APPENDIX C
MONITORING WELL INSTALLATION AND DEVELOPMENT LOGS

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MONITORING WELL INSTALLATION AND DEVELOPMENT LOGS

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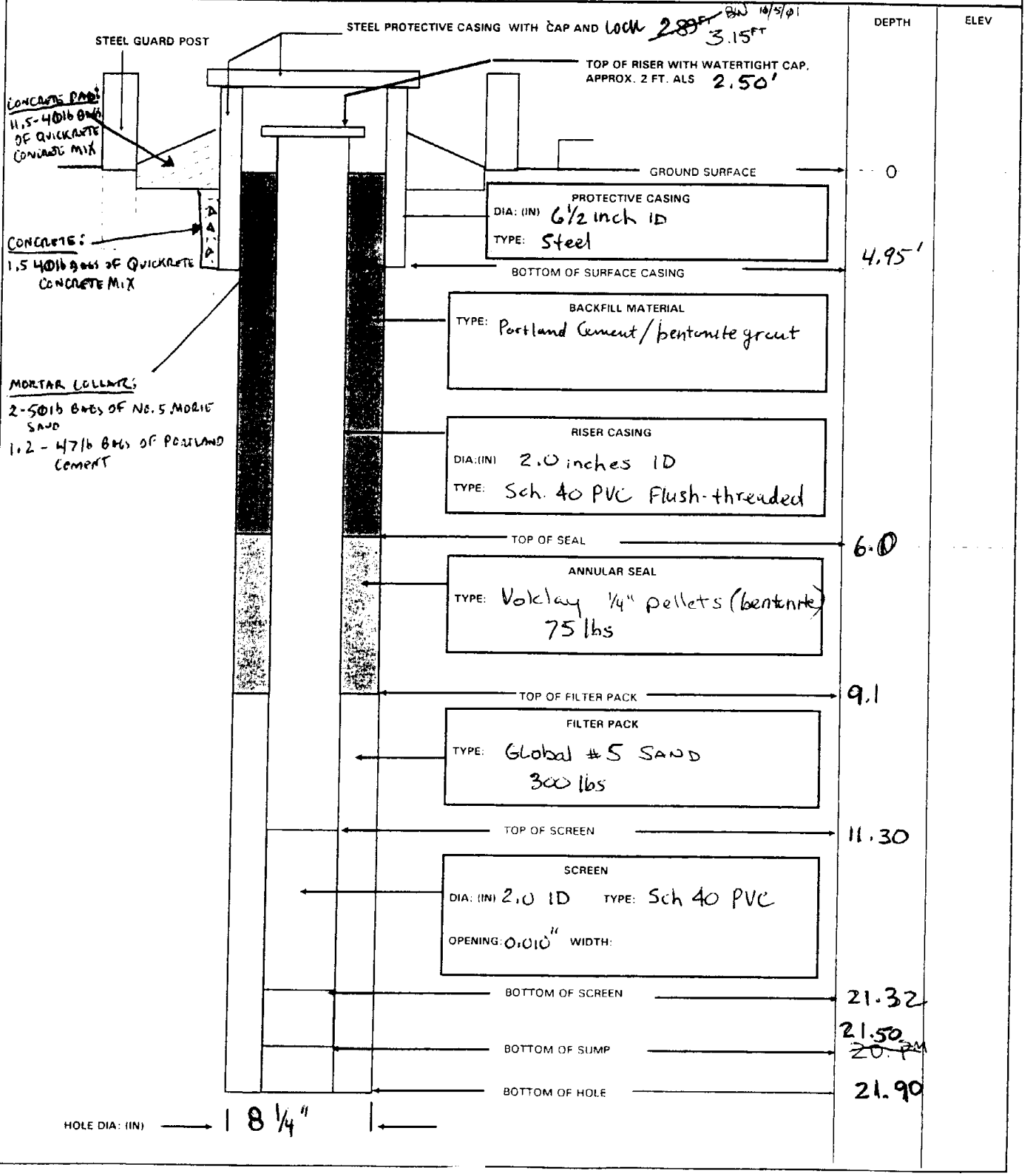
MONITORING WELL

PROJECT NAME: Load Line 4 Phase II RI **DELIVERY ORDER NO.:** ECAS 1186

WELL NUMBER: MW193	BEGIN: 07-26-01	END: 07-26-01
COORDINATES: N: E:	REFERENCE POINT:	ELEVATION:



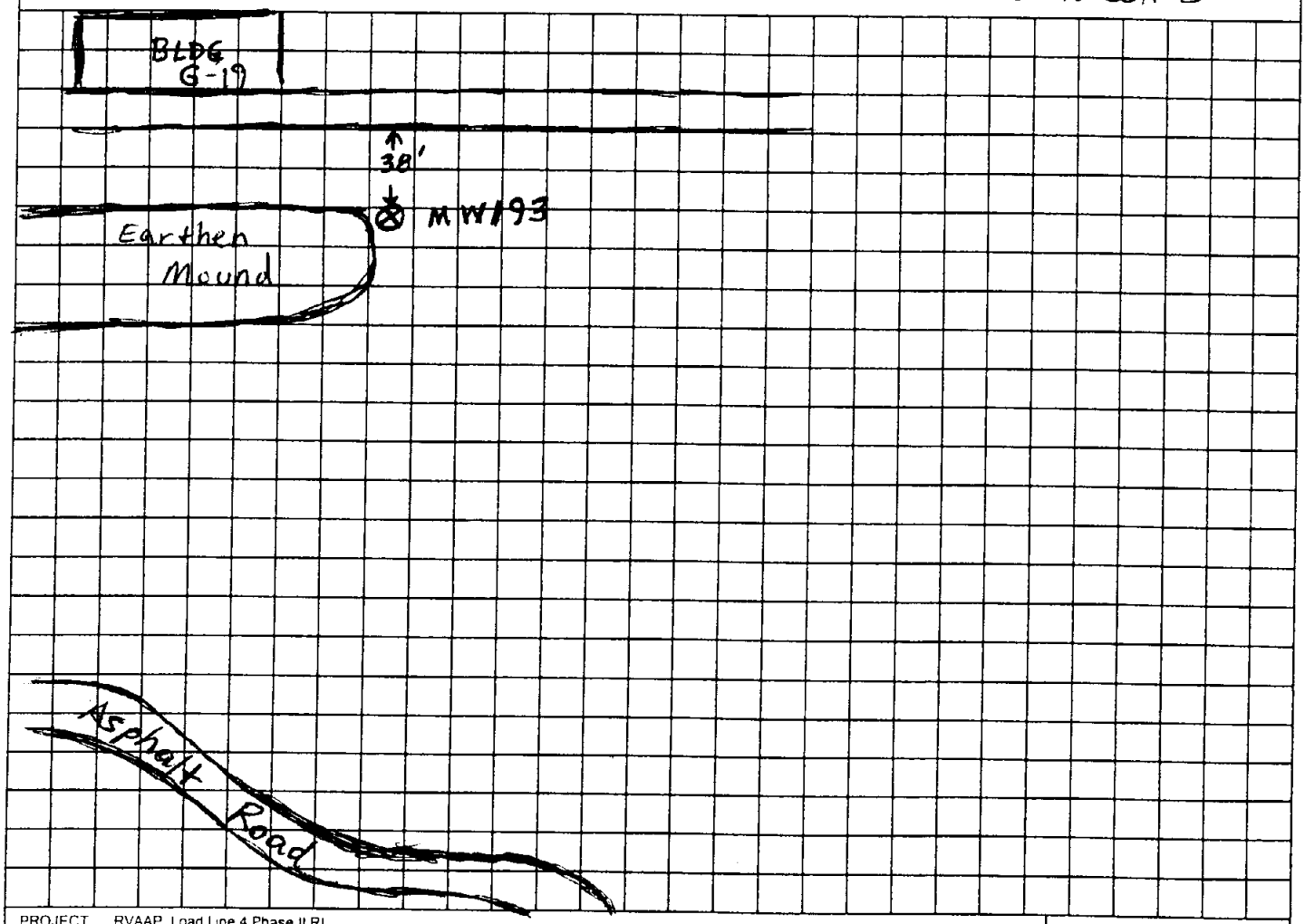
HTRW DRILLING LOG

DISTRICT: Louisville		HOLE NUMBER 193
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: Tol-Test	SHEET 1 OF 4

3. PROJECT: RVAAP, Load Line 4 Phase II RI	4. LOCATION: LOAD LINE 4, RVAAP
5. NAME OF DRILLER: NEIL WINTER	6. MANUFACTURERS DESIGNATION OF DRILL: CME-75
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4¼" ID HSA; 2" OD X 2 ft long Split Spoons; 3" ID X 2½ ft long Shelby Tubes	8. HOLE LOCATION: 982.92 TOC 854960.27 N 2364236.52 E KAP 1/31/02
	9. SURFACE ELEVATION:
	10. DATE STARTED: 7-26-01 / 11. DATE COMPLETED: 7-26-01
12. OVERBURDEN THICKNESS: > 21.9'	15. DEPTH GROUNDWATER ENCOUNTERED: 10.4 ft
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:
14. TOTAL DEPTH OF HOLE: 21.9'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):

18. GEOTECHNICAL SAMPLES	DISTURBED	2 UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES: N/A			
20. SAMPLES FOR CHEMICAL ANALYSIS: N/A	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY: 83%
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL: 44 MW193	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR: E.J. Schultheis		

LOCATION SKETCH/COMMENTS — SCALE: NOT TO SCALE



PROJECT: RVAAP, Load Line 4 Phase II RI — HOLE NUMBER: 193

HTRW DRILLING LOG

HOLE NUMBER 193

PROJECT: RVAAP, Load Line 4 Phase II RI | INSPECTOR EJSchubelein | SHEET 2 OF 34

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO (F)	REMARKS (G) EJS
		Sandy silt, brown 10YR 4/3 10-20% sand; non plastic moist, soft	0.0			BC 3, 12, 17, 24 Rec. 1.5/2
		weathered sandstone, gr.orange 10YR 7/4,				
	1	Silty sand, lt. yell. brn 10YR 6/4, moist, med. dense				
		weathered sandstone, as above				
	2	weathered ss, as above	0.0			BC 13, 18, 25, 25 Rec. 1.4/2
		fine to med. sand, yel. brn, 10YR 5/6 20% fine to med gravel, moist, loose				
	3					
		Silty clay, dk gr. brn 10YR 4/2, 20% fine to med gravel, low plas., firm				
	4					
		Silty clay, brn-yellow, 10YR 6/6; some gray mottling 10YR 6/1; 5% sand, med. plasticity, soft, moist	0.0			BC 5, 5, 4, 5 Rec 1.7/2
	5					
	6	as above, firm	0.0			BC 5, 7, 10, 12 Rec. 2/2
	7					
	8					
		silty clay, brown, 10YR 4/3, high plasticity, soft to firm, moist to wet in areas, few lenses of fine sand interspersed,	0.0			BC. 9, 12, 13, 10 Rec. 2/2
	9					

HTRW DRILLING LOG

HOLE NUMBER 193

PROJECT: RVAAP, Load Line 4 Phase II RI | INSPECTOR E. Schultheis | SHEET 3 OF 4

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
		as above to 10.4 ft	0.0			BC 5,4,5,5 Rec. 2/2
	11	clayey sand, 5% fine to med gravel, saturated very soft, yel. brn 10YR 5/4. Grades to silty clay, gray 10 YR 5/1, high plas., 5% fine to med. gravel, soft, moist to wet				Thin zone of saturation at 10.4 ft.
	12	gray silty clay as above. Bottom .9 ft stiff	0.0			BC 5,6,6,6 Rec 1.5/2
	13					
	14	very fine silty sand, gray 10YR 5/1, rapid dilatency, saturated med. dense	0.0			BC 2,2,3,3 Rec 1.3/2 saturated at 14.2 ft.
	15	silty clay, gray, med. plas. 20% fine sand, gravel firm, moist				
	16	Shelby tube; down pressure 250-400 psi silty sand on top, silt on bottom	0.0			full recovery
	17					
	18	Sandy silt, gray, 10 YR 5/1 20-25% very fine sand, wet to moist, stiff, rapid dilatency	0.0			BC 8,13,15,9 Rec. 1.25/2
	19					

HTRW DRILLING LOG

HOLE NUMBER 193

PROJECT: RVAAP, Load Line 4 Phase II RI | INSPECTOR EJ Schuetheis | SHEET 4 OF 34

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO (F)	REMARKS (G) EJS
	21	shelby tube down pressure 650 to 850 psi gray sandy silt at bottom	0.0			Recovery 1.7/2 Bottom 21.9'
	22					
	23					
	24					

Well volume calculation sheet

Date, 08/23/01 Time 0925
Well ID Num LL4, MW-193
Well Location

Total depth of well (ft BTOC) 23.57
Depth to water (ft BTOC) 10.55
Height of water column (ft) (Hc) 13.02

Well Volume Calculation

Vc = 3.142(Rc^2)*Hc 0.284 cu. ft.

Vf = 3.142[(Rf^2)-(Ro^2)]*(Hc or length of screen)*(0.30)
**note ** use length of screen if Hc > length of screen
= 1.046 cu. ft.

Vt = (Vc+Vf)*(7.48 gal/cu ft)
= 9.95 gal.

Where:
Vc = Volume of casing (ft^3)
Vf = Volume of filter pack (ft^3)
Vt = Total volume
Ro = outside radius of casing ~~0.083~~ (ft)
Hc = height of water column 13.02 (ft) SV 3/11/04
Rf = radius of filter pack 0.344 (ft)
Rc = radius of inside casing 0.0833 (ft)

[redacted]

Date: 08/23/01 Time: 0925

Well Number and Location: LL4, MW193

Development Crew: Jeffrey Lindow

Martha Clough

Driller (if applicable): C. Moore

Water Levels / Time: Initial: 10.55 btc / 0922 Pumping: see p. 31 / dry

Final: 11 43 / 9/24/01 1103

Total Well Depth: Initial: 23.57 FT BTOC Final: 24.31 FT BTOC

Date and Time: Begin: 08/23/01 / 0933 Completed: 08/23/01 / 1300

Development Method(S): whale pump

Total Quantity of Water Removed: 37 gals

FIELD MEASUREMENT	SERIAL NUMBER	DATE OF LAST CALIBRATION
Temperature	Horiba U-10 # 14639	08/23/01
Specific Conductivity	↓	↓
pH		
Turbidity	↓	↓

WELL DEVELOPMENT RECORD

PROJECT NAME: Load Line 4 Phase II RI — DELIVERY ORDER NO.

