1R - 428-51

WORKPLANS

Date:

8-8-13

L. Peter Galusky, Jr. Ph.D., P.G.
Texerra LLC

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August 8th, 2013

Mr. Edward Hansen
New Mexico Energy, Minerals, & Natural Resources
Oil Conservation Division, Environmental Bureau
1220 S. St. Francis Drive
Santa Fe, New Mexico 87504

Re: **Corrective Action Plan (CAP)**
Rice Operating Company – Hobbs O-29 EOL
UL O, Sec 29, T18S, R38E
OCD Case No. 1R428-51

Sent via Certified Mail w/ Return Receipt No. 7007 2560 0001 9729 0683

Mr. Hansen:

This letter summarizes information gained from the NMOCD approved Investigation and Characterization Plan (ICP) of January 20th, 2010 for Rice Operating Company's Hobbs O-29 EOL project and proposes a Corrective Action Plan to protect groundwater from potential future impacts from residual chlorides and hydrocarbons.

The subject site is located in west Hobbs, New Mexico The apparent direction of groundwater flow is toward the southeast (See Appendix). The estimated depth to groundwater (the water table) is approximately 67 ft bgs.

A summary of analyses for residual soil chlorides and petroleum hydrocarbons is given in the Appendix. Petroleum hydrocarbons were significant only near the former junction box (in SB-1) near the surface and to a depth of 40 ft bgs (as evidenced by a field PID reading greater than 100). Total BTEX measured 9.24 mg/kg at 5 ft bgs and 2.80mg/kg at 40 ft bgs. Petroleum hydrocarbons were essentially insignificant in all of the other soil borings. Residual soil chlorides decreased with depth to 352 mg/kg at 70 ft bgs in SB-1, 96 mg/kg at 65 ft in SB-2, 416 mg/kg at 40 ft in SB-3, 768 mg/kg at 40 ft in SB-4, and 464 mg/kg at 40 ft in SB-5.

Although these levels of residual soil chlorides and hydrocarbons are not high, we nevertheless propose to install an impermeable, synthetic subsurface liner to protect groundwater from potential future impacts. Subject to your approval, we propose to undertake the following actions:

1- Excavate chloride-impacted soil over an area of approximately 52 ft x 52 ft and to a depth of approximately 4-5 ft bgs. This area extends 5 ft in all directions beyond each of the soil bores.
2- Install and properly seat a 20-mil, reinforced poly liner over a prepared bed of approximately 6 inches of clean blow sand, and carefully secure the liner with another 6 inches of clean blow sand below the liner.

3- Backfill the remaining excavation with soil material having a chloride concentration no greater than 500 mg/kg and a field measurement of residual hydrocarbons no greater than 100 ppm. Any excess or soil material exceeding these standards will be properly disposed of at an NMOCD approved facility.
4- Restore the surface to natural grade, add amendments and seed with a blend of native vegetation mix, as necessary. Vegetation above the liner will also provide a natural infiltration barrier for the site since plants capture water through their roots thereby reducing the volume of water moving through the vadose zone to groundwater.

The MultiMed simulation model was run to estimate whether residual chlorides pose a potential threat to groundwater quality following the installation of the liner. Input parameter values are given in the Appendix where the infiltration parameter value used is that of a "good" liner (0.00762 m/yr). The projected maximum potential impact (increase) in groundwater chloride concentration 1 m downgradient from the former junction box (EOL) is 79 +/- mg/L at approximately 176 +/- years into the future (Appendix – MultiMed Chloride graph and report).

The MultiMed simulation model was also run to estimate whether residual soil BTEX poses a potential threat to groundwater quality following the installation of the liner. Input parameter values are given in the Appendix where the infiltration parameter value used is indicative of no liner (0.03048 m/yr). The projected maximum potential impact (increase) in groundwater BTEX concentration beneath the former junction box (EOL) is 0.0029+/- mg/L at approximately 41 +/- years into the future (Appendix – MultiMed BTEX graph and report). This total BTEX value is less than the WQCC standard for each of the BTEX constituents (0.010 mg/l for benzene, 0.750 mg/l for toluene, 0.750 mg/l for ethylbenzene and 0.620 for xylenes).

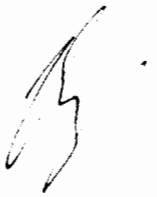
These MultiMed simulations indicate that residual chloride and BTEX will not, in any way, affect groundwater quality beneath the site. Therefore, upon completion of the vadose zone remediation, ROC will submit a written report providing documentation of CAP activities, and, in this report, request remediation termination status for this project.

ROC is the service provider (agent) for the Hobbs SWD System and has no ownership of any portion of the pipeline, well, or facility. The System is owned by a consortium of oil producers, System Parties, who provide all operating capital on a percentage ownership/usage basis.

Please do not hesitate to contact either Rice Operating Company or myself if you have any questions or need additional information.

Thank you for your consideration.

Sincerely,



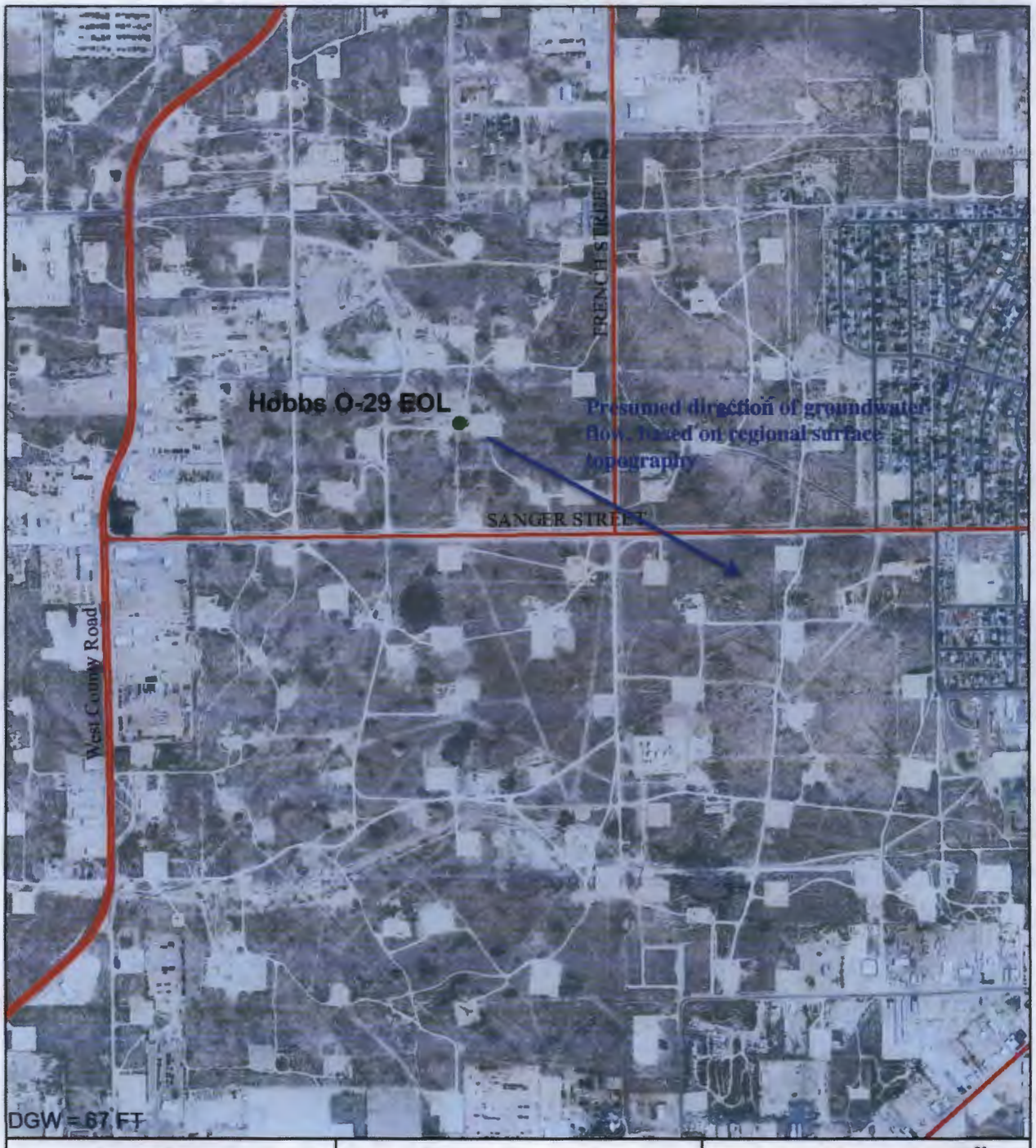
L. Peter Galusky, Jr. Ph.D.
Principal

Copy: Rice Operating Company

APPENDIX

- ✓ Site Location Map
- ✓ Liner Installation Map with Soil Bore Sampling Summary
- ✓ MultiMed Chloride Parameter Input Values
- ✓ MultiMed Chloride Graph
- ✓ MultiMed Chloride Report
- ✓ MultiMed BTEX Parameter Input Values
- ✓ MultiMed BTEX Graph
- ✓ MultiMed BTEX Report

