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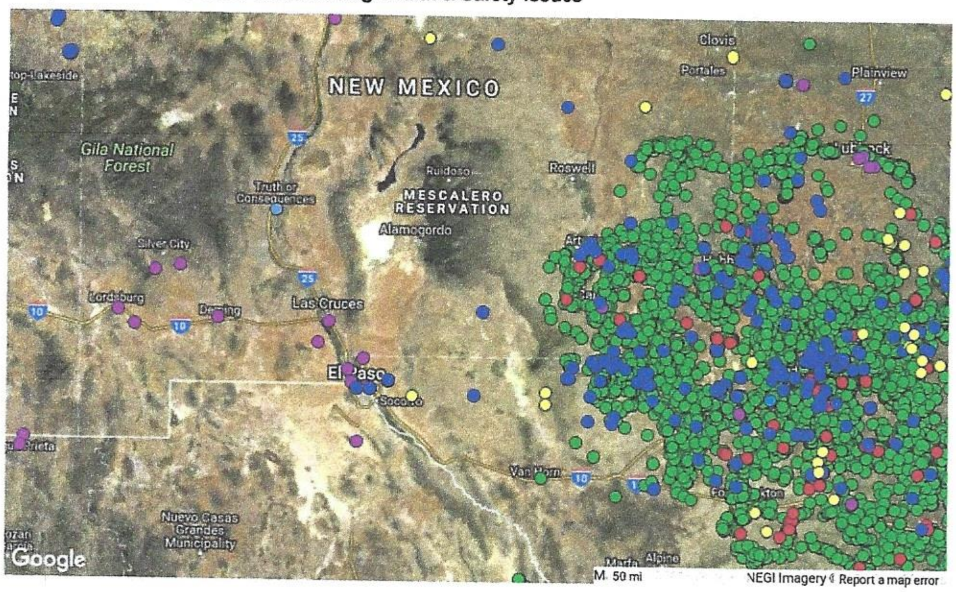

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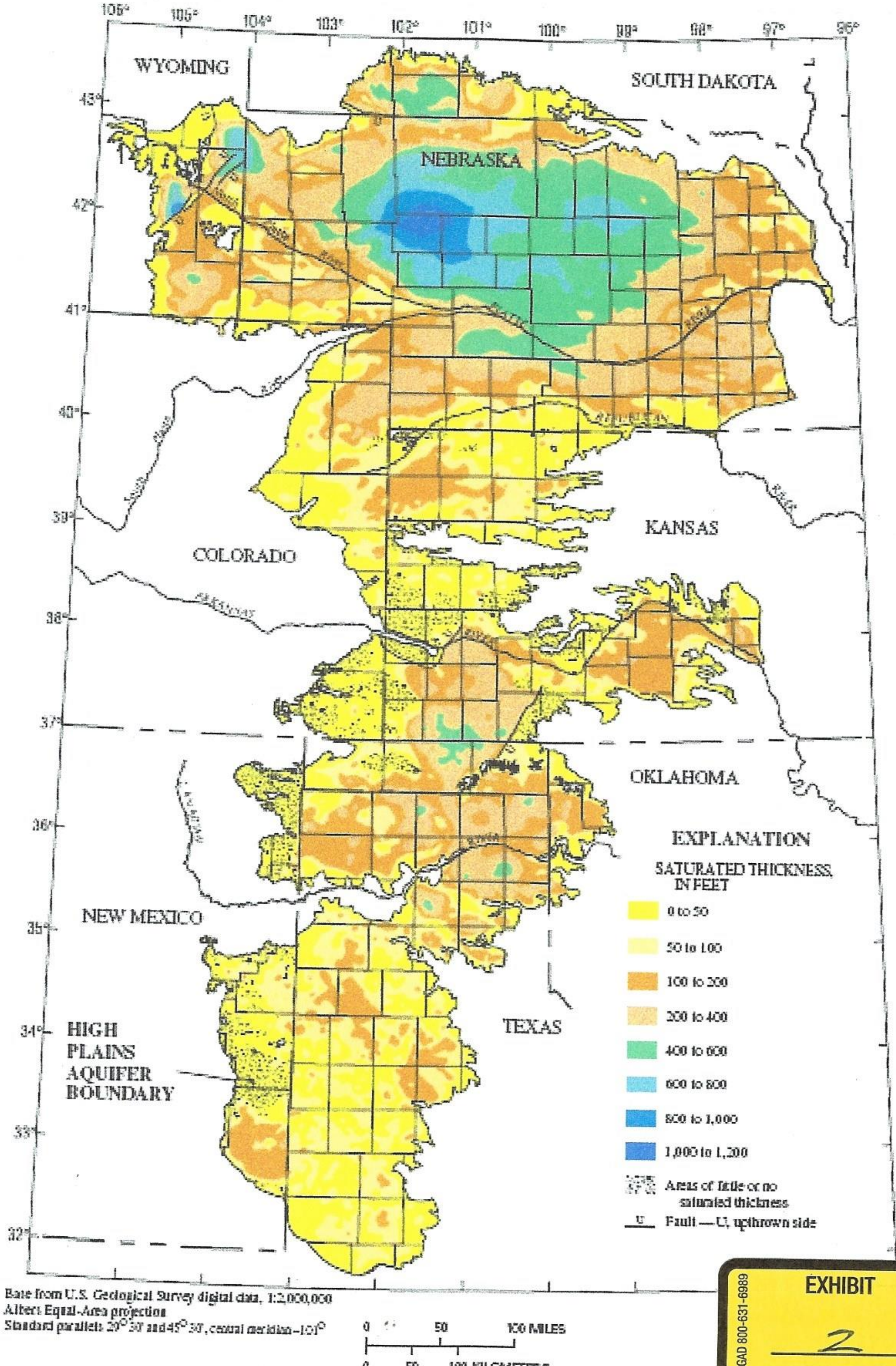

EXHIBIT 2

Figure 14. Saturated thickness of the High Plains aquifer, 2000. (Modified from Weeks and Gutentag, 1981.)

Occurrence of Groundwater at the Compact Waste Facility Waste Control Specialists Facility Andrews County, Texas

STATE OF TEXAS
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Geology
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May 3, 2012

Introduction

Groundwater (i.e., saturated conditions) exists in the buffer zone of the Compact Waste Facility (CWF) as well as in the CWF itself (figures 1 and 2). The groundwater occurs in two hydrologic units: the OAG unit[1] and the upper portion of the Dockum Group (aka red beds)[2] (figure 3). The OAG is the uppermost aquifer at the WCS facility[3]. Groundwater occurrence may be transient. That is, water levels fluctuate and a portion of the OAG or Dockum may be saturated at one time, and unsaturated at another[4].

Table 1 lists the wells where water has been measured within the buffer zone around the CWF, or within the CWF.

Table 1
Wells with Water at CWF[5]

Well ID	Location	Notes[6]
CWF-4A[7]	CWF buffer zone	Fluctuating water level. First dry, then rose into OAG. Water currently below screen slots[8]. Bottom of screen in Dockum.
OAG-21[9]	CWF buffer zone	Water in OAG.
OAG-22[10]	CWF buffer zone	Water in OAG.
TP-173[11]	CWF buffer zone	Fluctuating water level. First found in Dockum, then rose into OAG. Water currently below screen slots. Bottom of screen in Dockum.
OW-1[12]	Within CWF	Water found below screen slots. Currently dry. Bottom of screen in Dockum.
OW-2[13]	Within CWF	Water found above and below screen slots. Bottom of screen in Dockum.

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[1] The OAG unit consists of the Ogallala, Antlers, and Gatuña formations (WCS, 2007a, page 5-13).
[2] See hydrographs in INTERA/Cook-Joyce, 2012a. In this report, the upper portion of the Dockum refers to the portion within ten feet of the base of the OAG. At the CWF, this is approximately 25 to 40 feet below land surface (see lithology for wells OW-1 and OW-2 in WCS, 2012d; and lithology for wells OAG-21 and OAG-22 in Cook-Joyce, 2011a).
[3] Based on productivity reported in WCS, 2012c: 23,250 gallons between end of November and end of March.
[4] See, for example, hydrographs for wells AP-16, CWF-4A, TP-19, TP-122, and TP-173 (INTERA/Cook-Joyce, 2012a).
[5] Other wells at the CWF may also have contained water in the past. Available records were not complete.
[6] Construction information for these wells is given in attachment 1.
[7] INTERA/Cook-Joyce, 2012a.
[8] When water is found below the screen slots it is in the end cap – a short length (about six inches) of unperforated pipe attached to the bottom of the screen. When water is below the screen slots it means that the water table in the surrounding aquifer is below the bottom of the screen.
[9] WCS, 2012a; and INTERA/Cook-Joyce, 2012a.
[10] WCS, 2012a; and INTERA/Cook-Joyce, 2012a.
[11] WCS, 2012a; and INTERA/Cook-Joyce, 2012a.
[12] WCS, 2012a.
[13] WCS, 2012a.

