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Final

Meeting Minutes Transmittal/Approval
Unit Manager's Meeting: General Topics
740 Stevens Center Room 1200, Richland, Washington
February 23, 1993

FROM/APPROVAL: Robert K. Stewart Date 3/24/93
Robert K. Stewart, R.I. Coordinator, RL (A5-19)

APPROVAL: Pamela Innis for Date 03/24/93
Douglas R. Sherwood, Representative, EPA (B5-01)

APPROVAL: Date 3/24/93
Jack W. Donnelly, Representative, Washington Dept. of Ecology

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The purpose of this meeting was to discuss general topics which are common to all past practices operable units.

Meeting Minutes are attached. Minutes are comprised of the following:

Attachment #1	-	Summary of Meeting and Commitments and Agreements
Attachment #2	-	Attendance List
Attachment #3	-	Agenda for the Meeting
Attachment #4	-	Action Item Status List
Attachment #5	-	Analytical Services Status
Attachment #6	-	Management of Investigation Derived Waste
Attachment #7	-	Risk Assessment Working Group
Attachment #8	-	Status of the Data in the Hanford Environmental Information System
Attachment #9	-	Research, Development, Demonstration, Testing, and Evaluation
Attachment #10	-	Buried Waste Integrated Demonstration (BWID)
Attachment #11	-	Schedule Optimization Study (SOS)
Attachment #12	-	Groundwater Data Comparability for the 300-FF-5 Operable Unit

MAY 1993 RECEIVED EDMC

Prepared by: Suzanne E. Clarke Date: March 24, 1993
Suzanne Clarke, Kay Kimmel, GSSC (A4-35)

Concurrence by: H. D. Downey Date: 3/24/93
Hal Downey, WHC Coordinator (H6-27)

Attachment #1

Summary of Meeting and Commitments and Agreements

Unit Manager's Meeting: General Topics
February 23, 1993

1. SIGNING OF THE JANUARY UNIT MANAGER'S MEETING MINUTES

Minutes were signed with no changes.

2. ACTION ITEM UPDATE: (Attachment 4 shows the status of the action items before today's meeting; the updates to Attachment 4 are listed below and the text is highlighted on Attachment 4)

GT.38	Closed 02/23/93.
GT.128	No further information.
GT.149	Closed 02/23/93.
GT.150	No further information.
GT.151	Waiting for formal letter from Fred Ruck.
GT.152	No further information.
GT.153	Closed 02/23/93.
GT.154	No further information.

3. NEW ACTION ITEMS:

GT.155 Jeff Lerch	Provide the Regulators with a copy of the new Request for Proposal (RFP) for commercial laboratory services as soon as it is completed in order to verify that the RFP is in compliance with the M-14 settlement.

4. INFORMATION ITEMS:

- <u>Update on Laboratory Status</u> - Jeff Lerch presented the update on the laboratories (see attachment #5). Included was an overview of the Weston Laboratory Evaluation which is described below:

  - Maintenance:
    - Glassware storage rack had paint chipping.
    - Hood missing maintenance update sticker (although log showed that maintenance had been done).
    - Control charts not up to date.
  - Procedures:
    - TOC done in duplicate rather than quadruplicate.
    - Initial SW-846 precision and accuracy studies were deficient in some areas.

- Sample receiving area, not documenting temperature of samples upon receipt, unless out of compliance. All necessary equipment available and procedures in place to perform check.
- VOA's stored in refrigerator set at range inconsistent with SW-846 [set at (-14) - (-22) rather than (-10) - (-20)°C]. Correction implemented.

- **HEIS Update** - Mike Schwab presented an update on the status of the HEIS database (see Attachment #8).

- **Administrative Record:** - Dennis Faulk initiated a discussion to remind OU Manager's to utilize the Administrative Record for all official business and to insure that entries into the Administrative Record are clearly understood and can be clearly tracked from previous entries.

- **Integrated Demo (Buried Waste Demonstration @ Idaho)** - Joan Woolard presented a list of Integrated Demonstrations DOE Complex wide (see attachment #9) and the INEL Integrated Demonstration (see attachment #10).

5. **QUICK STATUS ITEMS:**

- **Management of Investigation Derived Waste** - Bob Hobbs presented the status of the IDW (see attachment #6).

- **Update Site-Wide Background Study** - Fred Ruck (WHC) presented the status of the background study by indicating that a draft letter has been written to the Regulators concerning this topic. This letter will close Action Item GT.151. A meeting is tentatively scheduled for March 23, 1993, to discuss site background issues.

- **UMM Format** - The format and content of the Unit Manager's Meeting was discussed, the following was proposed:
  - Using the meetings to discuss issues rather than a formalized update of OU Status.
  - General Topics on a quarterly basis.
  - More Regulator input into the Agenda.

6. **WORKING GROUPS:**

- **Working Groups** - The Working Group Management Procedure is currently in preparation for proposed inclusion into the TPA handbook. The earlier (proposed) procedure is being revised as follows:
  - The general protocols are being expanded to include all DOE Divisions (the draft version was written specifically for the Environmental Restoration Division).
  - Text is being added to define the criteria for establishing a working group.

- **Risk Assessment Working Group** - Steve Clark presented the status of the risk assessment working group. See attachment #7.

- **Schedule Optimization Study (SOS)** - Darby Stapp presented the findings of study to determine why 100-Area RI/FS work progressed more slowly than anticipated (see Attachment #11). The findings are summarized in:

"Schedule Optimization Study: Hanford RI/FS Program Self-Evaluation, Volumes 1 and 2", August 1992, Environmental Management Operations, Operated for the U.S. Department of Energy by Battelle Memorial Institute, EMO 1080 Vol.1, AD-902A.

- 300-FF-5 Area Comparison (CLP versus SW-846) - Kent Angelos presented an evaluation of split sample data analyzed via both SW-846 and CLP methodologies (see attachment #12).

  Note: Before this presentation was made at the 300-FF-5 Operable Unit UMM, it was discovered that analyses, for Round 2 only, that were to be performed utilizing SW-846 methods for metals and VOAs were actually run using CLP methods. For further details, see the 300-FF-5 minutes.

7. **AGENDA ITEMS FOR MARCH**

- Signing of February GT Meetings
- Nancy Werdel to present T-106 Status. (20 min)
- Dennis Faulk to present EPA's new Community Relations Plan. (30 min)
- Chuck Cline to present overview WAC-173-160. (30 min)
- Frank Calapristi will present revised Working Group Management Protocol (Preview copies will be sent to Regulators before March UMM).
- Action Item Status

The following items normally presented at the General Topics meeting will be handled as follows:

- Analytical Update on monthly basis via written report.
- Individual issues will be discussed at Operable Unit meetings.
- Subjects requested by Regulators will be presented on a "to be arranged" basis.

8. **Next meetings are scheduled** for March 24 and 25, 1993.

April	28 and 29
May	26 and 27
June	23 and 24

Attachment #2

General Topics Unit Manager's Meeting
Official Attendance Record
February 23, 1993

Please print clearly and use black ink

PRINTED NAME	SIGNATURE	ORGANIZATION	O.U. ROLE	TELEPHONE
KAY KIMMEL	Kay Kimmel	DAMES & MOORE	GSSC TO RL	376-1985
Allan C. Harris	Allan C Harris	RL	200 BP-1	376-4339
Robert W. Schlick	[illegible]	Dames & Moore	GSSC	946-0176
ROBERT HENCKEL	[illegible]	WHC	100 Area	509 376 2091
Jim PATTERSON	[illegible]	WHC	ER Program	509-376-0902
B.J. Hobbs	[illegible]	WHC	EFS	509-376-2935
Brian Drost	[illegible]	USGS	EPA Support	206-593-6510
Ward Staubitz	[illegible]	USGS	EPA Support	206-593-6710
DENNIS Faulk	[illegible]	EPA	UM	376-8631
CHUCK Clark	[illegible]	Ecology	UM & Hydrogeo	(206) 438-7550
Jeff Phillips	Jeff Phillips	Ecology	UM	736-3011
S.W. Peterson	[illegible]	WHC	Sitewide Background	509-376-1273
D.S. [illegible]	[illegible]	WHC	" "	509-376-2626
K.L. Jones	[illegible]	Dames + Moore	GSSC to RL	509-946-0176
R.G. McLeod	[illegible]	DOE-RL	UM	509 372-0096
S.W. Clark	[illegible]	WHC	Art Assessment	509-376-151
CHRIS W. DRIG	[illegible]	BATTELLE	ER PROG. MGR	375-2564
T.E. JONES	[illegible]	PNL	PRO. MANAGER	375-2716
Andrea DeAngeles	[illegible]	PRC	EPA Support	206-624-2692
Richard Hibbard		Ecology	Support	(206) 493-9367
Jeff Kellam	[illegible]	US Public Health Serv	Observer	404 639-6036
P.Evan Dresel	[illegible]	PNL	Ground-Water Surveillance	(509) 376-8341
R.A. Bechtold	[illegible]	WHC-ERE	Observer	376-9017
Joy P. Denkers	[illegible]	Ecology	Support	(206) 493-9366

General Topics Unit Manager's Meeting
Official Attendance Record
February 23, 1993

Please print clearly and use black ink

PRINTED NAME	SIGNATURE	ORGANIZATION	O.U. ROLE	TELEPHONE
Nancy Wendel	Nancy Wendel	DOE/RL	DOTA Mgmt	376-5500
Richard Carlson	Richard Carlson	WHC/ERE	200/300 Area RI's	376-9027
Dave Teel	Dave Teel	Ecol		736 3010
JULIE ERICKSON	[illegible]	DOE-RL	Env. Remed. Br. Chief	376-3603
~~Sue Patterson~~	[illegible]			
Ted Wooley	Ted Wooley	Ecol	OU Mgr - 100 Area 200 Area - 300 RF	736-3012
Dib Goswami	[illegible]	Ecol.	UMM	736-3015
Doug Sherwood	Doug Sherwood	EPA	UM	376-9529
PAMELA INNIS		EPA	UM	376-4919
Larry Gadbois	LE Gadbois	EPA	UM	376-9884
DONALD E. CLARK	D E Clark	WHC/ERE	Assessment / Data Verification	376-5935
Kevin Angelos	[illegible]	Golder Assoc.	WHC Support	206 883-0477
NANCY UZIEMBLO	Nancy Uziembło	Ecology	UM 200 area	736-3014
Roberta Day	Roberta Day	WHC/ERE	100 Areas	376-7602
Andrea De Angeles	A. De Angeles	PRC	EPA Support	206-624-2692
Larry Hulstrom	LC Hulstrom	WHC/ERE	300 RFS OU Coordinator	376-4034

Attachment #3

Agenda

Unit Manager's Meeting: General Topics
February 23, 1993

Approval of January General Topics Meeting Minutes - Bob Stewart

Update on Laboratory Status - Jeff Lerch

Quick Status
- Management of (IDW) - Bob Hobbs (Status 4.3)
- Update Site-Wide Background Study - Fred Ruck
- UMM Format - Eric Goller

Working Groups
- General
- Short discussion:
- Risk Assessment - Bob Stewart/Steve Clark

HEIS - Mike Schwab

Schedule Optimization Study (SOS) - Darby Stapp

300-FF-5 Area Comparison (CLP versus SW-846) - Kent Angelos

Integrated Demo (Buried Waste Demonstration @ Idaho)- Joan Woolard

Attachment #4

Action Items Status List
Unit Manager's Meeting: General Topics
February 23, 1993

ITEM NO.	ACTION/SOURCE OF ACTION	STATUS
GT.38	If possible, at the May Unit Manager's Meeting a presentation on the approved, preferred alternative method for disposal of the reactors will be given. Action: Jim Goodenough (4/18/90, GT-UMM)	Closed 02/23/93.
GT.128	Provide information on the date when Analytical Data Strategy document will be provided to Ecology and EPA. (2/26/92). Action: Jim Goodenough.	Open. To remain open pending outcome of meeting on 3/26/92. Eric Goller will give status of item at May UMM (4/22/92). Currently in RL review. The paper will be provided to EPA and Ecology upon satisfactory resolution of all RL comments. Pending formal transmittal (6/24/92). In internal DOE/RL review process (7/29/92). Comments have been submitted (10/21/92). This issue needs to be revisited, with a new actionee (01/27/93).
GT.136	Present a progress report in a few months on how the IDW work is going. Action: Daryl Koch (6/24/92)	Closed 01/27/93.
GT.149	Provide the report for the mid-October assessment of the Weston laboratory. Action: Jeff Lerch (WHC).	Closed 02/23/93.
GT.150	Work with Frank Calapristi to incorporate the Investigation Derived Waste Management Strategy into Appendix F of the TPA. Action: Bob Hobbs (WHC). 01/27/93.	Open.