Site Location



RICE ENVIRONMENTAL RECS CONSULTING & SAFETY, LLC

Hobbs O-29 EOL

Legals: UL/O sec. 29
T18S R38E

Case #: 1R428-51

N
W E
S

0 0.175 0.35 Miles

Drawing date: 10/23/12
Drafted by: L. Weinheimer

Liner Installation Map

SB-1

Depth	Cl-	PID	LAB Cl-	GRO	DRO	B	T	E	X
10	893	669.4	933	818	4960	<0.05	1.61	1.30	6.33
15	2528	309.1							
20	1900	190							
25	1862	65.8							
30	4003	145.6							
35	4245	126.3							
40	4416	158	4960	196	2800	<0.05	0.247	0.202	2.35
45	3095	55.9							
50	3196	42							
55	3711	19.7							
60	1595	8.8							
65	465	14.3							
70	356	5.7	352	<10	123				

SB-2

Depth	Cl-	LAB Cl-	GRO	DRO
5	840			
10	715			
15	1255	1680	<10	<10
20	616			
25	445			
30	361			
35	576			
40	578			
45	523			
50	602			
55	448			
60	508			
65	172	96	<10	<10

SB-3

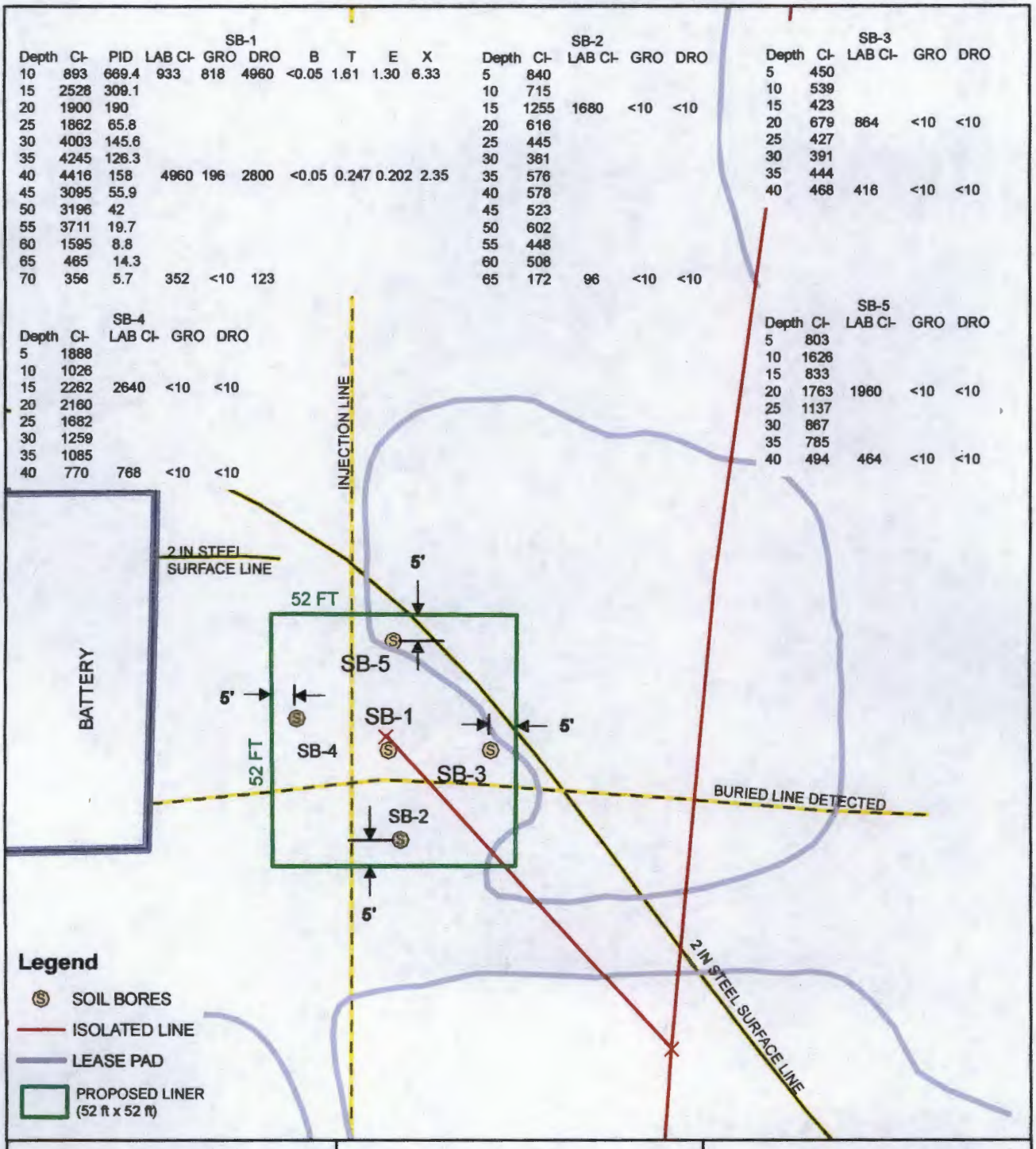
Depth	Cl-	LAB Cl-	GRO	DRO
5	450			
10	539			
15	423			
20	679	864	<10	<10
25	427			
30	391			
35	444			
40	468	416	<10	<10

SB-4

Depth	Cl-	LAB Cl-	GRO	DRO
5	1888			
10	1026			
15	2262	2640	<10	<10
20	2160			
25	1682			
30	1259			
35	1085			
40	770	768	<10	<10

SB-5

Depth	Cl-	LAB Cl-	GRO	DRO
5	803			
10	1626			
15	833			
20	1763	1960	<10	<10
25	1137			
30	867			
35	785			
40	494	464	<10	<10



