

APPENDIX 9

WELL LITHOLOGY DATA

Table of Contents

1. Suneco (Sun) Geothermal Well Lithologic Logs.....	2
2. Nevada Bureau of Mines and Geology Lithology Summary for Dixie Valley Wells.....	4

Baseline Conceptual Model

Suneco (Sun) Dixie Valley Wells' Lithologic Summary

The following summary is based on Sunoco data provided by Al Waibel of Columbia Geoscience with the approval of Terra-Gen Power.

The wells included in the dataset are:

Sun Wells (S.W.L. 1, 2, 2B, 3), other production wells (52-18, 65-18, 85-7), injection well 45-5, and dry well 62-21 (located near surface center of the valley).

The lithology has been summary and categorized into the eight geologic formations identified below.

LEGEND FOR GENERALIZED FORMATIONS

Fm	Description
Tsed	Basin-fill sediments and lowermost tuffaceous sediments/tuffs
Tmb	Miocene basalt
Tma	Miocene lake sediments
Tvs	Oligocene silicic volcanics
Kgr	Cretaceous granodiorite
Jvh	Jurassic mafic extrusive rocks (Humboldt igneous complexes: upper)
Jgh	Jurassic mafic intrusive rocks (Humboldt igneous complex: lower)
Tr	Triassic meta-sediments

Well ID	T.D.		Rock Type Interval				Rock Type Thickness (m)	Inferred Fm	Description
	feet	meters	start (ft)	end (ft)	start (m)	end (m)			
S.W.L. #1	7255	2211	5500	5550	1676	1692	15	Tsed	Basin fill sediments and silicic tuffs
			5550	7255	1692	2211	520	Tmb	Miocene basalt and mixed volc seds
S.W.L. #2	8900	2713	6400	7400	1951	2256	305	Tmb	Miocene basalt
									Fault: mylonitic zone (7400')
			7400	7980	2256	2432	177	Kgr	granodiorite
			7980	8070	2432	2460	27		Fault Zone (well established)
			8070	8900	2460	2713	253	Kgr	granodiorite
S.W.L. #2B	8588	2618	5600	6220	1707	1896	189	Tsed	Volc. derived seds, lithic crystal tuffs
			6220	8050	1896	2454	558	Tmb	Miocene basalt: heavily fractured zones
			8050	8380	2454	2554	101	Tma	Miocene lake sediments
			8380	8588	2554	2618	63	Kgr	granodiorite
S.W.L. #3	9126	2782		6620		2018	2018	Tsed	tuffaceous sediments
			6620	7840	2018	2390	372	Tmb	Miocene basalt
			7840	8230	2390	2509	119	Tma	Miocene lake sediments
			8230	8450	2509	2576	67	Tvs	Oligocene silicic volcanics
			8450	8740	2576	2664	88	Jvh	Jz Humboldt igneous complex (upper)
			8740	8880	2664	2707	43		FAULT ZONE: mylonite
			8880	9126	2707	2782	75	Kgr	granodiorite

Well ID	T.D.		Rock Type Interval				Rock Type Thickness	Inferred Fm	Description
	feet	meters	start (ft)	end (ft)	start (m)	end (m)	(m)		
U.S.A. 52-18	9816	2992	5540	6340	1689	1932	244	Tsed	Basin fill sediments
			6340	7485	1932	2281	349	Tvs	Oligocene volcanic sequence (upper)
			7485	8210	2281	2502	221		Eocene sedimentary sequence
			8210	8640	2502	2633	131	Jvh	mixed meta-volc/sed. (Humboldt ?)
			8640	9750	2633	2972	338	Jvh	Jz lower volc. seq. (Jz-K)(Humboldt)
			9750	9816	2972	2992	20	Jgh	Jz intrusives (Humboldt igneous com.)
U.S.A. 45-5	8261	2518	2500	3800	762	1158	396	Tsed	Basin fill sediments
			3800	4460	1158	1359	201	Tsed	tuffaceous sediment and silicic tuffs
			4460	5330	1359	1625	265	Tvs	Tuff
			5330	6100	1625	1859	235	Jvh	Basalt
			5950	6170	1814	1881	67		Fault Zone (mylonitized)
			6100	?	1859	?		Tr	Carbonaceous shales
U.S.A. 62-21	12500	3810	5000	7030	1524	2143	619	Tsed	Basin fill sediments
			7030	8450	2143	2576	433	Jgh	Hornfels sediments and meta-gabbro
			8450	8460	2576	2579	3		Fault or shear zone
			8460	9730	2579	2966	387	Jgh	Meta-seds(argill. siltstone),meta-gabbro
			9730	10280	2966	3133	168	Tr	Meta-seds (argill dolomite to dolo LS)
			10280	12500	3133	3810	677	Tr	Argillaceous Shale
U.S.A. 65-18	9305	2836	3700	5250	1128	1600	472	Tsed	Basin fill sediments
			5250	5740	1600	1750	149	Tsed	Tuffaceous sediments
			5740	7300	1750	2225	475	Tmb	Basalt
			7300	7650	2225	2332	107		Intercalated micro-gabbro/vol.-clastics
			7650	8135	2332	2480	148	Tma	Siltstone and shale
			8135	8220	2480	2505	26		Mylonitized Fault Zone
			8220	9270	2505	2825	320	Jvh	Basalt
			9270	9305	2825	2836	11		Fault Zone(mylonite/microbrecc bslt)
U.S.A. 84-7	8142	2482	5500	5970	1676	1820	143	Tsed	Basin fill sediments
			5970	6770	1820	2063	244	Tsed	Tuff and overlying tuffaceous sediment
			6770	7400	2063	2256	192	Tmb	Mafic Lava
			7440		2268				Fault? Loss of circulation
			7470	7710	2277	2350	73	Tma	Argillaceous Shale
			7710		2350				Fault
			7710	8130	2350	2478	128	Trs	Meta-arnaceous sediments
			8142		2482				Fault? Loss of circulation

