Remedial Action Plan
Lead Paint Remediation
IBM Poughkeepsie, NY Facility

23 October 1997

INTRODUCTORY SUMMARY

This Remedial Action Plan, which is based on written and verbal guidance received from the New York Department of Environmental Conservation (NYDEC), is being prepared to guide activities related to the remediation of metals contamination in surface and near-surface crushed stone/soil at the IBM facility (Site) in Poughkeepsie, NY. The metals are contained in paint that has flaked off of Air Products and Chemicals, Inc. (Air Products)-owned, aboveground hydrogen storage tubes located at the Site. An analysis of the paint shows it to contain arsenic, barium, chromium and lead. Material will be excavated from the affected area until cleanup standards are reached and confirmed by post-excavation sampling. The excavated area will be restored with appropriate certified-clean backfill material. All contaminated media generated will be properly characterized and disposed.

BACKGROUND INFORMATION

Paint Chip Analysis

A sample of the paint from the hydrogen storage tubes was analyzed for total RCRA metals via EPA methods SW-846 6010A and 7471A. The paint was found to contain 9,650 ppm of lead, 2,520 ppm of chromium, 141 ppm of barium and 34.8 ppm of arsenic. Appendix A contains copies of the chain-of-custody and laboratory reporting paperwork for the paint chip analysis.

Establishment of Cleanup Goals

The cleanup goals were established by following the guidance contained in the 24 January 1994 correspondence from Michael J. O'Tolle, Jr., Director, NYDEC Division of Hazardous Waste Remediation to NYDEC Regional Hazardous Waste Remediation Engineers, Bureau Directors & Section Chiefs entitled, " Division Technical and Administrative Guidance Memorandum: Determination of Soil Cleanup Objectives and Cleanup Levels (see Appendix B for a copy) and through discussions with Mr. Keith Brown, the oversight manager for this remediation from the NYDEC Regional Office located in New Paltz, NY. Table 4 of the memorandum contains the recommended soil cleanup objectives for heavy metals. The recommended soil cleanup levels for arsenic, barium and chromium are either those specifically stated in the table or site background concentrations. Per Mr. Brown, the higher of the two values can be chosen as the acceptable cleanup standard for these contaminants. However, the cleanup standard for lead can only be determined by site background.

On 17 September 1997, a representative of Advanced Environmental Technical Services (AETS) took five background soil samples at the Site. The samples were all taken 6" below grade and in close proximity to the area to be remediated, but far enough away to not be affected by the flaking paint. Samples 1 and 2 were taken in a grassy area adjacent to the crushed stone bed while samples 3, 4,and 5 were obtained in the crushed stone bed. Other samples (locations 6 through 13) taken around the storage tubes were used as a screening tool to predict the amount of material that will have to be excavated. Based on these samples the excavation area is estimated to be a rectangle 60' long x 18' wide and 18" deep. The sampling locations can be found on Figure 1.

The analytical results obtained for the background samples are displayed in Table 1. The average site background concentrations for the metals of interest were determined to be; arsenic - 5 ppm, barium - 41 ppm, chromium- 15 ppm and lead - 28 ppm. The laboratory data report package for these samples can be found in Appendix C.

In Table 2, the average site background concentrations for arsenic, barium, chromium and lead are compared to their NYDEC recommended soil cleanup objectives. Taking the highest value of each, as recommended by Mr. Brown, the project's cleanup goals for these constituents are as follows: arsenic - 7.5 ppm, barium - 300 ppm, chromium - 15 ppm and lead - 28 ppm.

REMEDIATION ACTIVITIES

Excavating

Once the storage tubes have been removed from the area, the impacted crushed stone/soil will be excavated. The remediation activities will be performed by AETS. A copy of their Health & Safety Plan can be found in Appendix D. The excavated material will be placed into lined roll-off containers staged at the Site.

Post-Excavation Sampling

As shown in Figure 2, 13 post-excavation soil samples will be taken; 6 samples around the perimeter of the excavation approximately one every 20 linear feet and 7 samples towards the center of the excavation strategically positioned in the footprint of the former storage tube installation. All samples will be taken at the base of the excavation and will be analyzed for total arsenic, barium, chromium and lead.

Backfilling and Site Restoration

Once post-excavation samples establish that the cleanup standards have been reached, the excavation will be backfilled with certified (either through sampling and analysis or supplier knowledge) clean fill material similar in nature to that which was excavated.

Soil Disposal

A composite sample of the excavated soil will be taken and analyzed for TCLP RCRA metals to determine if the material is an EPA RCRA hazardous waste. Air Products will be the generator of record and regardless of whether or not the material is RCRA hazardous, it will be transported and disposed at the Waste Management landfill in Model City, NY. Air Products is prepared to obtain a temporary hazardous waste EPA ID number from EPA Region 2 should the excavated material be a hazardous waste.

Final Report

A final report summarizing the entire remedial project will prepared and distributed to all key parties.

Table 1

Background Soil Sampling Results

Metals	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample Average
Arsenic	5.27 ppm[1]	4.19	4.74	4.62	5.92	4.95
Barium	57.8	38.9	35.7	32.2	40.4	41.0
Cadmium	0.224 U	0.218 U	0.218 U	0.217 U	0.217 U	
Chromium	18.2	15.0	13.5	13.8	14.1	14.9
Lead	62.8	20.5	14.3	22.3	18.6	27.7
Mercury	0.045	0.044 U	0.044 U	0.043 U	0.065	
Selenium	0.224 U	0.218 U	0.218 U	0.217 U	0.217 U	
Silver	0.280 U	0.272 U	0.273 U	0.272 U	0.272 U	

[1] All values ppm.
U = Not detected, numerical value is minimum detection limit.

Table 2

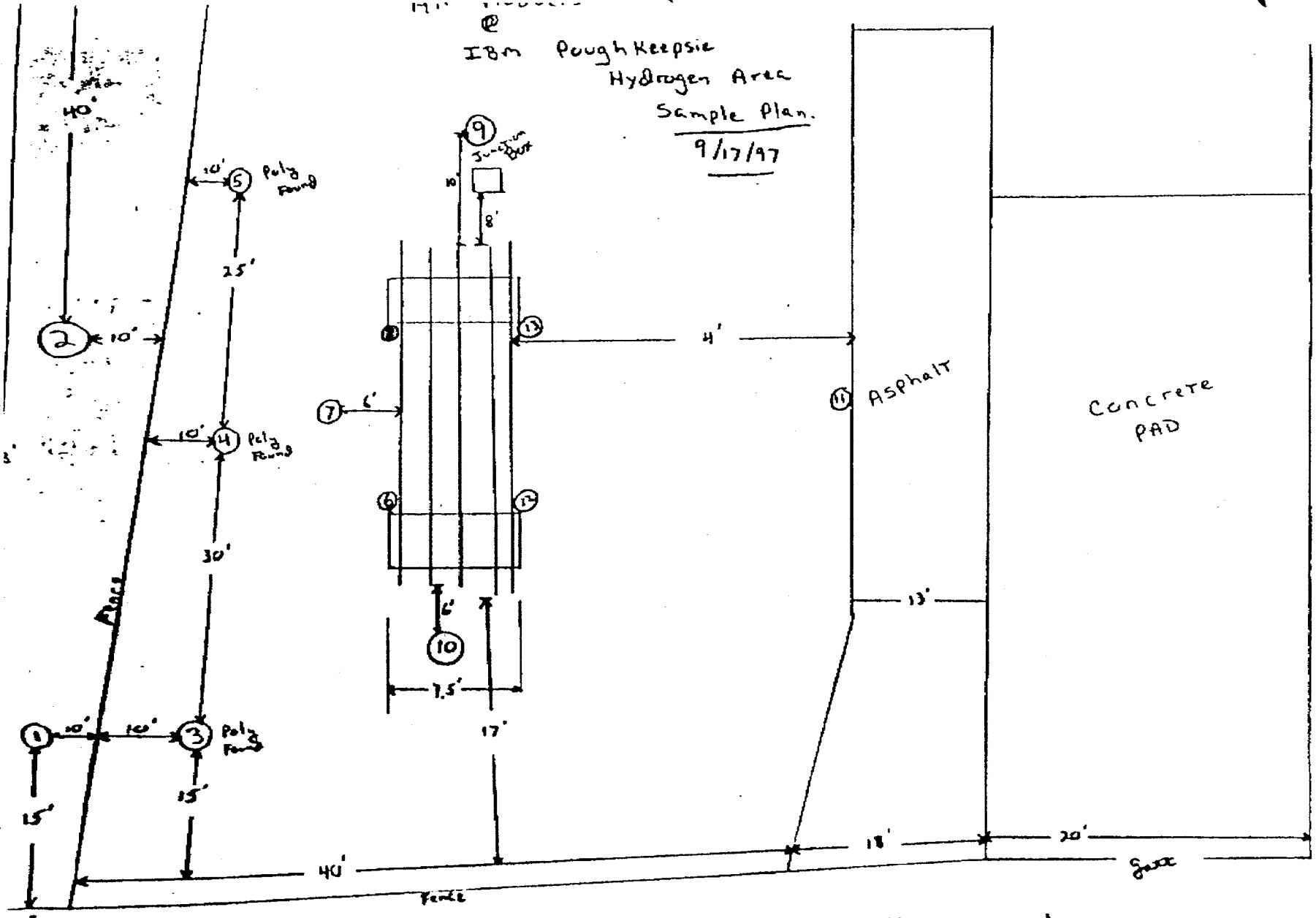
Background Soil Sampling Results Versus NYDEC Recommended Soil Cleanup Objectives

Metals	Background Average (rounded up)	Recommended Soil Cleanup Objective[2]	Project Cleanup Goal[3]
Arsenic	5ppm[1]	7.5	7.5
Barium	41	300	300
Chromium	15	10	15
Lead	28	N/A	28

[1] All values ppm.
[2] Taken from 24 January 1994 NYDEC memo, Table 4
[3] Higher value of the background average and NYDEC recommended soil cleanup objective.

FIGURE 1

@ IBM Poughkeepsie
Hydrogen Area
Sample Plan.
9/17/97



1). Samples #1 - #5 → 1 sample each @ approx. 6" below soil.

2). Samples #6A, 7A, 8A, 9A, 10A, 11A, 12A, 13A → 1 sample each @ 3" below soil.

#6B, 7B, 8B, 9B, 10B, 11B, 12B, 13B → 1 sample each @ 15" below soil.

AIR PRODUCTS

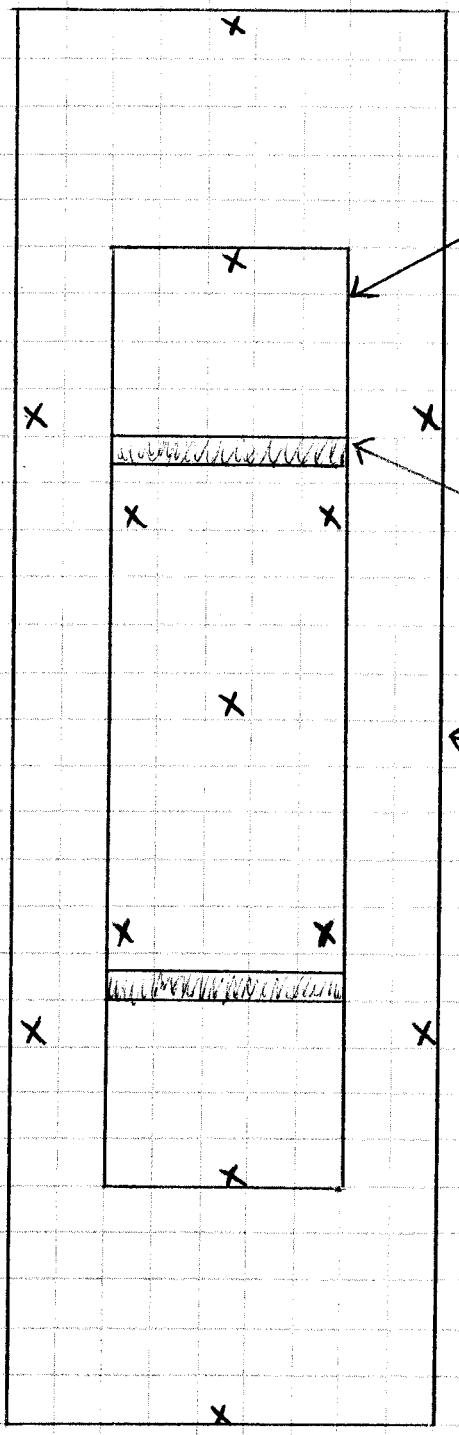
CALCULATION SHEET

FIGURE 2

SIGNATURE _____ CHARGE PROJ. NO. _____

TITLE: POST-EXCAVATION SAMPLING PLAN IBM POUGHKEEPSIE FACILITY. SHEET _____

DATE _____



X = SAMPLING POINTS
1 BLOCK = 2'

Appendix A

Lancaster Laboratories
A division of Thermo Analytical Inc.

LLI Sample No. SW 2727649
Collected: 6/11/97 at 12:00 by MC

Submitted: 6/16/97 Reported: 6/22/97
Discard: 7/ 7/97

Paint Chips (Sample #MCIBM) Grab Sample

Poughkeepsie, NY Facility

Account No: 01684
Air Products & Chemicals, Inc.
7201 Hamilton Blvd.
Allentown PA 18195-1526

P.O. XC-M1158
Rel.

CAT NO.	ANALYSIS NAME	AS RECEIVED RESULTS	LIMIT OF QUANTITATION	UNITS
1646	Barium	141.	20.	mg/kg
1649	Cadmium	< 4.0	4.0	mg/kg
1651	Chromium	2,520.	7.9	mg/kg
1655	Lead	9,650.	20.	mg/kg
1666	Silver	< 4.0	4.0	mg/kg
6935	Arsenic TR	34.8	2.0	mg/kg
6936	Selenium TR	< 1.0	1.0	mg/kg
0159	Mercury	< 0.096	0.096	mg/kg

1 COPY TO Air Products & Chemicals, Inc. ATTN: Mr Edward J. Dulac

Questions? Contact your Client Services Representative
Lisa M. Hetrick at (717) 656-2300
21:03:28 D 0001 1 569438
320 25.00 00026100 ASR000

MEMBER ACIL

Lancaster Laboratories
2425 New Holland Pike
PO Box 12425
Lancaster, PA 17605-2425
717-656-2300 Fax: 717-656-2681

Respectfully Submitted
Ramona V. Layman
Manager, Metals/Leachates

Lancaster Laboratories
A division of Thermo Analytical Inc.