RICE ENVIRONMENTAL CONSULTING & SAFETY, LLC — RECS

Hobbs O-29 EOL

Legals: UL/O sec. 29
T18S R38E

Case #: 1R428-51

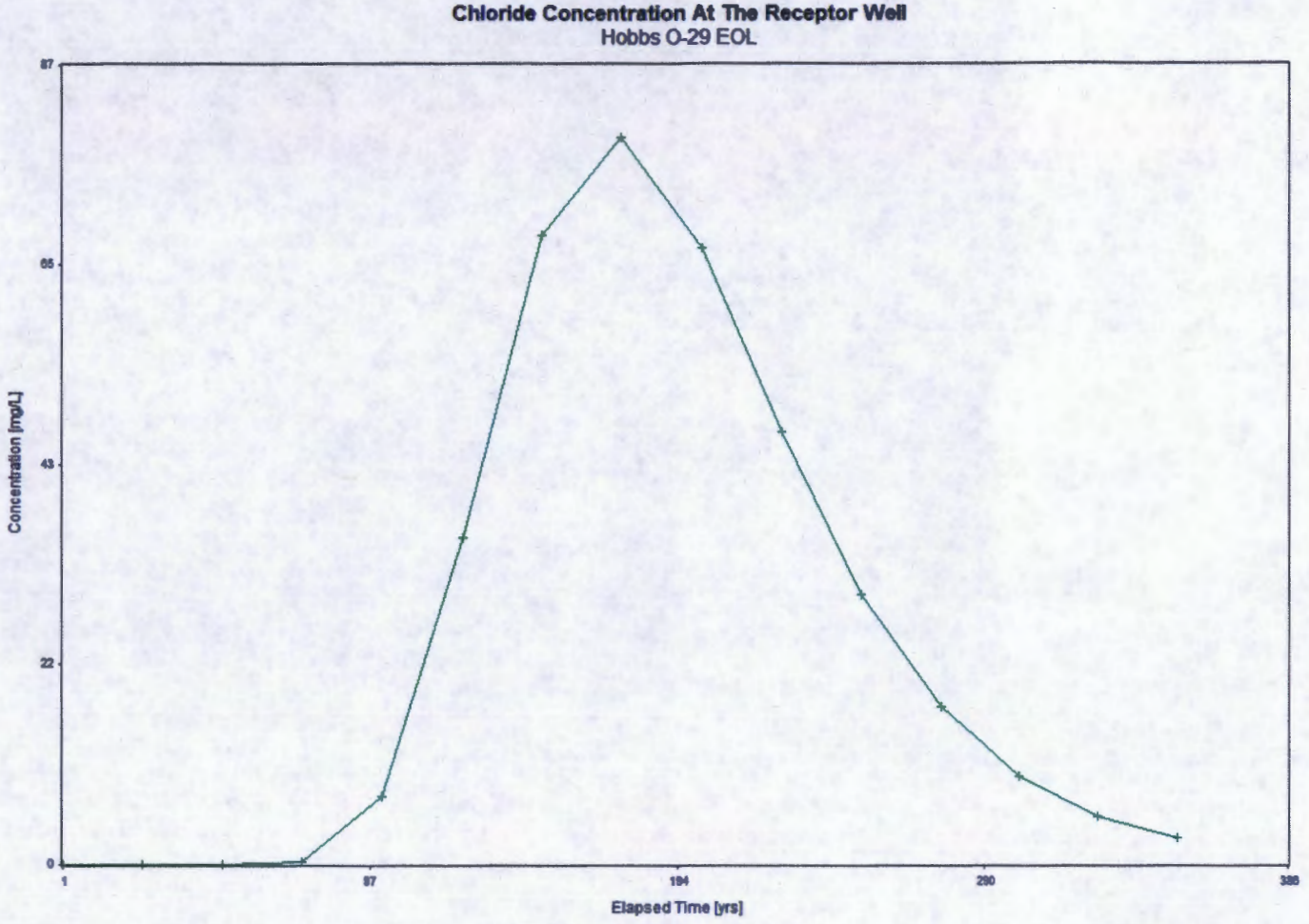
N W E S

0 12.5 25 50 Feet

Drawing date:7-31-13
Drafted by: LS

MultiMed Input Parameter Values for Residual Soil Chlorides

	General					
1	Title					Hobbs O-29 EOL
2	Application Type					Generic
3	Run Type					Deterministic
4	Source Type					Transient
5	Aquifer Source Patch					Gaussian
6	Active Modules					Unsaturated Zone
						Saturated Zone
	Source					
7	Source Area			251.21	m^2	0.05
8	Source Length	52	ft	15.85	m	Length
9	Source Width	52	ft	15.85	m	Width
10	Source Infiltration Rate	0.3	in	0.00762		Good liner
11	Outside Recharge Rate				m/yr	0
12	Initial Leachate Concentration			1,376	mg/L	Average Cl- Concentration (Lab Results)
13	Source Duration				yrs	Derive
14	Source Decay Coefficient				1/yr	2.5%
15	Initial Spread of Source				m	Derive
	Chemical					
16	Chemical Name					Chloride
17	Dissolved Decay Coefficients				1/yr	Derive
18	Sorbed Phase Decay Coef.				1/yr	Derive
19	Overall Aquifer Decay Coef.				1/yr	Derive
20	Acid Catalyzed Rate				l/mole-yr	0
21	Neutral Rate				1/yr	0
22	Base Catalyzed Rate				l/mole-yr	0
23	Reference Temperature				deg C	25
24	Normalized Distribution Coef.				ml/g	0
25	Aquifer Distribution Coef.				ml/g	Derive
26	Flow Layer Thickness	16	ft	4.88	m	Difference average depth and depth to GW
27	Saturated Hydraulic Conductivity				cm/hr	3.6
28	Effective Porosity				fraction	0.25
29	Air Entry Pressure Head				m	0.7
30	Residual Water Content				fraction	0.116
31	van Genuchten Alpha				1/cm	0.005
32	van Genuchten Beta				fraction	1.09
33	Brooks and Corey Exponent				fraction	-------
	Unsaturated Zone Transport					
34	Transport Layer Thickness	16	ft	4.88	m	Difference average depth and depth to GW
35	Longitudinal Dispersivity				m	Derive
36	Percent Organic Matter				%	0
37	Bulk Density				g/cm^3	1.99
38	Biological Decay Coefficient				1/yr	0
	Saturated Zone Flow					
39	Aquifer Thickness	20	ft	6.10	m	Aquifer Thickness
40	Mixing Zone Thickness				m	Derive
41	Effective Porosity				fraction	0.3
42	Bulk Density				g/cm^3	1.855
43	Saturated Hydraulic Conductivity				m/yr	315
44	Hydraulic Gradient				fraction	0.003
45	Seepage Velocity				m/yr	Derive
46	Longitudinal Dispersivity				m	Derive
47	Transverse Dispersivity				m	Derive
48	Vertical Dispersivity				m	Derive
49	Aquifer Temperature				deg C	20
50	Aquifer pH					7
51	Fraction Organic Carbon				fraction	0
52	Retardation Factor				fraction	Derive
53	Biological Decay Coefficient				1/yr	0
	Well Location and Time					
54	Radial Distance to Well				m	1
55	Angle Off Plume Axis				degree	0
56	Well Screen Depth Fraction				fraction	0
57	Time Step Option					Max Concentration
						Time Intervals


Chloride Concentration At The Receptor Well
Hobbs O-29 EOL
87
65
43
22
0
Concentration [mg/L]
1
97
194
290
386
Elapsed Time [yrs]

MULTIMED V1.01 DATE OF CALCULATIONS: 31-JUL-2013 TIME: 14: 7:37

U. S. E N V I R O N M E N T A L P R O T E C T I O N A G E N C Y

E X P O S U R E A S S E S S M E N T

M U L T I M E D I A M O D E L

MULTIMED (Version 1.50, 2005)

1
Run options
--- -------

Hobbs O-29 EOL

1R428-51
Chemical simulated is Chloride

Option Chosen Saturated and unsaturated zone models
Run was DETERMIN
Infiltration Specified By User: 7.620E-03 m/yr
Run was transient
Well Times: Entered Explicitly
Reject runs if Y coordinate outside plume
Reject runs if Z coordinate outside plume
Gaussian source used in saturated zone model
1
1
UNSATURATED ZONE FLOW MODEL PARAMETERS
(input parameter description and value)

NP	- Total number of nodal points	240
NMAT	- Number of different porous materials	1
KPROP	- Van Genuchten or Brooks and Corey	1
IMSHGN	- Spatial discretization option	1
NVFLAYR	- Number of layers in flow model	1

OPTIONS CHOSEN
------- ------
Van Genuchten functional coefficients
User defined coordinate system
1

Layer information

LAYER NO.	LAYER THICKNESS	MATERIAL PROPERTY
1	4.88	1

DATA FOR MATERIAL 1

VADOSE ZONE MATERIAL VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS MEAN	PARAMETERS STD DEV	LIMITS MIN	LIMITS MAX
Saturated hydraulic conductivity	cm/hr	CONSTANT	3.60	-999.	-999.	-999.
Unsaturated zone porosity	--	CONSTANT	0.250	-999.	-999.	-999.
Air entry pressure head	m	CONSTANT	0.700	-999.	-999.	-999.
Depth of the unsaturated zone	m	CONSTANT	4.88	0.000	0.000	0.000

DATA FOR MATERIAL 1

VADOSE ZONE FUNCTION VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS MEAN	PARAMETERS STD DEV	LIMITS MIN	LIMITS MAX
Residual water content	--	CONSTANT	0.116	-999.	-999.	-999.
Brook and Corey exponent,EN	--	CONSTANT	-999.	-999.	-999.	-999.
ALFA coefficient	1/cm	CONSTANT	0.500E-02	-999.	-999.	-999.
Van Genuchten exponent, ENN	--	CONSTANT	1.09	-999.	-999.	-999.

