significant features of the stability distributions are summarized in Table 3.1.4.1.3-1 [INN 3.1.4.1.3-2] (prepare table similar to Table 5-11 from the SCP, Chapter 5 for each SAIC station when data become available, example attached) and discussed in the following paragraphs.

Class A stability was most frequently associated with winds from the ___, while winds from the ___ through _____ were most frequently associated with class B stability. For class C stability, winds from the _____ were the most common occurrence, but winds from the _____ through the _____ were also quite frequently associated with class C stability. Occurrences of class D stability were the second most commonly observed stability classification and were commonly associated with winds from the _____ and the _____ through _____. The distribution for class E stability indicates that there is a distinct shift from the generally _____ly winds associated with the unstable and neutral stability classifications (classes A through D) to predominantly _____ly winds for class E and class F. Stable atmospheric conditions (class F) were the most commonly observed stability class and the distribution clearly shows the predominance of winds from the _____ through the _____. Because stability classes E and F are both associated with relatively light winds, the predominance of winds from the _____ through the _____ for these classes is most likely due to drainage winds at this site that develop under synoptically calm conditions.

In summary, neutral and stable conditions (classes D, E, and F) were by far the most commonly experienced at _____ (station name) and account for ___ percent of the total observations. Stable conditions tend to be dominated by winds generally from the _____, while neutral conditions had a significant _____ to _____ly component in addition to a strong _____ly component. Unstable conditions (classes A, B, and C) occurred only ____ percent of the time, had virtually no _____ly component, and were dominated by winds from the ____ through the ____, with the most unstable classes having a stronger _____ly element than the slightly unstable category.

Determining the stability distributions is important from the standpoint of evaluating the potential impacts of particulate and gaseous emissions from the repository. The data required as input to the dispersion models used in acquiring permits for both the site characterization activities and the repository (through the environmental impact statement process) are discussed in a plan for environmental monitoring and mitigation.

3.1.4.2 Paleoclimatology

[Skeleton text not developed for Subsections 3.1.4.2 through 3.1.5.3.]

3.1.4.3 Future Climatic Variation

3.1.5 Integrated Natural System Response to the Maximum Design Thermal Loading

3.1.5.1 Response of Geomechanical Subsystem

3.1.5.2 Hydrologic Response to Thermal Loading

3.1.5.3 Response of Geochemical System to Thermal Loading

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Table 3.1.1.1.4.2.1-1. List of Magnitude 5 and Greater Events Within 320 km of the Yucca Mountain Site [INN 3.1.1.1.4.2.1-1]

Table 3.1.1.2.2.3-1. Stratigraphy, Age, and Magnetic Polarity of Tertiary Volcanic Rocks at Yucca Mountain[a]

K-Ar age (my) [b]	Magnetic Polarity[c]	Rock Unit[d]	Thickness (m)
10.2		Basalt dikes	
		* Timber Mountain Tuff	
		* Rainier Mesa Member	0-46
		Bedded tuff	0-61
		* Paintbrush Tuff	
12.5	R	* Tiva Canyon Member	69-148
		Bedded tuff	1-15
	R	* Yucca Mountain Member	0-29
		Bedded tuff	0-47
	R	* Pah Canyon Member	0-71
		Bedded tuff	0-9
13.1	N	* Topopah Spring Member	287-369
		Bedded tuff	1-17
13.4[e]		Tuffaceous beds of Calico Hills	27-289
		Bedded tuff	0-21
		* Crater Flat Tuff	
	N	* Prow Pass Member	80-193
		Bedded tuff	2-10
13.5	N	* Bullfrog Member	68-187
		Bedded tuff	6-22
	R	* Tram Member	190-369
		Bedded tuff	3-50
	N	Dacite lava and flow breccia	0-249
		Bedded tuff	0-14
	I	* Lithic Ridge Tuff	3-7
		Older volcanic rocks and volcanic-genic sedimentary rocks	345+

[a]Source: USGS (1984).
[b]my = million years.
[c]Magnectic polarity: N = normal; R = reversed; I = intermediate.
[d]Names and rankings of some units do not conform to USGS usage. Formally recognized names are preceded by *.
[e]Age determined on associated lava flow.

Table 3.1.1.2.3.5.2-1: $^{40}Ar/^{39}Ar$ Ages of Basalitic Volcanic Centers in the Yucca Mountain Region[1]

Sample	Geologic Unit	Description	$^{40}Ar/^{39}Ar^{2}$	$^{37}Ar/^{39}Ar^{2}$	$^{36}Ar/^{39}Ar^{2}$	^{39}Ar	$^{40}Ar^{*}$	Age	±	Weighted Age
						(10^{-13} mol)	% radiogenic	(Ma)	(2σ)	(Ma)
NE-10-1-91-1-BMC	Thirsty Mesa	Basal lava flow, west side	19.58	1.05	0.04	7.47	40.5	4.68	0.04	4.68±.03
			23.1	1.06	0.05	5.69	33.9	4.68	0.05	
NE-10-1-91-2-BMC	Thirsty Mesa	Dike, summit scoria cone	19.29	0.92	0.04	5.22	41.9	4.79	0.05	4.88±.04
			23.1	0.93	0.05	5.73	35.7	4.96	0.05	
Well 25-1-BMC	Amargosa Valley	Cuttings, drill hole	23.22	1.48	0.06	4.11	27.8	3.88	0.07	3.85±.05
			24.92	1.47	0.06	3.34	25.9	3.81	0.08	
CF10FVP	SE, Crater Flat	Dike, southern vent	40.04	2.16	0.12	3.14	14.9	3.58	0.09	3.65±.06
			29.4	2.18	0.08	4.07	21.1	3.71	0.08	
CF12FVP	SE, Crater Flat	Lava flow, central vent	30.23	2.3	0.08	3.49	20.9	3.71	0.07	3.69±.05
			28.71	2.31	0.08	3.99	21.3	3.67	0.06	
CF14FVP	SE, Crater Flat	Lava flow, north exposure	19.85	2.29	0.05	4.58	32.2	3.8	0.06	3.75±.04
			17.74	2.32	0.04	9.15	35	3.73	0.04	
BC1FVP	Quat, Crater Flat	Black Cone, summit lava lake	89	1.98	0.3	3.8	1.9	1.03	0.21	1.05±.14
			74.21	1.94	0.25	2.89	2.4	1.07	0.18	
BC3AFVP	Quat, Crater Flat	Black Cone, replicate of BC3FVP	82.31	1.89	0.27	4.55	2	1.01	0.21	0.96±0.15
			77.27	2	0.26	2.48	2	0.91	0.21	