LABORATORY CHRONICLE

LLI Sample No. SW 2727649
Collected: 06/11/97 at 12:00 by MC

Submitted: 06/16/97

Account No: 01684
Air Products & Chemicals, Inc.
7201 Hamilton Blvd.
Allentown PA 18195-1526

Paint Chips (Sample #MCIBM) Grab Sample

Poughkeepsie, NY Facility
SDG#:

CAT NO	ANALYSIS NAME	METHOD	TRIAL	ANALYSIS DATE AND TIME	ANALYST
1646	Barium	SW-846 6010A	1	06/17/97 2224	Donna R. Sackett
1649	Cadmium	SW-846 6010A	1	06/17/97 2224	Donna R. Sackett
1651	Chromium	SW-846 6010A	1	06/17/97 2224	Donna R. Sackett
1655	Lead	SW-846 6010A	1	06/17/97 2224	Donna R. Sackett
1666	Silver	SW-846 6010A	1	06/17/97 2224	Donna R. Sackett
5708	SW SW846 ICP Digest	SW-846 3050A	1	06/17/97 1127	Rebekah K. Fox
6935	Arsenic TR	SW-846 6010A	1	06/17/97 2224	Donna R. Sackett
6936	Selenium TR	SW-846 6010A	1	06/17/97 2224	Donna R. Sackett
0159	Mercury	SW-846 7471A	1	06/19/97 1347	Damary S. Valentin
5711	SW SW846 Hg Digest	SW-846 7471A modified	1	06/17/97 1609	Timothy J. Shadle

Lancaster Laboratories
A division of Thermo Analytical Inc.

Acct# 1684 LL# 2727649

Please print. Instructions on reverse side correspond with circled numbers. SCR#:

(1) [redacted]: Air Products and Chemicals, Inc.
[redacted] 7201 Hamilton Boulevard
[redacted] Allentown, PA. 18195-1501
P.O. [redacted]#: XC-M1158 Consultant Work Release #:
Site Address: Poughkeepsie, NY Facility
Sampler: Melanie Chaney
APCI [redacted] Contact: Edward J. Dulac ph 610-481-6239 Fax 610-481-6186

(2) Sample Identification | Date Collected | Time Collected | (3) Grab | Composite | (4) Matrix: Soil | Potable Water | NPDES Water | Oil | Air

(5) Analyses Requested — List total number of containers in the box under each analysis.
BTEX/602 ☐ 8020 ☐ with MTBE ☐ NAPH ☐
GC/FID GRO ☐ CA-LUFT ☐ API ☐
DRO ☐
PCB 8080 only ☐ TPH 418.1 ☐
EPA 624/PPL ☐ 8240 ☐ LS (+15) ☐
EPA 625/PPL ☐ 8270 ☐ LS (+25) ☐
PAH: EPA 610 ☐ 8310 ☐
TCLP Metals ☐ VOA ☐ Semi-VOA ☐ Pest ☐ Herb ☐
EPA Metals - Priority Pollutant ☐ RCRA ☒
Lead 239.2 ☐ 7420 ☐ 60[illegible] ☐ 7421 ☐
Corrosivity ☐ Flash Point ☐ Reactivity ☐
AIR BTEX / C1-C4 / C5-C8 ☐ Halocarbons ☐

(6) Remarks | Temperature of samples upon receipt (if requested)

Sample Identification	Date Collected	Time Collected	Grab	Composite	Soil	Potable Water	NPDES Water	Oil	Air	RCRA	Remarks
Paint Chips (sample # MCIRM)	6/11/97	12:00	X							X	
Per Lisa Hetrick:											
Except for mercury, RCRA metals (total) results will be available within 48 hr. (≈ $180 cost for rapid turnaround)											

(8) Turnaround Time Requested (TAT) (please circle):
Overnight 24 hr. (48 hr.)
72 hr. other ____ day [redacted]

For Lancaster Laboratories use only
Account #:
Sample #:

Relinquished by:	Date	Time	Received by:	Date	Time
Edward J. Dulac	6/16/97	14:48	Donald Wagner	6-16-97	1448
Donald Wagner	6-16-97	1638			
			Kathleen Zappia	6/16/97	1638

2425 New Holland Pike, PO Box 12425, Lancaster, PA 17605-2425 (717) 656-2300 Copies: White and yellow should accompany samples to Lancaster Laboratories. The pink copy should be retained by the client 2466 Rev. 6/1/95

Appendix B

New York State Department of Environmental Conservation

MEMORANDUM

TO: Regional Haz. Waste Remediation Engineers, Bureau Dirs. & Section Chiefs
FROM: Michael J. O'Toole, Jr., Director, Div. of Hazardous Waste Remediation
SUBJECT: DIVISION TECHNICAL AND ADMINISTRATIVE GUIDANCE MEMORANDUM: DETERMINATION OF SOIL CLEANUP OBJECTIVES AND CLEANUP LEVELS
DATE: JAN 24 1994

Michael J. O'Toole Jr.

The cleanup goal of the Department is to restore inactive hazardous waste sites to predisposal conditions, to the extent feasible and authorized by law. However, it is recognized that restoration to predisposal conditions will not always be feasible.

1. INTRODUCTION:

This TAGM provides a basis and procedure to determine soil cleanup levels at individual Federal Superfund, State Superfund, 1986 EQBA Title 3 and Responsible Party (RP) sites, when the Director of the DHWR determines that cleanup of a site to predisposal conditions is not possible or feasible.

The process starts with development of soil cleanup objectives by the Technology Section for the contaminants identified by the Project Managers. The Technology Section uses the procedure described in this TAGM to develop soil cleanup objectives. Attainment of these generic soil cleanup objectives will, at a minimum, eliminate all significant threats to human health and/or the environment posed by the inactive hazardous waste site. Project Managers should use these cleanup objectives in selecting alternatives in the Feasibility Study (FS). Based on the proposed selected remedial technology (outcome of FS), final site specific soil cleanup levels are established in the Record of Decision (ROD) for these sites.

It should be noted that even after soil cleanup levels are established in the ROD, these levels may prove to be unattainable when remedial construction begins. In that event, alternative remedial actions or institutional controls may be necessary to protect the environment.

2. BASIS FOR SOIL CLEANUP OBJECTIVES:

The following alternative bases are used to determine soil cleanup objectives:

(a) Human health based levels that correspond to excess lifetime

cancer risks of one in a million for Class A[1] and B[2] carcinogens, or one in 100,000 for Class C[3] carcinogens. These levels are contained in USEPA's Health Effects Assessment Summary Tables (HEASTs) which are compiled and updated quarterly by the NYSDEC's Division of Hazardous Substances Regulation;

(b) Human health based levels for systemic toxicants, calculated from Reference Doses (RfDs). RfDs are an estimate of the daily exposure an individual (including sensitive individuals) can experience without appreciable risk of health effects during a lifetime. An average scenario of exposure in which children ages one to six (who exhibit the greatest tendency to ingest soil) is assumed. An intake rate of 0.2 gram/day for a five-year exposure period for a 16-kg child is assumed. These levels are contained in USEPA's Health Effects Assessment Summary Tables (HEASTs) which are compiled and updated quarterly by the NYSDEC's Division of Hazardous Substances Regulation;

(c) Environmental concentrations which are protective of groundwater/drinking water quality; based on promulgated or proposed New York State Standards;

(d) Background values for contaminants; and

(e) Detection limits.

A recommendation on the appropriate cleanup objective is based on the criterion that produces the most stringent cleanup level using criteria a, b, and c for organic chemicals, and criteria a, b, and d for heavy metals. If criteria a and/or b are below criterion d for a contaminant, its background value should be used as the cleanup objective. However, cleanup objectives developed using this approach must be, at a minimum, above the method detection limit (MDL) and it is preferable to have the soil cleanup objectives above the Contract Required Quantitation Limit (CRQL) as defined by NYSDEC. If the cleanup objective of a compound is "non-detectable", it should mean that it is not detected at the MDL. Efforts should be made to obtain the best MDL detection possible when selecting a laboratory and analytical protocol.

The water/soil partitioning theory is used to determine soil cleanup objectives which would be protective of groundwater/drinking water quality for its best use. This theory is conservative in nature and assumes that contaminated soil and groundwater are in direct contact. This theory is based upon the ability of organic matter in soil to adsorb organic chemicals. The approach predicts the maximum amount of contamination that may remain in soil so that leachate from the contaminated soil will not violate groundwater and/or drinking water

standards.

(1) Class A are proved human carcinogens
(2) Class B are probable human carcinogens
(3) Class C are possible human carcinogens

This approach is not used for heavy metals, which do not partition appreciably into soil organic matter. For heavy metals, eastern USA or New York State soil background values may be used as soil cleanup objectives. A list of values that have been tabulated is attached. Soil background data near the site, if available, is preferable and should be used as the cleanup objective for such metals. Background samples should be free from the influences of this site and any other source of contaminants. Ideal background samples may be obtained from uncontaminated upgradient and upwind locations.

3. DETERMINATION OF SOIL CLEANUP GOALS FOR ORGANICS IN SOIL FOR PROTECTION OF WATER QUALITY

Protection of water quality from contaminated soil is a two-part problem. The first is predicting the amount of contamination that will leave the contaminated media as leachate. The second part of the problem is to determine how much of that contamination will actually contribute to a violation of groundwater standards upon reaching and dispersing into groundwater. Some of the contamination which initially leaches out of soil will be absorbed by other soil before it reaches groundwater. Some portion will be reduced through natural attenuation or other mechanism.

PART A: PARTITION THEORY MODEL

There are many test and theoretical models which are used to predict leachate quality given a known value of soil contamination. The Water-Soil Equilibrium Partition Theory is used as a basis to determine soil standard or contamination limit for protection of water quality by most of the models currently in use. It is based on the ability of organic carbon in soil to adsorb contamination. Using a water quality value which may not be exceeded in leachate and the partition coefficient method, the equilibrium concentration (Cs) will be expressed in the same units as the water standards. The following expression is used:

Allowable Soil Concentration $Cs = f \times Koc \times Cw$ . . . . (1)

Where: f = fraction of organic carbon of the natural soil medium.

Koc = partition coefficient between water and soil media. Koc can be estimated by the following equation:

log Koc = 3.64 - 0.55 log S

S = water solubility in ppm
Cw = appropriate water quality value from TOGS 1.1.1

Most Koc and S values are listed in the Exhibit A-1 of the USEPA Superfund Public Health Evaluation Manual (EPA/540/1-86/060). The Koc values listed in this manual should be used for the purpose. If the Koc value for a contaminant is not listed, it should be estimated using the above mentioned equation.

PART B: PROCEDURE FOR DETERMINATION OF SOIL CLEANUP OBJECTIVES

When the contaminated soil is in the unsaturated zone above the water table, many mechanisms are at work that prevent all of the contamination that would leave the contaminated soil from impacting groundwater. These mechanisms occur during transport and may work simultaneously. They include the following: (1) volatility, (2) sorption and desorption, (3) leaching and diffusion, (4) transformation and degradation, and (5) change in concentration of contaminants after reaching and/or mixing with the groundwater surface. To account for these mechanisms, a correction factor of 100 is used to establish soil cleanup objectives. This value of 100 for the correction is consistent with the logic used by EPA in its Dilution Attenuation Factor (DAF) approach for EP Toxicity and TCLP. (Federal Register/Vol. 55, No. 61, March 29, 1990/Pages 11826-27). Soil cleanup objectives are calculated by multiplying the allowable soil concentration by the correction factor. If the contaminated soil is very close (<3' - 5') to the groundwater table or in the groundwater, extreme caution should be exercised when using the correction factor of 100 (one hundred) as this may not give conservative cleanup objectives. For such situations the Technology Section should be consulted for site-specific cleanup objectives.

Soil cleanup objectives are limited to the following maximum values. These values are consistent with the approach promulgated by the States of Washington and Michigan.

1) Total VOCs $\leq$ 10 ppm.
2) Total Semi VOCs $\leq$ 500 ppm.
3) Individual Semi VOCs $\leq$ 50 ppm.
4) Total Pesticides $\leq$ 10 ppm.

One concern regarding the semi-volatile compounds is that some of these compounds are so insoluble that their Cs values are fairly large. Experience (Draft TOGS on Petroleum

Contaminated Soil Guidance) has shown that soil containing some of these insoluble substances at high concentrations can exhibit a distinct odor even though the substance will not leach from the soil. Hence any time a soil exhibits a discernible odor nuisance, it shall not be considered clean even if it has met the numerical criteria.

4. DETERMINATION OF FINAL CLEANUP LEVELS:

Recommended soil cleanup objectives should be utilized in the development of final cleanup levels through the Feasibility Study (FS) process. During the FS, various alternative remedial actions developed during the Remedial Investigation (RI) are initially screened and narrowed down to the list of potential alternative remedial actions that will be evaluated in detail. These alternative remedial actions are evaluated using the criteria discussed in TAGM 4030, Selection of Remedial Actions at Inactive Hazardous Waste Sites, revised May 15, 1990, and the preferred remedial action will be selected. After the detailed evaluation of the preferred remedial action, the final cleanup levels which can be actually achieved using the preferred remedial action must be established. Remedy selection, which will include final cleanup levels, is the subject of TAGM 4030.

Recommended soil cleanup objectives that have been calculated by the Technology Section are presented in Appendix A. These objectives are based on a soil organic carbon content of 1% (0.01) and should be adjusted for the actual organic carbon content if it is known. For determining soil organic carbon content, use attached USEPA method (Appendix B). Please contact the Technology Section, Bureau of Program Management for soil cleanup objectives not included in Appendix A.

Attachments

cc: T. Jorling
J. Lacey
M. Gerstman
A. DeBarbieri
E. Sullivan
T. Donovan
C. Sullivan
J. Eckl
R. Davies
R. Dana
C. Goddard
E. McCandless
P. Counterman
J. Davis
J. Kelleher
J. Colquhoun
D. Persson
A. Carlson
M. Birmingham
D. Johnson
B. Hogan
Regional Directors
Regional Engineers
Regional Solid and Haz. Waste Engrs.
Regional Citizen Participation Spec.

