Art Whitman
D236

MD.003
MD.1

GRACE

Davison Chemical Division
W. R. Grace & Co.
P. O. Box 2117
Baltimore, Maryland 21203

(301) ~~727-3900~~
(301)659-9000

October 9,1978

Dr. William E. Mott
Director of Division of Environmental
Control Technology
Department of Energy
Washington, D.C. 20545

Dear Dr. Mott:

Enclosed is the report by our consultant Radiation Management Corporation, concerning the radioactive waste disposal site at our Curtis Bay Plant. Also, attached is our account of the facts pertaining to this site along with the photos and property plat you requested.

I trust this information is sufficient to enable you to determine what further investigation will be necessary. If I can provide any additional information please call.

Yours truly,

Fred V. Shaw
Energy Administrator

FVS:mf
cc: Mr. Robert E. Corcoran
Chief, Division of Radiation Control
Maryland State Department of Health
and Mental Hygiene
201 West Preston Street
Baltimore, Maryland 21201

TAB B

GRACE

Davison Chemical Division

W. R. Grace & Co.
P. O. Box 2117
Baltimore, Maryland 21203

(301) 727-3900

October 20, 1978

Mr. Donald H. Noren
Director,
Environmental Health Administration
Maryland State Department of Health
and Mental Hygiene
201 West Preston Street
Baltimore, Maryland 21201

Dear Mr. Noren:

In order to keep you fully current in the matter of the stored residues at our Curtis Bay plant, we have enclosed copies of all the materials we are submitting to Department of Energy for their evaluation. Included is background information concerning the matter, photographs of the site, a description of the process which created the residues and the report of our consultant, Radiation Management Corporation.

We want to assure you it is our intent to cooperate fully with you in this matter. We note however, that DOE has included this matter in their program for remedial action at formerly used Manhatten Engineering District and Atomic Energy Commission sites. From this we infer that DOE has assumed a degree of administrative control over the site. In this respect we would anticipate that you will communicate directly with DOE in dealing with this matter, although we stand ready to assist you at any time.

If you have any questions concerning the enclosed materials please call.

Very truly yours,

F. V. Shaw
Energy Administrator

FVS:mf
cc: Dr. William E. Mott
Director, Div. of Environmental
Control Technology
Department of Energy
Washington, D.C. 20545

The following is an account of the facts pertaining to the existence of a radioactive waste disposal site on the property of W.R.Grace &Co. at Curtis Bay, Maryland. Although there exists limited documentation supporting some of the information most of it relies on the recollection of individuals who were involved in the work. Also attached is a description of the chemical process which generated the waste material, a plat of the W.R.Grace & Co. property, and aerial photographs of the site in question.

Pursuant to a contract dated July 18, 1955 between Rare Earths,Inc. and the Atomic Energy Commission (A.E.C.), Rare Earths,Inc. obtained a license under the Atomic Energy Act of 1954 to possess, transfer, and use the radioactive material thorium which is defined by the U.S.Code as a "source material". In late 1956 or early 1957, this license was transferred to Grace along with the assignment of the Contract issued by the A.E.C., and was in effect from the end of 1956 or from early 1957. The thorium was shipped to Davison as a component of monazite sand which was obtained from India and other sources, some foreign and some domestic. Title to the monazite and the thorium remained in the government during the performance of work under the contract. According to the terms of the contract, at least 95% of the thorium was to be returned to the A.E.C., but the monazite gangue supposed to contain not more than 5%

thorium was retained by the Company for non-commercial disposition.

The gangue consists primarily of silica, calcium sulfate, and diatomaceous filter aid as well as traces of unreacted monazite and thorium and uranium compounds.

The processing plant utilized by the Company was never fully completed, and from May 1956 through late spring 1957 radioactive gangue was buried on the plant property at various depths up to nine feet. Other contaminated material such as filter cloths and miscellaneous equipment were also disposed of in the same manner. Company personnel still on hand recall that a health physics manual was prepared jointly by us and the A.E.C. prescribing the proper method of burial. The required procedure was followed throughout the life of the project, but a copy of this manual has not yet been located. Perhaps the D.O.E. could find a copy of this document in the former A.E.C. files. Because of these burials, there now exist in Baltimore City four acres of land owned by the Company which emit low-level radiation.

A review of the contract file and discussions with others who have peripheral knowledge of Company matters dating back to the late 1950's lead to the conclusion that the failure of the commercial facility and the termination of the contract venture with the A.E.C. caused the Company to dismiss the entire project as concluded. The plant facility was shut down in 1957, the assets were disposed of and the project abandoned. Neither the A.E.C. nor Grace made any further claim upon the other. Regulations, changes in regulations, specific requirements, financial accountings, were never commumincated to Grace as far as the files indicate, although the files are admittedly sparse. It seems fair, consequently, to draw the inference that since there was no on-going relation with the Government, there was no further Company concern over the actions which seemed safe and practical at the time they were taken and which apparently were done with A.E.C.'s express approval.

These four acres of contaminated land resemble in their general make-up a large but long abandoned disposal landfill with all kinds of debris, much of which is not contaminated, and some of which is mildly contaminated. Our experts are unable to quantify the exact amount of contaminated debris or the precise extent of any level of contamination of the total acreage.

The reason for this is the lack of consistency or uniformity throughout the acreage of the debris therein contained. The existence of a spot or point of contamination may be caused by a weathered piece of equipment or decaying laboratory paraphenalia or may simply be nondescript earth.

Since early May,1978, the four-acre site has been observed by each guard shift without entry onto the site. The site is unoccupied and untraversed, remote, and within the fenced enclosure surrounding the entire plant property, but not separately fenced or marked. We are advised by our consultant, Radiation Management Corporation, that there is no actual present danger to the health or safety of any individual. We are also advised that the danger of lateral or vertical motion into adjacent land or water is essentially nil because of the nature of underlying and surrounding soils and topography. Furthermore the rocky, barren substrate in the vicinity render erosion unlikely.

PROCESS DESCRIPTION FOR THE EXTRACTION

OF

THORIUM AND RARE EARTHS

FROM

MONAZITE ORE

GENERAL DESCRIPTION OF CURTIS BAY MONAZITE PROCESS

Monazite sand was ground through 200 mesh in a Hardinge ball mill and transferred to the reactors which were jacketed Dopp kettles. Here the ground sand was reacted with concentrated sulfuric acid for approximately 4 hours. The viscous mass was then dropped into large crystallizer tanks made up of dilute recycled thorium-bearing acid. The crystallizer slurry was pumped to a Dorr rake classifier where a crude separation of rare earth sulfate crystals from the thorium-bearing acid solution was accomplished. The thorium-bearing solution was then filtered on a large Dorr-Oliver rotary drum vacuum precoat filter. The thorium-bearing solution was separated from unreacted gangue and further processed by precipitation with concentrated hydrofluoric acid forming thorium fluoride. The thorium fluoride was reacted with 50% caustic soda forming sodium fluoride which was washed free of the insoluble thorium hydrate. The thorium hydrate was twin drum dried and packaged for shipment to GSA.

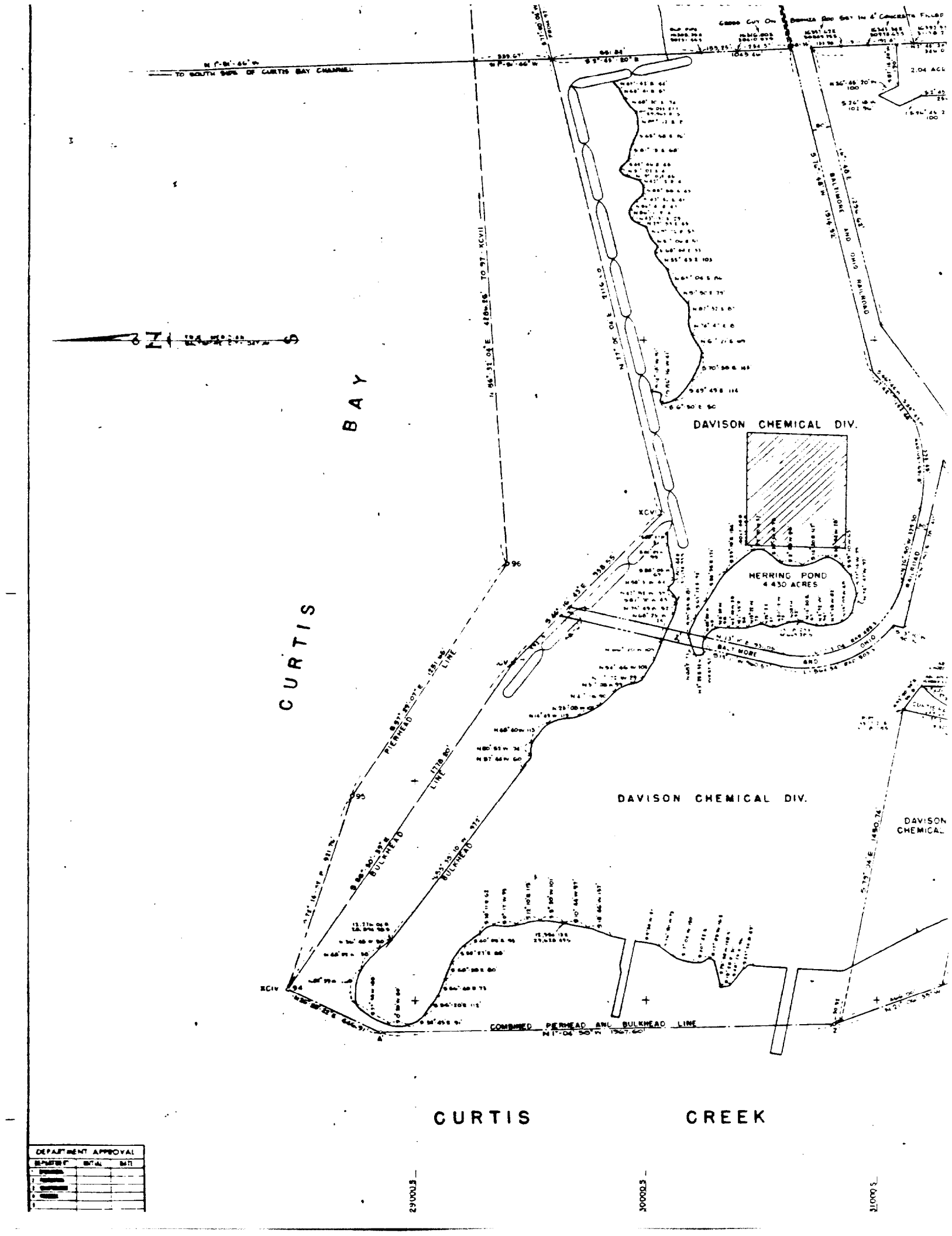
The aforementioned gangue which was made up of various forms of calcium sulfate, calcium silicate, iron sulfate and unreacted monazite was retained on the precoat (diatomaceous earth) of the filter and uniformly cut off by a doctor blade, collected in Dempster Dumpster-type tubs and removed from the plant by our yard crew truck. The Dempster Dumpsters were emptied in the designated area of our Curtis Bay dump.