Table 3.1.1.2.3.5.2-1: $^{40}Ar/^{39}Ar$ Ages of Basalitic Volcanic Centers in the Yucca Mountain Region[1] (continued)

Sample	Geologic Unit	Description	$^{40}Ar/^{39}Ar^2$	$^{37}Ar/^{39}Ar^2$	$^{36}Ar/^{39}Ar^2$	^{39}Ar	$^{40}Ar^*$	Age	±	Weighted Age
						(10^{-13} mol)	% radiogenic	(Ma)	(2o)	(Ma)
BC6FVP	Quat, Crater Flat	Black Cone, southern lava flow	27.29	2.05	0.09	3.75	5.9	0.96	0.07	0.94±.05
			29.1	2.07	0.09	3.45	5.1	0.92	0.07	
BC12FVP	Quat, Crater Flat	Black Cone, northern lava flow	33.37	1.62	0.11	4.31	5.4	1.08	0.09	1.05±.08
			38.14	1.75	0.12	3.94	4.2	0.99	0.12	
CF15FVP	Quat, Crater Flat	Little Cones, southern dike	58.88	1.64	0.19	3.65	3.1	1.11	0.14	1.02±0.10
			56.65	1.65	0.19	4.82	2.7	0.93	0.15	
LW20FVP	Lathrop Wells	Q11d, Old Quarry Flow	29.63	1.62	0.1	5.9	1.6	0.28	0.06	***
			29.62	1.65	0.1	5.98	1.8	0.31	0.08	
			23.75	1.63	0.08	5.13	0.7	0.09	0.06	

[1]Samples were irradiated at the Ford Reactor, University of Michigan, using ANU K-Ar standard GA1550 biotite as a flux monitor and Fish Canyon biotite as a cross check. J-factor=0.00033±1.

[2]Not corrected for interfering reactions. K correction ($^{40}Ar/^{39}Ar$)=0.0467; Ca correction ($^{36}Ar/^{37}Ar$)=0.0002279; Ca correction ($^{39}Ar/^{37}Ar$)=0.0007.

***Replicate ages are too variable to calculate a meaningful weighted age.

Table 3.1.1.2.3.5.2.2-1. K-Ar and $^{40}Ar/^{39}Ar$ Ages of Quaternary Basalt of Crater Flat
[INN 3.1.1.2.3.5.2.2-2]

Table 3.1.1.2.4.2.2-1. List of Earthquakes Having Strong Motion Recordings Near Yucca Mountain

Location	Date	North Latitude	West Longitude	Depth (km)	Magnitude	Mechanism
Massachusetts Mtn	1971.8.5			4.3	4.3	strike-slip
Little Skull Mountain	1992.6.29	36.717	116.293	9.6	5.6	normal
Little Skull Mountain	1992.7.5				4.4	strike-slip
Little Skull Mountain	1993.5.9	36.729	116.300	9.5	3.2	
Southern Utah	1992.9.2				5.9	
Little Skull Mountain	1992.9.7				3.1	
Rock Valley	1993.5.15	36.717	116.124		3.6 4.0 2.8	
Rock Valley	1993.5.30	36.719	116.102	0	4.0	
Eureka Valley	1993.5.17 1993.6.3 1993.6.8	37.176 37.117 37.012	117.832 117.795 117.762	9.1 5.9 1.7	6.1 3.9 4.4	normal

Table 3.1.1.2.4.3.4-1. Reduction with Depth of Ground Motion Recorded on Rock

Station	Number of Events	Depth (meters)	Reduction in PGV[1]		Reduction in PGA[2]	
			Horizontal	Vertical	Horizontal	Vertical
Yucca Mountain (W29) whole waveform	11	83	0.85	0.9	0.55	0.50
Yucca Mountain (W29) S wave	3	83	0.73	0.77	0.55	0.56
Little Skull Mountain[1]	Aftershock	100	0.65	0.5	0.45	0.65
	SE Utah	100	0.65	1.0	0.22	0.43
Tomioka	15	100			0.54	
Iwaki	15	130			0.80	
Garner Valley[1]	Joshua Tree Eqk[3]	200	0.63		0.57	
Iwaki	15	200			0.86	
Tomioka	15	250			0.27	
Iwaki	15	330			0.67	
Yucca Mountain (W12/30,25,28) whole waveform	35	~360	0.5	0.75	0.45	0.42
Yucca Mountain (W12/30,25,28) S wave	9	~360	0.37	0.52	0.38	0.53

[1] Peak Ground Velocity or response spectral velocity at 5% damping at 1 Hz
[2] Peak Ground Acceleration
[3] similar reduction in Fourier amplitude spectra for 17 events

Table 3.1.1.2.4.4-1. Fault Parameters for Significant Seismic Sources at the Yucca Mountain Site [INN 3.1.1.2.4.4-1]