The water levels measured in the wells in table 1 ranged from approximately 3437 feet above sea level (fasl)[14] to approximately 3444 fasl[15]. All of these levels are above the proposed bottom of the CWF. When excavated, the bottom of the CWF will be at an elevation of approximately 3383 fasl[16].

Discussion

Sources of water in wells

Water in the wells comes primarily from two sources.

1. Infiltration (recharge) of rainwater or snowmelt from the surface. Water tables in the OAG unit and the Dockum Group rise and fall in response to variations in recharge[17]. Much of the recharge at the WCS facility occurs through playas[18].

2. Lateral movement of groundwater. Groundwater is not static, it moves. Groundwater may flow from one saturated area to another, or may flow from a saturated area to an unsaturated area.

Condensation as a source of water in well OW-2

Waste Control Specialists (WCS) appears to believe that the water found in well OW-2 is the result of condensation flowing down the well bore and collecting in the end cap below the screen[19]. However, there are several reasons to doubt that all the water measured in OW-2 is the result of condensation:

- The well was dry from the time it was installed (January 4, 2012) until March 9, 2012[20]. What changes in conditions would cause condensation to suddenly begin forming at a rate high enough to fill the end cap[21]? This has not been explained[22].

- Wells OW-1 and OW-2 are similar. They are constructed of the same materials, penetrate similar materials, and are screened over approximately the same depths[23]. They were installed on the same day and are less than 100 feet apart[24]. However, water was found in OW 1 only once, the same day it was first found in

[14] Well CWF-4A, INTERA/Cook-Joyce, 2012a.
[15] OAG-22, INTERA/Cook-Joyce, 2012a.
[16] WCS, 2007a, figure 6-5r.
[17] See hydrographs in INTERA/Cook-Joyce, 2012a. At the CWF, water in well CWF-4A rose into the OAG after a rainfall (INTERA/Cook-Joyce, 2012a), and he highest water levels measured in well OW-2 occurred a number of days a rainfall (WCS, 2012a; and WCS, 2012b, table 5).
[18] WCS, 2007a, page 6-16.
[19] WCS, 2012c.
[20] WCS, 2012a.
[21] The depth of water in OW-2 on March 9th was 0.59 feet (WCS, 2012c). The length of the end cap (from bottom of cap to bottom of screen is 0.63 feet (calculated from data in attachment 1).
[22] It should be noted that the presumed source of the condensate, the screened interval, is more than 20 feet below land surface (WCS, 2012d).
[23] See well construction diagrams in WCS, 2012d.
[24] WCS, 2012d.

OW-2[25]. On the other hand, water was found in OW-2 from March 9 through March 31[26]. If the water in OW-2 was caused by condensation, why didn't condensation also cause water to collect in well OW-1 after March 9? This has not been explained.

- The water level in OW-2 has been found to be above the bottom of the screen slots[27]. Why didn't the water to leak out into the sand filter that occupies the space between the well screen and the surrounding formation? The most likely answer is; it didn't leak out because the water table in the Dockum was above the bottom of the screen slots. Thus, the water in OW-2 came from the Dockum.[28]

Groundwater saturation in the upper portion of the Dockum Group

Portions of the upper Dockum (within ten feet of the base of the OAG) are saturated at least part of the time at the WCS facility[29]. However, WCS does not appear to have thoroughly investigated the upper portion of the Dockum at the CWF. This is a serious oversight because 1) there is clear evidence that the upper Dockum is saturated in some areas of the CWF[30], and 2) other portions of the upper Dockum may be saturated at the CWF.

New Buffer Zone

Groundwater is present in the buffer zone along the south-eastern boundary of the CWF[31]. Presumably, a new buffer zone will be established to the west of this buffer zone. However, WCS does not appear to have installed monitor wells to determine whether groundwater is present in the new buffer zone.

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[25] WCS, 2012a.
[26] March 31 is the last day for which measurements are available (WCS, 2012a).
[27] Compare water levels shown in WCS, 2012a with the elevation of the screen slots given in attachment 1.
[28] The water found in OW-1 on March 9th could be the result of condensation. However, it could also be the result of water in the Dockum briefly rising above the lower screen slots in OW-1.
[29] See hydrographs for wells where the water table is below the OAG/Dockum contact: e.g., A-16, TP-12, TP-19, TP-36, TP-48, TP-49, TP-63, TP-105, and TP-122 (INTERA/Cook-Joyce, 2012a). In addition, the upper portion of the Dockum is almost certainly saturated in areas where the overlying OAG is saturated. See, for example, hydrographs for wells OAG-21, OAG-22, TP-71, TP-94, TP-111, TP-117, and TP-118 (INTERA/Cook-Joyce, 2012a).
[30] As shown by the presence of water in wells OW-2, OAG-21, OAG-22, and TP-173 (WCS, 2012a; and INTERA/Cook-Joyce, 2012a).
[31] Wells OAG-21 and OAG-22 (INTERA/Cook-Joyce, 2012a).

Conclusions and Recommendations

1. Groundwater exists in the buffer zone surrounding the CWF. The groundwater occurs in both the OAG unit and the upper portion of the Dockum Group[32].

2. Groundwater exists within the CWF. At least some of the water found in well OW-2 is from the upper portion of the Dockum Group.

3. Groundwater levels at the CWF fluctuate. Thus, some portions of the OAG unit and the upper Dockum Group are alternately saturated and unsaturated.

4. To the northwest of the CWF, a lobe of groundwater in the OAG appears to have advanced toward, and then retreated from, the CWF (see addendum). There does not appear to be anything to prevent this groundwater from entering the CWF in the future.

5. WCS should install a system of monitor wells to investigate groundwater conditions in the upper portion of Dockum Group at the CWF.

6. WCS should install monitor wells in any new buffer zones at the CWF.

References

Cook-Joyce, 2011a, boring logs for wells OAG-21 and OAG-22, June 21, 2011.

INTERA/Cook-Joyce, 2012a, map, *OAG Well Hydrographs – Facilities Area, March 2012*, issued April 10, 2012.

Waste Control Specialists LLC (WCS), 2007a, *Application for License to Authorize Near-Surface Land Disposal of Low-Level Radioactive Waste*, March 16, 2007.

WCS, 2012a, *Monthly Report of Water Level Measurements from OW-1, OW-2, OAG-21, OAG-22, and TP-173*, letter to TCEQ, April 3, 2012.

WCS, 2012b, *Monthly OAG Water Level Report Submitted in Support of LC 44 in RML No. R05807 and LC 70 in RML No. R04100, Waste Control Specialists LLC, Andrews County, Texas*, letter to TCEQ, April 10, 2012.

WCS, 2012c, *Observations at OW-1 and OW-2 and Progress at OAG-21*, letter to TCEQ, March 28, 2012.

WCS, 2012d, *Completed Activities for Area of Concern Regarding the Detection of Water in OAG Wells in CWF Buffer Zone, Radioactive Material License No. R04100 and License Condition 175*, letter to TCEQ, February 3, 2012.

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[32] See hydrographs for wells CWF-4A, OAG-21, OAG-22, and TP-173 (INTERA/Cook-Joyce, 2012a). Note, the buffer zone may have been re-defined and wells OAG-21, OAG-22, and TP-173 may not be in the new buffer zone.

