552839

Sandia National Laboratories
Operated for the U.S. Department of Energy by
Sandia Corporation
Carlsbad, New Mexico 88220

date: January 13, 2010

to: Records Center

from: Patricia Johnson, SNL Contractor

subject: 2009 Calculated Densities

The groundwater densities for the WIPP Culebra monitoring wells were calculated for 2009 as described in the Activity/Project Specific Procedure (SP) 9-11 *Calculation of Densities for Groundwater in WIPP Wells*. The derivation of the data is explained in the following sections and the supporting data are attached. Although the density for WIPP-25 was calculated and is presented, it is not considered reliable and should not be used to calculate freshwater head.

1. Calculation Process:

As stated in SP 9-11, for each calculation, the measured pressure value minus the closest corresponding barometric pressure was divided by the Troll depth minus the closest corresponding depth to water (from or adjusted to the same measurement point elevation), and that result was then divided by 0.4335 (pressure to feet of water conversion at 4°C, at which temperature the density of pure water is 1.000 g/cm^3). The individual calculated density results for each well were then averaged for a final density value.

The density data are included in the *2009 Calc Densities.xls* spreadsheet file created in Excel. Within that spreadsheet, the worksheet *2009 Calc Dens* summarizes the resulting density values and supporting information for the calculated densities and the worksheet *2009 Calc Dens Formulas* provides the formulas in the worksheet. In addition, the Excel file contains individual well worksheets that include the data used for the calculations and plots of the Troll pressure data. The columns in the worksheets and their contents are described below:

- A – Monitor Well – Well name
- B – 2009 Avg Calc Dens (g/cm^3) – Average Calculated Density Value for 2009
- C – 2008 Avg Calc Dens (g/cm^3) – Average Calculated Density Value for 2008
- D – 2009 - 2008 Diff – Difference between 2009 and 2008 densities (Column C - Column B)
- E – 2007 Avg Calc Dens (g/cm^3) – Average Calculated Density Value for 2007
- F – # of Dens Averaged – number of density values averaged to get the final value
- G – Troll – Mini or Level/Vented (v) or Non-Vented (nv) – the type of Troll and cable used to collect pressure measurements
- H – Timeframe of Data – Time period for pressure data used in calculations

- I – Troll File Name(s) – File names for pressure data
- J – Troll Install Depth (ft BTOC/T) – Depth the Troll was installed to below primary measuring point
- K – Troll Ideal Install Depth (ft BTOC/T) (ERMS 549564) – Mid-Culebra depth below top of casing (unless otherwise noted)
- L – Length Off Ideal Install Depth (feet) – Number of feet the Troll is installed off Ideal (Column K - Column J) (manual calculations were completed for those wells with 2 different depths during the calculation time period)
- M – Date of Install – Date the Troll was installed into the well
- N – Installation Logbook Page – Reference to the logbook and page where the Troll installation was documented
- O – Comments/Explanations – Comments and/or explanations regarding data

The spreadsheet entries were verified by Shelly Johnsen, Organization 6710.

2. Identification/Listing of Input, Input sources, and Output:

- Excel spreadsheet including the data – 2009 Calc Densities.xls
  - Worksheet 1 – 2009 Calc Dens (printed copy attached)
  - Worksheet 2 – 2009 Calc Dens Formulas (printed copy attached)
  - Worksheet 3 – Baro Data 11064
  - Worksheet 4 – Baro Data 10532
  - Worksheet 5 – AEC-7
  - Worksheet 6 – C-2737
  - Worksheet 7 – ERDA-9
  - Worksheet 8 – H-2b2
  - Worksheet 9 – H-3b2
  - Worksheet 10 – H-4bR
  - Worksheet 11 – H-5b
  - Worksheet 12 – H-6bR
  - Worksheet 13 – H-7b1
  - Worksheet 14 – H-9c
  - Worksheet 15 – H-10c
  - Worksheet 16 – H-11b4
  - Worksheet 17 – H-12
  - Worksheet 18 – H-15R
  - Worksheet 19 – H-16
  - Worksheet 20 – H-17
  - Worksheet 21 – H-19b0
  - Worksheet 22 – IMC-461
  - Worksheet 23 – SNL-1
  - Worksheet 24 – SNL-2
  - Worksheet 25 – SNL-3
  - Worksheet 26 – SNL-5
  - Worksheet 27 – SNL-6
  - Worksheet 28 – SNL-8
  - Worksheet 29 – SNL-9