Table 3.1.1.2.7.1.1-1. Thermomechanical Stratigraphy

Description	Unit Name (designator)
Alluvium; colluvium; nonwelded, vitric ashflow tuff of the Tiva Canyon member of the Paintbrush tuff; any other geologic material that overlies the welded devitrified Tiva Canyon member.	Undifferentiated Overburden (UO)
Moderately to densely welded, devitrified ashflow tuff of the Tiva Canyon member of the Paintbrush tuff	Tiva Canyon welded unit (TCw)
Partially welded to nonwelded, vitric and occasionally devitrified tuffs of the lower Tiva Canyon and the Yucca Mountain, the Pah Canyon and the upper Topopah Spring member of the Paintbrush tuff	Upper Paintbrush non-welded Unit (PTn)
Moderately to densely welded, devitrified ashflows of the Topopah Spring member of the Paintbrush tuff that locally contain more than 10% by volume lithophysal cavities.	Topopah Spring welded unit, lithophysae-rich (TSw1)
Moderately to densely welded, devitrified ashflows of the Topopah Spring member of the Paintbrush tuff that locally contain less than 10% by volume lithophysal cavities.	Topopah Spring welded unit lithophysae-poor (TSw2)
Vitrophyre near the base of the Topopah Spring member of the Paintbrush tuff	Topopah Spring welded unit, vitrophyre (TSw3)
Nonwelded ashflows, bedded and reworked tuffs of the lower Topopah Spring member of the Paintbrush tuff	Topopah Spring non-welded unit (TSn)
Nonwelded tuffaceous beds of Calico Hills	Calico Hills non-welded unit (CHn1)
Basal bedded and reworked zones of the tuffaceous beds of Calico Hills	Lower Calico Hills non-welded unit (CHn2)
Upper partially welded to non-welded ashflows of the Prow Pass member of the Crater Flat tuff	Prow Pass non-welded unit (PPn)
Moderately welded, devitrified ashflows of the Prow Pass member of the Crater Flat tuff	Prow Pass welded unit (PPw)
Zeolitic nonwelded to partially welded ashflows and bedded, reworked portions of the lower Prow Pass member of the Crater Flat tuff	Prow Pass non-welded unit (lower) (PPn2)
Moderately to densely welded, devitrified ashflows of the Bullfrog member of the Crater Flat tuff	Bullfrog welded unit (BFw)
Zeolitic partially welded to non-welded ashflows of the lower Bullfrog member of the Crater Flat tuff	Bullfrog non-welded unit (BFn1)

Table 3.1.1.2.7.1.1-1. Thermomechanical Stratigraphy (Continued)

Description	Unit Name (designator)
Zeolitic basal bedded, reworked portion of the Bullfrog member of the Crater Flat tuff	Bullfrog non-welded unit (BFn2)
Zeolitic, partially welded ashflows of the upper portion of the Tram member of the Crater Flat tuff	Tram non-welded unit (TRn)
Moderately welded, devitrified ashflows of the Tram member of the Crater Flat tuff	Tram welded unit (TRw)

Table 3.1.1.2.7.3.1-1. Unconfined Compressive Test Results

Rock Unit	Source of Sample/ Hole Number	Unconfined Compressive Strength(MPa)*	Young's Modulus(GPa)*	Poisson's Ratio*
TCw	No Data	No Data	No Data	No Data
PTn	No Data	No Data	No Data	No Data
TSw1 (lithophysae-poor)	All Holes	142.9± 55.1(11)	19.0 ± 5.2 (3)	0.14 ± 0.0(2)
	USW G-2	171.7± 29.1(8)	NA**	NA**
	USW G-3	65.9 ± 2.9 (3)	19.0 ± 5.2 (3)	0.14 ± 0.0 (2)
TSw1 (litho-physae-rich)##	Busted Butte Outcrop	16.2 ± 5.0 (10)	15.5 ± 3.2 (10)	0.16 ± 0.03(10)
TSw2	All Holes	164.7± 64.0(45)	32.1 ± 3.5 (22)	0.23 ± 0.06(16)
	USW G-1	96.0± 36.6 (4)	29.9 ± 5.2 (4)	0.21 ± 0.05 (4)
	USW G-2	120.3 ± 44(10)	NA**	NA**
	USW G-3	184.9± 51.0(11)	32.4± 2.6 (11)	0.21± 0.03 (11)
	USW G-4	189.5± 63.0(20)	36.3 ± 3.2 (6)	0.27 ± 0.07 (6)
TSw3	USW G-4	68.4 ± 28.6 (4)	NA**	NA**
CHn1v	USW G-3	91.6±1.2 (2)	16.3±0.5(2)	0.18±0.005(2)
CHn1z	All Holes	22.9±8.0(27)	6.2±1.6 (17)	0.26±0.07(8)
	USW G-1	23.7 ± 6.1(18)	6.2 ±1.6 (17)	0.25± 0.07(8)
	USW G-2	31.6 ± 6.7 (4)	NA**	NA**
	USW G-4	12.9 ± 4.8 (5)	NA**	NA**
CHn2z	USW G-1	27.8 ± 14.7(4)	5.3 ± 3.4(4)	0.33 ± 0.05(4)

\# Data derived from unconfined compressive tests performed on artificially saturated samples. Testing artificially saturated samples results in underestimation of the compressive strength.