WELL NUMBER AND LOCATION: LL4 mw 193

DATE	TIME	GALLONS REMOVED	TEMP(C)	SPECIFIC CONDUCTIVITY (µMHOS/CM)	pH (Standard Units)	TURBIDITY	TOTAL GALLONS REMOVED	WELL VOLUMES REMOVED	COMMENTS
08/23/01	0933	0	13.2	0.571	7.36	999	0	0	Initial Reading
	1007	≈ 5	13.5	0.613	7.33	999	5	0.5	After surging
	1041	≈ 14	19.4	0.629	7.39	904	14	~~2~~ ≈ 1	
	1103	≈ 17	18.0	0.633	7.30	999	17	≈ 1.5	
	1153	13	16.7	0 621	7 34	593	30	3	
	1225	≈ 2	16.7	0.617	7.32	999	32	3.2	
	1241	≈ 3	16.1	0.625	7.29	94	35	3.5	
	1300	≈ 2	17.6	0.621	7.37	96	37	3.7	Final Horiba Reading
									Collect (1) Qt jar sample

08/23/01

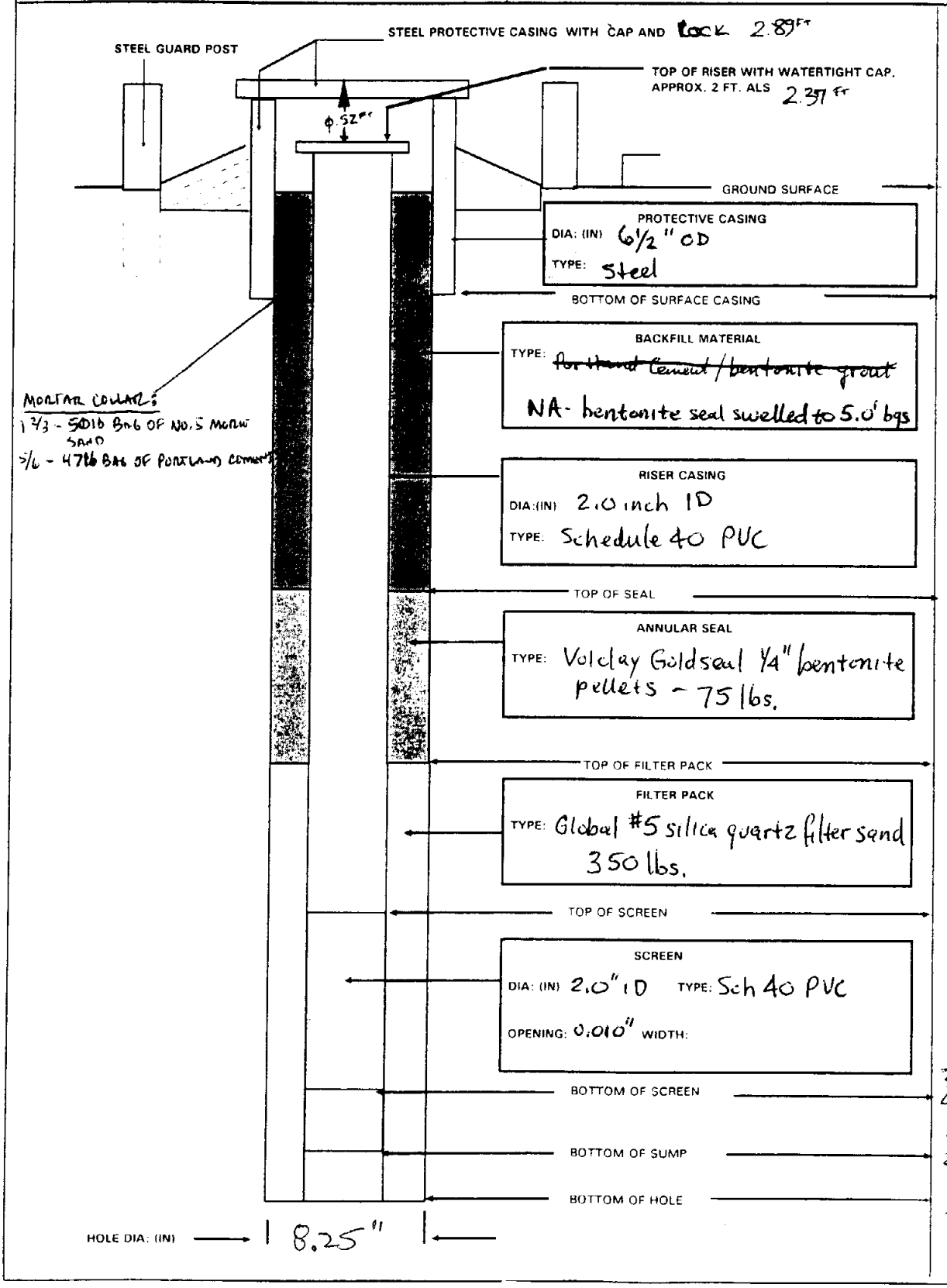
RECORDED BY: _____ 08/23/01
(Signature and Date)

QA CHECK BY: Helen Brumbach 9-11-01
(Signature and Date)

MONITORING WELL

PROJECT NAME: Load Line 4 Phase II RI/FS — DELIVERY ORDER NO.: ECAS 186

WELL NUMBER: MW 194	BEGIN: 07-26-01 1510	END: 07-26-01 1615
COORDINATES: N: E:	REFERENCE POINT:	ELEVATION:

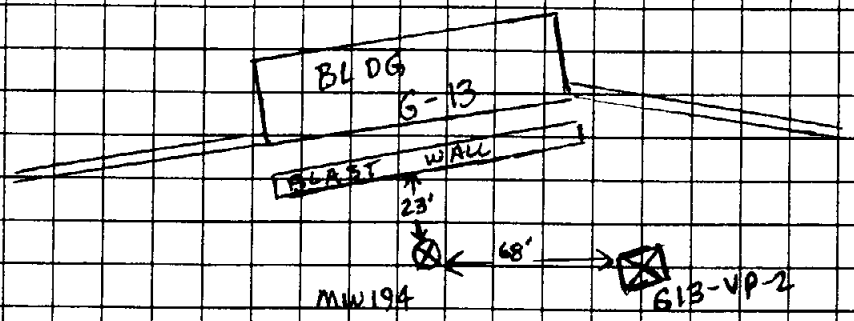


HTRW DRILLING LOG

DISTRICT: Louisville		HOLE NUMBER 194
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: Tol-Test	SHEET 1 OF 4
3. PROJECT: RVAAP, Load Line 4 Phase II RI	4. LOCATION: LOAD LINE 4	
5. NAME OF DRILLER: NEIL WILKTOR	6. MANUFACTURERS DESIGNATION OF DRILL: CME MODEL 75	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4¼" ID HSA; 2"OD x 2 ft long split spoons; 3"ID x 2½ ft Long Shelby Tubes	8. HOLE LOCATION: See map below	
	9. SURFACE ELEVATION: 973.76 TOC	556089.22 N 2364584.86 E
	10. DATE STARTED: 07-26-01	11. DATE COMPLETED: 7-26-01
12. OVERBURDEN THICKNESS: >21.5 ft	15. DEPTH GROUNDWATER ENCOUNTERED: 8½ ft bgs	
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 11.89 ft TOC after 48 hrs	
14. TOTAL DEPTH OF HOLE: 21.5 ft bgs	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):	

18. GEOTECHNICAL SAMPLES	DISTURBED	2 UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES: None			
20. SAMPLES FOR CHEMICAL ANALYSIS: None	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
22. DISPOSITION OF HOLE: Completed as Monitor Well	BACKFILLED	MONITORING WELL: MW194	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR: EJSchulteis		

LOCATION SKETCH/COMMENTS — SCALE: Not to Scale



PROJECT: RVAAP, Load Line 4 Phase II RI — HOLE NUMBER: 194

HTRW DRILLING LOG

HOLE NUMBER 194

PROJECT: RVAAP, Load Line 4 Phase II RI | INSPECTOR E/Schumacher | SHEET 2 OF 4

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0	Sandy silt, brown 10YR 4/3, 10% fine to coarse sand, non plastic, loose, damp	0.0			BC 5, 7, 8, 8 Rec. 1.9/2
	1	Silty sand, pale brown 10YR 7/4, dry to damp, loose.				
		Clayey silt, hard, ltgy, 10YR 7/1, mottled yel-brown, 10-20%, med to coarse sand, non plastic, moist				
	2					
		silty clay, DK yel. brown, 10YR 4/4, hard, moist, non plastic some gray mottling,	0.0			BC 12, 15, 12, 15 Rec 1.6/2
	3					
	4					
		As above, but firm	0.0			BC 5, 5, 6, 7 Rec. 1.75/2
	5					
	6					
		Silty clay, 10YR 4/6 with some finely laminated sands, moist, firm	0.0			BC 6, 8, 8, 8 REC 1.3/2
	7					
	8					
		As Above, DK gray, 10YR 4/1, soft, moist	0.0			BC 4, 6, 4, 4 REC 1.7/2 SATURATED AT 8.5 feet
	9	Silty sand, very fine to fine, med density, saturated, well sorted, DK yel brn 10YR 4/4				
		Silty clay, DK gray 10YR 4/1, 10% fine to med gravel, firm,				

HTRW DRILLING LOG

HOLE NUMBER 194

PROJECT: RVAAP, Load Line 4 Phase II RI | INSPECTOR E/Schultheis | SHEET 3 OF 4

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	11	As above, some fine to med. gravel, finely laminated, high plasticity	0.0			BC 4,6,7,7 Rec 1.5/2
	12	Shelby Tube down pressure 500 psi				Rec. 1.8/2
	13	Bottom - gray silty clay w/ gravel				
	14	As above, gray silty clay w/ gravel	0.0			BC 4,5,6,6 Rec 1/2
	15					
		Sand, very fine, gray 10YR5/1, rapid dilatency, well sorted, saturated, med. dense				
	16	Shelby tube down pressure 600 psi				Rec 2/2
	17	Sand at top and bottom				
	18	Sand, very fine to fine, saturated gray 10YR5/1,				BC 33,3,5 Rec 2/2
	19					
		finely laminated gray silty clay 10YR 4/1 w/ gravel Med. plasticity, moist				

HTRW DRILLING LOG

HOLE NUMBER 194

PROJECT: RVAAP, Load Line 4 Phase II RI | INSPECTOR Eschultz | SHEET 1 OF 2

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	21	as above, gray silty clay	0.0			BC 5,5,6,5 REC 1.6/2
	22					BOH 21.5'

Well volume calculation sheet

Date 8/21/01 Time 1425
Well ID Num LLtmw194
Well Location Load Line 4

Total depth of well (ft BTOC) 23.80
Depth to water (ft BTOC) 10.80
Height of water column (ft) (Hc) 13.00

Well Volume Calculation

Vc = 3.142(Rc^2)*Hc .284 cu. ft.

Vf = 3.142[(Rf^2)-(Ro^2)]*(Hc or length of screen)*(0.30)
**note ** use length of screen if Hc > length of screen
1.36 cu. ft.
1.046
1.044

Vt = (Vc+Vf)*(7.48 gal/cu ft)
= 12.3 gal.
10 gal

Where:
Vc = Volume of casing (ft^3)
Vf = Volume of filter pack (ft^3)
Vt = Total volume
Ro = outside radius of casing .0833 (ft)
Hc = height of water column 13.00 (ft)
Rf = radius of filter pack .344 (ft)
Rc = radius of inside casing .0833 (ft)

GW 3/11/04

[redacted] DEVELOPMENT FORM

[redacted] DELIVERY ORDER NO. [redacted]

Date: 8/21/01 Time: 1425

Well Number and Location: LL4mw194

Development Crew: M. Clough

Driller (if applicable): C. Moore

Water Levels / Time: Initial: 10.80 / 1429 Pumping: 20.6 / 1704

Final: 11.10 / 8/28/01 1058

Total Well Depth: Initial: 23.80 FT BTOC Final: 23.81 FT BTOC

Date and Time: Begin: 8/21/01 / 1441 Completed: 8/21/01 / 1733

Development Method(S): Pump & Surge

Total Quantity of Water Removed: 54 gals

FIELD MEASUREMENT	SERIAL NUMBER	DATE OF LAST CALIBRATION
Temperature	1639	8/21/01
Specific Conductivity		
pH		
Turbidity		

WELL DEVELOPMENT RECORD

PROJECT NAME: Load Line 4 Phase II RI

PAGE 1 OF 1

WELL NUMBER AND LOCATION: LL4mw194

DATE	TIME	GALLONS REMOVED	TEMP(C)	SPECIFIC CONDUCTIVITY (µMHOS/CM)	pH (Standard Units)	TURBIDITY	TOTAL GALLONS REMOVED	WELL VOLUMES REMOVED	COMMENTS
8/21/01	1441	0	13.6	0.562	7.36	7949	0	0	Initial
	1504	10	14.8	0.582	7.36	764	10	1	
	1641	10	16.2	0.564	7.39	936	20	2	
	1615	5	14.7	0.574	7.36	456	25	2.5	
	1631	5	15.0	0.579	7.40	151	30	3	
	1649	5	14.7	0.576	7.35	561	35	3.5	
	1704	5	15.2	0.564	7.25	Clear*	40	4	*Turbidity meter on blank
↓	1733	10	14.7	0.573	7.34	Clear	50	5	Dev. Complete

RECORDED BY: [signature] 8/21/01
(Signature and Date)

QA CHECK BY: [signature]
(Signature and Date)

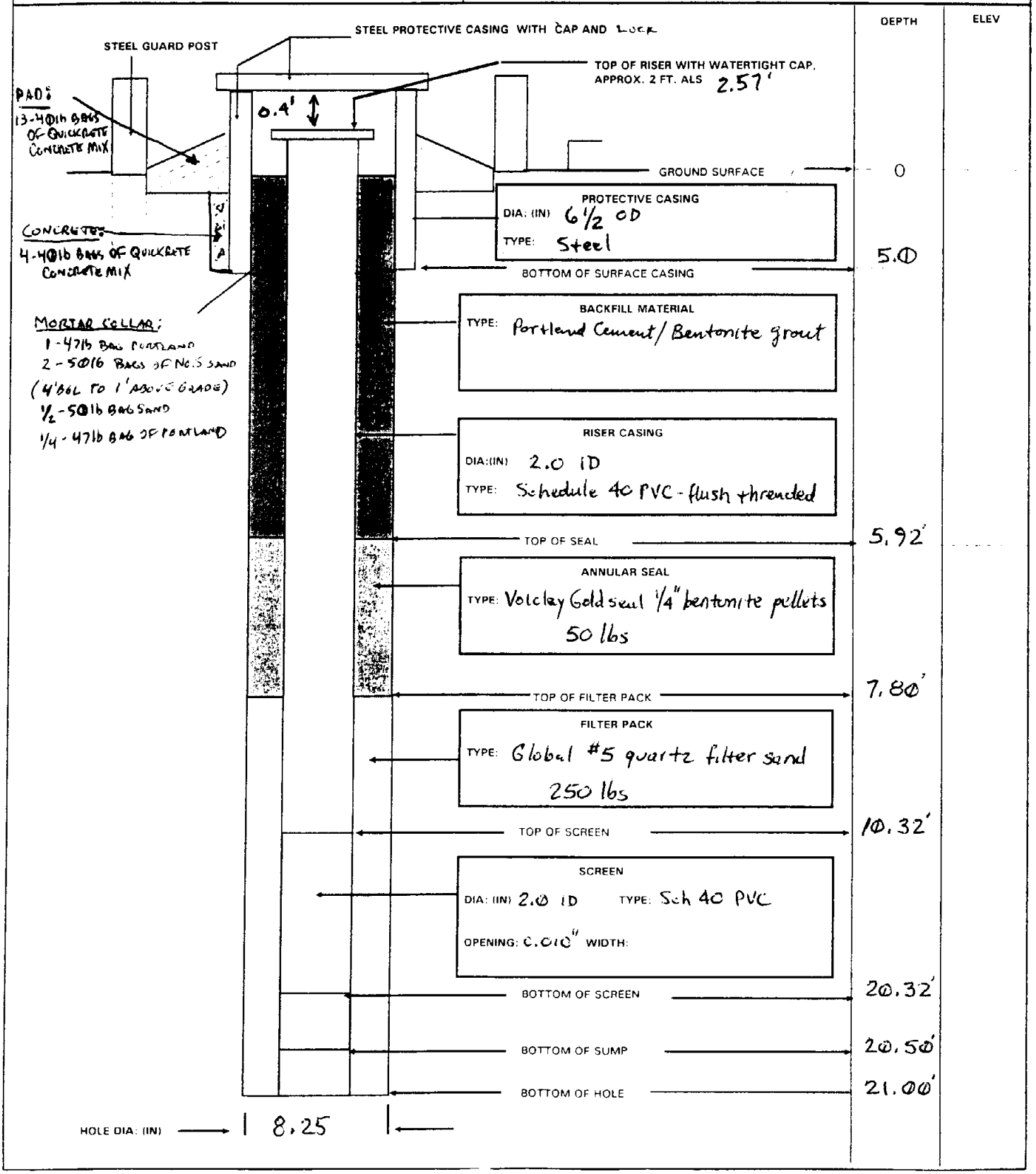
C-20

20

MONITORING WELL

PROJECT NAME: Load Line 4 Phase II RI/FS **DELIVERY ORDER NO.:** ECAS-1863

WELL NUMBER: LL4 MW195	**BEGIN:** 07/25/01 1550	**END:** 07/25/01 1705
COORDINATES: N: E:	**REFERENCE POINT:**	**ELEVATION:**



