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Meeting Minutes Transmittal/Approval
Unit Manager's Meeting: 1100-EM-1 Operable Unit
450 Hills St., Richland, Washington
June 25, 1992

FROM/APPROVAL: Robert K. Stewart Date 7/30/92
Robert K. Stewart, 1100-EM-1 Operable Unit Manager, RL

APPROVAL: Dave Einan for Date 7-30-92
Dave Einan, 1100-EM-1 Unit Manager, EPA

APPROVAL: Rich Hibbard Date 7/30/92
~~Dib Goswami~~, 1100-EM-1 Unit Manager, WA Department of Ecology
Rich Hibbard

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

Attachment #1 - Meeting Summary/Summary of Commitments and Agreements
Attachment #2 - Attendance List
Attachment #3 - Agenda For 1100-EM-1 Meeting
Attachment #4 - Action Items Status List
Attachment #5 - 1100-EM-1 Operable Unit RI/FS Progress
Attachment #6 - Approved Document Change Control Form 1100-EM1-92-01
Attachment #7 - Approved Document Change Control Form 1100-EM1-92-02
Attachment #8 - Approved Document Change Control Form 1100-EM1-92-03
Attachment #9 - Status of 1100-EM-1 Groundwater Modeling
Attachment #10 - Human Health Risk Assessment
Attachment #11 - Vadose Zone Modeling

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PREPARED BY: Suzanne Clarke Date 7/30/92
Suzanne Clarke, Kay Kimmel, GSSC (A4-35)

CONCURRENCE BY: John T. Stewart Date 30 July 92
John Stewart, USACE 1100-EM-1 Project Manager (A5-20)

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Attachment #1

Meeting Summary and Summary of Commitments and Agreements
Unit Manager's Meeting: 1100-EM-1 Operable Unit
June 25, 1992

1. SIGNING OF THE MAY 1100-EM-1 MEETING MINUTES - The May minutes were signed with no changes.

2. ACTION ITEM UPDATE (See Attachment #4):

11EM1.91 Closed **Provided at this meeting (6/25/92).**
John Stewart

11EM1.101 Closed **Provided at this meeting (6/25/92).**
John Stewart

11EM1.102 Closed **Provided at this meeting (6/25/92).**
John Stewart

3. NEW ACTION ITEMS (INITIATED June 25, 1992):

No new action items were presented at this meeting.

4. OVERALL PROJECT STATUS: See Attachment #5.

5. INFORMATION ITEMS:

- 3 Change Requests were signed at this meeting (see Attachments #6, #7 and #8).
- Bob Stewart and John Stewart informed EPA and Ecology that a policy letter was being drafted and would be sent to them as soon as possible. The intent of the letter is to initiate discussions concerning preliminary remediation goals.
- John Stewart updated the status of Combined RI/FS Report Activities. Risk Assessment reports may be ready for review and comment at the July UMM.
    - Alden Foote presented the groundwater modeling - See Attachment #9. Meeting will be scheduled to further discuss input parameters.
    - Alden Foote presented the effect of utilizing the 95% upper confidence level (rather than maximum contaminant level) on the human health risk assessments, see Attachment #10.
    - Jim McBaine presented progress report on the vadose zone modeling. The purpose of this effort is to determine recharge to the aquifer. Preliminary data using a 30 year model suggest the aquifer is not being recharged. See Attachment #11.

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- Summary of EM-24 Meeting - DOE is looking into using probabilistic risk assessments. RL may present data to the regulators for comparison purposes.

- Siemens Nuclear Power Corporation Status - Finalizing soils sampling under lagoon #1. Nothing unexpected was found, i.e., no buried drums were found. Hydraulic conductivities were found to be an order of magnitude higher than others had reported, but were in-line with estimates by the USGS.

6. **INFORMAL AGREEMENTS:**

- Ward Staubitz and Matt Johanson will schedule a meeting between all interested parties to discuss groundwater model input parameters.

- Ward Staubitz and Jim McBaine will coordinate a meeting to discuss vadose zone modeling on the same day as the groundwater model meeting.

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Attachment #2

1100-EM-1 Operable Unit Manager's Meeting
Official Attendance Record
June 25, 1992

Please print clearly and use black ink

PRINTED NAME	SIGNATURE	ORGANIZATION	O.U. ROLE	TELEPHONE
Bob Stewart	Robert K Stewart	DOE-RL/ERD	DOE Unit Mgr	376-6192
Brian Drost	Brian Drost	USGS	EPA Support	206-593-6510
CHUCK CLINE	Charles A Cline	Ecology	Ecology geologist	(206) 438-7556
LOREN MAAS	Loren Maas	SNP		375-8537
Wendell Greenwald	Wendell Greenwald	USACE	TM	376-1252
Jon Sprecher	Jon Sprecher	Brown and Caldwell	Ecology Support	(503) 244-7005
Alden Foote	Alden Foote	USACE	Env Engr	(509) 522-6870
Susan Keith	Susan Keith	C&M for SNP		(206) 869-6321
Jim McBane	James C McBane	USACE	Geotech Eng	(509) 522-6833
HA PARKER	HA Parker	WHC	Escort	
SW Clark	SW Clark	WHC	Risk Assess. Coordinator	(509) 376-1513
D. Goswami	D. Goswami	Ecology	Unit Mgr	546-4301
LISA CHETNIK TREICHEL	Lisa Chetnik Treichel	DOE-HQ/EM-442	DOE Program Mgr.	301-903-8677
KAY KIMMEL	Kay Kimmel	SWEC	GSSC	509-372-0610
Ward Staubitz	Ward Staubitz	USGS	EPA Support	206-593-6510
Dave Einan		EPA	Unit Mgr	509-376-3883
Andree DeAngeles	Andree DeAngeles	PRC	EPA Support	206-624-2692
Suzanne Clarke	Suzanne Clarke	SWEC	GSSC for DOE RL	509-372-0630
John Stewart	John T. Stewart	USACE	PM	509-376-9101

AGENDA FOR 1100-EM-1 UNIT MANAGERS MEETING

June 25, 1992
8:00 to 9:30 am
450 Hills St./Rm. 47

8:00 - 8:05	Introduction
8:05 - 8:15	Overall Project Status
8:15 - 8:50	Status of Combined RI/FS Report Activities
	• Human Health Risk Assessments
	• Vadose Zone Modeling
	• Groundwater Modeling
8:50 - 9:00	Summary of EM-24 Meeting
9:00 - 9:10	Siemens Nuclear Power Corporation Status
9:10 - 9:30	Action Item Status

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Actions Items Status List

1100-EM-1 Operable Unit
June 25, 1992

Item No.	Action/Source of Action	Status
11EM1.91	A level three change request is to be submitted for the revised schedule to show additional activities. Action: John Stewart (11/20/91).	Open. Provided 6/25/92.
11EM1.98A	Provide EPA and Ecology with both comments and revised pages of the Supplemental Work Plan containing incorporated comments. Action: John Stewart (3/25/92).	Closed. Provided 5/28/92.
11EM1.101	USACE will prepare a level 3 change request for removal of the PNL method 7.40-39 from the beta emitter task. Action: John Stewart (4/22/92).	Open. Provided 6/25/92.
11EM1.102	USACE to provide a Level 3 Change Request to reduce quantity of validated groundwater data. This will include cost savings analysis. Action: John Stewart (5/28/92).	Open. Provided 6/25/92.

