From:	Saxton, John
To:	John Cash
Subject:	Action items from call
Date:	Thursday, November 16, 2017 1:26:00 PM
Attachments:	image001.png image002.png image003.png image004.png image005.png

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John,

As requested

From the responses to RAIs (page 14-15)

iii) Drawdown at Well LC27M

In Volume 4 of the LCEEA, a vertical to horizontal anisotropy ratio is used in several curve fitting plots (e.g. center test well LC27M, south cluster wells M-HJ1 and M-HJ2A). The report does not discuss these ratios. Please provide a rationale for using these anisotropy ratios, and an explanation of the drawdown at this well in comparison to other observation wells.

Response: The reviewer is reminded that the Battle Spring Formation was deposited in a high-energy, over-bank, braided stream environment. As such, the anisotropy at any given place on the property will likely be different. Compounding the issue is the fact that well LC27M is located approximately 0.8 miles from the pumping well, with an assortment of anisotropies between wells. The aquifer response over that distance will obviously yield regional or averaged aquifer characteristics. Accordingly, given the depositional environment and distance between wells, an anisotropy of 1 was considered a reasonable estimate.

From the report in Attachment D6-6

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In each simulation, groundwater sweep (GWS) was effective in reversing the hydraulic gradient and altering the injectate flowpaths back toward the wellfield. None of the ISR simulations indicated vertical flare into the overlying HJ Horizon or the underlying L Horizons when operations were conducted under balanced flow conditions.

Adapted from Table 3

Table 3. Hydraulic Conductivity Zones, KM Horizon Model, Lost Creek Uranium ISR Project