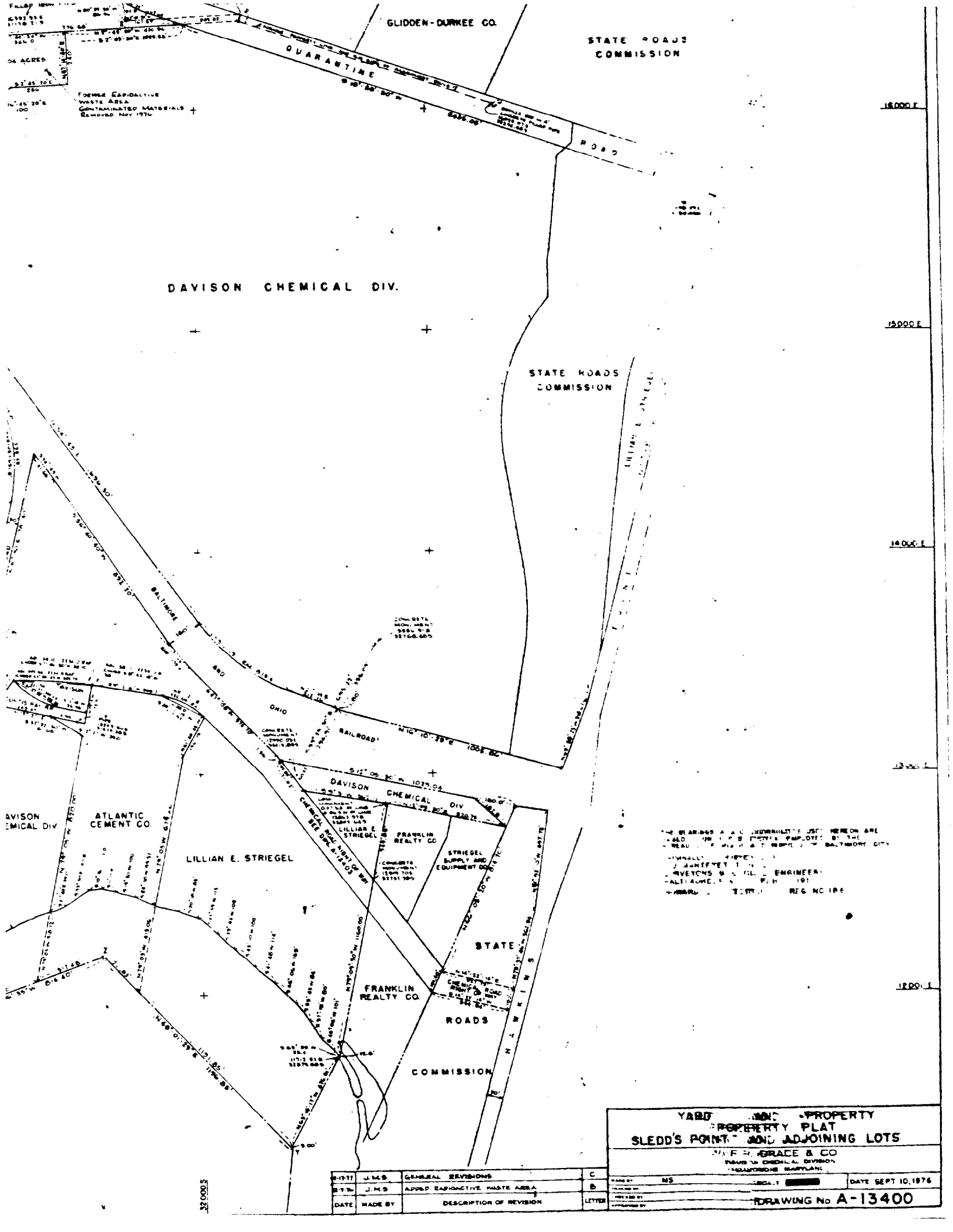
The underflow from the aforementioned Dorr classifier containing essentially rare earth sulfate crystals was then filtered using a Dorr filter, separating the crystals from the occluded thorium-containing acid which was then recycled to the crystallizers. The washed rare earth sulfate crystals were then dissolved in hot water and precipitated as the rare earth double salt by the addition of sodium sulfate. The bulk of this rare earth double salt, after proper washing, was then dried in a rotary dryer and packaged for shipment to GSA with the dried thorium hydrate.

In order to keep the entire process in a very critical water balance mode, some rare earth double salt was recycled by dissolving in 50% caustic soda forming rare earth hydroxide while washing out the freed sodium sulfate. The rare earth hydroxide thusly made was used for pH adjustment in the rare earth stream to obtain the highest possible yields of both thorium and rare earths.

PLAT OF W.R.GRACE & CO. PROPERTY

The disposal sites are entirely contained within the shaded area but do not necessarily include this entire area


CURTIS BAY
DAVISON CHEMICAL DIV.
HERRING POND
4.430 ACRES
DAVISON CHEMICAL DIV.
DAVISON CHEMICAL
PIERHEAD LINE
BULKHEAD LINE
BULKHEAD LINE
COMBINED PIERHEAD AND BULKHEAD LINE
CURTIS CREEK
DEPARTMENT APPROVAL



DATE	MADE BY	DESCRIPTION OF REVISION	LETTER
10-17-77	J.M.S.	GENERAL REVISIONS	C
8-9-76	J.M.S.	ADDED RADIOACTIVE WASTE AREA	B

YARD AND PROPERTY PLAT
SLEDD'S POINT AND ADJOINING LOTS

W. R. GRACE & CO.
DAVISON CHEMICAL DIVISION
BALTIMORE, MARYLAND

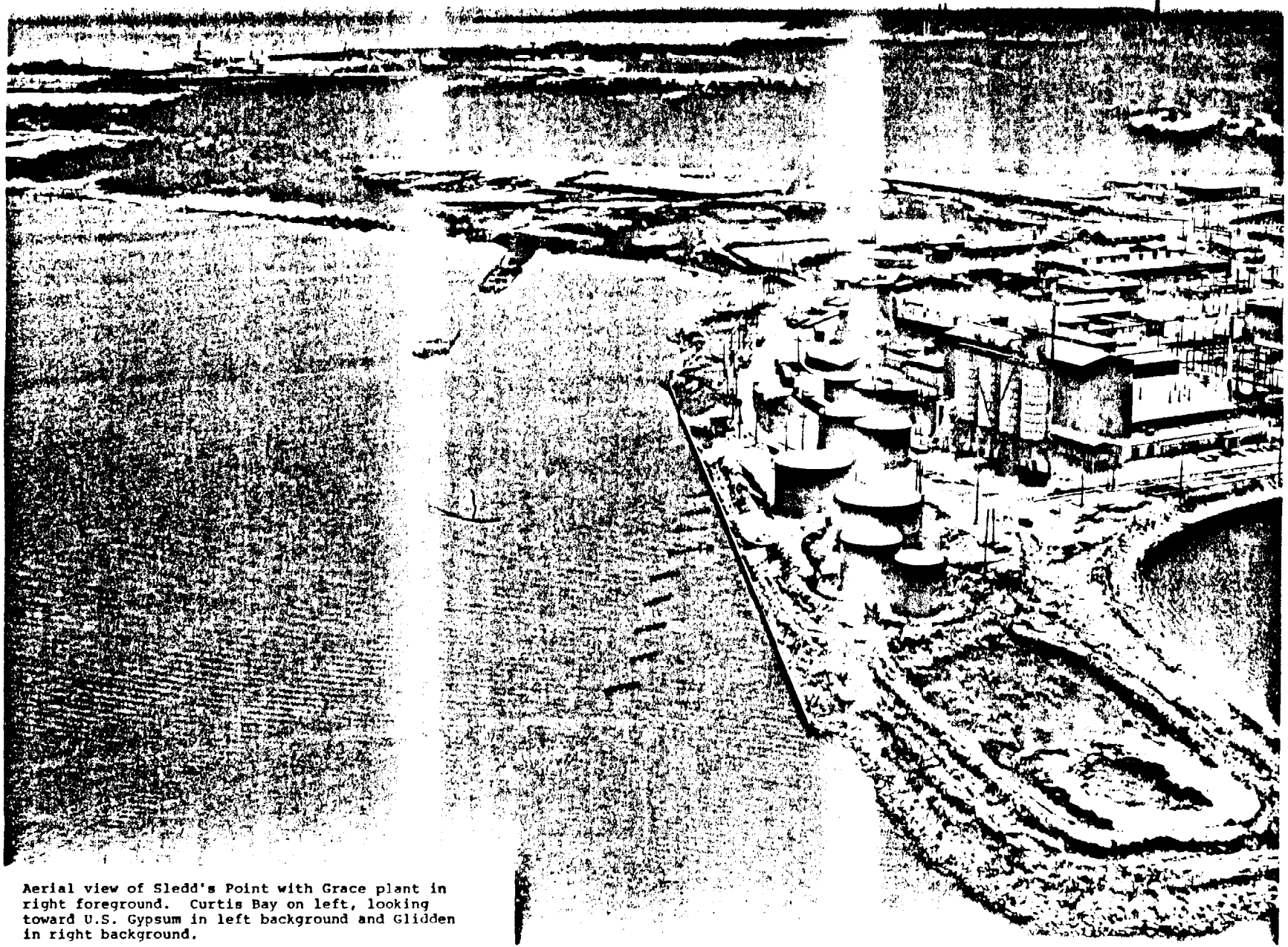
DRAWN BY: MS | SCALE: 1" = [redacted] | DATE: SEPT 10, 1976