APPENDIX A

TABLE 1

Recommended soil cleanup objectives (mg/kg or ppm)

Volatile Organic Contaminants

Contaminant	Partition coefficient Koc	Groundwater Standards/ Criteria Cw ug/l or ppb.	a Allowable Soil conc. ppm. Cs	b ** Soil Cleanup objectives to Protect GW Quality (ppm)	USEPA Health Based (ppm) Carcinogens	Systemic Toxicants	CRQL (ppb)	*** Rec.soil Clnup Objct (ppm)
Acetone	2.2	50	0.0011	0.11	N/A	8,000	10	0.2
Benzene	83	0.7	0.0006	0.06	24	N/A	5	0.06
Benzoic Acid	54*	50	0.027	2.7	N/A	300,000	5	2.7
2-Butanone	4.5*	50	0.003	0.3	N/A	4,000	10	0.3
Carbon Disulfide	54*	50	0.027	2.7	N/A	8,000	5	2.7
Carbon Tetrachloride	110*	5	0.006	0.6	5.4	60	5	0.6
Chlorobenzene	330	5	0.017	1.7	N/A	2,000	5	1.7
Chloroethane	37*	50	0.019	1.9	N/A	N/A	10	1.9
Chloroform	31	7	0.003	0.30	114	800	5	0.3
Dibromochloromethane	N/A	50	N/A	N/A	N/A	N/A	5	N/A
1,2-Dichlorobenzene	1,700	4.7	0.079	7.9	N/A	N/A	330	7.9
1,3-Dichlorobenzene	310 *	5	0.0155	1.55	N/A	N/A	330	1.6
1,4-Dichlorobenzene	1,700	5	0.085	8.5	N/A	N/A	330	8.5
1,1-Dichloroethane	30	5	0.002	0.2	N/A	N/A	5	0.2
1,2-Dichloroethane	14	5	0.001	0.1	7.7	N/A	5	0.1
1,1-Dichloroethene	65	5	0.004	0.4	12	700	5	0.4
1,2-Dichloroethene(trans)	59	5	0.003	0.3	N/A	2,000	5	0.3
1,3-dichloropropane	51	5	0.003	0.3	N/A	N/A	5	0.
Ethylbenzene	1,100	5	0.055	5.5	N/A	8,000	5	5
113 Freon(1,1,2 Trichloro-1,2,2 Trifluoroethane)	1,230*	5	0.060	6.0	N/A	200,000	5	6.0
Methylene chloride	21	5	0.001	0.1	93	5,000	5	0.1
4-Methyl-2-Pentanone	19*	50	0.01	1.0	N/A	N/A	10	1.0
Tetrachloroethene	277	5	0.014	1.4	14	800	5	1.4
1,1,1-Trichloroethane	152	5	0.0076	0.76	N/A	7,000	5	0.8
1,1,2,2-Tetrachloroethane	118	5	0.006	0.6	35	N/A	5	0.6
1,2,3-trichloropropane	68	5	0.0034	0.34	N/A	80	5	0.4
1,2,4-Trichlorobenzene	670 *	5	0.034	3.4	N/A	N/A	330	3.4
Toluene	300	5	0.015	1.5	N/A	20,000	5	1.5
Trichloroethene	126	5	0.007	0.70	64	N/A	5	0.7
Vinyl chloride	57	2	0.0012	0.12	N/A	N/A	10	0.2
Xylenes	240	5	0.012	1.2	N/A	200,000	—	1.2

a. Allowable Soil Concentration Cs = f x Cw x Koc

b. Soil cleanup objective = Cs x Correction Factor (CF)

N/A is not available

* Partition coefficient is calculated by using the following equation:
log Koc = -0.55 log S + 3.64, where S is solubility in water in ppm.
All other Koc values are experimental values.

** Correction Factor (CF) of 100 is used as per TAGM #4046

*** As per TAGM #4046, Total VOCs < 10 ppm.

Note: Soil cleanup objectives are developed for soil organic carbon content (f) of 1% , and should be adjusted for the actual soil organic carbon content if it is known.

APPENDIX A (cont.)
TABLE 2
Recommended Soil Cleanup Objectives (mg/kg or ppm)
Semi-Volatile Organic Contaminants

Contaminant	Partition coefficient Koc	Groundwater Standards/ Criteria Cw ug/l or ppb.	a Allowable Soil conc. ppm. Cs	b ** Soil Cleanup objectives to Protect GW Quality (ppm)	USEPA Health Based (ppm) Carcinogens	Systemic Toxicants	CRQL (ppb)	Rec.soil Clnup Objct. (ppm)
Acenaphthene	4,600	20	0.9	90.0	N/A	5,000	330	50.0***
Acenaphthylene	2,056*	20	0.41	41.0	N/A	N/A	330	41.0
Aniline	13.8	5	0.001	0.1	123	N/A	330	0.1
Anthracene	14,000	50	7.00	700.0	N/A	20,000	330	50.0***
Benzo(a)anthracene	1,380,000	0.002	0.03	3.0	0.224	N/A	330	0.224 or MDL
Benzo(a)pyrene	5,500,000	0.002(ND)	0.110	11.0	0.0609	N/A	330	0.061 or MDL
Benzo(b)fluoranthene	550,000	0.002	0.011	1.1	N/A	N/A	330	1.1
Benzo(g,h,i)perylene	1,600,000	5	8.0	800	N/A	N/A	330	50.0***
Benzo(k)fluoranthene	550,000	0.002	0.011	1.1	N/A	N/A	330	1.1
bis(2-ethylhexyl)phthalate	8,706*	50	4.35	435.0	50	2,000	330	50.0***
Butylbenzylphthlate	2,430	50	1.215	122.0	N/A	20,000	330	50.0***
Chrysene	200,000	0.002	0.004	0.4	N/A	N/A	330	0.4
4-Chloroaniline	43 ****	5	0.0022	0.22	200	300	330	0.220 or MDL
4-Chloro-3-methylphenol	47	5	0.0024	0.24	N/A	N/A	330	0.240 or MDL
2-Chlorophenol	15*	50	0.008	0.8	N/A	400	330	0.8
Dibenzofuran	1,230*	5	0.062	6.2	N/A	N/A	330	6.2
Dibenzo(a,h)anthracene	33,000,000	50	1,650	165,000	0.0143	N/A	330	0.014 or MDL
3'-Dichlorobenzidine	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2,4-Dichlorophenol	380	1	0.004	0.4	N/A	200	330	0.4
2,4-Dinitrophenol	38	5	0.002	0.2	N/A	200	1,600	0.200 or MDL
2,6 Dinitrotoluene	198*	5	0.01	1.0	1.03	N/A	330	1.0
Diethylphthlate	142	50	0.071	7.1	N/A	60,000	330	7.1
Dimethylphthlate	40	50	0.020	2.0	N/A	80,000	330	2.0
Di-n-butyl phthalate	162*	50	0.081	8.1	N/A	8,000	330	8.1
Di-n-octyl phthlate	2,346*	50	1.2	120.0	N/A	2,000	330	50.0***
Fluoranthene	38,000	50	19	1900.0	N/A	3,000	330	50.0***
Fluorene	7,300	50	3.5	350.0	N/A	3,000	330	50.0***
Hexachlorobenzene	3,900	0.35	0.014	1.4	0.41	60	330	0.41
Indeno(1,2,3-cd)pyrene	1,600,000	0.002	0.032	3.2	N/A	N/A	330	3.2
Isophorone	88.31*	50	0.044	4.40	1,707	20,000	330	4.40
2-methylnaphthalene	727*	50	0.364	36.4	N/A	N/A	330	36.4
2-Methylphenol	15	5	0.001	0.1	N/A	N/A	330	0.100 or MDL
4-Methylphenol	17	50	0.009	0.9	N/A	4,000	330	0.9
Naphthalene	1,300	10	0.130	13.0	N/A	300	330	13.0
Nitrobenzene	36	5	0.002	0.2	N/A	40	330	0.200 or MDL
2-Nitroaniline	86	5	0.0043	0.43	N/A	N/A	1,600	0.430 or MDL
2-Nitrophenol	65	5	0.0033	0.33	N/A	N/A	330	0.330 or MDL
4-Nitrophenol	21	5	0.001	0.1	N/A	N/A	1,600	0.100 or MDL
3-Nitroaniline	93	5	0.005	0.5	N/A	N/A	1,600	0.500 or MDL
Pentachlorophenol	1,022	1	0.01	1.0	N/A	2,000	1,600	1.0 or MDL
Phenanthrene	4,365*	50	2.20	220.0	N/A	N/A	330	50.0***
Phenol	27	1	0.0003	0.03	N/A	50,000	330	0.03 or MDL
Pyrene	13,295*	50	6.65	665.0	N/A	2,000	330	50.0***
2,4,5-Trichlorophenol	89*	1	0.001	0.1	N/A	8,000	330	0.1

a. Allowable Soil Concentration Cs = f x Cw x Koc
b. Soil cleanup objective = Cs x Correction Factor (CF)

N/A is not available
MDL is Method Detection Limit

* Partition coefficient is calculated by using the following equation:
log Koc = -0.55 log S + 3.64, where S is solubility in water in ppm. Other Koc values are experimental values.

** Correction Factor (CF) of 100 is used as per TAGM #4046

*** As per TAGM #4046, Total VOCs < 10 ppm., Total Semi-VOCs < 500 ppm. and Individual Semi-VOCs < 50 ppm.

**** Koc is derived from the correlation Koc = 0.63 Kow (Determining Soil Response Action Levels.....
EPA/540/2-89/057). Kow is obtained from the USEPA computer database 'MAIN'.

Note: Soil cleanup objectives are developed for soil organic carbon content (f) of 1%,
and should be adjusted for the actual soil organic carbon content if it is known.

APPENDIX A (cont.)

TABLE 3

Recommended soil cleanup objectives (mg/kg or ppm)

Organic Pesticides / Herbicides and PCBs

Contaminant	Partition coefficient Koc	Groundwater Standards/ Criteria Cw ug/l or ppb.	a Allowable Soil conc. ppm. Cs	b ** Soil Cleanup objectives to Protect GW Quality (ppm)	USEPA Health Based (ppm) Carcinogens	Systemic Toxicants	CRQL (ppb)	*** Rec.soil Clnup Objct. (ppm)
Aldrin	96,000	ND(<0.01)	0.005	0.5	0.041	2	8	0.041
alpha - BHC	3,800	ND(<0.05)	0.002	0.2	0.111	N/A	8	0.11
beta - BHC	3,800	ND(<0.05)	0.002	0.2	3.89	N/A	8	0.2
delta - BHC	6,600	ND(<0.05)	0.003	0.3	N/A	N/A	8	0.3
Chlordane	21,305*	0.1	0.02	2.0	0.54	50	80	0.54
2,4-D	104*	4.4	0.005	0.5	N/A	800	800	0.5
4,4'-DDD	770,000*	ND(<0.01)	0.077	7.7	2.9	N/A	16	2.9
4,4'-DDE	440,000*	ND(<0.01)	0.0440	4.4	2.1	N/A	16	2.1
4,4'-DDT	243,000*	ND(<0.01)	0.025	2.5	2.1	40	16	2.1
Dibenzo-P-dioxins(PCDD)								
2,3,7,8 TCDD	1709800	0.000035	0.0006	0.06	N/A	N/A	N/A	N/A
Dieldrin	10,700*	ND(<0.01)	0.0010	0.1	0.044	4	16	0.044
Endosulfan I	8,168*	0.1	0.009	0.9	N/A	N/A	16	0.9
Endosulfan II	8,031*	0.1	0.009	0.9	N/A	N/A	16	0.9
Endosulfan Sulfate	10,038*	0.1	0.01	1.0	N/A	N/A	16	1.0
Endrin	9,157*	ND(<0.01)	0.001	0.1	N/A	20	8	0.10
Endrin keytone	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
gamma - BHC (Lindane)	1,080	ND(<0.05)	0.0006	0.06	5.4	20	8	0.06
gamma - chlordane	140,000	0.1	0.14	14.0	0.54	5	80	0.54
Heptachlor	12,000	ND(<0.01)	0.0010	0.1	0.16	40	8	0.10
Heptachlor epoxide	220	ND(<0.01)	0.0002	0.02	0.077	0.8	8	0.02
Methoxychlor	25,637	35.0	9.0	900	N/A	400	80	***
Mitotane	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Parathion	760	1.5	0.012	1.2	N/A	500	8	1.2
PCBs	17,510*	0.1	0.1	10.0	1.0	N/A	160	1.0(Surface) 10(sub-surf)
Polychlorinated dibenzo-furans(PCDF)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Silvex	2,600	0.26	0.007	0.7	N/A	600	330	0.7
2,4,5-T	53	35	0.019	1.9	N/A	200	330	1.9

a. Allowable Soil Concentration Cs = f x Cw x Koc

b. Soil cleanup objective = Cs x Correction Factor (CF)

N/A is not available

* Partition coefficient is calculated by using the following equation: log Koc = -0.55 log S + 3.64, where S is solubility in water in ppm. All other Koc values are experimental values.

** Correction Factor (CF) of 100 is used as per TAGM #4046

*** As per TAGM #4046, Total Pesticides < 10 ppm.

Note: Soil cleanup objectives are developed for soil organic carbon content (f) of 1% (5% for PCBs as per PCB guidance document), and should be adjusted for the actual soil organic Carbon content if it is known.

APPENDIX A

Rev. 12/93

TABLE 4

Recommended Soil Cleanup Objectives (mg/kg or ppm) for Heavy Metals

Contaminants	Protect Water Quality ppm	Eastern USA Background ppm	CRDL * mg/kg or ppm	Rec.soil Clnup Objct. ***** (ppm)
Aluminum	N/A	33,000	2.0	SB
Antimony	N/A	N/A	0.6	SB
Arsenic	N/A	3-12 **	0.1	7.5 or SB
Barium	N/A	15-600	2.0	300 or SB
Beryllium	N/A	0-1.75	0.05	0.16(HEAST) or SB
Cadmium	N/A	0.1-1	0.05	1 or SB
Calcium	N/A	130 - 35,000 **	50.0	SB
Chromium	N/A	1.5-40 **	0.1	10 or SB
Cobalt	N/A	2.5-60 **	0.5	30 or SB
Copper	N/A	1-50	0.25	25 or SB
Cyanide	N/A	N/A	0.1	***
Iron	N/A	2,000 - 550,000	1.0	2,000 or SB
Lead	N/A	****	0.03	SB****
Magnesium	N/A	100 - 5,000	50.0	SB
Manganese	N/A	50 - 5,000	0.15	SB
Mercury	N/A	0.001-0.2	0.002	0.1
Nickel	N/A	0.5-25	0.4	13 or SB
Potassium	N/A	8,500 - 43,000 **	50.0	SB
Selenium	N/A	0.1-3.9	0.05	2 or SB
Silver	N/A	N/A	0.1	SB
Sodium	N/A	6,000 - 8,000	50.0	SB
Thallium	N/A	N/A	0.1	SB
Vanadium	N/A	1-300	0.5	150 or SB
Zinc	N/A	9-50	0.2	20 or SB

Note: Some forms of metal salts such as Aluminum Phosphide, Calcium Cyanide, Potassium Cyanide, Copper cyanide, Silver cyanide, Sodium cyanide, Zinc phosphide, Thallium salts, Vanadium pentoxide, and Chromium (VI) compounds are more toxic in nature. Please refer to the USEPA HEASTs database to find cleanup objectives if such metal salts are present in soil.