* The format used in this table to report measured values of a parameter is Mean ± Standard Deviation (Number of tests)

** NA stands for "not available".

\## Data from Price et al. (1985), SAND84-0860

Table 3.1.1.2.7.3.2-1. Unconfined Compressive Test on Saturated Samples of Various Sizes of Topopah Spring Tuff from Outcrops at Busted Butte

Sample Dia. (mm)	Mean Comp. Strength (MPa)	Standard Deviation	Number of Tests
25.4	193.8	61.8	6
50.8	140.8	35.4	6
82.6	119.6	31.7	9
127.0	97.7	30.6	11
228.6	90.1	4.6	2

Table 3.1.1.2.7.3.2-2. Compressive Test Results of Saturated and Oven Dry Samples

Strain Rate	Moisture Content	Number of Tests	Compressive Strength± Std. Dev. (Percent) MPa	Young's Modulus± Std. Dev. (Percent) GPa
10^{-2}/second	Oven dry	3	180± 7.5 (4.2%)	27.7± 1.5 (5.4%)
10^{-2}/second	Saturated	3	125± 15 (12.1%)	24.2± 1.7 (7.0%)
10^{-4}/second	Oven dry	3	158± 2.8 (1.6%)	27.4± 1.2 (4.4%)
10^{-4}/second	Saturated	3	112± 10 (8.9%)	24.7± 0.7 (2.8%)
10^{-6}/second	Oven dry	3	137± 3.7 (2.8%)	28.4± 1.1 (3.9%)
10^{-6}/second	Saturated	3	94.3± 14.6 (15.5%)	26.0± 0.7 (2.7%)

Table 3.1.1.2.7.3.2-3. Effects of Changes in Strain Rate on Rock Properties for Yucca Mountain Tuffs[a, b]

Unit	USW G-1 depth (m)	USW G-4 depth (m)	Strain rate (s^{-1})	Strength (mpa)	Axial strain to failure (%)	Young's modulus (GPa)	Poisson's ratio	Reference[c]
TSw2	372.5	--[d]	10^{-2}	157.2	0.48	29.2	0.31	P
TSw2	384.8	--	10^{-2}	149.7	0.49	36.6	--[d]	P
TSw2	372.5	--	10^{-4}	133.8	0.57	27.7	--	P
TSw2	373.0	--	10^{-4}	157.2	0.46	37.5	0.25	P
TSw2	371.3	--	10^{-6}	176.6	0.51	40.8	0.25	P
TSw2	373.0	--	10^{-6}	156.6	0.47	35.3	0.21	P
TSw2	390.0	--	10^{-6}	44.9	0.41	22.9	0.27	P
TSw2	--[d]	226.4	10^{-3}	319	0.95	37.4	0.29	N1
TSw2	--	226.4	10^{-3}	283	0.94	34.0	0.28	N1
TSw2	--	226.4	10^{-3}	280	0.89	38.4	0.25	N1
TSw2	--	226.4	10^{-5}	235	0.72	35.6	0.21	N1
TSw2	--	226.4	10^{-5}	256	0.83	36.8	0.21	N1
TSw2	--	226.4	10^{-5}	279	0.93	34.6	0.21	N1
TSw2	--	226.4	10^{-7}	243	0.69	37.5	0.20	N1
TSw2	--	226.4	10^{-7}	230	0.75	33.6	0.11	N1
TSw2	--	305.5	10^{-5}	179	0.56	33.6	0.32	N1
TSw2	--	305.5	10^{-5}	137	0.45	33.1	--[e]	N1
TSw2	--	305.5	10^{-7}	123	0.44	22.0	0.11	N1
TSw2	--	305.5	10^{-7}	138	0.45	32.8	0.20	N1

Table 3.1.1.2.7.3.2-3. Effects of Changes in Strain Rate on Rock Properties for Yucca Mountain Tuffs[a, b] (continued)

Unit	USW G-1 depth (m)	USW G-4 depth (m)	Strain rate (s^{-1})	Strength (mpa)	Axial strain to failure (%)	Young's modulus (GPa)	Poisson's ratio	Reference[c]
TSw2[f]	--	--	10^{-5}	167	0.46	42.0	0.30	N2
TSw2[f]	--	--	10^{-5}	157	0.33	49.0	0.26	N2
TSw2[f]	--	--	10^{-7}	115	0.30	41.9	0.26	N2
TSw2[f]	--	--	10^{-7}	117	0.32	42.1	0.26	N2
CHnlz	508.4	--	10^{3}	24.7	0.61	5.41	0.33	PJ
CHnlz	508.4	--	10^{-3}	23.4	0.58	5.45	--[e]	PJ
CHnlz	508.4	--	10^{-5}	25.4	0.57	6.15	0.36	PJ
CHnlz	508.4	--	10^{-5}	16.7	0.43	4.92	0.18	PJ
CHnlz	508.4	--	10^{-7}	21.5	0.55	7.86	0.21	PJ
CHnlz	508.4	--	10^{-7}	19.9	0.51	7.03	0.22	PJ

[a] Data from unconfined, ambient temperature, constant-strain-rate tests on saturated samples allowed to drain during testing.

[b] Unit identifications, thicknesses and relation to formal stratigraphy are shown in Figure 3.1.1.2.7.1.1-1

[c] References: P = Price et al. (1982b); PJ = Price and Jones (1982); N1 = Nimick et al. (1985); N2 = Nimick and Schwartz (1987).

[d] The symbol "--" in this column indicates that the column is not relevant to the row in which the dashes appear

[e] Data not available

[f] Samples from drill hole USW G-2, 298.1 m depth 1

Table 3.1.1.2.7.3.3-1. Tensile Strength of Yucca Mountain Tuff

Rock Unit	Average Tensile Strength by Brazilian Method (MPa)	Standard Deviation (MPa)	Number of Tests	Average Porosity of samples (percent)
Topopah Spring Welded Unit	19.1	5.5	5	10.0
	18.8	3.0	5	10.0
	20.5	3.7	5	9.0
	25.9	2.4	5	10.0
	17.7	5.2	5	11.0
	7.6	0.1	3	25.0
	23.7	3.3	3	12.0
	11.4	2.8	4	9.0
Topopah Spring Vitrophyre	8.6	1.8	4	1.7
Calico Hills Unit	5.3	0.8	5	29.0
	5.9	0.9	5	26.0
	5.6	1.0	5	25.0
	5.8	0.8	5	20.0
	6.2	1.1	5	26.0
	5.4	0.4	5	26.0
	5.1	1.0	5	30.0
Bullfrog Unit	2.2	0.2	10	26.9
	2.4	0.2	5	26.1
Tram Unit	3.7	0.4	5	28.3
	12.2	3.0	4	16.1
	9.5	1.2	5	17.7

