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MDA C Technical Team Project
Meeting Summary - Technical Team Meeting #1
March 20, 2019

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Meeting Purpose and Objectives:

The purpose of this technical team meeting was to discuss the MDA C topics listed below. The meeting minutes summaries are intended to document the topics discussed and any agreement and actions that may have resulted from discussions in an effort to guide ongoing assessment activities and associated discussions between Newport News Nuclear BWXT – Los Alamos (N3B), the Department of Energy Environmental Manager – Los Alamos (EM-LA), and the State of New Mexico Environment Department (NMED).

Specific objectives for the meeting included:

- Follow up on 2-Hexanone white paper
- Corrective Measures Evaluation (CME) Revision
- Appendix F – Groundwater Monitoring
- Rescreening of Data (Tier 1 and 2)
- CME Timeline
- Open Discussion

Participants: See Attachment 1

Meeting Outcomes:

Note: Any technical team decision and/or agreement is considered draft until such time as the MDA C Technical Team representatives confirm that the summation accurately and adequately captures the agreements and has management approval. Presentation materials and technical materials should be considered pre-decisional/working level products unless otherwise noted. Technical discussions and information are working group discussions and do not represent final agreements.

Technical Information

1. 2-Hexanone White Paper
    a. N3B will submit a white paper to NMED on 2-Hexanone in April 2019. White paper to discuss N3B position that the 2-Hexanone data is erroneous.

2. CME Revision
    a. EM-LA, NMED, and N3B agreed that a CME revision is required and the best path forward. It was also agreed that changes to the CME will be discussed through a technical team approach.
    b. NMED will provide draft comments to EM-LA/N3B on the current MDA C CME through future technical team meeting. NMED to provide formal comments, if any, on revised MDA C CME. See Attachment 2.
    c. The MDA C Technical Team will compile the actions and information that need to be completed, and will decide the appropriate location for including the information (CME versus CMI).

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d. The CME must include enough engineering detail to adequately estimate all CME options, such that the actual implemented option doesn't alter the relative financial ranking of the remedial alternatives presented in the CME. Expected that the level of detail equates to a 30% engineering design.
e. The CMI will contain the detailed engineering information which will be used for the final remedy.
f. If an alternative cap design is proposed, then an analysis must be included in the CME.
g. N3B to add concepts of passive extraction versus active extraction wells into the CME revision.
h. N3B to provide defense in depth for the use of vapor monitoring wells and groundwater monitoring wells for long term monitoring.
i. N3B will review NMED's draft comments on the CME and provide feedback in the next technical team meeting.

3. CME Appendix F – Groundwater Network Analysis
   a. NMED would like to have a demonstration of the groundwater modeling used for the CME. NMED wants to evaluate how modification of various input parameters affects the model in order to become more fluent with how the model performs.
   b. N3B to prepare a demonstration of the model for NMED. Estimated that the earliest a model demonstration could happen would be July 2019.

4. Rescreening of Data (Tier 1 and 2)
   a. N3B will update the screening data table to reflect the new groundwater standards implemented on 12-21-18. N3B will rescreen all data to determine the chemicals of potential concern (COPCs).
   b. Handout on assumptions used for screening data table. See Attachment 3. NMED will review the assumptions used in screening the data and provide comments to N3B.
   c. Handout for Tier II Screening Levels for TCE as a Function of Depth. See Attachment 4. N3B to research the depth dependency of screening levels for COPCs.

5. CME Timeline
   a. N3B to provide NMED a proposed schedule for CME revision submittal.

6. Open Discussion
   a. It was discussed that EM-LA needs to determine any potential impacts from DOE HQ if the CME preferred option exceeds the DOE capital projects threshold limit. A significant amount of time for DOE review and approval will be required if the threshold limit is exceeded.