ITEM NO.	ACTION/SOURCE OF ACTION	STATUS
GT.151	Write a letter to EPA and Ecology stating that a response to comments on the groundwater background report will be provided upon completion of the EPA and Ecology submittal of comments on Appendix D. Also, provide a final date when the document will be completed. Action: Fred Ruck (WHC). 01/27/93.	Open. Waiting for formal letter from F. Ruck 02/23/93.
GT.152	Initiate the action to establish a working group to develop background parameters for radiochemicals. Action: Bob Stewart (RL). 01/27/93.	Open.
GT.153	Provide a list of all of integrated demonstrations and provide a 30 minute briefing describing the INEL integrated demo. Action: Joan Woolard (WHC). 01/27/93.	Closed 02/23/93.
GT.154	Resolve internal issues and provide a report to the regulators concerning groundwater site-background concentrations at the February Unit Manager's Meeting. Action: Mike Thompson (RL). 01/27/93.	Open.
GT.155	Provide the Regulators with a copy of the new Request for Proposal (RFP) for commercial laboratory services as soon as it is completed in order to verify that the RFP is in compliance with the M-14 settlement. Action: Jeff Lerch.	NEW.

ANALYTICAL SERVICES STATUS

J. A. Lerch

February 23, 1993

COMMERCIAL LABORATORIES

- Technical Proposals for contract extensions through March 1994 under review.

- DataChem and S-Cubed continue to have small workloads.

- TMA backlog elevated due to carryover from samples submitted in September 1992.

  - Backlog recovery projected for March 1993.

COMMERCIAL LABORATORIES (continued)

- Assessment of Teledyne facility performed January 27-28, 1993.

- Weston and TMA scheduled for site visit during March 1993.

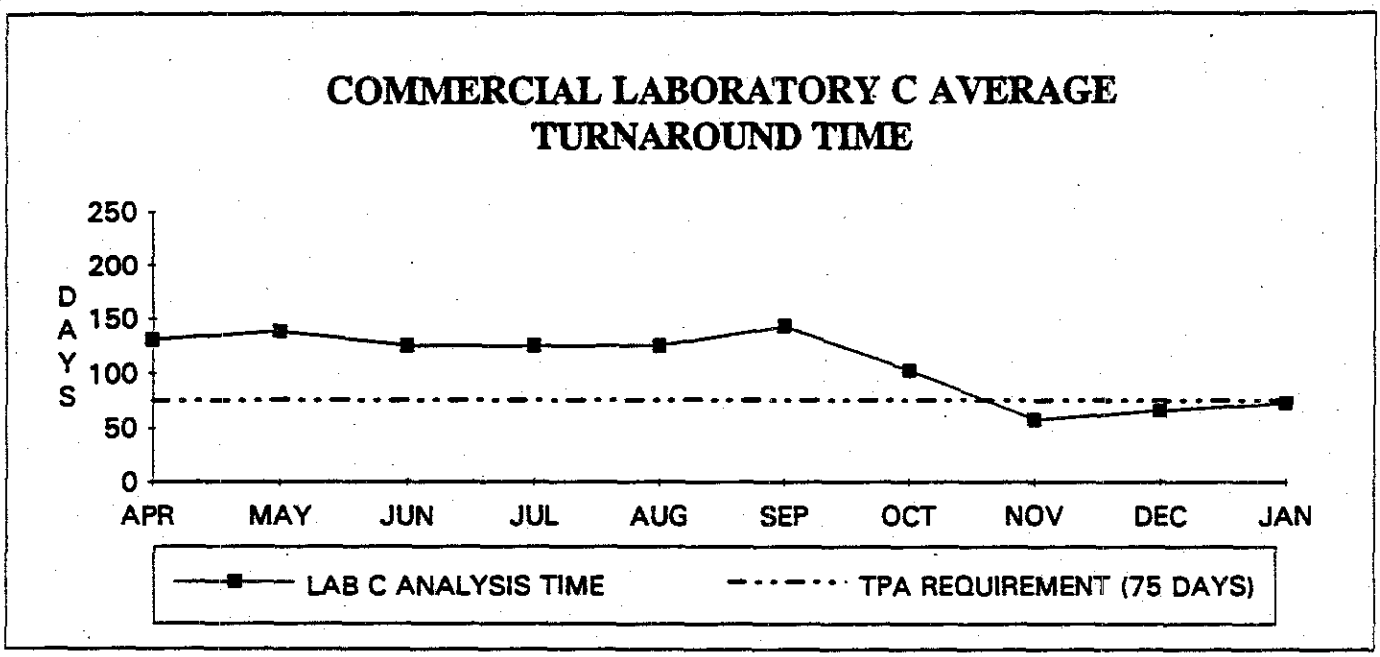
ANALYTICAL SERVICES PROCUREMENT

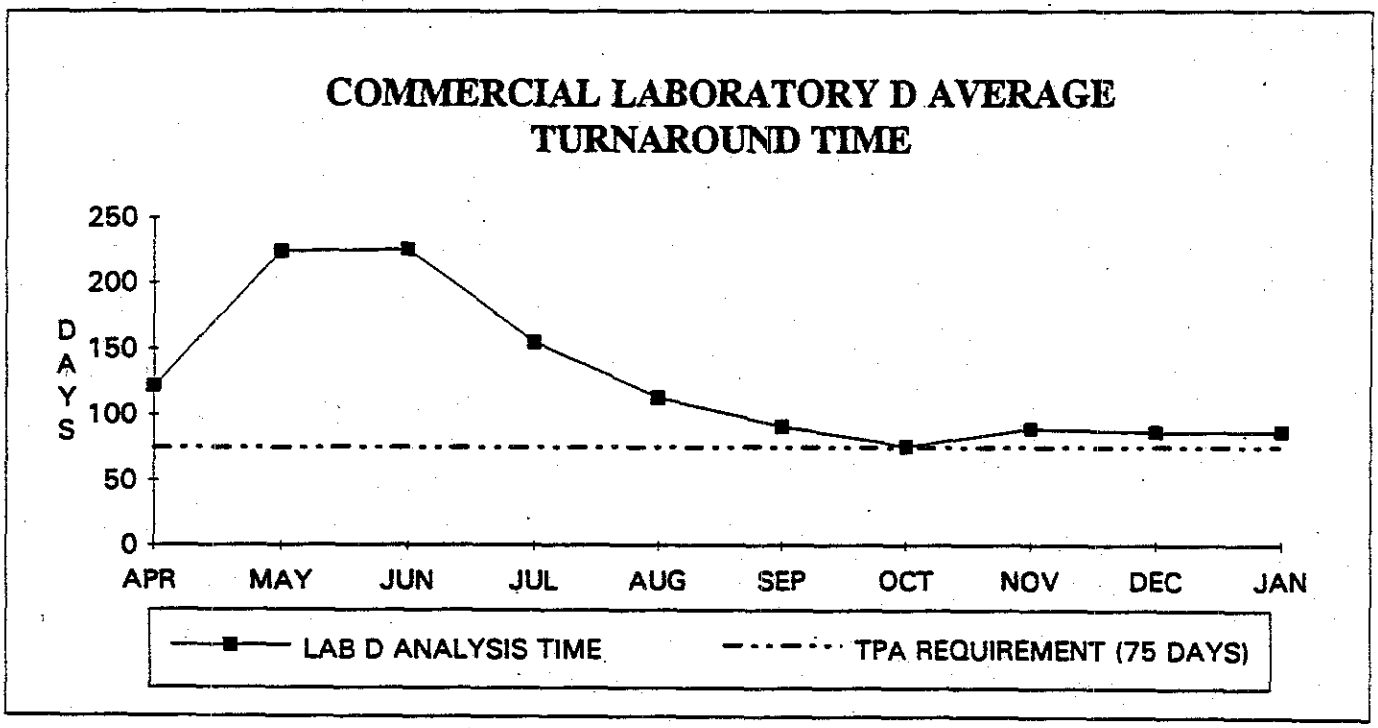
- CBD announcement issued February 17, 1993.
- Amended RFP issued week of February 22, 1993.
  - Consistent with M-14-04 requirements.
- July 1993 target award date.