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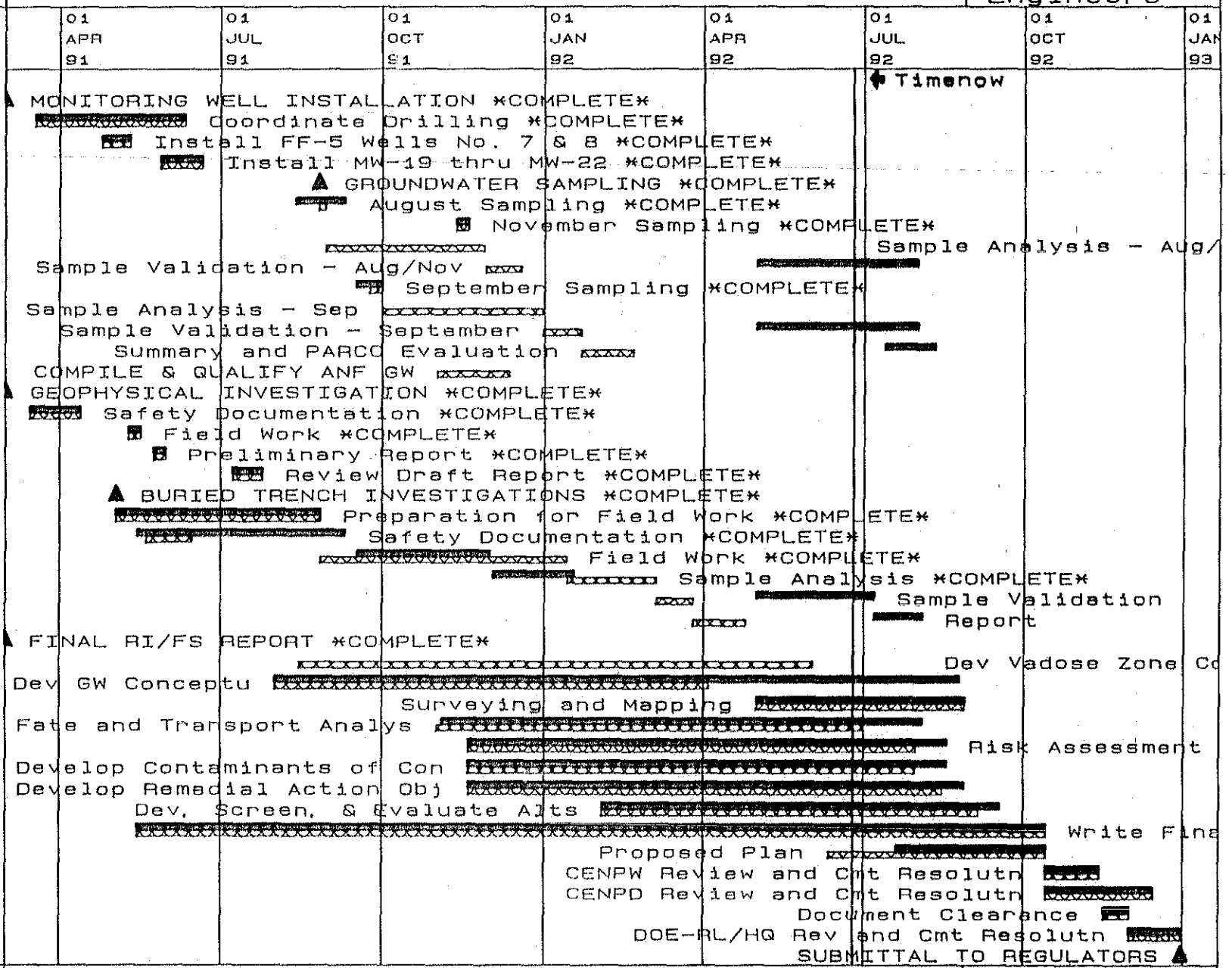
ATTACHMENT #5
Page 1 of 1

OPEN PLAN (R)
Report: GRAFBAR1
Project: 1100EM1B
Time Now: 25JUN92
Date: 25JUN92
Time: 05:40:05
Page: 1

1100-EM-1 Operable Unit RI/FS Progress

Walla Walla District, Corps of Engineers



Legend
- In progress
- Planned
- Critical
- Baseline

Bar Chart Key: Early Dates against Baseline

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Signatures
Prep: _____
Aprv: _____

Change Number	APPROVED DOCUMENT CHANGE CONTROL FORM	Date
1100 - EM1-92-01 LTS	Do not use blue ink. Type or print in black.	June 23, 1992

Document Number & Title	Date Document Last Issued
DOE/RL-90-37; Remedial Investigation Phase 2 Supplemental Work Plan for the Hanford Site 1100-EM-1 Operable Unit	September 1991

Originator	Phone
John T. Stewart *John T. Stewart*	509-376-9101

Description of Change: Revise Baseline Scedule to reflect November resampling of August samples; and to substitute a Surveying and Mapping activity for the Resolve Landuse Dispute activity.

The 1100 area and portions of the 300 area from Columbia River mile 340 to river mile 346.5 and west approximately 2.5 miles will be mapped. Mapping will be used as the base map for the 1100-EM-1 Operable Unit RI/FS activities.

Justification and Impact of Change: Elevated gross Beta samples collected in August were preserved by accident with sulfuric acid which could interfere with the planned analysis. It became necessary to replace these samples, and additional ones were collected in November.

Existing mapping is disjointed within the 1100-EM-1 Operable Unit and between the 1100 and 300 areas, and does not adequately cover the area between Stevens Drive and the Columbia River.

DESCRIBED CHANGES TO THE BASELINE SCHEDULE DO NOT IMPACT MILESTONE M-15-01B/C

Robert K. Stewart — DOE Unit Manager — Date *6/25/92*

David R. Gai — Lead Regulatory Unit Manager — Date *25 Jun 92*

Per Action Plan for Implementation of the Hanford Consent Order and Compliance Agreement Section 9.3

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Change Number	APPROVED DOCUMENT CHANGE CONTROL FORM	Date
1100-EM1-92-02 JTS	Do not use blue ink. Type or print in black.	June 23, 1992

Document Number & Title	Date Document Last Issued
DOE/RL-90-37; Remedial Investigation Phase 2 Supplemental Work Plan for the Hanford Site 1100-EM-1 Operable Unit	September 1991

Originator	Phone
John T. Stewart John T. Stewart	509-376-9101

Description of Change: Deletion of the chemical separation of Technitium 99 (Tc-99) using Battelle Pacific Northwest Laboratory (PNL) Method 7.40-39 from the Supplemental Work Plan, Section 4.5.3.8, Activity 3h - Identification and Quantification of Beta emitter.

Justification and Impact of Change: See attached page for Justification.

DESCRIBED CHANGE DOES NOT IMPACT MILESTONE M-15-01B/C

Robert K. Stewart
DOE Unit Manager

6/25/92
Date

David R. Sisson
Lead Regulatory Unit Manager

25 Jun 92
Date

Per Action Plan for Implementation of the Hanford Consent Order and Compliance Agreement Section 9.3

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JUSTIFICATION OF CHANGE:

1. The quantification of Tc-99 by method 7.40-39 would provide additional confidence in the quantification determined by ICP/MS methods. This is considered unnecessary because of PNL's high degree of confidence in the ICP/MS results. Additionally, an increase in the level of confidence in the Tc-99 quantification is not warranted unless there is a corresponding increase in the level of confidence in the gross Beta quantification.

2. The detection limits for the chemical separation method would not be an improvement over the detection limits provided by the ICP/MS method.

3. Confirmation of the Tc-99 activity counts will be provided by a Tc-99 sparing method performed by the K25 laboratory.

4. Other analyses performed by PNL, such as the gamma energy analysis, liquid scintillation, tritium and strontium 90 analysis indicate that there are no other radionuclides that may be contributing to the elevated beta activity. Therefore there is no reason to suspect the results of the ICP/MS analysis.

5. Good correlation exists for all the data available, and does not suggest a concern about the ICP/MS.

6. ~~The proposed MCL for Tc-99 is 3,790 pCi/l, which is substantially greater than the concentrations observed. Even a gross error in the Tc-99 concentration would not affect the risk posed by this contaminant.~~

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Change Number	APPROVED DOCUMENT CHANGE CONTROL FORM	Date
1100-EM1-92-03 JTS	Do not use blue ink. Type or print in black.	June 23, 1992

Document Number & Title	Date Document Last Issued
DOE/RL-90-37; Remedial Investigation Phase 2 Supplemental Work Plan for the Hanford Site 1100-EM-1 Operable Unit	September 1991

Originator	Phone
John T. Stewart John T. Stewart	509-376-9101

Description of Change: Reduce validation of groundwater data. Presently seven rounds of the total ten rounds of groundwater data (January 1990 to March 1992) have been validated. It is proposed that the three rounds of unvalidated groundwater data can be compared with the validated results to assure the quality of that data. Validation of the three unvalidated rounds of groundwater data will not be performed. Validation of soil data will continue.

Validation of data is described in Appendix A (Quality Assurance Project Plan), Section 3 and Section 8.

Justification and Impact of Change: Attachment 1 is a summary table of the analytical results for validated and unvalidated data. There is a sufficient number of validated rounds of groundwater data for comparison purposes to justify not validating all data.

Attachment 2 is an estimate of validation costs. There is the potential to save approximately $60,000 by reducing the amount of data requiring validation. Time savings are proportional, depending on the number of people assigned to task activity.

DESCRIBED CHANGE DOES NOT IMPACT MILESTONE M-15-01B/C

Robert K. Stewart — 6/25/92
DOE Unit Manager — Date

David R. Gin — 25 Jun 92
Lead Regulatory Unit Manager — Date

Per Action Plan for Implementation of the Hanford Consent Order and Compliance Agreement Section 9.3

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ATTACHMENT 1

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Groundwater Data for Monitoring Wells in the 1100-EM-1 Operable Unit