1

UNSATURATED ZONE TRANSPORT MODEL PARAMETERS

NLAY	- Number of different layers used		1
NTSTPS	- Number of time values concentration calc		40
DUMMY	- Not presently used		1
ISOL	- Type of scheme used in unsaturated zone		2
N	- Stehfest terms or number of increments		18
NTEL	- Points in Lagrangian interpolation		3
NGPTS	- Number of Gauss points		104
NIT	- Convolution integral segments		2
IBOUND	- Type of boundary condition		3
ITSGEN	- Time values generated or input		1
TMAX	- Max simulation time	--	0.0
WTFUN	- Weighting factor	--	1.2

OPTIONS CHOSEN

Convolution integral approach
Exponentially decaying continuous source
Computer generated times for computing concentrations

1

DATA FOR LAYER 1

VADOSE TRANSPORT VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS		LIMITS	
			MEAN	STD DEV	MIN	MAX
Thickness of layer	m	CONSTANT	4.88	-999.	-999.	-999.
Longitudinal dispersivity of layer	m	DERIVED	-999.	-999.	-999.	-999.
Percent organic matter	--	CONSTANT	0.000	-999.	-999.	-999.
Bulk density of soil for layer	g/cc	CONSTANT	1.99	-999.	-999.	-999.
Biological decay coefficient	1/yr	CONSTANT	0.000	-999.	-999.	-999.

1

CHEMICAL SPECIFIC VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS		LIMITS	
			MEAN	STD DEV	MIN	MAX
Solid phase decay coefficient	1/yr	DERIVED	-999.	-999.	-999.	-999.
Dissolved phase decay coefficient	1/yr	DERIVED	-999.	-999.	-999.	-999.
Overall chemical decay coefficient	1/yr	DERIVED	-999.	-999.	-999.	-999.
Acid catalyzed hydrolysis rate	l/M-yr	CONSTANT	0.000	-999.	-999.	-999.
Neutral hydrolysis rate constant	1/yr	CONSTANT	0.000	-999.	-999.	-999.
Base catalyzed hydrolysis rate	l/M-yr	CONSTANT	0.000	-999.	-999.	-999.
Reference temperature	C	CONSTANT	25.0	-999.	-999.	-999.
Normalized distribution coefficient	ml/g	CONSTANT	0.000	-999.	-999.	-999.
Distribution coefficient	--	DERIVED	-999.	-999.	-999.	-999.
Biodegradation coefficient (sat. zone)	1/yr	CONSTANT	0.000	-999.	-999.	-999.
Air diffusion coefficient	cm2/s	CONSTANT	-999.	-999.	-999.	-999.
Reference temperature for air diffusion	C	CONSTANT	-999.	-999.	-999.	-999.
Molecular weight	g/M	CONSTANT	-999.	-999.	-999.	-999.
Mole fraction of solute	--	CONSTANT	-999.	-999.	-999.	-999.
Vapor pressure of solute	mm Hg	CONSTANT	-999.	-999.	-999.	-999.
Henry`s law constant	atm-m^3/M	CONSTANT	-999.	-999.	-999.	-999.
Overall 1st order decay sat. zone	1/yr	DERIVED	0.000	0.000	0.000	1.00
Not currently used		CONSTANT	0.000	0.000	0.000	0.000
Not currently used		CONSTANT	0.000	0.000	0.000	0.000

1

SOURCE SPECIFIC VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS		LIMITS	
			MEAN	STD DEV	MIN	MAX
Infiltration rate	m/yr	CONSTANT	0.762E-02	-999.	-999.	-999.
Area of waste disposal unit	m^2	DERIVED	251.	-999.	-999.	-999.
Duration of pulse	yr	DERIVED	50.0	-999.	-999.	-999.
Spread of contaminant source	m	DERIVED	-999.	-999.	-999.	-999.
Recharge rate	m/yr	CONSTANT	0.000	-999.	-999.	-999.
Source decay constant	1/yr	CONSTANT	0.250E-01	0.000	0.000	0.000
Initial concentration at landfill	mg/l	CONSTANT	0.138E+04	-999.	-999.	-999.
Length scale of facility	m	CONSTANT	15.9	-999.	-999.	-999.
Width scale of facility	m	CONSTANT	15.9	-999.	-999.	-999.
Near field dilution		DERIVED	1.00	0.000	0.000	1.00

1

AQUIFER SPECIFIC VARIABLES

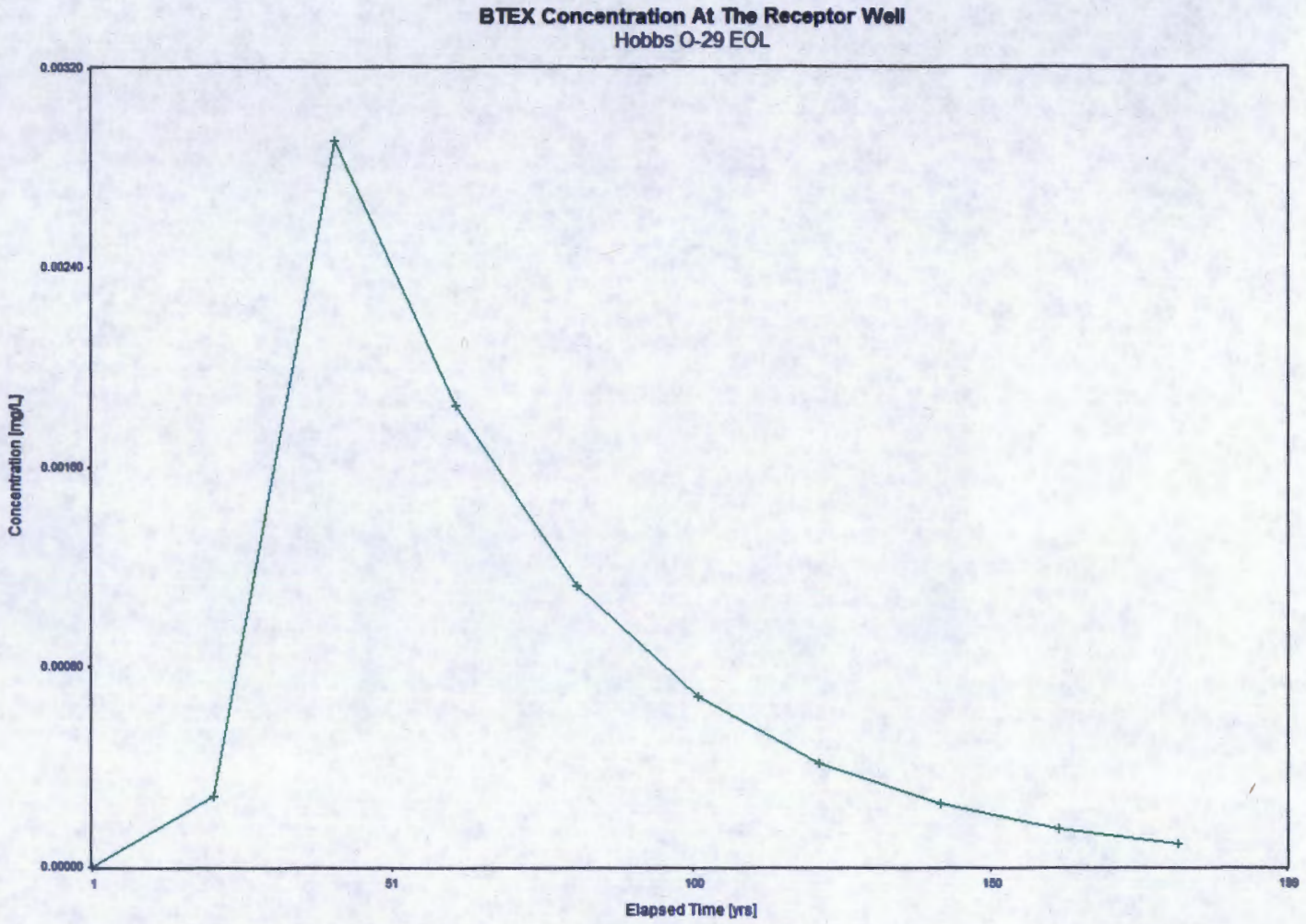
VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS		LIMITS	
			MEAN	STD DEV	MIN	MAX
Particle diameter	cm	CONSTANT	-999.	-999.	-999.	-999.
Aquifer porosity	--	CONSTANT	0.300	-999.	-999.	-999.
Bulk density	g/cc	CONSTANT	1.86	-999.	-999.	-999.
Aquifer thickness	m	CONSTANT	6.10	-999.	-999.	-999.
Source thickness (mixing zone depth)	m	DERIVED	-999.	-999.	-999.	-999.
Conductivity (hydraulic)	m/yr	CONSTANT	315.	-999.	-999.	-999.
Gradient (hydraulic)		CONSTANT	0.300E-02	-999.	-999.	-999.
Groundwater seepage velocity	m/yr	DERIVED	-999.	-999.	-999.	-999.
Retardation coefficient	--	DERIVED	-999.	-999.	-999.	-999.
Longitudinal dispersivity	m	FUNCTION OF X	-999.	-999.	-999.	-999.
Transverse dispersivity	m	FUNCTION OF X	-999.	-999.	-999.	-999.
Vertical dispersivity	m	FUNCTION OF X	-999.	-999.	-999.	-999.
Temperature of aquifer	C	CONSTANT	20.0	-999.	-999.	-999.
pH	--	CONSTANT	7.00	-999.	-999.	-999.
Organic carbon content (fraction)		CONSTANT	0.000	-999.	-999.	-999.
Well distance from site	m	CONSTANT	1.00	-999.	-999.	-999.
Angle off center	degree	CONSTANT	0.000	-999.	-999.	-999.
Well vertical distance	m	CONSTANT	0.000	-999.	-999.	-999.