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Attachment 1: Attendees

First	Last	Organization	Email	Phone Number
Cristopher	Hall	EM-LA	cristopher.hall@em.doe.gov	
Danny	Katzman	N3B	danny.katzman@em-la.doe.gov	505-309-1371
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Tom	McCrory	EM-LA	thomas.mccrory@em.doe.gov	505-412-9527
Dane	Andersen	NMED-HWB	dane.andersen@state.nm.us	505-476-6056
Christian	Maupin	N3B	christian.maupin@em-la.doe.gov	505-695-4281
Michel	Dale	NMED-HWB	michel.dale@state.nm.us	505-231-5423
Cheryl	Rodriguez	EM-LA	cheryl.rodriguez@em.doe.gov	505-665-5330
David	Dail	N3B	david.dail@em-la.doe.gov	505-412-0191

Attachment 2: NMED Draft Comment on MDA C CME

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Attachment 2: NMED Draft Comment on MDA C CME

Jerzy Kulis
July 29, 2013

Comments on groundwater-related issues in CME for MDA C

1. Section 3.2.4.2, VOCs in Pore Gas, page 20, first paragraph
Correct the wording "... half the sampling events in every event" to "... half the sampling ports in every event."

2. Section 3.2.4.2, VOCs in Pore Gas, Tier I Screening, page 21, second paragraph
The Permittees omitted 1,2,4-trimethylbenzene from the list of VOCs that exceeded Tier I screening levels. Concentration of this compound at location 50-24813 during August 2011 sampling event was at 5500 µg/L (Table C-5.0-4, page C-239) while its Tier I screening level is 3780 µg/L (Table 3.2-10, page 124). Add 1,2,4-trimethylbenzene to the list of VOCs that exceeded Tier I screening levels and make appropriate corrections to other parts of the report, including the attachments (for example, Section H-2.1 of Appendix H).

3. Section 3.2.4.2, VOCs in Pore Gas, Tier I Screening, page 22, second paragraph
The locations listed in the third sentence (50-603183, 50-603184, and 50-603185) do not exist. The correct locations are 50-613183, 50-613184, and 50-613185.

4. Section 3.2.4.2, VOCs in Pore Gas, Tier II Screening, page 23, last paragraph
The part of the Tier II evaluation described by the Permittees as the "preliminary Tier II screening" is not clearly explained. First, the Permittees utilize the aquifer dilution factor for fracture flow (14.44) but this approach is not representative of actual site conditions, where the groundwater table is entirely within the unfractured Puye Formation, and the Permittees do not present the rationale behind using the aquifer dilution factor for fracture flow.

   Second, since the Permittees compare the aquifer dilution factor for fracture flow (14.44) to the aquifer dilution factor for porous media flow (330.52), which was previously calculated by the Permittees for pore-water phase migration (LANL, EP2011-0223, Table F-2.2-1), it appears that the "preliminary Tier II screening" refers to water-phase transport of VOCs as opposed to the subsequent two-step Tier II screening that describes vapor-phase transport. However, the Permittees do not clearly distinguish between water-phase and vapor-phase transport in their analyses. The Permittees must clearly state the mode of VOC transport that is being discussed.

   Furthermore, the Permittees must perform separate Tier II analyses for pore water and vapor phase transport for each constituent detected above the Tier I screening level and select the lower of the calculated values as the Tier II screening level for a given constituent. If the Permittees continue to use the aquifer dilution factor for fracture flow, they must provide justification for such approach, equation(s) used to calculate it, values of parameters used in the equation(s) (including sources of data), and assumptions made.