Well #	Analyte	Round 1	Round 2	Round 3	Round 4	Round 5	Round 6	Round 7	Round 7.5	Round 8	Round 9	Round 10
MW-1	NO3-N (ppm)	2.2 V	3.9 V	4.4 V	7.7 V		4.1 V					
	TCE (ppb)	ND V	ND V	ND V	ND V		ND V					
MW-2	NO3-N (ppm)	3.5 V	2.4 V	3.3 V	3.3 V		6 V				5 V	
	TCE (ppb)	ND V	ND V	ND V	ND V		ND V				ND V	
MW-3	NO3-N (ppm)	3.6 V	1.5 V	2.7 V	4.5 V		2.4 V					
	TCE (ppb)	ND V	ND V	ND V	ND V		ND V			ND U		
MW-4	NO3-N (ppm)	1.6 V	1.6 V	1.8 V	1.5 V		1.8 V					
	TCE (ppb)	ND V	ND V	ND V	ND V		ND V			ND U		
MW-5	NO3-N (ppm)	1.9 V	1.5 V	1.6 V	1.7 V		1.5 V					
	TCE (ppb)	ND V	ND V	ND V	ND V		ND V			ND U		
MW-6	NO3-N (ppm)	2.7 V	2.5 V	2.3 V	2.2 V		2.4 V					
	TCE (ppb)	ND V	ND V	ND V	ND V		ND V			ND U		
MW-7	NO3-N (ppm)	2.3 V	2.1 V	2.3 V	2.1 V		3.5 V					
	TCE (ppb)	ND V	ND V	ND V	ND V		ND V		ND U			
MW-8	NO3-N (ppm)	6.9 V	6.7 V	7.4 V	7 V		6.7 V		6.8 U		6.5 V	
	TCE (ppb)	ND V	ND V	ND V	ND V		ND V		ND U		ND V	
MW-9	NO3-N (ppm)	ND V	ND V	ND V	ND V		ND V		ND U			
	TCE (ppb)	ND V	ND V	ND V	ND V		ND V		ND U			
MW-10	NO3-N (ppm)	38.4 V	36.9 V	42.1 V	38.3 V	39 V	38 V	47 U	38 U	42 U	43 V	
	TCE (ppb)	0.6 J V	2 V	2 V	ND V	ND V	2 J V	3 J U	ND U	3 J U	2 V	
MW-11	NO3-N (ppm)	40.6 V	40.5 V	47.8 V	46.5 V	40 V	46 V	39 U	48 U		49 V	
	TCE (ppb)	0.9 J V	3 V	2 V	3 V	4 J V	3 J V	3 J U	4 J U	4 J U	6 V	
MW-12	NO3-N (ppm)	49 V	49 V	56.7 V	50.8 V	50 V	49 V	51 U	52		52 V	
	TCE (ppb)	92 V	110 V	80 V	74 V	79 V	78 V	69 U	67 U	69 U	58 V	
MW-13	NO3-N (ppm)	47 V	44.9 V	60.6 V	46.7 V	45 V	46 V	45 U	43 U			
	TCE (ppb)	90 V	91 V	81 V	69 V	68 V	70 V	69 U	66 U	63 U		
MW-14	NO3-N (ppm)	48.5 V	50.9 V	61 V	49.9 V	47 V	47 V	47 U	48 U		51 V	
	TCE (ppb)	40 V	73 V	60 V	66 V	82 V	75 V	75 U	76 U	67 U	58 V	
MW-15	NO3-N (ppm)	32.3 V	32.2 V	44.3 V	31 V	30 V	33 V	30 U	36 U		24 V	
	TCE (ppb)	84 V	80 V	82 V	59 V	60 V	62 V	70 U	66 U	64 U	34 V	
MW-17	NO3-N (ppm)	ND V	ND V	ND V	ND V		ND V					
	TCE (ppb)	ND V	ND V	ND V	ND V		ND V					
MW-18	NO3-N (ppm)					2.2 V	1.9 V	1.6 U				
	TCE (ppb)					ND V	ND V					
MW-19	NO3-N (ppm)							3.4 U	3.4 U		3.6 V	
	TCE (ppb)						ND V	ND U	ND U	ND U	ND V	
MW-20	NO3-N (ppm)							31 U	31 U	28 U	35 V	
	TCE (ppb)						3 J V	2 J U	3 J U	4 J U	4 V	
MW-21	NO3-N (ppm)						ND V	ND U	ND U			
	TCE (ppb)						ND V	ND U	ND U			
MW-22	NO3-N (ppm)							3.3 U	3.7 U		4.2 V	
	TCE (ppb)											

This table is only applicable and appropriate to Change Number EM1-92-03. Other uses are not appropriate. JTS

J = Estimated Value V = Validated Data U = Unvalidated Data ND = Not Detected

ATTACHMENT 2

Summary of Costs for Validation of All Samples Not Validated to Date
(Groundwater and Soil Validation)

Metals Analysis:	
7 sample delivery groups (SDG) X 10 hrs/SDG X $68.05/chemist hr =	$4,763.50
7 SDG X 1 hr/SDG X $97.84/managing chemist hr =	684.88
7 SDG X 0.5 hr/SDG X $107.13/project manager hr =	374.96
119 samples X 1 hr/sample X $68.05/ chemist hr =	8,097.95
TOTAL METALS (±)	$13,900
VOC:	
14 SDG X 10 hrs/SDG X $68.05/chemist hr =	$9,527.00
14 SDG X 1 hr/SDG X $97.84/managing chemist hr =	1,369.76
14 SDG X 0.5 hr/SDG X $107.13/project manager hr =	749.91
80 samples X 1 hr/sample X $68.05/ chemist hr =	5,444.00
TOTAL VOCs (±)	$17,100
SVOC:	
11 SDG X 10 hrs/SDG X $68.05/chemist hr =	$7,485.50
11 SDG X 1 hr/SDG X $97.84/managing chemist hr =	1,076.24
11 SDG X 0.5 hr/SDG X $107.13/project manager hr =	589.22
39 samples X 1 hr/sample X $68.05/ chemist hr =	2,653.95
TOTAL SVOCs (±)	$11,800
Pesticides:	
11 SDG X 10 hrs/SDG X $68.05/chemist hr =	$7,485.50
11 SDG X 1 hr/SDG X $97.84/managing chemist hr =	1,076.24
11 SDG X 0.5 hr/SDG X $107.13/project manager hr =	589.22
47 samples X 1 hr/sample X $68.05/ chemist hr =	3,198.35
TOTAL PESTICIDES (±)	$12,300
Wet Chemistry:	
14 SDG X 3 hrs/SDG X $68.05/chemist hr =	$2,858.10
14 SDG X 1 hr/SDG X $97.84/managing chemist hr =	1,369.76
14 SDG X 0.5 hr/SDG X $107.13/project manager hr =	749.91
74 samples X 1 hr/sample X $68.05/ chemist hr =	6,396.70
TOTAL WET CHEMISTRY (±)	$11,400
COSTS FOR VALIDATING ALL REMAINING UNVALIDATED GROUNDWATER SDG:	$66,500
REPORT:	
300 hrs X $68.05/chemist hr =	$20,415.00
40 hrs X $97.84/ managing chemist hr =	4,097.84
TOTAL REPORT (±)	$24,500
TOTAL FOR VALIDATION AND REPORT:	$91,000

ATTACHMENT 2 (continued)

Summary of Costs for Reduced Validation of Groundwater Samples Not Validated to Date
(Soil Validation Only)

Metals Analysis:

3 sample delivery groups (SDG) X 10 hrs/SDG X $68.05/chemist hr =	$2,041.50
3 SDG X 1 hr/SDG X $97.84/managing chemist hr =	293.52
3 SDG X 0.5 hr/SDG X $107.13/project manager hr =	160.70
14 samples X 1 hr/sample X $68.05/ chemist hr =	952.70
TOTAL METALS (±)	$3,400

ASSUME SAME TOTAL COST FOR VOC, SVOC, AND PESTICIDES

Wet Chemistry:

3 SDG X 3 hrs/SDG X $68.05/chemist hr =	$ 612.45
3 SDG X 1 hr/SDG X $97.84/managing chemist hr =	293.52
3 SDG X 0.5 hr/SDG X $107.13/project manager hr =	160.70
14 samples X 1 hr/sample X $68.05/ chemist hr =	952.70
TOTAL WET CHEMISTRY (±)	$2,000

COSTS FOR REDUCED VALIDATING ALL REMAINING UNVALIDATED GROUNDWATER SDG:

4 x $3,400 + 2,000 =	$15,600

REPORT:

150 hrs X $68.05/chemist hr =	$10,207.00
40 hrs X $97.84/ managing chemist hr =	4,097.84
TOTAL REPORT (±)	$14,300

TOTAL FOR REDUCED VALIDATION AND REPORT: $30,000

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Attachment #9

Status of 1100-EM-1 Groundwater Modeling

23 June 1992

Groundwater flow and contaminant transport at the 1100-EM-1 Operable Unit are being numerically simulated using PORFLOW, a porous media software package from Analytical and Computational Research, Inc., Los Angeles, CA. The software was installed on a DELL 486 PC at the Walla Walla District office of the Corps with successful installation being verified on 14 April 1992.

A model for the site has been constructed with the flow portion of the model being completed and calibrated. The model consists of a three-dimensional grid with high, average, and low river-stage boundary conditions, upper surface recharge, lower surface seepage, and lateral boundary inflow and outflow. Site stratigraphy was represented by designating separate zones for the Hanford formation, the uppermost sand/gravel layer in the Ringold formation, the uppermost silt layer in the Ringold formation, and the lower Ringold formation down to the mud/silt unit above the Basalt bedrock.

The contaminant transport portion of the model is currently being calibrated. The model is capable of simulating contaminant transport by the groundwater, through time, in three dimensions, and includes all significant processes affecting contaminant movement.

9212615

Attachment #10

CONTAMINANT: GROSS ALPHA

LOCATION: ALL PERTINANT MONITORING WELLS 10–15

	pCi/L
AVE	3.8
STD	3.7
*UCL	4.8
n	50
MAX	12.2
MCL	15

UCL=95% UCL =AVE+1.96(STD/sqrt(n))
NA=not applicable

CONTAMINANT: GROSS BETA

LOCATION: ALL PERTINANT MONITORING WELLS 10–15,20

	pCi/L
AVE	60
STD	21
*UCL	66
n	53
MAX	95.4
MCL	50

NOTE: While these results show gross beta values to be above MCL's, speciation of the radionuclide by PNL show the activity to be from technetium–99. (SEE BELOW)

UCL=95% UCL =AVE+1.96(STD/sqrt(n))
NA=not applicable

CONTAMINANT: Tc–99

LOCATION: MW–10, MW–11, MW–12, MW–13, MW–14, MW–15

	pCi/L
AVE	116.46
STD	22.48
*UCL	128.68
n	13
MAX	149
MIN	84
MCL	900

For technetium–99 the current annual average concentration yielding a 4 millirem per year for a two liter daily intake is 900 pCi/l.