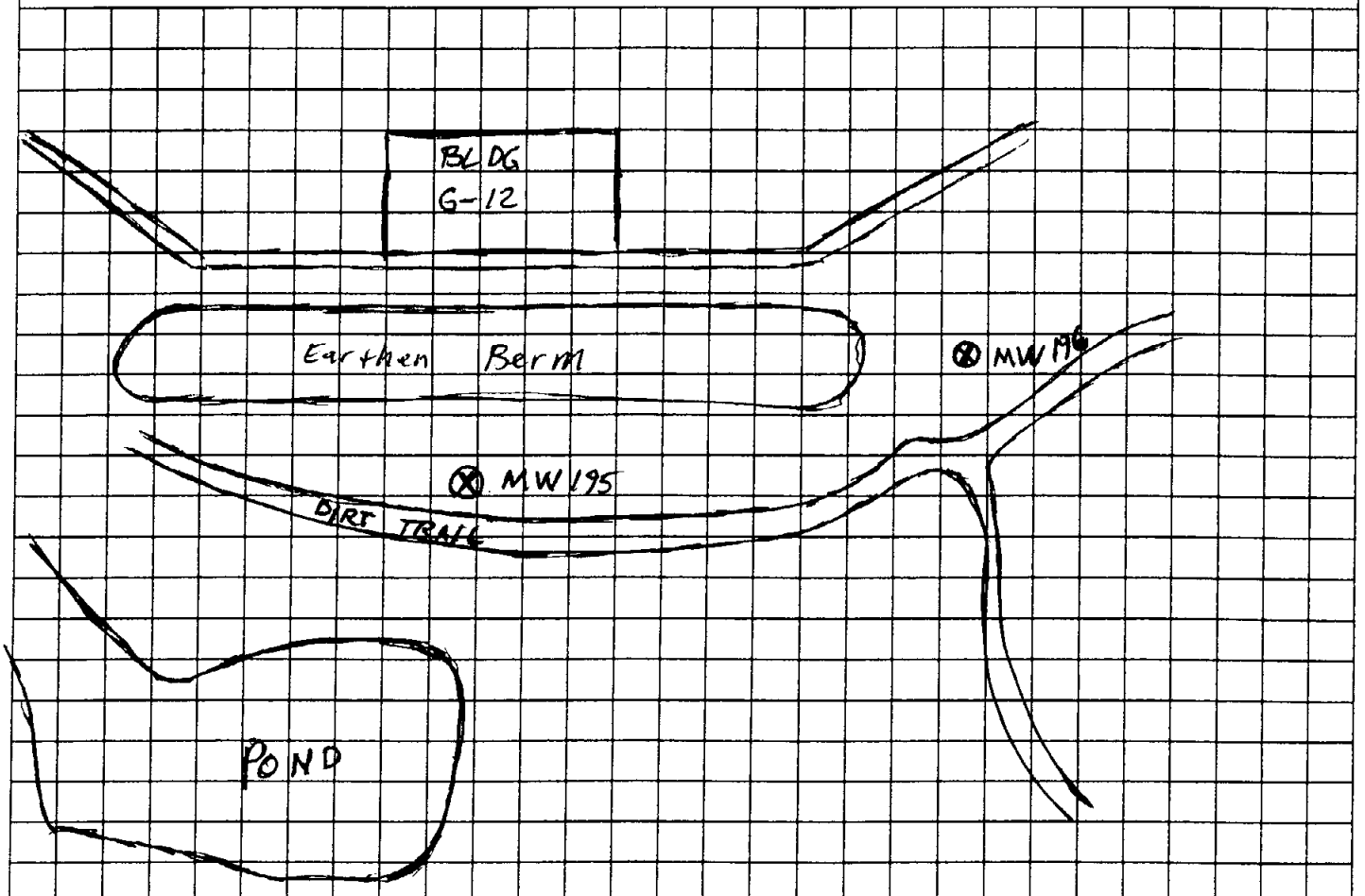
HTRW DRILLING LOG

DISTRICT: Louisville		HOLE NUMBER MW195
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: Tol-Test	SHEET 1 OF 3

3. PROJECT: RVAAP, Load Line 4 Phase II RI	4. LOCATION: Load Line 2
5. NAME OF DRILLER: Neil Wiktor	6. MANUFACTURERS DESIGNATION OF DRILL: CME 75
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4 1/4" ID Hollow stem Augers; 2"OD x 2ft long split spoon Samplers; 3"OD x 2.5 ft long Shelby Tube samplers	8. HOLE LOCATION: See map below
	9. SURFACE ELEVATION: 982.59 TOC 555046.75 N 2365198.76 E KAP 1/31/02
	10. DATE STARTED: 07/25/01 — 11. DATE COMPLETED: 07/25/01
12. OVERBURDEN THICKNESS: > 21.0 ft	15. DEPTH GROUNDWATER ENCOUNTERED: 9.4 ft bgs
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 14.25 ft Toc after 72 hrs
14. TOTAL DEPTH OF HOLE: 21.0 ft bgs	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):

18. GEOTECHNICAL SAMPLES	DISTURBED	2 UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES: None			
20. SAMPLES FOR CHEMICAL ANALYSIS: None	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY: 88 %
22. DISPOSITION OF HOLE: Completed as Monitor Well	BACKFILLED	MONITORING WELL: MW195	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR: EJ Schuckelaus		

LOCATION SKETCH/COMMENTS — SCALE: Not to Scale



PROJECT: RVAAP, Load Line 4 Phase II RI — HOLE NUMBER: MW195

HTRW DRILLING LOG

HOLE NUMBER MW195

PROJECT: RVAAP, Load Line 4 Phase II RI | INSPECTOR: Eschenbach | SHEET 2 OF 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0	SANDY SILT (ML); light yellowish brown 10YR6/4, 20% F-med sand, 10% fine gravel, stiff, dry	0.0 ppm			Blow counts: 11-15-4-10 Recovery: 1.7'/2'
	1	WEATHERED SANDSTONE (boulder ?) grayish orange 10YR7/4, med. grained, damp				
	2	CLAYEY SILT (ML); grayish brown 10YR5/2, firm, non-plastic, moist, iron staining increasing w/ depth	0.0 ppm			Blow Counts: 10-10-8-8 Recovery: 1.75'/2'
	3					
	4	- gradual color change to dark yellowish brown 10YR 4/6, 1-5% fine gravel, hard, moist	0.0 ppm			Blow Counts: 7-8-8-8 Recovery: 2'/2'
	5					
	6	- same CLAYEY SILT but 10% fine gravel, some iron staining, low plasticity	0.0 ppm			Blow Counts: 5-8-11-13 Recovery: 1.4'/2'
	7					
	8	SILTY CLAY (CL); gray 7.5 YR 5/1, 5% fine gravel, high plasticity, moist, firm grades to hard	0.0 ppm			Blow Counts: 4-5-9-10 Recovery: 1.6'/2'
	9	SAND (SW); fine, dark yellowish brown 10YR 4/6 well, wet to saturated				Water encountered at 9.4 ft
	10					

HTRW DRILLING LOG

HOLE NUMBER MW195

PROJECT: RVAAP, Load Line 4 Phase II RI | INSPECTOR EJSchuldheis | SHEET 3 OF 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	11	- - - ?- - - ?- -	Shelby Tube 10-12' down pressure 400-1200 psi recovery 1.75/2			Breathing Zone 0.0 ppm - Contact uncertain because sample from 10-12' is in the Shelby Tube
	12	SILT (ML); gray 7.5YR 5/1, grades to fine sand, Saturated	0.0 ppm			Blow counts: 5-5-6-4 Recovery: 2'/2'
	13	CLAY (CL); gray 10YR 5/1, 5-10% fine gravel, moist SILT (ML); gray 10YR 5/1, non-plastic Saturated CLAY (CL); gray 10YR 5/1, med. plasticity, moist				
	14		0.0 ppm	Shelby Tube 14-16' down pressure 600 psi recovery 1.7'/2'		
	15	- - ?- - - - ?- -				- Contact uncertain because sample from 14-16' is in the Shelby Tube
	16	CLAYEY SILT (ML); gray 10YR 5/1, low plasticity, grades to fine-med. grained sand, med. stiff to stiff (med. dense sand) wet to Saturated	0.0 ppm			Blow Counts: 9-8-10-20 Recovery: 1.7'/2'
	17					
	18		0.0 ppm			Blow Counts: 6-8-13-13 Recovery: 2'/2'
	19					
	20					Bottom - 20.0'

Well volume calculation sheet

Date 8/21/01 Time 1335
Well ID Num LL4mw195
Well Location LL4

Total depth of well (ft BTOC) 22.70
Depth to water (ft BTOC) 12.20
Height of water column (ft) (Hc) 10.5

Well Volume Calculation

Vc = 3.142(Rc^2)*Hc .073 cu. ft. Ø.227 SW 3/15/04

Vf = 3.142[(Rf^2)-(Ro^2)]*(Hc or length of screen)*(0.30)
**note ** use length of screen if Hc > length of screen
= 1.046 cu. ft. - 111 (3.142)(10)(.3

Vt = (Vc+Vf)*(7.48 gal/cu ft)
= ~~9.7~~ 9.5 gal. SW 3/15/04

Where:
Vc = Volume of casing (ft^3)
Vf = Volume of filter pack (ft^3)
Vt = Total volume
Ro = outside radius of casing Ø.Ø83 (ft)
Hc = height of water column 10.5 (ft)
Rf = radius of filter pack Ø.344 (ft)
Rc = radius of inside casing Ø.Ø83 (ft)

SW 3/15/04

[redacted]

Date: 8/21/01 Time: 1335

Well Number and Location: LL4mw195

Development Crew: M. Clough

Driller (if applicable): C. Moore

Water Levels / Time: Initial: 12.20 / 1537 Pumping: 14.48 / 1416

Final: 13.22 / 8/28/01 1056

Total Well Depth: Initial: 22.70 FT BTOC Final: 22.85 FT BTOC

Date and Time: Begin: 8/21/01 / 1353 Completed: 8/21/01 / 1417

Development Method(S): Surge & Pump

Total Quantity of Water Removed: 15 gals

FIELD MEASUREMENT	SERIAL NUMBER	DATE OF LAST CALIBRATION
Temperature	14639	8/21/01
Specific Conductivity		
pH		
Turbidity		

WELL DEVELOPMENT RECORD

PROJECT NAME: Load Line 4 Phase II RI

PAGE 1 OF 1

WELL NUMBER AND LOCATION: LL4mw195

DATE	TIME	GALLONS REMOVED	TEMP(C)	SPECIFIC CONDUCTIVITY (µMHOS/CM)	pH (Standard Units)	TURBIDITY	TOTAL GALLONS REMOVED	WELL VOLUMES REMOVED	COMMENTS
8/21/01	1353	0	15.9	1.43	6.84	>999	0	0	Grayish
	1359	10	12.5	1.48	6.83	>999	10	>1	
	1403	8	12.0	1.47	6.84	>999	18	2.1	clearing
	1409	9	11.7	1.37	6.87	457	27	3.2	
	1413	9	11.5	1.32	6.89	208	36	4.3	
	1415	4	11.4	1.30	6.90	167	40	4.8	
	1417	5	11.4	1.28	6.89	37	45	5	Dev. Comp

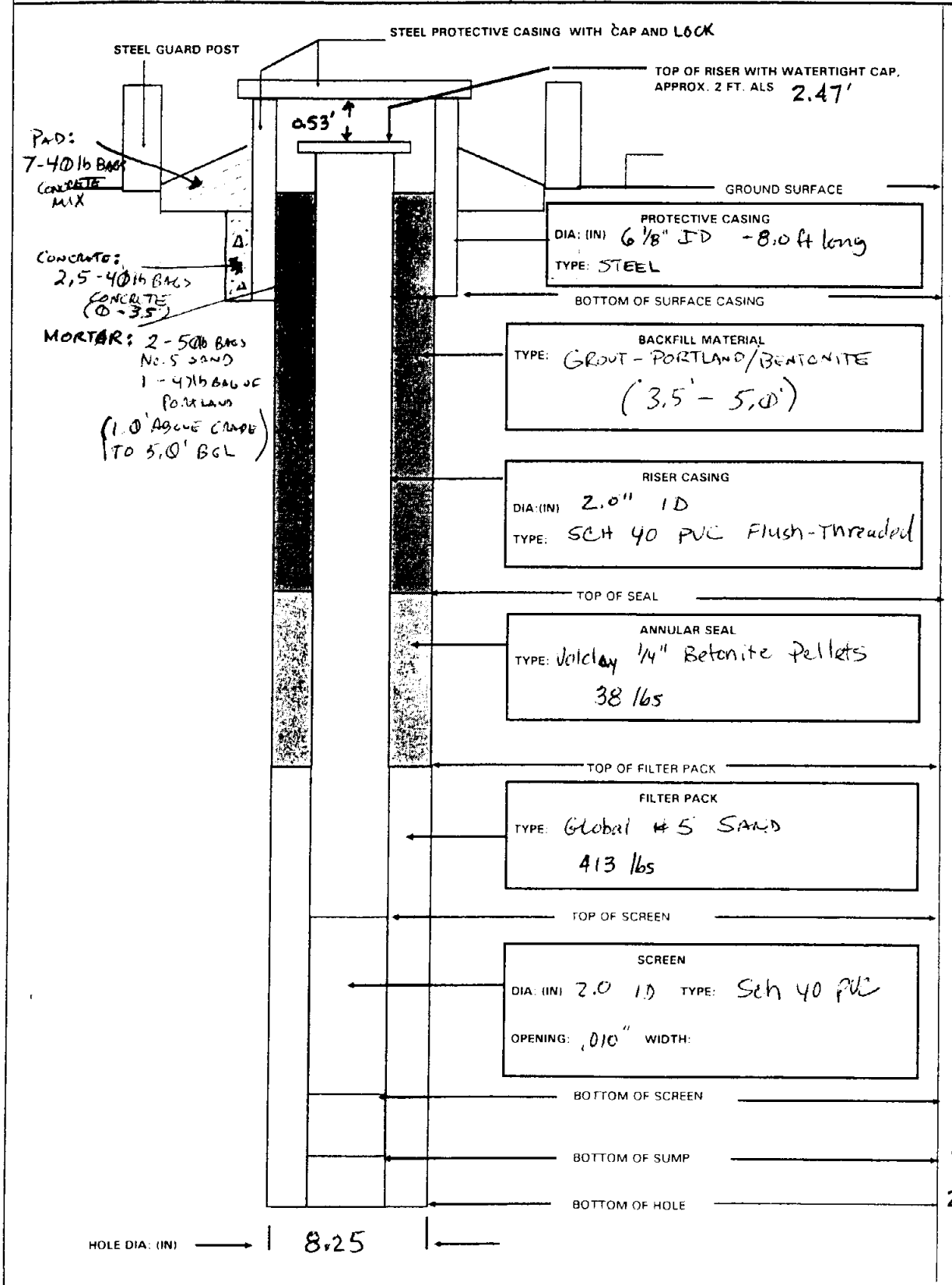
RECORDED BY: _____ (Signature and Date)