Table 3.1.1.2.7.3.4-1. Summary of Coulomb Failure Criteria Parameters[a]

Thermal mechanical unit[b]	USW G4	Depth (m) USW G1	UE-25a#1q	Effective pressure (MPA)	Temp. (° C)	Strain rate (S^{-1})	Saturation (S,R)[c]	Drained Condition (Y,N)[d]	Cohesion (MPa)	Angle of internal friction (°)	Correlation coefficient
TCw	--[e]	--	26.7	0,10,20	23	10^{-4}	R	N	28.1	68.0	0.89
TSw2	--	--	381.0	0,10,20	23	10^{-4}	R	N	17.5	66.7	0.999
TS[c]	--	--	--	10,20,30,50	23	10^{-4}	S	N	92.0	29.1	0.47
TS[c]	--	--	--	10,20,30,40	23	10^{-6}	S	N	48.9	45.6	0.70
TSw2	209.3	--	--	0,5,10	23	10^{-5}	S	Y	37.1	51.8	0.31
TSw2	294.2	--	--	0,10	23	10^{-5}	S	Y	47.4	27.2	0.16
CHnlz	426.9	--	--	0,5,10	23	10^{-5}	S	Y	6.6	15.9	0.45
CHnlz	--	453.4	--	0,10,20	23	10^{-5}	S	Y	10.2	11.1	0.04
CHnlz	--	453.4	--	0,10,20	23	10^{-5}	S	N	10.6	7.8	0.62
CHnlz	--	507.6	--	0,10	23	10^{-5}	R	N	10.2	32.2	0.96
CHnlz	--	507.6	--	0,10,20	23	10^{-5}	S	N	13.2	6.8	0.55
CHnlz	--	508.4	--	0,10	23	10^{-5}	S	N	9.7	4.8	0.21
BFw	--	759	--	5,12.5,20.7	200	10^{-4}	S	Y	23.6	19.6	0.93
BFw	--	759	--	5,10,20.7	200	10^{-4}	R	Y	16.5	37.7	0.89
BF	--	--	--	10,30,40,50	23	10^{-4}	S	N	22.7	42.1	0.93
BF	--	--	--	10,20,30,40, 50	23	10^{-6}	S	N	15.2	44.3	0.98

[a]Olsson and Jones (1980); Olsson (1982); Price and Jones (1982); Price (1983); Morrow and Byerlee (1984); Nimick et al, (1985).
[b]Unit identifications, thicknesses, and relation to the formal stratigraphy are shown in Figure 3.1.1.2.7.2.1-1.
[c] Saturation: R - room dried (unknown degree of saturation) and S -= fully saturated
[d]Drained condition: N = undrained and Y = drained
[e]Data not available

Table 3.1.1.2.7.5-1. Fracture Orientations as Estimated from Oriented Core and Borehole Television Surveys

Geologic Member	USW GU-3		USW G-4	
	Strike	Dip	Strike	Dip
Tiva Canyon Member	N-N30°W	85°-90°SW/NE	N-N22°E	65°-90°NW
	N50°W	12°NE	---	---
	N18°W-36°E	*NM*	E-W	70°-90°N/S
	---	---	N50°W	70°-90°NE/SW
Topopah Spring Member	N10°W	75o°90°NE/SW	N°12W	80°-90°NE/SW
	N25°E	10°SE	---	---
	N45°E	80°-90°SE/NW	N-N40°E	NM

NM = Not measured by borehole television system.
--- = No corresponding joint was observed.

Table 3.1.1.2.7.5-2. Thickness, Numbers of Fractures, and Linear Fracture, and Linear Fracture Frequencies in Tuff Units

Thermomechanical Units		USW G-1	USW G-4	USW GU-3	UE-25a#1
TCw	Interval (m)	NA	9.1-36.0	12.2-104.5	9.1-59.4
	Thickness (m)	NA	26.8	92.4	50.3
	Fractures	NA	207	349	138
	Frequency (m^{-1})	NA	7.7	3.8	2.7
PTn	Interval (m)	18.3-85.3	36.0-74.1	104.5-131.1	59.4-84.4
	Thickness (m)	67.1	38.0	26.5	25
	Fractures	NA	38	41	10
	Frequency (m^{-1})	NA	1.0	1.5	0.4
TSw1	Interval (m)	85.3-217.9	74.1-204.2	131.1-210.3	84.4-189.0
	Thickness (m)	189.9	130.1	79.2	104.5
	Fractures	790	561	105	46
	Frequency (m^{-1})	4.2	4.3	1.3	0.4
TSw2	Interval (m)	217.9-392.3	204.2-394.1	210.3-361.8	189.0-384.7
	Thickness (m)	174.3	189.9	151.5	195.7
	Fractures	152	790	860	339
	Frequency (m^{-1})	0.9	4.2	5.7	1.7
TSw3	Interval (m)	392.3-409.0	394.1-410.0	361.8-386.8	384.7-401.4
	Thickness (m)	16.8	15.8	25	16.8
	Fractures	42	53	43	33
	Frequency (m^{-1})	2.5	3.4	1.7	2.0
CHn1	Interval (m)	409.0-529.1	410.0-519.7	386.8-459.3	401.4-545.3
	Thickness (m)	120.1	109.7	72.5	143.9
	Fractures	12	25	35	28
	Frequency (m^{-1})	0.1	0.2	0.5	0.2

NA = Data not available.