DRAWING No. A-13400

AERIAL PHOTOGRAPHS

OF

DISPOSAL SITE



Aerial view of Sledd's Point with Grace plant in right foreground. Curtis Bay on left, looking toward U.S. Gypsum in left background and Glidden in right background.

GENERAL OVERALL AERIAL VIEW (CURTIS BAY ON LEFT, CURTIS CREEK ON RIGHT.)

7108-103

Credit:
TADDER / Baltimore
501 St. Paul Place
(301) 837-7427

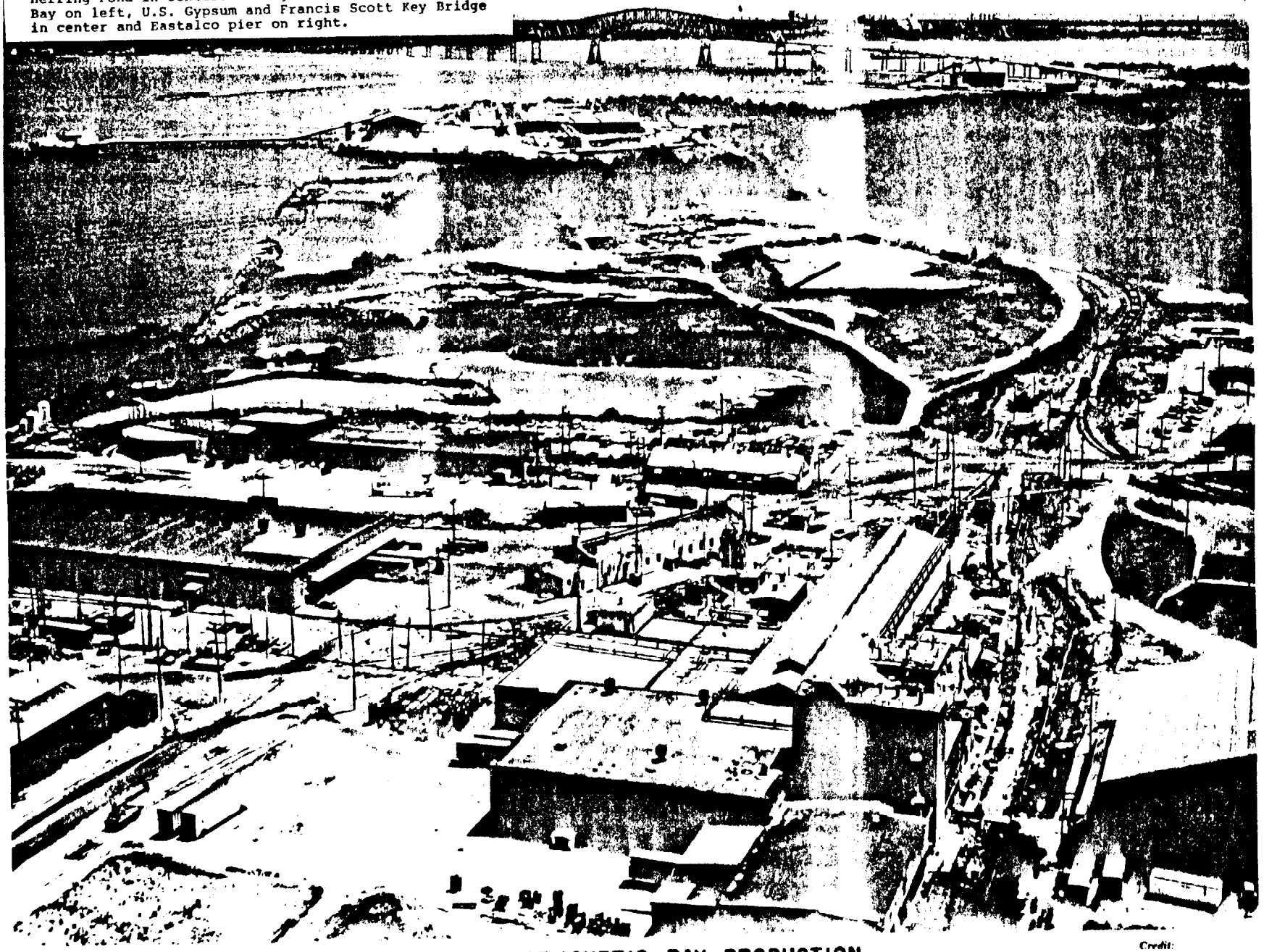
AERIAL VIEW APPROACHING FROM THE NORTHEAST.

Aerial view of Grace plant in center. Licensed dump area in left foreground. Curtis Bay in right foreground. Fertilizer plants of U. S. Steel and Southern States Coop. in left background. Hess and Amoco petroleum terminals in right background.

7108-115

Credit
TADDER / Baltimore
501 St. Paul Place
(301) 837-7427

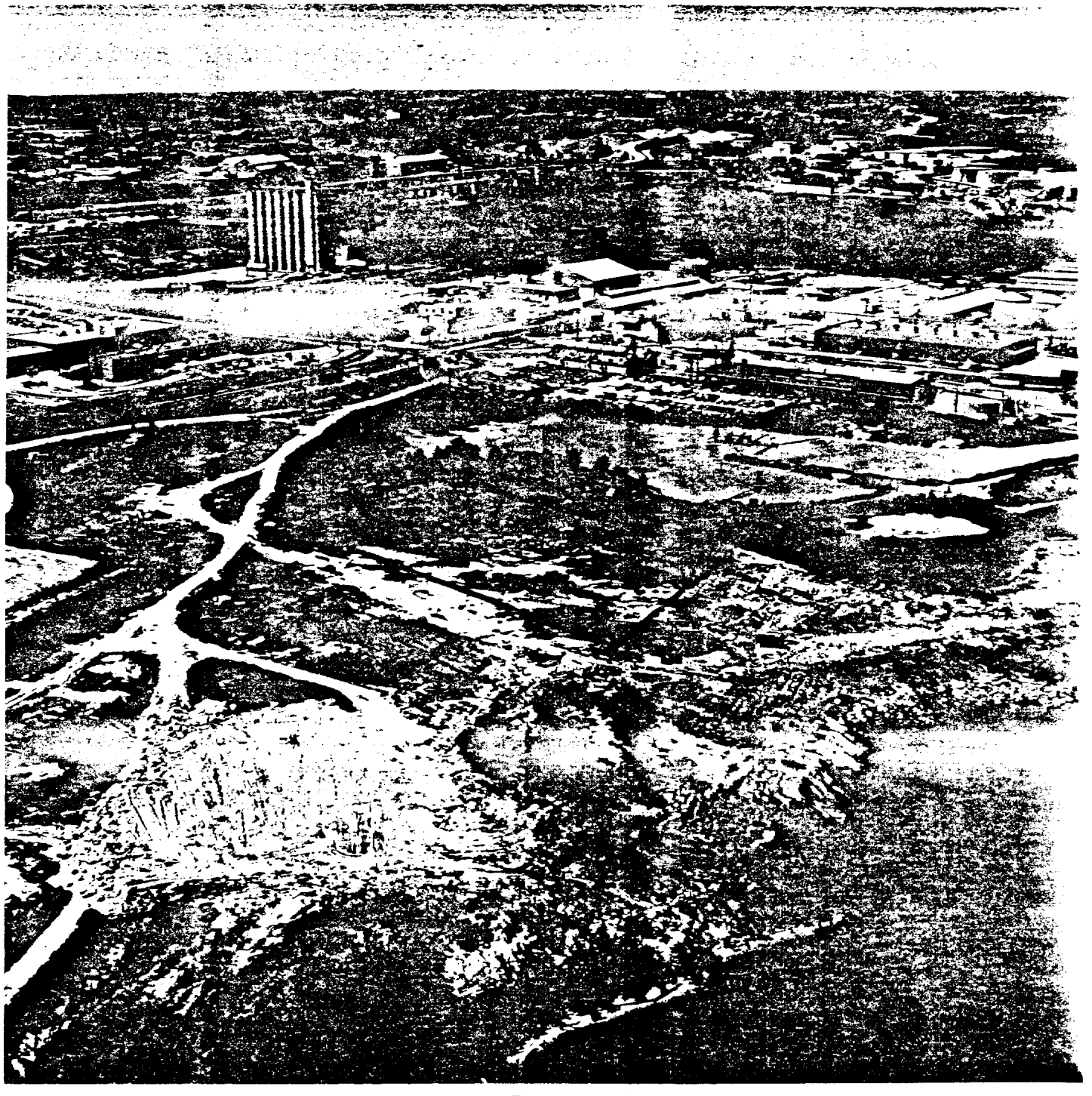
Aerial view of Grace plant in entire foreground. Herring Pond in center. Background includes Curtis Bay on left, U.S. Gypsum and Francis Scott Key Bridge in center and Eastalco pier on right.



