP DATE	STOP TIME	NUCLIDE	ACTIVITY (PCI/GM DRY)	NUCL-UNIT-% U/M *	MID-COUNT TIME DATE	MID-COUNT TIME TIME	VOLUME - UNITS ASH-WGHT-% *	LAB.
19620	LC2GRD1 ABC-345 PSCG		07/08	1830			AC-228	1.89+-0.41E 01		07/17			4
							TH-234	L.T. 4. E 01		07/17			4
	Sample #11												
19621	LC2GRD1 ABC-123 PSCG		07/08	1836			K-40	L.T. 1. E 01		07/17			4
							TL-208	6.91+-0.68E 00		07/17			4
							PB-212	1.87+-0.19E 01		07/17			4
							BI-214	5.27+-0.53E 02		07/17			4
	Sample #12						PB-214	6.05+-0.61E 02		07/17			4
							RA-226	5.99+-0.60E 02		07/17			4
							AC-228	1.44+-0.36E 01		07/17			4
							TH-234	L.T. 2. E 01		07/17			4

LAST PAGE OF REPORT

APPROVED BY J. GUENTHER 07/20/93

SEND 1 COPIES TO CH0855 STEVE MARSHALL

2 - GAS LAB. 3 - RADIO CHEMISTRY LAB. 4 - GE(LI) GAMMA SPEC LAB. 5 - TRITIUM GAS/L.S. LAB. 6 - ALPHA SPEC LAB.

REPORT OF ANALYSIS

RUN DATE 07/27/93

WORK ORDER NUMBER	CUSTOMER P.O. NUMBER	DATE RECEIVED	DELIVERY DATE	PAGE
3-2837		07/23/93	08/25/93	1

STEVE MARSHALL
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109 DAVENTRY LANE SUITE 300
LOUISVILLE KY 40223

LIQUIDS

SAMPLE NUMBER	CUSTOMER'S IDENTIFICATION	STA NUM	COLLECTION-DATE START DATE	START TIME	STOP DATE	STOP TIME	NUCLIDE	ACTIVITY (PCI/LITER)	NUCL-UNIT-% U/M *	MID-COUNT TIME DATE	MID-COUNT TIME TIME	VOLUME - UNITS ASH-WGHT-% *	LAB.
20860	BRINE-013 (DOW CHEM)		07/22				K-40	4.6 +-0.5 E 03		07/26			4
							TL-208	2.4 +-1.1 E 01		07/26			4
							PB-212	L.T. 3. E 01		07/26			4
							BI-214	3.8 +-2.1 E 01		07/26			4
	Sample #13						PB-214	7.0 +-2.0 E 01		07/26			4
							RA-226	L.T. 3. E 02		07/26			4
							AC-228	L.T. 6. E 01		07/26			4
							TH-234	L.T. 3. E 02		07/26			4

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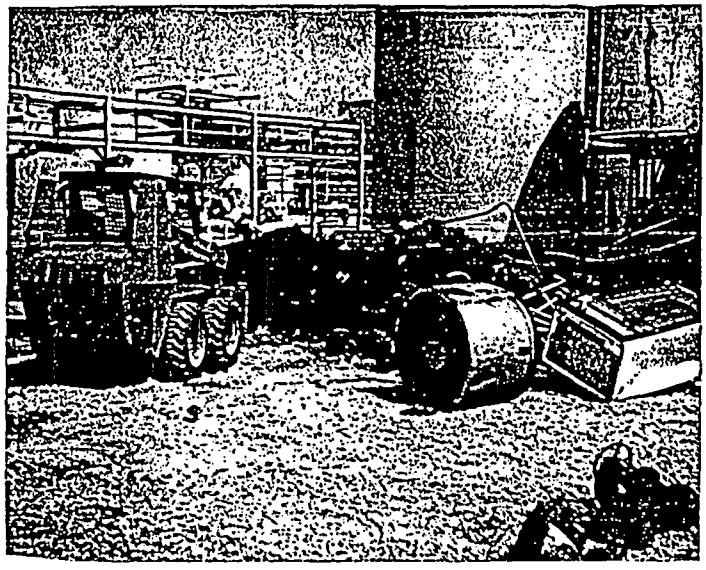
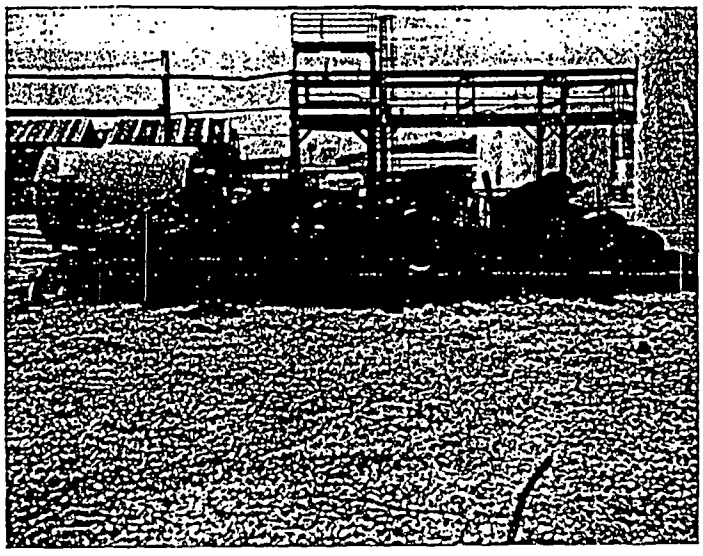
ATTACHMENT F