5. Section 3.2.4.2, VOCs in Pore Gas, Tier II Screening, pages 23-25
The Permittees performed two-step Tier II screening regarding VOCs transport in a vapor phase. Step 1 assumes porous media flow in the Bandelier tuff units and fracture flow in the underlying vadose zone units (Tschicoma dacite and Puye Formation). Step 2 assumes porous media flow in all vadose zone units. This Tier II Step 2 analysis is inadequate. The Permittees cannot assume porous media flow in the Tschicoma dacite unless demonstrated otherwise. The

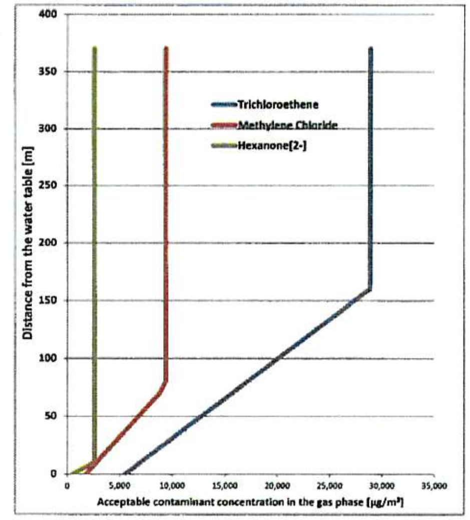
borehole lithologic logs for two regional wells closest to MDA C, R-60 (LANL, EP-2011-0003) and R-46 (LANL, LA-UR-09-1338), show, respectively, 235 and 258 feet of Tschicoma dacite, 215 feet (91%) and 216 feet (84%) of which are described as massive dacite with a variable degree of fracturing, with the remainder being altered dacite in R-60 and vesicular dacite and dacite scoria and breccia in R-46. If the Permittees retain the two-step Tier II screening, they must modify the Step 2 by assuming fracture flow in the Tschicoma dacite and porous media flow in the Puye Formation. Furthermore, the Permittees use the term "Tier II screening" throughout the report without specifying if they refer to Step 1 or Step 2. If the Permittees retain the two-step Tier II screening, they must state the type of Tier II screening (Step 1 or Step 2) whenever they use the term "Tier II screening". Overall, the two-step approach to the Tier II screening regarding VOCs transport in a vapor phase seems to be unnecessarily complicated. The Permittees may consider a simpler approach, consisting of a single step that assumes porous media flow in the Bandelier tuff and the Puye Formation, and fracture flow in the Tschicoma dacite.

6. Section 3.2.4.2, VOCs in Pore Gas, Tier II Screening, pages 23-25
   The current conceptual site model, on which Tier II screening levels are based, does not properly explain the distribution of all organic vapor contaminants present beneath MDA C, in particular 2-hexanone, benzene, and 1,2,4-trimethylbenzene. The distribution of these contaminants appears to be decoupled from the distribution of the predominant contaminant, trichloroethene (TCE). Their highest concentrations, above Tier I levels, were detected in the deepest ports of some boreholes (600 ft bgs at location 50-603467 for 2-hexanone; 632.5 ft bgs at 50-613182 for benzene; and 600 ft bgs at 50-24813 for benzene and 1,2,4-trimethylbenzene), suggesting that even higher concentrations might be present at greater depths, possibly within the Tschicoma dacite. Given the limitations of the site conceptual model, the estimated nature of many model parameters, and the heterogeneity of geologic formations within the vadose zone, the Permittees must apply a safety factor of 2 in their Tier II calculations for VOC transport by using one-half of applicable groundwater standards as their groundwater screening levels. Alternatively, the Permittees may present a site conceptual model that fully explains the observed distribution and distribution trends of all VOCs present beneath MDA C above Tier I screening levels.
   Furthermore, in Tier II analyses for pore-water phase migration, the Permittees have used the infiltration rate through the vadose zone of 1 mm/year (LANL, EP2011-0223, Table F-2.2-1). According to the Permittees' calculations (LANL, EP2011-0223, Table F-2.2-1), the migration of 2-hexanone through the vadose zone occurs predominantly in a pore-water phase. However, the highest concentration of 2-hexanone were measured at 600 ft bgs, which cannot be explained by the infiltration rate of 1 mm/year. The Permittees must reevaluate the infiltration rate used in Tier II calculations for pore-water phase migration and propose the infiltration rate (possibly, a temporally and/or spatially variable infiltration rate) that explains the current distribution of 2-hexanone and can be used in predicting its future behavior. Alternatively, the Permittees may present a conceptual model or mechanism that explains the observed distribution of 2-hexanone beneath MDA C with infiltration rate being at 1 mm/year, and discuss the implications of this conceptual model or mechanism on the behavior of other contaminants beneath MDA C.