Attachment 1
Construction Information for Wells in Table 1[33]

Well ID	Top of casing (famsl)[34]	Total well depth (ft, btoc)[35]	Bottom of screen slots (famsl)	Top of Red beds (famsl)
CWF-4A	3471.65	34.52	3437.78	3438.57
OAG-21	3471.57	35.18	3437.01	3439.65
OAG-22	3473.01	34.27	3439.36	3442.88
TP-173	3470.96	30.34	3441.24	3443.36
OW-1	3470.31	27.87	3443.07	3445.77
OW-2	3468.48	28.67	3440.44	3442.88

33 Data from WCS, 2012b, table 1.
34 famsl: feet above mean sea level.
35 btoc: below top of casing.

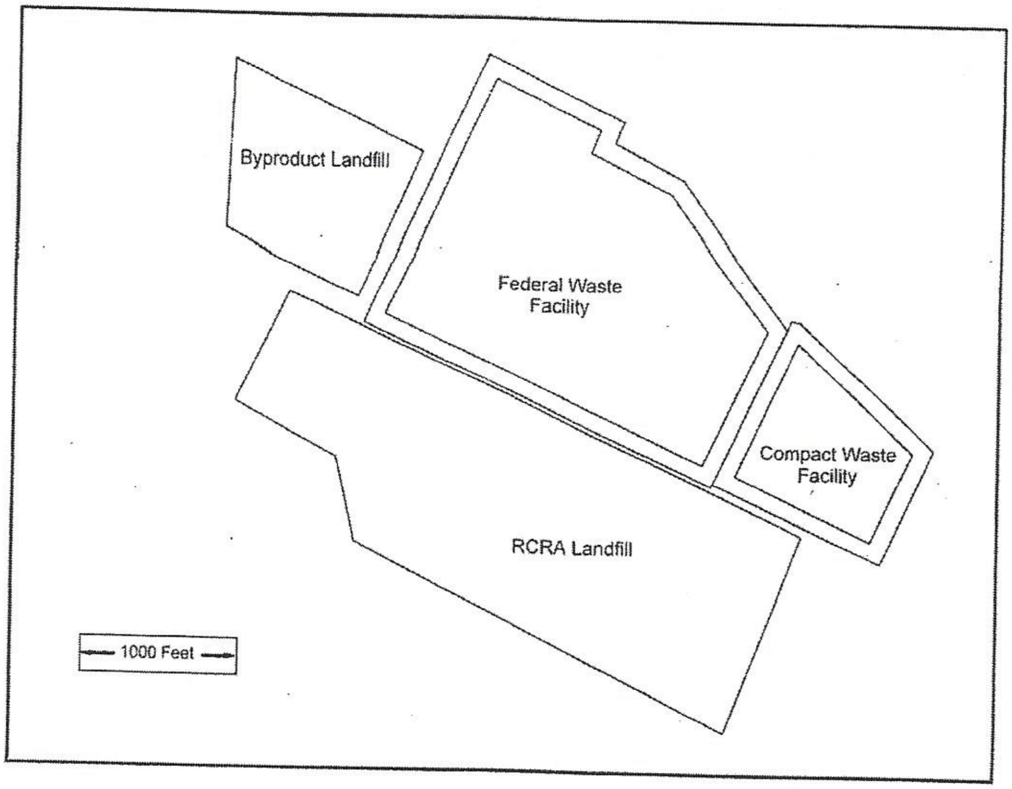

Figure 1
WCF Facility

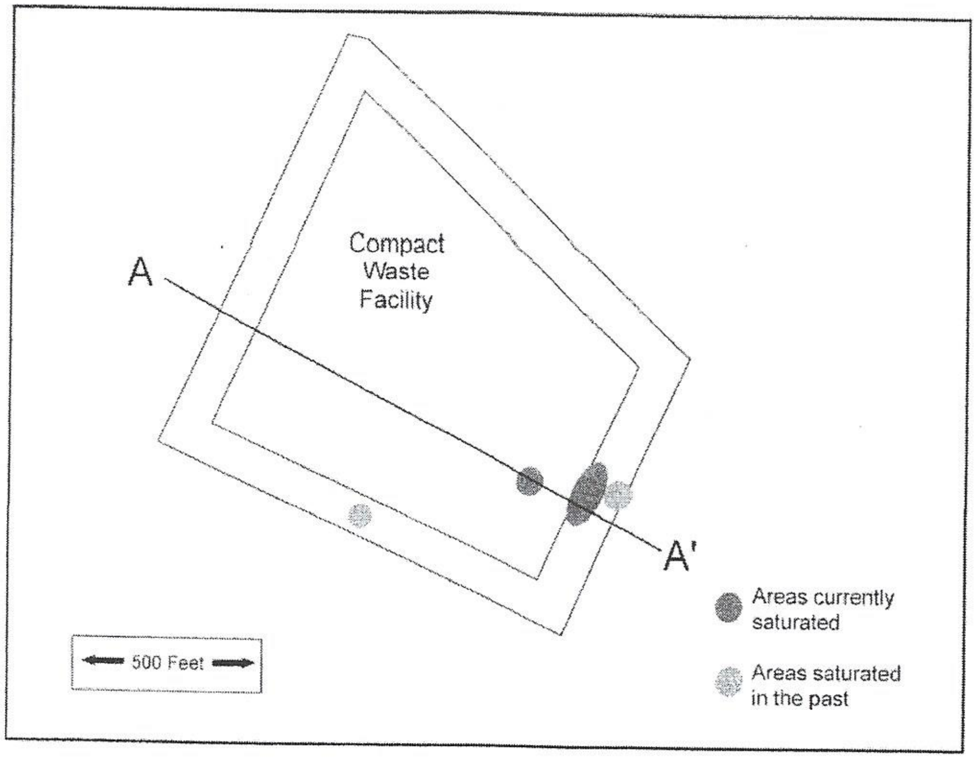

Figure 2
CWF, Map View

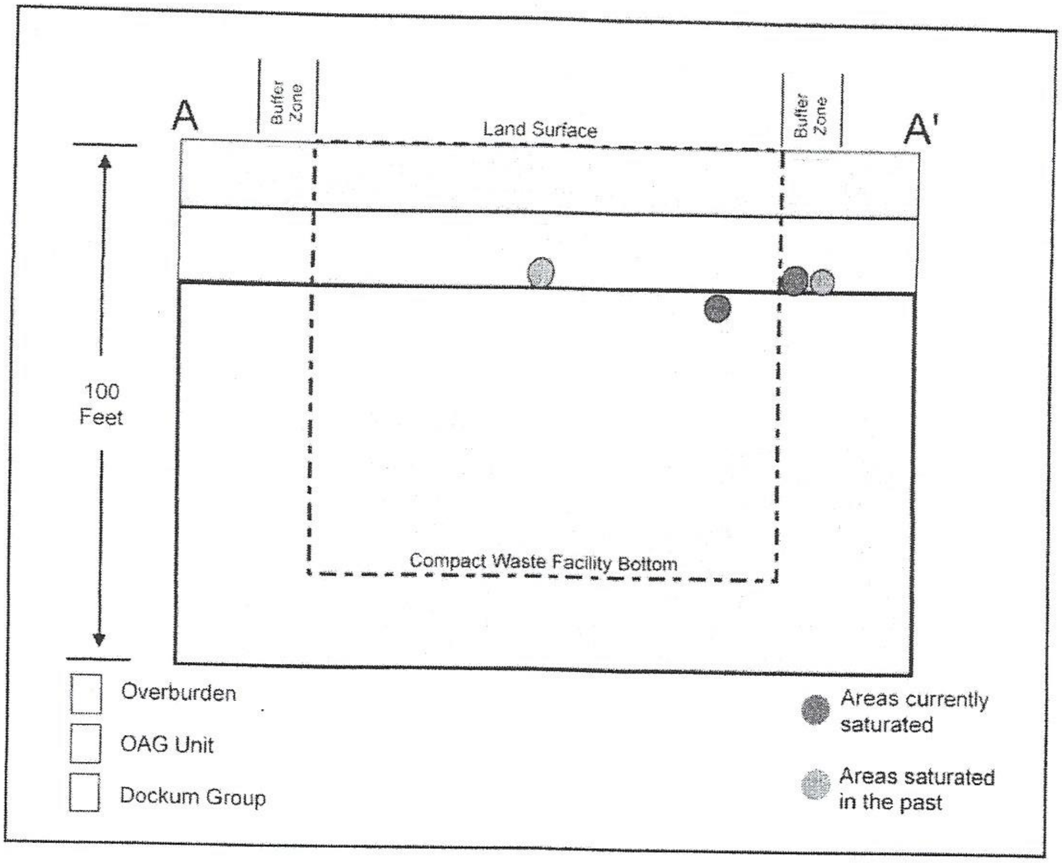

Figure 3
CWF, Schematic Cross-Section

Addendum

There is a lobe of groundwater in the OAG that extends toward the northwest corner of the CWF[36] (figure A-1). The groundwater is now approximately 250 feet from the CWF buffer zone[37]. However, in 2006 the lobe appears to have extended within 50 feet of the buffer[38]. At that time the lobe actually extended into the CWF[39]. The boundary of the CWF has been changed and the portion of the CWF that contained the groundwater is now outside of the boundary[40].

In the past six years the lobe of groundwater in the OAG appears to have advanced toward, and retreated from, the CWF. In the future, groundwater in the OAG may advance into the CWF. There does not appear to be anything to prevent this from happening.

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36 INTERA/Cook-Joyce, 2012b.