SB is site background
N/A is not available

* CRDL is contract required detection limit which is approx. 10 times the CRDL for water.

** New York State backgrond

*** Some forms of Cyanide are complex and very stable while other forms are pH dependent and hence are very unstable. Site-specific form(s) of Cyanide should be taken into consideration when establishing soil cleanup objective.

**** Background levels for lead vary widely. Average levels in undeveloped, rural areas may range from 4-61 ppm. Average background levels in metropolitan or suburban areas or near highways are much higher and typically range from 200-500 ppm.

*****Recommended soil cleanup objectives are average background concentrations as reported in a 1984 survey of reference material by E. Carol McGovern, NYSDEC.

Appendix C

APPENDIX C

AETS/CWM

October 2, 1997

Air Products
Gases and Equipment Group Environmental
7201 Hamilton Blvd.
Allentown, PA 18195-1501
Attention: Mr. Ed Dulac

Dear Ed:

Please find the enclosed formal analytical for the soil samples at the IBM Poughkeepsie, New York site.

Should you have any questions or concerns, please feel free to contact me at your earliest convenience at (914) 592-1580.

Sincerely,

Kevin B. Anderson

Kevin B. Anderson
Business Manager

1 Eden Lane • Flanders, New Jersey 07836 • 201-347-7111 • Fax: 201-691-7359

ANALYTICAL DATA REPORT PACKAGE

September 25, 1997

AETS

Air Products

DUSTRIAL CORROSION MANAGEMENT, Inc.
52 Route 10
-dolph, NJ 07869
-584-0330
ptember 25, 1997

Certified for: NJ, PA, DE, CT, NY(DOH)
NJ #14116 NY #11376
US EPA CLP Lab

ANALYTICAL DATA REPORT PACKAGE

ient: AETS
mpled By: Customer

AMPLE ID:	MATRIX	LAB NUMBER	DATE & TIME COLLECTED	AT LAB DATE
	Soil	272357	09/17/97	09/18/97
	Soil	272358	09/17/97	09/18/97
	Soil	272359	09/17/97	09/18/97
	Soil	272360	09/17/97	09/18/97
	Soil	272361	09/17/97	09/18/97
A	Soil	272362	09/17/97	09/18/97
B	Soil	272363	09/17/97	09/18/97
A	Soil	272364	09/17/97	09/18/97
B	Soil	272365	09/17/97	09/18/97
A	Soil	272366	09/17/97	09/18/97
B	Soil	272367	09/17/97	09/18/97
A	Soil	272368	09/17/97	09/18/97
B	Soil	272369	09/17/97	09/18/97
	Soil	272370	09/17/97	09/18/97
JB	Soil	272371	09/17/97	09/18/97
LA	Soil	272372	09/17/97	09/18/97
LB	Soil	272373	09/17/97	09/18/97
2A	Soil	272374	09/17/97	09/18/97
2B	Soil	272375	09/17/97	09/18/97
3A	Soil	272376	09/17/97	09/18/97
3B	Soil	272377	09/17/97	09/18/97

Supervisor/Manager Signature:

Richard S. Levine

CLIENT: AETS

ADDRESS: 1 Eden Lane Flanders, NJ

PHONE: 201-691-7359

PROJECT: Air Products

PROJ. MGR.: Kevin Anderson

BILL TO:

SEND REPORT TO: Kevin Anderson

IN CASE OF QUESTIONS UPON SAMPLE RECEIPT CALL:

PHONE: 914-592-1580

DELIVERABLES: NY ASP A

- ☐ REDUCED DELIVERABLES NON-CLP FORMAT
- ☐ REDUCED DEL. CLP FORMAT
- ☐ REGULATORY FORMAT
- ☐ FULL DEL. CLP FORMAT
- ☐ NPDES
- ☐ STATE FORMS REQUIRED

TURNAROUND TIME

FAX (PRELIMINARIES) (If required): Rush

HARDCOPY:

COOLER TEMP:

LABORATORY ID CODE	SAMPLE IDENTIFICATION	SAMPLE DATE	SAMPLE TIME	COMPOSITE	SAMPLE MATRIX: GRAB	SOIL	LIQUID	SLUDGE	OTHER	# OF BOTTLES	ANALYSIS	PRESERVATIVES: H_2SO_4	HNO_3	HCl	NaOH	OTHER
		9/17/97	6:30AM	-												
			9:30AM													

SAMPLED BY: Kevin Anderson

RELINQUISHED BY: [signature] DATE: 9/17/97

RECEIVED BY: James Burke TIME: DATE: 9/18/97

RELINQUISHED BY: James Burke TIME: 9:15 DATE: 9-18-97

RECEIVED BY: Sandra Charters TIME: 0915 DATE: 9-18-97

RELINQUISHED BY: TIME: 0930 DATE: 9/18/97

RECEIVED BY: TIME: 0930 DATE:

RELINQUISHED BY: TIME: DATE:

RECEIVED BY: TIME:

COMMENTS: Send analytical to:
AETS
Annex 2 Building
777 Old Saw Mill River RD
Tarrytown, NY 10591-6719 Attn: Kevin Anderson

COMPOUND LIST

- ☐ PRIORITY POLLUTANT
- ☐ TARGET COMPOUND LIST
- ☐ NJAC 7:14A APP B
- ☐ OTHER

CONCENTRATIONS EXPECTED

- ☐ HIGH
- ☐ MEDIUM
- ☐ LOW

IS SAMPLE CHLORINATED? ☐ YES ☐ NO

KNOWN HAZARD

If analysis is for informational purposes only, please sign the following statement:

"Analysis is for informational purposes, not to be used for compliance or regulatory purposes."

Signature:

Air Products Samples at IBM, Poughkeepsie Site				
Sample #	# of Inches below soil	Poly Sheeting?	Analytical Required	Key Metals
1	6	No	Total RCRA Metals	Lead, Chromium, Arsenic.
2	6	No	Total RCRA Metals	Lead, Chromium, Arsenic.
3	6	Yes	Total RCRA Metals	Lead, Chromium, Arsenic.
4	6	Yes	Total RCRA Metals	Lead, Chromium, Arsenic.
5	6	Yes	Total RCRA Metals	Lead, Chromium, Arsenic.
6A	3	No	Total Lead	Lead
6B	15	No	Total Lead	Lead
7A	3	Yes	Total Lead	Lead
7B	15	Yes	Total Lead	Lead
8A	3	No	Total Lead	Lead
8B	15	No	Total Lead	Lead
9A	3	No	Total Lead	Lead
9B	15	No	Total Lead	Lead
10A	3	Yes	Total Lead	Lead
10B	15	Yes	Total Lead	Lead
11A	3	No	Total Lead	Lead
11B	15	No	Total Lead	Lead
12A	3	No	Total Lead	Lead
12B	15	No	Total Lead	Lead
13A	3	No	Total Lead	Lead
13B	15	No	Total Lead	Lead

ICM Laboratories, Inc.
Internal Chain-of-Custody

272357-272377

count number: WA1000
oject: Air Products AETS
er Level: NY A

boratory Person Breaking Seal on Shuttle: Shannon Charters
Title: Logger

umber	Relinq. By	Recd. By	Date	Time	Reason for Transfer	Aliquot ID
2a	SR	SV	09/18/97	10:42		
	JL	R	9-22-97	9:30	STORAGE	ALL
	R	JL	9-23-97	9:45	METals	SU1
					Storage	SU1

DUSTRIAL CORROSION MANAGEMENT, INC.
Route 10
olph, NJ 07869
3-584-0330, FAX: 973-584-0515
EPTEMBER 25, 1997

Certified for: NJ, PA, DE, CT, NY(DOH)
NJ #14116 NY #11376
US EPA CLP Lab

LABORATORY CHRONICLE

B #:	272357
URCE:	Air Products
TRIX:	Soil
TE SAMPLED:	09/17/97
TE RECEIPT:	09/18/97

*** INORGANICS - METALS: ***

Tot. Arsenic Analyzed:	09/23/97
Tot. Barium Analyzed:	09/23/97
Tot. Cadmium Analyzed:	09/23/97
Tot. Chromium Analyzed:	09/23/97
Tot. Lead Analyzed:	09/23/97
Tot. Mercury Analyzed:	09/23/97
Tot. Selenium Analyzed:	09/23/97
Tot. Silver Analyzed:	09/23/97

DUSTRIAL CORROSION MANAGEMENT, INC.
Route 10
dolph, NJ 07869
73-584-0330, FAX: 973-584-0515
EPTEMBER 25, 1997

Certified for: NJ, PA, DE, CT, NY(DOH)
NJ #14116 NY #11376
US EPA CLP Lab

LABORATORY CHRONICLE

AB #:	272358
OURCE:	Air Products
ATRIX:	Soil
ATE SAMPLED:	09/17/97
ATE RECEIPT:	09/18/97

*** INORGANICS - METALS: ***

Tot. Arsenic Analyzed:	09/23/97
Tot. Barium Analyzed:	09/23/97
Tot. Cadmium Analyzed:	09/23/97
Tot. Chromium Analyzed:	09/23/97
Tot. Lead Analyzed:	09/23/97
Tot. Mercury Analyzed:	09/23/97
Tot. Selenium Analyzed:	09/23/97
Tot. Silver Analyzed:	09/23/97

TUSTRIAL CORROSION MANAGEMENT, INC.
Route 10
ndolph, NJ 07869
73-584-0330, FAX: 973-584-0515
EPTEMBER 25, 1997

Certified for: NJ, PA, DE, CT, NY(DOH)
NJ #14116 NY #11376
US EPA CLP Lab

LABORATORY CHRONICLE

AB #:	272359
OURCE:	Air Products
ATRIX:	Soil
ATE SAMPLED:	09/17/97
ATE RECEIPT:	09/18/97

*** INORGANICS - METALS: ***

Tot. Arsenic Analyzed:	09/23/97
Tot. Barium Analyzed:	09/23/97
Tot. Cadmium Analyzed:	09/23/97
Tot. Chromium Analyzed:	09/23/97
Tot. Lead Analyzed:	09/23/97
Tot. Mercury Analyzed:	09/23/97
Tot. Selenium Analyzed:	09/23/97
Tot. Silver Analyzed:	09/23/97

DUSTRIAL CORROSION MANAGEMENT, INC.
Route 10
dolph, NJ 07869
3-584-0330, FAX: 973-584-0515
PTEMBER 25, 1997

Certified for: NJ, PA, DE, CT, NY(DOH)
NJ #14116 NY #11376
US EPA CLP Lab

LABORATORY CHRONICLE

B #:	272360
URCE:	Air Products
TRIX:	Soil
TE SAMPLED:	09/17/97
TE RECEIPT:	09/18/97

*** INORGANICS - METALS: ***

Tot. Arsenic Analyzed:	09/23/97
Tot. Barium Analyzed:	09/23/97
Tot. Cadmium Analyzed:	09/23/97
Tot. Chromium Analyzed:	09/23/97
Tot. Lead Analyzed:	09/23/97
Tot. Mercury Analyzed:	09/23/97
Tot. Selenium Analyzed:	09/23/97
Tot. Silver Analyzed:	09/23/97

DUSTRIAL CORROSION MANAGEMENT, INC.
Route 10
[illegible]lph, NJ 07869
3-584-0330, FAX: 973-584-0515
PTEMBER 25, 1997

Certified for: NJ, PA, DE, CT, NY(DOH)
NJ #14116 NY #11376
US EPA CLP Lab

LABORATORY CHRONICLE

B #:	272361
URCE:	Air Products
TRIX:	Soil
TE SAMPLED:	09/17/97
TE RECEIPT:	09/18/97

*** INORGANICS - METALS: ***

Tot. Arsenic Analyzed:	09/23/97
Tot. Barium Analyzed:	09/23/97
Tot. Cadmium Analyzed:	09/23/97
Tot. Chromium Analyzed:	09/23/97
Tot. Lead Analyzed:	09/23/97
Tot. Mercury Analyzed:	09/23/97
Tot. Selenium Analyzed:	09/23/97
Tot. Silver Analyzed:	09/23/97

DUSTRIAL CORROSION MANAGEMENT, INC.
Route 10
lph, NJ 07869
3-584-0330, FAX: 973-584-0515
PTEMBER 25, 1997

Certified for: NJ, PA, DE, CT, NY(DOH)
NJ #14116 NY #11376
US EPA CLP Lab

LABORATORY CHRONICLE

B #:	272362
URCE:	Air Products
TRIX:	Soil
TE SAMPLED:	09/17/97
TE RECEIPT:	09/18/97

*** INORGANICS - METALS: ***

Tot. Lead Analyzed:	09/23/97

NDUSTRIAL CORROSION MANAGEMENT, INC.
Route 10
olph, NJ 07869
73-584-0330, FAX: 973-584-0515
EPTEMBER 25, 1997

Certified for: NJ, PA, DE, CT, NY(DOH)
NJ #14116 NY #11376
US EPA CLP Lab

LABORATORY CHRONICLE

AB #:	272363
OURCE:	Air Products
ATRIX:	Soil
ATE SAMPLED:	09/17/97
ATE RECEIPT:	09/18/97

*** INORGANICS - METALS: ***

Tot. Lead Analyzed:	09/23/97

DUSTRIAL CORROSION MANAGEMENT, INC.
Route 10
[redacted]olph, NJ 07869
'3-584-0330, FAX: 973-584-0515
:PTEMBER 25, 1997

Certified for: NJ, PA, DE, CT, NY(DOH)
NJ #14116 NY #11376
US EPA CLP Lab

LABORATORY CHRONICLE

AB #:	272364
OURCE:	Air Products
ATRIX:	Soil
ATE SAMPLED:	09/17/97
ATE RECEIPT:	09/18/97

*** INORGANICS - METALS: ***

Tot. Lead Analyzed:	09/23/97

DUSTRIAL CORROSION MANAGEMENT, INC.
Route 10
olph, NJ 07869
3-584-0330, FAX: 973-584-0515
PTEMBER 25, 1997

Certified for: NJ, PA, DE, CT, NY(DOH)
NJ #14116 NY #11376
US EPA CLP Lab

LABORATORY CHRONICLE

B #:	272365
URCE:	Air Products
TRIX:	Soil
TE SAMPLED:	09/17/97
TE RECEIPT:	09/18/97

*** INORGANICS - METALS: ***

Tot. Lead Analyzed:	09/23/97

IT'STRIAL CORROSION MANAGEMENT, INC.
Route 10
ndolph, NJ 07869
'3-584-0330, FAX: 973-584-0515
:PTEMBER 25, 1997

Certified for: NJ, PA, DE, CT, NY(DOH)
NJ #14116 NY #11376
US EPA CLP Lab

LABORATORY CHRONICLE

AB #:	272366
SOURCE:	Air Products
MATRIX:	Soil
DATE SAMPLED:	09/17/97
DATE RECEIPT:	09/18/97