1

TIME	CONCENTRATION
0.100E+01	0.00000E+00
0.260E+02	0.00000E+00
0.510E+02	0.00000E+00
0.760E+02	0.23289E+00
0.101E+03	0.73163E+01
0.126E+03	0.35396E+02
0.151E+03	0.68151E+02
0.176E+03	0.78892E+02
0.201E+03	0.66805E+02
0.226E+03	0.46831E+02
0.251E+03	0.29301E+02
0.276E+03	0.17033E+02
0.301E+03	0.95431E+01
0.326E+03	0.52286E+01
0.351E+03	0.28310E+01

MultiMed Input Parameter Values for Residual Soil BTEX

	General					
1	Title					**Hobbs O-29 EOL**
2	Application Type					Generic
3	Run Type					Deterministic
4	Source Type					Transient
5	Aquifer Source Patch					Gaussian
6	Active Modules					Unsaturated Zone
						Saturated Zone
	Source					
7	Source Area			251.21	m^2	Area
8	Source Length	52	ft	15.85	m	Length
9	Source Width	52	ft	15.85	m	Width
10	Source Infiltration Rate	1.2	in	0.03048		No liner
11	Outside Recharge Rate				m/yr	0
12	Initial Leachate Concentration			6.33	mg/L	Highest BTEX concentration
13	Source Duration				yrs	Derive
14	Source Decay Coefficient				1/yr	2.5%
15	Initial Spread of Source				m	Derive
	Chemical					
16	Chemical Name					BTEX
17	Dissolved Decay Coefficients				1/yr	20%
18	Sorbed Phase Decay Coef.				1/yr	20%
19	Overall Aquifer Decay Coef.				1/yr	Derive
20	Acid Catalyzed Rate				l/mole-yr	0
21	Neutral Rate				1/yr	0
22	Base Catalyzed Rate				l/mole-yr	0
23	Reference Temperature				deg C	25
24	Normalized Distribution Coef.				ml/g	0
25	Aquifer Distribution Coef.				ml/g	Derive
26	Flow Layer Thickness	16	ft	4.88	m	Difference average depth and depth to GW
27	Saturated Hydraulic Conductivity				cm/hr	3.6
28	Effective Porosity				fraction	0.25
29	Air Entry Pressure Head				m	0.7
30	Residual Water Content				fraction	0.116
31	van Genuchten Alpha				1/cm	0.005
32	van Genuchten Beta				fraction	1.09
33	Brooks and Corey Exponent				fraction	-------
	Unsaturated Zone Transport					
34	Transport Layer Thickness	16	ft	4.88	m	Difference average depth and depth to GW
35	Longitudinal Dispersivity				m	Derive
36	Percent Organic Matter				%	0
37	Bulk Density				g/cm^3	1.99
38	Biological Decay Coefficient				1/yr	0
	Saturated Zone Flow					
39	Aquifer Thickness	20	ft	6.10	m	Aquifer Thickness
40	Mixing Zone Thickness				m	Derive
41	Effective Porosity				fraction	0.3
42	Bulk Density				g/cm^3	1.855
43	Saturated Hydraulic Conductivity				m/yr	315
44	Hydraulic Gradient				fraction	0.003
45	Seepage Velocity				m/yr	Derive
46	Longitudinal Dispersivity				m	Derive
47	Transverse Dispersivity				m	Derive
48	Vertical Dispersivity				m	Derive
49	Aquifer Temperature				deg C	20
50	Aquifer pH					7
51	Fraction Organic Carbon				fraction	0
52	Retardation Factor				fraction	Derive
53	Biological Decay Coefficient				1/yr	0
	Well Location and Time					
54	Radial Distance to Well				m	1
55	Angle Off Plume Axis				degree	0
56	Well Screen Depth Fraction				fraction	0
57	Time Step Option					Max Concentration
						Time Intervals


BTEX Concentration At The Receptor Well
Hobbs O-29 EOL
0.00320
0.00240
0.00160
0.00080
0.00000
Concentration [mg/L]
1
51
100
150
199
Elapsed Time [yrs]

MULTIMED V1.01 DATE OF CALCULATIONS: 31-JUL-2013 TIME: 14:47:32

U. S. E N V I R O N M E N T A L P R O T E C T I O N A G E N C Y

E X P O S U R E A S S E S S M E N T

M U L T I M E D I A M O D E L

MULTIMED (Version 1.50, 2005)

1
Run options
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Hobbs O-29 EOL

1R428-51
Chemical simulated is BTEX

Option Chosen Saturated and unsaturated zone models
Run was DETERMIN
Infiltration Specified By User: 3.048E-02 m/yr
Run was transient
Well Times: Entered Explicitly
Reject runs if Y coordinate outside plume
Reject runs if Z coordinate outside plume
Gaussian source used in saturated zone model
1
1
UNSATURATED ZONE FLOW MODEL PARAMETERS
(input parameter description and value)

NP	- Total number of nodal points	240
NMAT	- Number of different porous materials	1
KPROP	- Van Genuchten or Brooks and Corey	1
IMSHGN	- Spatial discretization option	1
NVFLAYR	- Number of layers in flow model	1

OPTIONS CHOSEN
------- ------
Van Genuchten functional coefficients
User defined coordinate system
1

Layer information

LAYER NO.	LAYER THICKNESS	MATERIAL PROPERTY
1	4.88	1

DATA FOR MATERIAL 1

VADOSE ZONE MATERIAL VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS MEAN	PARAMETERS STD DEV	LIMITS MIN	LIMITS MAX
Saturated hydraulic conductivity	cm/hr	CONSTANT	3.60	-999.	-999.	-999.
Unsaturated zone porosity	--	CONSTANT	0.250	-999.	-999.	-999.
Air entry pressure head	m	CONSTANT	0.700	-999.	-999.	-999.
Depth of the unsaturated zone	m	CONSTANT	4.88	0.000	0.000	0.000

DATA FOR MATERIAL 1

VADOSE ZONE FUNCTION VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS MEAN	PARAMETERS STD DEV	LIMITS MIN	LIMITS MAX
Residual water content	--	CONSTANT	0.116	-999.	-999.	-999.
Brook and Corey exponent,EN	--	CONSTANT	-999.	-999.	-999.	-999.
ALFA coefficient	1/cm	CONSTANT	0.500E-02	-999.	-999.	-999.
Van Genuchten exponent, ENN	--	CONSTANT	1.09	-999.	-999.	-999.