UCL=95% UCL =AVE+1.96(STD/sqrt(n)) =116.46 + 12.22027

9 2 1 2 6 3 4 1 5 1 6

TABLE 3

EXPOSURE FACTORS

Exposure Factor	Average	Reasonable Maximum Exposure
Ingestion intake rate	1.4 L/day	2 L/day
Inhalation intake rate	15 m^3/day	15 m^3/day
Exposure frequency	275 days/year	350 days/year
Exposure duration	9 years	30 years
Body weight	70 kilograms	70 kilograms
Averaging time, carcinogens	70 years x 365 days/year	70 years x 365 days/year
Averaging time, noncarcinogens	9 years x 365 days/year	30 years x 365 days/year
Volatilization constant[a]	0.5 L/m^3	0.5 L/m^3

From EPA (1991a,b; Sweeney 1991)

a For volatile compounds (Andelman 1990)

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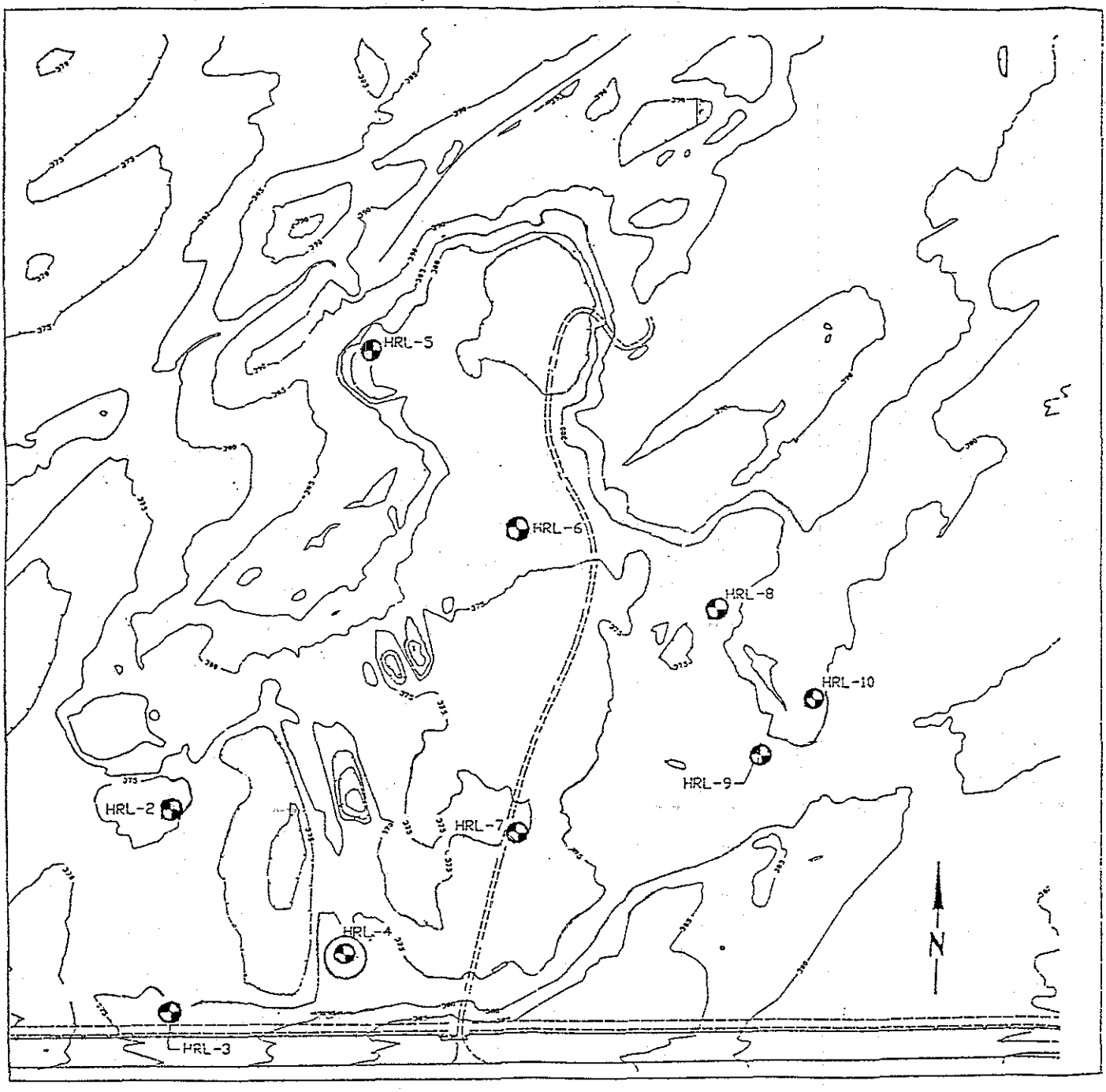
HORN RAPIDS LANDFILL



LEGEND:

HRL-10 Soil Borehole Location and Number, Phase I

Approx. Location of Phase II, HRL-1 to HRL-4 and HRL-1A to HRL-4A

0 75 150 METERS
0 250 500 FEET

Contour Interval 5 ft

92126541518

PRELIMINARY RISK ASSESSMENT CALCULATIONS FOR PCBs AND CHROMIUM IN HRL

RESIDENTIAL SCENARIO

PCB

	AVE	95% UCL	ICR–AVE	ICR–95%UCL
MAX	100000 ppb	100000 ppb	1E–04	1E–03
PHASE I&II	24490 ppb	35922 ppb	3E–05	4E–04

CHROMIUM

	AVE	95% UCL	ICR–AVE	ICR–95%UCL
MAXIMUM CONC.	1250 mg/kg	1250 mg/kg	5E–04	2E–03
BOREHOLE HRL–4	256 mg/kg	691 mg/kg	1E–04	1E–03
ALL HRL BOREHOLES	35 mg/kg	68 mg/kg	1E–05	1E–04

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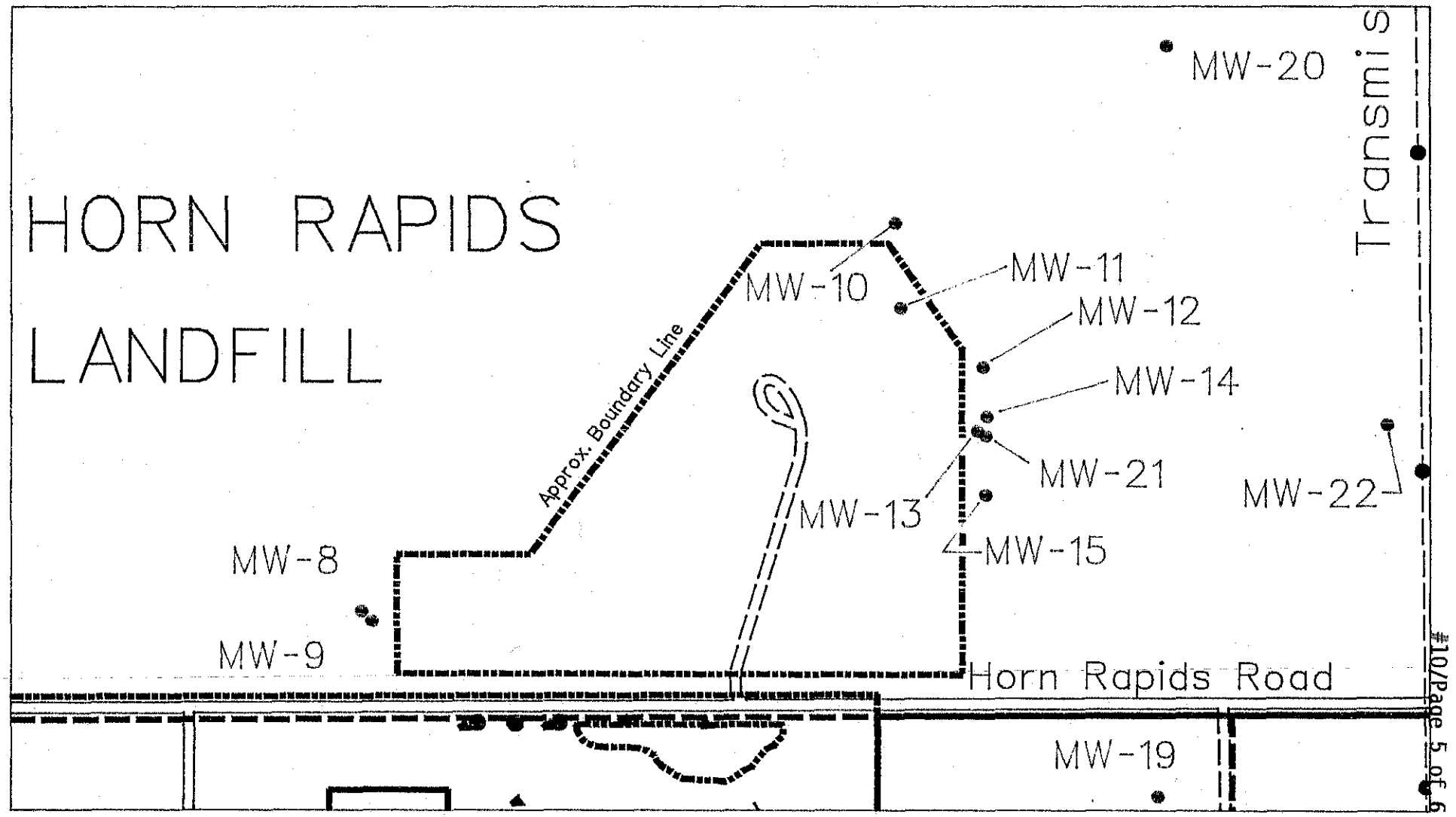