37 As of March 2012 (INTERA/Cook-Joyce, 2012b).

38 Based on two feet of water above the OAG/Dockum contact in well TP-39 (WCS, 2007a, figure 6-3a). Another nearby well, TP-19, contained 0.5 feet of water. WCS shows the saturated zone around wells TP-39 and TP-19 as being isolated from the main body of groundwater. However, there were no wells between the saturated zone around wells TP-39 and TP-19 and the main body of groundwater. Thus, there is no reason to believe that the groundwater found in TP-39 and TP-19 was separated from the main body of groundwater.

39 WCS, 2007a, figure 6-3a.

40 The well within the CWF that contained groundwater in 2006 (TP-39) is now approximately 50 feet outside of the current CWF buffer zone (INTERA/Cook-Joyce, 2012b).

Isotope	40 GWd/MTU W/MTU Time since discharge (yr)		40 GWd/MTU Ci/MTU Time since discharge (yr)		Half-lifet τ (yr)	ln(2)/τ	W/assembly 1 yr	3 yr	4 yr	U wt/PWR assembly 1017.23 lb 461.4155 kg 0.461416 MTU 10yr	25 yr	U wt/BWR assembly 0.1977 MTU wt ratio BWR/PWR 50 yr		29 x 10yr-4 0.428464	8x10yr-60	sum		12yr	16yr	31yr
	1	10	1	10																
H-3			8.43E+02	5.09E+02	1.24E+01															
C-14			2.05E+00	2.05E+02																
Mn-54			1.49E+02																	
Fe-55			2.54E+03	2.31E+02	2.60E+00															
Co-58			3.75E+01																	
Co-60	4.04E+01	1.24E+01	2.62E+03	8.01E+02	5.26E+00	1.32E-01	1.86E+01	1.43E+01	1.26E+01	5.70E+00	7.91E-01	2.94E-02		1.65E+02	166.0864	3.31E+02	Co-60	4.38E+00	2.59E+00	3.59E-01
Ni-59			1.39E+00	1.39E+00													Ni-59			
Ni-63			2.08E+02	1.94E+02	8.95E+01												Ni-63			
Zn-65			3.56E+01														Zn-65			
Kr-85	1.43E+01	2.97E+00	9.52E+03	5.32E+03	1.07E+01	6.47E-02	6.60E+00	5.80E+00	5.43E+00	3.69E+00	1.40E+00	2.78E-01		1.07E+02	41.2106	1.48E+02	Kr-85	3.24E+00	2.50E+00	9.48E-01
Sr-89	1.24E+01		3.59E+03														Sr-89			
Sr-90	9.51E+01	7.68E+01	8.20E+04	6.62E+04	2.91E+01	2.38E-02	4.39E+01	4.18E+01	4.09E+01	3.54E+01	2.48E+01	1.37E+01		1.03E+03	391.5135	1.42E+03	Sr-90	3.38E+01	3.07E+01	2.15E+01
Y-90	4.54E+02	3.67E+02	8.20E+04	6.62E+04	2.91E+01	2.38E-02	2.09E+02	2.00E+02	1.95E+02	1.69E+02	1.18E+02	6.53E+01		4.90E+03	1865.621	6.77E+03	Y-90	1.61E+02	1.47E+02	1.03E+02
Y-91	3.38E+01		9.41E+03														Y-91			
Zr-93			2.56E+00	2.56E+00													Zr-93			
Zr-95	1.10E+02		2.18E+04														Zr-95			
Nb-95	2.35E+02		4.89E+04														Nb-95			
Tc-99			1.56E+01	1.56E+01													Tc-99			
Ru-103			1.86E+03														Ru-103			
Ru-106	1.35E+01		2.28E+05	4.67E+02	1.01E+00												Ru-106			
Rh-106	2.18E+03	4.48E+00	2.28E+05	4.67E+02	1.01E+00	6.88E-01	1.01E+03	2.54E+02	1.28E+02	2.06E+00	6.81E-05	2.31E-12		5.97E+01	27.87565	8.76E+01	Rh-106	5.21E-01	3.32E-02	1.10E-06
Ag-110m	2.72E+01		1.63E+03														Ag-110m			
Sn-119m			3.83E+03														Sn-119m			
Sn-126			8.88E-01	8.88E-01													Sn-126			
Sb-125	3.90E+01	4.10E+00	1.25E+04	1.31E+03	2.77E+00	2.51E-01	1.80E+01	1.09E+01	8.48E+00	1.89E+00	4.39E-02	8.35E-05		5.47E+01	20.77477	7.55E+01	Sb-125	1.14E+00	4.19E-01	9.77E-03
Te-125m			3.04E+03	3.20E+02	2.77E+00												Te-125m			
I-129			3.73E-02	3.73E-02													I-129			
Cs-134	1.29E+03	6.26E+01	1.27E+05	6.15E+03	2.06E+00	3.36E-01	5.95E+02	3.04E+02	2.17E+02	2.88E+01	1.85E-01	4.13E-05		8.36E+02	475.9554	1.31E+03	Cs-134	1.47E+01	3.83E+00	2.46E-02
Cs-137	1.32E+02	1.07E+02	1.19E+05	9.66E+04	2.99E+01	2.32E-02	6.09E+01	5.81E+01	5.68E+01	4.94E+01	3.49E+01	1.96E+01		1.43E+03	588.2892	2.02E+03	Cs-137	4.72E+01	4.30E+01	3.04E+01
Ba-137m	4.42E+02	3.59E+02	1.12E+05	9.14E+04	3.07E+01	2.26E-02	2.04E+02	1.95E+02	1.90E+02	1.66E+02	1.17E+02	6.55E+01		4.80E+03	1986.723	6.79E+03	Ba-137m	1.58E+02	1.44E+02	1.02E+02
Ce-144	2.03E+02		3.06E+05	1.01E+02	7.78E-01												Ce-144			
Pr-144	2.25E+03		3.06E+05	1.01E+02	7.78E-01												Pr-144			
Pr-144m			3.67E+03	0.00E+00													Pr-144m			
Pm-147	3.17E+01	2.94E+00	8.80E+05	8.20E+03	1.33E+00	5.20E-01	1.46E+01	5.17E+00	3.08E+00	1.36E-01	5.62E-05	1.29E-10		3.95E+00	11.53891	1.55E+01	Pm-147	4.82E-02	6.04E-03	2.49E-06
Sm-151			3.80E+02	3.55E+02	9.17E+01												Sm-151			
Eu-154	1.17E+02	5.64E+01	1.30E+04	6.31E+03	8.63E+00	8.03E-02	5.40E+01	4.60E+01	4.24E+01	2.62E+01	7.86E+00	1.05E+00		7.60E+02	374.1545	1.13E+03	Eu-154	2.23E+01	1.62E+01	4.85E+00
Eu-155			7.46E+03	2.12E+03	4.96E+00												Eu-155			
Np-239			2.83E+01	2.83E+01									35	40						
Pu-238	1.34E+02	1.28E+02	4.06E+03	3.85E+03	1.17E+02	5.90E-03	6.18E+01	6.11E+01	6.07E+01	5.86E+01	5.37E+01	4.63E+01						5.79E+01	5.66E+01	5.18E+01
Pu-239	9.44E+00	9.44E+00	3.06E+02	3.06E+02	2.41E+04	2.88E-05	4.36E+00	4.36E+00	4.36E+00	4.35E+00	4.35E+00	4.35E+00						4.35E+00	4.35E+00	4.35E+00
Pu-240	1.75E+01	1.76E+01	5.63E+02	5.65E+02	-1.76E+03	-3.94E-04	8.07E+00	8.08E+00	8.08E+00	8.10E+00	8.15E+00	8.23E+00						8.11E+00	8.12E+00	8.17E+00
Pu-241	4.24E+00	2.75E+00	1.37E+05	8.87E+04	1.44E+01	4.83E-02	1.95E+00	1.77E+00	1.68E+00	1.25E+00	5.96E-01	1.73E-01						1.13E+00	9.30E-01	4.43E-01
Am-241	1.45E+01	6.71E+01	4.36E+02	2.02E+03	-4.07E+00	-1.70E-01	6.68E+00	1.55E+01	1.60E+01	3.09E+01	5.27E+01	8.69E+01	5.99E+01	6.22E+01				3.49E+01	4.17E+01	5.75E+01
Am-243	9.10E-01	9.09E-01	2.83E+01	2.83E+01									3.40E+02	3.40E+02						
Cm-242	5.91E+02		1.60E+04	1.09E+01	8.56E-01	8.10E-01														
Cm-243	1.34E+00	1.07E+00	3.64E+01	2.92E+01	2.83E+01	2.45E-02	6.18E-01	5.89E-01	5.75E-01	4.96E-01	3.44E-01	1.86E-01						4.72E-01	4.28E-01	2.97E-01
Cm-244	1.31E+02	9.30E+01	3.75E+03	2.66E+03	1.82E+01	3.82E-02	6.04E+01	5.60E+01	5.39E+01	4.29E+01	2.42E+01	9.32E+00						3.97E+01	3.41E+01	1.92E+01
Other	1.24E+01	7.85E+00	4.95E+03	2.15E+01	1.15E+00	6.04E-01	5.72E+00	1.71E+00	9.34E-01	2.49E-02	2.87E-06	7.89E-13						7.42E-03	6.62E-04	7.65E-08
Other-AC			1.94E+03	1.84E+03	1.18E+02															
TOTAL	**8.64E+03**	**1.38E+03**	**2.79E+06**	**4.54E+05**			**2.38E+03**	**1.28E+03**	**1.05E+03**	**6.35E+02**	**4.49E+02**	**3.21E+02**	**4.00E+02**	**4.02E+02**				**5.93E+02**	**5.36E+02**	**4.04E+02**
FP	7.68E+03	1.04E+03	2.61E+06	3.52E+05		3.98E+00														