Table 3.1.1.2.7.5-3. Volumetric Fracture Frequency in a Unit Volume (m^3) of Rock

Drill Hole	TCw	PTn	TSw1	TSw2	TSw3	CHn1
USW G-1	NA[1]	NA	3.04	5.41	15.36	0.81
USW G-4	30.87	3.95	22.35	21.56	17.39	1.53
USW GU-3	20.79	NA	9.48	40.61	12.16	2.46
UE-25a#1	8.36	NA	2.87	10.96	12.45	1.59
Mean	20.01	NA	9.44	19.64	14.34	1.60

[1]NA *Data not available.*

Table 3.1.1.2.7.6.1-1. Individual Rating Attributes for Parameters in the Rock Mass Rating System [INN 3.1.1.2.7.6.1-2]

Table 3.1.1.2.7.6.1-2. Ratings of Rock Mass Classes and the Significance to Unsupported Tunnel Span and Average Stand-Up Time

Table 3.1.1.2.7.6.1-3. Descriptors Applied to the Joint Alteration Number in the Rock Mass Rating System

Table 3.1.1.2.7.6.1-4. Descriptors Applied to the Joint Water Reduction Factor in the Rock Mass Rating System

Table 3.1.1.2.7.6.1-5. Descriptors Applied to the Stress Reduction Factor in the Rock Mass Rating System

Table 3.1.1.2.7.6.1.1-1. Parameters Required by both the RMR and Q Classification Systems for the Determination of Rock Mass Quality Categories for the TSw2 Unit.

Table 3.1.1.2.7.6.1.1-2. Values Utilized in the Analysis for the Appropriate Level of Probability and the Resulting Rock Mass Classification for the Q and RMR Systems

Table 3.1.1.2.7.6.1.1-3. Q and RMR Values for Each of the Geologic Units Identified

Table 3.1.1.2.7.6.4.1-1. Parameters for the Determination of Rock Mass Compressive Strength for each Rock Mass Category in each Geologic Unit

Table 3.1.1.2.7.6.4.3-1. Elastic Modulus Values for each Rock Mass Quality Category and each Geologic Unit

Table 3.1.2.1.1-1. Approximate Areas of the Eight Hydrographic Areas in the Hydrographic Study Area

Area Number on Figure 3.1.2.1.1-1	Hydrographic Area	State[a, b]	Approximate Area (mi^2)	Approximate Area (km^2)
1	Death Valley and	NV	344	891
	Lower Amargosa	CA	5,019	13,000
2	Amargosa Desert and	NV	896	2,321
	Upper Amargosa Area	CA	1,122	2,906
3	Crater Flat	NV	182	471
4	Fortymile Canyon, Jackass Flats	NV	279	723
5	Fortymile Canyon, Buckboard Mesa	NV	240	622
6	Mercury Valley	NV	110	285
7	Oasis Valley	NV	460	1,191
8	Rock Valley	NV	82	212

[a]Data for Nevada from Rush (pg. 27, 1968)
[b]Data for California from U.S. Geological Survey (1978)

Table 3.1.2.1.1-2. Summary of Peak Streamflow Data for Selected Crest-Stage Sites in Hydrographic Study Area and Adjacent Areas[a]

Site Number	Station Number	Station Name	Drainage Area (mi^2)	Drainage Area (km^2)	Period of Record	Peak Discharge (m^3/s)	Date of Peak Discharge	Discharge per unit area $(m^3/s)/km^2$
1	10247860	Penoyer Valley tributary near Tempiute, Nevada	1.48	3.83	1964-80	3.68	1968	0.96
2	10248490	Indian Springs Valley tributary near Indian Springs, Nevada	29.0	75.1	1964-80	14.1	1972	0.19
3	10251270	Amargosa River Tributary near Mercury, Nevada	110.0	284.9	1963-80	97.1	1968	0.34
4	10251271	Amargosa River tributary No. 1 near Johnnie, Nevada	2.21	5.72	1967-80	9.9	1970	1.73
5	10251272	Amargosa River tributary No. 2 near Johnnie, Nevada	2.49	6.45	1968-80	3.54	1968	0.55
6	10251220	Amargosa River near Beatty, Nevada	470.0	1217.0	1964-79	453.0	1969	0.37
7	10249050	Sarcobatus Flat tributary near Springdale, Nevada	37.1	96.1	1961-80	1.78	1980	0.02

Table 3.1.2.1.1-2. Summary of Peak Streamflow Data for Selected Crest-Stage Sites in Hydrographic Study Area and Adjacent Areas[a] (continued)

Site Number	Station Number	Station Name	Drainage Area (mi^2)	Drainage Area (km^2)	Period of Record	Peak Discharge (m^3/s)	Date of Peak Discharge	Discharge per unit area $(m^3/s)/km^2$
8	10249850	Palmetto Wash tributary near Lida, Nevada	4.73	12.25	1967-80	5.46	1969	0.45
9	10248970	Stonewall Flat tributary near Goldfield, Nevada	0.53	1.37	1964-79	4.25	1969	3.10
10	10249680	Big Smoky Valley tributary near Blair Junction, Nevada	11.4	29.5	1961-79	4.81	1976	0.16
11	10249135	San Antonio Wash tributary near Tonopah, Nevada	3.42	8.86	1965-80	18.7	1972	2.10
12	10249180	Salsbury Wash, Tonopah, Nevada	56.0	145.0	1962-80	9.62	1969	0.07

[a] Source: Squires and Young, (pg. 15, 1984) and Waddell et al. (pp. 8-13, 1984).