- Worksheet 30 – SNL-10
- Worksheet 31 – SNL-12
- Worksheet 32 – SNL-13
- Worksheet 33 – SNL-14
- Worksheet 34 – SNL-15
- Worksheet 35 – SNL-16
- Worksheet 36 – SNL-17A
- Worksheet 37 – SNL-18
- Worksheet 38 – SNL-19
- Worksheet 39 – WIPP-11
- Worksheet 40 – WIPP-13
- Worksheet 41 – WIPP-19
- Worksheet 42 – WIPP-25

3. Data Qualification for Compliance Decision Analysis:
Data sources provided in Column I (Troll File Name(s)), Column N (Installation Logbook Page), and in the References Section.

4. Software Used:
Microsoft Office Excel 2003 SP2, Intel Pentium 2 Quad CPU processor under Microsoft Windows XP

5. Reviews:
Technical: Richard Beauheim, 6712
QA: Shelly Johnsen, 6710

6. References:

- Troll installation data and SNL water level data from the following logbooks:
  Long-Term Monitoring Notebook (LTM)-8 (package ERMS 543277)
  Long-Term Monitoring Notebook (LTM)-9 (package ERMS 543277)
  Long-Term Monitoring Notebook (LTM)-10 (package ERMS 543277)
  Long-Term Monitoring Notebook (LTM)-11 (package ERMS 543277)
  Long-Term Monitoring Notebook (LTM)-12 (package ERMS 543277)
  WIPP Site Well Testing (WSWT)-13 (package ERMS 540244)
- WRES Water Level Data submitted to SNL in monthly memoranda (package ERMS 546636)
- Johnson, Patricia B., Culebra Center Depths for Use in Calculating Equivalent Freshwater Heads of the Culebra Dolomite Member of the Rustler Formation near the WIPP Site, Revision 2, August 7, 2008 (ERMS 549564)
- Mercer, J.W. and Snyder, R.P., Basic Data Report for Drillhole H-16 (Waste Isolation Pilot Plan – WIPP) (SAND89-0203)

7. List of Attachments:

1. Printout of Excel file worksheet 2009 Calc Dens.xls
2. Printout of Excel file worksheet 2009 Calc Dens Formulas.xls
3. CD including the Excel file and memorandum