QA CHECK BY: _____ (Signature and Date)

MONITORING WELL

PROJECT NAME: Load Line 4 Phase II RI **DELIVERY ORDER NO.:** ECAS1186

WELL NUMBER: LL4MW-196	**BEGIN:** 7/25/01 1140	**END:** 7/25/01 1220
COORDINATES: N: E:	**REFERENCE POINT:**	**ELEVATION:**



HTRW DRILLING LOG

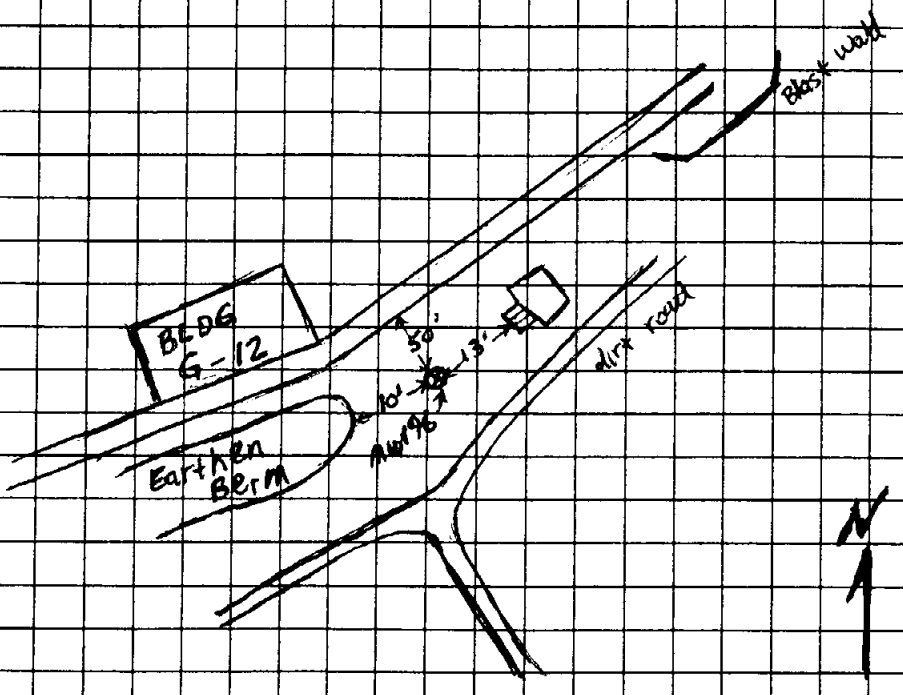
DISTRICT: Louisville		HOLE NUMBER: MW196
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: Tol-Test	SHEET 1 OF 3
3. PROJECT: RVAAP, Load Line 4 Phase II RI	4. LOCATION: Load Line 4	
5. NAME OF DRILLER: NEIL WIKTOR	6. MANUFACTURERS DESIGNATION OF DRILL: CME 75	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4 1/4" ID HSA; 2" OD X 2' LONG SPLIT SPOONS; 3" ID X 2.5' LONG SHELBY TUBES	8. HOLE LOCATION: see map below	
8/1/01 SM	9. SURFACE ELEVATION: 984.55 TOC	555213.52 N 2365297.10 E
	10. DATE STARTED: 7-25-01	11. DATE COMPLETED: 7-25-01
12. OVERBURDEN THICKNESS: >20.0 ft	15. DEPTH GROUNDWATER ENCOUNTERED: 9.65 ft bgs	
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 14.44 ft TOC after 75 hrs	
14. TOTAL DEPTH OF HOLE: 20.0 ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):	

18. GEOTECHNICAL SAMPLES	DISTURBED: 1	UNDISTURBED: Ø	19. TOTAL NUMBER OF CORE BOXES: None

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY: 67%
None						

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
Completed as Monitor Well		MW196		EJ Schulthess

LOCATION SKETCH/COMMENTS — SCALE: Not to Scale



PROJECT: RVAAP, Load Line 4 Phase II RI — HOLE NUMBER: MW196

HTRW DRILLING LOG

HOLE NUMBER 196

PROJECT: RVAAP, Load Line 4 Phase II RI | INSPECTOR EJSchulteis | SHEET 2 OF 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0	SILTY GRAVEL (GM); fine to coarse; brown 10YR 4/3, 20% F-Med sand, 10% silt, loose, dry	0.0 ppm			Blow Counts 8-7-6-6 Recovery 1.65/2'
	1	SANDY SILT (ML); yellowish brown 10YR 5/4, 20% fine to med. gravel, stiff, damp				
	2	CLAYEY SILT (ML); grayish brown 10YR 5/2, 5% fine gravel, iron staining, low plasticity, moist - at 2.4 ft depth there is 0.2 ft of fibrous organic material	0.0 ppm			Blow Counts 6-4-5-6 Recovery 1.4/2'
	3					
	4	SILTY CLAY (CL); gray 10YR 5/1, low plasticity, moist, extensive iron staining, some roots present	0.0 ppm			Blow Counts 6-6-9-9 Recovery 2/2'
	5					
	6	SANDY CLAY (CL); gray 10YR 5/1, 25% fine sand, firm, med. plasticity, moist	0.0 ppm			Blow Counts 6-8-10-10 Recovery 1.4/2'
	7	SAND (SW); fine-med., grayish brown 10YR 5/2, well sorted, 5-10% clay, moist SILTY CLAY (CL); dark yellowish brown 10YR 4/6, 10% fine gravel, firm, moist SAND (SW); fine, yellowish brown 10YR 5/6, 5% silt, loose, moist, well sorted				
	8	color change to dark yellowish brown 10YR 4/6	0.0 ppm			Blow Counts 5-5-7-7 Recovery 1.45/2'
	9	medium dense; wet				— wet at 9.65 ft
	10					

PROJECT RVAAP, Load Line 4 Phase II RI | HOLE NUMBER 196

HTRW DRILLING LOG

HOLE NUMBER 196

PROJECT: RVAAP, Load Line 4 Phase II RI | INSPECTOR EJSchultheis | SHEET 3 OF 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	11	same SAND - Saturated	0.0ppm			Blow Counts 5-7-7-7 Recovery 2/2'
	12	SAND (SM); very fine sand & silt, gray 10YR5/1, rapid dilatency, saturated				~~Blow Counts~~ EJS Recovery - None
	13	Shelby Tube pressed from 12-14 ft at down pressure -250psi				
	14					
	15	Shelby Tube pressed from 14-16 ft at down pressure 250psi				Recovery - None
	16	Same very fine sand as above	0.0ppm			Blow Counts 2-3-3-3 Recovery 1.5/2'
	17					
	18		0.0ppm			Blow Counts 4-4-4-4 Recovery 2/2'
	19					
	20	CLAY (CL); gray 10YR5/1, med. plasticity, wet				Bottom @ 20.0'

Well volume calculation sheet

Date 8/14/01 Time 1500
Well ID Num LL4mw196
Well Location LL4

Total depth of well (ft BTOC) 21.76
Depth to water (ft BTOC) 14.53
Height of water column (ft) (Hc) 7.23

Well Volume Calculation

Vc = 3.142(Rc^2)*Hc .158 cu. ft.

$\pi(\frac{1}{12})^2(7.23)$

Vf = 3.142[(Rf^2)-(Ro^2)]*(Hc or length of screen)*(0.30)

**note ** use length of screen if Hc > length of screen

= .754 cu. ft.

$\pi\left[\left(\frac{4.125}{12}\right)^2 - \left(\frac{1}{12}\right)^2\right](7.23)(.3)$

.118 − .001

.111)(7.23)(.3)(π)

.756

.914

Vt = (Vc+Vf)*(7.48 gal/cu ft)

= 6.84 gal.

Where:

Vc	=	Volume of casing (ft^3)
Vf	=	Volume of filter pack (ft^3)
Vt	=	Total volume
Ro	=	outside radius of casing 0.083 (ft)
Hc	=	height of water column 7.23 (ft)
Rf	=	radius of filter pack 0.344 (ft)
Rc	=	radius of inside casing 0.083 (ft)

SV 3/15/04

Date: 5/14/01 Time: 1525

Well Number and Location: LL4mw196

Development Crew: M Clough B Richardson
J Leach

Driller (if applicable): C. Moore

missing final Total well depth

Water Levels / Time: Initial: 14.53 / 1504 Pumping: dry /

Final: /

Total Well Depth: Initial: 21.76 FT BTOC Final: FT BTOC

Date and Time: Begin: 5/14/01 / 1525 Completed: 5/20/01 / 1145

Development Method(S): Pump & Surge

Total Quantity of Water Removed: 4L gals

FIELD MEASUREMENT	SERIAL NUMBER	DATE OF LAST CALIBRATION	
Temperature	14639	5/14/01	5/20/01
Specific Conductivity			
pH			
Turbidity			

WELL DEVELOPMENT RECORD

PROJECT NAME: Load Line 4 Phase II RI DELIVERY ORDER NO.: [illegible]

PAGE 1 OF 1

WELL NUMBER AND LOCATION: LL4mw-196

DATE	TIME	GALLONS REMOVED	TEMP(C)	SPECIFIC CONDUCTIVITY (μMHOS/CM)	pH (Standard Units)	TURBIDITY	TOTAL GALLONS REMOVED	WELL VOLUMES REMOVED	COMMENTS
8/14/01	1525	∅	16.4	0.534	7.57	>999	∅	∅	
8/21/01	0815	10	12.7	0.456	6.78	>999	10	>1	
	0925	7	13.2	0.385	7.03	>999	17	>2	
	0946	5	14.2	0.389	7.18	167	21	3	
	0959	4	14.9	0.377	7.19	144	25	3.5	
	1001	3	15.0	0.396	7.18	>999	28	4.0	B. Richardson replaces M. Clough
	1035	3	15.2	0.373	7.26	>999	31	4.5	
	1050	2	14.4	0.368	7.22	76.2	33	4.8	
	1105	2	15.1	0.368	7.23	153	35	5.0	
	1125	2	15.3	0.372	7.22	28	37	5.3	
	1145	2	15.3	0.371	7.23	34	39	5.6	Stable
				9-11-01	vjb				

RECORDED BY: [illegible signature] 8/21/01
(Signature and Date)

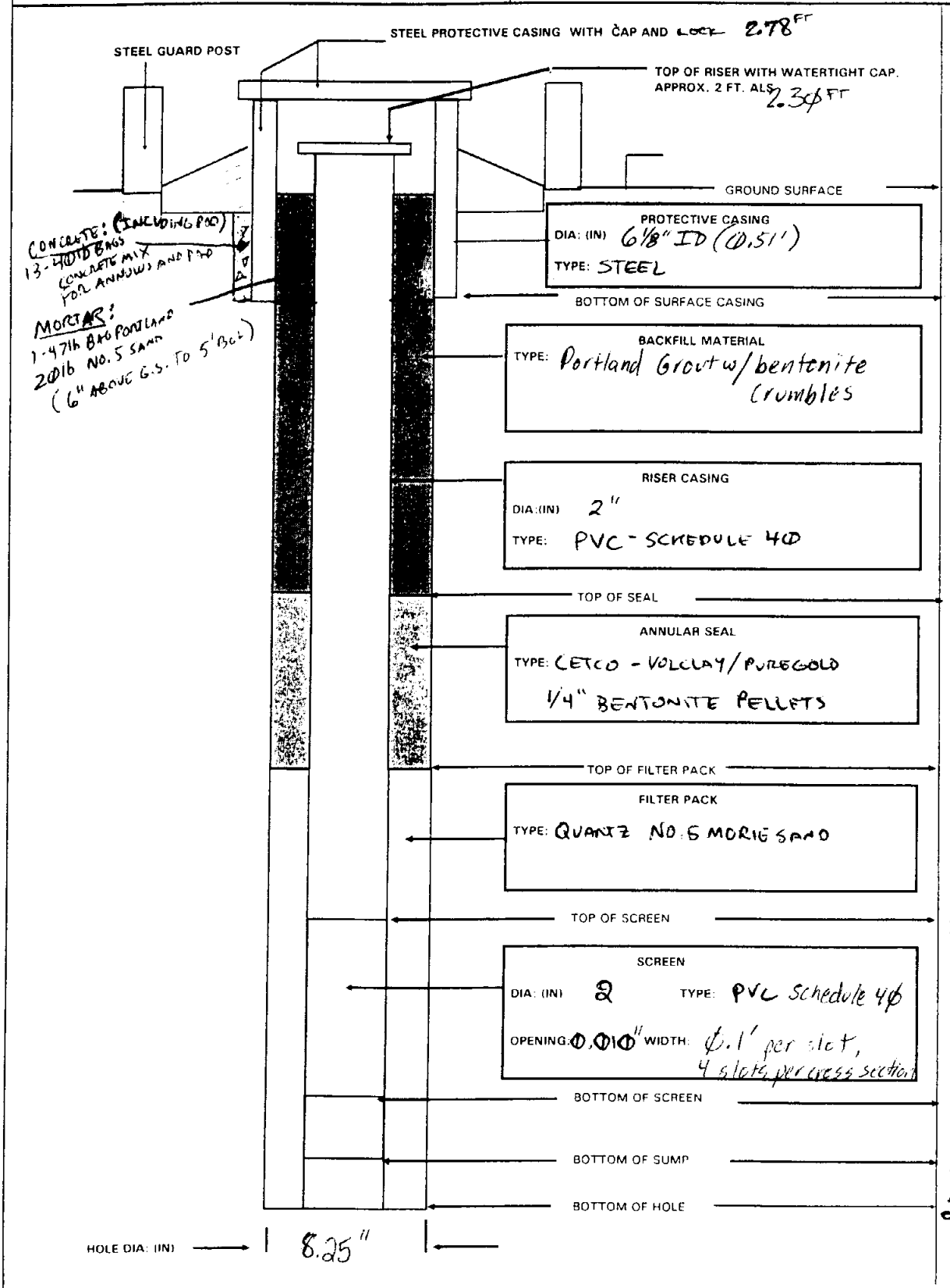
QA CHECK BY: [illegible signature]
(Signature and Date)

10

MONITORING WELL

PROJECT NAME: Load Line 4 Phase II RI **DELIVERY ORDER NO.:** ECAS 186

WELL NUMBER: LL4 MW-~~200~~ msm 197	**BEGIN:** 7/25/01 1020	**END:** 7/27/01 1559
COORDINATES: N: E:	**REFERENCE POINT:**	**ELEVATION:**