Figure 4

COMMERCIAL LABORATORIES AVERAGE TURNAROUND TIMES FOR LOW LEVEL RADIOACTIVE SAMPLE ANALYSIS*

BY MONTH COMPLETE DATA IS RECEIVED



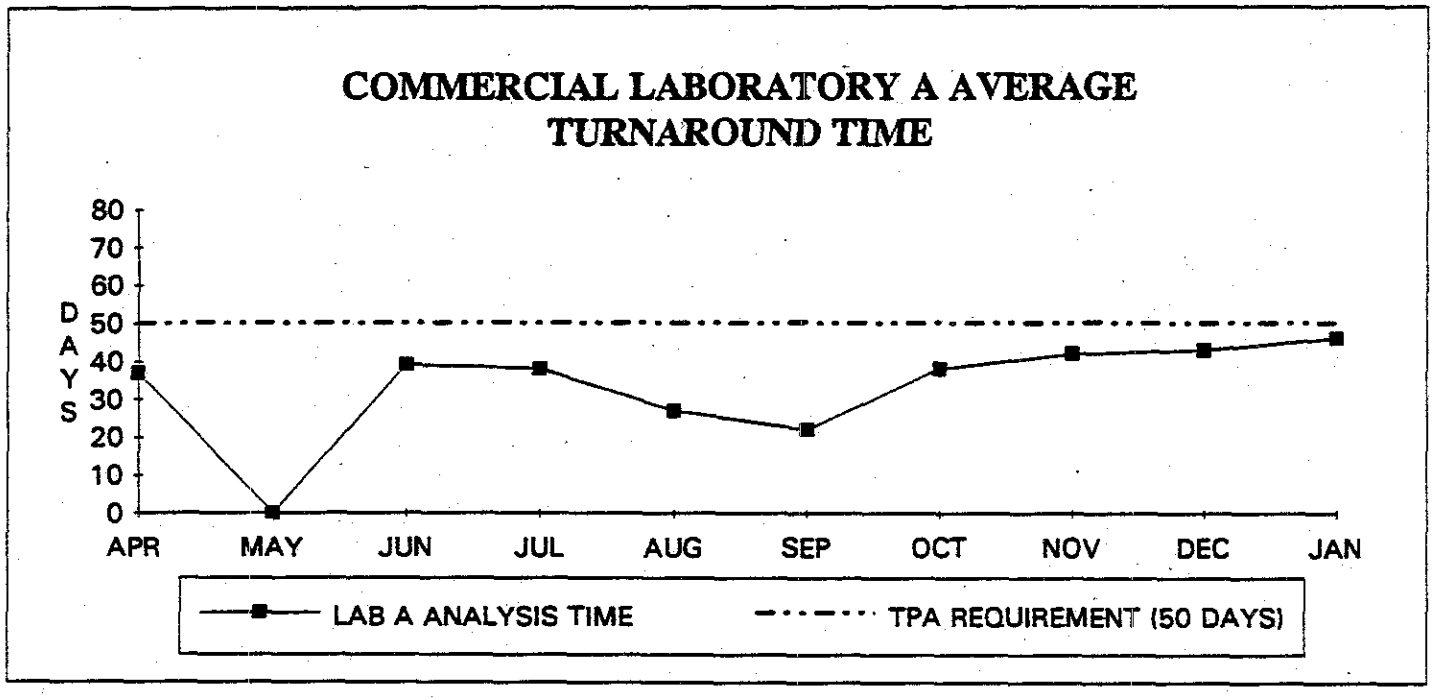


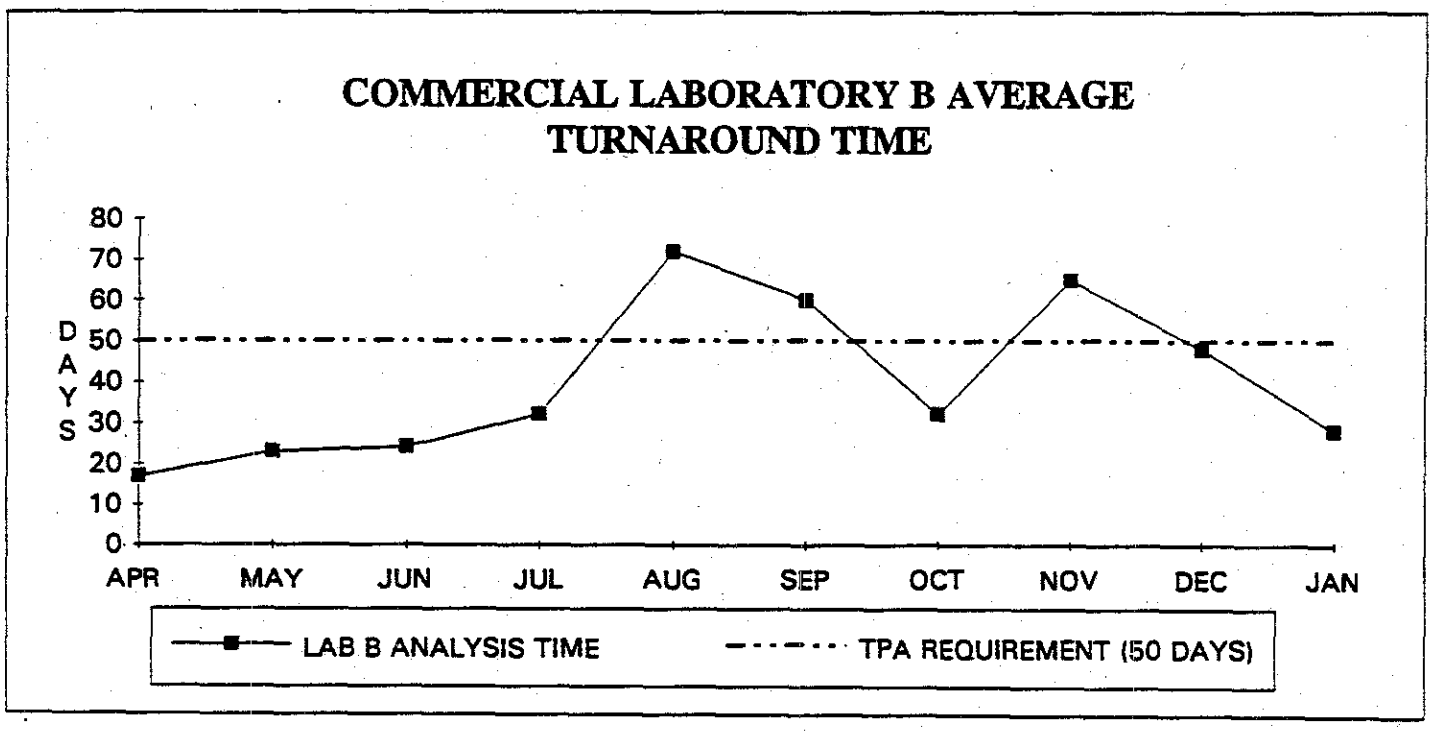
*Note: Turnaround times are calculated from the date of sample collection to the date of complete data received

Figure 3

COMMERCIAL LABORATORIES AVERAGE TURNAROUND TIMES FOR NON RADIOACTIVE SAMPLE ANALYSIS*

BY MONTH COMPLETE DATA IS RECEIVED

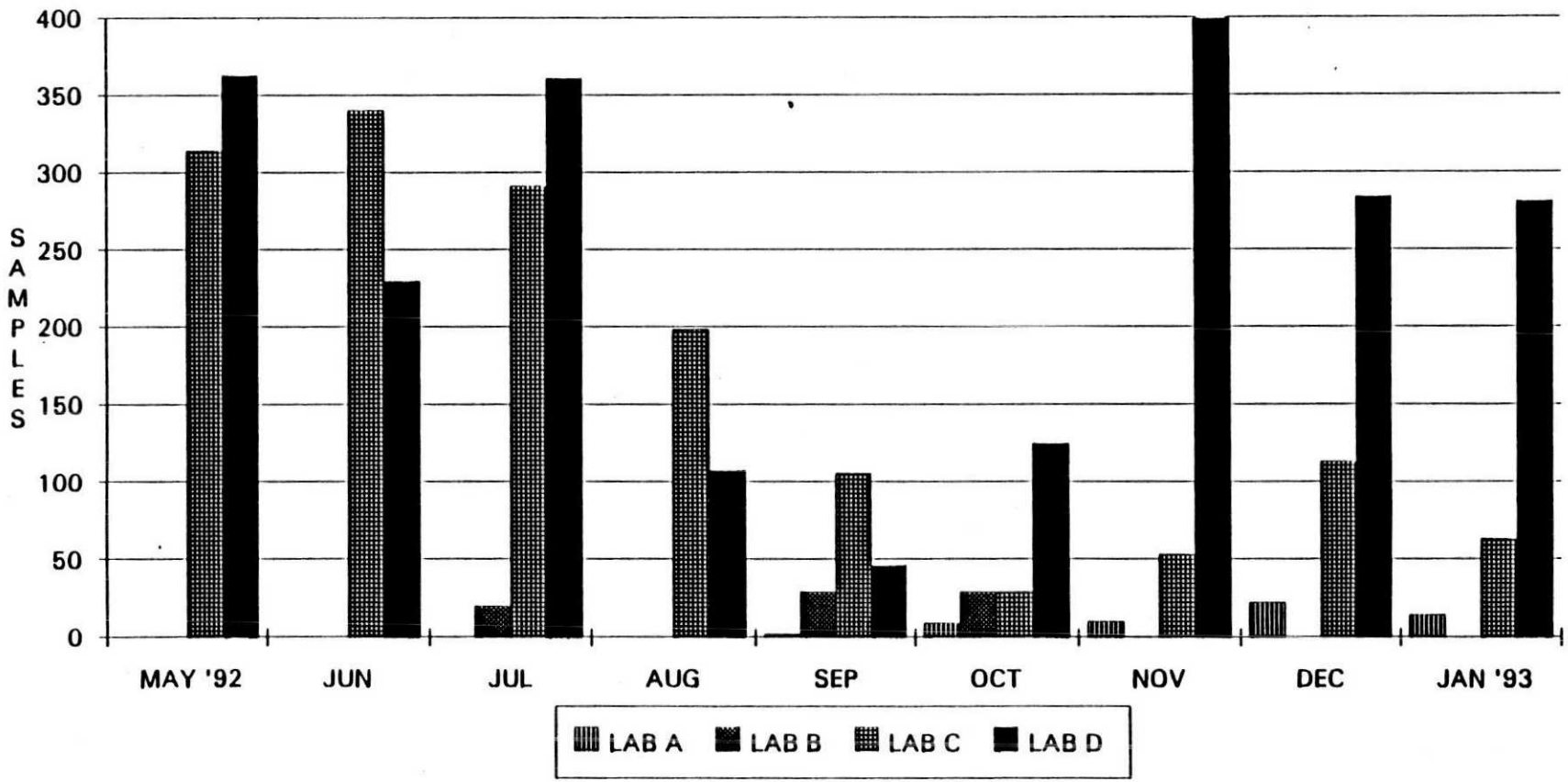




*Note: Turnaround times are calculated from the date of sample collection to the date of complete data received

Figure 5

COMMERCIAL LABORATORIES SAMPLE BACKLOG



BACKLOG DEFINITION: FOR LABORATORIES A & B SAMPLES WHICH HAVE BEEN AT THE LABORATORY LONGER THAN 35 DAYS. FOR LABORATORIES C & D SAMPLES WHICH HAVE BEEN AT THE LABORATORY LONGER THAN 60 DAYS.

TURNAROUND TIME SUMMARY TABLES

- Backlog samples included in all average TAT calculations.

- TAT calculated for all samples submitted to commercial laboratories.

- TAT calculated based on two sample groups:

  - Group 1 -- based on month sample submitted.

  - Group 2 -- based on month data received.

LABORATORY A TURNAROUND TIME SUMMARY - 01/25/93

	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	
# Samples Submitted	0	2	2	11	66	33	50	97	41	24	
Performance by Month Samples Submitted											
# Samples Completed	N/A	2	2	11	66	29	50	91	37	5	
Shipping Time	N/A	9	2	3	6	9	10	9	6	8	
Analysis Time	N/A	44	24	21	24	*	28	*	*	*	
Turnaround Time	N/A	52	26	24	30	*	38	*	*	*	
Performance by Month Complete Data Received											
# Samples Completed	4	0**	3	1	73	8	6	62	78	62	
Shipping Time	3	N/A	6	2	5	3	9	11	8	8	
Analysis Time	34	N/A	33	36	22	19	29	31	35	38	
Turnaround Time	37	N/A	39	38	27	22	38	42	43	46	

*Will not be calculated until all data is complete for the subject month (# samples submitted = # samples completed)

**No sample data due

Monthly Sample Backlog[1]		0	0	0	0	2	9	10	22	14	

[1]Backlog defined as samples which have been at Laboratory A for >35 calendar days.

LABORATORY B TURNAROUND TIME SUMMARY - 01/25/93

	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	
# Samples Submitted	24	79	70	36	37	21	5	32	21	40	
Performance by Month Samples Submitted											
# Samples Completed	24	79	70	36	37	21	5	32	21	7	
Shipping Time	11	3	4	46	3	3	1	27	2	6	
Analysis Time	10	24	21	28	62	32	10	23	21	*	
Turnaround Time	23	32	25	74	65	35	11	50	23	*	
Performance by Month Complete Data Received											
# Samples Completed	1	10	98	47	36	12	22	33	38	22	
Shipping Time	7	5	5	4	46	23	2	2	25	7	
Analysis Time	10	18	19	28	26	37	30	63	23	21	
Turnaround Time	17	23	24	32	72	60	32	65	48	28	

*Will not be calculated until all data is complete for the subject month
(# samples submitted = # samples completed)

Monthly Sample Backlog[1]		0	0	20	0	29	29	0	0	0	

[1]Backlog defined as samples which have been at Laboratory B for >35 calendar days.