years	Ci/MTU Pu-241	Ci/MTU Am-241	BWR Ci/assembly Pu-241	BWR Ci/assembly Am-241
1	1.37E+05	4.36E+02	2.71E+04	8.62E+01
3	1.24E+05	1.01E+03	2.45E+04	1.99E+02
4	1.18E+05	1.05E+03	2.33E+04	2.07E+02
10	8.77E+04	2.01E+03	1.73E+04	3.98E+02
12	7.95E+04	2.27E+03	1.57E+04	4.50E+02
16	6.52E+04	2.72E+03	1.29E+04	5.38E+02
25	4.18E+04	3.44E+03	8.25E+03	6.79E+02
31	3.10E+04	3.75E+03	6.13E+03	7.41E+02
35	2.54E+04	3.91E+03	5.03E+03	7.72E+02
40	1.99E+04	4.05E+03	3.93E+03	8.02E+02
50	1.21E+04	5.67E+03	2.39E+03	1.12E+03

Isotope	40 GWd/MTU W/MTU Time since discharge (yr) 1	10	40 GWd/MTU Ci/MTU Time since discharge (yr) 1	10	Half-lifet τ (yr)	ln(2)/τ	PWR 40 GWd/MTU Ci/assembly 1 yr	3 yr	4 yr	10yr	25 yr	50 yr
H-3			8.43E+02	5.09E+02	1.24E+01	5.61E-02	3.89E+02	3.48E+02	3.29E+02	2.35E+02	1.01E+02	2.49E+01
C-14			2.05E+00	2.05E+02	5.73E+03	1.21E-04	9.46E-01	9.46E-01	9.46E-01	9.45E-01	9.43E-01	9.40E-01
Mn-54			1.49E+02					6.88E+01	6.88E+01	6.88E+01	6.88E+01	6.88E+01
Fe-55			2.54E+03	2.31E+02	2.60E+00	2.66E-01	1.17E+03	6.88E+02	5.27E+02	1.07E+02	1.96E+00	2.51E-03
Co-58			3.75E+01					1.73E+01	1.73E+01	1.73E+01	1.73E+01	1.73E+01
Co-60	4.04E+01	1.24E+01	2.62E+03	8.01E+02	5.26E+00	1.32E-01	1.21E+03	9.29E+02	8.14E+02	3.70E+02	5.13E+01	1.91E+00
Ni-59			1.39E+00	1.39E+00	7.60E+04	9.12E-06	6.41E-01	6.41E-01	6.41E-01	6.41E-01	6.41E-01	6.41E-01
Ni-63			2.08E+02	1.94E+02	8.95E+01	7.74E-03	9.60E+01	9.45E+01	9.38E+01	8.95E+01	7.97E+01	6.57E+01
Zn-65			3.56E+01					1.64E+01	1.64E+01	1.64E+01	1.64E+01	1.64E+01
Kr-85	1.43E+01	2.97E+00	9.52E+03	5.32E+03	1.07E+01	6.47E-02	4.39E+03	3.86E+03	3.62E+03	2.45E+03	9.31E+02	1.85E+02
Sr-89	1.24E+01		3.59E+03					1.66E+03	1.66E+03	1.66E+03	1.66E+03	1.66E+03
Sr-90	9.51E+01	7.68E+01	8.20E+04	6.62E+04	2.91E+01	2.38E-02	3.78E+04	3.61E+04	3.52E+04	3.05E+04	2.14E+04	1.18E+04
Y-90	4.54E+02	3.67E+02	8.20E+04	6.62E+04	2.91E+01	2.38E-02	3.78E+04	3.61E+04	3.52E+04	3.05E+04	2.14E+04	1.18E+04
Y-91	3.38E+01		9.41E+03					4.34E+03	4.34E+03	4.34E+03	4.34E+03	4.34E+03
Zr-93			2.56E+00	2.56E+00			1.18E+00	1.18E+00	1.18E+00	1.18E+00	1.18E+00	1.18E+00
Zr-95	1.10E+02		2.18E+04					1.01E+04	1.01E+04	1.01E+04	1.01E+04	1.01E+04
Nb-95	2.35E+02		4.89E+04					2.26E+04	2.26E+04	2.26E+04	2.26E+04	2.26E+04
Tc-99			1.56E+01	1.56E+01			7.20E+00	7.20E+00	7.20E+00	7.20E+00	7.20E+00	7.20E+00
Ru-103			1.86E+03					8.58E+02	8.58E+02	8.58E+02	8.58E+02	8.58E+02
Ru-106	1.35E+01		2.28E+05	4.67E+02	1.01E+00	6.88E-01	1.05E+05	2.66E+04	1.34E+04	2.15E+02	7.12E-03	2.42E-10
Rh-106	2.18E+03	4.48E+00	2.28E+05	4.67E+02	1.01E+00	6.88E-01	1.05E+05	2.66E+04	1.34E+04	2.15E+02	7.12E-03	2.42E-10
Ag-110m	2.72E+01		1.63E+03					7.52E+02	7.52E+02	7.52E+02	7.52E+02	7.52E+02
Sn-119m			3.83E+03					1.77E+03	1.77E+03	1.77E+03	1.77E+03	1.77E+03
Sn-126			8.88E-01	8.88E-01				4.10E-01	4.10E-01	4.10E-01	4.10E-01	4.10E-01
Sb-125	3.90E+01	4.10E+00	1.25E+04	1.31E+03	2.77E+00	2.51E-01	5.77E+03	3.49E+03	2.72E+03	6.04E+02	1.41E+01	2.68E-02
Te-125m			3.04E+03	3.20E+02	2.77E+00	2.50E-01	1.40E+03	8.51E+02	6.62E+02	1.48E+02	3.46E+00	6.67E-03
I-129			3.73E-02	3.73E-02			1.72E-02	1.72E-02	1.72E-02	1.72E-02	1.72E-02	1.72E-02
Cs-134	1.29E+03	6.26E+01	1.27E+05	6.15E+03	2.06E+00	3.36E-01	5.86E+04	2.99E+04	2.14E+04	2.84E+03	1.83E+01	4.06E-03
Cs-137	1.32E+02	1.07E+02	1.19E+05	9.66E+04	2.99E+01	2.32E-02	5.49E+04	5.24E+04	5.12E+04	4.46E+04	3.15E+04	1.76E+04
Ba-137m	4.42E+02	3.59E+02	1.12E+05	9.14E+04	3.07E+01	2.26E-02	5.17E+04	4.94E+04	4.83E+04	4.22E+04	3.01E+04	1.71E+04
Ce-144	2.03E+02		3.06E+05	1.01E+02	7.78E-01	8.91E-01	1.41E+05	2.38E+04	9.76E+03	4.66E+01	7.35E-05	1.57E-14
Pr-144	2.25E+03		3.06E+05	1.01E+02	7.78E-01	8.91E-01	1.41E+05	2.38E+04	9.76E+03	4.66E+01	7.35E-05	1.57E-14
Pr-144m			3.67E+03	0.00E+00			1.69E+03	1.69E+03	1.69E+03	1.69E+03	1.69E+03	1.69E+03
Pm-147	3.17E+01	2.94E+00	8.80E+05	8.20E+03	1.33E+00	5.20E-01	4.06E+05	1.44E+05	8.54E+04	3.78E+03	1.56E+00	3.57E-06
Sm-151			3.80E+02	3.55E+02	9.17E+01	7.56E-03	1.75E+02	1.73E+02	1.71E+02	1.64E+02	1.46E+02	1.21E+02
Eu-154	1.17E+02	5.64E+01	1.30E+04	6.31E+03	8.63E+00	8.03E-02	6.00E+03	5.11E+03	4.71E+03	2.91E+03	8.73E+02	1.17E+02
Eu-155			7.46E+03	2.12E+03	4.96E+00	1.40E-01	3.44E+03	2.60E+03	2.26E+03	9.78E+02	1.20E+02	3.65E+00
Np-239			2.83E+01	2.83E+01			1.31E+01	1.31E+01	1.31E+01	1.31E+01	1.31E+01	1.31E+01
Pu-238	1.34E+02	1.28E+02	4.06E+03	3.85E+03	1.17E+02	5.90E-03	1.87E+03	1.85E+03	1.84E+03	1.78E+03	1.63E+03	1.40E+03
Pu-239	9.44E+00	9.44E+00	3.06E+02	3.06E+02	2.41E+04	2.88E-05	1.41E+02	1.41E+02	1.41E+02	1.41E+02	1.41E+02	1.41E+02
Pu-240	1.75E+01	1.76E+01	5.63E+02	5.65E+02	-1.76E+03	-3.94E-04	2.60E+02	2.60E+02	2.60E+02	2.61E+02	2.62E+02	2.65E+02
Pu-241	4.24E+00	2.75E+00	1.37E+05	8.87E+04	1.44E+01	4.83E-02	6.32E+04	5.74E+04	5.47E+04	4.09E+04	1.98E+04	5.93E+03
Am-241	1.45E+01	6.71E+01	4.36E+02	2.02E+03	-4.07E+00	-1.70E-01	2.01E+02	2.83E+02	3.35E+02	9.32E+02	1.20E+04	8.49E+05
Am-243	9.10E-01	9.09E-01	2.83E+01	2.83E+01			1.31E+01	1.31E+01	1.31E+01	1.31E+01	1.31E+01	1.31E+01
Cm-242	5.91E+02		1.60E+04	1.09E+01	8.56E-01	8.10E-01	7.38E+03	1.46E+03	6.50E+02	5.03E+00	2.65E-05	4.24E-14
Cm-243	1.34E+00	1.07E+00	3.64E+01	2.92E+01	2.83E+01	2.45E-02	1.68E+01	1.60E+01	1.56E+01	1.35E+01	9.33E+00	5.06E+00
Cm-244	1.31E+02	9.30E+01	3.75E+03	2.66E+03	1.82E+01	3.82E-02	1.73E+03	1.60E+03	1.54E+03	1.23E+03	6.92E+02	2.67E+02
Other	1.24E+01	7.85E+00	4.95E+03	2.15E+01	1.15E+00	6.04E-01	5.72E+00	1.71E+00	9.34E-01	2.49E-02	2.87E-06	7.89E-13
Other-AC			1.94E+03	1.84E+03	1.18E+02							
TOTAL	**8.64E+03**	**1.38E+03**	**2.79E+06**	**4.54E+05**			**1.24E+06**	**5.72E+05**	**4.41E+05**	**2.52E+05**	**1.85E+05**	**9.59E+05**