*** INORGANICS - METALS: ***

Tot. Lead Analyzed:	09/23/97

NDUSTRIAL CORROSION MANAGEMENT, INC.
Route 10
olph, NJ 07869
73-584-0330, FAX: 973-584-0515
EPTEMBER 25, 1997

Certified for: NJ, PA, DE, CT, NY(DOH)
NJ #14116 NY #11376
US EPA CLP Lab

LABORATORY CHRONICLE

AB #:	272367
OURCE:	Air Products
ATRIX:	Soil
ATE SAMPLED:	09/17/97
ATE RECEIPT:	09/18/97

*** INORGANICS - METALS: ***

Tot. Lead Analyzed:	09/23/97

JSTRIAL CORROSION MANAGEMENT, INC.
Route 10
olph, NJ 07869
3-584-0330, FAX: 973-584-0515
EPTEMBER 25, 1997

Certified for: NJ, PA, DE, CT, NY(DOH)
NJ #14116 NY #11376
US EPA CLP Lab

LABORATORY CHRONICLE

AB #:	272368
OURCE:	Air Products
ATRIX:	Soil
ATE SAMPLED:	09/17/97
ATE RECEIPT:	09/18/97

*** INORGANICS - METALS: ***

Tot. Lead Analyzed:	09/23/97

DUSTRIAL CORROSION MANAGEMENT, INC.
Route 10
lph, NJ 07869
3-584-0330, FAX: 973-584-0515
PTEMBER 25, 1997

Certified for: NJ, PA, DE, CT, NY(DOH)
NJ #14116 NY #11376
US EPA CLP Lab

LABORATORY CHRONICLE

B #:	272369
URCE:	Air Products
TRIX:	Soil
TE SAMPLED:	09/17/97
TE RECEIPT:	09/18/97

*** INORGANICS - METALS: ***

Tot. Lead Analyzed:	09/23/97

DUSTRIAL CORROSION MANAGEMENT, INC.
Route 10
lph, NJ 07869
3-584-0330, FAX: 973-584-0515
PTEMBER 25, 1997

Certified for: NJ, PA, DE, CT, NY(DOH)
NJ #14116 NY #11376
US EPA CLP Lab

LABORATORY CHRONICLE

B #:	272370
URCE:	Air Products
TRIX:	Soil
TE SAMPLED:	09/17/97
TE RECEIPT:	09/18/97

*** INORGANICS - METALS: ***

Tot. Lead Analyzed:	09/23/97

NDUSTRIAL CORROSION MANAGEMENT, INC.
Route 10
olph, NJ 07869
73-584-0330, FAX: 973-584-0515
EPTEMBER 25, 1997

Certified for: NJ, PA, DE, CT, NY(DOH)
NJ #14116 NY #11376
US EPA CLP Lab

LABORATORY CHRONICLE

AB #:	272371
OURCE:	Air Products
ATRIX:	Soil
ATE SAMPLED:	09/17/97
ATE RECEIPT:	09/18/97

*** INORGANICS - METALS: ***

Tot. Lead Analyzed:	09/23/97

JUSTRIAL CORROSION MANAGEMENT, INC.
Route 10
[redacted]olph, NJ 07869
73-584-0330, FAX: 973-584-0515
EPTEMBER 25, 1997

Certified for: NJ, PA, DE, CT, NY(DOH)
NJ #14116 NY #11376
US EPA CLP Lab

LABORATORY CHRONICLE

AB #:	272372
OURCE:	Air Products
ATRIX:	Soil
ATE SAMPLED:	09/17/97
ATE RECEIPT:	09/18/97

*** INORGANICS - METALS: ***

Tot. Lead Analyzed:	09/23/97

NDUSTRIAL CORROSION MANAGEMENT, INC.
2 Route 10
dolph, NJ 07869
73-584-0330, FAX: 973-584-0515
EPTEMBER 25, 1997

Certified for: NJ, PA, DE, CT, NY(DOH)
NJ #14116 NY #11376
US EPA CLP Lab

LABORATORY CHRONICLE

AB #:	272373
OURCE:	Air Products
ATRIX:	Soil
ATE SAMPLED:	09/17/97
ATE RECEIPT:	09/18/97

*** INORGANICS - METALS: ***

Tot. Lead Analyzed:	09/23/97

NDUSTRIAL CORROSION MANAGEMENT, INC.
- - Route 10
olph, NJ 07869
73-584-0330, FAX: 973-584-0515
EPTEMBER 25, 1997

Certified for: NJ, PA, DE, CT, NY(DOH)
NJ #14116 NY #11376
US EPA CLP Lab

LABORATORY CHRONICLE

AB #:	272374
OURCE:	Air Products
ATRIX:	Soil
ATE SAMPLED:	09/17/97
ATE RECEIPT:	09/18/97

*** INORGANICS - METALS: ***

Tot. Lead Analyzed:	09/23/97

NDUSTRIAL CORROSION MANAGEMENT, INC.
- Route 10
a[redacted]olph, NJ 07869
73-584-0330, FAX: 973-584-0515
EPTEMBER 25, 1997

Certified for: NJ, PA, DE, CT, NY(DOH)
NJ #14116 NY #11376
US EPA CLP Lab

LABORATORY CHRONICLE

AB #:	272375
OURCE:	Air Products
ATRIX:	Soil
ATE SAMPLED:	09/17/97
ATE RECEIPT:	09/18/97

*** INORGANICS - METALS: ***

Tot. Lead Analyzed:	09/23/97

NDUSTRIAL CORROSION MANAGEMENT, INC.
Route 10
olph, NJ 07869
73-584-0330, FAX: 973-584-0515
EPTEMBER 25, 1997

Certified for: NJ, PA, DE, CT, NY(DOH)
NJ #14116 NY #11376
US EPA CLP Lab

LABORATORY CHRONICLE

AB #:	272376
OURCE:	Air Products
ATRIX:	Soil
ATE SAMPLED:	09/17/97
ATE RECEIPT:	09/18/97

*** INORGANICS - METALS: ***

Tot. Lead Analyzed:	09/23/97

NDUSTRIAL CORROSION MANAGEMENT, INC.
Route 10
olph, NJ 07869
73-584-0330, FAX: 973-584-0515
EPTEMBER 25, 1997

Certified for: NJ, PA, DE, CT, NY(DOH)
NJ #14116 NY #11376
US EPA CLP Lab

LABORATORY CHRONICLE

AB #:	272377
OURCE:	Air Products
ATRIX:	Soil
ATE SAMPLED:	09/17/97
ATE RECEIPT:	09/18/97

*** INORGANICS - METALS: ***

Tot. Lead Analyzed:	09/23/97

INDUSTRIAL CORROSION MANAGEMENT, INC.
1152 Route 10
Randolph, NJ 07869
201-584-0330

NJ DEP and PA DER Certified.
NJ DEP Lab ID# 14116
US EPA Historic CLP Lab

CONFORMANCE/NONCONFORMANCE SUMMARY CHECKLIST

Lab Numbers: 272357-272377

Volatile Organics: Analyzed____ Not Analyzed✓

All tunes were run in required frequency. Yes____ No____ N/A____

All tune m/z ratios met criteria. Yes____ No____ N/A____

All initial and/or continuing calibrations were run in required frequency. Yes____ No____

All calibration SPCCs and CCCs met criteria. Yes____ No____ N/A____

Surrogate recoveries met QC criteria. Yes____ No____

All method blanks met contamination criteria. Yes____ No____

All samples were analyzed within the required holding times. Yes____ No____

Comments: _____

_____

_____

_____

Semi-volatile Organics: Analyzed____ Not Analyzed✓

All tunes were run in required frequency. Yes____ No____ N/A____

All tune m/z ratios met criteria. Yes____ No____ N/A____

All initial and/or continuing calibrations were run in required frequency. Yes____ No____

All calibration SPCCs and CCCs met criteria. Yes____ No____ N/A____

Surrogate recoveries met QC criteria. Yes____ No____

All method blanks met contamination criteria. Yes____ No____

All samples were extracted and analyzed within the required holding times. Yes____ No____

Comments: _____ 26 _____

_____

_____

INDUSTRIAL CORROSION MANAGEMENT, INC.
1152 Route 10
Randolph, NJ 07869
201-584-0330

NJ DEP and PA DER Certified.
NJ DEP Lab ID# 14116
US EPA Historic CLP Lab

CONFORMANCE/NONCONFORMANCE SUMMARY CHECKLIST

Lab Numbers: 272357 - 272377

Pesticides/PCBs: Analyzed____ Not Analyzed ✓

All method blanks met contamination criteria. Yes____ No____

All samples were extracted and analyzed within the required holding times. Yes____ No____

Comments: _____

_____

_____

_____

Metals: Analyzed ✓ Not Analyzed____

All method blanks met contamination criteria. Yes ✓ No____

All samples were analyzed within the required holding times. Yes ✓ No____

Comments: _____

_____

_____

_____

Petroleum Hydrocarbons: Analyzed____ Not Analyzed ✓

All samples were extracted and analyzed within the required holding times. Yes____ No____

Comments: _____

_____

_____

_____

INDUSTRIAL CORROSION MANAGEMENT, INC.
1152 Route 10
Randolph, NJ 07869
201-584-0330

NJ DEP and PA DER Certified.
NJ DEP Lab ID# 14116
US EPA Historic CLP Lab

CONFORMANCE/NONCONFORMANCE SUMMARY CHECKLIST

Lab Numbers: 272357-272377

General Chemistry: Analyzed____ Not Analyzed✓

All samples were analyzed within the required holding times.
Yes____ No____

Comments:_____

Susan Stanley
Quality Assurance Coordinator

9/25/97
Date

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**Method 3050A/6010A

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*Test Methods for Evaluating Solid Wastes, SW846, 3rd edition
**Method 3050A/6010A

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NDUSTRIAL CORROSION MANAGEMENT, INC.
152 Route 10
dolph, NJ 07869
01-584-0330, FAX: 201-584-0515
EPTEMBER 23, 1997

Certified for: NJ, PA, DE, CT, NY(DOH)
NJ #14116 NY #11376
US EPA CLP Lab

INORGANIC LABORATORY ANALYSIS

ab Number: 272357
lient: AETS
ample source: Air Products
ample ID: 1
ample date: 09/17/97
ampled by: Customer
t lab date: 09/18/97
atrix: SOIL
ercent Moisture: 10.84 %

ICP/FURNACE Initial weight: 2.0 g
Mercury Initial weight: 0.5 g
Results in mg/Kg dry weight basis.

ICP/FURNACE Final volume: 100 ml
Mercury Final volume: 100 ml

Parameter	Sample Result	Method Blank Analysis	Minimum Detection Limit	Dilution Factor	Analysis Date
enic	5.27	U	0.224	1	09/23/97
arium	57.8	U	0.280	1	09/23/97
Cadmium	U	U	0.224	1	09/23/97
Chromium	18.2	U	0.280	1	09/23/97
Lead	62.8	U	0.224	1	09/23/97
Mercury	0.045	U	0.045	1	09/23/97
Selenium	U	U	0.224	1	09/23/97
Silver	U	U	0.280	1	09/23/97

U = Not Detected

INDUSTRIAL CORROSION MANAGEMENT, INC.
Richard Levine, President

LYN

INDUSTRIAL CORROSION MANAGEMENT, INC.
1152 Route 10
[illegible]dolph, NJ 07869
[illegible]1-584-0330, FAX: 201-584-0515
SEPTEMBER 23, 1997

Certified for: NJ, PA, DE, CT, NY(DOH)
NJ #14116 NY #11376
US EPA CLP Lab

INORGANIC LABORATORY ANALYSIS

Lab Number: 272358
Client: AETS
Sample source: Air Products
Sample ID: 2
Sample date: 09/17/97
Sampled by: Customer
At lab date: 09/18/97
Matrix: SOIL
Percent Moisture: 8.07 %

ICP/FURNACE Initial weight: 2.0 g
Mercury Initial weight: 0.5 g
Results in mg/Kg dry weight basis.

ICP/FURNACE Final volume: 100 ml
Mercury Final volume: 100 ml

Parameter	Sample Result	Method Blank Analysis	Minimum Detection Limit	Dilution Factor	Analysis Date
[illegible]enic	4.19	U	0.218	1	09/23/97
[illegible]rium	38.9	U	0.272	1	09/23/97
Cadmium	U	U	0.218	1	09/23/97
Chromium	15.0	U	0.272	1	09/23/97
Lead	20.5	U	0.218	1	09/23/97
Mercury	U	U	0.044	1	09/23/97
Selenium	U	U	0.218	1	09/23/97
Silver	U	U	0.272	1	09/23/97

U = Not Detected

INDUSTRIAL CORROSION MANAGEMENT, INC.
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NDUSTRIAL CORROSION MANAGEMENT, INC.
152 Route 10
dolph, NJ 07869
-584-0330, FAX: 201-584-0515
EPTEMBER 23, 1997

Certified for: NJ, PA, DE, CT, NY(DOH)
NJ #14116 NY #11376
US EPA CLP Lab

INORGANIC LABORATORY ANALYSIS

.ab Number: 272359
:lient: AETS
;ample source: Air Products
;ample ID: 3
;ample date: 09/17/97
;ampled by: Customer
\t lab date: 09/18/97
latrix: SOIL
'ercent Moisture: 8.32 %

:CP/FURNACE Initial weight: 2.0 g
Mercury Initial weight: 0.5 g
Results in mg/Kg dry weight basis.

ICP/FURNACE Final volume: 100 ml
Mercury Final volume: 100 ml

Parameter	Sample Result	Method Blank Analysis	Minimum Detection Limit	Dilution Factor	Analysis Date
enic	4.74	U	0.218	1	09/23/97
ium	35.7	U	0.273	1	09/23/97
Cadmium	U	U	0.218	1	09/23/97
Chromium	13.5	U	0.273	1	09/23/97
Lead	14.3	U	0.218	1	09/23/97
Mercury	U	U	0.044	1	09/23/97
Selenium	U	U	0.218	1	09/23/97
Silver	U	U	0.273	1	09/23/97

U = Not Detected

INDUSTRIAL CORROSION MANAGEMENT, INC.
Richard Levine, President

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NDUSTRIAL CORROSION MANAGEMENT, INC.
152 Route 10
dolph, NJ 07869
584-0330, FAX: 201-584-0515
EPTEMBER 23, 1997

Certified for: NJ, PA, DE, CT, NY(DOH)
NJ #14116 NY #11376
US EPA CLP Lab

INORGANIC LABORATORY ANALYSIS

ab Number: 272360
lient: AETS
ample source: Air Products
ample ID: 4
ample date: 09/17/97
ampled by: Customer
t lab date: 09/18/97
atrix: SOIL
ercent Moisture: 8.03 %

CP/FURNACE Initial weight: 2.0 g
lercury Initial weight: 0.5 g
esults in mg/Kg dry weight basis.