AERIAL VIEW APPROACHING FROM THE WEST (CURTIS BAY PRODUCTION FACILITIES IN FOREGROUND.)

7108-112

Credit:
TADDER / Baltimore
501 St. Paul Place
(301) 837 7427

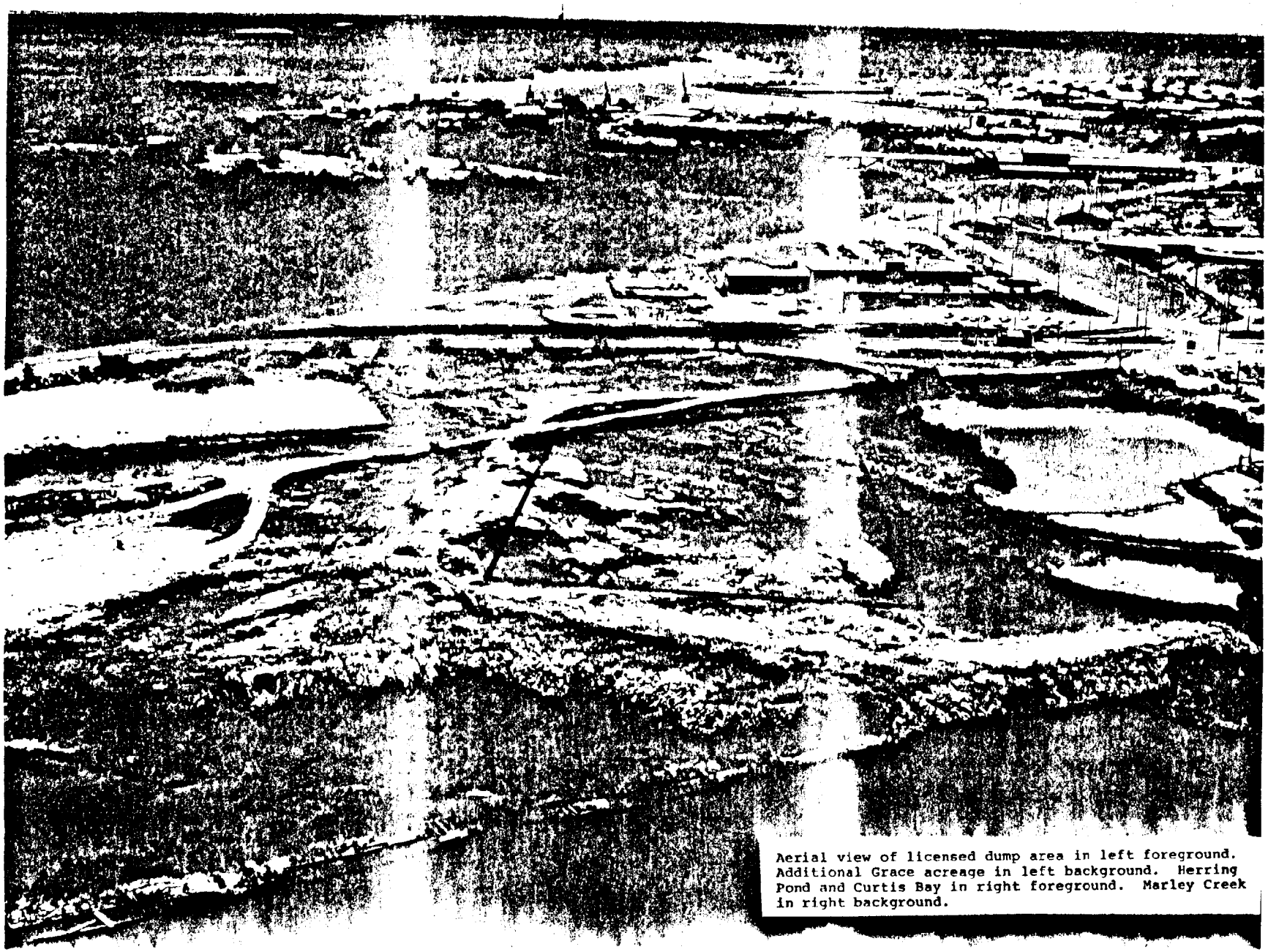


RIAL VIEW FROM NORTHEAST AT LOWER ALTITUDE.

Aerial view of licensed dump area in foreground. Atlantic Cement and Curtis Creek Bridge in left background. Curtis Creek and Hess and Amoco petroleum terminals in right background.

Credit:
TADDER / Baltimore
501 St Paul Place
(301) 837-7427

7108-107



Aerial view of licensed dump area in left foreground. Additional Grace acreage in left background. Herring Pond and Curtis Bay in right foreground. Marley Creek in right background.

AERIAL VIEW FROM THE NORTH (CURTIS BAY.)

Credit
TADDER / Baltimore
501 St. Paul Place
(301) 837-7427

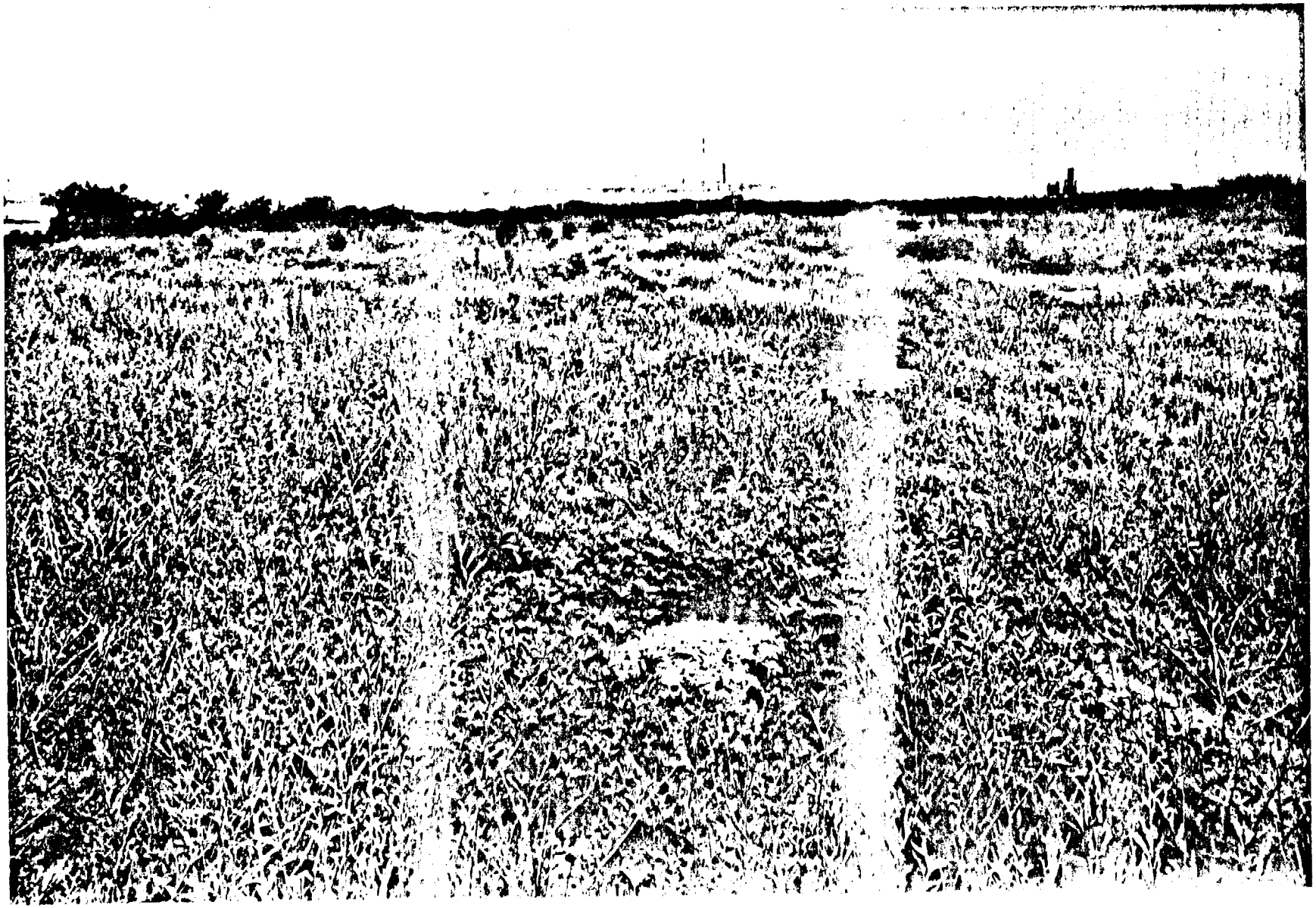
7108-106

RIAL VIEW IMMEDIATELY OVER AREA APPROACHING FROM SOUTHEAST.

Aerial view of licensed dump area in entire foreground. Grace plant in left background. Curtis Bay in right background.