Nevada Bureau of Mines and Geology (NBMG) Lithology Summary for Dixie Valley Wells

LEGEND FOR GENERALIZED FORMATIONS

Fm	Description
Tsed	Basin-fill sediments and lowermost tuffaceous sediments and tuffs
Tmb	Miocene basalt flows
Tma	Miocene lake sediments
Tvs	Oligocene silicic volcanics (tuffs, volcaniclastics, underlying sediments)
Kgr	Cretaceous granodiorite (intrusive)
Jhg	Jurassic mafic rocks (Humboldt igneous group)
Jbrq	Jurassic sediments (Boyer Ranch quartzite)
Trs	Triassic meta-sediments

Well	Total Depth		Rock Type Interval				Lithology	Inferred Fm	Correlation to Sunoco Logs
	ft	m	start (ft)	end (ft)	start (m)	end (m)			Yes/No
65-18	9466	2885	0	5250	0	1600	Sand/gravel/clays	Tsed	Yes
			5250	5750	1600	1753	Tuffaceous sediments	Tsed	
			5750	7660	1753	2335	Mafic volcanics	Tmb	
			7660	8230	2335	2509	Siltstone/shales	Tma	
			8230	9466	2509	2885	Metavolcanics	Jhg	
62-21	12500	3810	0	900	0	274	Tuffaceous sediments	Tsed	No
			900	3500	274	1067	Jurassic oceanic crust	Jhg	
			3500		1067		Triassic marine sediments	Trs	
82-5	9942	3030	0	5450	0	1661	Alluvium	Tsed	N/A
			5450	5500	1661	1676	Tuff	Tsed	
			5500	5630	1676	1716	Siltstone	Tsed	
			5630	6040	1716	1841	Sandstone/conglomerate	Tsed	
			6040	7510	1841	2289	Andesite	Tmb	
			7510	8060	2289	2457	Tuff	Tvs	
			8060	8150	2457	2484	Siltstone		
			8150	8200	2484	2499	Tuff	Tvs	
			8200	9250	2499	2819	Sandstone/siltstone		
			9250	9450	2819	2880	Tuff	Tvs	
			9450	9500	2880	2896	Diorite	Tvs or Jhg	
			9500	9570	2896	2917	Sandstone/siltstone		
			9570	9690	2917	2954	Meta-ultramafic	Jhg	
			9690	9942	2954	3030	Granite	Kgr	

Well	Total Depth		Rock Type Interval				Lithology	Inferred Fm	Correlation to Sunoco Logs
	ft	m	start (ft)	end (ft)	start (m)	end (m)			Yes/No
28-33	9507	2898	0	5740	0	1750		Tsed	N/A
			5740	6080	1750	1853	Tuff	Tsed	
			6080	6120	1853	1865	Basalt	Tmb	
			6120	6310	1865	1923	Tuff		
			6310	7300	1923	2225	Basalt	Tmb	
			7300	8650	2225	2637	Tuff	Tvs	
			8650	9060	2637	2761	Albitite	Jhg	
			9060	9507	2761	2898	Quartzite	Jbrq	
52-18	9860	3005	0	4775	0	1455	Alluvium	Tsed	No
			4775	5020	1455	1530	Basalt	Tmb	
			5020	5330	1530	1625	Volcanic sediments	Tma/Tvs	
			5330	5700	1625	1737	Rhyolite	Tvs	
			5700	5850	1737	1783	Granite	Tvs	
			5850	7300	1783	2225	Meta-igneous complex	Jhg	
			7300	7380	2225	2249	Diabase basalt	Jhg	
			7380	7515	2249	2291	Granite	Kgr	
			7515	7670	2291	2338	Diabase	Jhg	
			7670	8040	2338	2451	Granite	Kgr	
			8040	8265	2451	2519	Basalt intrusive	Jhg	
			8265	9860	2519	3005	Granite??	Kgr	
76-7	7926	2416	0	6140	0	1871	Valley fill	Tsed	N/A
			6140	7120	1871	2170	Tuffaceous sediments	Tsed	
			7120	7926	2170	2416	Basalt	Tmb	
82-7	9838	2999	0	5690	0	1734	Alluvium	Tsed	N/A
			5690	5810	1734	1771	Lithic Tuff	Tsed	
			5810	6030	1771	1838	Alluvium	Tsed	
			6030	6600	1838	2012	Lithic Tuff	Tsed	
			6600	7620	2012	2323	Basalt	Tmb	
			7620	7640	2323	2329	Siltstone	Tma	
			7640	7760	2329	2365	Tuff	Tvs	
			7760	7800	2365	2377	Albitite	Jhg	
			7800	7900	2377	2408	Fault gouge		
			7900	9838	2408	2999	Albitite	Jhg	