ICP/FURNACE Final volume: 100 ml
Mercury Final volume: 100 ml

Parameter	Sample Result	Method Blank Analysis	Minimum Detection Limit	Dilution Factor	Analysis Date
enic	4.62	U	0.217	1	09/23/97
ium	32.2	U	0.272	1	09/23/97
Cadmium	U	U	0.217	1	09/23/97
Chromium	13.8	U	0.272	1	09/23/97
Lead	22.3	U	0.217	1	09/23/97
Mercury	U	U	0.043	1	09/23/97
Selenium	U	U	0.217	1	09/23/97
Silver	U	U	0.272	1	09/23/97

J = Not Detected

INDUSTRIAL CORROSION MANAGEMENT, INC.
Richard Levine, President

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INDUSTRIAL CORROSION MANAGEMENT, INC.
1152 Route 10
Rodolph, NJ 07869
201-584-0330, FAX: 201-584-0515
SEPTEMBER 23, 1997

Certified for: NJ, PA, DE, CT, NY(DOH)
NJ #14116 NY #11376
US EPA CLP Lab

INORGANIC LABORATORY ANALYSIS

Lab Number: 272361
Client: AETS
Sample source: Air Products
Sample ID: 5
Sample date: 09/17/97
Sampled by: Customer
At lab date: 09/18/97
Matrix: SOIL
Percent Moisture: 8.01 %

ICP/FURNACE Initial weight: 2.0 g
Mercury Initial weight: 0.5 g
Results in mg/Kg dry weight basis.

ICP/FURNACE Final volume: 100 ml
Mercury Final volume: 100 ml

Parameter	Sample Result	Method Blank Analysis	Minimum Detection Limit	Dilution Factor	Analysis Date
Arsenic	5.92	U	0.217	1	09/23/97
Barium	40.4	U	0.272	1	09/23/97
Cadmium	U	U	0.217	1	09/23/97
Chromium	14.1	U	0.272	1	09/23/97
Lead	18.6	U	0.217	1	09/23/97
Mercury	0.065	U	0.043	1	09/23/97
Selenium	U	U	0.217	1	09/23/97
Silver	U	U	0.272	1	09/23/97

U = Not Detected

INDUSTRIAL CORROSION MANAGEMENT, INC.
Richard Levine, President

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INDUSTRIAL CORROSION MANAGEMENT, INC.
1152 Route 10
dolph, NJ 07869
201-584-0330, FAX: 201-584-0515
SEPTEMBER 23, 1997

Certified for: NJ, PA, DE, CT, NY(DOH)
NJ #14116 NY #11376
US EPA CLP Lab

INORGANIC LABORATORY ANALYSIS

Lab Number: 272362
Client: AETS
Sample source: Air Products
Sample ID: 6A
Sample date: 09/17/97
Sampled by: Customer
At lab date: 09/18/97
Matrix: SOIL
Percent Moisture: 8.46 %

ICP/FURNACE Initial weight: 2.0 g
ICP/FURNACE Final volume: 100 ml
Results in mg/Kg dry weight basis.

Parameter	Sample Result	Method Blank Analysis	Minimum Detection Limit	Dilution Factor	Analysis Date
Lead	43.8	U	0.218	1	09/23/97

U = Not Detected

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NDUSTRIAL CORROSION MANAGEMENT, INC.
152 Route 10
dolph, NJ 07869
01-584-0330, FAX: 201-584-0515
EPTEMBER 23, 1997

Certified for: NJ, PA, DE, CT, NY(DOH)
NJ #14116 NY #11376
US EPA CLP Lab

INORGANIC LABORATORY ANALYSIS

ab Number: 272363
lient: AETS
ample source: Air Products
ample ID: 6B
ample date: 09/17/97
ampled by: Customer
t lab date: 09/18/97
latrix: SOIL
ercent Moisture: 10.17 %

CP/FURNACE Initial weight: 2.0 g
esults in mg/Kg dry weight basis.

ICP/FURNACE Final volume: 100 ml

Parameter	Sample Result	Method Blank Analysis	Minimum Detection Limit	Dilution Factor	Analysis Date
ead	16.7	U	0.223	1	09/23/97

U = Not Detected

INDUSTRIAL CORROSION MANAGEMENT, INC.
Richard Levine, President

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INDUSTRIAL CORROSION MANAGEMENT, INC.
1152 Route 10
Rodolph, NJ 07869
201-584-0330, FAX: 201-584-0515
SEPTEMBER 23, 1997

Certified for: NJ, PA, DE, CT, NY(DOH)
NJ #14116 NY #11376
US EPA CLP Lab

INORGANIC LABORATORY ANALYSIS

Lab Number: 272364
Client: AETS
Sample source: Air Products
Sample ID: 7A
Sample date: 09/17/97
Sampled by: Customer
At lab date: 09/18/97
Matrix: SOIL
Percent Moisture: 10.03 %

ICP/FURNACE Initial weight: 2.0 g ICP/FURNACE Final volume: 100 ml
Results in mg/Kg dry weight basis.

Parameter	Sample Result	Method Blank Analysis	Minimum Detection Limit	Dilution Factor	Analysis Date
Lead	12.0	U	0.222	1	09/23/97

U = Not Detected

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1152 Route 10
dolph, NJ 07869
201-584-0330, FAX: 201-584-0515
SEPTEMBER 23, 1997

Certified for: NJ, PA, DE, CT, NY(DOH)
NJ #14116 NY #11376
US EPA CLP Lab

INORGANIC LABORATORY ANALYSIS

Lab Number: 272365
Client: AETS
Sample source: Air Products
Sample ID: 7B
Sample date: 09/17/97
Sampled by: Customer
At lab date: 09/18/97
Matrix: SOIL
Percent Moisture: 8.66 %

ICP/FURNACE Initial weight: 2.0 g ICP/FURNACE Final volume: 100 ml
Results in mg/Kg dry weight basis.

Parameter	Sample Result	Method Blank Analysis	Minimum Detection Limit	Dilution Factor	Analysis Date
Lead	16.6	U	0.219	1	09/23/97

U = Not Detected

INDUSTRIAL CORROSION MANAGEMENT, INC.
Richard Levine, President

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NDUSTRIAL CORROSION MANAGEMENT, INC.
152 Route 10
'olph, NJ 07869
-584-0330, FAX: 201-584-0515
Certified for: NJ, PA, DE, CT, NY(DOH)
NJ #14116 NY #11376
US EPA CLP Lab

EPTEMBER 23, 1997

INORGANIC LABORATORY ANALYSIS

ab Number: 272366
lient: AETS
ample source: Air Products
ample ID: 8A
ample date: 09/17/97
ampled by: Customer
t lab date: 09/18/97
latrix: SOIL
'ercent Moisture: 6.16 %

CP/FURNACE Initial weight: 2.0 g ICP/FURNACE Final volume: 100 ml
esults in mg/Kg dry weight basis.

Parameter	Sample Result	Method Blank Analysis	Minimum Detection Limit	Dilution Factor	Analysis Date
Lead	61.3	U	0.213	1	09/23/97

J = Not Detected

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INDUSTRIAL CORROSION MANAGEMENT, INC.
1152 Route 10
Randolph, NJ 07869
201-584-0330, FAX: 201-584-0515
SEPTEMBER 23, 1997

Certified for: NJ, PA, DE, CT, NY(DOH)
NJ #14116 NY #11376
US EPA CLP Lab

INORGANIC LABORATORY ANALYSIS

Lab Number: 272367
Client: AETS
Sample source: Air Products
Sample ID: 8B
Sample date: 09/17/97
Sampled by: Customer
At lab date: 09/18/97
Matrix: SOIL
Percent Moisture: 8.64 %

ICP/FURNACE Initial weight: 2.0 g ICP/FURNACE Final volume: 100 ml
Results in mg/Kg dry weight basis.

Parameter	Sample Result	Method Blank Analysis	Minimum Detection Limit	Dilution Factor	Analysis Date
Lead	39.4	U	0.219	1	09/23/97

U = Not Detected

LYN

INDUSTRIAL CORROSION MANAGEMENT, INC.
1152 Route 10
Randolph, NJ 07869
201-584-0330, FAX: 201-584-0515
SEPTEMBER 23, 1997

Certified for: NJ, PA, DE, CT, NY(DOH)
NJ #14116 NY #11376
US EPA CLP Lab

INORGANIC LABORATORY ANALYSIS

Lab Number: 272368
Client: AETS
Sample source: Air Products
Sample ID: 9A
Sample date: 09/17/97
Sampled by: Customer
At lab date: 09/18/97
Matrix: SOIL
Percent Moisture: 7.8 %

ICP/FURNACE Initial weight: 2.0 g ICP/FURNACE Final volume: 100 ml
Results in mg/Kg dry weight basis.

Parameter	Sample Result	Method Blank Analysis	Minimum Detection Limit	Dilution Factor	Analysis Date
Lead	23.0	U	0.217	1	09/23/97

U = Not Detected

LYN

INDUSTRIAL CORROSION MANAGEMENT, INC.
1152 Route 10
Randolph, NJ 07869
201-584-0330, FAX: 201-584-0515
SEPTEMBER 23, 1997

Certified for: NJ, PA, DE, CT, NY(DOH)
NJ #14116 NY #11376
US EPA CLP Lab

INORGANIC LABORATORY ANALYSIS

Lab Number: 272369
Client: AETS
Sample source: Air Products
Sample ID: 9B
Sample date: 09/17/97
Sampled by: Customer
At lab date: 09/18/97
Matrix: SOIL
Percent Moisture: 9.33 %

ICP/FURNACE Initial weight: 2.0 g
ICP/FURNACE Final volume: 100 ml
Results in mg/Kg dry weight basis.

Parameter	Sample Result	Method Blank Analysis	Minimum Detection Limit	Dilution Factor	Analysis Date
Lead	16.5	U	0.221	1	09/23/97

U = Not Detected

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INDUSTRIAL CORROSION MANAGEMENT, INC.
1152 Route 10
Randolph, NJ 07869
201-584-0330, FAX: 201-584-0515
SEPTEMBER 23, 1997

Certified for: NJ, PA, DE, CT, NY(DOH)
NJ #14116 NY #11376
US EPA CLP Lab

INORGANIC LABORATORY ANALYSIS

Lab Number: 272370
Client: AETS
Sample source: Air Products
Sample ID: 10A
Sample date: 09/17/97
Sampled by: Customer
At lab date: 09/18/97
Matrix: SOIL
Percent Moisture: 11.22 %

ICP/FURNACE Initial weight: 2.0 g ICP/FURNACE Final volume: 100 ml
Results in mg/Kg dry weight basis.

Parameter	Sample Result	Method Blank Analysis	Minimum Detection Limit	Dilution Factor	Analysis Date
Lead	16.5	U	0.225	1	09/23/97

U = Not Detected

INDUSTRIAL CORROSION MANAGEMENT, INC.
Richard Levine, President

LYN

INDUSTRIAL CORROSION MANAGEMENT, INC.
1152 Route 10
Randolph, NJ 07869
201-584-0330, FAX: 201-584-0515
SEPTEMBER 23, 1997

Certified for: NJ, PA, DE, CT, NY(DOH)
NJ #14116 NY #11376
US EPA CLP Lab

INORGANIC LABORATORY ANALYSIS

Lab Number: 272371
Client: AETS
Sample source: Air Products
Sample ID: 10B
Sample date: 09/17/97
Sampled by: Customer
At lab date: 09/18/97
Matrix: SOIL
Percent Moisture: 9.72 %

ICP/FURNACE Initial weight: 2.0 g
ICP/FURNACE Final volume: 100 ml
Results in mg/Kg dry weight basis.

Parameter	Sample Result	Method Blank Analysis	Minimum Detection Limit	Dilution Factor	Analysis Date
Lead	16.6	U	0.222	1	09/23/97

U = Not Detected

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SEPTEMBER 23, 1997

Certified for: NJ, PA, DE, CT, NY(DOH)
NJ #14116 NY #11376
US EPA CLP Lab

INORGANIC LABORATORY ANALYSIS

Lab Number: 272372
Client: AETS
Sample source: Air Products
Sample ID: 11A
Sample date: 09/17/97
Sampled by: Customer
At lab date: 09/18/97
Matrix: SOIL
Percent Moisture: 6.62 %

ICP/FURNACE Initial weight: 2.0 g
ICP/FURNACE Final volume: 100 ml
Results in mg/Kg dry weight basis.

Parameter	Sample Result	Method Blank Analysis	Minimum Detection Limit	Dilution Factor	Analysis Date
Lead	98.0	U	0.214	1	09/23/97

U = Not Detected

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SEPTEMBER 23, 1997

Certified for: NJ, PA, DE, CT, NY(DOH)
NJ #14116 NY #11376
US EPA CLP Lab

INORGANIC LABORATORY ANALYSIS

Lab Number: 272373
Client: AETS
Sample source: Air Products
Sample ID: 11B
Sample date: 09/17/97
Sampled by: Customer
At lab date: 09/18/97
Matrix: SOIL
Percent Moisture: 8.96 %

ICP/FURNACE Initial weight: 2.0 g ICP/FURNACE Final volume: 100 ml
Results in mg/Kg dry weight basis.

Parameter	Sample Result	Method Blank Analysis	Minimum Detection Limit	Dilution Factor	Analysis Date
Lead	41.6	U	0.220	1	09/23/97

U = Not Detected

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Richard Levine, President

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1152 Route 10
Randolph, NJ 07869
201-584-0330, FAX: 201-584-0515
SEPTEMBER 23, 1997

Certified for: NJ, PA, DE, CT, NY(DOH)
NJ #14116 NY #11376
US EPA CLP Lab

INORGANIC LABORATORY ANALYSIS

Lab Number: 272374
Client: AETS
Sample source: Air Products
Sample ID: 12A
Sample date: 09/17/97
Sampled by: Customer
At lab date: 09/18/97
Matrix: SOIL
Percent Moisture: 9.59 %

ICP/FURNACE Initial weight: 2.0 g ICP/FURNACE Final volume: 100 ml
Results in mg/Kg dry weight basis.