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PRELIMINARY RISK ASSESSMENT CALCULATIONS FOR NITRATES AND TCE FOR GROUNDWATER RESULTS ROUNDS 1–9

NO3–N

	AVE	95% UCL	HQ–AVE	HQ–95% UCL
MW 12	51 mg/l	53 mg/l	< 1 (0.5)	< 1 (0.9)
MCL WELLS	43 mg/l	45 mg/l	< 1 (0.4)	< 1 (0.8)

TCE

	AVE	95% UCL	ICR–AVE	ICR–95%UCL
MW 12	78 ppb	86 ppb	6E–06	3E–05
MCL WELLS	71 ppb	75 ppb	6E–06	3E–05

9 2 1 2 6 5 4 1 5 2 1

Attachment #11

Table ___-___: UNSAT-H Input Listing.

Parameter Description	Average Case	Worst Case
Code Run Options:		
Plant Option	On	Off
Lower Boundary Condition	------- Constant Head -------	
Profile Orientation	--------- Vertical ----------	
Heat Flow Option	Off	Off
Upper Boundary Condition	---- Calculated Heat Flux ---	
Lower Boundary Condition	----- Constant Heat Flux ----	
Simulation Years	30	1
Water Application	-- Values Provided as Input -	
Convective Heat Flow	Off	Off
Evaporation Option (No Plants)	---	On
Evapotranspiration Distribution	----- Generated by Model ----	
Surface Boundary Condition	Flux	Flux
Meteorological Condition	-- Values Provided as Input -	
Cloud Cover Condition	----- Generated by Model ----	
Soil Hydraulic Computation	-------- Brooks-Corey -------	
Vapor Flow	On	On
Upper Surface Head Limit	- Constant Upper Head Value -	
Maximum Soil Head	1.0E5	1.0E5
Minimum Soil Head	1.0E-4	1.0E-4
Tortuosity	0.66	0.66
Average Soil Temperature	288°K	288°K
Vapor Diffusion in Air	$0.24 cm^2/s$	$0.24 cm^2/s$
Number of Soil Types	1	1
Number of Analysis Nodes	48	48
Soil Property Description Options:		
Saturated Soil Water Content	$0.29 cm^3/cm^3$	$0.29 cm^3/cm^3$
Saturated Hydraulic Conductivity	1.0764cm/h	1.0764cm/h
Residual Water Content	0.00	0.00
Conductivity Model	Mualem	Mualem
Initial Conditions:		
Initial Suction Heads	---- See Table ___-____ -----	
Plant Information:		
Leaf Area Index	Off	Off
Root Growth	-- exponential relationship -	
PET Partitioning	- based on cheatgrass data --	
Day of Year; Seed Germination	275	275
Day of Year Transpiration Ends	180	180

9 2 1 2 6 5 4 1 5 2 2

Table ___-___: UNSAT-H Input Listing cont.:

Parameter Description	Average Case	Worst Case
Plant Information cont.:		
Coefficients for Root Growth Equation		
a.	1.163	1.163
b.	0.129	0.129
c.	0.020	0.020
Growth Day Roots Reach Each Node	------ See Table ___-___	----
Wilting Head Value	30,000cm	30,000cm
Head Where Transpiration Starts Decreasing	3000cm	3000cm
Transpiration Limiting Head	0.10cm	0.10cm
Percent of Bare Ground Surface	0.70	0.70
Boundary Conditions:		
Surface Albedo	0.23	0.23
Altitude of Study Site	103m	103m
Height of Wind Speed Measurements	3.0m	3.0m
Average Annual Atmospheric Pressure	929mb	929mb
Meteorological Data	------ See Table ___-___	----

Table ___-___: UNSAT-H Average Climatological Input Data cont.

Day	Max Air Temp °F	Min Air Temp °F	Dew Point °F	Solar Radiation	Wind Speed	Cloud Cover Units[1]	Precip.
361	49.8	35.2	9.1	125.	4.4	7.5	0.00
362	67.5	28.8	30.7	37.	4.8	9.2	0.05
363	42.0	21.9	16.2	162.	3.9	6.8	0.00
364	38.8	23.1	30.7	137.	0.0	7.3	0.00
365	57.7	29.1	20.5	37.	10.3	9.2	0.26
					Total Inches		6.70
					Total Centimeters		17.018

1. Not used in the model computations.

Table ___-___: UNSAT-H Worst Case Climatological Data cont.

Day	Max Air Temp °F	Min Air Temp °F	Dew Point °F	Solar Radiation	Wind Speed	Cloud Cover Units[1]	Precip.
361	36.9	29.6	32.9	37.	11.0	5.0	0.282
362	52.4	42.6	24.8	113.	7.0	5.0	0.000
363	46.3	27.9	34.4	114.	10.6	5.0	0.000
364	45.0	36.7	25.2	115.	5.7	5.0	0.000
365	48.1	22.6	35.0	37.	5.4	5.0	0.275
					Total Inches		10.815
					Total Centimeters		27.470

1. Not used in the model computations.

Made in Denmark
9 2 1 2 6 5 4 1 5 2 5

UNSAT-H 30-YEAR RUN OUTPUT

Year	Actual Transpiration	Actual Evaporation	Base Drainage	Actual Rainfall	Moisture Storage	Mass Balance Error
1	4.6516E+00	1.0473E+01	-1.5198E-03	1.7018E+01	6.0702E+01	7.4913E-02
2	4.8164E+00	1.1411E+01	-2.0040E-03	1.7018E+01	6.7775E+01	6.1401E-02
3	4.8601E+00	1.1529E+01	-1.4681E-03	1.7018E+01	6.8320E+01	6.0249E-02
4	4.8777E+00	1.1581E+01	-1.7181E-03	1.7018E+01	6.8825E+01	5.5984E-02
5				1.7018E+01		
6	4.8938E+00	1.1626E+01	-1.6776E-03	1.7018E+01	6.9974E+01	5.5733E-02
7	4.8981E+00	1.1639E+01	-1.5097E-03	1.7018E+01	7.0160E+01	5.8022E-02
8	4.9017E+00	1.1648E+01	-1.6927E-03	1.7018E+01	7.0574E+01	5.5283E-02
9	4.9046E+00	1.1660E+01	-1.6040E-03	1.7018E+01	7.0975E+01	5.3925E-02
10	4.9067E+00	1.1664E+01	-1.7902E-03	1.7018E+01	7.1367E+01	5.7762E-02
11	4.9082E+00	1.1673E+01	-1.9241E-03	1.7018E+01	7.1750E+01	5.5885E-02
12	4.9096E+00	1.1677E+01	-1.8921E-03	1.7018E+01	7.2128E+01	5.5290E-02
13	4.9107E+00	1.1680E+01	-1.8979E-03	1.7018E+01	7.2503E+01	5.3947E-02
14	4.9123E+00	1.1685E+01	-1.8769E-03	1.7018E+01	7.2868E+01	5.7724E-02
15	4.9119E+00	1.1686E+01	-2.0360E-03	1.7018E+01	7.3230E+01	5.9547E-02
16	4.9134E+00	1.1687E+01	-1.8560E-03	1.7018E+01	7.3590E+01	6.0310E-02
17	4.9143E+00	1.1687E+01	-1.7974E-03	1.7018E+01	7.3949E+01	5.9486E-02
18	4.9147E+00	1.1694E+01	-2.0208E-03	1.7018E+01	7.4305E+01	5.5130E-02
19	4.9162E+00	1.1692E+01	-1.6335E-03	1.7018E+01	7.4660E+01	5.6046E-02
20	4.9155E+00	1.1693E+01	-1.8733E-03	1.7018E+01	7.5011E+01	6.0127E-02
21	4.9159E+00	1.1698E+01	-2.0326E-03	1.7018E+01	7.5361E+01	5.6145E-02
22	4.9158E+00	1.1698E+01	-1.7523E-03	1.7018E+01	7.5708E+01	5.8617E-02
23	4.9159E+00	1.1699E+01	-1.8457E-03	1.7018E+01	7.6057E+01	5.6732E-02
24	4.9171E+00	1.1700E+01	-1.8234E-03	1.7018E+01	7.6404E+01	5.5084E-02
25	4.9173E+00	1.1699E+01	-1.8754E-03	1.7018E+01	7.6749E+01	5.7983E-02
26	4.9177E+00	1.1697E+01	-1.6603E-03	1.7018E+01	7.7097E+01	5.7236E-02
27	4.9174E+00	1.1701E+01	-1.6976E-03	1.7018E+01	7.7440E+01	5.8197E-02
28	4.9176E+00	1.1700E+01	-1.8543E-03	1.7018E+01	7.7783E+01	5.9853E-02
29	4.9175E+00	1.1702E+01	-1.7745E-03	1.7018E+01	7.8124E+01	5.9540E-02
30	4.9174E+00	1.1702E+01	-1.4298E-03	1.7018E+01	7.8465E+01	5.9212E-02