Credit
TADDER / Baltimore
501 St Paul Place
(301) 837-7427

7108-117

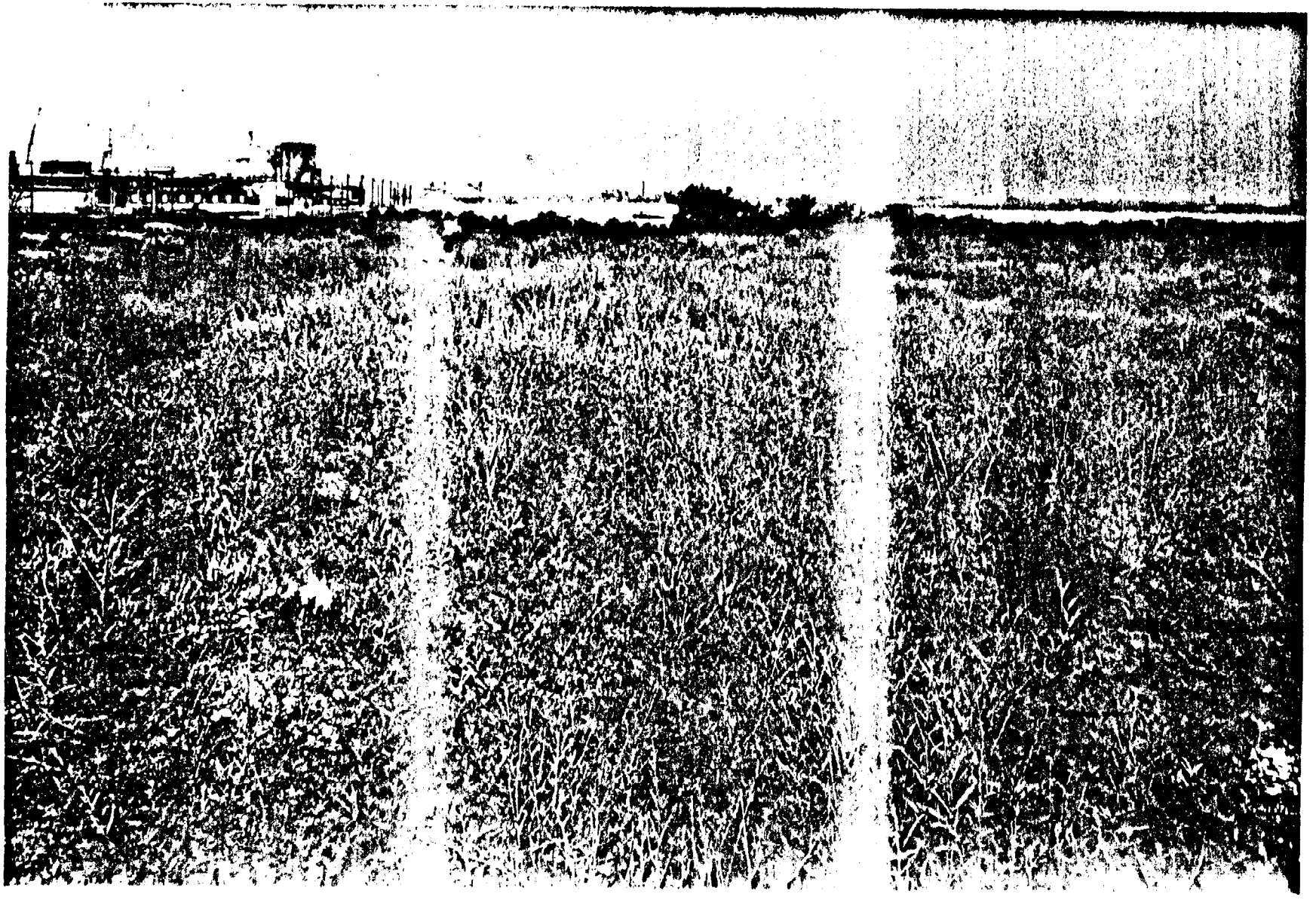


GROUND VIEW OF AREA FROM SOUTHEAST CORNER.

Ground view of disposal area in entire foreground. Curtis Bay and Fairfield in extreme background

7108-126

Credit:
TADDER / Baltimore
501 St. Paul Place
(301) 837-7497

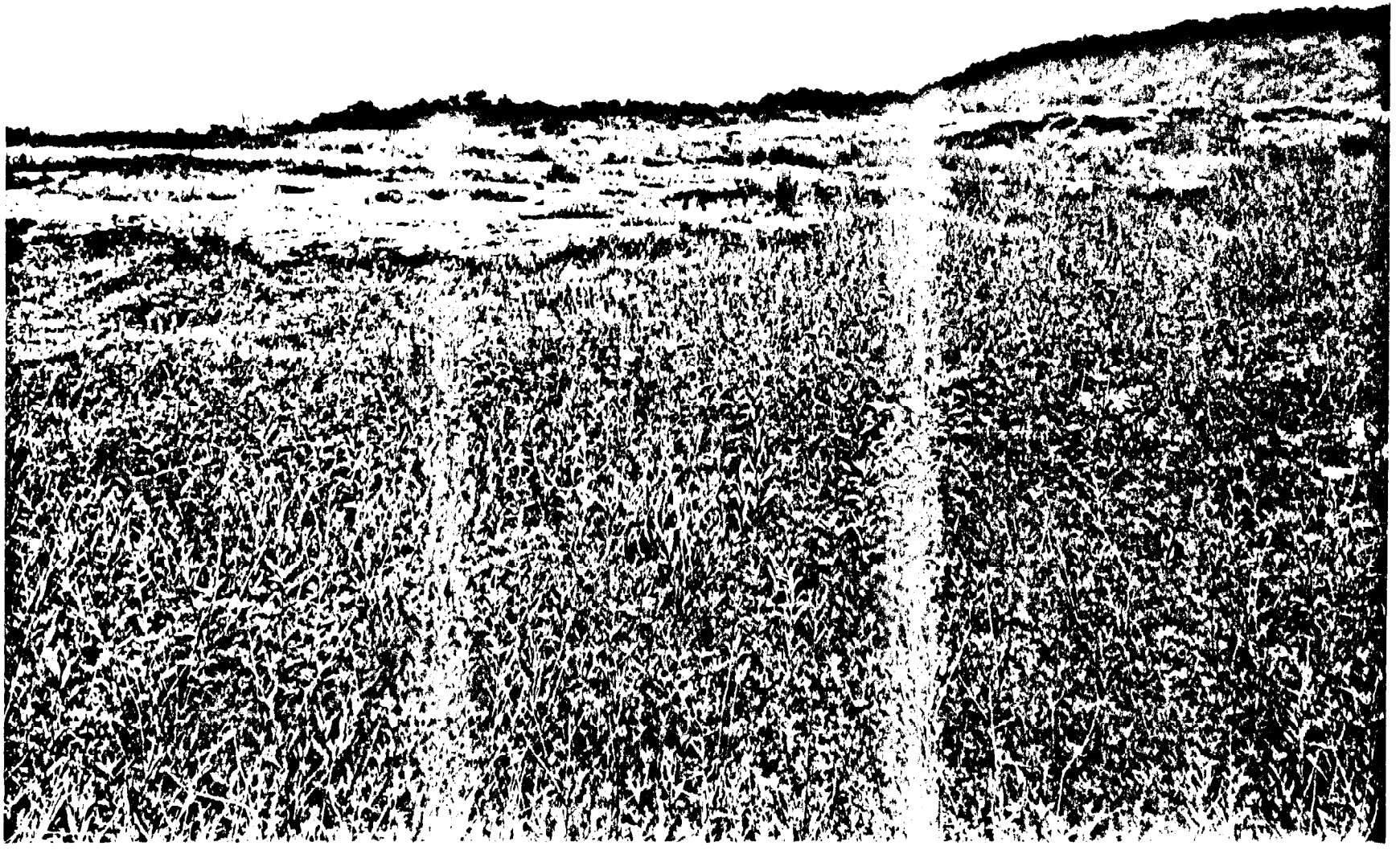


GROUND VIEW OF AREA – CAMERA APPROXIMATELY 15 DEGREES TOWARD THE WEST (CURTIS BAY FACILITIES IN BACKGROUND.)

Ground view of disposal area in entire foreground. Grace plant in left background. Curtis Bay and Fairfield in right background.