2009 Calculated Densities

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
Monitor Well	2009 Avg Calc Dens (g/cm^3)	2008 Avg Calc Dens (g/cm^3)	2009 - 2008 Diff (g/cm^3)	2007 Avg Calc Dens (g/cm^3)	# of Dens Averaged	Troll - Mini/Level, Vented (v)/Non-Vented (nv)	Timeframe of Data	Troll File Name(s)	Troll Install Depth (ft BTOC/T)	Troll Ideal Install Depth (ft BTOC/T) (ERMS 549564)	Length Off Ideal Install Depth (feet)	Date of Install	Installation Logbook Page	Comments/Explanations
AEC-7	1.078	1.078	0.000	1.211	5	level, nv	June - August	SN116300 021809 AEC-7(C8) 2009-08-26 14.27.33.wsl	872.4	872.4	0.00	2/18/2009	LTM-10, pg. 26	
C-2737	1.025	1.029	-0.005	1.010	5	level, nv	June - August	SN121359 110408 C-2737(C19) 2009-08-25 09.03.07.wsl	688.9	691.0	2.15	11/4/2008	LTM-8, pg. 153	Reference in logbook is to top of environmental casing, which is 1.65' above top of reference casing
ERDA-9	1.068	1.067	0.001	1.047	5	level, nv	June - August	SN123367 110408 ERDA-9(C11) 2009-08-06 11.30.52.wsl	717.2	716.8	-0.42	11/4/2008	LTM-8, pg. 154	
								SN146411 080609 ERDA-9 (C12) 2009-08-25 08.48.00.wsl				8/6/2009	LTM-11, pg. 97	
H-2b2	1.009	0.999	0.010	1.014	5	level, nv	June - August	SN126691 032509 H-2b2(C6) 2009-08-27 10.36.20.wsl	635.5	635.5	0.00	2/26/2009	LTM-10, pg. 42	Suspected freshwater in well, purged well in December 2008 bringing the density back to representative
H-3b2	1.040	1.038	0.002	1.042	4	level, nv	December - January 2010	SN116299 121709 H-3b2 (C8) 2010-01-05 10.06.03.wsl	672.7	687.7	15.03	12/17/2009	LTM-12, pg. 144	Troll depth prior to 12/17/09 was inaccurate because of an apparent obstruction. Troll reinstalled on 12/17/09 and depth now appears to be accurate
H-4bR	1.016	1.013	0.003	1.015	3	level, nv	November - December	SN102924 102909 H4bR(C2) 2009-11-19 10.43.33.wsl	503.3	504.1	0.85	10/29/2009	WSWT-13, pg. 108	
								SN102924 111909 H-4bR (C3) 2009-12-10 12.24.35.wsl	507.9	504.1	-3.80	11/19/2009	LTM-12, pg. 113	ideal install depth is for H-4b
H-5b	1.094	1.093	0.001	1.091	5	level, nv	June - August	SN133569 012809 H-5b (C8) 2009-06-25 14.52.36.wsl	910.3	910.3	0.00	11/25/2008	LTM-9, pg. 60	
								SN146412 062509 H-5b (C9) 2009-10-20 15.03.46.wsl				6/25/2009	LTM-11, pg. 33	
H-6bR	1.035	1.033	0.002	1.034	5	level, nv	June - August	SN121344 022409 H-6bR(C1) 2009-10-01 08.55.29.wsl	616.6	617.5	0.90	2/24/2009	WSWT-13, pg. 53	
H-7b1	1.004	0.994	0.010	1.002	5	level, nv	June - August	SN136297 110608 H-7b1 (C11) 2009-07-14 12.44.38.wsl	269.9	269.9	0.00	11/6/2008	LTM-8, pg. 9	
								SN121345 071409 H-7b1 (C12) 2009-10-19 15.26.17.wsl				7/14/2009	LTM-11, pg. 54	
H-9c	1.004	1.003	0.000	1.001	5	level, nv	June - August	SN110383 012709 H-9c (C16) 2009-08-06 08.30.08.wsl	663.5	663.5	0.00	10/20/2008	LTM-8, pg. 109	