Table 3.1.2.1.1-3. Springs, Seeps, and Phreatophyte Areas in the Hydrogeologic Study Area

Latitude/Longitude	Township, range & spring location #	Name[a]	Aquifer[b]	Discharge (gpm)	Use	Reference[c]	Comments
Alkali Flat-Furnace Creek Ranch Subbasin (California)							
36 26 40/116 49 50	27N/01E-23R1	Travertine		305	ND	T&R, 71 P&K, 64	
36 26 30/116 49 40	27N/01E-26A2	Travertine		220	Irrigation	T&R, 71 P&K, 64	
36 26 30/116 49 50	27N/01E-26AS5	Travertine		ND[d]	Irrigation	T&R, 71 P&K, 64	
36 26 30/116 49 50	27N/01E-A	Travertine		270	Irrigation	T&R, 71 P&K, 64	
36 26 30/116 49 50	27N/01E-26A7	Travertine		ND	Irrigation	T&R, 71 P&K, 64	
36 26 30/116 49 40	27N/01E-26A1	Travertine		103	Irrigation	T&R, 71 P&K, 64	
36 26 30/116 49 40	27N/01E-25D2	Travertine		ND	Irrigation	T&R, 71 P&K, 64	Seep
36 26 30/116 49 40	27N/01E-25D1	Travertine		ND	Irrigation	T&R, 71 P&K, 64	
36 26 30/116 49 50	27N-01E-26A3	Travertine		0.4	Irrigation	T&R, 71 P&K, 64	
36 26 30/116 49 50	27N/01E-26A4	Travertine		4	Irrigation	T&R, 71 P&K, 64	
36 30 30/116 49 10	28N/01E-36K1	Nevares		ND	Domestic Public Supp.	M, 77 P&K, 64	Seep
36 30 30/116 49 40	28N/01E-36M2	Nevares		ND	Domestic Public Supp.	M, 77 P&K, 64	
36 30 30/116 49 40	28N/01E-36M1	Nevares		31	Domestic Public Supp.	M, 77 P&K, 64	

Table 3.1.2.1.1-3. Springs, Seeps, and Phreatophyte Areas in the Hydrogeologic Study Area (continued)

Latitude/Longitude	Township, range & spring location #	Name[a]	Aquifer[b]	Discharge (gpm)	Use	Reference[c]	Comments
36 30 40/116 49 10	28N/01E-36G2	Nevares		22	Domestic Public Supp.	M, 77 P&K, 64	
ND/ND	28N/01E-36FS1			40	ND	M, 77 P.59	
36 30 40/116 49 10	28N/01E-36GS1	Nevares		269	Domestic Public Supp.	M, 77 P&K, 64	
36 29 40/116 51 20	27N/01E-03P1	Salt		4	Unused	P&K, 64	
36 29 40/116 51 20	27N/01E-03K1	Salt		ND	NA[c]	P&K, 64	
36 27 10/116 51 00	27N/01E-22H1	Furnace Creek Inn Tunnel		148	Irrigation	P&K, 64	
36 26 30/116 49 40	27N/01E-26B1	South Travertine (Sump in Furnace Creek Wash)		566	Irrigation	M, 77 P&K, 64	
36 26 30/116 49 40	27N/01E-26B2	Buried tile in Furnace Creek Wash		200	Irrigation	P&K, 64	
36 26 40/116 49 50	27N/01E-23B1	Texas Spring (Tunnel)		224	Irrigation and Public Supply	P&K, 64	
	27N/01E-14N1			NA	NA	P&K, 64	Phreatophyte
	27N/01E-14P1			NA	NA	P&K, 64	Phreatophyte
	27N/01E-14Q1			NA	NA	P&K, 64	Phreatophyte
	27N/01E-23B2			NA	NA	P&K, 64	Phreatophyte
	27N/01E-23B3			NA	NA	P&K, 64	Phreatophyte
	27N/01E-23B4			NA	NA	P&K, 64	Phreatophyte

Table 3.1.2.1.1-3. Springs, Seeps, and Phreatophyte Areas in the Hydrogeologic Study Area (continued)

Latitude/Longitude	Township, range & spring location #	Name[a]	Aquifer[b]	Discharge (gpm)	Use	Reference[c]	Comments
36 27 10/116 50 20	27N/01E-23F1			4	ND	P&K, 64	Phreatophyte
	27N/01E-23G1			NA	NA	P&K, 64	Phreatophyte
	27N/01E-23G2			NA	NA	P&K, 64	Phreatophyte
	27N/01E-23J1			NA	NA	P&K, 64	Phreatophyte
	27N/01E-23J2			NA	NA	P&K, 64	Phreatophyte
36 27 00/116 50 10	27N/01E-23K1			NA	NA	P&K, 64	Seep
36 27 00/116 50 10	27N/01E-23K2			4	ND	P&K, 64	
36 27 00/116 50 20	27N/01E-23L1			NA	NA	P&K, 64	Seep
36 27 00/116 50 20	27N/01E-23L2			NA	NA	P&K, 64	Phreatophyte
36 27 00/116 50 20	27N/01E-23L3			NA	NA	P&K, 64	Seep
36 26 40/116 50 10	27N/01E-23Q1			NA	NA	P&K, 64	Seep
36 26 40/116 50 10	27N/01E-23Q2			NA	NA	P&K, 64	Seep
36 26 40/116 50 10	27N/01E-23Q3			4	ND	P&K, 64	
36 26 40/116 50 10	27N/01E-23Q4			NA	NA	P&K, 64	Seep
36 26 40/116 50 10	27N/01E-23Q5			NA	NA	P&K, 64	Seep
36 26 40/116 50 10	27N/01E-23Q6			NA	NA	P&K, 64	Seep
36 26 40/116 49 50	27N/01E-23R2			NA	NA	P&K, 64	Phreatophyte
36 26 40/116 49 50	27N/01E-23R3			NA	NA	P&K, 64	Phreatophyte
36 26 40/116 49 40	27N/01E-24N1			NA	NA	P&K, 64	Seep
36 26 30/116 50 10	27N/01E-26B4			NA	NA	P&K, 64	Seep