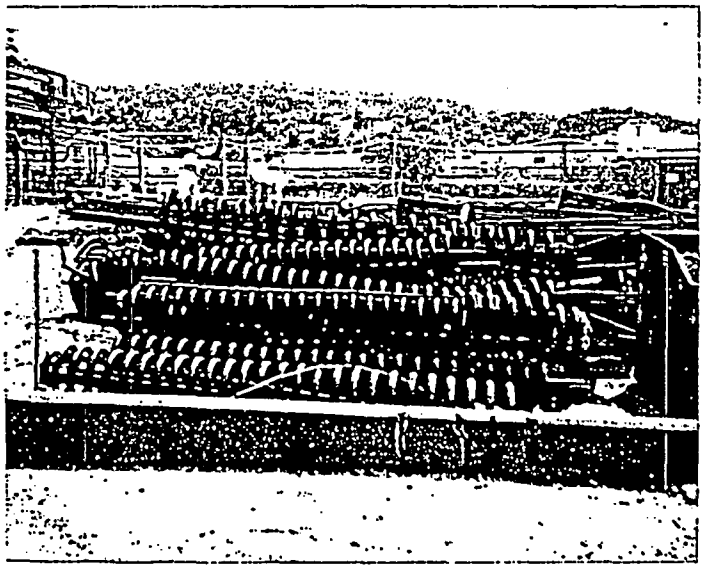


Location #1
Waste debris intermingled with radioactively contaminated materials located within the Union Carbide facility. Photograph taken prior to commencing work. View toward the northwest.

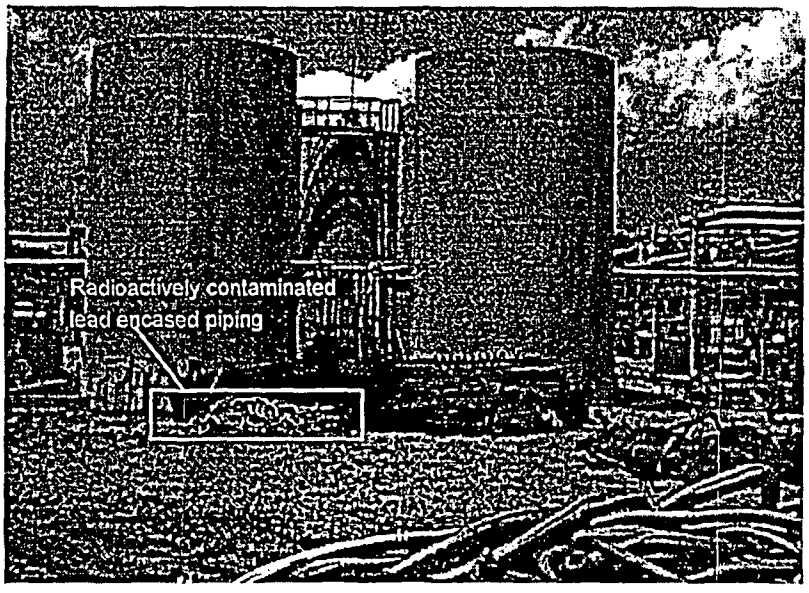
Location #1
View of grid #2 area following segregation of non-radioactive contaminated material. CEG staff shown in background surveying materials segregated from the original debris pile.