								SN133569 080609 H-9c (C17) 2009-10-19 13.42.08.wsl				8/6/2009	LTM-11, pg. 93	
H-10c	1.005	1.001	0.004	1.008	3	level, nv	June	SN129649 060409 H-10c (c7) 2009-07-10 09.20.52.wsl	1372.1	1372.1	0.00	6/4/2009	LTM-10, pg. 153	Density value good for pre-July 11, 2009 water levels
	1.089		0.088		3	level, nv	July - August	SN129649 072709 H-10c (C8) 2009-10-19 12.50.02.wsl				7/27/2009	LTM-11, pg. 65	Density value applicable for post-July 14, 2009 water levels, well purged of an estimated 2,440 gallons 7/11 through 7/14
H-11b4	1.058	1.062	-0.005	1.070	5	level, nv	June - August	SN102920 062409 H-11b4 (C10) 2009-10-19 10.54.15.wsl	736.3	736.2	-0.08	6/24/2009	LTM-11, pg. 15	
H-12	1.095	1.096	-0.001	1.097	5	level, nv	June - August	SN123363 120508 H-12(C17) 2009-08-06 09.58.43.wsl	831.0	838.4	7.40	12/5/2008	LTM-9, pg. 70	
								SN121786 080609 H-12 (C18) 2009-08-25 13.01.41.wsl				8/6/2009	LTM-11, pg. 95	
H-15R	1.118	1.130	-0.012	NA	5	level, nv	June - August	SN116450 041309 H-15R(C6) 2009-10-21 08.43.13.wsl	872.5	872.5	0.04	4/13/2009	LTM-10, pg. 81	
H-16	1.037	1.039	-0.002	NA	5	level, nv	June - August	SN110390 021709 H-16(C1) 2009-10-19 08.07.29.wsl	715.1	715.1	-0.01	2/17/2009	LTM-10, pg. 6	Ideal install per BDR (SAND89-0203) and LTM-9 p. 69
H-17	1.133	1.120	0.013	1.133	5	level, nv	June - August	SN116453 012709 H-17 (C5) 2009-11-09 13.57.54.wsl	700.6	720.4	19.80	1/27/2009	LTM-9, pg. 118	
H-19b0	1.065	1.075	-0.010	1.068	5	level, nv	June - August	SN116451 042309 H-19b0 (C9) 2009-10-19 10.06.41.wsl	754.0	754.0	0.00	4/23/2009	LTM-10, pg. 83	
IMC-461	1.005	1.019	-0.014	1.005	5	level, nv	June - August	SN121361 012709 IMC-461 (C16) 2009-09-15 13.26.40.wsl	375.3	376.5	1.18	10/21/2008	LTM-8, pg. 118	Reference in logbook is to top of environmental casing, which is 1.18' above top of reference casing
SNL-1	1.028	1.032	-0.005	1.033	5	level, nv	June - August	SN116299 110608 SNL-1(C16) 2009-10-20 12.29.21.wsl	612.9	612.9	-0.03	11/6/2008	LTM-9, pg. 11	
SNL-2	1.006	1.015	-0.010	1.012	5	level, nv	June - August	SN110382 032409 SNL-2(C24) 2009-07-28 08.43.06.wsl	470.7	470.7	0.00	11/12/2008	LTM-8, pg. 16	
								SN147947 072809 SNL-2 (C25) 2009-11-18 11.07.53.wsl				7/28/2009	LTM-11, pg. 73	
SNL-3	1.030	1.029	0.001	1.023	5	level, nv	April - June	SN139810 012809 SNL-3 (C10) 2009-07-09 08.47.24.wsl	767.3	766.5	-0.80	1/28/2009	LTM-9, pg. 135	
SNL-5	1.007	1.012	-0.005	1.010	5	level, nv	June - August	SN121786 012809 SNL-5 (C14) 2009-06-25 09.20.27.wsl	649.0	649.0	0.00	10/21/2008	LTM-8, pg. 124	
								SN116454 062509 SNL-5 (C15) 2009-11-18 11.26.18.wsl				6/25/2009	LTM-11, pg. 27	
SNL-6	1.230	1.253	-0.023	1.246	5	level, nv	June - August	SN144634 062509 SNL-6 (C8) 2009-11-18 14.54.08.wsl	1338.2	1338.2	0.00	6/25/2009	LTM-11, pg. 30	500 psi Troll installed at approximate mid-formation, which is 30 feet deeper than depth in 2008 when a 300 psi Troll was installed.