35 40

W/Ci Pu-241 3.09E-05

	BWR 40 GWd/MTU Ci/assembly 1 yr	3 yr	4 yr	10yr	25 yr	50 yr	W/Ci	BWR 40 GWD/MTU W/assembly 1 yr	3 yr	4 yr	10yr	25 yr	50 yr
H-3	1.67E+02	1.49E+02	1.41E+02	1.01E+02	4.34E+01	1.07E+01							
C-14	4.05E-01	4.05E-01	4.05E-01	4.05E-01	4.04E-01	4.03E-01							
Mn-54	0.00E+00	2.95E+01	2.95E+01	2.95E+01	2.95E+01	2.95E+01							
Fe-55	5.02E+02	2.95E+02	2.26E+02	4.57E+01	8.40E-01	1.08E-03							
Co-58	0.00E+00	7.41E+00	7.41E+00	7.41E+00	7.41E+00	7.41E+00							
Co-60	5.18E+02	3.98E+02	3.49E+02	1.58E+02	2.20E+01	8.17E-01	1.54E-02	7.99E+00	6.14E+00	5.38E+00	2.44E+00	3.39E-01	1.26E-02
Ni-59	2.75E-01	2.75E-01	2.75E-01	2.75E-01	2.75E-01	2.75E-01							
Ni-63	4.11E+01	4.05E+01	4.02E+01	3.84E+01	3.41E+01	2.81E+01							
Zn-65	0.00E+00	7.04E+00	7.04E+00	7.04E+00	7.04E+00	7.04E+00							
Kr-85	1.88E+03	1.65E+03	1.55E+03	1.05E+03	3.99E+02	7.92E+01	1.50E-03	2.83E+00	2.48E+00	2.33E+00	1.58E+00	5.99E-01	1.19E-01
Sr-89	0.00E+00	7.10E+02	7.10E+02	7.10E+02	7.10E+02	7.10E+02	3.45E-03		2.45E+00	2.45E+00	2.45E+00	2.45E+00	2.45E+00
Sr-90	1.62E+04	1.55E+04	1.51E+04	1.31E+04	9.16E+03	5.06E+03	1.16E-03	1.88E+01	1.79E+01	1.75E+01	1.52E+01	1.06E+01	5.86E+00
Y-90	1.62E+04	1.55E+04	1.51E+04	1.31E+04	9.16E+03	5.06E+03	5.54E-03	8.98E+01	8.56E+01	8.36E+01	7.25E+01	5.07E+01	2.80E+01
Y-91	0.00E+00	1.86E+03	1.86E+03	1.86E+03	1.86E+03	1.86E+03	3.59E-03		6.68E+00	6.68E+00	6.68E+00	6.68E+00	6.68E+00
Zr-93	5.06E-01	5.06E-01	5.06E-01	5.06E-01	5.06E-01	5.06E-01							
Zr-95	0.00E+00	4.31E+03	4.31E+03	4.31E+03	4.31E+03	4.31E+03	5.05E-03		2.17E+01	2.17E+01	2.17E+01	2.17E+01	2.17E+01
Nb-95	0.00E+00	9.67E+03	9.67E+03	9.67E+03	9.67E+03	9.67E+03	4.81E-03		4.65E+01	4.65E+01	4.65E+01	4.65E+01	4.65E+01
Tc-99	3.08E+00	3.08E+00	3.08E+00	3.08E+00	3.08E+00	3.08E+00							
Ru-103	0.00E+00	3.68E+02	3.68E+02	3.68E+02	3.68E+02	3.68E+02							
Ru-106	4.51E+04	1.14E+04	5.72E+03	9.23E+01	3.05E-03	1.04E-10	5.92E-05	2.67E+00	6.74E-01	3.39E-01	5.47E-03	1.81E-07	6.14E-15
Rh-106	4.51E+04	1.14E+04	5.72E+03	9.23E+01	3.05E-03	1.04E-10	9.56E-03	4.31E+02	1.09E+02	5.47E+01	8.83E-01	2.92E-05	9.92E-13
Ag-110m	0.00E+00	3.22E+02	3.22E+02	3.22E+02	3.22E+02	3.22E+02	1.67E-02		5.38E+00	5.38E+00	5.38E+00	5.38E+00	5.38E+00
Sn-119m	0.00E+00	7.57E+02	7.57E+02	7.57E+02	7.57E+02	7.57E+02	0.00E+00						
Sn-126	0.00E+00	1.76E-01	1.76E-01	1.76E-01	1.76E-01	1.76E-01	0.00E+00						
Sb-125	2.47E+03	1.50E+03	1.17E+03	2.59E+02	6.03E+00	1.15E-02	3.12E-03	7.71E+00	4.67E+00	3.64E+00	8.08E-01	1.88E-02	3.58E-05
Te-125m	6.01E+02	3.64E+02	2.84E+02	6.33E+01	1.48E+00	2.86E-03							
I-129	7.37E-03	7.37E-03	7.37E-03	7.37E-03	7.37E-03	7.37E-03							
Cs-134	2.51E+04	1.28E+04	9.15E+03	1.22E+03	7.82E+00	1.74E-03	1.02E-02	2.55E+02	1.30E+02	9.30E+01	1.24E+01	7.95E-02	1.77E-05
Cs-137	2.35E+04	2.25E+04	2.19E+04	1.91E+04	1.35E+04	7.56E+03	1.11E-03	2.61E+01	2.49E+01	2.43E+01	2.12E+01	1.50E+01	8.38E+00
Ba-137m	2.21E+04	2.12E+04	2.07E+04	1.81E+04	1.29E+04	7.32E+03	3.95E-03	8.74E+01	8.35E+01	8.17E+01	7.13E+01	5.08E+01	2.89E+01
Ce-144	6.05E+04	1.02E+04	4.18E+03	2.00E+01	3.15E-05	6.72E-15	6.63E-04	4.01E+01	6.76E+00	2.77E+00	1.32E-02	2.09E-08	4.46E-18
Pr-144	6.05E+04	1.02E+04	4.18E+03	2.00E+01	3.15E-05	6.72E-15	7.35E-03	4.45E+02	7.49E+01	3.07E+01	1.47E-01	2.31E-07	4.94E-17
Pr-144m	7.26E+02	7.26E+02	7.26E+02	7.26E+02	7.26E+02	7.26E+02							
Pm-147	1.74E+05	6.16E+04	3.66E+04	1.62E+03	6.69E-01	1.53E-06	3.60E-05	6.27E+00	2.22E+00	1.32E+00	5.84E-02	2.41E-05	5.51E-11
Sm-151	7.51E+01	7.40E+01	7.34E+01	7.02E+01	6.27E+01	5.19E+01							
Eu-154	2.57E+03	2.19E+03	2.02E+03	1.25E+03	3.74E+02	5.02E+01	9.00E-03	2.31E+01	1.97E+01	1.82E+01	1.12E+01	3.37E+00	4.52E-01
Eu-155	1.47E+03	1.12E+03	9.70E+02	4.19E+02	5.15E+01	1.56E+00							
Np-239	5.59E+00	5.59E+00	5.59E+00	5.59E+00	5.59E+00	5.59E+00							
Pu-238	8.03E+02	7.93E+02	7.89E+02	7.61E+02	6.97E+02	6.01E+02	3.30E-02	2.65E+01	2.62E+01	2.60E+01	2.51E+01	2.30E+01	1.98E+01
Pu-239	6.05E+01	6.05E+01	6.05E+01	6.05E+01	6.05E+01	6.04E+01	3.08E-02	1.87E+00	1.87E+00	1.87E+00	1.87E+00	1.86E+00	1.86E+00
Pu-240	1.11E+02	1.11E+02	1.11E+02	1.12E+02	1.12E+02	1.13E+02	3.11E-02	3.46E+00	3.46E+00	3.46E+00	3.47E+00	3.49E+00	3.53E+00
Pu-241	2.71E+04	2.45E+04	2.33E+04	1.73E+04	8.25E+03	2.39E+03	3.09E-05	8.38E-01	7.58E-01	7.21E-01	5.35E-01	2.55E-01	7.40E-02
Am-241	8.62E+01	1.99E+02	2.07E+02	3.98E+02	6.79E+02	1.12E+03	3.33E-02	2.87E+00	6.62E+00	6.88E+00	1.32E+01	2.26E+01	3.72E+01
Am-243	5.59E+00	5.59E+00	5.59E+00	5.59E+00	5.59E+00	5.59E+00	3.22E-02	1.80E-01	1.80E-01	1.80E-01	1.80E-01	1.80E-01	1.80E-01
Cm-242	3.16E+03	6.26E+02	2.78E+02	2.15E+00	1.14E-05	1.82E-14	3.69E-02	1.17E+02	2.31E+01	1.03E+01	7.96E-02	4.20E-07	6.71E-16
Cm-243	7.20E+00	6.85E+00	6.69E+00	5.77E+00	4.00E+00	2.17E+00	3.68E-02	2.65E-01	2.52E-01	2.46E-01	2.13E-01	1.47E-01	7.98E-02
Cm-244	7.41E+02	6.87E+02	6.61E+02	5.26E+02	2.97E+02	1.14E+02	3.49E-02	2.59E+01	2.40E+01	2.31E+01	1.84E+01	1.04E+01	3.99E+00
	2.45E+00	7.32E-01	4.00E-01	1.06E-02	1.23E-06	3.38E-13							
	5.31E+05	**2.45E+05**	**1.89E+05**	**1.08E+05**	**7.45E+04**	**4.83E+04**		**1.62E+03**	**7.38E+02**	**5.75E+02**	**3.55E+02**	**2.76E+02**	**2.21E+02**