Parameter	Sample Result	Method Blank Analysis	Minimum Detection Limit	Dilution Factor	Analysis Date
Lead	33.1	U	0.221	1	09/23/97

U = Not Detected

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Randolph, NJ 07869
201-584-0330, FAX: 201-584-0515
SEPTEMBER 23, 1997

Certified for: NJ, PA, DE, CT, NY(DOH)
NJ #14116 NY #11376
US EPA CLP Lab

INORGANIC LABORATORY ANALYSIS

Lab Number: 272375
Client: AETS
Sample source: Air Products
Sample ID: 12B
Sample date: 09/17/97
Sampled by: Customer
At lab date: 09/18/97
Matrix: SOIL
Percent Moisture: 9.95 %

ICP/FURNACE Initial weight: 2.0 g ICP/FURNACE Final volume: 100 ml
Results in mg/Kg dry weight basis.

Parameter	Sample Result	Method Blank Analysis	Minimum Detection Limit	Dilution Factor	Analysis Date
Lead	20.5	U	0.222	1	09/23/97

U = Not Detected

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Richard Levine, President

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INDUSTRIAL CORROSION MANAGEMENT, INC.
1152 Route 10
Randolph, NJ 07869
201-584-0330, FAX: 201-584-0515
SEPTEMBER 23, 1997

Certified for: NJ, PA, DE, CT, NY(DOH)
NJ #14116 NY #11376
US EPA CLP Lab

INORGANIC LABORATORY ANALYSIS

Lab Number: 272376
Client: AETS
Sample source: Air Products
Sample ID: 13A
Sample date: 09/17/97
Sampled by: Customer
At lab date: 09/18/97
Matrix: SOIL
Percent Moisture: 5.9 %

ICP/FURNACE Initial weight: 2.0 g ICP/FURNACE Final volume: 100 ml
Results in mg/Kg dry weight basis.

Parameter	Sample Result	Method Blank Analysis	Minimum Detection Limit	Dilution Factor	Analysis Date
Lead	160	U	0.213	1	09/23/97

U = Not Detected

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1152 Route 10
Randolph, NJ 07869
201-584-0330, FAX: 201-584-0515
SEPTEMBER 23, 1997

Certified for: NJ, PA, DE, CT, NY(DOH)
NJ #14116 NY #11376
US EPA CLP Lab

INORGANIC LABORATORY ANALYSIS

Lab Number: 272377
Client: AETS
Sample source: Air Products
Sample ID: 13B
Sample date: 09/17/97
Sampled by: Customer
At lab date: 09/18/97
Matrix: SOIL
Percent Moisture: 10.13 %

ICP/FURNACE Initial weight: 2.0 g ICP/FURNACE Final volume: 100 ml
Results in mg/Kg dry weight basis.

Parameter	Sample Result	Method Blank Analysis	Minimum Detection Limit	Dilution Factor	Analysis Date
Lead	14.1	U	0.223	1	09/23/97

U = Not Detected

INDUSTRIAL CORROSION MANAGEMENT, INC.
Richard Levine, President

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Appendix D

AETS/CWM

October 15, 1997

Mr. Edward J. Dulac
Air Products Gases and Equipment Group
Air Products and Chemicals Inc.
7201 Hamilton Blvd.
Allentown, PA 18195-1501

RE: HEALTH AND SAFETY PLAN FOR EXCAVATION AT IBM POUGHKEEPSIE, NEW YORK

Dear Mr. Dulac:

Advanced Environmental Technical Services (AETS), a leader in the hazardous waste management industry, is pleased to submit the following Health and Safety Plan for performing remedial services at the IBM Poughkeepsie, New York Facility. Please review this plan, any comments will be greatly appreciated.

AETS wishes to thank Air Products for the continuing opportunity to offer our services. Should any questions arise regarding this correspondence or any other matter, please contact me at (201) 347-7111, or Kevin Anderson at (914) 592-1580.

Sincerely,

ADVANCED ENVIRONMENTAL
TECHNICAL SERVICES

Thomas Swain

Thomas Swain
Project Manager
AETS New Jersey Business Unit

cc: Kevin Anderson

SITE SPECIFIC SAFETY & HEALTH PLAN

AIR PRODUCTS INC.

POUGHKEEPSIE, NEW YORK

SOIL EXCAVATION, HYDROGEN TANK AREA

OCTOBER 13, 1997

THOMAS SWAIN

PROJECT SCHEDULED FOR
OCTOBER 27, 1997

APPROVALS:

Project Manager: _____

Thomas Swain **Date**

Health and Safety Manager: _____ 10/15/97

Paul DeGiulo **Date**

PLEASE RETURN COMPLETED HEALTH AND SAFETY PLAN, PERMITS, AND LOGS, TO THE OPERATIONS DEPARTMENT UPON PROJECT COMPLETION.

TABLE OF CONTENTS

APPENDICES

Appendix A - Chemical Fact Sheets/MSDS

Site Name: IBM
Address: RT. 9 Poughkeepsie, New York
Contact: Edward J. Dulac (Air Products 610-481-6239)
Joe Witkowski (IBM 914-433-7752)

AETS Project Manager: **THOMAS SWAIN (201) 691-7336**
AETS Project Foreman: **ROBERT TIERNEY (201) 691-7377**

INTRODUCTION

This site-specific Safety and Health Plan was prepared in accordance with Part 1910 of Title 29, Section 1910.120 of the Code of Federal Regulations entitled Hazardous Waste Operations and Emergency Response and all applicable OSHA regulations. The purpose of this Safety and Health Plan is to provide employees governed by the plan with the site information, training, medical monitoring, personal monitoring, and protective equipment necessary so that they will be protected from hazards at the site during all work tasks.

2.0 SITE DESCRIPTION:

The scope of work includes excavating soil from the area where the hydrogen tanks were located on the IBM Poughkeepsie site. Soil will be excavated in area anywhere from fifteen (15) inches to twenty (20) inches pending analytical. All soils excavated will be loaded into roll-offs for disposal at Model City, New York. Post excavation samples will be taken under the direction of Air Products/IBM at the conclusion of the project. The area will then be backfilled using virgin source quarry process and crushed stone.

A DETAILED SITE SKETCH WILL BE COMPLETED BY THE AETS PROJECT MANAGER/SUPERVISOR, IN CONJUNCTION WITH THE FIELD AIR MONITORING LOG, PRIOR TO PROJECT START

2.1 NON-DISRUPTIVE ACTIVITIES

Health and Safety plan review
Call Dig Safe for utility markout
Discuss excavation with IBM on site engineers about utilities
Mobilize equipment and personal to site

2.2 DISRUPTIVE ACTIVITIES

Marking out excavation area
Positioning backhoe and roll-offs
Calibrating and positioning monitoring equipment
Excavating soils
Loading and shipping roll-offs
Taking post excavation samples
Backfilling excavation

3.0 PERSONAL HYGIENIC MEASURES

General

To prevent injuries and to minimize potential exposure, the following general safe work practices will be adhered to at the facility. These procedures are particularly important when dealing with situations of known or unknown toxic hazards, and/or when relying on portable field monitoring equipment. These practices serve as a guideline of general precautionary operations at potentially hazardous locations.

Personal Hygiene

1. Eating, drinking, chewing gum or tobacco, taking medication, smoking, and the application of makeup is prohibited in any contaminated or potentially contaminated area or where the possibility for the transfer of contamination exists.

2. All contact with potentially contaminated substances will be avoided. Do not walk through puddles, pools, mud, etc. Avoid, whenever possible, kneeling on ground, leaning or sitting on drums, equipment, or ground. Do not place monitoring equipment on potentially contaminated surfaces (i.e., drum, ground, etc.). Whenever possible, limit the number of individuals entering a known contaminated or restricted work zone.

3. No beard or facial hair may be worn by individuals working in areas that require respiratory protection.

Personal Protection

1. Be familiar with and knowledgeable about standard operating safety procedures. USE YOUR COMMON SENSE.

2. Be familiar, knowledgeable, and adhere to all instructions in the site safety plan. Any individual who continually fails to adhere to this plan will not be permitted to return to work at the site.

3. Identify and be aware of arrangements for emergency medical assistance.

4. While working, consider fatigue, heat stress, and other environmental factors such as motor traffic influencing personal safety.

4.0 HAZARD ASSESSMENT

The investigative activities to be conducted under the Safety and Health Plan include the following potential hazards:

4.1 Chemical Exposure: Suspected Contaminants

Material(s)	Most Likely Route Of Exposure	P.E.L.(s)
LEAD	INHALATION, INGESTION	0.1MG/M3 NIOSH 0.05MG/M3 OSHA

4.2 Fire and Explosion

- **Confined Spaces:**

N/A

- **Buried Utilities:**

Although the excavation is not very deep, Dig Safe will be notified. IBM on site engineers will also be informed and utilized to pinpoint underground utilities.

- **Flammable Materials:**

N/A

4.3 Oxygen Deficiency

- **Confined Spaces:**

N/A

- **Asphyxiants:**

N/A

4.4 Ionizing Radiation

N/A

4.5 Biological Hazards

N/A

4.6 Physical Safety Hazards

Use caution when working around heavy equipment.

4.7 Electrical Hazards

Overhead

Confirm that there are no utilities overhead and within reach of the backhoe and roll-off trucks.

Underground:

Be familiar with all markouts before beginning excavation.

General Shock or Electrical Hazards:

N/A

4.8 Heat Stress

N/A

4.9 Cold Exposure

N/A

4.10 Noise Level

Wear ear protection when working around heavy equipment.

5.0 MONITORING PROCEDURES AND PERMITS

Breathing zone will be monitored using a Mini-dataram aerosol monitor.

5.1 TOTAL DUST LEVELS:

Level D =	<0.25m/m3
Level C =	0.25m/m3-0.65m/m3
Level B =	>0.65m/m3

5.2 Explosimetry/Oxygen Level:

N/A

5.3 Additional Air Monitoring Requirements:

N/A

5.4 Confined Space Entry Requirements:

N/A

5.5 Hot Work Requirements:

N/A

5.6 Block & Tag Verification:

N/A

5.7 Other Permit Requirements:

Any IBM permits required.

6.0 MEDICAL MONITORING

All personnel involved in site activities are required to have completed and satisfactorily passes a baseline medical examination. Baseline examinations shall include, as a minimum, the following: medical history, general physical examination, electro-cardiogram (at physician's discretion), CBC and blood chemistry profiles, urinalysis, chest x-ray, pulmonary function testing, and other tests as determined necessary by the physician. These medical examinations will include an evaluation for heat stress under work uniforms and loads, and in particular, high exertion in a hot environment with respiratory protection. Re-examination of affected personnel shall be performed annually for the above criteria.

All AETS personnel and on-site subcontractors are required to comply with the medical surveillance and examination requirements outlined in 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response.

7.0 EQUIPMENT REQUIREMENTS

7.1 Personal Protection Requirements

7.2 Disruptive Activities And Hot Zone:

Head/Face:	Hard hat and safety glasses
Body:	Tyvek over AETS work uniform
Respiratory:	See section 5.1 Use GMEH cartridges for level C work
Hands/Feet:	Nitrile under lather gloves. Latex booties over steal toed work boots.

7.3 Non-Disruptive Activities And Support Zone:

Head/Face:	Safety glasses
Body:	AETS work uniform
Respiratory:	Level D
Hands/Feet:	Steel toe work boots

7.4 Equipment List:

MONITORING EQUIPMENT POLY SHEETING HAND TOOLS BACKHOE
PPE EQUIPMENT BAGS DANGER TAPE

8.0 SITE ENTRY/WORK AREAS

Personnel safety equipment as identified in the personal protection requirements will be utilized by all personnel entering potentially hazardous areas on site.

The following areas will be delineated by the on-site Safety Officer with approval from the regional Safety/Regulatory Administrator as necessary to maintain cleanliness:

Exclusion Area
Decontamination Area
Support Area

Anticipated site work areas are shown on the site sketch.

These areas conform to guidelines as published by USEPA: "Standard Operating Safety Guides," 1984 and as published by NIOSH/OSHA/USCG/USEPA in Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities: 1985.

For work in roadways, public works and police officials shall be notified in advance and all safety precautions necessary such as use of roadway cones, traffic control, flagmen, and safety vests shall be used as necessary to insure safety of all workers.

In selecting locations for heavy equipment operations or drilling activities, all utility companies shall be requested to map-out buried pipelines and wire prior to operation of equipment. Under no circumstances shall site activities be conducted where there is a question as to the location of underground natural gas or electrical lines. In positioning heavy equipment or any conductive equipment, vertical or overhead booms and gantries must be oriented such that contact with overhead wires is not possible.

9.0 DECONTAMINATION PROCEDURES

All protective clothing to be removed in a designed decontaminated area and disposed of properly. Workers will wash face and hands immediately, and shower as soon as possible after leaving site. All sampling equipment and heavy equipment is to be detergent cleaned or steam-cleaned before leaving site.

General decontamination procedures to be utilized when leaving the exclusion zone will consist of:

1. The removal of all visible contamination by washing with clean, potable water, or detergent solution.
2. The removal of all outer protective clothing that came in contact with the contamination.

3. The removal of all respiratory protection equipment.
4. Decontamination of all sample containers and equipment before leaving the work area.
5. Decontamination by steam cleaning of all heavy equipment on site before leaving the work area.
6. Proper disposal of all contaminated clothing and wash waters.

10.0 EDUCATION AND TRAINING REQUIREMENTS

All personnel will receive safety training in accordance with 29 CFR 1910.120 prior to performing any work at the site. The goal of this safety training will be the development of safety awareness as a part of the though process of all personnel. To accomplish this, safety training will be provided to all personnel commensurate with the activities they will perform at the site.

Additional safety training and education at the site shall provide basic on-the-job training in the following areas:

- An introduction to the project site.
- An overview of the existing contamination profile and safety concerns associated with working at the project site.
- Instruction on organization and reporting procedures.
- Instruction on the use of personal protection, safety, and monitoring equipment.
- Instruction on decontamination and disposal measures.
- An overview of accident and emergency response procedures.

With regard to respirator usage, training and education activities will follow the procedures set forth by 29 CFR 1910.134, "Respiratory Protection," of the US Department of Labor, Occupational Safety and Health Administration (OSHA), General Industry Standards.

As a minimum, training and education in respiratory protection will focus on the following items:

- Proper use of respirators and their limitations in both routine and emergency situations.
- Cleaning, decontamination, and disinfection procedures.
- Storage requirements.
- Inspection, maintenance, and repair requirements.

All personnel will be instructed on how to properly fit a respirator to achieve the required face-to-face seal for respiratory protective purposes. Conditions which could affect this face seal will be highlighted, including the presence of beards, sideburns, eyeglasses, and the absence of one or both dentures. All employees will be subjected to an initial semi-quantitative respirator fit test with annual semi-quantitative fit tests thereafter.

11.0 EMERGENCY RESPONSE PROCEDURES

In the event of personnel exposure, accident, injury, or fire at the facility, the following general accident and emergency response procedures are to be followed by all personnel.