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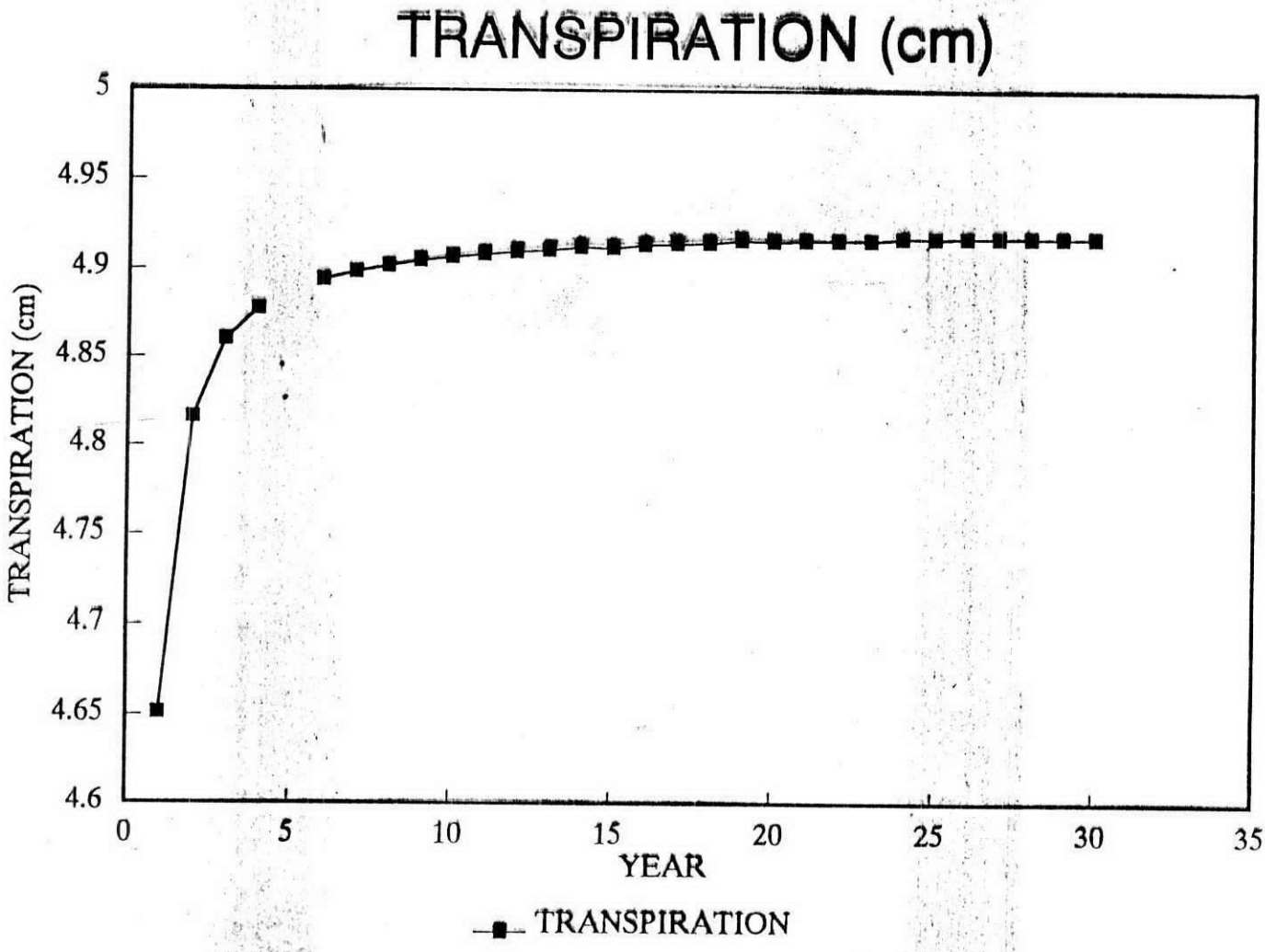

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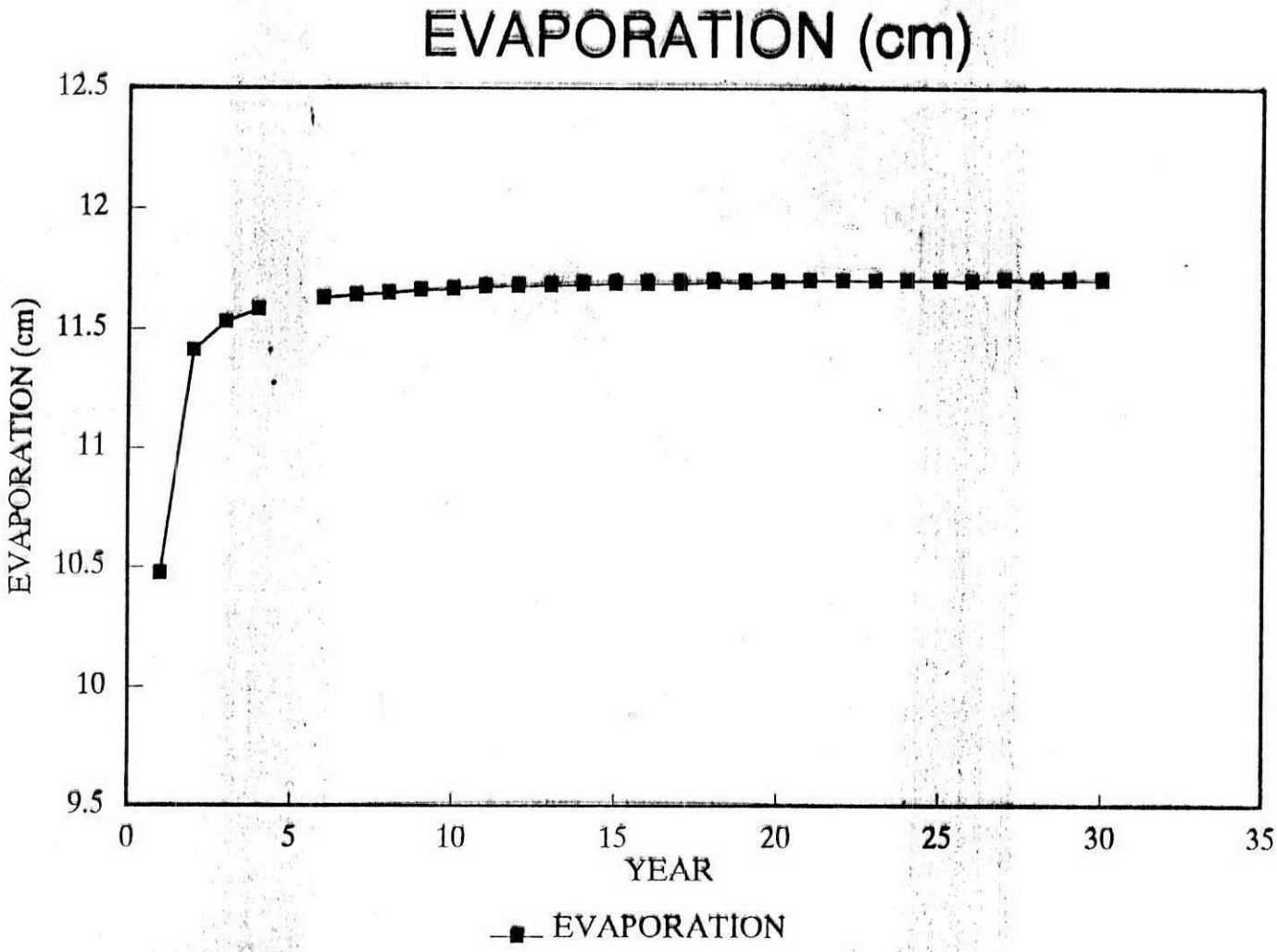