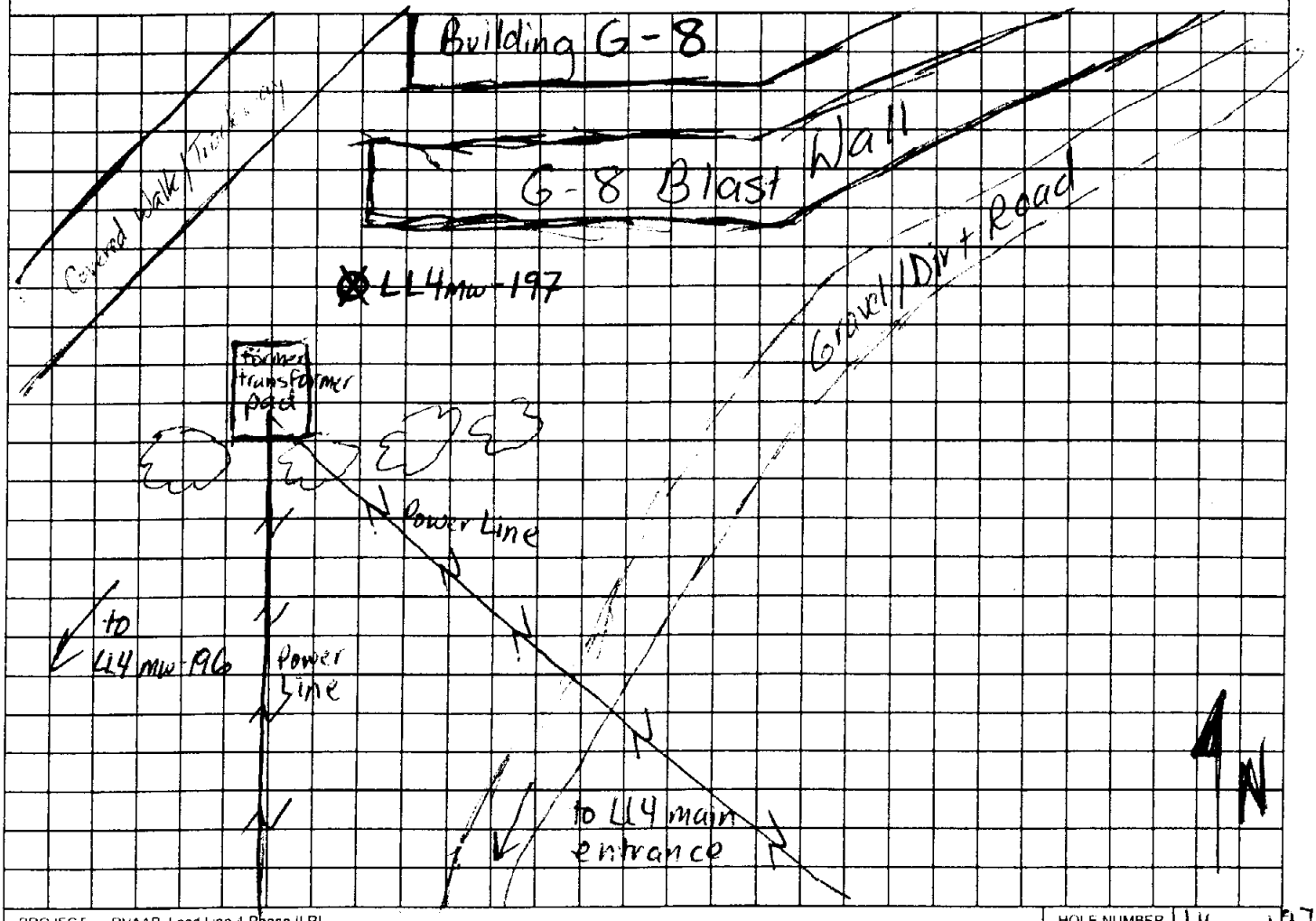


HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: Tol-Test	DISTRICT: Louisville HOLE NUMBER: LL4MW-197 SHEET 1 OF 4
3. PROJECT: RVAAP, Load Line 4 Phase II RI	4. LOCATION: LL4mw-197, directly south of G-8 blast wall	
5. NAME OF DRILLER: BOB GOLLIHUE	6. MANUFACTURERS DESIGNATION OF DRILL: CME 55Ø	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: ~~CME~~ 140 lb. hammer; 4¼" ID AUGERS; 2" X 2' LONG SPLIT SPOONS; ~~MGA 7.25 ID~~	8. HOLE LOCATION: (S) of G-8 blast wall, see map below	
	9. SURFACE ELEVATION: 975.46 TOC	555397.05 N ±2' 2365384.91 E 1/31/02
	10. DATE STARTED: 7/25/01	11. DATE COMPLETED: 7/27/01
12. OVERBURDEN THICKNESS: 21.7'	15. DEPTH GROUNDWATER ENCOUNTERED: ~12.2' bgs	
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: ~13.Ø' bgs @ Ø758 on 8/14/Ø1	
14. TOTAL DEPTH OF HOLE: 21.7' bgs	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):	

18. GEOTECHNICAL SAMPLES - 1	DISTURBED	(UNDISTURBED)	19. TOTAL NUMBER OF CORE BOXES: N/A			
20. SAMPLES FOR CHEMICAL ANALYSIS: N/A	VOC: N/A	METALS: N/A	OTHER (SPECIFY): N/A	OTHER (SPECIFY): N/A	OTHER (SPECIFY): N/A	21. TOTAL CORE RECOVERY: N/A
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL: X	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR		

LOCATION SKETCH/COMMENTS: LL4mw-197, Load Line 4 SCALE: NTS



PROJECT: RVAAP Load Line 4 Phase II RI — HOLE NUMBER: LL4mw-197

HTRW DRILLING LOG

HOLE NUMBER LL4MW-197

PROJECT: RVAAP, Load Line 4 Phase II RI | INSPECTOR Todd Eaby | SHEET 2 OF 4

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0	LIGHT YELLOWISH BROWN (2.5Y 6/4) SANDY SILT, SOME VERY FINE SAND, ~20% SUB-ROUNDED GRAVEL, ML, DRY, CRUMBLY	N/A	N/A	N/A	CUTTINGS CHARACTERIZED FROM AUGER DURING UXO CLEARANCE
	1					
	2	YELLOWISH BROWN (10YR 5/6) MOTTLED W/ GREENISH GRAY (5GY 6/1), SILTY CLAY, DRY, LOW PLASTICITY, HARD, ~5% SUB-ANGULAR GRAVEL, CL				SPLIT SPOON 2-4' 5/7/7/7 0.9'/2.0
	3					
	4	DECREASED AMOUNT OF GRAY MOTTLING				SPLIT SPOON 4-6' 5/9/12/12 1.7/2.0
	5					
	6					SS 6-8' 5/12/20/19 1.5/2.0
	7					
	8					SPLIT SPOON 8-10' 5/7/10/9 1.9/2.0
	9	YELLOWISH BROWN (10YR 5/6) VERY FINE GRAINED, WELL SORTED SAND-SILTY, SM, LOOSE, DRY				
	10					

HTRW DRILLING LOG

HOLE NUMBER LL4-197

PROJECT RVAAP, Load Line 4 Phase II RI | INSPECTOR T. Eaby | SHEET 22 OF 34

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	11	DARK YELLOWISH BROWN (10YR 4/6) VERY FINE SILTY SAND, WELL-SORTED, SLIGHTLY MOIST	N/A		N/A	SPLIT SPOON 10-12' 8/9/9/9 1.9/2.0
	12	↓ SATURATED, SAME AS ABOVE				SPLIT SPOON 12-14' 4/6/5/6 1.5/2.0
	13					
	14					SPLIT SPOON 14-16' 4/6/9/8 1.4/2.0
	15					
	16	GREENISH GRAY (5GY 4/1) SANDY ROCK FLOUR, SATURATED OCCASSION PIECE OF SUB-ANGULAR GRAVEL, RAPID DILATANCY				SHELBY TUBE 16-18 220 PSI -NO RECOVERY PUSH SPLIT SPOON 16-18 1/2/1/2 1.2/2.0
	17					
	18	TOP OF SHELBY IS SAME AS ABOVE		LL4mw197-1129-50		SHELBY TUBE 18-20 140 PSI 1.7/2.0 REC.
	19					
		BOTTOM OF SHELBY - GREENISH GRAY (5GY6/1) CLAY, VERY LOW PLASTICITY, LOW COHESIVENESS, CL	↓		↓	

HTRW DRILLING LOG

HOLE NUMBER LL4-197

PROJECT: RVAAP, Load Line 4 Phase II RI | INSPECTOR T. Eaby | SHEET 4 OF 34 MSM

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	21	TD = 21' MSM	N/A	N/A	N/A	SHELBY TUBE 20-21' 80 PSI - NO RECOVERY MSM
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					

MSM 7-25-01

Well volume calculation sheet

Date 8/22/01 Time 1030
Well ID Num LL4mw197
Well Location Load Line 4 near blast wall

Total depth of well (ft BTOC) 23.60
Depth to water (ft BTOC) 15.73
Height of water column (ft) (Hc) 7.87

Well Volume Calculation

Vc = 3.142(Rc^2)*Hc .172 cu. ft.

Vf = 3.142[(Rf^2)-(Ro^2)]*(Hc or length of screen)*(0.30)
**note ** use length of screen if Hc > length of screen
= .823 cu. ft.

Vt = (Vc+Vf)*(7.48 gal/cu ft) .995
= 7.4 gal.

Where:
Vc = Volume of casing (ft^3)
Vf = Volume of filter pack (ft^3)
Vt = Total volume
Ro = outside radius of casing 0.083 (ft)
Hc = height of water column 7.87 (ft) SV
Rf = radius of filter pack 0.344 (ft) 3/15/04
Rc = radius of inside casing 0.083 (ft)

Date: 8/22/01 Time: 1030

Well Number and Location: LL4mw197

Development Crew: M Clough
J. Lindaw

Driller (if applicable): C. Moore

Water Levels / Time: Initial: 16.73 / 7032 Pumping: — /
Final: 15.52 / 8/23/01 1052

Total Well Depth: Initial: 23.60 FT BTOC Final: 23.60 FT BTOC

Date and Time: Begin: 8/22/01 / 1044 Completed: 8/23/01 / 0901

Development Method(S): Pump & Surge

Total Quantity of Water Removed: 23 gals

FIELD MEASUREMENT	SERIAL NUMBER	DATE OF LAST CALIBRATION
Temperature	14639	8/22/01 / 8/23/01
Specific Conductivity		
pH		
Turbidity		

WELL DEVELOPMENT RECORD

PROJECT NAME: Load Line 4 Phase II RI

PAGE 1 OF 1

WELL NUMBER AND LOCATION: LL4mw197

DATE	TIME	GALLONS REMOVED	TEMP(C)	SPECIFIC CONDUCTIVITY (µMHOS/CM)	pH (Standard Units)	TURBIDITY	TOTAL GALLONS REMOVED	WELL VOLUMES REMOVED	COMMENTS
8/22/01	1044	0	12.6	0.566	7.35	>999	0	0	Initial - brown
↓	1141	7	14.2	0.522	7.26	>999	7	1	
	1644	9	14.4	0.507	7.38	>999	16	2	
↓	1704	1	14.3	0.508	7.30	>999	17		End of day
8/23/01	0842	0	14.3*	1.564*	6.84*	>999	17		*8/23 Initial
↓	0901		14.3	0.505	7.25	>999	22.5	3	Development Complete

C-42

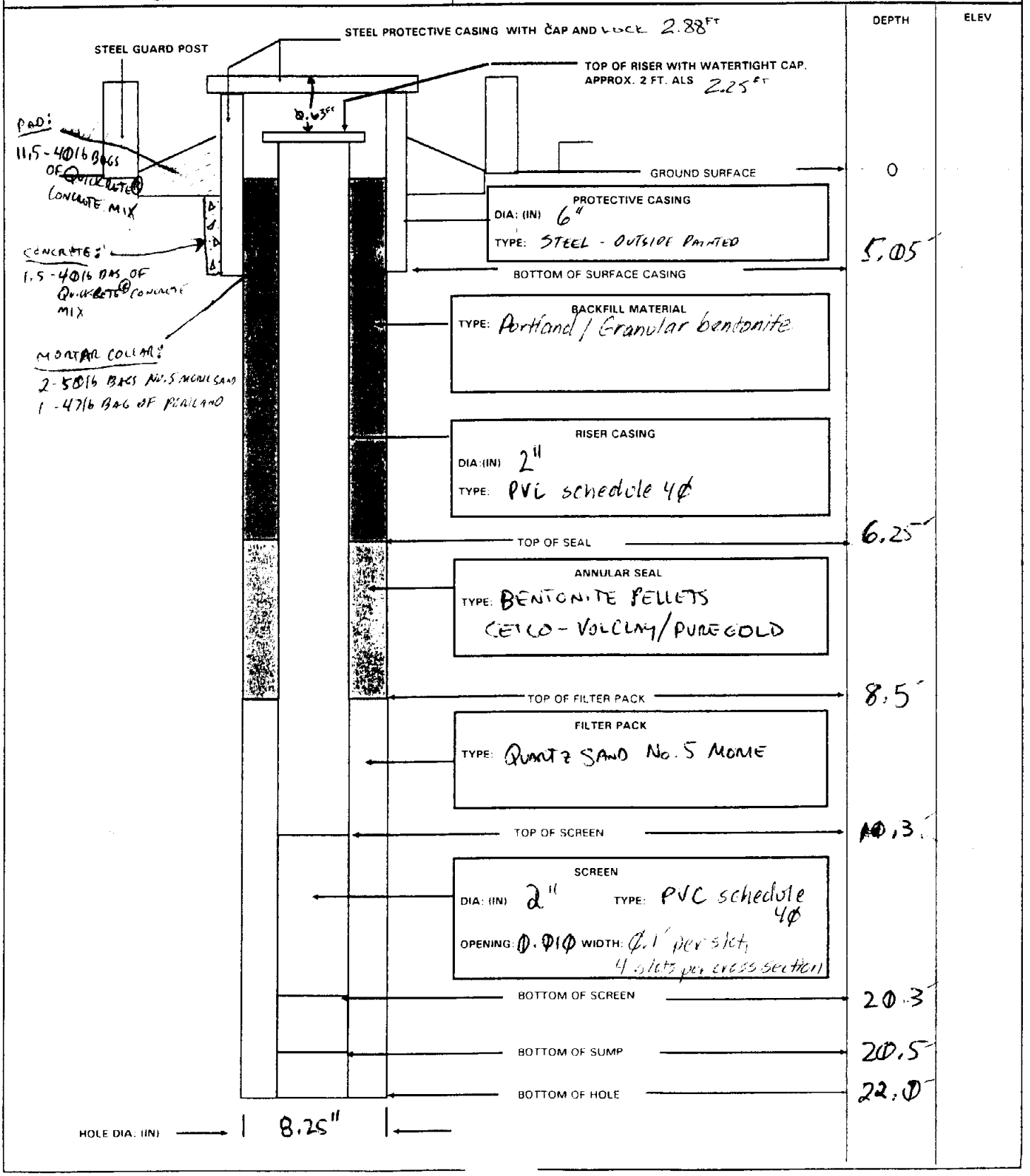
RECORDED BY: Sandra Clough (Signature and Date)

QA CHECK BY: Jen Loerch 8-27-01 (Signature and Date)

MONITORING WELL

PROJECT NAME: Load Line 4 Phase II RI — **DELIVERY ORDER NO.:** ECAS 186

WELL NUMBER: LL4 MW-198	BEGIN: 7/26/01 1604	END: 7/31/01 1742
COORDINATES: N: E:	REFERENCE POINT:	ELEVATION:



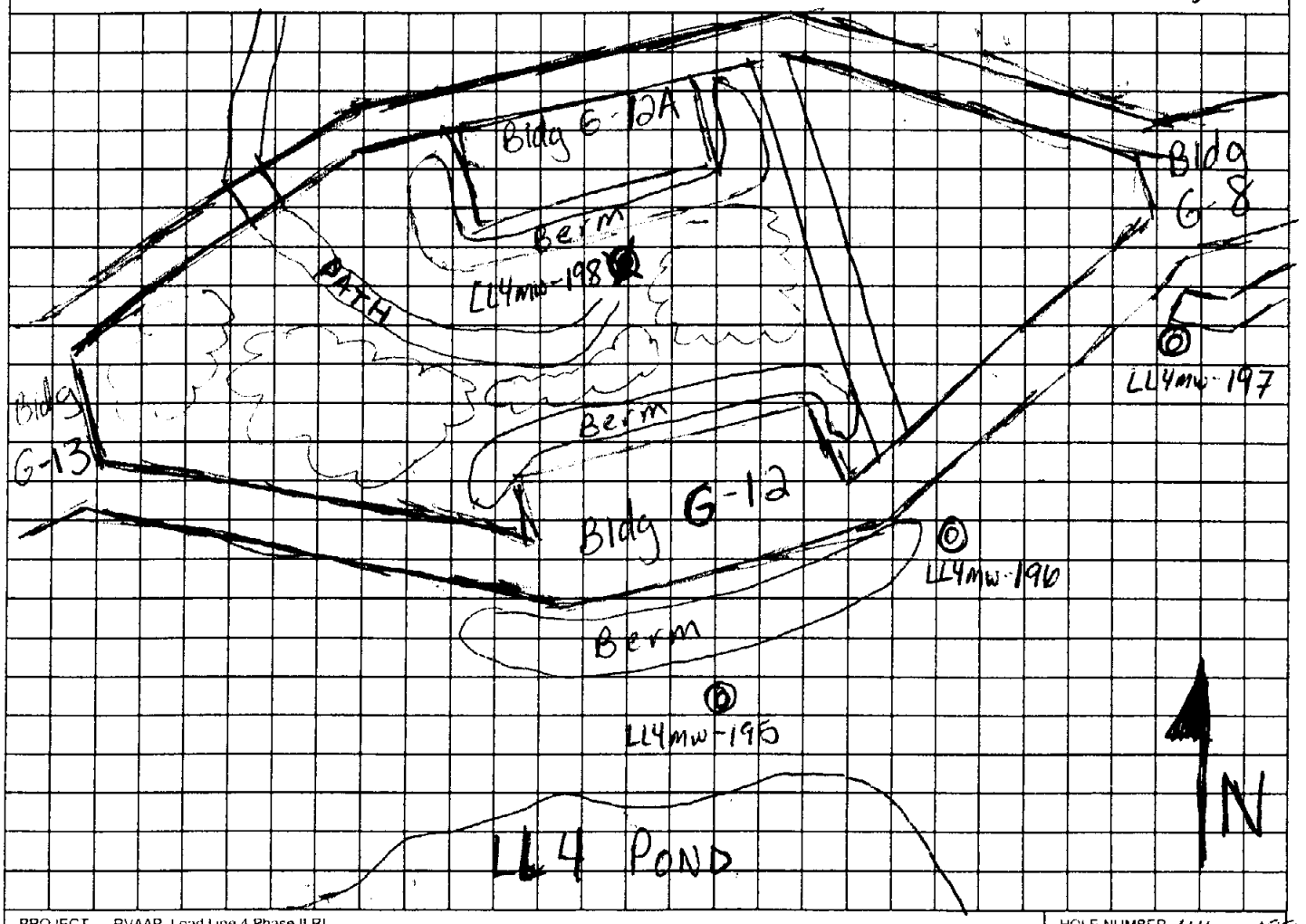
HTRW DRILLING LOG

	DISTRICT: Louisville	HOLE NUMBER LL4mw-198
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: Tol-Test	SHEET 1 OF 4

3. PROJECT: RVAAP, Load Line 4 Phase II RI	4. LOCATION: S of Bldg G-12A, center of "diamond" at LL4
5. NAME OF DRILLER: Bob Collihue	6. MANUFACTURERS DESIGNATION OF DRILL: CME 550
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4¼" ID augers; 2" x 2' long split spoons; 140 lb hammer; MSM 7-86-01	8. HOLE LOCATION: LL4mw-198, S of Bldg G-12A; see map below
	9. SURFACE ELEVATION: 983.42 TOC; 553442.04 N, 2364991.19 E KJP 11/30/02
	10. DATE STARTED: 07/26/01; 11. DATE COMPLETED: 07/31/01
12. OVERBURDEN THICKNESS: 22.0'	15. DEPTH GROUNDWATER ENCOUNTERED: ~9.5' bgs
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 9.3' bgs @ 0808 on 8/14/01
14. TOTAL DEPTH OF HOLE: 22.0' bgs	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):

18. GEOTECHNICAL SAMPLES: 1	DISTURBED	(UNDISTURBED)	19. TOTAL NUMBER OF CORE BOXES: N/A			
20. SAMPLES FOR CHEMICAL ANALYSIS: N/A	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY: N/A
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL X	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR		

LOCATION SKETCH/COMMENTS: LL4mw-198, S of Bldg G-12A SCALE: NTS



PROJECT: RVAAP, Load Line 4 Phase II RI — HOLE NUMBER: LL4mw-198

HTRW DRILLING LOG

HOLE NUMBER LL4mw-198

PROJECT: RVAAP, Load Line 4 Phase II RI | INSPECTOR Todd Eaby | SHEET 2 OF 4

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
		CLAYEY SILT, GRAY (7.5 YR 5/1) MOTTLED, ROOT ZONE, DRY, HARD ML		N/A	N/A	SPLIT SPOON 0-2' 2/3/3/4 REC. 1.6/2.0
	1	LIGHT GRAY (10 YR 7/1) SILT, DRY, SOME MOTTLING, ML	0.0 ppm			
	2	- MINOR CLAY CONTENT, INCREASING WITH DEPTH				SPLIT SPOON 2-4' 4/5/7/9 REC. 1.5/2.0
	3					
		STRONG BROWN (7.5 YR 5/6) SILT, DRY, LOOSE, ML				
	4	STRONG BROWN (7.5 YR 5/6) MOTTLED SILT, MEDIUM TO FINE GRAINED SAND INTERBEDS, ML	0.0 ppm			4/6/8/11 SPLIT SPOON 4-6' REC. 1.8'/2.0'
	5					
	6		0.0 ppm			SPLIT SPOON 6-8' 5/12/15/17 REC. 1.5/2.0'
	7					
		STRONG BROWN (7.5 YR 5/6) MOTTLED SILTY CLAY, < 5% SUB-ROUNDED GRAVEL, LOW PLASTICITY, LOW COHESIVENESS, DRY, HARD, CL				
	8		0.0 ppm			SPLIT SPOON 8-10 5/7/9/8 REC 1.6/2.0
		STRONG BROWN (7.5 YR 5/6) VERY FINE SAND, MOIST, LOOSE, SILTY				
	9					
		SATURATED				
		SEE NEXT PAGE				
	10					

46

HTRW DRILLING LOG

HOLE NUMBER LL4MW-198

PROJECT: RVAAP, Load Line 4 Phase II RI | INSPECTOR Todd Eaby | SHEET 3 OF 4

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	11	DARK GREENISH GRAY (5GY 4/1) SILT, SATURATED, MEDIUM DILATANCY ML	0.0 ppm		N/A	SPLIT SPOON 10-12' 4/5/7/8 REC 1.6/2.0
	12		0.0 ppm			SPLIT SPOON 12-14' 5/7/7/9 REC 2.0/2.0
	13					
	14		0.0 ppm	LL4MW-198 1131-SO		SHELBY TUBE 14-16' 150 PSI 2.0'/2.0'
	15					
	16		0.0 ppm	Other Shelby Tube not collected upon discussion with Brad Richardson - similar materials throughout screened interval.		SPLIT SPOON 16-18' 4/6/7/6 1.8/2.0
	17					
	18	DARK GREENISH GRAY (5GY 4/1) SILTY CLAY, HARD, LOW PLASTICITY, LOW COHESIVENESS, CL, OCCASSIONAL PIECE OF GRAVEL - SUB ROUNDED	0.0 ppm	~~LL4MW-198 1131-SO~~ MSMW		SPLIT SPOON 18-20' 3/5/6/9 2.0/2.0
	19					

HTRW DRILLING LOG

HOLE NUMBER LL4MW-198

PROJECT: RVAAP, Load Line 4 Phase II RI

INSPECTOR Todd Eaby

SHEET 4 OF 4

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
		SAME AS ABOVE	Ø.Ø ppm	N/A	N/A	SPLITSPOON 20Ø-22' 5/9/12/17 REC. 1.6/2.Ø
	21	DARK GREENISH GRAY (5GY 4/1) SILT, SATURATED, MEDIUM DILATANCY				
	22	TD = 22'				

RPM 7-26-Ø1

Well volume calculation sheet

Date 08/23/01 Time 1355
Well ID Num LL4mw19B
Well Location LL4

Total depth of well (ft BTOC) 22.01
Depth to water (ft BTOC) 11.67
Height of water column (ft) (Hc) 10.34

Well Volume Calculation

Vc = 3.142(Rc^2)*Hc 0,225 ~~1.3~~ cu. ft.

Vf = 3.142[(Rf^2)-(Ro^2)]*(Hc or length of screen)*(0.30)
**note ** use length of screen if Hc > length of screen
= 1.1 cu. ft.

Vt = (Vc+Vf)*(7.48 gal/cu ft)
= ~~10.7~~ gal. 9.91
MJ 8/23/01

Where:
Vc = Volume of casing (ft^3)
Vf = Volume of filter pack (ft^3)
Vt = Total volume
Ro = outside radius of casing 0.083 (ft)
Hc = height of water column 10.34 (ft)
Rf = radius of filter pack 0.344 (ft) SV 3/15/04
Rc = radius of inside casing ~~0.1~~ (ft)
0.083

[redacted]

Date: 08/23/01 Time: 1355

Well Number and Location: LL4mw 98

Development Crew: Jeffrey Linlaw, SAIC

Charlie Moore, TolTest

Driller (if applicable):

Water Levels / Time: Initial: 11.67 btoc / 1355 Pumping: See p 36-37

Final: 13.57 / 8/28/01 1108

Total Well Depth: Initial: 22.01 FT BTOC Final: 22.40 FT BTOC

Date and Time: Begin: 08/23/01 / 1355 Completed: 08/24/01 / 1130

Development Method(S): whale pump

Total Quantity of Water Removed: 77 gals

FIELD MEASUREMENT	SERIAL NUMBER	DATE OF LAST CALIBRATION
Temperature	Horiba U-10 #14639	08/23/01
Specific Conductivity	↓	↓
pH		
Turbidity		

WELL DEVELOPMENT RECORD

PROJECT NAME: Load Line 4 Phase II RI

PAGE 1 OF 1

WELL NUMBER AND LOCATION: LL4 mw198

DATE	TIME	GALLONS REMOVED	TEMP(C)	SPECIFIC CONDUCTIVITY (μMHOS/CM)	pH (Standard Units)	TURBIDITY	TOTAL GALLONS REMOVED	WELL VOLUMES REMOVED	COMMENTS
08/23/01	1400	0	14.0	0.253	6.43	>999	0	0	Initial reading
↓	1430	15	14.3	0.246	6.70	>999	15	1.5	
	1453	3	13.6	0.258	6.62	>999	18	2	
↓	1554	12	14.6	0.309	6.80	>999	30	~~1.5~~ 3	08/23/01
08/24/01	0747	0	13.9	0.281	6.45	>999	30	3	Initial reading
	0825	10	14.7	0.305	6.75	>999	40	4	
	0905	10	13.4	0.313	6.80	>999	50	5	
	0948	10	12.9	0.297	6.81	>999	60	6	
	1037	5	15.4	0.332	6.93	>999	65	6.5	
	1120	7	10.0	0.332	6.98	>999	72	7.2	
	1125								Collected (1) 0.5 mason jar sample. Still v. silty.
					9-11-01	vjb			

RECORDED BY: [signature] 08/23/01
(Signature and Date)

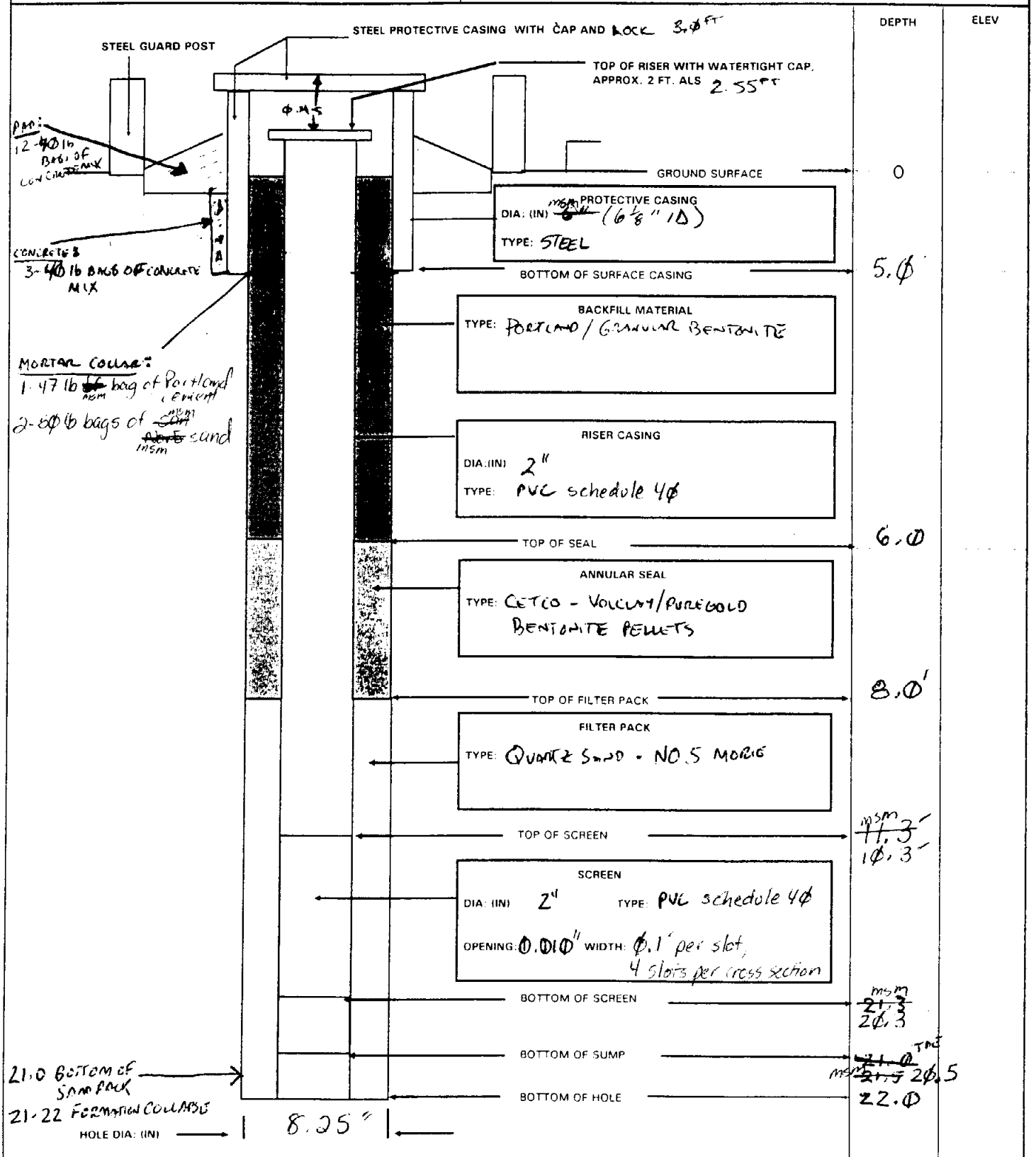
QA CHECK BY: Vicki Brumbach 9-11-01
(Signature and Date)