SNL-8	1.091	1.104	-0.013	1.103	5	level, nv	June - August	SN123357 012809 SNL-8 (C26) 2009-10-20 14.19.48.wsl	969.7	969.7	0.00	10/30/2008	LTM-8, pg. 149	
SNL-9	1.016	1.026	-0.010	1.024	5	level, nv	June - August	SN121047 012709 SNL-9 (C20) 2009-09-30 09.38.26.wsl	567.2	567.2	0.00	10/21/2008	LTM-8, pg. 116	
SNL-10	1.007	1.013	-0.006	1.011	5	level, nv	June - August	SN110407 101708 SNL-10(C10) 2009-08-27 08.14.08.wsl	613.5	613.5	-0.04	10/17/2008	LTM-8, pg. 97	
SNL-12	1.002	1.011	-0.009	1.005	5	level, nv	June - August	SN129856 062409 SNL-12 (C12) 2009-11-17 13.35.56.wsl	570.9	570.9	0.00	6/24/2009	LTM-11, pg. 21	
SNL-13	1.023	1.028	-0.005	1.027	5	level, nv	June - August	SN106823 042809 SNL-13 (C11) 2009-11-09 12.35.55.wsl	401.2	401.2	-0.04	4/28/2009	LTM-10, pg. 110	
SNL-14	1.044	1.048	-0.004	1.048	5	level, nv	June - August	SN143789 062409 SNL-14(C18) 2009-07-27 10.08.17.wsl, SN143789 072709 SNL-14 (C19) 2009-11-17 10.26.53.wsl	670.1	669.5	-0.58	6/24/2009	LTM-11, pg. 13	
SNL-15	1.223	1.232	-0.008	1.228	5	level, nv	June - August	SN123384 012709 SNL-15 (C14) 2009-09-29 12.02.27.wsl	922.8	922.8	0.00	10/30/2008	LTM-8, pg. 147	
SNL-16	1.013	1.023	-0.010	1.010	5	level, nv	May - July	SN121791 082608 SNL-16 (C6) 2009-07-14 09.32.37.wsl	208.8	206.3	-2.50	8/26/2008	LTM-8, pg. 36	
SNL-17A	1.003	1.007	-0.004	1.006	5	level, nv	July - September	SN131837 071409 SNL-17 (C12) 2009-07-27 15.08.27.wsl	349.6	349.6	-0.04	7/14/2009	LTM-11, pg. 53	
								SN147945 072709 SNL-17 (C13) 2009-11-17 15.28.29.wsl	349.6		-0.04	7/27/2009	LTM-11, pg. 68	
SNL-18	1.003	1.011	-0.008	1.028	5	level, nv	June - August	SN121360 021809 SNL-18(C13) 2009-08-26 11.52.51.wsl	551.3	551.2	-0.11	10/21/2008	LTM-8, pg. 122	
SNL-19	1.005	1.008	-0.003	1.003	5	level, nv	June - August	SN121044 022509 SNL-19 (C11) 2009-09-15 12.21.27.wsl	355.1	355.1	0.00	2/25/2009	LTM-10, pg. 40	
WIPP-11	1.035	1.035	0.000	1.038	5	level, nv	June - August	SN110411 110608 WIPP-11(C19) 2009-10-28 08.49.44.wsl	857.8	857.8	0.00	11/6/2008	LTM-9, pg. 12	
WIPP-13	1.043	1.055	-0.012	1.053	5	level, nv	June - August	SN116452 012809 WIPP-13 (C11) 2009-11-09 10.26.21.wsl	715.3	715.3	0.00	1/28/2009	LTM-9, pg. 142	
WIPP-19	1.049	1.046	0.003	1.044	5	level, nv	June - August	SN136296 012809 WIPP-19 (C3) 2009-07-28 13.46.04.wsl	770.2	770.2	0.00	10/30/2008	LTM-8, pg. 151	
								SN134842 072809 WIPP-19 (C4) 2009-11-18 16.27.41.wsl	770.2		0.00	7/28/2009	LTM-11, pg. 79	
WIPP-25	0.984	1.010	-0.026	1.011	5	mini, v	March - May	SN04580 2009-03-24 090000 WIPP-25 (C9).bin	160.0	461.9	301.90	3/24/2009	LTM-10, pg. 61	Value not reliable and should not be used, miniTroll not at optimal depth for pressure readings, packer and well failing