Zone Number	Kx (ft/d)	Kz (ft/d)	Kx/Kz	Model Layer	Zone Number	Kx (ft/d)	Kz (ft/d)	Kx/Kz	Model Layer
1	9.786E-01	9.200E-02	10.6	1	58	4.335E-02	1.084E-02	4.0	2
2	2.970E+00	3.213E-01	9.2	1	59	1.000E+01	1.634E-02	612.0	5
3	7.028E-01	1.001E-02	70.2	1	60	1.000E+00	1.000E-01	10.0	Not Used
4	1.647E+00	6.038E-01	2.7	1	61	1.000E+00	1.000E-01	10.0	Not Used
5	5.176E+00	8.000E-01	6.5	1	62	7.600E-05	2.100E-05	3.6	Not Used
6	1.735E+00	4.000E-02	43.4	1	63	1.571E+00	8.258E-03	190.2	11
7	5.991E-01	3.032E-02	19.8	1	64	4.600E+00	5.233E-04	8790.4	5
8	9.471E-01	1.109E-02	85.4	1	65	4.068E+00	3.941E-01	10.3	7
9	2.704E+00	2.249E-02	120.2	1	66	1.169E+00	7.583E-04	1541.6	7
10	2.952E+00	1.693E-01	17.4	1	67	2.464E-03	1.158E-01	0.0	1
11	6.515E-02	1.000E-01	0.7	1	68	3.000E-01	3.472E-01	0.9	4
12	4.846E-02	2.992E-01	0.2	1	69	8.130E-01	4.585E-01	1.8	4
13	5.819E-01	2.009E-01	2.9	1	70	1.816E-02	2.662E-04	68.2	4
14	9.122E-02	6.408E-03	14.2	All except 1, 2	71	2.778E+00	2.284E+00	1.2	4
15	2.916E-03	1.253E-02	0.2	All except 1, 2	72	9.160E-01	1.127E-01	8.1	4
16	6.503E-01	1.506E-01	4.3	11	73	1.708E+00	1.728E-02	98.8	4
17	6.306E+00	2.000E-02	315.3	11	74	8.119E-02	6.995E-04	116.1	4
18	4.832E-02	8.810E-01	0.1	10	75	1.624E-02	1.362E+00	0.0	4
19	4.688E-02	1.094E-06	42851.9	10	76	1.617E+00	6.792E-04	2380.7	4
20	3.597E-01	6.014E-02	6.0	8	77	3.740E+00	9.649E-02	38.8	4
21	2.023E+00	2.179E-01	9.3	8	78	7.117E+00	2.641E-02	269.5	4
22	2.329E-03	3.165E-03	0.7	6	79	4.147E+00	1.670E-03	2483.2	4
23	1.118E-01	1.468E-01	0.8	6	80	1.000E+00	1.000E-01	10.0	Not Used
24	7.288E-05	9.597E-07	75.9	2	81	4.661E-01	1.957E-01	2.4	3
25	7.758E-05	1.553E-04	0.5	2	82	5.050E-01	6.541E-01	0.8	3
26	9.971E-03	2.465E-06	4045.0	9	83	1.111E+00	6.901E-06	160991.2	3
27	1.287E-01	1.256E-03	102.5	9	84	1.877E+00	3.245E+00	0.6	3
28	5.733E-01	8.115E-06	70647.0	9	85	7.893E-01	1.366E-01	5.8	3
29	6.006E-02	5.358E-01	0.1	9	86	6.897E-01	8.049E-04	856.9	3
30	7.049E-01	1.098E-02	64.2	9	87	6.776E-01	2.547E-05	26603.8	3
31	3.957E-01	1.517E-03	260.8	9	88	5.496E-02	9.606E-01	0.1	3
32	3.324E+00	9.856E-05	33725.6	9	89	6.487E-01	4.219E-03	153.8	3
33	2.176E-01	3.072E-04	708.3	9	90	5.941E-03	2.507E-01	0.0	2
34	1.866E+00	8.435E-05	22122.1	9	91	5.730E+00	1.906E-01	30.1	3
35	3.623E+00	2.242E-01	16.2	9	92	1.000E+01	3.557E-02	281.1	3
36	8.951E-01	3.321E-04	2695.3	9	93	3.080E+00	2.581E-03	1193.3	3
37	2.235E+00	3.121E-01	7.2	7	94	1.337E+00	7.896E-02	16.9	5
38	3.188E-01	6.373E-01	0.5	7	95	1.023E+00	4.626E-02	22.1	5
39	1.528E+00	8.569E-03	178.3	7	96	1.551E+00	7.499E-02	20.7	5
40	3.060E-01	6.688E-01	0.5	7	97	4.267E-01	4.326E-02	9.9	5
41	6.862E-02	1.385E-01	0.5	7	98	1.339E+00	1.296E-01	10.3	4
42	6.591E-02	8.601E-01	0.1	7	99	1.205E+00	1.995E-02	60.4	4
43	1.000E+01	4.120E-02	242.7	7	100	7.518E-01	4.930E-03	152.5	4
44	9.768E-01	5.046E-01	1.9	7	101	6.759E-01	5.000E+00	0.1	4
45	3.469E+00	4.401E-01	7.9	7	102	5.655E+00	5.000E+00	1.1	4
46	1.000E+01	8.647E-03	1156.5	7	103	1.878E+00	8.861E-02	21.2	3
47	7.614E+00	2.935E-01	25.9	7	104	4.795E-02	1.997E-02	2.4	3
48	5.926E-01	3.938E-01	1.5	5	105	1.766E+00	1.296E-01	13.6	3
49	7.737E-01	4.954E-01	1.6	5	106	4.457E-01	5.864E-04	760.1	3
50	6.111E-01	8.257E-06	74009.9	5	107	1.000E+01	5.000E+00	2.0	3
51	3.035E+00	2.099E+00	1.4	5	108	7.779E+00	4.011E-01	19.4	3
52	7.662E-01	9.502E-02	8.1	5	109	5.187E+00	5.000E+00	1.0	3
53	4.516E-01	3.012E-01	1.5	5	110	1.436E-03	1.076E-03	1.3	3
54	8.406E-01	1.298E-05	64761.2	5	111	8.573E-01	7.291E-02	11.8	3
55	2.863E-02	1.552E+00	0.0	5	112	5.891E-03	9.993E-04	5.9	3
56	6.826E-01	7.327E-04	931.6	5	113	2.639E+00	9.912E-04	2662.4	3
57	3.458E+00	5.834E-02	59.3	5					

ft/d - feet/day

Kx - horizontal hydraulic conductivity Kz - vertical hydraulic conductivity

KM Horizon Model Report Lost Creek Uranium ISR Project

December 2015

The simulated production period of 585 days was immediately followed by simulation of aquifer restoration. LC ISR has indicated that restoration at RA3 will include groundwater sweep (GWS) for an equivalent of 1/3 of a PV followed by reverse osmosis (RO) treatment and reinjection for 6 PVs. For purposes of this modeling effort, only GWS was simulated, although for a total of 4 PV instead of 1/3 PV. The longer simulation of GWS than is actually planned provides a better representation of the extended period of restoration (and maintenance of an inward hydraulic gradient) that will occur with the inclusion of RO.