LABORATORY C TURNAROUND TIME SUMMARY - 01/25/93

	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	
# Samples Submitted	151	70	77	178	110	189	247	115	79	31	
Performance by Month Samples Submitted											
# Samples Completed	151	70	77	178	110	165	218	101	30	0	
Shipping Time	3	3	4	4	3	7	3	4	3	6	
Analysis Time	89	76	52	59	57	*	*	*	*	*	
Turnaround Time	92	79	56	63	60	*	*	*	*	*	
Performance by Month Complete Data Received											
# Samples Completed	68	150	103	135	204	226	171	191	204	127	
Shipping Time	5	3	3	4	4	10	14	3	3	3	
Analysis Time	126	135	122	120	121	132	88	55	63	70	
Turnaround Time	131	138	125	124	125	142	102	58	66	73	

*Will not be calculated until all data is complete for the subject month
(# samples submitted - # samples completed)

Monthly Sample Backlog[1]		314	340	291	198	106	29	53	113	67	

[1]Backlog defined as samples which have been at Laboratory C for >60 calendar days.

LABORATORY D TURNAROUND TIME SUMMARY - 01/25/93

	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	
# Samples Submitted	106	304	103	114	218	531	195	286	238	115	
Performance by Month Samples Submitted											
# Samples Completed	106	304	103	114	218	516	89	126	32	0	
Shipping Time	5	3	3	8	5	8	6	6	4	4	
Analysis Time	75	88	77	70	84	*	*	*	*	*	
Turnaround Time	80	91	80	78	89	*	*	*	*	*	
Performance by Month Complete Data Received											
# Samples Completed	203	148	338	155	348	192	143	239	307	316	
Shipping Time	6	29	57	5	10	5	4	5	11	4	
Analysis Time	116	195	168	150	103	86	72	84	76	83	
Turnaround Time	122	224	225	155	113	91	76	89	87	87	

*Will not be calculated until all data is complete for the subject month
(# samples submitted = # samples completed)

Monthly Sample Backlog[1]		363	230	361	108	46	125	399	284	281	

[1]Backlog defined as samples which have been at Laboratory D for >60 calendar days.

MANAGEMENT OF INVESTIGATION DERIVED WASTE

Unit Managers Meeting February 23, 1993

B. J. Hobbs

Current Waste Inventory

RCRA Groundwater Monitoring Wells		424
Past Practice Waste (PPW)		1,299
	TOTAL:	1,723

Other information

- Analysis has been received for all RCRA wells drilled to date. Disposition of the associated waste (424 drums) will start by March 1.

- Analysis and designation of 739 containers of Investigative Derived Waste (IDW) from Operable Units 100-BC-1, 100-DR-1, 200-BP-1, 300-FF-1 and 300-FF-5 has been received. Anticipated disposition is as follows:

  - 162 drums of non-regulated waste to be dumped
  - 268 drums of radiation trash to be compacted at 100-N
  - 291 drums to be sent to the Low Level Burial Ground
  - Nine drums of mixed waste to be sent to the Central Waste Complex
  - Nine drums of hazardous waste to be sent to the 616 building

  When completed this effort will reduce past-practice waste on-hand by 56%

- Consolidation of drums of past practice IDW from the point of generation to operable unit specific centralized waste container storage areas (CWCSA) is ongoing. Transfer of the IDW from operable units 100-BC-1, 100-BC-5, 100-FR-1, 100-FR-3, 100-DR-1, 100-KR-1 and 100-KR-4 is complete. Consolidation of IDW from operable unit 100-NR-1 is currently being addressed. The consolidation effort is expected to enhance EFS IDW management capabilities.

UNIT MANAGERS MEETING
Tuesday, February 23, 1993, 740 Steven Center/Room 1200

RISK ASSESSMENT WORKING GROUP
R. K. Stewart/S. W. Clark

1. Revision of Hanford Site Baseline Risk Assessment Methodology - The Risk Assessment Committee met at the U.S. Environmental Protection Agency (EPA) Hanford Project Office on February 8, 1993, to disposition internal comments on a mock-up of Revision 2 of the Hanford Baseline Risk Assessment Methodology (HSBRAM), DOE/RL-91-45. Additional dispositions of comments occurred in a telephone conference call between the Washington Department of Ecology (Ecology) and the U.S. Department of Energy Richland Field Office (RL) on February 17, 1993. All current versions of qualitative risk assessments and remedial investigation reports have been based upon Revision 2 of the HSBRAM because publication of Revision 2 had been scheduled to occur several months ago. These documents cannot be released to EPA and Ecology until Revision 2 is approved by the regulatory agencies. It is expected that approval will be obtained in the next few weeks so Revision 2 of the HSBRAM be published at the end of March 1993. References in current QRAs and RI reports must be reviewed for consistency with the revised March 1993 publication date of the HSBRAM.

2. 100 Area Qualitative Risk Assessments - Examples of qualitative risk assessments for a source operable unit (100-BC-1) and a groundwater operable unit (100-HR-3) have been presented to RL, EPA, and Ecology at meetings of the Risk Assessment Committee.

Status of Data in the Hanford Environmental Information System (HEIS)

Mike Schwab
Environmental Data Management Group
HEIS Project

Unit Managers Meeting
February 23, 1993

- Data Validation Process Status
  - Data Package Verification Study Completed.
  - Data Package Verification Procedure and Checklists
    - Draft Checklists Issued 1/29/93
    - Draft Procedure Issued 2/16/93
  - Data Package Verification Staff Being Hired
    - ECD ~3/5/93

- o Validated Data Entry into HEIS (Manual)
  - Hired (2) HEIS Data Entry Staff from Kelly Services (Temp)
    - . 1st on 2/9/93, 2nd on 2/16/93
    - . Training Completed 2/18/93
    - . Work Stations Completed 2/18/93
  - Hire (2) Data Entry Staff at PNL (Temp)
    - . Work Order/Letter of Instruction Issued 2/18/93

o Validated Data Entry into HEIS (Electronic)

- Implementation of Electronic Transfer of Changed (Validated) Data Qualifiers to HEIS

  . HEIS Data Loader for Changed Data Qualifiers .....Completed 2/4/93.

  . Electronic 'DQs' from BOA Validators ECD 3/31/93

o Implementation of Electronic HEIS Data Loaders

- Changed (Validated) Data Qualifier Loader
  - . Software Completed 2/11/93
  - . BOA Inputs ESD 3/1/93
- RadChem Electronic Data Format/Loader
  - . Software ECD 6/1/93
- WetChem Electronic Data Format/Loader
  - . Software ECD 9/1/93

RESEARCH, DEVELOPMENT, DEMONSTRATION, TESTING, AND EVALUATION

Conducted by the Office of Technology Development

A Synopsis of Technologies Being Developed and Demonstrated by EM-50

OCTOBER, 1992

Technology Development

INTEGRATED DEMONSTRATIONS:

- VOCs in Non-Arid Soils (Savannah River)
- VOCs in Arid Soils (Hanford)
- Mixed Waste Landfill (Sandia)
- Plutonium in Soil (Nevada)
- Uranium in Soil (Fernald)
- Buried Waste (INEL)
- Underground Storage Tanks (Hanford)
- D&D Of Concrete and Metals (Oak Ridge)
- Environmentally Conscious Manufacturing (Sandia)
- Dismantlement (Sandia)

INTEGRATED PROGRAMS:

- Robotics (HQ)
- Characterization, Monitoring, and Sensor Technology Development (HQ, Ames)
- Efficient Separations (Hanford)
- In Situ Remediation (Hanford)
- In Situ Vitrification (Hanford)
- Mixed and Hazardous Waste Processing (Oak Ridge)
- Dynamic Stripping (LLNL)

VOCs IN NON-ARID SOILS (SAVANNAH RIVER)

PROBLEM: VOCs trapped in clay zones

REMEDIATION:

- Soil gas extraction combined with horizontal drilling
- Bioremediation - vapor and liquid phase, in situ and ex situ
- Radiofrequency and ohmic soil heating combined with soil gas extraction
- Off gas treatment: catalytic oxidation, free radical oxidation (low temperature plasma), and biodestruction

DIRECTIONAL DRILLING:

- Adaptation and development of petroleum and mining industry technology
- Focusing development on borehole stabilization, guidance, and minimization of drilling fluids

MONITORING AND CHARACTERIZATION:

- 13 field monitoring systems being developed/demonstrated

MIXED WASTE LANDFILL (SANDIA)

PROBLEM: Landfills containing conglomerates of radioactive, organic, and inorganic wastes

CHARACTERIZATION

- Directional boring
- SEAMIST membrane hole liner
- Downhole X-ray fluorescence
- Cross-hole electromagnetic imaging

IN SITU REMEDIATION

- Radiofrequency heating to enhance vapor extraction
- Electrokinetic remediation of metals
- Gaseous reduction to control chromium mobility

IN SITU CONTAINMENT/STABILIZATION

- Bio-engineered caps
- Determination of effects of capping on contaminant transport
- In situ grouting
- Subsurface barriers

PLUTONIUM IN SOIL (NEVADA)

PROBLEM: Near surface (top few inches) of Plutonium-contaminated soil

SOIL SURFACE REMOVAL:

- Pavement Profiler - removes the top few inches of contamination from the soil surface with minimal dust generation

SOIL SEPARATION:

- Conventional Mining Technologies - sieves, jigs/gravity tables, air separation, flotation

URANIUM IN SOIL (FERNALD)

PROBLEM: Large volumes of uranium contaminated soils

CHARACTERIZATION:

- Field screening techniques - real time gamma ray spectrometer, real time beta/gamma detector, MLA-ICP-OES
- Adaptation of laboratory techniques to better understand physical and chemical characteristics

EXCAVATION:

- Remotely operable, precise near-surface soil removal demonstration

SOIL DECONTAMINATION:

- Chemically selective extraction
- Electrochemical separation (for deep soils and those under buildings)
- In situ biotransformation and leaching of uranium

SECONDARY WASTE TREATMENT/DISPOSAL:

- Immobilization technologies not yet selected for demonstration

BURIED WASTE (INEL)

PROBLEM: Buried TRU waste in drums, boxes, and scrap materials, random and stacked configurations

CHARACTERIZATION:

- Broadband electromagnetic sensor - subsurface 3-D characterization
- Magnetometer and Magnet Tensor Gradiometer
- Transfer of activities to Characterization IP

RETRIEVAL:

- Robotics
- Cryogenics
- Contaminant Control

EX SITU TREATMENT:

- Thermal treatment technologies

IN SITU TREATMENT/PRETREATMENT:

- Relying on In Situ Remediation and In Situ Vitrification Integrated Program technologies

UNDERGROUND STORAGE TANKS (HANFORD)

PROBLEM: Underground storage tanks at 5 DOE locations

CHARACTERIZATION:

- Ultrasonic, nondestructive techniques - physical characterization
- Surface spectographic
- Cone penetrometer in tanks
- Laser raman scattering spectroscopy for ferrocyanide detection

RETRIEVAL:

- Sludge dislodging end effector
- Remotely operable, light duty arm combined with control, positioning, and sensor systems
- Slurry conveyance systems