7108-125

Credit:
TADDER / Baltimore
501 St. Paul Place
(301) 837-7427

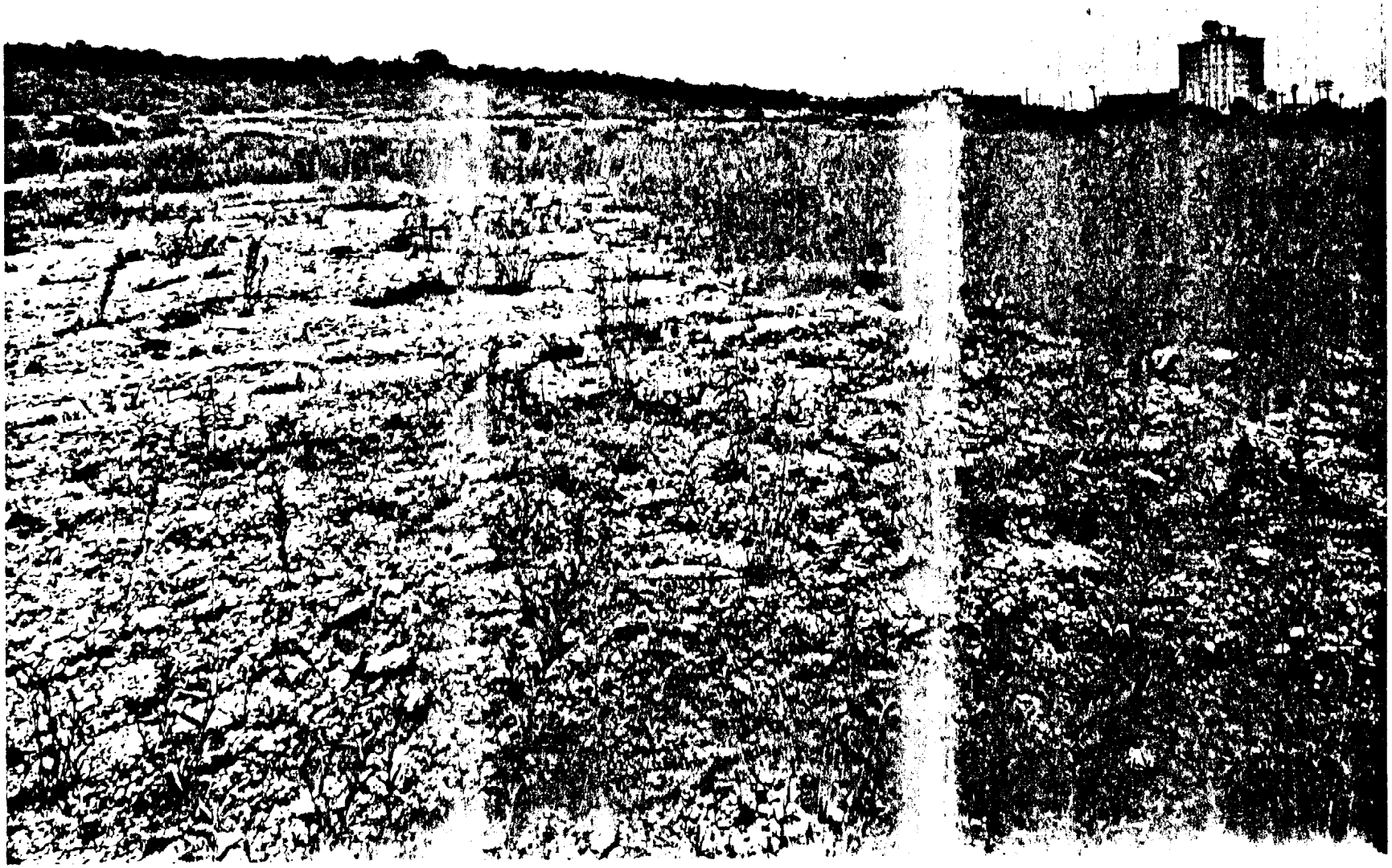


GROUND VIEW OF AREA FROM NORTH, LOOKING SOUTH BY SOUTHEAST.

Ground view of disposal area in entire foreground. U.S. Gypsum in left background. Additional Grace acreage in right background.

7108-130

Credit:
TADDER / Baltimore
501 St. Paul Place
(301) 837-7437

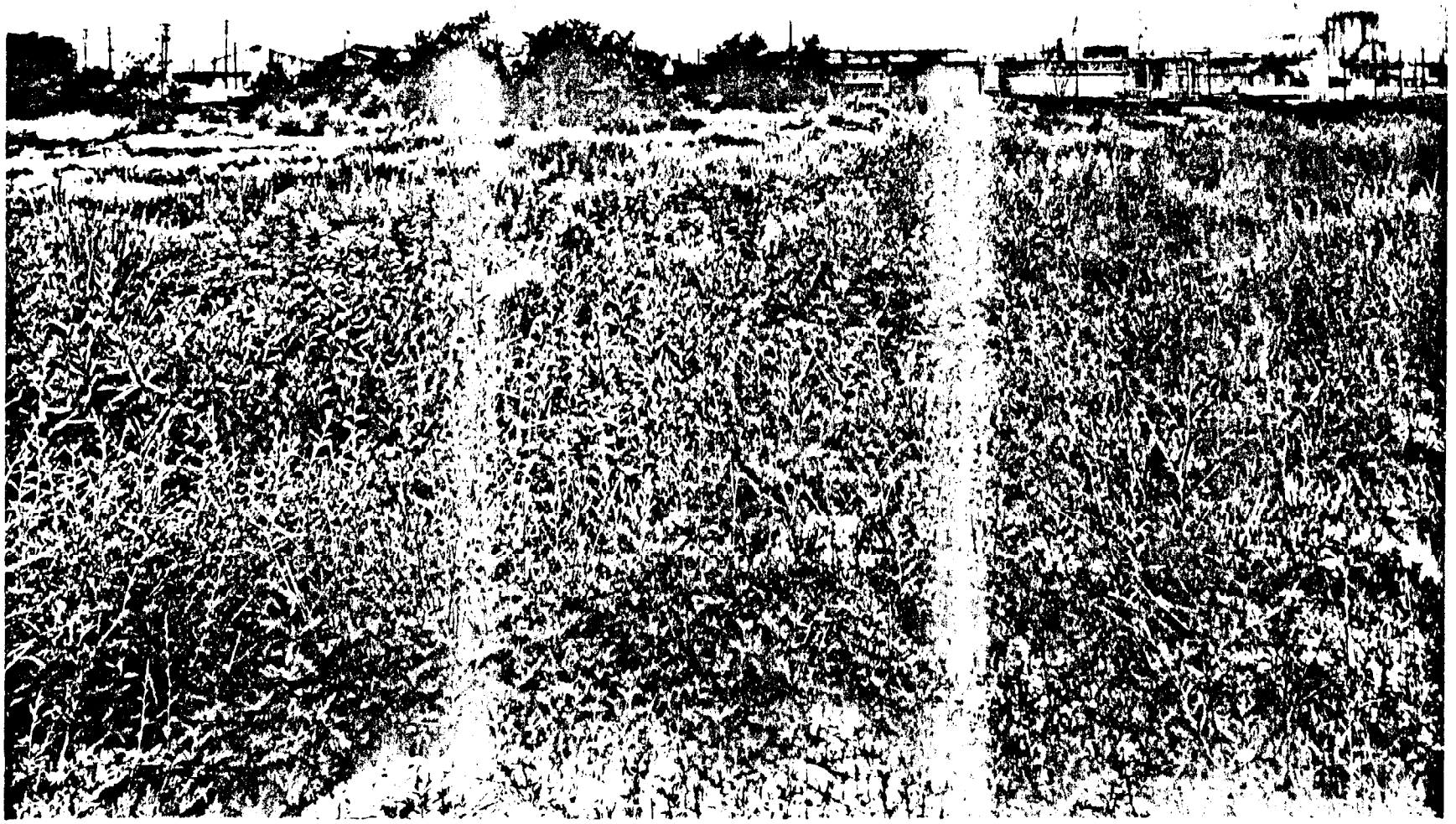


GROUND VIEW OF AREA ABOUT 15 DEGREES FARTHER TO THE SOUTH (ATLANTIC CEMENT IN RIGHT BACKGROUND.)

Ground view of disposal area in entire foreground. Additional Grace acreage in left background. Atlantic Cement in right backgroumd.