1

UNSATURATED ZONE TRANSPORT MODEL PARAMETERS

NLAY	- Number of different layers used		1
NTSTPS	- Number of time values concentration calc		40
DUMMY	- Not presently used		1
ISOL	- Type of scheme used in unsaturated zone		2
N	- Stehfest terms or number of increments		18
NTEL	- Points in Lagrangian interpolation		3
NGPTS	- Number of Gauss points		104
NIT	- Convolution integral segments		2
IBOUND	- Type of boundary condition		3
ITSGEN	- Time values generated or input		1
TMAX	- Max simulation time	--	0.0
WTFUN	- Weighting factor	--	1.2

OPTIONS CHOSEN

Convolution integral approach
Exponentially decaying continuous source
Computer generated times for computing concentrations

1

DATA FOR LAYER 1

VADOSE TRANSPORT VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS MEAN	PARAMETERS STD DEV	LIMITS MIN	LIMITS MAX
Thickness of layer	m	CONSTANT	4.88	-999.	-999.	-999.
Longitudinal dispersivity of layer	m	DERIVED	-999.	-999.	-999.	-999.
Percent organic matter	--	CONSTANT	0.000	-999.	-999.	-999.
Bulk density of soil for layer	g/cc	CONSTANT	1.99	-999.	-999.	-999.
Biological decay coefficient	1/yr	CONSTANT	0.000	-999.	-999.	-999.

1

CHEMICAL SPECIFIC VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS MEAN	PARAMETERS STD DEV	LIMITS MIN	LIMITS MAX
Solid phase decay coefficient	1/yr	CONSTANT	0.200	-999.	-999.	-999.
Dissolved phase decay coefficient	1/yr	CONSTANT	0.200	-999.	-999.	-999.
Overall chemical decay coefficient	1/yr	DERIVED	-999.	-999.	-999.	-999.
Acid catalyzed hydrolysis rate	l/M-yr	CONSTANT	0.000	-999.	-999.	-999.
Neutral hydrolysis rate constant	1/yr	CONSTANT	0.000	-999.	-999.	-999.
Base catalyzed hydrolysis rate	l/M-yr	CONSTANT	0.000	-999.	-999.	-999.
Reference temperature	C	CONSTANT	25.0	-999.	-999.	-999.
Normalized distribution coefficient	ml/g	CONSTANT	0.000	-999.	-999.	-999.
Distribution coefficient	--	DERIVED	-999.	-999.	-999.	-999.
Biodegradation coefficient (sat. zone)	1/yr	CONSTANT	0.000	-999.	-999.	-999.
Air diffusion coefficient	cm2/s	CONSTANT	-999.	-999.	-999.	-999.
Reference temperature for air diffusion	C	CONSTANT	-999.	-999.	-999.	-999.
Molecular weight	g/M	CONSTANT	-999.	-999.	-999.	-999.
Mole fraction of solute	--	CONSTANT	-999.	-999.	-999.	-999.
Vapor pressure of solute	mm Hg	CONSTANT	-999.	-999.	-999.	-999.
Henry`s law constant	atm-m^3/M	CONSTANT	-999.	-999.	-999.	-999.
Overall 1st order decay sat. zone	1/yr	DERIVED	0.000	0.000	0.000	1.00
Not currently used		CONSTANT	0.000	0.000	0.000	0.000
Not currently used		CONSTANT	0.000	0.000	0.000	0.000

1

SOURCE SPECIFIC VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS MEAN	PARAMETERS STD DEV	LIMITS MIN	LIMITS MAX
Infiltration rate	m/yr	CONSTANT	0.305E-01	-999.	-999.	-999.
Area of waste disposal unit	m^2	DERIVED	251.	-999.	-999.	-999.
Duration of pulse	yr	DERIVED	50.0	-999.	-999.	-999.
Spread of contaminant source	m	DERIVED	-999.	-999.	-999.	-999.
Recharge rate	m/yr	CONSTANT	0.000	-999.	-999.	-999.
Source decay constant	1/yr	CONSTANT	0.250E-01	0.000	0.000	0.000
Initial concentration at landfill	mg/l	CONSTANT	6.33	-999.	-999.	-999.
Length scale of facility	m	CONSTANT	15.9	-999.	-999.	-999.
Width scale of facility	m	CONSTANT	15.9	-999.	-999.	-999.
Near field dilution		DERIVED	1.00	0.000	0.000	1.00

1

AQUIFER SPECIFIC VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS		LIMITS	
			MEAN	STD DEV	MIN	MAX
Particle diameter	cm	CONSTANT	-999.	-999.	-999.	-999.
Aquifer porosity	--	CONSTANT	0.300	-999.	-999.	-999.
Bulk density	g/cc	CONSTANT	1.86	-999.	-999.	-999.
Aquifer thickness	m	CONSTANT	6.10	-999.	-999.	-999.
Source thickness (mixing zone depth)	m	DERIVED	-999.	-999.	-999.	-999.
Conductivity (hydraulic)	m/yr	CONSTANT	315.	-999.	-999.	-999.
Gradient (hydraulic)		CONSTANT	0.300E-02	-999.	-999.	-999.
Groundwater seepage velocity	m/yr	DERIVED	-999.	-999.	-999.	-999.
Retardation coefficient	--	DERIVED	-999.	-999.	-999.	-999.
Longitudinal dispersivity	m	FUNCTION OF X	-999.	-999.	-999.	-999.
Transverse dispersivity	m	FUNCTION OF X	-999.	-999.	-999.	-999.
Vertical dispersivity	m	FUNCTION OF X	-999.	-999.	-999.	-999.
Temperature of aquifer	C	CONSTANT	20.0	-999.	-999.	-999.
pH	--	CONSTANT	7.00	-999.	-999.	-999.
Organic carbon content (fraction)		CONSTANT	0.000	-999.	-999.	-999.
Well distance from site	m	CONSTANT	1.00	-999.	-999.	-999.
Angle off center	degree	CONSTANT	0.000	-999.	-999.	-999.
Well vertical distance	m	CONSTANT	0.000	-999.	-999.	-999.

1

TIME	CONCENTRATION
0.100E+01	0.00000E+00
0.210E+02	0.28054E-03
0.410E+02	0.29099E-02
0.610E+02	0.18455E-02
0.810E+02	0.11222E-02
0.101E+03	0.68035E-03
0.121E+03	0.41339E-03
0.141E+03	0.25013E-03
0.161E+03	0.15158E-03
0.181E+03	0.91580E-04

Hansen, Edward J., EMNRD

From: Katie Jones <kjones@riceswd.com>
Sent: Tuesday, August 27, 2013 2:04 PM
To: Hansen, Edward J., EMNRD
Cc: Hack Conder; L Peter Galusky; Laura Pena
Subject: ROC - Hobbs O-29 EOL (1R428-51) CAP Addendum
Attachments: ROC - Hobbs O-29 EOL (1R428-51) Proposed Liner.jpg

Mr. Hansen,

This email is an Addendum to the Hobbs O-29 EOL (1R428-51) Corrective Action Plan (CAP), submitted to the NMOCD on August 8, 2013. Pages 1 and 2, paragraph 4, points 1-4: text in blue lettering, below, will be added to the paragraph. Red lettering marked with a strike-through will be deleted. A plat showing the updated liner dimensions is attached.