PRETREATMENT (IN SITU AND EX SITU):

- High gradient magnetic separator
- TRUEX
- Conversion of nitrates to ammonia

ISOLATION BARRIER SYSTEMS:

- Permanent isolation surface barriers
- Interim subsurface confinement barriers

DISMANTLEMENT (SANDIA)

PROBLEM: Destruction and disposal of classified nuclear weapon components, primarily electronic subassemblies

MATERIAL PREPARATION: Used to declassify components

- Forge hammer rubbilization
- Cryofracture

TREATMENT:

- Acid digestion
- Plasma arc
- Vitrification

CHARACTERIZATION, MONITORING, & SENSOR TECHNOLOGY DEVELOPMENT (HQ, AMES)

NEEDS: Characterization represents 1/4 of technology needs for DOE EM-40

NONDESTRUCTIVE CHARACTERIZATION TECHNOLOGIES:

- Associated Particle Imaging - nonintrusive, neutron based technique for sealed containers

REMOTE SENSING AND NONINVASIVE GEOPHYSICAL SENSORS:

- Satellite imagery
- Airborne imagery
- Adaptation and improvement of ground-based nonintrusive methods and subsurface invasive methods

FIELD DEPLOYABLE INSTRUMENTATION:

- Infrared Photoacoustic Methods: for real-time and in situ field analysis of toxic organics
- Improvements to ICP-MS - for trace elements and radionuclides
- In Situ Secondary Ion Mass Spectrometry (SIMS) - for direct sampling of nonvolatile contaminants in soils (esp. chelating agents)

IN SITU VITRIFICATION (HANFORD)

PROBLEM: Soils contaminated with radionuclides, heavy metals and/or nonvolatile organics that would normally require removal and treatment

OFF GAS CONTAINMENT:

- Cesium suppression/recycle for high Cs concentrations (>1000 Ci/setting)
- Improvements to TOUGH to define operational constraints to preclude pressurization events

VOC MIGRATION CONTROL:

- Determine behavior of steam and VOCs through TOUGH modeling and field data collection

MELT DEPTH AND SHAPE CONTROL:

- Electrode Feed System - eliminates need to predrill electrodes
- Depth Enhancement - to achieve > 10 m depth
- Subsurface Vitrified Barriers - for permanent isolation of wastes

MIXED AND HAZARDOUS WASTE PROCESSING (OAK RIDGE)

PROBLEM: Mixed waste currently stored, generated from operations, or generated from environmental restoration and D&D

FINAL FORM:
- Vitrification
- Polymer Solidification

OFF GAS TECHNOLOGY

DESTRUCTION/REDUCTION/ STABILIZATION:
- Microwave Fluidized Bed
- Solar Detoxification
- Biodegradation
- Plasma Arc Furnace
- Catalytic Destruction

SEPARATION OF SUSPENDED & DISSOLVED MATERIALS:
- CEPOD

SORTING, FEED PREP, SIZE REDUCTION

FRONT END WASTE HANDLING

MERCURY CONTROL:
- Electromagnetic Separations

DECONTAMINATION AND RECYCLE:
- Liquid Carbon Dioxide Cleaning

DYNAMIC STRIPPING (LLNL)

PROBLEM: Concentrated underground organic contaminant plumes above and below water table

DYNAMIC STRIPPING PROCESS OPTIONS:

- Steam Injection - permeable soils
- Electrical Heating - relatively impermeable soils

MONITORING:

- Electrical resistance tomography
- Seismic imaging

BWID FY 1993 Core Program

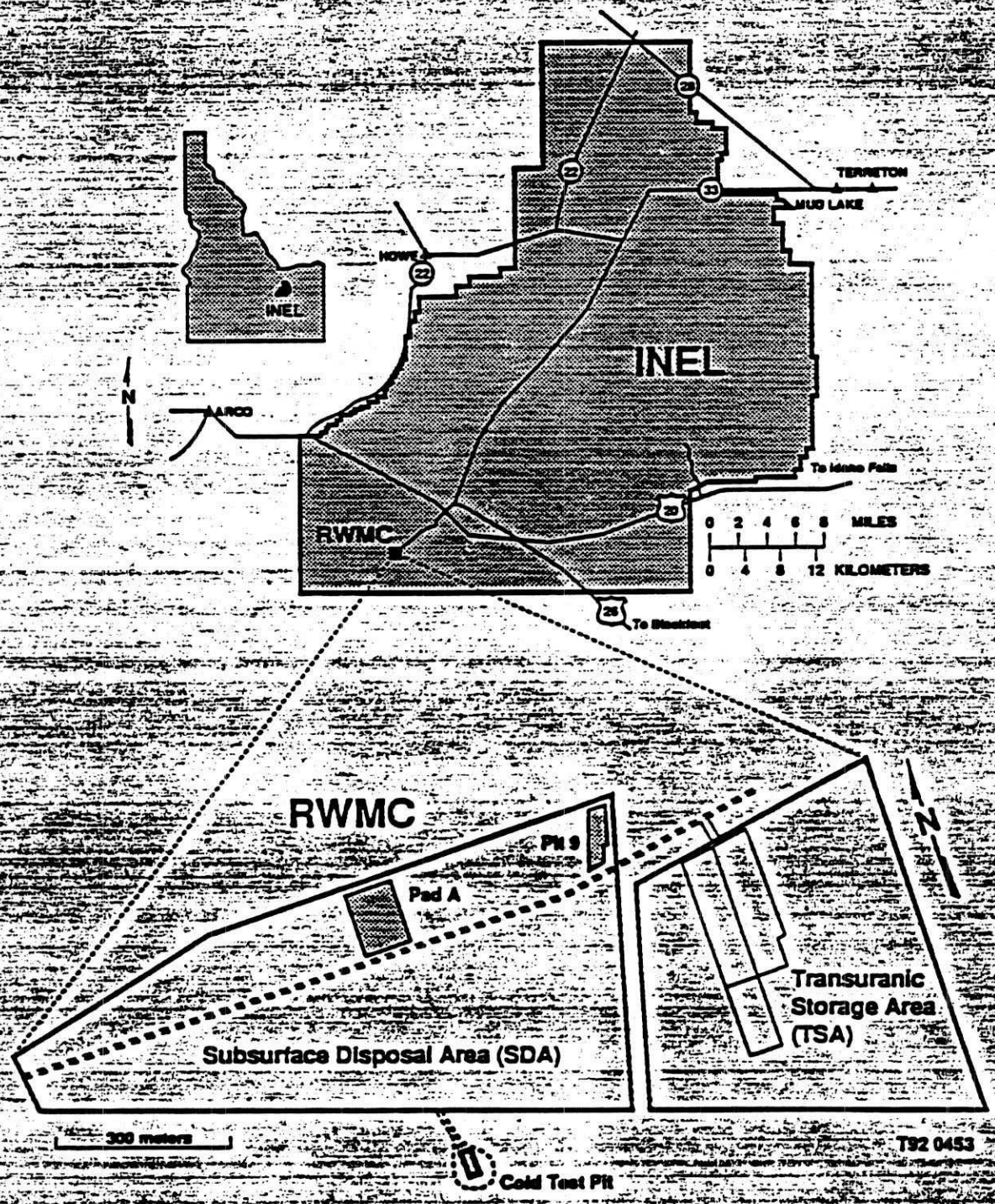
- Five System Components Will be Demonstrated at the INEL Cold Test Pit in June and July
  - Remote Characterization
  - Remote Excavation
  - Overburden Removal
  - Waste Isolation
  - Dust Control Unit
- Thermal Treatment and Other Characterization and Retrieval Technologies Will Undergo Lab Demonstrations
- Field Demonstration of Excavators and End Effectors Will be Conducted at a Vendor Site
- An Open House / Technology Exchange Meeting will be Held at INEL in July

BURIED WASTE INTEGRATED DEMONSTRATION (BWID)

J. G. WOOLARD

FEBRUARY 1993

Radioactive Waste Management Complex



Buried Waste Problem

- 2.1 Million Cubic Meters of Buried Waste in DOE Complex as of 1990
- Approximately Half the Waste was Disposed Prior to 1970, with Little Regulation
- Much of the Waste is Co-mingled
- Containers have Failed, Contaminating Surrounding Soils

Typical Waste Forms

- Construction and Demolition Materials
- Lab Equipment
- Process Equipment
- Maintenance Equipment
- Decontamination Materials

BWID Concept

- Waste Forms at INEL are Generally Representative of Other DOE Waste Sites
- Technology Demonstrations at the INEL Should Have Universal Application Throughout the DOE Complex
- BWID was Initiated to Provide Technical Solutions and Data for Remediation Decision Making

BWID Mission

- Support the Development and Demonstration of Remediation Technologies
- Form a Remediation System for Buried Waste Throughout the DOE Complex
- Establish Technologies that are Faster, Better, Safer, and Cheaper than the State of the Art

BWID Goals

- Develop Technologies for Complex-wide Needs
- Advance Current State of the Art Technology in Support of DOE Missions
- Eliminate Duplication of Effort
- Encourage Free Exchange of Information
- Provide Technology Infusion and Diffusion Between Government, Industry, and Universities

BWID Strategy

- Focus on Specific Needs
- Use Sites Representative of Complex-wide Problems
- Initiate Collaborative Efforts
- Evaluate Performance
- Emphasize Technology Transfer

BWID Technical Focus

- Retrieve / Ex-situ Treatment (Main Focus of FY 1993)
- In-Situ Treatment / Retrieval
- In-Situ Treatment / Monitoring
- Contain / Stabilize / Monitoring

Note: All Systems Start With Characterization

ER/WM System Requirements

Site/Waste Characterization	Below Grade Isolation	Above Grade Containment	Overburden Characterization	Overburden Removal	Retrieval	Treatment
• Determine Waste Debris	• Minimize Retrieval Volume	• Prevent Contaminant Migration	• Survey "Clean" Soil	• Remove "Clean" Soil	• Maintain Production Rates	• Maintain Production Rates
• Locate Original Pit Boundaries	• Support Containment	• Encompass Active Retrieval	• Locate Hot Spots	• Maintain Primary Containment	• Minimize Personnel Exposure	• Destroy Organics
• Locate Depth to Basalt						• Satisfy Final Waste TCLP