7108-134

Credit:
TADDER / Baltimore
501 St. Paul Place
(301) 837 7427

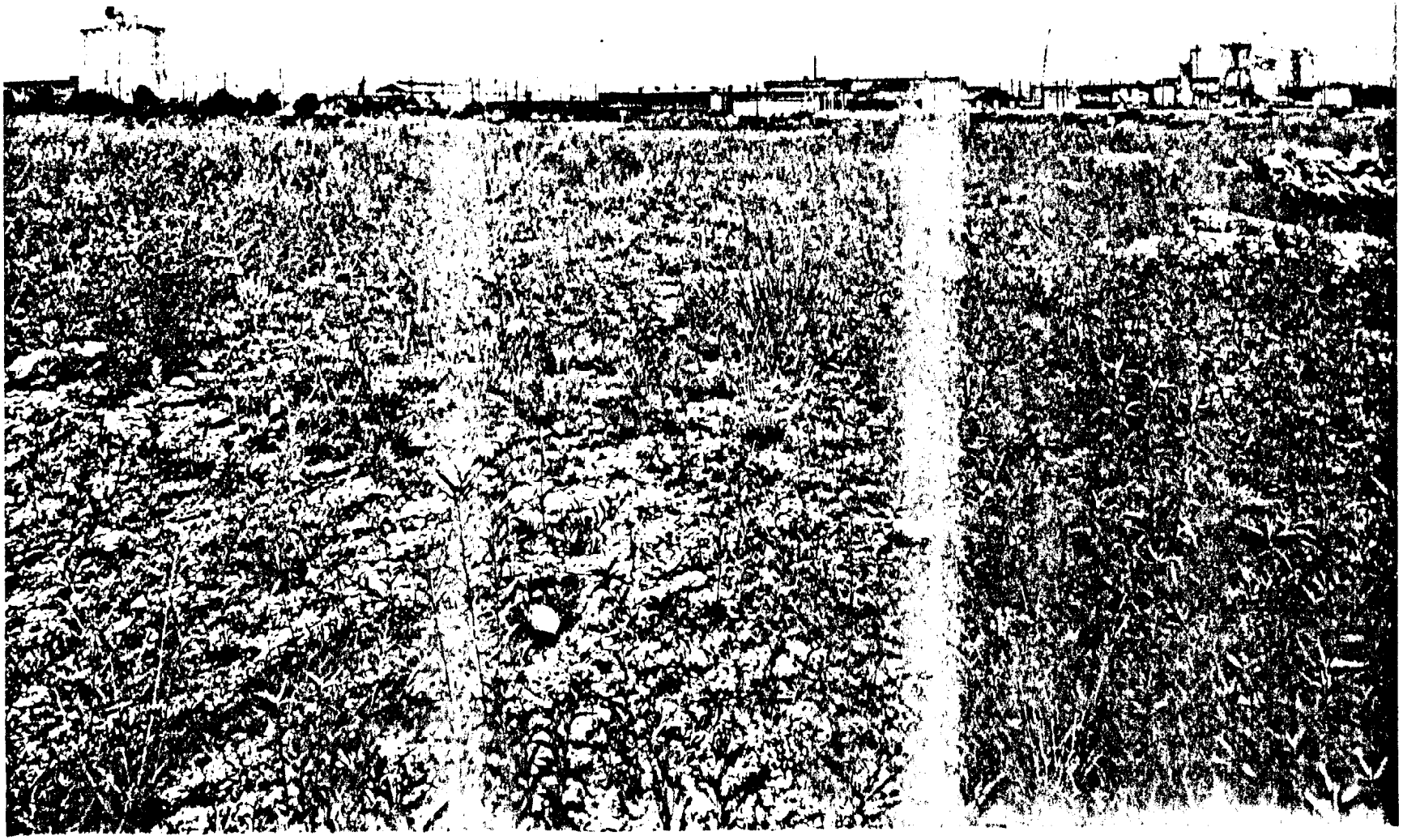


GROUND VIEW OF AREA APPROXIMATELY 15 DEGREES FARTHER TOWARD THE WEST.

Ground view of disposal area in entire foreground. Grace plant in entire background.

7108-132

Credit:
TADDER / Baltimore
501 St. Paul Place
(301) 837-7477



GROUND VIEW OF AREA FROM NORTHEAST CORNER. (CURTIS BAY PLANT AND ATLANTIC CEMENT IN BACKGROUND.)

Ground view of disposal area in entire foreground. Atlantic Cement in left background. Grace plant in center and right background.

7108-13

Credit:
TADDER / Baltimore
501 St. Paul Place
(301) 837-7427

rmc

STEPHEN M. KIM
Executive Vice President

radiation management corporation

UNIVERSITY CITY SCIENCE CENTER

3508 MARKET STREET
PHILADELPHIA, PA 19104
(215) 243-2950

October 5, 1978

Mr. Fred V. Shaw
W.R. Grace & Co.
Davison Chemical Division
P.O. Box 2117
Baltimore, MD 21203

Dear Fred:

Thank you very much for waiting this long for the enclosed report.

The report is prepared to reflect factual matters rather than other information.

It would be beneficial to get together in the near future to discuss this matter.

I am looking forward to hearing from you.

Yours sincerely,

Stephen M. Kim

SMK:lw
enc. - Report +
Attachments
cc: John Hardwicke (w/o enc.)

RADIATION STATUS
OF
W.R.GRACE & CO.
DAVISON CHEMICAL DIVISION
CURTIS BAY PLANT WASTE DEPOSIT AREA

SCOPE OF WORK

The purpose of this study was to measure external radiation levels of the Curtis Bay Plant Waste Deposit Area, and to investigate the possible migration of radioactive material from the deposit site.

SURFACE RADIATION LEVEL OF WASTE DEPOSIT SITE

A Radiation Survey of the surface area was conducted with a portable survey meter calibrated with ^{137}Cs as standard and the measurements ranged from a highest point of 17 mr/hour to background level. The diagrams showing surface radiation are attached. (Attachments A, B, C)

The measurements and their ranges indicate that the radioactive material is spottily dispersed throughout the deposit site; therefore it is difficult to estimate the exact quantity of radioactive material which is present.

In order to evaluate the possible uptake of radioactive material by plantlife at the site, samples were taken of plant material grown in the area during the summer period. Gamma spectral analysis indicated no detectable thorium daughter products.

VERTICAL & HORIZONTAL PROFILE OF THE DEPOSIT

In order to assess dispersion of the radioactive material in the site augered core samples were taken in five locations. The core sample locations (1-5) are shown in Attachment A. Twenty one samples were taken from different depths and different strata in order to characterize the vertical profile of the deposit site. From evaluation of these samples, the vertical profile of the site was constructed as shown in Attachment D. Radioactive material is dispersed in multi-colored fine to coarse sand and industrial waste zones as defined in Attachment D. The twenty one samples were analyzed for gross gamma activity. The results of the analysis, as shown in Attachment E, indicate that the radioactive material is not uniformly deposited throughout the site.

Gamma spectroscopy was performed on core samples from Location 3, 5 and 15 feet depth levels. The results are shown below.

Depth	Th pCi/gm
5 feet	6.2 ± 0.9
15 feet	97 ± 10

These results were calculated considering Thorium and its daughter products to be in equilibrium.

The distribution of radioactive material in the deposit area indicates that there is no certain concentration gradient. The absence of concentration gradient vertically or horizontally indicates the radioactive materials in the deposit to be very insoluble and immobile. Study of the cracking processes used by W.R.Grace & Co. to produce the radioactive waste deposited in the study area verifies the immobility of the radioactive material. The majority of the material deposited consists of monazite residues which are insoluble. Radioactive material at the deposit area may only be migrated by physical mechanisms such as erosion; however, the rocky barren substrate in the vicinity render erosion unlikely.

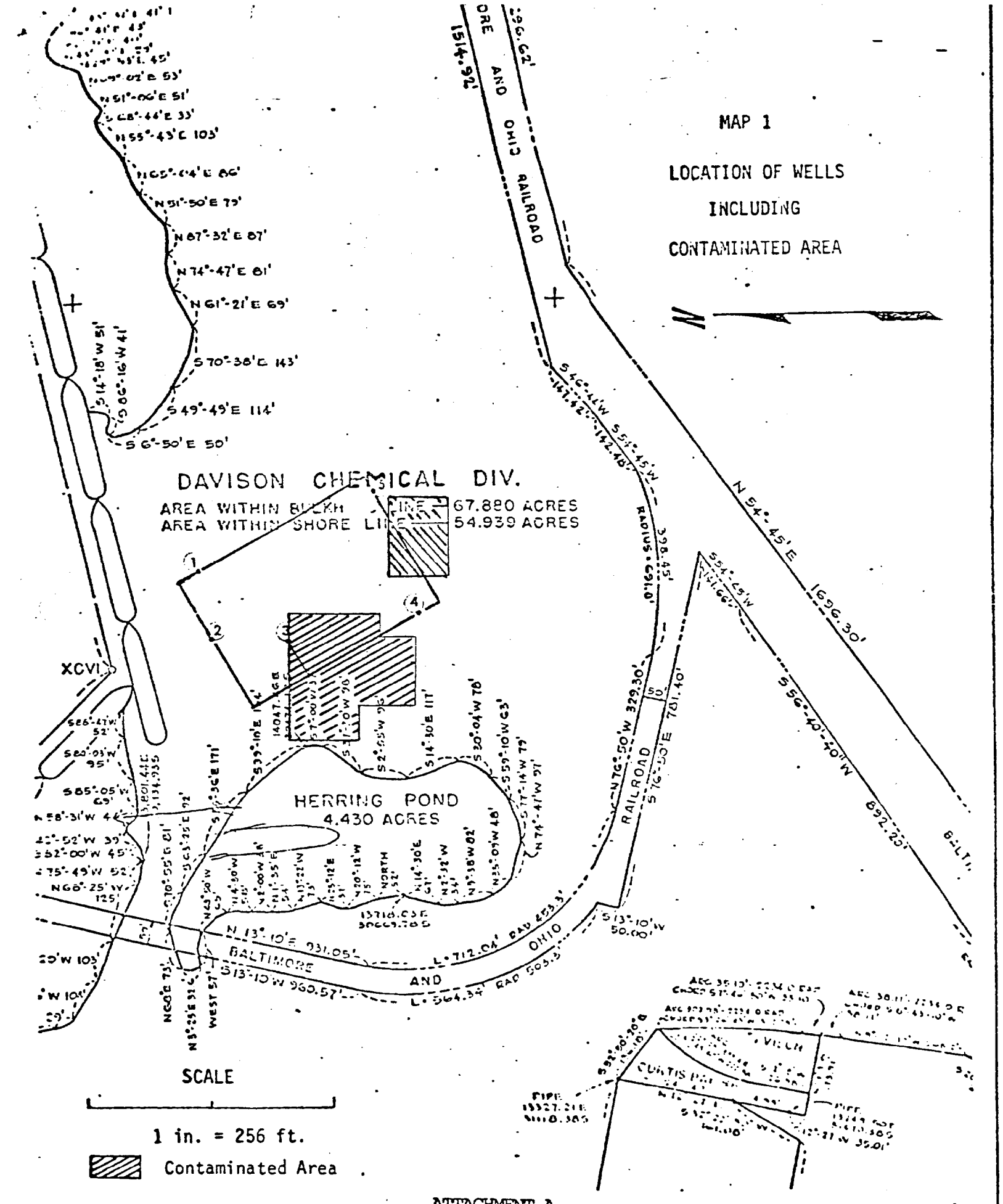
VOLUME OF WASTE MATERIAL

It is estimated that the total volume of waste material possibly contaminated with monazite residue in the two locations outlined in Attachment A is 504,000 cubic feet and 200,000 cubic feet respectively.