C-50

MONITORING WELL

PROJECT NAME: Load Line 4 Phase II RI **DELIVERY ORDER NO.:** ECAS 186

WELL NUMBER: LL4mw-199	BEGIN: 07/26/01 0815	END: 07/30/01 0906
COORDINATES: N: E:	REFERENCE POINT:	ELEVATION:



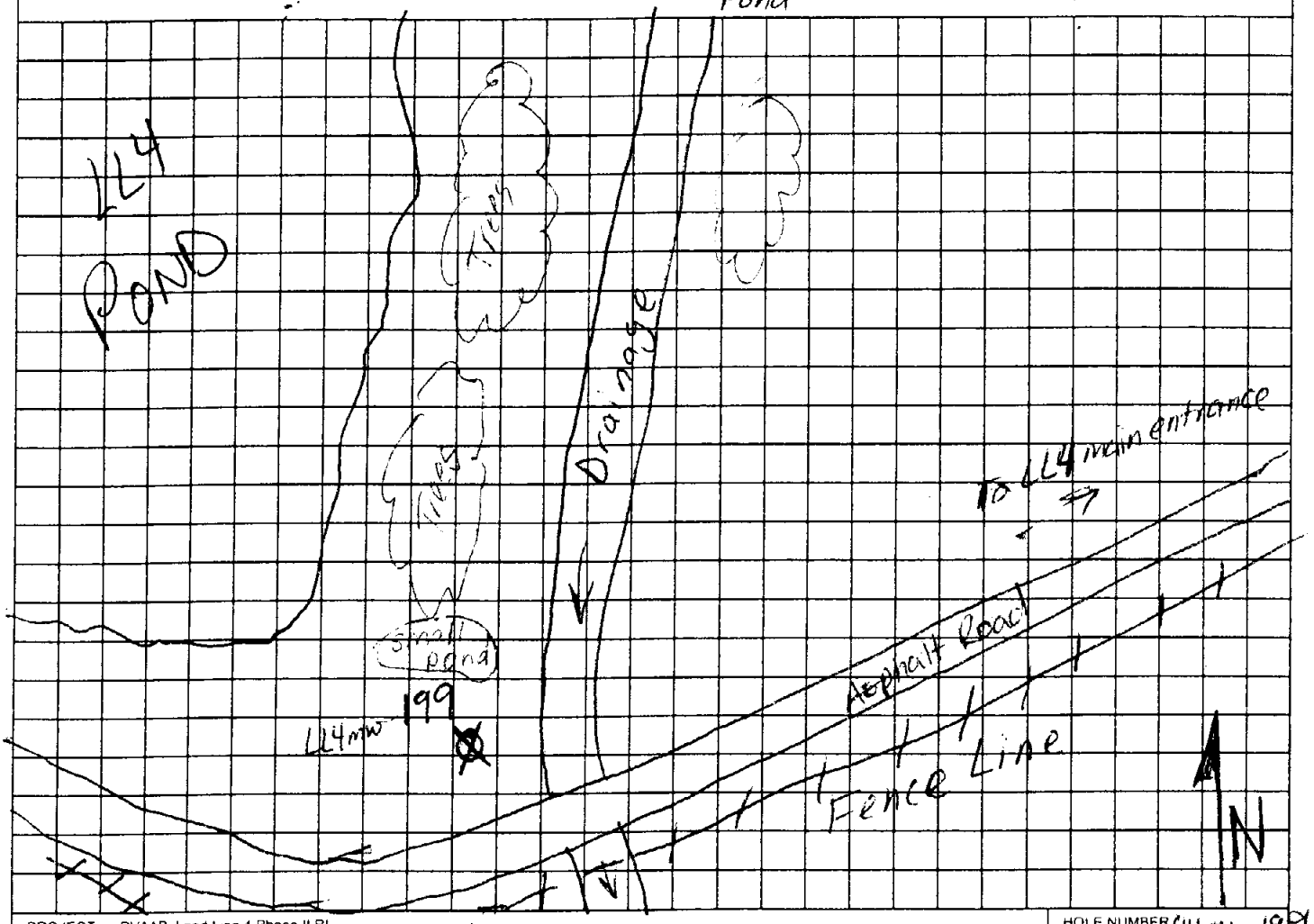
HTRW DRILLING LOG

	DISTRICT: Louisville	HOLE NUMBER LL4mw 199
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: Tol-Test	SHEET 1 OF 4

3. PROJECT: RVAAP, Load Line 4 Phase II RI	4. LOCATION: @ SE end of LL4 Pond LL4mw-199
5. NAME OF DRILLER: Bob Gollihue, Tol-Test	6. MANUFACTURERS DESIGNATION OF DRILL: CME 55Ø
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4¼" ID augers; 2" x 2' long split spoons; 14Ø lb. hammer; MSM E-25-Ø1	8. HOLE LOCATION: @ SE end of LL4 Pond, see map below
	9. SURFACE ELEVATION: 977.27 TOC 554621.62 N 2365420.78 E 11/3/02
	10. DATE STARTED: Ø7/25/Ø1 — 11. DATE COMPLETED: Ø7/3Ø/Ø1
12. OVERBURDEN THICKNESS: 722'	15. DEPTH GROUNDWATER ENCOUNTERED: ~1Ø' bgs
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 6.7' bgs @ Ø74Ø on 8/14/Ø1
14. TOTAL DEPTH OF HOLE: 22.Ø' bgs	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):

18. GEOTECHNICAL SAMPLES: 1	DISTRICT	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES: N/A				
20. SAMPLES FOR CHEMICAL ANALYSIS: N/A	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY: N/A	
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL +	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR			

LOCATION SKETCH/COMMENTS: LL4mw 199, SE end of LL4 Pond — SCALE: NTS



PROJECT: RVAAP, Load Line 4 Phase II RI — HOLE NUMBER: LL4mw-199

HTRW DRILLING LOG

HOLE NUMBER 114MW-199

PROJECT: RVAAP, Load Line 4 Phase II RI | INSPECTOR T. Eaby | SHEET 2 OF 4

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
		SAME AS 0.4 - 2.5 INTERVAL		N/A	N/A	SPLIT SPOON 0 - 2'
		ASPHALT ~~MIXED~~ TOE PAVEMENT				3/3/4/5
		SILTY CLAY, GRAY (2.5Y 6/1) LOW PLASTICITY HARD, LOW COHESIVENESS, DRY, CL, TRACE VERY FINE SAND, MOTTLED				1.5/2.0'
	1					
	2	INCREASING VERY FINE SAND				SPLIT SPOON 2-4'
		~~ST~~ TOE DUSKY RED (2.5YR 4/4) MEDIUM TO FINE GRAINED SAND, DRY, TRACE OF MICA, LOOSE	0.0 ppm			5/2?/9/7
	3					1.3/2.0
		DARK GRAYISH BROWN (2.5Y 4/2) MOTTLED, GREENISH GRAY (5BG 6/1) MOD. PLASTIC CLAY, MOIST, 3.2-3.4				
	4	SILT, INTERBEDDED/MIXED SAND AS INTERVAL 2.5 - 3.2' ~5% SUBROUNDED GRAVEL ML				SPLIT SPOON 4-6'
						2/3/4/5
	5	GREENISH GRAY (5GY 6/1) SILTY CLAY, LOW PLASTICITY AND COHESIVENESS, MOIST, SOFT, CL	0.0 ppm			1.7/2.0
		GREENISH GRAY (5GY 6/1) SILTY SAND, MOIST, WELL SORTED, LOOSE, ML				
	6					SPLIT SPOON 6-8'
		DARK GREENISH GRAY (5GY 4/1) SANDY CLAY (CL), MOIST, HIGH ORGANIC CONTENT, ROOTS, MEDIUM TO FINE GRAINED SAND				~~3/3/3/3~~ TOO
	7		0.0 ppm			2/1/2/2
						1.4/2.0
	8	BLUISH GRAY (5B 6/1), MOIST SILT (ROCK FLOUR) SOFT, SUBROUNDED GRAVEL IN 1ST 0.1' FOOT				SPLIT SPOON 8-10'
						3/3/3/3
	9		0.0 ppm			1.7/2.0

HTRW DRILLING LOG

HOLE NUMBER LL4MW-199

PROJECT: RVAAP, Load Line 4 Phase II RI | INSPECTOR T. Eaby | SHEET 3 OF 4

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	11	BLUISH GRAY (5B 6/1) SILTY CLAY, MEDIUM PLASTICITY, MOIST TO WET, SMALL-SUB-ROUNDED GRAVEL < 5%, MED.-TO LOW COHESIVENESS, OCCASIONAL MEDIUM SIZED SUB-ROUNDED GRAVEL, CL	0.0 ppm		N/A	SPLIT SPOON 10-12 2|3|6|8 2.0/2.0
	12					SPLIT SPOON 12-14' 2|4|5|9 1.5/2.0'
	13		0.0 ppm			
	14					SS 14'-16' 4|4|4|4 1.7/2.0'
	15	BLUISH GRAY (5B 6/1) SILT SATURATED, RAPID DILATANCY ML	0.0 ppm			
	16					SS 16-18' 3|5|5|6 2.0/2.0
	17		0.0 ppm			
	18	→ BLUISH GRAY (5B 4/1) VERY FINE GRAINED SILTY SAND SEAM BLUISH GRAY (5B 6/1) FINE TO MED. GRAINED SILTY SAND, SATURATED, WELL SORTED (SM)		LL4MW-199-1133-SO		SHELBY TUBE 18-20' 80 PSI 1.8'/2.0' REC
	19					HEAVING SANDS

HTRW DRILLING LOG

HOLE NUMBER LL4mw-199

PROJECT: RVAAP, Load Line 4 Phase II RI | INSPECTOR T. Eaby | SHEET 4 OF 4

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	21	Same As Above	0.0ppm	collected disturbed grab sample from split spoon	N/A	SHELBY TUBE 20-22' 650 psi - NO RECOVERY SPLIT SPOON 20-22' 1/1/1/1 1.6' RECOVERY
	22	TD = 22'				
	23					
	24					

MSM 7-26-11

Well volume calculation sheet

Date 8/22/01 Time 0800
Well ID Num LL4mw199
Well Location Load Line 4

Total depth of well (ft BTOC) 23.25
Depth to water (ft BTOC) 9.13
Height of water column (ft) (Hc) 14.12

Well Volume Calculation

Vc = 3.142(Rc^2)*Hc 0.308 cu. ft.

Vf = 3.142[(Rf^2)-(Ro^2)]*(Hc or length of screen)*(0.30)
**note ** use length of screen if Hc > length of screen
= 1.046 cu. ft.

3.142(.111)(10)(.3)
1.357

Vt = (Vc+Vf)*(7.48 gal/cu ft)
= 10.1 gal.

Where:
Vc = Volume of casing (ft^3)
Vf = Volume of filter pack (ft^3)
Vt = Total volume
Ro = outside radius of casing 0.083 (ft)
Hc = height of water column 14.12 (ft)
Rf = radius of filter pack 0.344 (ft)
Rc = radius of inside casing 0.083 (ft)

SW 3/15/04

[redacted]

Date: 8/22/01 Time: 0800

Well Number and Location: LL4mw199

Development Crew: M. Clough

Driller (if applicable): C. Moore

Water Levels / Time: Initial: 9.13 / 0800 Pumping: dry /

Final: 9.84 / 8/22/01 1140

Total Well Depth: Initial: 23.25 FT BTOC Final: 23.26 FT BTOC

Date and Time: Begin: 8/22/01 / 0812 Completed: 8/22/01 / 1557

Development Method(S): Pump & Surge

Total Quantity of Water Removed: 40 gals

FIELD MEASUREMENT	SERIAL NUMBER	DATE OF LAST CALIBRATION
Temperature	14639	8/22/01
Specific Conductivity		
pH		
Turbidity		

WELL DEVELOPMENT RECORD

PROJECT NAME: Load Line 4 Phase II RI

PAGE 1 OF 1

WELL NUMBER AND LOCATION: LL4mw199

DATE	TIME	GALLONS REMOVED	TEMP(C)	SPECIFIC CONDUCTIVITY (µMHOS/CM)	pH (Standard Units)	TURBIDITY	TOTAL GALLONS REMOVED	WELL VOLUMES REMOVED	COMMENTS
8/22/01	0912	9	12.2	0.358	7.49	>999	9	0	
	0912	10	12.3	0.419	7.64	>999	10	1	
	0951	7	11.9	0.431	7.62	>999	17	1.7	
	1354	8	16.2	0.431	7.52	>999	20	2	
	1417	5	16.2	0.439	7.59	>999	25	2.5	
	1451	5	15.7	0.437	7.60	575	30	3	
	1524	5	15.2	0.438	7.60	252	35	3.5	
	1557	5	15.2	0.439	7.60	76	40	4	Dev. Complete

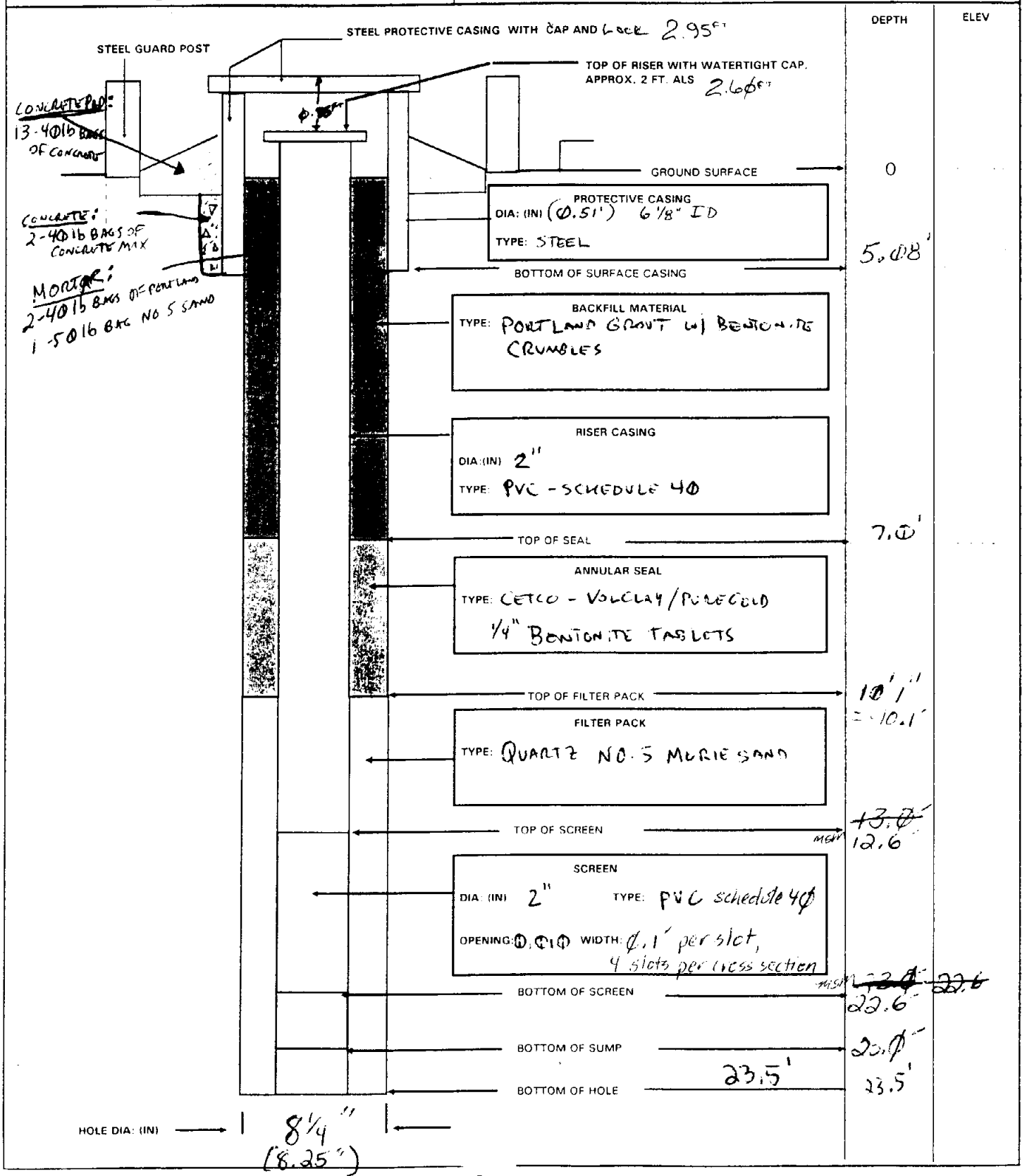
RECORDED BY: Heather Clough 8/22/01
(Signature and Date)