BWID
Buried Waste Integrated Demonstration

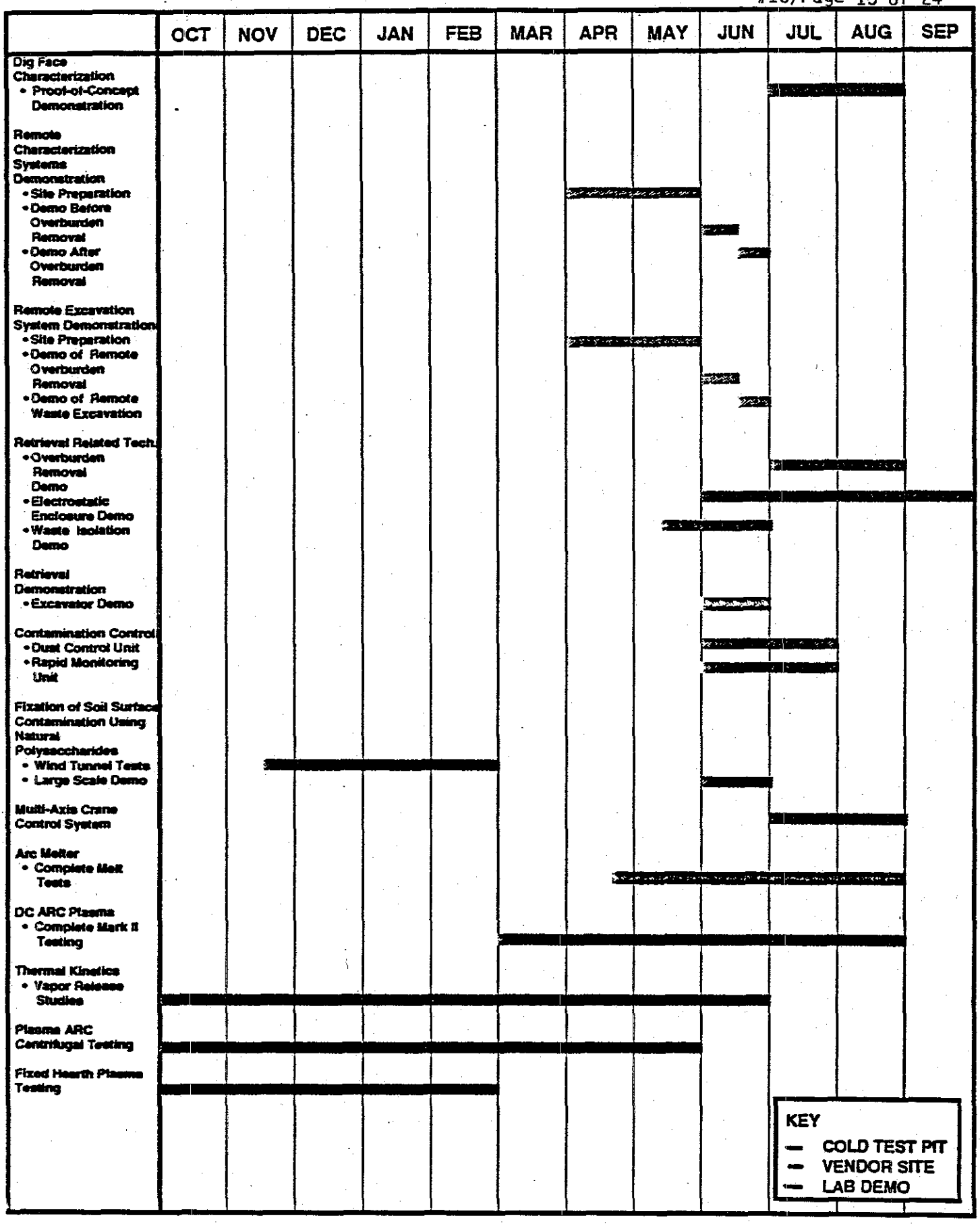
BWID Test Objectives

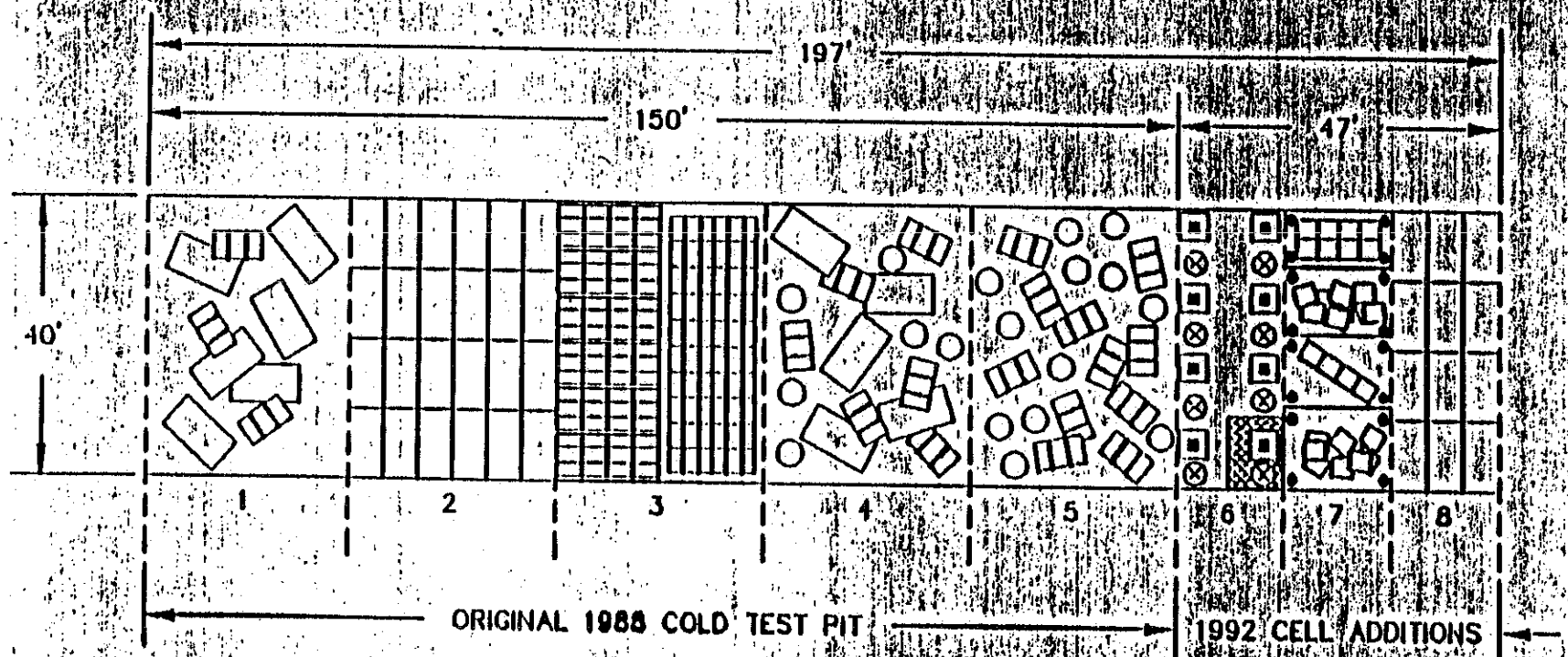
Site/Waste Characterization	Below Grade Isolation	Above Grade Containment	Overburden Characterization	Overburden Removal	Retrieval	Treatment
• Define Excavation Boundaries	• Determine Ability to Anchor to Basalt	• Measure Airborne Particulates	• Establish Rate of "Clean" Survey	• Remove Precise Layers	• Establish Production Rates	• Establish Production Rates
• Define Depth to Basalt	• Determine Structural Integrity	• Measure Reduction in Contamination Mobilization	• Determine Sensitivity to Hot Spots	• Maneuver Around Hot Spots	• Evaluate Remote Control	• Destroy Organics
• Define Buried Waste Form Objects					• Evaluate Dexterity with Waste Objects	• Measure TCLP of Glass Product

BWID
Buried Waste Integrated Demonstration

BWID FY93 Core Program Demonstration Dates

02/16/93
#10/Page 13 of 24





LEGEND

1. LARGE OBJECT PIT
2. STACKED BOXES
3. STACKED DRUMS
4. RANDOM DUMP BOXES/DRUMS
5. RANDOM DUMP DRUMS
6. CHARACTERIZATION CELL
7. RETRIEVAL CELL
8. CRYORETRIEVAL BOXES CELL

DRUMS

BOX

INSTRUMENT ACCESS PIPE 8" DIA (CHARACTERIZATION CELL)

SAND AND GRAVEL AREA (CHARACTERIZATION CELL)

WASTE FORM (CHARACTERIZATION CELL)

4" DIA CORNER MARKING PIPE (12 FT LG MARKED EVERY 1 FT – RETRIEVAL CELL)

NOTE: The reader should be cognizant that there is varying thicknesses of soil berm between cells that are to be determined through interrogation.

Figure A-1. Cold Test Pit.

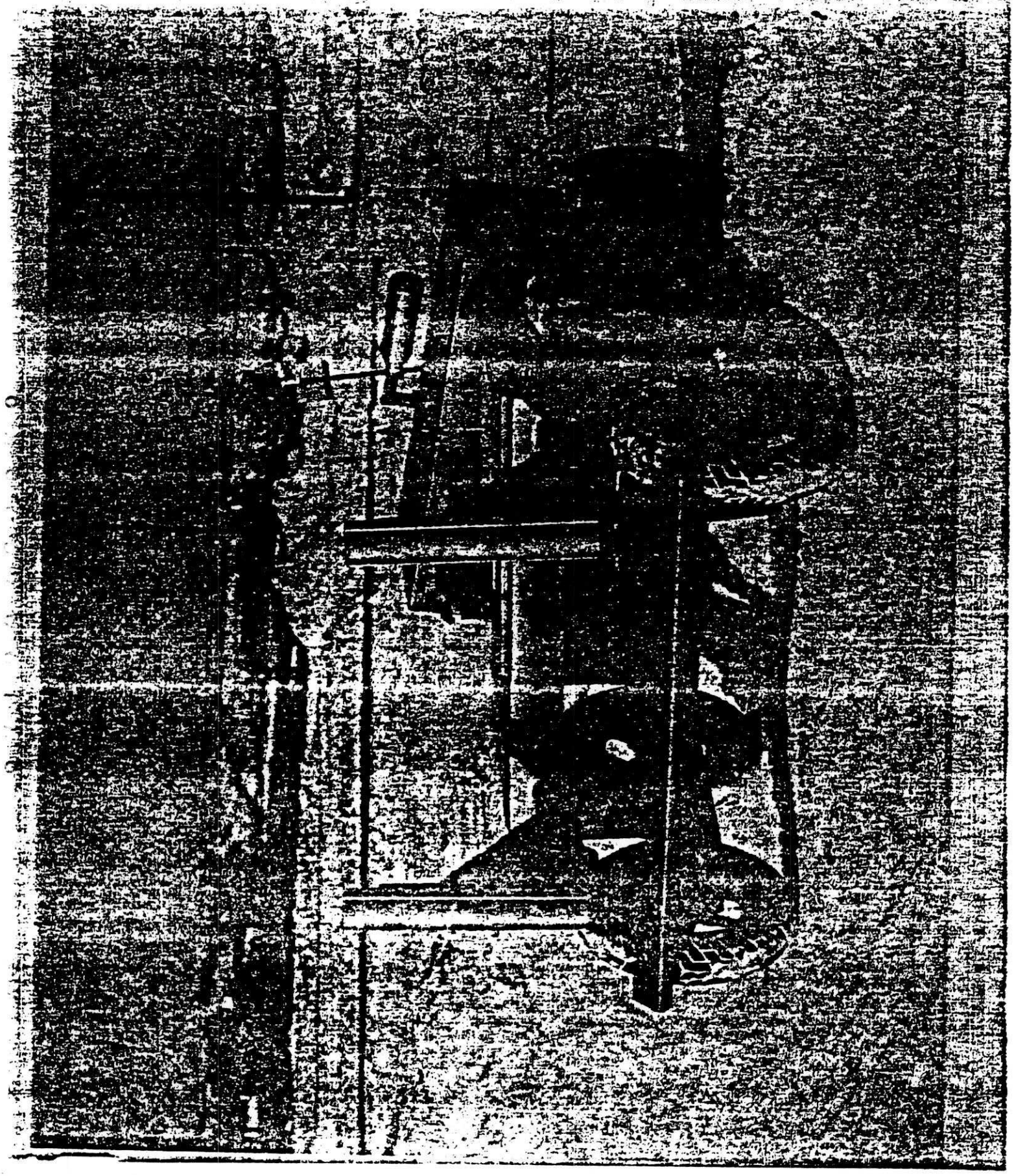
Remote Characterization System Demonstration