Notes:

Attempts have been made to explain changes in calculated density between 2008 and 2009 = to or >0.02 g/cm^3

ft BTOC = feet below top of casing

ft BTOT = feet below top of tubing

(v) = vented

(nv) = non-vented

NA = not applicable/available

LTM = Long-Term Monitoring

WSWT = WIPP Well Site Testing

Barometric data are from Port-a-camp baro Troll file SN11064 2009-06-10 090000 P-A-C (baro6).bin and SN10532 2009-01-29 130000 prt-a-cmp(BARO4).bin

2009 Calculated Densities

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
Monitor Well	2009 Avg Calc Dens (g/cm^3)	2008 Avg Calc Dens (g/cm^3)	2009 - 2008 Diff (g/cm^3)	2007 Avg Calc Dens (g/cm^3)	# of Dens Averaged	Troll - Mini/Level, Vented (v)/Non-Vented (nv)	Timeframe of Data	Troll File Name(s)	Troll Install Depth (ft BTOC/T)	Troll Ideal Install Depth (ft BTOC/T) (ERMS 549564)	Length Off Ideal Install Depth (feet)	Date of Install	Installation Logbook Page	Comments/Explanations
AEC-7	1.0778	1.078	=B4-C4	1.2106	5	level, nv	June - August	SN116300 021809 AEC-7(C8) 2009-08-26 14.27.33.wsl	872.4	872.4	=K4-J4	39862	LTM-10, pg. 26	
C-2737	1.0246	1.0293	=B5-C5	1.01032370894645		level, nv	June - August	SN121359 110408 C-2737(C19) 2009-08-25 09.03.07.wsl	688.85	691	=K5-J5	39756	LTM-8, pg. 153	Reference in logbook is to top of environmental casing, which is 1.65' above top of reference casing
ERDA-9	1.0682	1.0669	=B6-C6	1.047150340250855		level, nv	June - August	SN123367 110408 ERDA-9(C11) 2009-08-06 11.30.52.wsl	717.2	716.78	=K6-J6	39756	LTM-8, pg. 154	
								SN146411 080609 ERDA-9 (C12) 2009-08-25 08.48.00.wsl				40031	LTM-11, pg. 97	
H-2b2	1.0088	0.9987	=B8-C8	1.013939323421855		level, nv	June - August	SN126691 032509 H-2b2(C6) 2009-08-27 10.36.20.wsl	635.5	635.5	=K8-J8	39870	LTM-10, pg. 42	Suspected freshwater in well, purged well in December 2008 bringing the density back to representative
H-3b2	1.04	1.0377	=B9-C9	1.042368450267944		level, nv	December - January 2010	SN116299 121709 H-3b2 (C8) 2010-01-05 10.06.03.wsl	672.67	687.7	=K9-J9	40164	LTM-12, pg. 144	Troll depth prior to 12/17/09 was inaccurate because of an apparent obstruction. Troll reinstalled on 12/17/09 and depth now
H-4bR	1.016	1.013	=B10-C10	1.014806253640003		level, nv	November - December	SN102924 102909 H4bR(C2) 2009-11-19 10.43.33.wsl	503.25	504.1	=K10-J10	40115	WSWT-13, pg. 108	
								SN102924 111909 H-4bR (C3) 2009-12-10 12.24.35.wsl	507.9	504.1	=K11-J11	40136	LTM-12, pg. 113	ideal install depth is for H-4b
H-5b	1.0939	1.0925	=B12-C12	1.090816061344755		level, nv	June - August	SN133569 012809 H-5b (C8) 2009-06-25 14.52.36.wsl	910.3	910.3	=K12-J12	39777	LTM-9, pg. 60	
								SN146412 062509 H-5b (C9) 2009-10-20 15.03.46.wsl				39989	LTM-11, pg. 33	
H-6bR	1.0353	1.0332	=B14-C14	1.0336	5	level, nv	June - August	SN121344 022409 H-6bR(C1) 2009-10-01 08.55.29.wsl	616.6	617.5	=K14-J14	39868	WSWT-13, pg. 53	
H-7b1	1.0037	0.9937	=B15-C15	1.002135414503355		level, nv	June - August	SN136297 110608 H-7b1 (C11) 2009-07-14 12.44.38.wsl	269.9	269.9	=K15-J15	39758	LTM-8, pg. 9	
								SN121345 071409 H-7b1 (C12) 2009-10-19 15.26.17.wsl				40008	LTM-11, pg. 54	
H-9c	1.0035	1.0033	=B17-C17	1.001390182096755		level, nv	June - August	SN110383 012709 H-9c (C16) 2009-08-06 08.30.08.wsl	663.5	663.5	=K17-J17	39741	LTM-8, pg. 109	