7. Figure 7.2-1, Conceptual cover layout for Alternatives 3A and 3B, page 92
   The 7265 contour line for the proposed cover, to the southwest of the 7255 contour line, is not properly marked.

Attachment 3: Screening Data Assumptions Table

	Parameters		Unit	Hexanone[2-] original analysis	Hexanone[2-] porous	Hexanone[2-] fracture	Methylene Chloride original analysis	Methylene Chloride porous	Methylene Chloride fracture	Trichloroethene original analysis	Trichloroethene porous	Trichloroethene fracture
COPC	Screening Level (SL) / Maximum Contaminant Level (MCL) (contaminant specific)	C^w_{eqSL}	μg/L	47	47	47	5	5	5	5	5	5
COPC	Maximum contaminant concentration in the gas phase in the vadose zone at the source (contaminant specific)	C^g_{vz}	μg/m³	1200	1200	1200	1600	1600	1600	93000	93000	93000
COPC	Henry's law coefficient (dimensionless) (contaminant specific)	H	-	0.00381	0.00381	0.00381	0.13	0.13	0.13	0.4	0.4	0.4
Tier I	Contaminant concentration in the aquifer (Tier I prediction ignoring VZ transport)	C^w_{aq}	μg/L	314.96	314.96	314.96	12.31	12.31	12.31	232.50	232.50	232.50
Tier I	Sceening level (Tier I): acceptable contaminant concentration in the gas phase in the vadose zone at the source	C^g_{vzMAX}	μg/L	179.07	179.07	179.07	650.00	650.00	650.00	2000.00	2000.00	2000.00
Tier I	COPC of concern based on Tier I analysis ignoring VZ transport? [yes/no]	-	yes/no	yes	yes	yes	yes	yes	yes	yes	yes	yes
VZ	Distance from the vadose zone source to the water table	d_w	m	230	230	230	400	400	400	384	384	384
	Source length along the regional groundwater flow direction	L	m	107	107	1.07	107	107	1.07	107	107	1.07
Aquifer	Hydraulic conductivity in the regional aquifer	k	m/d	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3
Aquifer	Hydraulic gradient in the regional aquifer	I	m/m	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014
Aquifer	Considered aquifer thickness (e.g. screen length of a monitoring well)	d_a	m	3	3	3	3	3	3	3	3	3
Aquifer	Darcy velocity	v	m/d	0.0322	0.0322	0.0322	0.0322	0.0322	0.0322	0.0322	0.0322	0.0322
	Infiltration rate through the vadose zone	R	m/a	0.001	0.001	0.1	0.001	0.001	0.1	0.001	0.001	0.1
Liquid-phase migration	Infiltration flux	q_{inf}	m²/d	2.93E-04	2.93E-04	2.93E-04	2.93E-04	2.93E-04	2.93E-04	2.93E-04	2.93E-04	2.93E-04
Liquid-phase migration	Regional aquifer flux (unit length perpendicular to the groundwater flow)	q_{aq}	m²/d	9.66E-02	9.66E-02	3.94E-03	9.66E-02	9.66E-02	3.94E-03	9.66E-02	9.66E-02	3.94E-03
Liquid-phase migration	Contaminant flux from the vadose-zone source to the water table under steady-state	q_{sw}	m/d*μg/m³	315	315	31496	12	12	1231	233	233	23250
Liquid-phase migration	Aquifer mixing zone	d_m	m	3.00	3.00	0.12	3.00	3.00	0.12	3.00	3.00	0.12