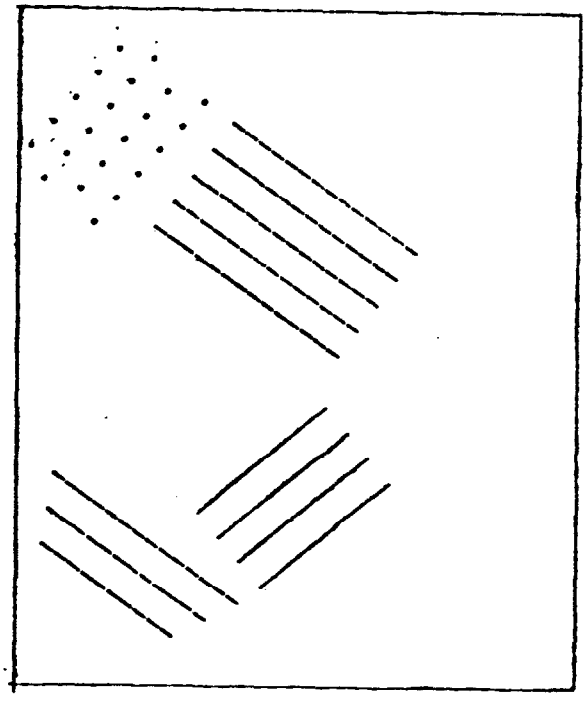
CONCLUSION

Since it is difficult to calculate if all waste material deposited exceeds 0.05% of ThO_2, further investigation should be conducted to verify the concentration of ThO_2.

Upon verification of external radiation levels, W.R.Grace & Co. has instituted control measures to limit access to the deposit site.



ATTACHMENT A



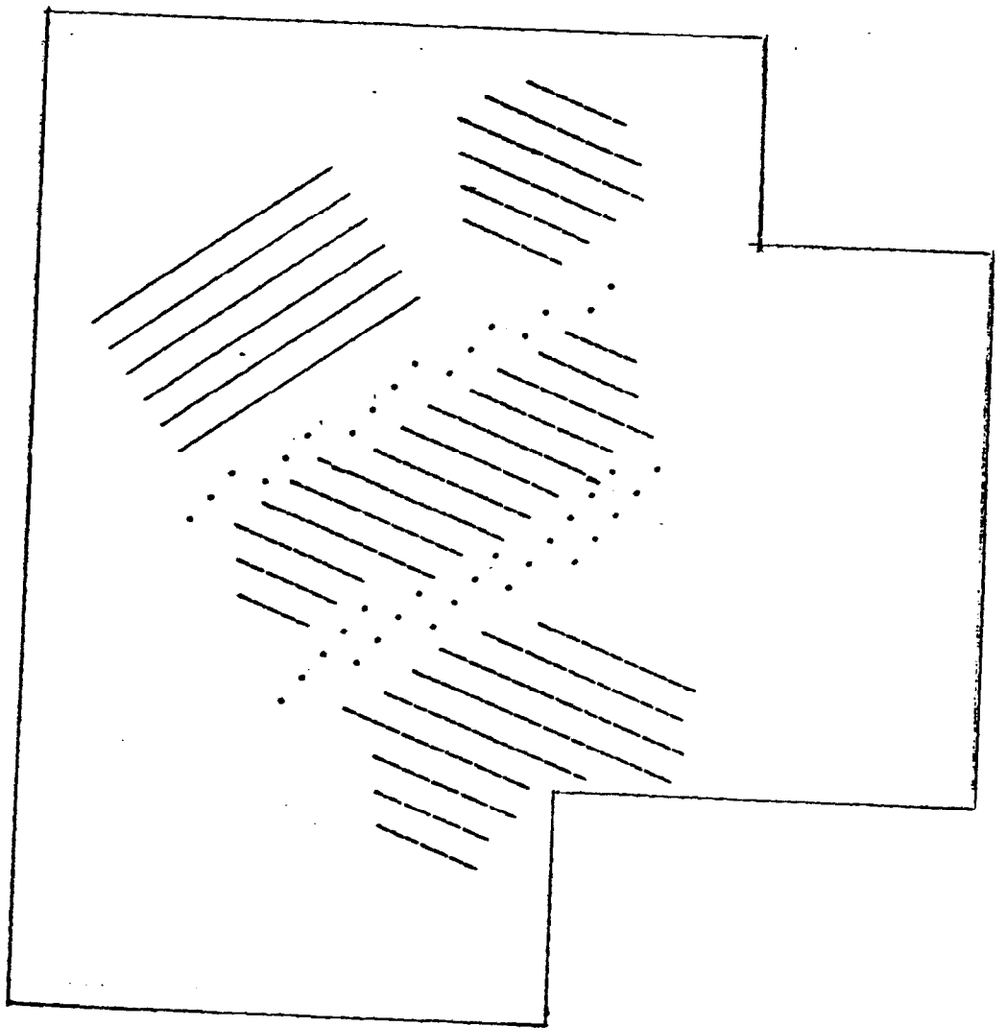
KEY

. . . . = < 0.10 MR/hr

——— = 0.1 to 1.0 MR/hr

_____ = > 1.0 MR/hr

ATTACHMENT B



KEY

. . . . = < 0.10 MR/hr

——— = 0.1 to 1.0 MR/hr

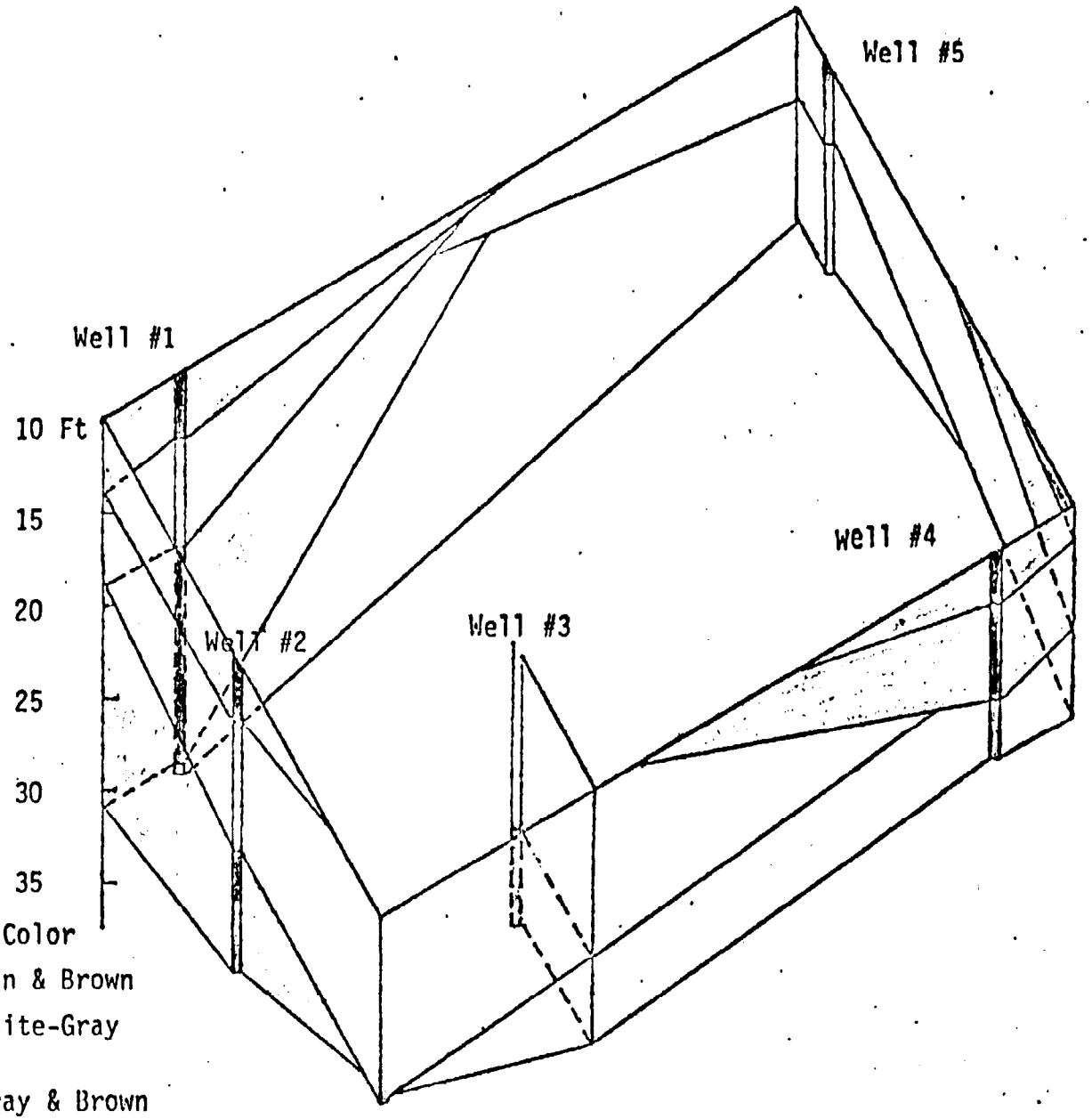
_____ = > 1.0 MR/hr

ATTACHMENT C

ATTACHMENT D

MAP 2

SECTIONAL DIAGRAM SHOWING PRINCIPAL FILL MATERIAL ADJACENT TO THE DAVISON CHEMICAL COMPANY



LEGEND

Horizontal Scale

0 100 200

1 in. = 100 ft.

Vertical Scale

0 10 20

1 in. = 10 ft.

Explaination

Symbol	Material	Color
	Fine to Coarse Sand	Tan & Brown
	Industrial Waste	White-Gray
	Organic Silt (w/lenses-fine silt)	Gray & Brown
	Fine Sand	Orange
	Fine to Coarse Sand	Multi-Colored
	Soil Fill	Brown & Black
	Coal Fill (w/inclusions-Ind. Waste)	Gray & Black

ATTACHMENT E