Well	Total Depth		Rock Type Interval				Lithology	Inferred Fm	Correlation to Sunoco Logs
	ft	m	start (ft)	end (ft)	start (m)	end (m)			Yes/No
84-7	8139	2481	0	6000	0	1829	Valley Fill	Tsed	Yes
			6000	6785	1829	2068	Tuff and Tuffaceous sed.	Tsed	
			6785	7450	2068	2271	Andesite and basalt lava	Tmb	
			7450	7700	2271	2347	Shale	Tma	
			7700	8139	2347	2481	Metasediments and hornfels	Trs	
73-7	8890	2710	0	6120	0	1865	alluvium	Tsed	N/A
			6120	7120	1865	2170	Tuff and tuffaceous sed.	Tsed	
			7120	7590	2170	2313	Basalt	Tmb	
			7590	8433	2313	2570	Miocene sediments	Tma	
			8433	8668	2570	2642	Silicic tuff	Tvs	
			8668	8890	2642	2710	Humboldt Lopolith	Jhg	
SWL-2B	8901	2713	0	4000	0	1219	Sand, gravel	Tsed	Yes
			4000	5150	1219	1570	Volcaniclastic sediments	Tsed	
			5150	5500	1570	1676	Basal conglomerate	Tsed	
			5500		1676		Volc. flows, volcanic sed	Tmb?	
32-18	7461	2274	0	3480	0	1061	Alluvium	Tsed	N/A
			3480	5950	1061	1814	Valley fill conglomerate	Tsed	
			5950	6570	1814	2003	Tuffaceous sediments	Tsed	
			6570	7461	2003	2274	Basalt	Tmb	
76-28	10419	3176	0	5440	0	1658	Alluvium	Tsed	N/A
			5440	5500	1658	1676	Basalt	Tmb	
			5500	5820	1676	1774	Sandstone/conglomerate		
			5820	5920	1774	1804	Mylonite	FZ	
			5920	6100	1804	1859	Microdiorite/granodiorite	Kgr	
			6100	6940	1859	2115	Microdiorite	Kgr	
			6940	8070	2115	2460	Siltstone/sandstone		
			8070	9390	2460	2862	Argillite/shale/carbonate	Trs	
			9390	9780	2862	2981	Metasediments	Trs	
45-5	9118	2779	9780	10419	2981	3176	Diorite	Kgr or Trs	Yes
			0	4390	0	1338	Alluvium	Tsed	
			4390	5330	1338	1625	Tuffaceous sediments	Tsed	
			5330	6500	1625	1981	Tertiary basalt	Tmb	
			6500	7130	1981	2173	Miocene sediments	Tma	
			7130	9118	2173	2779	Granite	Kgr	No

Well	Total Depth		Rock Type Interval				Lithology	Inferred Fm	Correlation to Sunoco Logs
	ft	m	start (ft)	end (ft)	start (m)	end (m)			Yes/No
45-14	9022	2750	0	700	0	213	Alluvium	Tsed	N/A
			700	840	213	256	Tuff/andesite	Tsed	
			840	1100	256	335	Alluvium	Tsed	
			1100	1410	335	430	Tuff/siltstone	Tsed	
			1410	1650	430	503	Andesite	Tvs	
			1650	1860	503	567	Tuff	Tvs	
			1860	2180	567	664	Andesite/basalt	Tvs	
			2180	2500	664	762	Tuff	Tvs	
			2500	3740	762	1140	Siltstone		
			3740		1140		Shale/siltstone/gabroic dikes	Trs	
74(85)-7	8890	2710	0	3490	0	1064			N/A
			3490	4960	1064	1512	Alluvium	Tsed	
			4960	5210	1512	1588	Tuff	Tsed	
			5210	6380	1588	1945	Volcanic breccia		
			6380	6560	1945	1999	Mudstone	Tsed	
			6560	7110	1999	2167	Tuff	Tsed	
			7110	7410	2167	2259	Basalt	Tmb	
			7410	7610	2259	2320	Volcanic sediments	Tmb	
			7610	8300	2320	2530	Siltstone/sandstone	Tma	
			8300	8500	2530	2591	Volcaniclastics	Jhg	
			8500	8550	2591	2606	Metabasalt	Jhg	
			8550	8700	2606	2652	Metavolcaniclastics	Jhg	
			8700	8890	2652	2710	Anorthosite	Jhg	