Purpose:

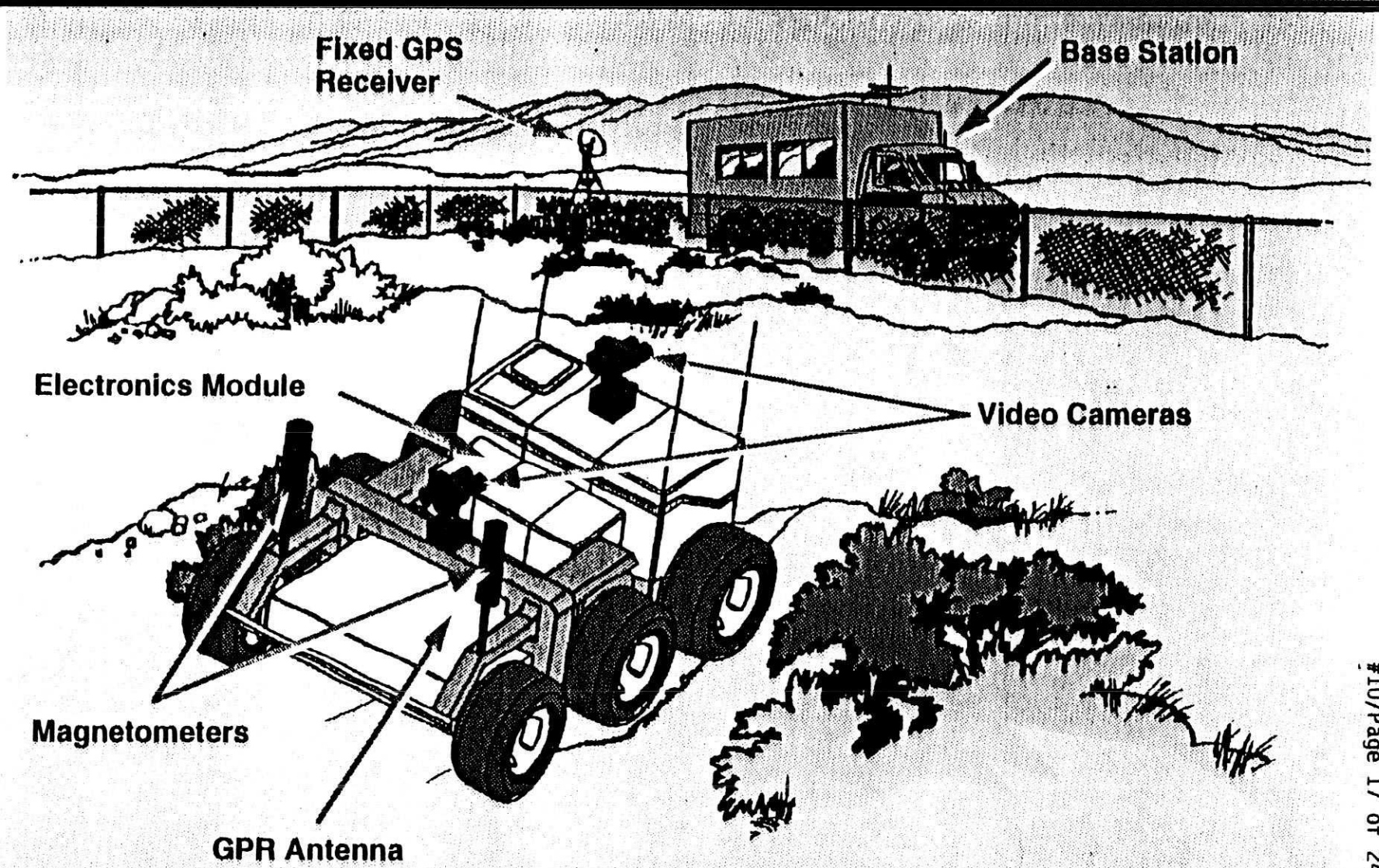
- Demonstrate Remote Delivery of Multiple Geophysical Sensors to a Buried Waste Site
- Obtain Data Over a Radio Frequency Link to an Advanced Human Engineered Control Station

System Components:

- Low Signature Vehicle
- High Level Control Station
- Global Positioning System
- Magnetometers
- Two-Channel Video Camera Mounts
- Vehicle Control Module
- Telemetry -- Commands, System Status, Data, Video



Remote Characterization System



R9210031.2

Rapid TRU Monitoring Laboratory

Purpose:

- Demonstrate Capability to Continuously Monitor Airborne TRU Concentrations
- Demonstrate Capability to Rapidly Analyze Soil, Smear, and Air Filter Samples for PU 238, PU 239, PU 240, AM 241, CO 60, and CS 137

System Components:

- Sample Preparation Trailer
- Sample Analysis Trailer
  - Control Terminal for Alpha CAMS (CAMS to be Installed in Pit)
- Two Ordela Large-Area Ionization Chamber Alpha Spectrometers
- Thin-Window Gamma-Ray Spectrometer and Associated Automatic Sample Changer
- Computer Terminals

Contamination Control Unit

Purpose:

- **Demonstrate a System for Controlling the Spread of Contaminants During Retrieval of TRU Contaminated Buried Waste**

System Components:

- **Mobile Trailer Designed to Dispense the Following:**
  - **Fixants - Provides a Moisture and Vapor Barrier to Maintain Naturally Occurring Moisture**
  - **Dust Suppressants - Eliminates Dust in Vehicle Traffic Areas**
  - **Misting Agent - Removes Airborne Dust**
  - **Vacuum System - Removes Soil Debris That has Accumulated Around Equipment**

Overburden Soil Removal Demonstration

Purpose:

- Demonstrate the Capability to Remove Overburden

Technical Issues:

- Minimize Potential Contamination Spread
- Maneuverability in Confined Space with Obstacles
- Process Speed
- Removal of Overburden Without Causing Unexpected Exposure of Waste
- On-line Radiological Monitoring

Remote Excavation System

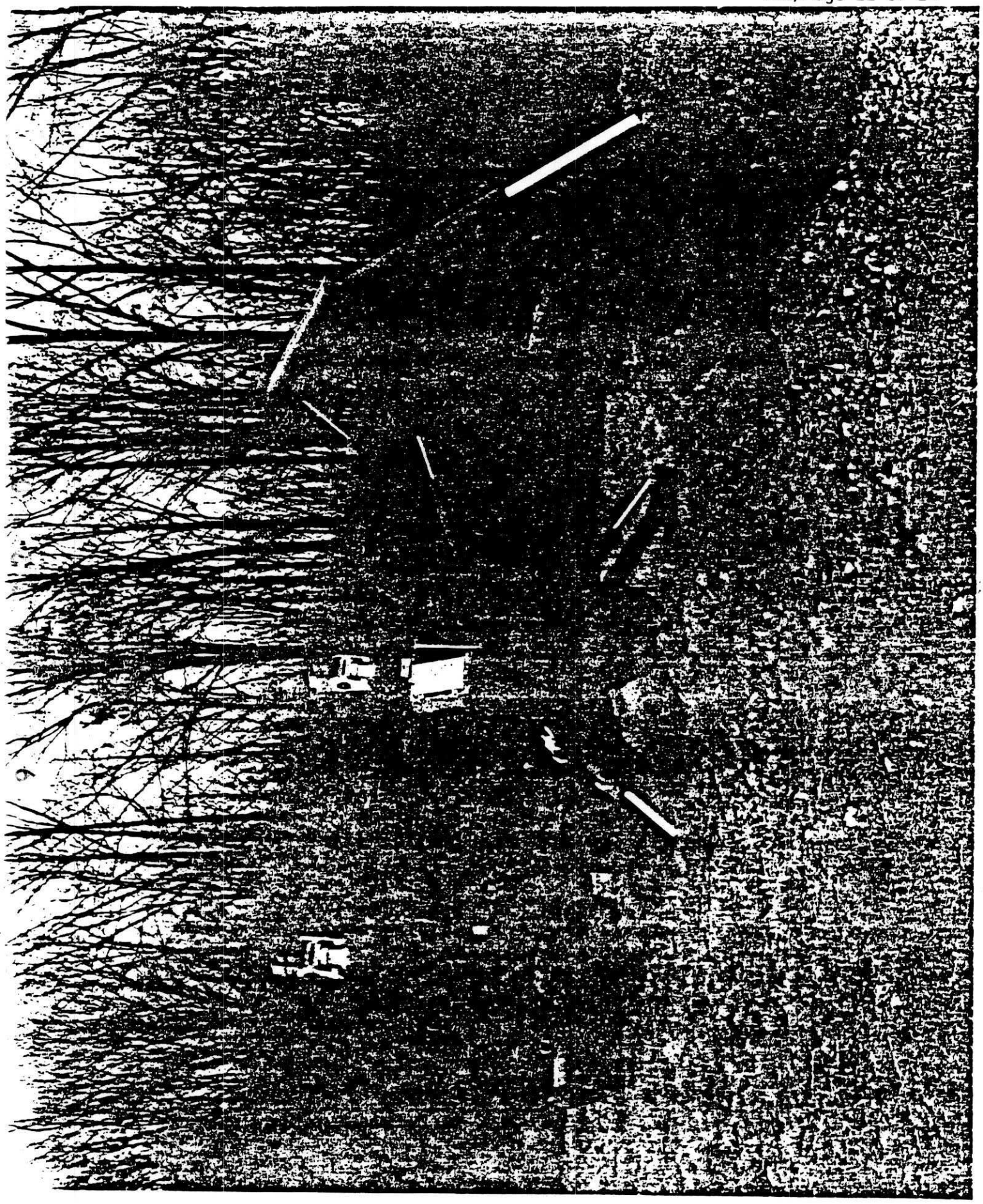
Purpose:

- Demonstrate Advanced Telerobotic and Robotic Excavation Technologies

System Components:

- Excavator with Front End Loader and Backhoe
- Cameras
- Control and Communications Equipment (Compact Portable Operator Console)
- Global Positioning System
- Modified Hydraulic Power System

Note: Telerobotic Excavator and Front End Loader Controls and Operator Interface can be Ported to a Large Number of Commercial Excavation Systems with Minimal Software Modifications and Reconfiguration



Retrieval Demonstration

Purpose:

- Demonstrate Various Excavators and End Effectors to Determine Efficiency of Removing Buried Waste

Potential System Components:

- Grapples
- Front Shovels
- Backhoes
- Clamshells
- Jaw Buckets
- Shears, Etc.