Liquid-phase migration	Dilution factor	F_{dw}	-	330.52	330.52	14.44	330.52	330.52	14.44	330.52	330.52	14.44
Liquid-phase migration	Contaminant concentration in the aquifer within the mixing zone	C^w_{aq}	μg/L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.70	0.70	[illegible]
Liquid-phase migration	Sceening level (Tier II): acceptable contaminant concentration in the gas phase in the vadose zone at the source	C^g_{vzMAX}	μg/m³	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Liquid-phase migration	COPC of concern based on pore-water migration? [yes/no]	-	yes/no	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	yes
Gas-phase migration	Diffusion coefficient of contaminants in air (contaminant specific)	D_a	m²/d	0.6078	0.6078	0.6078	0.8640	0.8640	0.8640	0.5962	0.5962	0.5962
Gas-phase migration	Diffusion coefficient of contaminants in the vadose zone	D_{vp}	m²/d	0.0316	0.0316	0.0001	0.0449	0.0449	0.0001	0.0310	0.0310	0.0001
Gas-phase migration	Diffusion coefficient of contaminants in water	D_w	m²/d	1.0E-04	1.0E-04	1.0E-04	1.0E-04	1.0E-04	1.0E-04	1.0E-04	1.0E-04	1.0E-04
Gas-phase migration	Diffusion coefficient of contaminants in the aquifer	D_{wp}	m²/d	2.01E-05	2.01E-05	1.00E-08	2.01E-05	2.01E-05	1.00E-08	2.01E-05	2.01E-05	1.00E-08
Gas-phase migration	Porosity	n	-	0.3	0.3	1.0E-03	0.3	0.3	1.0E-03	0.3	0.3	1.0E-03
Gas-phase migration	Volumetric moisture content in the vadose zone	θ	-	0.1	0.1	1.0E-06	0.1	0.1	1.0E-06	0.1	0.1	1.0E-06
Gas-phase migration	Contaminant concentration in the vadose zone at the water table under steady state	C^g_{wt}	μg/m³	2	2	0	68	68	6	8326	8326	779
Gas-phase migration	Contaminant concentration in the aquifer at the water table under steady state	C^w_{wt}	μg/m³	501	501	43	524	524	47	20815	20815	1948
Gas-phase migration	Contaminant flux from the vadose-zone source to the water table under steady-state	q_{sg}	m/d*μg/m³	0.16	0.16	0.00	0.17	0.17	0.00	6.83	6.83	0.01
Gas-phase migration	Aquifer mixing zone (only due to diffusion; if dispersion is included the contaminant flux will increase)	d_m	m	0.06	0.06	0.00	0.06	0.06	0.00	0.06	0.06	0.00
Gas-phase migration	Dilution factor	F_{dg}	-	6.6	6.6	342821.7	8.4	8.4	420963.0	12.3	12.3	588388.2
Gas-phase migration	Contaminant concentration in the aquifer within the mixing zone	C^w_{aq}	μg/L	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	7.6	7.6	[illegible]
Gas-phase migration	Sceening level (Tier II): acceptable contaminant concentration in the gas phase in the vadose zone at the source	C^g_{vzMAX}	μg/m³	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Gas-phase migration	COPC of concern based on air-phase migration? [yes/no]	-	yes/no	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	yes	yes	[illegible]