fines 7.32E+04

Table 1. W/BWR assembly

1 yr	3 yr	4 yr	10yr	25 yr	50 yr
1622	738	575	355	276	221

N1,1	1.88E+05
N2,1	5.77E+02
Lambda1	0.049510513
Lambda2	0.001604507
C(t)	0
A	-1.033492823
N2	#NAME?

40 GWd/MTU

N1,1	1.37E+05
N2,1	4.36E+02

	60 GWd/MTU			40 GWd/MTU	
t	C(t)	N2	t (-1)	C(t)	N2
0	0	577.00	0	0	436.00
1	-0.04670163	9650.04	1	-0.04670163	7047.71
2	-0.09107246	18270.23	2	-0.09107246	13329.42
3	-0.13322522	26459.44		-0.13322522	19297.07
5	-0.21130038	41627.34	5	-0.21130038	30350.22
9	-0.34521985	67643.79		-0.34521985	49308.92
10	-0.37457614	73346.70	10	-0.37457614	53464.74
11	-0.40244057	78759.76		-0.40244057	57409.34
15	-0.50037213	97783.91	15	-0.50037213	71272.58
20	-0.59692071	116538.47	20	-0.59692071	84939.35
24	-0.65747042	128299.50		-0.65747042	93509.79
25	-0.67064883	130859.14	25	-0.67064883	95375.03
30	-0.726574	141720.78	30	-0.726574	103290.04
34	-0.7611588	148436.97		-0.7611588	108184.20
35	-0.76861329	149884.48	35	-0.76861329	109239.01
39	-0.7943257	154876.82		-0.7943257	112876.95
40	-0.79982471	155944.39	40	-0.79982471	113654.89
45	-0.82259557	160364.37	45	-0.82259557	116875.72
49	-0.83600198	162965.76		-0.83600198	118771.31
50	-0.83878957	163506.52	50	-0.83878957	119165.36
55	-0.84986159	165653.52	55	-0.84986159	120729.82
60	-0.8569474	167026.05	60	-0.8569474	121729.89
65	-0.86093359	167796.37	65	-0.86093359	122291.13
70	-0.86251222	168098.94	70	-0.86251222	122511.51
75	-0.8622235	168038.72	75	-0.8622235	122467.51
80	-0.86048908	167697.64	80	-0.86048908	122218.85
85	-0.85763805	167139.64	85	-0.85763805	121812.11
90	-0.85392723	166414.62	90	-0.85392723	121283.66
95	-0.84955703	165561.51	95	-0.84955703	120661.88
100	-0.84468382	164610.70	100	-0.84468382	119968.90

$N_2 = \lambda_1/(\lambda_2 - \lambda_1)N_{1,1}(e^{-\lambda_1 t} - e^{-\lambda_2 t}) + N_{2,1}e^{-\lambda_2 t}$

atoms/MTU

years	Pu-241			Am-241
1	1.20E+14			1.13E+13
10	7.67E+13	4.27E+13	1.13403E+13	5.41E+13
25	3.65E+13	8.14E+13	1.13397E+13	9.27E+13
50	1.06E+13	1.03E+14	1.13387E+13	1.15E+14
75	3.07E+12	1.07E+14	1.13376E+13	1.18E+14
100	8.90E+11	1.05E+14	1.13366E+13	1.16E+14

	Ci/MTU		W/MTU			W/assembly	
years	Pu-241	Am-241	Pu-241	Am-241	years	Pu-241	Am-241
						3.09E-05	0.033256881
1	1.88E+05	5.77E+02	5.82E+00	1.92E+01	1	2.68E+00	8.85E+00
10	1.20E+05	2.75E+03	3.73E+00	9.15E+01	10	1.72E+00	4.22E+01
25	5.73E+04	4.72E+03	1.77E+00	1.57E+02	25	8.17E-01	7.23E+01
50	1.66E+04	5.84E+03	5.14E-01	1.94E+02	50	2.37E-01	8.95E+01
75	4.82E+03	6.01E+03	1.49E-01	2.00E+02	75	6.88E-02	9.21E+01
100	1.40E+03	5.90E+03	4.33E-02	1.96E+02	100	1.99E-02	9.04E+01