NOTIFICATION PROCEDURES

As time permits, the first person on the scene should immediately notify either his immediate supervisor, the Project Manager, or the client contact that an emergency incident has or is occurring. The contacted individual, as the circumstance dictates, should contact any or all of the following services to obtain emergency assistance:

Local Services

Ambulance:	**33333**	**IBM IN HOUSE**
Police:	**33333**	**IBM IN HOUSE**
Fire:	**33333**	**IBM IN HOUSE**

Poison Information Center: **1-800-843-0505**

Hospital: **Vassar Brothers Hospital**
45 Reade Place
Poughkeepsie New York
(914) 454 8500

UTILIZE EMERGENCY SERVICES IN THE EVENT OF AN MEDICAL EMERGENCY REQUIRING MORE THAN FIRST AID.

Bring mobile phone to work area

AETS Project Manager:	**THOMAS SWAIN (201) 516 2065**
AETS Project Supervisor:	**ROBERT TIERNEY (201) 516 2074**
Client Contact:	**JOE WITKOWSKI (IBM) (914) 433-7752** **ED DULAC (AIR PRODUCTS) (610) 481-6239**

EVACUATION PROCEDURES

In an emergency situation, when the time permits, the individuals responsible for determining when evacuation of the work area is required, includes either the client Project Manager, the Site Safety Office, or assigned Task Leaders, depending on availability and ongoing work activities.

Imminent or actual dangers that constitute an evacuation scenario include:

- Unexpected release of toxic substances.
- A generalized fire or threat of generalized fire that cannot be avoided.
- An explosion or the threat of explosion that cannot be averted.
- The escape of toxic vapors when personal respiratory equipment is not available or inaccessible.

EMERGENCY DECONTAMINATION PROCEDURES

In the event of an accident or emergency incident, the decontamination and disposal procedures outlined will be followed to the greatest extent possible as time and circumstances permit. Care will be take to avoid cross-contaminating inner-layer garments as much as possible, while hastily removing safety equipment.

INCIDENT REPORTING

Following an accident or emergency episode, an incident report will be completed by the responsible individual in charge at the scene of the incident. Personnel that witnessed the episode will be questioned as necessary. Information to be included in the incident report will include, as a minimum, the following items:

- Name of person or persons involved
- Date and time
- Exact location
- Description
- Type of exposure suspected or nature of injury
- Nature of emergency response of medical attention received
- Witnesses/other personnel involved
- Corrective measures recommended to prevent the repeat of the incident

All incident reports must be filed with the Project Manager, AETS Health and Safety, and the Client.

Genium Publishing Corporation
1145 Catalyn Street
Schenectady, NY 12303-1836 USA
(518) 377-8854

Material Safety Data Sheets Collection:

Sheet No. 713
Lead (Inorganic)

Issued: 8/90

Section 1. Material Identification

Lead (Inorganic) (Pb) Description: Exists widely throughout the world in a number of ores. Its main commercial source is galena (lead sulphide). Lead mineral is separated from crude ores by blast-furnace smelting, drossing, or electrolytic refining. Lead is used mostly in manufacturing storage batteries. Other uses are in manufacturing tetraethyllead and both organic and inorganic lead compounds in ceramics, plastics, and electronic devices; in producing ammunition, solder, cable covering, sheet lead, and other metal products (brass, pipes, caulking); in metallurgy; in weights and as ballast; as a chemical intermediate for lead alkyls and pigments; as a construction material for the tank linings, piping, and equipment used to handle the corrosive gases and liquids used in sulfuric acid manufacturing, petroleum refining, halogenation, sulfonation, extraction, and condensation; and for x-ray and atomic radiation protection.

R 0
I 4
S -
K 0

32
Genium

HMIS
H 3
F 1
R 0
PPG*
* Sec. 8

Other Designations: CAS No. 7439-92-1, lead oxide; lead salts, inorganic; metallic lead; plumbum.

Manufacturer: Contact your supplier or distributor. Consult the latest *Chemicalweek Buyers' Guide*(73) for a suppliers list.

Cautions: *Inorganic lead is a potent systemic poison.* Organic lead (for example, tetraethyl lead) has severe, but different, health effects. Occupational lead poisoning is due to inhalation of dust and fumes. Major affected organ systems are the nervous, blood, and reproductive systems, and kidneys. Health impairment or disease may result from a severe acute short- or long-term exposure.

Section 2. Ingredients and Occupational Exposure Limits

Lead (inorganic) fumes and dusts, as Pb, ca 100%

1989 OSHA PELs (Lead, inorganic compounds)
8-hr TWA: 50 µg/m³
Action Level TWA*: 30 µg/m³

29 CFR 1910.1025 Lead Standard
Blood Lead Level: 40 µg/100 g

1989-90 ACGIH TLV (Lead, inorganic, fumes and dusts)
TLV-TWA: 150 µg/m³

1988 NIOSH REL
10-hr TWA: <100 µg/m³

1985-86 Toxicity Data†
Human, inhalation, TC_{Lo}: 10 µg/m³ affects gastrointestinal tract and liver
Human, oral, TD_{Lo}: 450 mg/kg ingested over 6 yr affects peripheral and central nervous systems
Rat, oral, TD_{Lo}: 790 mg/kg affects multigeneration reproduction

* Action level applies to employee exposure without regard to respirator use.
† See NIOSH, *RTECS* (OF7525000), for additional mutative, reproductive, and toxicity data.

Section 3. Physical Data

Boiling Point: 3164 °F (1740 °C)
Melting Point: 621.3 °F (327.4 °C)
Vapor Pressure: 1.77 mm Hg at 1832 °F (1000 °C)
Viscosity: 3.2 cp at 621.3 °F (327.4 °C)

Molecular Weight: 207.20
Specific Gravity (20 °C/4 °C): 11.34
Water Solubility: Relatively insoluble in hot or cold water*

Appearance and Odor: Bluish-white, silvery, gray, very soft metal.

* Lead dissolves more easily at a low pH.

Section 4. Fire and Explosion Data

Flash Point: None reported	Autoignition Temperature: None reported	LEL: None reported	UEL: None reported

Extinguishing Media: Use dry chemical, carbon dioxide, water spray, or foam to extinguish fire.
Unusual Fire or Explosion Hazards: Flammable and moderately explosive in the form of dust when exposed to heat or flame.
Special Fire-fighting Procedures: Isolate hazard area and deny entry. Since fire may produce toxic fumes, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode and full protective equipment. Be aware of runoff from fire control methods. Do not release to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: Lead is stable at room temperature in closed containers under normal storage and handling conditions. It tarnishes on exposure to air. Hazardous polymerization cannot occur.
Chemical Incompatibilities: Mixtures of hydrogen peroxide + trioxane explode on contact with lead. Lead is incompatible with sodium azide, zirconium, disodium acetylide, and oxidants. A violent reaction on ignition may occur with concentrated hydrogen peroxide, chlorine trifluoride, sodium acetylide (with powdered lead), ammonium nitrate (below 200 °C with powdered lead). Lead is attacked by pure water and weak organic acids in the presence of oxygen. Lead is resistant to tap water, hydrofluoric acid, brine, and solvents.
Conditions to Avoid: Rubber gloves containing lead may ignite in nitric acid.
Hazardous Products of Decomposition: Thermal oxidative decomposition of lead can produce highly toxic fumes of lead.

Section 6. Health Hazard Data

Carcinogenicity: Although the NTP and OSHA do not list lead as a carcinogen, the IARC lists it as probably carcinogenic to humans, but having (usually) no human evidence. However, the literature reports instances of lead-induced neoplasms, both benign and malignant, of the kidney and other organs in laboratory rodents. Excessive exposure to lead has resulted in neurologic disorders in infants. Experimental studies show lead has reproductive and teratogenic effects in laboratory animals. Human male and female reproductive effects are also documented.
Summary of Risks: Lead is a potent, systemic poison that affect a variety of organ systems, including the nervous system, kidneys, reproductive system, blood formation, and gastrointestinal (GI) system. The most important way lead enters the body is through inhalation, but it can also be ingested when lead dust or unwashed hands contaminate food, drink, or cigarettes. Much of ingested lead passes through feces without absorption into the body. Adults may absorb only 5 to 15% of ingested lead; children may absorb a much larger fraction. Once in the body, lead enters the bloodstream and circulates to various organs. Lead concentrates and remains in bone for many years. The amount of lead the body stores increases as exposure continues, with possibly cumulative effects. Depending on the dose entering the body, lead can be deadly within several days or affect health after many years. Very high doses can cause brain damage (encephalopathy).
Medical Conditions Aggravated by Exposure: Lead may aggravate nervous system disorders (e.g., epilepsy, neuropathies), kidney diseases, high blood pressure (hypertension), infertility, and anemia. Lead-induced anemia and its effect on blood presssure can aggravate cardiovascular disease.

Continue on next page

Section 6: Health Hazard Data, *continued*

Target Organs: Blood, central and peripheral nervous systems, kidneys, and gastrointestinal (GI) tract.
Primary Entry Routes: Inhalation, ingestion.
Acute Effects: An acute, short-term dose of lead could cause acute encephalopathy with seizures, coma, and death. However, short-term exposures of this magnitude are rare. Reversible kidney damage can occur from acute exposure, as well as anemia.
Chronic Effects: Symptoms of chronic long-term overexposure include appetite loss, nausea, metallic taste in the mouth, lead line on gingival (gum) tissue, constipation, anxiety, anemia, pallor of the face and the eye grounds, excessive tiredness, weakness, insomnia, headache, nervous irritability, fine tremors, numbness, muscle and joint pain, and colic accompanied by severe abdominal pain. Paralysis of wrist and, less often, ankle extensor muscles may occur after years of increased lead absorption. Kidney disease may also result from chronic overexposure, but few, if any, symptoms appear until severe kidney damage has occurred. Reproductive damage is characterized by decreased sex drive, impotence, and sterility in men; and decreased fertility, abnormal menstrual cycles, and miscarriages in women. Unborn children may suffer neurologic damage or developmental problems due to excessive lead exposure in pregnant women. Lead poisoning's severest result is encephalopathy manifested by severe headache, convulsions, coma, delirium, and possibly death.
FIRST AID
Eyes: Gently lift the eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately.
Skin: *Quickly* remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. Consult a physician if any health complaints develop.
Inhalation: Remove exposed person to fresh air and support breathing as needed. Consult a physician.
Ingestion: Never give anything by mouth to an unconscious or convulsing person. If large amounts of lead were ingested, induce vomiting with Ipecac syrup. Consult a physician immediately.
After first aid, get appropriate in-plant, paramedic, or community medical support.
Physician's Note: For diagnosis, obtain blood pressure, blood lead level (PbB), zinc protoporphyrin (ZPP), complete blood count for microcytic anemia and basophilic stippling, urinalysis, and blood urea nitrogen (BUN) of creatinine. Examine peripheral motor neuropathy, pallor, and gingival lead line. Use Ca-EDTA to treat poison, but *never* chelate prophylactically. Consult an occupational physician or toxicologist.

Section 7: Spill, Leak, and Disposal Procedures

Spill/Leak: Notify safety personnel and evacuate all unnecessary personnel immediately. Cleanup personnel should protect against inhalation of dusts or fume and contact with skin or eyes. Avoid creating dusty conditions. Water sprays may be used in large quantities to prevent the formation of dust. Cleanup methods such as vacuuming (with an appropriate filter) or wet mopping minimizes dust dispersion. Scoop the spilled material into closed containers for disposal or reclamation. Follow applicable OSHA regulations (29 CFR 1910.120).
Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.
EPA Designations
Listed as a RCRA Hazardous Waste (40 CFR 261.33, Appendix II—EP Toxicity Test Procedures)
Listed as a CERCLA Hazardous Substance* (40 CFR 302.4). Reportable Quantity (RQ): 1 lb (0.454 kg) [* per Clean Water Act, Sec. 307(a)]
SARA Extremely Hazardous Substance (40 CFR 355): Not listed
Listed as a SARA Toxic Chemical (40 CFR 372.65)
OSHA Designations
Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)

Section 8: Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133).
Respirator: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a NIOSH-approved respirator. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.*
Other: Wear impervious gloves, boots, aprons, and gauntlets to prevent skin contact. Protective clothing made of man-made fibers and lacking turn-ups, pleats, or pockets retain less dust from lead.
Ventilation: Provide general and local ventilation systems to maintain airborne concentrations below the OSHA PELs (Sec. 2). Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by controlling it at its source.[105]
Safety Stations: Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities.
Contaminated Equipment: Never wear contact lenses in the work area: soft lenses may absorb, and all lenses concentrate, irritants. Remove this material from your shoes and equipment. Launder contaminated clothing before wearing.
Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially washing hands before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9: Special Precautions and Comments

Storage Requirements: Store in tightly closed containers in a cool, dry, well-ventilated area away from all incompatible materials, direct sunlight, and heat and ignition sources.
Engineering Controls: Educate worker about lead's hazards. Follow and inform employees of the lead standard (29 CFR 1910.1025). Avoid inhalation of lead dust and fumes and ingestion of lead. Use only with appropriate personal protective gear and adequate ventilation. Institute a respiratory protection program that includes regular training, maintenance, inspection, and evaluation. Avoid creating dusty conditions. Segregate and launder contaminated clothing. Take precautions to protect laundry personnel. Practice good personal hygiene and housekeeping procedures. For a variety of reasons, the lead concentration in workroom air may not correlate with the blood lead levels in individuals.
Other Precautions: Provide preplacement and periodic medical examinations which emphasize blood, nervous system, gastrointestinal tract, and kidneys, including a complete blood count and urinalysis. Receive a complete history including previous surgeries and hospitalization, allergies, smoking history, alcohol consumption, proprietary drug intake, and occupational and nonoccupational lead exposure. Maintain records for medical surveillance, airborne exposure monitoring, employee complaints, and physician's written opinions for at least 40 years or duration of employment plus 20 years. Measurement of blood lead level (PbB) and zinc protoporphyrin (ZPP) are useful indicators of your body's lead absorption level. Maintain worker PbBs at or below 40 µg/100 g of whole blood. To minimize adverse reproductive health effects to parents and developing fetus, maintain the PbBs of workers intending to have children below 30 µg/100 g. Elevated PbBs increase your risk of disease, and the longer you have elevated PbBs, the greater your chance of substantial permanent damage.

Transportation Data (49 CFR 172.102)
IMO Shipping Name: Lead compounds, soluble, n.o.s.
IMO Hazard Class: 6.1
UN No.: UN2291
IMO Label: St. Andrews Cross (X, Stow away from foodstuffs)
IMDG Packaging Group: III

MSDS Collection **References:** 26, 38, 73, 84, 85, 88, 89, 90, 100, 101, 103, 109, 124, 126, 132, 133, 134, 136, 138, 139, 142, 143
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