								SN133569 080609 H-9c (C17) 2009-10-19 13.42.08.wsl				40031	LTM-11, pg. 93	
H-10c	1.005		=B19-C19		3	level, nv	June	SN129649 060409 H-10c (c7) 2009-07-10 09.20.52.wsl				39968	LTM-10, pg. 153	Density value good for pre-July 11, 2009 water levels
	1.089	1.001	=B20-C19	1.008118136758133		level, nv	July - August	SN129649 072709 H-10c (C8) 2009-10-19 12.50.02.wsl	1372.1	1372.1	=K19-J19	40021	LTM-11, pg. 65	Density value applicable for post-July 14, 2009 water levels, well purged of an estimated 2,440 gallons 7/11 through 7/14
H-11b4	1.0576	1.0622	=B21-C21	1.070309726530455		level, nv	June - August	SN102920 062409 H-11b4 (C10) 2009-10-19 10.54.15.wsl	736.28	736.2	=K21-J21	39988	LTM-11, pg. 15	
H-12	1.095	1.0957	=B22-C22	1.097005635506455		level, nv	June - August	SN123363 120508 H-12(C17) 2009-08-06 09.58.43.wsl	831	838.4	=K22-J22	39787	LTM-9, pg. 70	
								SN121786 080609 H-12 (C18) 2009-08-25 13.01.41.wsl				40031	LTM-11, pg. 95	
H-15R	1.1181	1.13	=B24-C24	NA	5	level, nv	June - August	SN116450 041309 H-15R(C6) 2009-10-21 08.43.13.wsl	872.5	=870.5+2.04	=K24-J24	39916	LTM-10, pg. 81	
H-16	1.0367	1.0388	=B25-C25	NA	5	level, nv	June - August	SN110390 021709 H-16(C1) 2009-10-19 08.07.29.wsl	715.1	=713.5+1.59	=K25-J25	39861	LTM-10, pg. 6	Ideal install per BDR (SAND89-0203) and LTM-9 p. 69
H-17	1.1332	1.1201	=B26-C26	1.132523266245755		level, nv	June - August	SN116453 012709 H-17 (C5) 2009-11-09 13.57.54.wsl	700.6	720.4	=K26-J26	39840	LTM-9, pg. 118	
H-19b0	1.065	1.0748	=B27-C27	1.068171401485	5	level, nv	June - August	SN116451 042309 H-19b0 (C9) 2009-10-19 10.06.41.wsl	754	754	=K27-J27	39926	LTM-10, pg. 83	
IMC-461	1.005	1.0187	=B28-C28	1.005121706129555		level, nv	June - August	SN121361 012709 IMC-461 (C16) 2009-09-15 13.26.40.wsl	375.32	376.5	=K28-J28	39742	LTM-8, pg. 118	Reference in logbook is to top of environmental casing, which is 1.18' above top of reference casing
SNL-1	1.0275	1.0321	=B29-C29	1.033088693574155		level, nv	June - August	SN116299 110608 SNL-1(C16) 2009-10-20 12.29.21.wsl	612.9	612.87	=K29-J29	39758	LTM-9, pg. 11	
SNL-2	1.0058	1.0153	=B30-C30	1.0118	5	level, nv	June - August	SN110382 032409 SNL-2(C24) 2009-07-28 08.43.06.wsl	470.7	470.7	=K30-J30	39764	LTM-8, pg. 16	
								SN147947 072809 SNL-2 (C25) 2009-11-18 11.07.53.wsl				40022	LTM-11, pg. 73	
SNL-3	1.03	1.029	=B32-C32	1.023375899963555		level, nv	April - June	SN139810 012809 SNL-3 (C10) 2009-07-09 08.47.24.wsl	767.3	766.5	=K32-J32	39841	LTM-9, pg. 135	
SNL-5	1.0067	1.0119	=B33-C33	1.01	5	level, nv	June - August	SN121786 012809 SNL-5 (C14) 2009-06-25 09.20.27.wsl	649	649	=K33-J33	39742	LTM-8, pg. 124	
								SN116454 062509 SNL-5 (C15) 2009-11-18 11.26.18.wsl				39989	LTM-11, pg. 27	
SNL-6	1.23	1.2532	=B35-C35	1.245631941707655		level, nv	June - August	SN144634 062509 SNL-6 (C8) 2009-11-18 14.54.08.wsl	1338.2	1338.2	=K35-J35	39989	LTM-11, pg. 30	500 psi Troll installed at approximate mid-formation, which is 30 feet deeper than depth in 2008 when a 300 psi Troll was installed.
SNL-8	1.091	1.1037	=B36-C36	1.1026	5	level, nv	June - August	SN123357 012809 SNL-8 (C26) 2009-10-20 14.19.48.wsl	969.7	969.7	=K36-J36	39751	LTM-8, pg. 149	
SNL-9	1.016	1.0261	=B37-C37	1.0243	5	level, nv	June - August	SN121047 012709 SNL-9 (C20) 2009-09-30 09.38.26.wsl	567.2	567.2	=K37-J37	39742	LTM-8, pg. 116	