$N_2 = \lambda_1/(\lambda_2 - \lambda_1)N_{1,1}(e^{-\lambda_1 t} - e^{-\lambda_2 t}) + N_{2,1}e^{-\lambda_2 t}$

$$N_2 = \lambda_1(\lambda_2 - \lambda_1)N_{1,1}\ e^{-\lambda_1 t} - e^{-\lambda_2 t}) + N_{2,1}e^{-\lambda_2 t}$$

$$e^{\lambda_2 t}(N_{2,1} - \lambda_1/(\lambda_2 - \lambda_1)N_{1,0}(e^{-\lambda_1 t} - e^{-\lambda_2 t})) = N_{2,0}$$

N1,1	1.20E+14	
N2,1	1.13E+13	
Lambda1	1.56997E-09	/sec
Lambda2	5.08786E-11	/sec

 # atoms/MTU **60 GWd/MTU**

years	Pu-241			Am-241
1	1.20E+14		1.13E+13	1.13E+13
3	1.08E+14	1.13E+13	1.13E+13	2.26E+13
4	1.03E+14	1.65E+13	1.13E+13	2.78E+13
10	7.67E+13	4.64E+13	1.12E+13	5.75E+13
12	6.95E+13	4.98E+13	1.11E+13	6.09E+13
16	5.70E+13	6.19E+13	1.11E+13	7.30E+13
25	3.65E+13	8.14E+13	1.09E+13	9.23E+13
31	2.71E+13	8.99E+13	1.08E+13	1.01E+14
35	2.22E+13	9.51E+13	1.07E+13	1.06E+14
40	1.74E+13	9.90E+13	1.07E+13	1.10E+14
50	1.06E+13	1.04E+14	1.05E+13	1.14E+14

	Ci/MTU		W/MTU		W/assembly	
years	Pu-241	Am-241	Pu-241	Am-241	Pu-241	Am-241
1	1.88E+05	5.77E+02	5.82E+00	1.92E+01	2.68E+00	8.85E+00
3	1.70E+05	1.15E+03	5.27E+00	3.82E+01	2.43E+00	1.76E+01
4	1.62E+05	1.41E+03	5.02E+00	4.70E+01	2.31E+00	2.17E+01
10	1.20E+05	2.93E+03	3.73E+00	9.74E+01	1.72E+00	4.49E+01
12	1.09E+05	3.10E+03	3.38E+00	1.03E+02	1.56E+00	4.75E+01
16	8.95E+04	3.71E+03	2.77E+00	1.24E+02	1.28E+00	5.69E+01
25	5.73E+04	4.70E+03	1.77E+00	1.56E+02	8.17E-01	7.20E+01
31	4.26E+04	5.12E+03	1.32E+00	1.70E+02	6.07E-01	7.86E+01
35	3.49E+04	5.39E+03	1.08E+00	1.79E+02	4.98E-01	8.26E+01
40	2.73E+04	5.58E+03	8.44E-01	1.86E+02	3.89E-01	8.55E+01
50	1.66E+04	5.81E+03	5.14E-01	1.93E+02	2.37E-01	8.92E+01

N1,1	8.73E+13	
N2,1	8.57E+12	
Lambda1	1.56997E-09	/sec
Lambda2	5.08786E-11	/sec

 # atoms/MTU **40 GWd/MTU**

years	Pu-241			Am-241
1	8.73E+13		8.57E+12	8.57E+12
3	7.90E+13	1.13E+13	8.54E+12	1.98E+13
4	7.52E+13	1.20E+13	8.53E+12	2.05E+13
10	5.59E+13	3.11E+13	8.45E+12	3.96E+13
12	5.06E+13	3.63E+13	8.42E+12	4.47E+13
16	4.15E+13	4.51E+13	8.37E+12	5.35E+13
25	2.66E+13	5.93E+13	8.25E+12	6.75E+13
31	1.98E+13	6.55E+13	8.17E+12	7.37E+13
35	1.62E+13	6.86E+13	8.11E+12	7.68E+13
40	1.27E+13	7.16E+13	8.05E+12	7.97E+13
50	7.71E+12	1.03E+14	7.92E+12	1.11E+14

	Ci/MTU		W/MTU		W/assembly	
years	Pu-241	Am-241	Pu-241	Am-241	Pu-241	Am-241
1	1.37E+05	4.36E+02	4.24E+00	1.45E+01	1.95E+00	6.68E+00
3	1.24E+05	1.01E+03	3.84E+00	3.35E+01	1.77E+00	1.55E+01
4	1.18E+05	1.05E+03	3.65E+00	3.48E+01	1.68E+00	1.60E+01
10	8.77E+04	2.01E+03	2.72E+00	6.70E+01	1.25E+00	3.09E+01
12	7.95E+04	2.27E+03	2.46E+00	7.57E+01	1.13E+00	3.49E+01
16	6.52E+04	2.72E+03	2.02E+00	9.05E+01	9.30E-01	4.17E+01
25	4.18E+04	3.44E+03	1.29E+00	1.14E+02	5.96E-01	5.27E+01
31	3.10E+04	3.75E+03	9.60E-01	1.25E+02	4.43E-01	5.75E+01
35	2.54E+04	3.91E+03	7.88E-01	1.30E+02	3.63E-01	5.99E+01
40	1.99E+04	4.05E+03	6.15E-01	1.35E+02	2.83E-01	6.22E+01
50	1.21E+04	5.67E+03	3.75E-01	1.88E+02	1.73E-01	8.69E+01

TABLE 4-1
RADIONUCLIDE INVENTORY

		Ci/assembly[1]
Volatiles		
	Sr 90	1.36E+04
	Cs134	1.30E+03
	Cs137	2.02E+04
	Total – Volatiles	3.51E+04
Gases		
	H 3	6.40E+01
	Kr 85	1.03E+03
	I129	7.62E-03
	Total - Gases	1.09E+03
Fines		
	Pu238	8.19E+02
	Pu239	6.32E+01
	Pu240	1.09E+02
	Pu241	1.81E+04
	Am241	4.06E+02
	Cm244	6.25E+02
	Y 90	1.36E+04
	Ru106	1.15E+02
	Sb125	1.32E+02
	Pm147	2.10E+03
	Sm151	7.57E+01
	Eu154	1.32E+03
	Eu155	4.61E+02
	Total – Fines	3.79E+04

1 Values are based on a 7x7 fuel assembly (40,000 MWD/MTU burnup, 3.3 wt% U-235 initial bundle average enrichment, and 10 year cooled).

2 Ba137m and Rh106 contribute 20.4% and 0.1%, respectively, to the total design basis activity. Ba137m and Rh106 are daughters of Cs137 and Ru106, respectively, with half lives of 2.6 min and 30 sec, respectively. In accordance with 10CFR71 Appendix A Note III, these radionuclides are evaluated with the parent nuclide.

Provided all the requirements listed in this section are met, the bounding fuel characteristics for the intact fuel assemblies are:

Intact BWR Fuel Assembly Characteristics	
Physical Parameters:	
Fuel Design:	7x7, 8x8, 9x9, or 10x10 BWR fuel assemblies manufactured by General Electric or equivalent reload fuel
Cladding Material:	Zircaloy.
Fuel Damage:	Cladding damage in excess of pinhole leaks or hairline cracks is not authorized to be stored as "Intact BWR Fuel".
Channels:	Fuel may be stored with or without fuel channels
Radiological Parameters:	
Group 1:	
Maximum Burnup:	27,000 MWd/MTU
Minimum Cooling Time:	6-years
Maximum Initial Enrichment:	See Poison Material Design Requirements Table
Minimum Initial Bundle Average Enrichment:	2.0 wt. % U-235
Maximum Initial Uranium Content:	198 kg/assembly
Maximum Decay Heat:	260 W/assembly
Group 2:	
Maximum Burnup:	35,000 MWd/MTU
Minimum Cooling Time:	12-years
Maximum Initial Enrichment:	See Poison Material Design Requirements Table
Minimum Initial Bundle Average Enrichment:	2.65 wt. % U-235
Maximum Initial Uranium Content:	198 kg/assembly
Maximum Decay Heat:	260 W/assembly
Group 3:	
Maximum Burnup:	37,200 MWd/MTU
Minimum Cooling Time:	12-years
Maximum Initial Enrichment:	See Poison Material Design Requirements Table
Minimum Initial Bundle Average Enrichment:	3.38 wt. % U-235
Maximum Initial Uranium Content:	198 kg/assembly
Maximum Decay Heat:	260 W/assembly
Group 4:	
Maximum Burnup:	40,000 MWd/MTU
Minimum Cooling Time:	15-years
Maximum Initial Enrichment:	See Poison Material Design Requirements Table
Minimum Initial Bundle Average Enrichment:	3.4 wt. % U-235
Maximum Initial Uranium Content:	198 kg/assembly
Maximum Decay Heat:	260 W/assembly

EXHIBIT
6
PENGAD 800-631-6989