"Although these levels of residual soil chlorides and hydrocarbons are not high, we nevertheless propose to install an impermeable, synthetic subsurface liner to protect groundwater from potential future impacts. Subject to your approval, we propose to undertake the following actions:

1- Excavate chloride-impacted soil ~~over an area of approximately 52 ft x 52 ft and to a depth of approximately 4-5 ft bgs.~~ surrounding the O-29 EOL site. There are pipelines running through the site preventing the installation of a single liner; a buried injection line running north-south and a buried pipeline running east-west. In order to remain a safe distance from those pipelines, ROC will excavated four separate areas to a depth of 4-5 ft bgs and install four separate 20 mil, reinforced liners. Each liner extends 5 ft in all directions beyond each of the soil bores. The northwest liner will measure approximately 34x14-ft, the northeast liner will measure approximately 33x32-ft, the southwest liner will measure approximately 12x14-ft, and the southeast liner will measure approximately 13x32-ft. Each excavation will remain at least 3 ft or a safe distance away from the pipelines.
2- Install and properly seat a 20-mil, reinforced poly liner in each of the excavations~~over a prepared bed of approximately 6 inches of clean blow sand, and carefully secure the liner with another 6 inches of clean blow sand below the liner~~.
3- Backfill the remaining excavations with soil material having a chloride concentration no greater than 500 mg/kg and a field measurement of residual hydrocarbons no greater than 100 ppm.Any excess or soil material exceeding these standards will be properly disposed of at an NMOCD approved facility.
4- Restore the surface to natural grade, add amendments and seed with a blend of native vegetation mix, as necessary. Vegetation above the liner will also provide a natural infiltration barrier for the site since plants capture water through their roots thereby reducing the volume of water moving through the vadose zone to groundwater."

If you need any further information, please let me or Hack know.

Thank you.

Katie Jones
Environmental Project Manager
RICE *Operating Company*

Soil Bore Installation and Proposed Liner

SB-1

Depth	Cl-	PID	LAB Cl-	GRO	DRO	B	T	E	X
10	893	669.4	933	818	4960	<0.05	1.61	1.30	6.33
15	2528	309.1							
20	1900	190							
25	1862	65.8							
30	4003	145.6							
35	4245	126.3							
40	4416	158	4960	196	2800	<0.05	0.247	0.202	2.35
45	3095	55.9							
50	3196	42							
55	3711	19.7							
60	1595	8.8							
65	465	14.3							
70	356	5.7	352	<10	123				

SB-2

Depth	Cl-	LAB Cl-	GRO	DRO
5	840			
10	715			
15	1255	1680	<10	<10
20	616			
25	445			
30	361			
35	576			
40	578			
45	523			
50	602			
55	448			
60	508			
65	172	96	<10	<10

SB-3

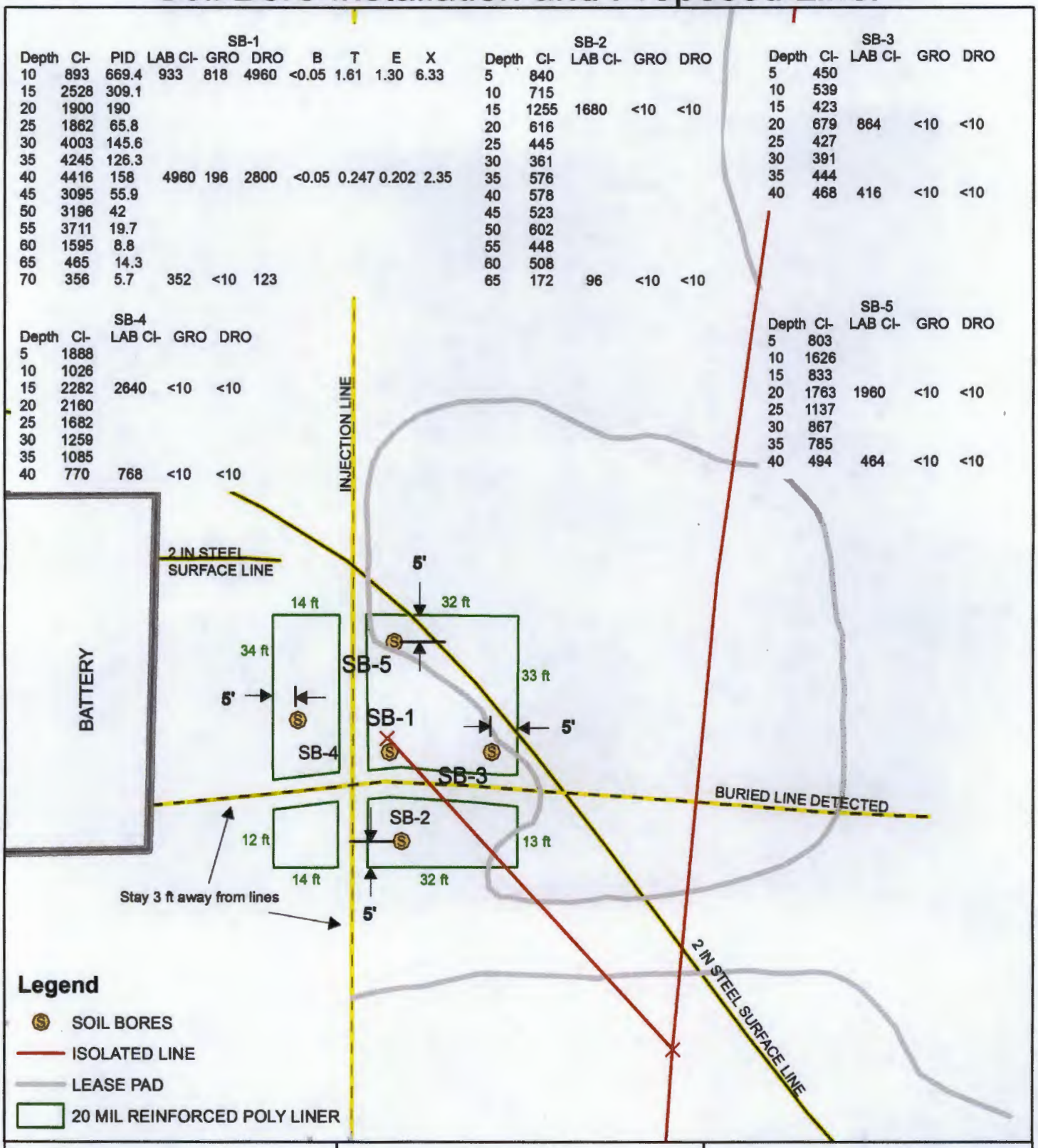
Depth	Cl-	LAB Cl-	GRO	DRO
5	450			
10	539			
15	423			
20	679	864	<10	<10
25	427			
30	391			
35	444			
40	468	416	<10	<10

SB-4

Depth	Cl-	LAB Cl-	GRO	DRO
5	1888			
10	1026			
15	2282	2640	<10	<10
20	2160			
25	1682			
30	1259			
35	1085			
40	770	768	<10	<10

SB-5

Depth	Cl-	LAB Cl-	GRO	DRO
5	803			
10	1626			
15	833			
20	1763	1960	<10	<10
25	1137			
30	867			
35	785			
40	494	464	<10	<10



RICE ENVIRONMENTAL CONSULTING & SAFETY, LLC — RECS

Hobbs O-29 EOL

Legals: UL/O sec. 29
T18S R38E

Case #: 1R428-51

N W E S

0 12.5 25 50 Feet

Drawing date: 8/23/13
Drafted by: L. Weinheimer

MULTIMED V1.01 DATE OF CALCULATIONS: 3-SEP-2013 TIME: 15:16:23

U. S. ENVIRONMENTAL PROTECTION AGENCY

EXPOSURE ASSESSMENT

MULTIMEDIA MODEL

MULTIMED (Version 1.50, 2005)