2009 Calculated Densities

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
Monitor Well	2009 Avg Calc Dens (g/cm^3)	2008 Avg Calc Dens (g/cm^3)	2009 - 2008 Diff (g/cm^3)	2007 Avg Calc Dens (g/cm^3)	# of Dens Averaged	Troll - Mini/Level, Vented (v)/Non-Vented (nv)	Timeframe of Data	Troll File Name(s)	Troll Install Depth (ft BTOC/T)	Troll Ideal Install Depth (ft BTOC/T) (ERMS 549564)	Length Off Ideal Install Depth (feet)	Date of Install	Installation Logbook Page	Comments/Explanations
SNL-10	1.007	1.0133	=B38-C38	1.0106	5	level, nv	June - August	SN110407 101708 SNL-10(C10) 2009-08-27 08.14.08.wsl	613.5	613.46	=K38-J38	39738	LTM-8, pg. 97	
SNL-12	1.002	1.011	=B39-C39	1.005	5	level, nv	June - August	SN129856 062409 SNL-12 (C12) 2009-11-17 13.35.56.wsl	570.9	570.9	=K39-J39	39988	LTM-11, pg. 21	
SNL-13	1.023	1.0276	=B40-C40	1.0267	5	level, nv	June - August	SN106823 042809 SNL-13 (C11) 2009-11-09 12.35.55.wsl	401.2	401.16	=K40-J40	39931	LTM-10, pg. 110	
SNL-14	1.044	1.0479	=B41-C41	1.0476	5	level, nv	June - August	SN143789 062409 SNL-14(C18) 2009-07-27 10.08.17.wsl, SN143789 072709 SNL-14 (C19) 2009-11-17 10.26.53.wsl	670.08	669.5	=K41-J41	39988	LTM-11, pg. 13	
SNL-15	1.223	1.2315	=B42-C42	1.22768383580925		level, nv	June - August	SN123384 012709 SNL-15 (C14) 2009-09-29 12.02.27.wsl	922.8	922.8	=K42-J42	39751	LTM-8, pg. 147	
SNL-16	1.013	1.0228	=B43-C43	1.0104	5	level, nv	May - July	SN121791 082608 SNL-16 (C6) 2009-07-14 09.32.37.wsl	208.8	206.3	=K43-J43	39686	LTM-8, pg. 36	
SNL-17A	1.003	1.0072	=B44-C44	1.00606911413895		level, nv	July - September	SN131837 071409 SNL-17 (C12) 2009-07-27 15.08.27.wsl	349.6	349.56	=K44-J44	40008	LTM-11, pg. 53	
								SN147945 072709 SNL-17 (C13) 2009-11-17 15.28.29.wsl	349.6		=K44-J45	40021	LTM-11, pg. 68	
SNL-18	1.003	1.0106	=B46-C46	1.02750489464845		level, nv	June - August	SN121360 021809 SNL-18(C13) 2009-08-26 11.52.51.wsl	551.3	551.19	=K46-J46	39742	LTM-8, pg. 122	
SNL-19	1.005	1.0075	=B47-C47	1.00304806603625		level, nv	June - August	SN121044 022509 SNL-19 (C11) 2009-09-15 12.21.27.wsl	355.1	355.1	=K47-J47	39869	LTM-10, pg. 40	
WIPP-11	1.035	1.0352	=B48-C48	1.038007458099	5	level, nv	June - August	SN110411 110608 WIPP-11(C19) 2009-10-28 08.49.44.wsl	857.8	857.8	=K48-J48	39758	LTM-9, pg. 12	
WIPP-13	1.043	1.0552	=B49-C49	1.0525	5	level, nv	June - August	SN116452 012809 WIPP-13 (C11) 2009-11-09 10.26.21.wsl	715.3	715.3	=K49-J49	39841	LTM-9, pg. 142	
WIPP-19	1.049	1.0462	=B50-C50	1.04370501044135		level, nv	June - August	SN136296 012809 WIPP-19 (C3) 2009-07-28 13.46.04.wsl	770.2	770.2	=K50-J50	39751	LTM-8, pg. 151	
								SN134842 072809 WIPP-19 (C4) 2009-11-18 16.27.41.wsl	770.2		=K50-J51	40022	LTM-11, pg. 79	
WIPP-25	0.984	1.0096	=B52-C52	1.011	5	mini, v	March - May	SN04580 2009-03-24 090000 WIPP-25 (C9).bin	160	461.9	=K52-J52	39896	LTM-10, pg. 61	Value not reliable and should not be used, miniTroll not at optimal depth for pressure readings, packer and well failing

Notes:
Attempts have
ft BTOC = feet
ft BTOT = feet
(v) = vented
Barometric dat

(nv) = non-vented
NA = not applicable/available
LTM = Long-Term Monitoring
WSWT = WIPP Well Site Testing