QA CHECK BY: [signature]
(Signature and Date)

MONITORING WELL

PROJECT NAME: Load Line 4 Phase II RI | **DELIVERY ORDER NO.:** CAS1186

WELL NUMBER: LL4 MW-2000	**BEGIN:** 7/24/01 1450	**END:** 7/27/01 1636
COORDINATES: N: E:	**REFERENCE POINT:**	**ELEVATION:**



	DEPTH	ELEV
GROUND SURFACE	0	
BOTTOM OF SURFACE CASING	5.08'	
TOP OF SEAL	7.0'	
TOP OF FILTER PACK	10' 1" = 10.1'	
TOP OF SCREEN	~~13.0'~~ meas 12.6	
BOTTOM OF SCREEN	~~23.6~~ meas 22.6	
BOTTOM OF SUMP	23.0'	
BOTTOM OF HOLE	23.5'	

HTRW DRILLING LOG

HTRW DRILLING LOG	DISTRICT: Louisville	HOLE NUMBER LL4mw-200
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: Tol-Test	SHEET 1 OF 4

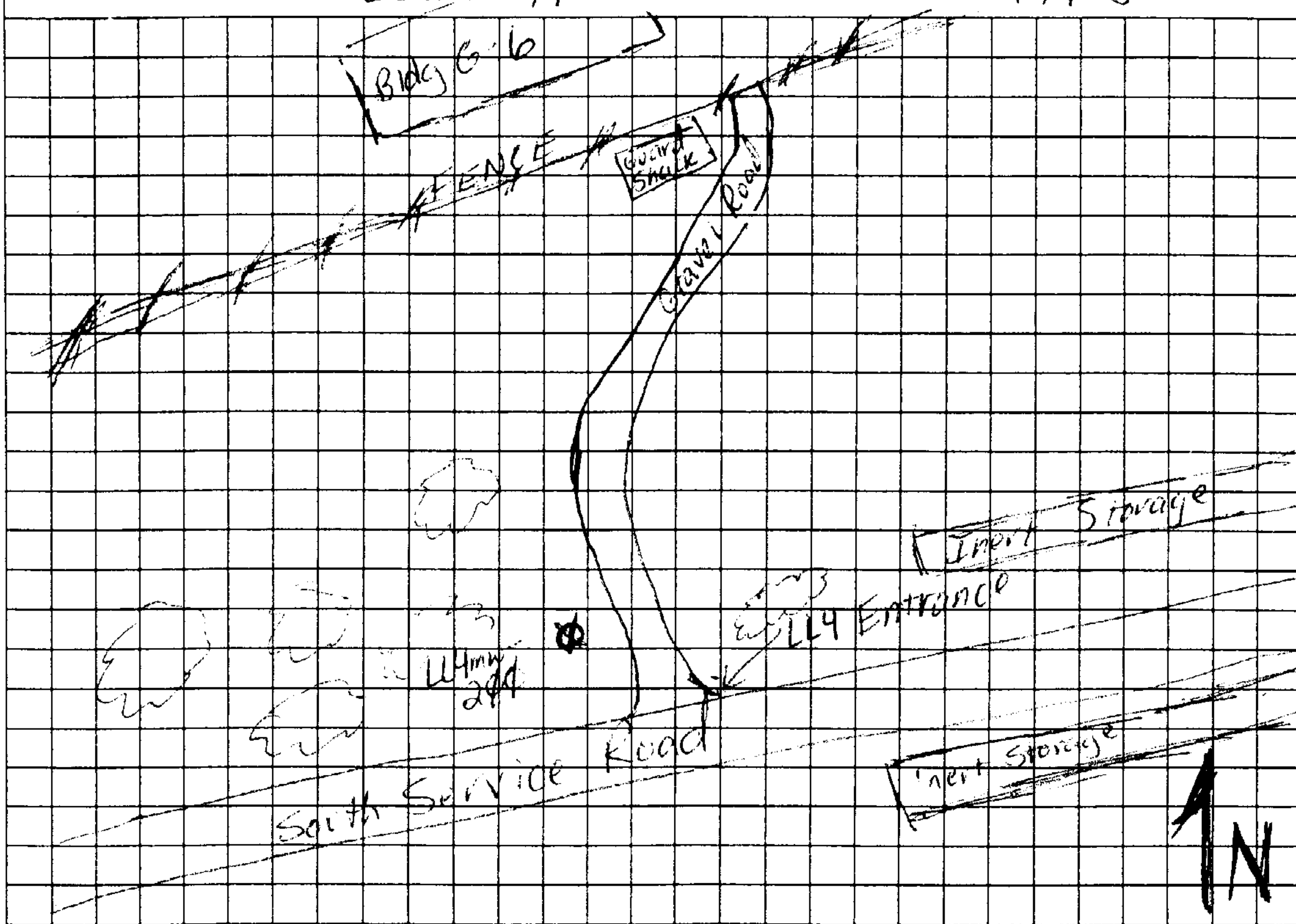
3. PROJECT: RVAAP, Load Line 4 Phase II RI	4. LOCATION: LL4mw-200, @ south entrance of LL4
5. NAME OF DRILLER: BOB COLLIHUE	6. MANUFACTURERS DESIGNATION OF DRILL: CME-550 AUGER RIG
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4 1/4" ID AUGERS; ~~2" x 2' msm~~ 2" ID x 2' long split spoons; 140 lb hammer; ~~MSM 7-24-01~~	8. HOLE LOCATION: LL4mw-200, see map below
	9. SURFACE ELEVATION: 987.93 TOC; 554580.15 N; 2365903.05 E (KJP 1/31/02)
	10. DATE STARTED: 7/24/01 — 11. DATE COMPLETED: 7/27/01
12. OVERBURDEN THICKNESS: ? 23.5'	15. DEPTH GROUNDWATER ENCOUNTERED: 16.0' bgs
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 16.6' bgs @ 0750 on 8/14/01
14. TOTAL DEPTH OF HOLE: 23.5 ft. bgs	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)

18. GEOTECHNICAL SAMPLES - 2	DISTURBED	UNDISTURBED (circled)	19. TOTAL NUMBER OF CORE BOXES N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
N/A	N/A	N/A	N/A	N/A	N/A	N/A %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
		X		[signature]

LOCATION SKETCH/COMMENTS LL4mw 200 — SCALE: NTS



PROJECT RVAAP Load Line 4 Phase II RI — HOLE NUMBER LLMW-200

HTRW DRILLING LOG

HOLE NUMBER LL4MW-2000

PROJECT: RVAAP, Load Line 4 Phase II RI | INSPECTOR Todd Eaby | SHEET 2 OF 4

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0 TOG	OLIVE BROWN (2.5Y4/3) DRY, HARD, TOS ~~SILTY~~ CLAYEY SILT ML	N/A	N/A	N/A	0-5' LOGGED FROM AUGER CUTTINGS BECAUSE HOLE WAS ADVANCED BY HAND AUGER FOR UXO CLEARANCE
	1					
	2					
	3					
	4					5/5/6/5 SPLIT SPOON 4-6' 1.2/2'
	5					
	6	DARK GREENISH GRAY (5GY4/1) MOIST, SOFT, SILTY CLAY, MEDIUM TO HIGH PLASTICITY, MEDIUM COHESIVE - CH WEBS, BLACK MOTTLING (6-6.5)				SS 6-8' 2/2/4/8 1.3/2' 6-6.5' POSSIBLE OLD ORGANIC LAYER
	7	DARK GREENISH GRAY (5GY4/1) WITH (10YR6/4) ~~YELLOW~~ MOTTLING ~50%, DRY, HARD, SILTY CLAY, LOW TO MEDIUM PLASTICITY - POSSIBLE OLD ROOT ZONE CL				
	8	SAME AS ABOVE W/ DARK GREENISH GRAY MOTTLING DECREASING TO <5% AT BOTTOM OF INTERVAL, CL DRY, HARD				SS 8-10' 4/6/11/15 0.8'/2'
	9					
	10					

HTRW DRILLING LOG

HOLE NUMBER MW-200

PROJECT: RVAAP, Load Line 4 Phase II RI | INSPECTOR Todd Eaby | SHEET 3 OF 4

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	10	SAMENS ABOVE	N/A		N/A	SS 10-12' 4/11/11/11 1.9/2.0'
	11	YE LLOWISH BROWN (10YR5/6) VERY FINE GRAINED SAND, DRY MEDIUM DENSE SAND, LOOSE, WELL SORTED, W/ SOME SILT				
	12					SS 12-14' 9/8/11/11 2.0/2.0'
	13					
	14	- IRON OXIDE(?) STAINED SANDS IN THIN STRATIONS MOIST BELOW 14'				SS 14-16' 4/6/7/8. 1.5/2.0
	15					
	16	SATURATED BELOW 16' LOW DILATANCY				SS 16-18' 6/8/9/9 1.7/2.0
	17					
	18			CL4 mw-200-1135-SO		SHELBY TUBE 18-20' 18" 120 PSI 24" 260 PSI AT BOTTOM 2.0/2.0
	19					
	20					

PROJECT RVAAP, Load Line 4 Phase II RI

HOLE NUMBER CL4mw-200

HTRW DRILLING LOG

HOLE NUMBER LL4mw-2000

PROJECT: RVAAP, Load Line 4 Phase II RI | INSPECTOR Todd Eaby | SHEET 4 OF 4

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	21	SAME AS ABOVE GRAY (NS) VERY FINE SAND, WELL SORTED, SOME SILT, LOOSE, SATURATED, MEDIUM DILATANCY	N/A		N/A	SS 20-22' 4/4/6/7 1.8'/2.0
	22			LL4mw-2000-1136-SO		SHELBY TUBE 22-24' 1000 PSI / 1 FOOT - NO RECOVERY, SHELBY TUBE BENT, REFUSED ON COBBLE AUGER TO 23'
	23					SHELBY TUBE 23-25' 1000 PSI FOR 18" SHELBY REFUSED @ 18"
	24	TD = 23.5'	MSM			
	25					
	26					
	27		MSM 7-25-01			
	28					
	29					

Well volume calculation sheet

Date 8/14/01 Time 0800
Well ID Num LL4mw200
Well Location Load Line 4 just off of LL4 Road.

Total depth of well (ft BTOC) 24.15
Depth to water (ft BTOC) 19.58
Height of water column (ft) (Hc) 4.57

Well Volume Calculation

Vc = 3.142(Rc^2)*Hc 0.099 cu. ft. GW 3/15/04

Vf = 3.142[(Rf^2)-(Ro^2)]*(Hc or length of screen)*(0.30)
**note ** use length of screen if Hc > length of screen
= 0.48 cu. ft.

GW 3/15/04

Vt = (Vc+Vf)*(7.48 gal/cu ft)
= 0.579 gal.

Where:
Vc = Volume of casing (ft^3)
Vf = Volume of filter pack (ft^3)
Vt = Total volume
Ro = outside radius of casing 0.083(ft)
Hc = height of water column 4.57 (ft) GW 3/15/04
Rf = radius of filter pack 0.344 (ft)
Rc = radius of inside casing 0.083 (ft)

[redacted]

Date: 8/14/01 Time: 800

Well Number and Location: LL4MW200

Development Crew: M. Clough
J. Loerch

Driller (if applicable): gal 8/27/01

Water Levels / Time: Initial: 19.58 / 0802 Pumping: NR (dry) /
Final: 19.79 / 8/28/01 1450

Total Well Depth: Initial: 24.15 FT BTOC Final: 25.24 FT BTOC

Date and Time: Begin: 8/14/01 / 0847 Completed: ~~8/24/01~~ / 1730

Development Method(S): Pump & Surge

Total Quantity of Water Removed: 84 gals

FIELD MEASUREMENT	SERIAL NUMBER	DATE OF LAST CALIBRATION
Temperature	14639	8/14/01
Specific Conductivity		
pH		
Turbidity		

WELL DEVELOPMENT RECORD

PROJECT NAME: Load Line 4 Phase II RI

WELL NUMBER AND LOCATION: LL4mw200

DATE	TIME	GALLONS REMOVED	TEMP(C)	SPECIFIC CONDUCTIVITY (μMHOS/CM)	pH (Standard Units)	TURBIDITY	TOTAL GALLONS REMOVED	WELL VOLUMES REMOVED	COMMENTS
8/14/01	0847	Ø	14.1	0.798	6.92	>999	Ø	0	
↓	0910	7	13.0	Ø.98	7.02	>999	7	~1.8	
	0940	8	13.4	Ø.96	7.02	>999	15	~3.9	
	1000	5	13.8	Ø.96	7.02	>999	20	~5.3	
	1310	5	15.4	Ø.814	7.18	>999	25	~6.6	
	1333	10	14.2	Ø.813	7.21	>999	35	~9.2	
	1434	20	14.1	Ø.816	7.18	281	55	~14.5	
	1605	7	13.6	Ø.792	7.33	>999	62	~16.3	
↓	1635	3.	13.2	Ø.794	7.17	268	65	~17.1	
Ø8/24/Ø1	161Ø	Ø.5	16.Ø	Ø.72Ø	6.88	>999	65.5	~17.2	Begin pumping wl: 20.85
↓	1635	4.5	13.7	Ø.7ØØ	6.93	>999	7Ø	~18.4	
	171Ø	1Ø	14.1	Ø.7ØØ	6.97	95Ø	80	~21.5	
↓	1718	4	13.9	Ø.7Ø3	6.95	51Ø	84	~22.1	Final reading. Collect (1)
									@1 mason jar sample.

RECORDED BY: [signature] 8/14/01 (Signature and Date)

QA CHECK BY: [signature] (Signature and Date)