1
Run options
--- -------

Hobbs O-29 EOL

1R428-51
Chemical simulated is Chloride

Option Chosen	Saturated and unsaturated zone models
Run was	DETERMIN

Infiltration Specified By User: 4.800E-03 m/yr
Run was transient
Well Times: Find Maximium Concentration
Reject runs if Y coordinate outside plume
Reject runs if Z coordinate outside plume
Gaussian source used in saturated zone model
1
1
UNSATURATED ZONE FLOW MODEL PARAMETERS
(input parameter description and value)

NP	- Total number of nodal points	240
NMAT	- Number of different porous materials	1
KPROP	- Van Genuchten or Brooks and Corey	1
IMSHGN	- Spatial discretization option	1

NVFLAYR - Number of layers in flow model 1

OPTIONS CHOSEN
------- ------
Van Genuchten functional coefficients
User defined coordinate system
1

Layer information

LAYER NO.	LAYER THICKNESS	MATERIAL PROPERTY
1	10.00	1

DATA FOR MATERIAL 1
---- --- --------
VADOSE ZONE MATERIAL VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS		LIMITS	
			MEAN	STD DEV	MIN	MAX
Saturated hydraulic conductivity	cm/hr	CONSTANT	3.60	-999.	-999.	-999.
Unsaturated zone porosity	--	CONSTANT	0.250	-999.	-999.	-999.
Air entry pressure head	m	CONSTANT	0.700	-999.	-999.	-999.
Depth of the unsaturated zone	m	CONSTANT	10.0	0.000	0.000	0.000

DATA FOR MATERIAL 1

VADOSE ZONE FUNCTION VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS MEAN	PARAMETERS STD DEV	LIMITS MIN	LIMITS MAX
Residual water content	--	CONSTANT	0.116	-999.	-999.	-999.
Brook and Corey exponent,EN	--	CONSTANT	-999.	-999.	-999.	-999.
ALFA coefficient	1/cm	CONSTANT	0.500E-02	-999.	-999.	-999.
Van Genuchten exponent, ENN	--	CONSTANT	1.09	-999.	-999.	-999.

1

UNSATURATED ZONE TRANSPORT MODEL PARAMETERS

NLAY	- Number of different layers used		1
NTSTPS	- Number of time values concentration calc		40
DUMMY	- Not presently used		1
ISOL	- Type of scheme used in unsaturated zone		2
N	- Stehfest terms or number of increments		18
NTEL	- Points in Lagrangian interpolation		3
NGPTS	- Number of Gauss points		104
NIT	- Convolution integral segments		2
IBOUND	- Type of boundary condition		2
ITSGEN	- Time values generated or input		1
TMAX	- Max simulation time	--	0.0

WTFUN - Weighting factor -- 1.2

OPTIONS CHOSEN
------- ------
Convolution integral approach
Nondecaying pulse source
Computer generated times for computing concentrations
1

DATA FOR LAYER 1
---- --- -----
VADOSE TRANSPORT VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS		LIMITS	
			MEAN	STD DEV	MIN	MAX
Thickness of layer	m	CONSTANT	10.0	-999.	-999.	-999.
Longitudinal dispersivity of layer	m	DERIVED	-999.	-999.	-999.	-999.
Percent organic matter	--	CONSTANT	0.000	-999.	-999.	-999.
Bulk density of soil for layer	g/cc	CONSTANT	1.99	-999.	-999.	-999.
Biological decay coefficient	1/yr	CONSTANT	0.000	-999.	-999.	-999.

1

CHEMICAL SPECIFIC VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS		LIMITS	
			MEAN	STD DEV	MIN	MAX
Solid phase decay coefficient	1/yr	DERIVED	-999.	-999.	-999.	-999.
Dissolved phase decay coefficient	1/yr	DERIVED	-999.	-999.	-999.	-999.
Overall chemical decay coefficient	1/yr	DERIVED	-999.	-999.	-999.	-999.
Acid catalyzed hydrolysis rate	l/M-yr	CONSTANT	0.000	-999.	-999.	-999.
Neutral hydrolysis rate constant	1/yr	CONSTANT	0.000	-999.	-999.	-999.
Base catalyzed hydrolysis rate	l/M-yr	CONSTANT	0.000	-999.	-999.	-999.
Reference temperature	C	CONSTANT	25.0	-999.	-999.	-999.
Normalized distribution coefficient	ml/g	CONSTANT	0.000	-999.	-999.	-999.
Distribution coefficient	--	DERIVED	-999.	-999.	-999.	-999.
Biodegradation coefficient (sat. zone)	1/yr	CONSTANT	0.000	-999.	-999.	-999.
Air diffusion coefficient	cm2/s	CONSTANT	-999.	-999.	-999.	-999.
Reference temperature for air diffusion	C	CONSTANT	-999.	-999.	-999.	-999.
Molecular weight	g/M	CONSTANT	-999.	-999.	-999.	-999.
Mole fraction of solute	--	CONSTANT	-999.	-999.	-999.	-999.
Vapor pressure of solute	mm Hg	CONSTANT	-999.	-999.	-999.	-999.

	Henry`s law constant	atm-m^3/M	CONSTANT	-999.	-999.
-999.	-999.				
	Overall 1st order decay sat. zone	1/yr	DERIVED	0.000	0.000
0.000	1.00				
	Not currently used		CONSTANT	0.000	0.000
0.000	0.000				
	Not currently used		CONSTANT	0.000	0.000
0.000	0.000				

1

SOURCE SPECIFIC VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS		LIMITS	
			MEAN	STD DEV	MIN	MAX
Infiltration rate	m/yr	CONSTANT	0.480E-02	-999.	-999.	-999.
Area of waste disposal unit	m^2	DERIVED	251.	-999.	-999.	-999.
Duration of pulse	yr	CONSTANT	50.0	-999.	-999.	-999.
Spread of contaminant source	m	DERIVED	-999.	-999.	-999.	-999.
Recharge rate	m/yr	CONSTANT	0.000	-999.	-999.	-999.
Source decay constant	1/yr	CONSTANT	0.000	0.000	0.000	0.000
Initial concentration at landfill	mg/l	CONSTANT	0.496E+04	-999.	-999.	-999.
Length scale of facility	m	CONSTANT	15.9	-999.	-999.	-999.
Width scale of facility	m	CONSTANT	15.9	-999.	-999.	-999.

	Near field dilution		DERIVED	1.00	0.000	
0.000	1.00					
1						

AQUIFER SPECIFIC VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS		LIMITS	
			MEAN	STD DEV	MIN	MAX
Particle diameter	cm	CONSTANT	-999.	-999.	-999.	-999.
Aquifer porosity	--	CONSTANT	0.300	-999.	-999.	-999.
Bulk density	g/cc	CONSTANT	1.86	-999.	-999.	-999.
Aquifer thickness	m	CONSTANT	6.10	-999.	-999.	-999.
Source thickness (mixing zone depth)	m	DERIVED	-999.	-999.	-999.	-999.
Conductivity (hydraulic)	m/yr	CONSTANT	315.	-999.	-999.	-999.
Gradient (hydraulic)		CONSTANT	0.300E-02	-999.	-999.	-999.
Groundwater seepage velocity	m/yr	DERIVED	-999.	-999.	-999.	-999.
Retardation coefficient	--	DERIVED	-999.	-999.	-999.	-999.
Longitudinal dispersivity	m	FUNCTION OF X	-999.	-999.	-999.	-999.
Transverse dispersivity	m	FUNCTION OF X	-999.	-999.	-999.	-999.
Vertical dispersivity	m	FUNCTION OF X	-999.	-999.	-999.	-999.

	Temperature of aquifer	C	CONSTANT	20.0	-999.
-999.	-999.				
	pH	--	CONSTANT	7.00	-999.
-999.	-999.				
	Organic carbon content (fraction)		CONSTANT	0.000	-999.
-999.	-999.				
	Well distance from site	m	CONSTANT	1.00	-999.
-999.	-999.				
	Angle off center	degree	CONSTANT	0.000	-999.
-999.	-999.				
	Well vertical distance	m	CONSTANT	0.000	-999.
-999.	-999.				

MAXIMUM WELL CONCENTRATION IS 103.6 AT 0.481E+03 YEARS