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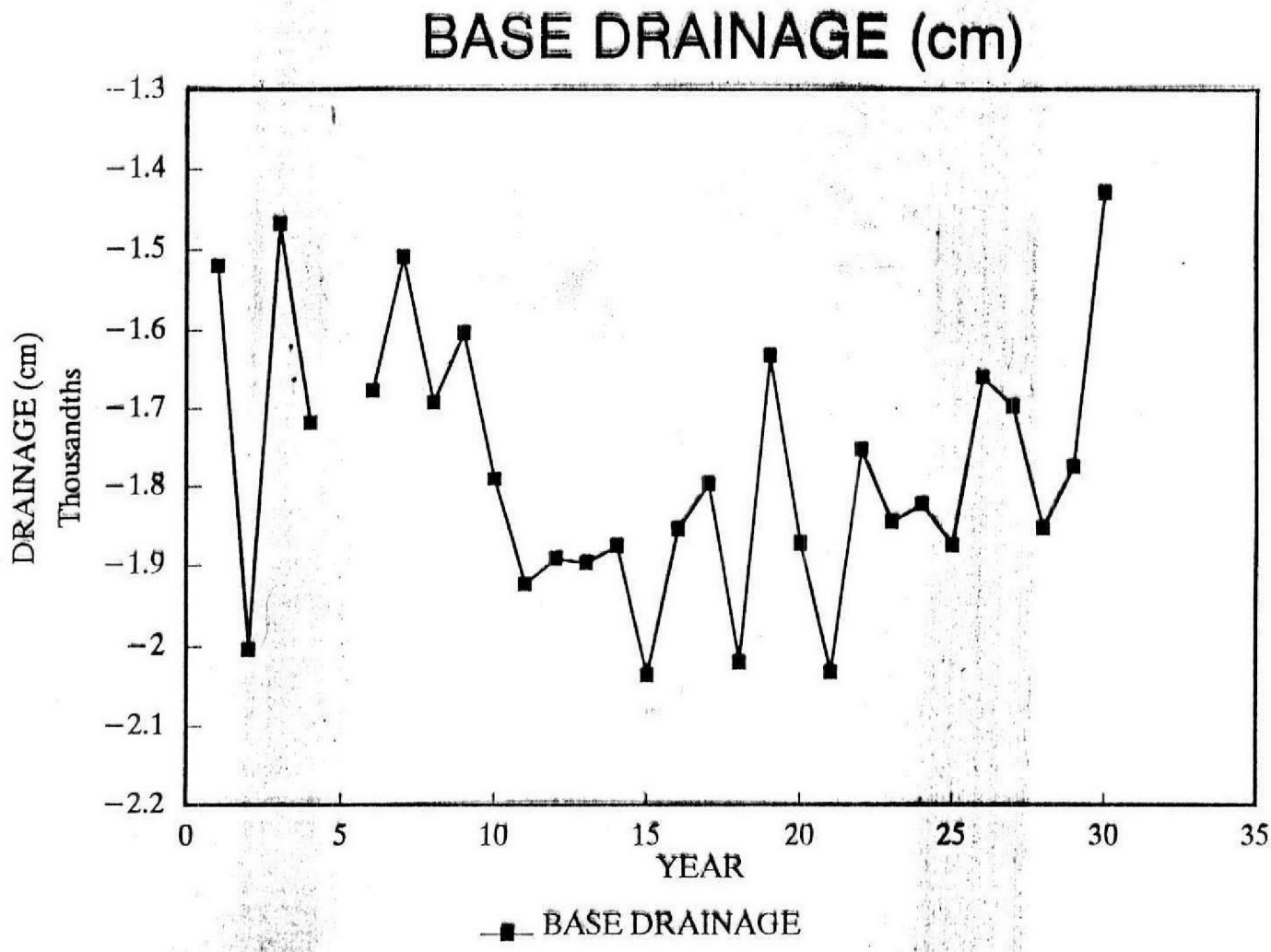

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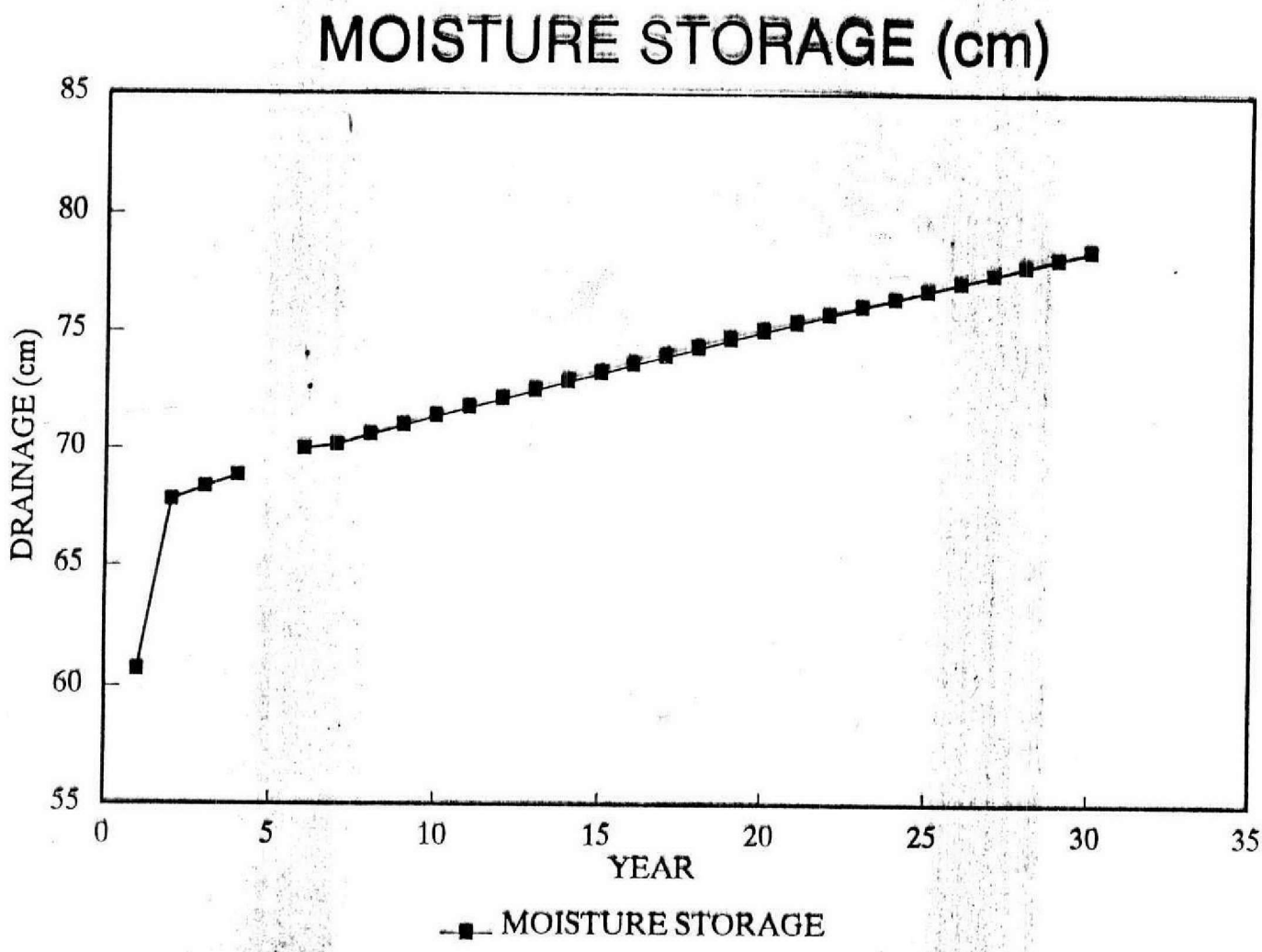

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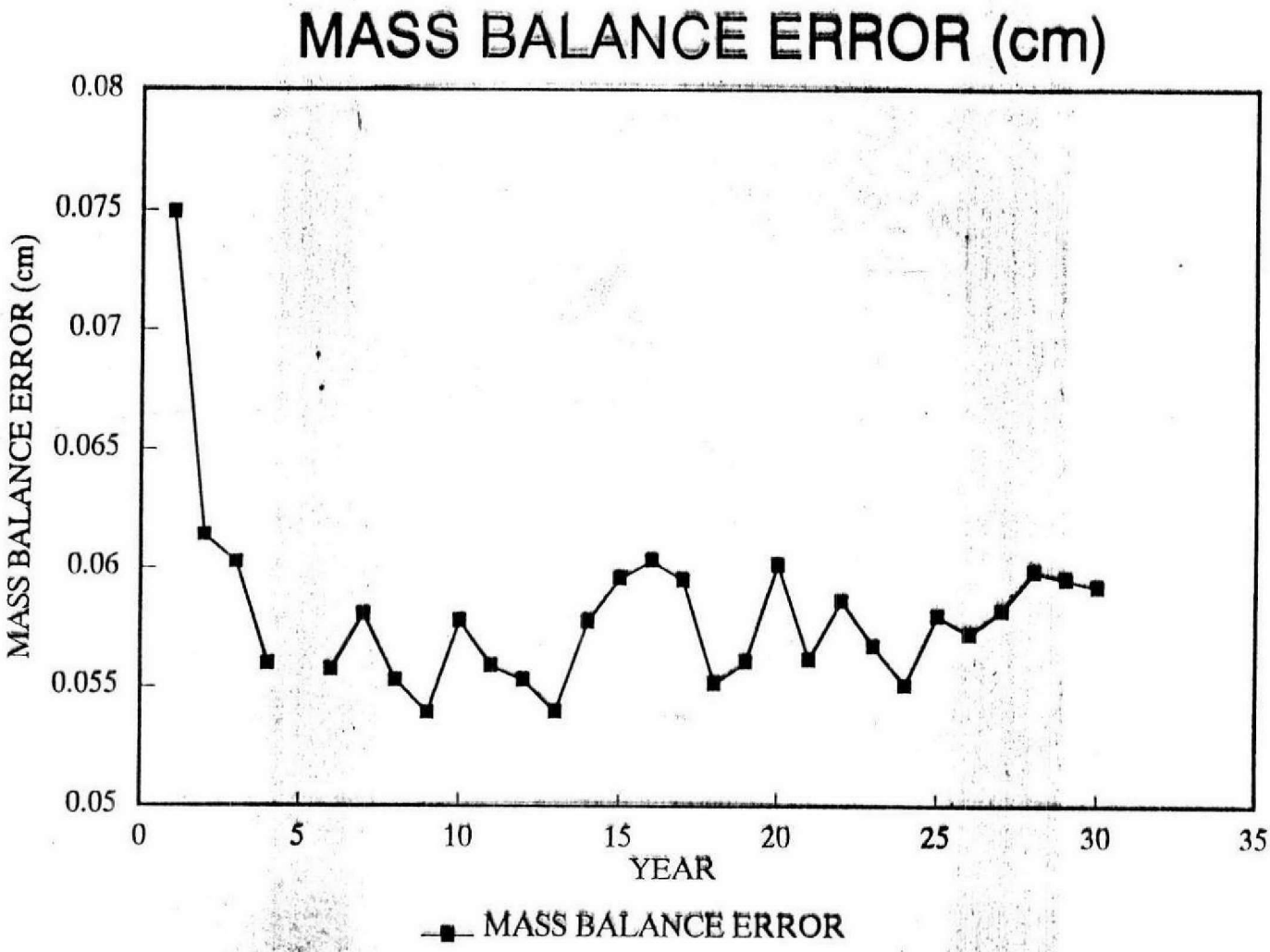