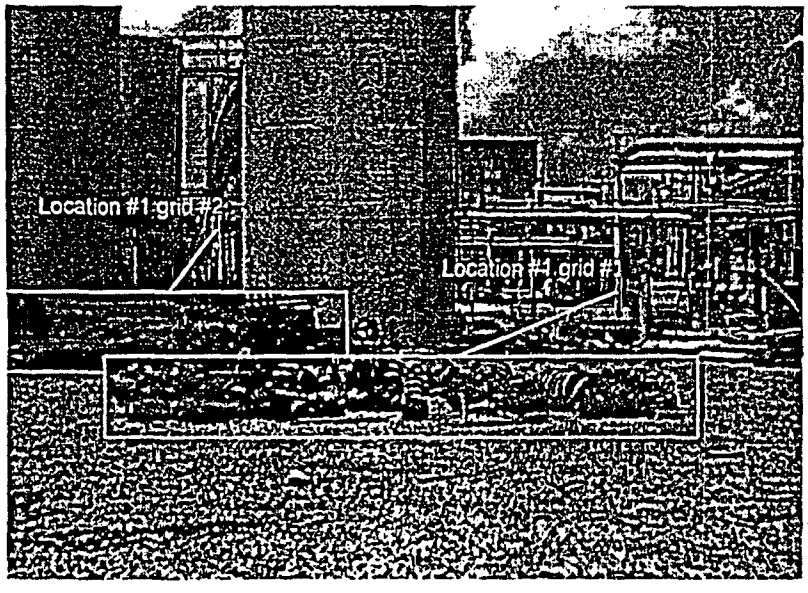
Location #1
Debris pile consisting primarily of tubing and pipe. View toward west.



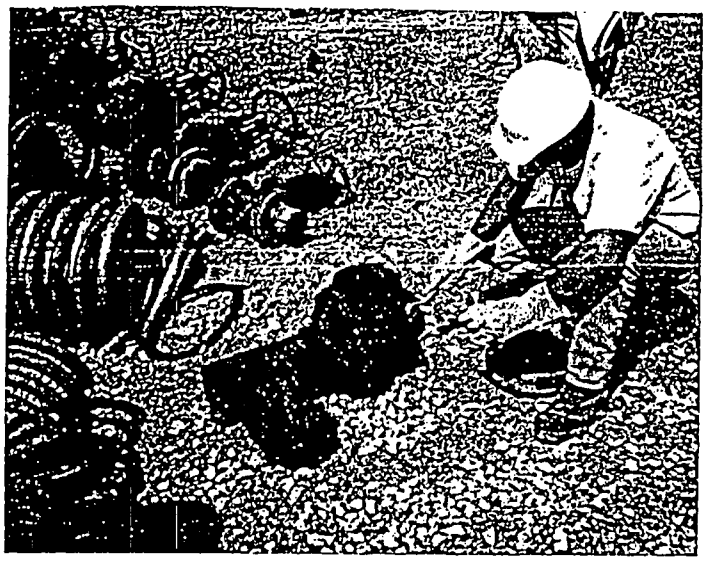
Location #1
Debris pile consisting of tubing and pipe. View toward the south.



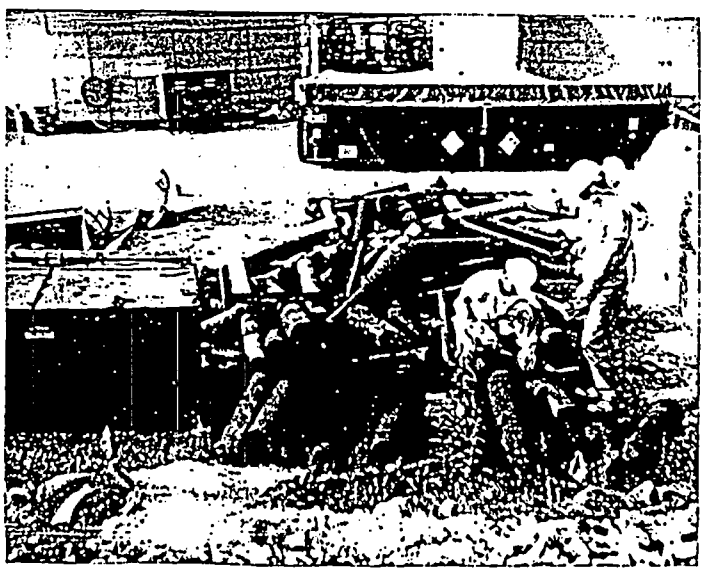
Location #1
View toward north showing radioactive contaminated debris following segregation of materials. The debris primarily consists of steel tubing and pipe. Surface area is approximately 30 feet by 30 feet.



Location #1
View toward north showing Grid #1and Grid #2 containing radioactively contaminated materials. Grid #1generally consists of steel valves and flanges which were segregated from the original debris pile to facilitate surveys.



Location #1
Composite sample being collected at Location #1Grid #1
by CEG staff.



Location #2
Soil/gravel sample being collected at Location #2 Grid #1
within the Union Carbide facility. View toward north.