Notes:

(a) Concentrations are maximum values from March 2011 sampling event

(b) Depth of maximum concentration for each VOC from March 2011 data set; Depth to water table assumed to be 400 m.

(c) Source length along the regional groundwater flow direction based on Earthvision interpolation for TCE, A-A' cross section, Figure B-3.1-1; conservative estimate for 2-hexanone and methylene chloride.

(d) Hydraulic conductivity and gradient from Appendix G, based on data from R-46 and R-60 pump tests (LANL 2009, 105592)

(e) Infiltration rate of 1 mm/yr representative of a dry mesa

Attachment 4: Figure on Tier II Screening Levels for TCE as a Function of Depth

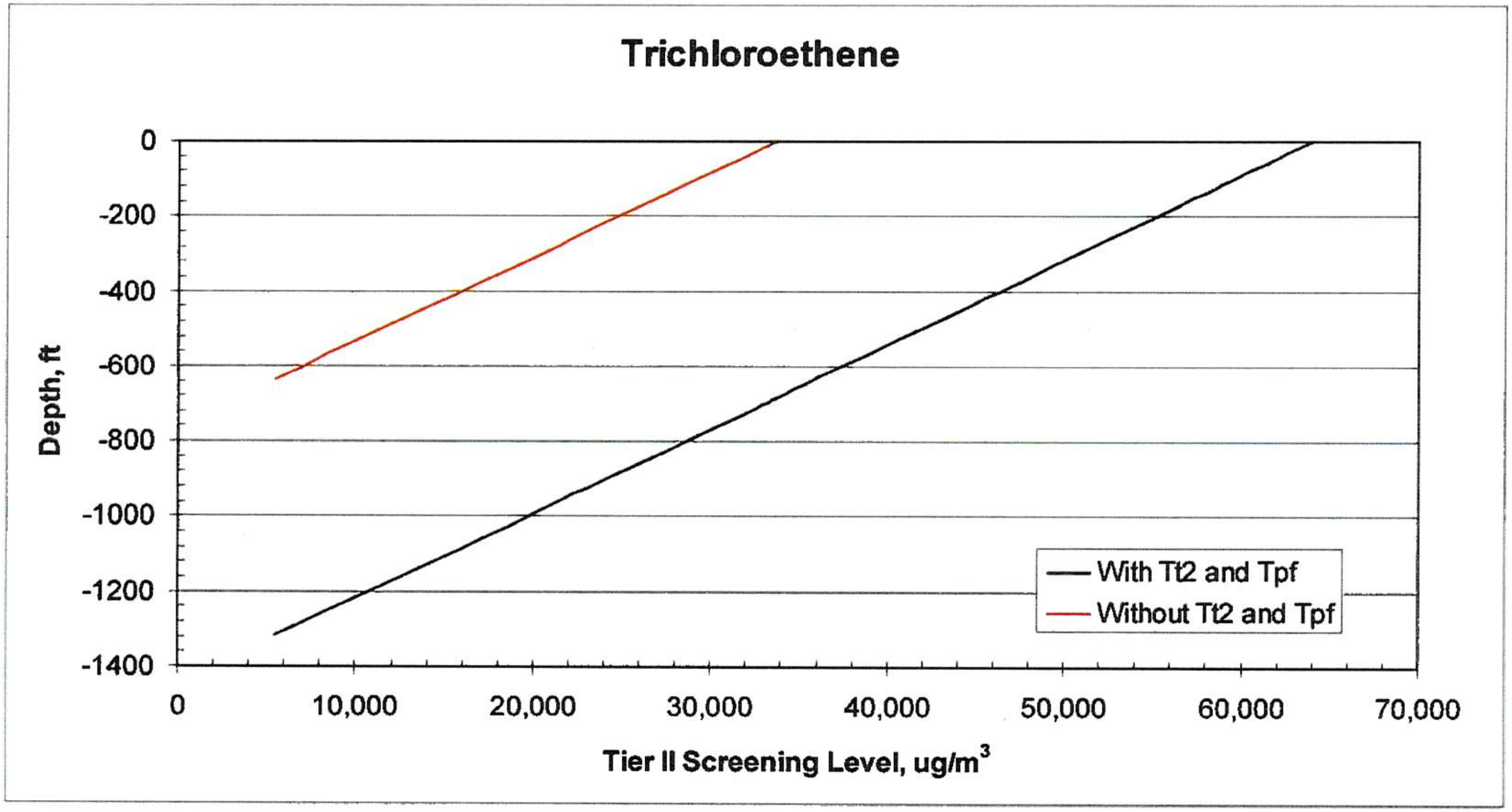


Figure 3 **Tier II screening levels for TCE as a function of depth**