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9 2 1 2 6 5 4 1 5 3 2

Operable Subunit	Borehole Number	Sample Number	Sample Depth From	Sample Depth To	Soil Gradations LAB % G	% S	% M	Soil Conductivity at Lab Saturation Ks(cm/s)	In-Situ Soil Conduct. Ki(cm/sec)	Residual Moisture (THETA r)	Moisture Values In-Situ Moisture Content (THETA)	Moisture Weight % Measured	Bulk Density	Estimated Soil Porosity = Saturated Moisture Content (THETA s)	SpG	Brooks-Corey Parameters he	b	b'	Calculated Matric Potential (cm) (h)
Monitoring Wells	MW-13	1	9.5	10.0	62	35	3	1.78E-04	1.34E-10	0.00	0.0535	2.78	1.92	0.29	2.70	4.77236	2.93040	2.50000	668.80
		2	13.0	13.5	47	51	2	5.73E-04	3.74E-11	0.00	0.0448	2.33	1.92	0.29	2.70	11.58480	3.18989	2.50000	4,417.38
		3	14.0	14.5	63	30	7	2.82E-04	5.57E-09	0.00	0.0446	2.32	1.92	0.29	2.69	3.98105	1.66448	2.50000	87.77
		4	17.5	18.0	86	12	2	2.82E-04	2.59E-08	0.00	0.0574	2.94	1.95	0.28	2.72	3.98105	1.66448	2.50000	56.61
		5	25.5	26.0	77	19	4	1.38E-05	3.70E-14	0.00	0.0210	1.09	1.92	0.29	2.69	6.39672	2.52583	2.50000	4,711.16
	MW-14	1	7.6	8.8	53	39	8	1.38E-05	1.65E-09	0.00	0.0866	4.50	1.92	0.29	2.69	6.39672	2.52583	2.50000	131.15
		2	10.8	11.5	50	44	6	2.82E-04	1.60E-08	0.00	0.0535	2.78	1.92	0.29	2.69	3.98105	1.66448	2.50000	64.95
		3	20.5	21.0	82	16	2	2.82E-04	7.73E-09	0.00	0.0457	2.38	1.95	0.28	2.72	3.98105	1.66448	2.50000	79.92
		4	21.5	22.0	58	31	11	1.38E-05	2.19E-13	0.00	0.0268	1.39	1.92	0.29	2.69	6.39672	2.52583	2.50000	2,598.27
	MW-15	1	5.0	7.0	54	38	8	1.78E-04	4.18E-12	0.00	0.0350	1.82	1.92	0.29	2.69	4.77236	2.93040	2.50000	2,252.76
		2	9.0	10.0	55	40	5	2.82E-04	3.03E-09	0.00	0.0402	2.09	1.92	0.29	2.69	3.98105	1.66448	2.50000	104.43
		3	14.5	15.0	73	22	5	1.80E-03	1.39E-09	0.00	0.0454	2.36	1.92	0.29	2.69	13.14579	2.57202	2.50000	1,498.01
		4	19.5	20.0	72	24	4	1.80E-03	1.99E-10	0.00	0.0352	1.83	1.92	0.29	2.69	13.14579	2.57202	2.50000	2,881.52
		5	24.7	25.2	68	22	10	5.77E-04	6.51E-14	0.00	0.0256	1.33	1.92	0.28	2.67	10.96131	3.53020	2.50000	51,657.58
		2	15.0	16.0	72	23	5	2.82E-04	1.04E-09	0.00	0.0335	1.74	1.92	0.29	2.69	3.98105	1.66448	2.50000	141.68
		5	30.0	31.0	0	88	12	2.41E-05	3.00E-09	0.00	0.1341	6.97	1.92	0.30	2.74	6.57540	4.34915	2.50000	215.92
		6	35.0	36.0	28	65	7	2.82E-04	2.68E-09	0.00	0.0512	3.06	1.67	0.37	2.66	3.98105	1.66448	2.50000	108.11
		7	37.0	38.0	52	41	7	2.82E-04	7.89E-06	0.00	0.1401	7.28	1.92	0.26	2.59	3.98105	1.66448	2.50000	11.05
Sum					**********			1.07E-01	4.32E-04	0.00	9.89	534.54	319.13	51.32	457.12	1204.43	469.52938	422.50000	1234286.8
n					168	168	168	168	168	168	168	168	168	168	168	168	168	168	168
Average					50	42	9	6.38E-04	2.57E-06	0.00	0.06	3.18	1.90	0.31	2.72	7.16921	2.79482	2.51483	7,346.95

NOTES:

1. Bulk density values estimated from table 3.5, Geotechnical Engineering Analysis and Design, R.E. Hunt.
2. Specific gravity values from lab testing were used for all similarly classified soils; the average of measured Silty Sandy Gravel specific gravity analyses were used in the similar soil type where no testing was performed; all other values were estimated.
3. Soil porosity calculated from: (1-(bulk density/specific gravity)). Soil porosity is assumed equal to the saturated moisture content.
4. Soil in-situ moisture calculated from (((bulk density * weight % measured)/0.998)/100). Units in cubic cm./cubic cm. 0.998 = grams water per cubic cm.
5. Soil residual moisture value of zero was the recommended value for sands and gravels per Mr. Michael Fayer, PNL.
6. Brooks-Corey parameters were derived from converting Van Genuchten functions using the formulas:
   he = 1/a
   b = 1/(n-1)
   b' = (2.0+l) where l is taken as 0.5 for the Mualem conductivity model.
7. Soil Conductivity at Lab Saturation was obtained in the same method as the van Genuchten parameters (see note 6).
8. Calculated matric potential was obtained using an HP28S calculator and the formula:
   h = he/(THETA/THETA s)^b
9. Shaded rows indicate questionably high in-situ moisture values. Do not use.

Distribution

Unit Manager's Meeting: 1100-EM-1 Operable Unit
June 25, 1992

Ronald D. Izatt . . . . . Director, DOE-RL, ERD (A5-15)
June M. Hennig . . . . . DOE-RL, WMD (A5-21)
Julie K. Erickson . . . . . Chief, DOE-RL, ERB (A5-19)
Roger D. Freeberg . . . . . Chief, Rstr. Br., DOE-RL, ERD (A5-19)
Steven H. Wisness . . . . . TPA Proj. Mgr., DOE-RL, EAP/TPA (A5-15)
Bob Stewart . . . . . Operable Unit Manager, DOE-RL, ERD (A5-19)
Mike Thompson . . . . . DOE-RL (A6-95)
Diane Clark . . . . . DOE-RL (A5-55)
Mary Harmon . . . . . DOE-HQ (EM-442)
Lisa Chetnik Treichel . . . . . DOE-HQ (EM-442)

John Stewart . . . . . 1100-EM-1 Prog. Mgr., USACE (A5-20)
Raimo Liias . . . . . Env. Eng. Branch Chief, USACE, (Walla Walla)

Dave Einan . . . . . EPA (B5-01)
Ward Staubitz . . . . . USGS, Support to EPA
Audree DeAngeles . . . . . PRC, Support to EPA

Richard Hibbard . . . . . WDOE, (Kennewick Office)
Larry Goldstein . . . . . WDOE, (Lacy Office)

Lynn Albin . . . . . Washington Dept. of Health

Don Praast . . . . . GAO (A1-80)

Chuck Malody . . . . . SNP
Cliff Francis . . . . . SNP
Susan Keith . . . . . G&M, support to SNP

Thomas Wintczak (L4-92) . . . . . Prgm. Mgr. WHC

ADMINISTRATIVE RECORD: 1100-EM-1; Care of EDMC, WHC (H4-22)

This list has been updated. Please contact Suzanne E. Clarke (SWEC 372-0630) if further changes to the distribution list are needed.

9 2 1 2 6 5 4 1 5 3 3