Components will be Selected by the Vendor and Demonstrated at the Vendor Test Site

Background

- 1100-EM-1 Dispute

- 1100 - EM-1 Dispute Resolution Decision Statement (August 1991)

  "DOE, in consultation with EPA and Ecology, will carry out a study of the processes that govern schedules in place for RI/FS work at Hanford . . . "

Balanced Team of Professionals Experienced with Clean-up Success

- DOE-HQ
- DoD
  - Air Force
  - Corps of Engineers
  - Navy
  - Army
- EPA
- Department of Justice
- Private Sector
  - Versar
  - EG&G -- Rocky Flats
  - Geotech -- INEL

EMO's Approach

EMO assigned responsibility for study

- **Planning (Spring 1992)**
- **Assessment**
  - **Internal self-evaluation (Summer 1992)**
  - **External - SOS Team (September 1992)**
- **Implementation plan ready next week**

Schedule Optimization Study

SOS Focus

Management Structure and Process	Technical Approach	Sampling and Analysis	Policy, Legal, Regulatory	Document Review Process	Procurement New Goods And Services

Cross-Cutting Issues

- Hanford still oriented to production mission
- Conservative interpretation of regulations
- Little focus on site cleanup goals
- Lack of integration of ER and WM activities
- Severe shortage of RL ER Staff
- Confusing lines of authority
- DOE unable to exercise appropriate oversite
- Mistrust and poor communication persist among TPA partners

Schedule Optimization Study

Recommendations

Cross-Cutting Issues	Management Structure and Process	Technical Approach	Sampling and Analysis	Policy Legal Regulatory	Document Review Process	Procurement
Production culture						
Conservative Interp.						
Little focus on goals						
ER & WM Int.						
Shortage of RL-ER Staff						
Confusing Lines of Authority						
Lack of Oversight						
Poor Communication TPA						
Number of Recommendations	9	12	9	9	11	11

Management Structure and Processes

Major Findings:

- No single point of authority
- Lack of team integration
- Insufficient DOE ER staff onsite
- Fragmentation of contracts hampers accountability

Major Recommendations:

- Establish technical support team
- Streamline management organization and operations
- Review applicability of DOE orders to ER mission
- Do not make ERMC use services of other parallel contractors

Technical Approach to Site

Major Findings:

- HPPS approach & macroengineering concept = streamlining of RI/FS process
- More emphasis on short-term vs. long-term
- Common activities at many sites

Major Recommendations:

- Implement HPPS
- Develop macroengineering concept
- Integrate data quality objectives for long-term cleanup activities
- Use commonalities to optimize schedules

Sampling and Analysis

Major Findings:

- **Inexperienced staff conducting sampling and analysis**
- **Inadequate laboratory capacity = delays**
- **Limited field team leader authority**

Major Recommendations:

- **Have TST develop sampling & analysis strategy to improve quality**
- **Build LLMW facility; make HL radioactive testing laboratory operational**
- **Empower FTLs with authority**

Policy/Legal/Regulatory Issues

Major Findings:

- NEPA Process = burdensome, little benefit
- Lack of integration between NEPA & CERCLA
- Lack of integration between RCRA & CERCLA

Major Recommendations:

- Reconsider policy applying NEPA to CERCLA
- Focus Hanford EIS away from cleanup technologies and toward long-term site use
- Seek integration & flexibility for RCRA/CERCLA activities

Technical Document Review Process

Major Findings:

- **Multiple reviews = lack of trust**
- **Lack of direction to reviewers**
- **HPPS is effective basis for streamlining cleanup**

Major Recommendations:

- **Use team approach to document preparation from scoping onward**
- **Define purpose of each level of review**
- **Implement HPPS and commit to revised milestones and OU/OA redesignations**

Procurement of Goods & Services

Major Findings:

- ER mission not shared by procurement
- Conservative procurement practices and regulations delay schedules
- Procurement rewards and incentives not related to ER mission

Major Recommendations:

- Make procurement staff part of ER team effort
- Review conservative procurement practices & regulations
- Develop long-term contracting plan
- Integrate incentives for ER goals into award fee

Next Step

Implementation

- Final report is ready for release
- Commitment to change is in place

  "RL and its contractors will make appropriate changes in their own internal procedures as rapidly as possible . . . EPA and Ecology will also make appropriate changes to their procedures (1100 EM-1 dispute resolution statement, 1991) . . ."
- Proposed approach has been developed

Summary

- Hanford needs an EM culture
- EPA, Air Force, Army, Navy overcame similar problems
- Hanford can build upon their experiences
- SOS is the vehicle for creating a new Hanford culture

GROUNDWATER DATA COMPARABILITY

FOR THE

300-FF-5 OPERABLE UNIT

FIRST AND SECOND GROUNDWATER SAMPLING ROUNDS 1992

February 1993

9 3 1 2 9 3 2 1 0 8 2

CRITERIA FOR EVALUATION

RELATIVE PERCENT DIFFERENCE (RPD) EVALUATED FOR ALL DETECTED RESULTS

- RPD $\leq$ 100% FOR RESULTS > 5X CRQL
- RPD $\leq$ 20% FOR RESULTS > 5X CRQL BUT < 100X CRQL
- RPD $\leq$ 10% FOR RESULTS > 100X CRQL

$$\frac{|A-B|}{(A+B)\div 2}\times 100$$

A = PRIMARY SAMPLE RESULT
B = SPLIT SAMPLE RESULT

9 3 1 2 9 3 2 1 0 8 3

EVALUATION CRITERIA (CONTD)

- COMPOUND OR ANALYTE MUST BE DETECTED IN BOTH SAMPLES
- DIRECT COMPARISON OF MS/MSD RECOVERY (SPIKED COMPOUNDS ONLY)
- DIRECT COMPARISON OF SURROGATE RECOVERIES

9 3 1 2 9 3 2 1 0 9 4

VOLATILE ORGANIC ANALYSIS RESULTS COMPARISON

ROUND 1

WELL: 1-16B			
LAB:	TMA CLP	DC SW-846	RPD
1,2-DCE	120	100	18%
TCE	9	10	11%
WELL: 2-1			
TCM	11	4.4	86%

1,2-DCE = 1,2-Dichloroethene (total)
TCE = Trichloroethene
TCM = Trichloromethane (Chloroform)

9 3 1 1 1 9 2 2 1 0 8 5

VOLATILE ORGANIC ANALYSIS RESULTS COMPARISON, (CONTD)

ROUND 2

WELL: 2-1			
LAB:	TMA CLP	DC SW-846	RPD
TCM	10 B	4 J	86%
TCE	2 J	2 J	40%
WELL: 2-2			
DCM	4 BJ	1 BJ	120% (*)
TCM	9 BJ	4 J	77%
TCE	5 J	4 J	22%

DCM = Dichloromethane (Methylene Chloride)

(*) - Exceeds evaluation criteria however compound is common lab contaminant

9 3 1 2 9 1 2 1 0 9 6

METALS ANALYSIS RESULTS COMPARISON

ROUND 1

WELL	1-17B (UNFILT.)			1-17B (FILT.)		
LAB	TMA	DC	RPD	TMA	DC	RPD
BA	62.6 B	62	1%	62.5 B	64	2%
CA	18800	19200	2%	18600	19000	2%
FE	441	440	0.2%	303	430	35%
MG	6690	6600	1%	6660	6900	4%
MN	75.2	78	4%	73.4	80	9%
K	5970	5400	10%	5930	5500	8%
NA	48300	48000	1%	48000	49000	2%

OVERALL RANGE OF RPDs: 0.2% to 69% with none exceeding criteria

VOLATILES QC ANALYSIS

SURROGATE RECOVERIES

WELL: 1-16B		
LAB	TMA	DC
Toluene-d8	119%[1]	94%
BFB	105%	94%
1,2-DCA-d4	124%[1]	94%

MATRIX SPIKE/MATRIX SPIKE DUPLICATES

	TMA			DC[2]	
	MS	MSD	RPD	MS	RPD
DCE	81	98	19	107	6
TCE	90	96	3	97	3.1
B	91	96	2	101	3.9
T	99	94	5	97	3.4
CB	95	95	0	108	2.5

[1]exceeds SOW QC limits.
[2]Average values.

9 3 1 3 9 7 2 1 0 8 8

METALS QC ANALYSIS

MATRIX SPIKE RECOVERY

ANALYTE	CLP %R	SW846 %R
Antimony	92.1	76
Barium	93	102.4
Beryllium	97.9	103
Cadmium	97.8	99.7
Chromium	98.3	106
Cobalt	94	102.8
Copper	94.3	105.3
Iron	102.7	104.7
Manganese	94.5	102.9
Nickel	95.7	107.3
Silver	97.5	99.9
Vanadium	94.0	103.3
Zinc	96.4	103.1

MATRIX DUPLICATE RPD

ANALYTE	CLP RPD	SW846 RPD[1]
Chromium	15.7	13.1

[1]average value.

9 3 1 2 9 3 2 0 0 3 9

SUMMARY

- RPD VALUES BETWEEN WELLS ACCEPTABLE WITH EXCEPTION OF METHYLENE CHLORIDE AND IRON EACH IN ONE SAMPLE SET

  METHYLENE CHLORIDE DETECTED BELOW CRQL AND IN METHOD BLANKS

  IRON FLAGGED AS ESTIMATED DUE TO INTERFERENCE

- LABORATORY QA/QC ACCEPTABLE AND COMPARABLE BETWEEN BOTH METHODS WITH EXCEPTION OF TWO CLP SURROGATE COMPOUNDS

- SAMPLE QUANTITATION LIMITS COMPARABLE BETWEEN THE TWO METHODS AND LABORATORIES

9 3 1 2 9 3 2 1 0 9 0

Distribution
Unit Manager's Meeting: General Topics
February 23, 1993

DOE (and GSSC to DOE-RL)

C.E. Clark, RL . . . . . (A5-15)
D.L. Clark, RL . . . . . (A5-55)
R.D. Freeberg, RL /Julie Erickson, RL . . . . . (A5-19)
Bryan Foley, RL . . . . . (A5-19)
E.D. Goller, RL . . . . . (A5-19)
A.C. Harris, RL . . . . . (A5-19)
R.G. McLeod, RL . . . . . (A5-19)
Paul Pak, RL . . . . . (A5-19)
Bob Stewart, RL . . . . . (A5-19)
Mike Thompson, RL . . . . . (A5-15)
Nancy Werdel, RL . . . . . (A5-19)
J.M. Hennig, RL . . . . . (A5-21)
Heather Trumble, RL . . . . . (A6-55)
Mary Harmon, DOE-HQ . . . . . (EM-442)

EPA (and Contractors/Agencies in Support of EPA)

Dan Duncan, EPA, Region 10, RCRA . . . . . .
Audree DeAngeles, PRC . . . . . .
Doug Sherwood, EPA . . . . . (B5-01)
Ward Staubitz, USGS . . . . . .

Ecology (WDOE)

Larry Goldstein . . . . . Lacey Office
Jack Donnelly ~~Gluck Cline~~, WDOE . . . . . Kennewick Office ~~(c/o Darci Teel)~~ 3/23/93
3/23/93
Lynn Albin . . . . . Washington Dept. of Health

USACE

John Stewart, USACE . . . . . (A5-20)

WHC

Melvin Adams, WHC (Please route to:) . . . . . (H6-01)
Larry Hulstrom WHC . . . . . (H6-03)
Wayne Johnson, WHC . . . . . (H6-04)
Alan Krug, WHC . . . . . (H6-02)
Meri Lauterbach, WHC . . . . . (H6-01)
Bob Henckel, WHC . . . . . (H6-02)
Rich Carlson, WHC . . . . . (H6-03)
Hal Downey, WHC /Diana Sickle, WHC . . . . . (H6-27)
Tom Winteriak, WHC . . . . . Program Manager (H6-27)
L.D. Arnold, WHC . . . . . (B2-35)
Chris Widrig, PNL (Please route to:) . . . . . (K1-21)
Wayne Martin, PNL (K1-19)
Mark Hanson, PNL (K1-51)
Roy Gephart, PNL (K1-22)
Steve Slate, PNL (K1-19)
Joan Keller, PNL (K1-21)
Ben Johnson, PNL (K1-78)
Don Kane, EMO . . . . . (K1-74)
Chris Abraham, GAO . . . . . (A1-80)
R.O. Patt, OR Water Resources Dept. . . . . .

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