Table 3.1.2.1.1-3. Springs, Seeps, and Phreatophyte Areas in the Hydrogeologic Study Area (continued)

Latitude/Longitude	Township, range & spring location #	Name[a]	Aquifer[b]	Discharge (gpm)	Use	Reference[c]	Comments
36 26 30/116 50 10	27N/01E-26B5			NA	NA	P&K, 64	Seep
36 30 00/116 51 00	27N/01E-3A1	Cow		18	Unused	P&K, 64	
	27N/01E-3B1			NA	NA	P&K, 64	Phreatophyte
	27N/01E-34M1			NA	NA	P&K, 64	Phreatophyte
36 30 10/116 51 50	28N/01E-34N1			NA	NA	P&K, 64	Seep
36 30 10/116 51 50	28N/01E-34N2			NA	NA	P&K, 64	Phreatophyte
	28N/01E-34P1			NA	NA	P&K, 64	Phreatophyte
	28N/01E-35E1			NA	NA	P&K, 64	Phreatophyte
	28N/01E-35G1			NA	NA	P&K, 64	Phreatophyte
36 30 30/116 50 20	28n/01E-35k1			NA	Unused	P&K, 64	Seep
	28N/01E-35n1			4	NA	P&K, 64	
	25N/02E-13GS1	Lemonade	Volcanic Rock	<1	ND	USGS Map Death Valley M, 77	
	26N/02E-13FS1	Navel	Fanglomerate	ND	ND	USGS Map Death Valley M, 77	
36°39'/116°51'	29N/01E-15			ND	ND	USGS Map Death Valley M, 77	
36°37'/116°48'	29N/02E-30			ND	ND	USGS Map Death Valley M, 77	

Table 3.1.2.1.1-3. Springs, Seeps, and Phreatophyte Areas in the Hydrogeologic Study Area (continued)

Latitude/Longitude	Township, range & spring location #	Name[a]	Aquifer[b]	Discharge (gpm)	Use	Reference[c]	Comments
Alkali Flat-Furnace Creek Ranch Subbasin (Nevada)							
36 25 40/116 24 50	17S/49E-35d1	Ash Tree	ND	9	ND	T&R, 71 W&T, 75	
36 48 07/116 05 13	ND	Cane	Tertiary igneous	2	Unused	T&R, 71 W&T, 75	Perched
36 53 00/115 45 00	12S/47E-20bb1		ND	ND	Irrigation	T&R, 71	
36 53 10/116 45 00	12S/47E-20bbb		ND	100	Irrigation	T&R, 71	
36 56 21/116 16 14	ND	Topopah	Tertiary igneous	0.1	Unused	T&R, 71	Perched
37 02 36/116 12 26	ND	Tippipah	Tertiary igneous	8	Unused	T&R, 71	Perched
37 11 22/116 11 43	ND	Rainier	Tertiary igneous	0.1	Unused	T&R, 71	
37 26 30/116 06 00	06S/52E-10ad	Indian	Tertiary-Quaternary alluvium	2	Unused	T&R, 71	
37 30 40/116 05 20	05S/52E-14db	Cliff	Tertiary igneous	0.4	Unused	T&R, 71	
37 37 00/116 20 00	04S/50E-01dd		Tertiary igneous	0.1	Unused	T&R, 71	
36 45 30/115 15	ND	Pavits	Tertiary igneous	ND	ND	T&R, 71	Perched
36 18 50/116 18 40	19S/50E-02	Grapevine	ND	ND	ND	T&R, 71 W&T, 75	
36 52 50/116 39 40	12S/48E-30	Specie	ND	ND	ND	USGS Map Death Valley	

Table 3.1.2.1.1-3. Springs, Seeps, and Phreatophyte Areas in the Hydrogeologic Study Area (continued)

Latitude/Longitude	Township, range & spring location #	Name[a]	Aquifer[b]	Discharge (gpm)	Use	Reference[c]	Comments
Oasis Valley Subbasin							
36 55 10/116 44 40	12S/47E-05cda	Beatty	Tertiary volcanic	100	Public Use	T&R, 71 W, 79	Not used
36 56 30/116 43 40	11S/47E-33bac		ND	25	Domestic	T&R, 71	
36 56 40/116 47 40	11S/46E-26dcc	Lower Indian	Tertiary igneous	8	Stock	T&R, 71 M&E, 62	Perched
36 57 00/116 47 50	11S/46E-26ca-1	Middle Indian	Tertiary igneous	ND	Municipal	T&R, 71 M&E, 62	Perched
36 57 10/116 48 20	11S/46E-26cbb-1	Upper Indian	Tertiary igneous	5	Municipal	T&R, 71 M&E, 62	Perched
36 57 00/116 43 00	11S/47E-28dac-1		Tertiary-Quaternary alluvium	35	Irrigation	T&R, 71	
36 57 30/116 43 10	11S/47E-28aa-2	Ute	Quaternary alluvium	25	Irrigation	T&R, 71 W, 79	
36 57 50/116 43 20	11S/47E-21dbb-2		Tarrtiary-Quaternary alluvium	37	Domestic	T&R, 71	
36 58 20/116 43 10	11S/47E-21aba-2	(Hicks?) (Bailey?)	Tertiary alluvium	ND	Public	T&R, 71	
36 58 30/116 43 20	11S/47E-16dcd-2	Burro Hot	Tertiary igneous	5	Public	T&R, 71 M&E, 62	
36 58 30/116 43 20	11S/47E-16dcd-1	Burro Hot	Tertiary igneous	ND	Domestic	T&R, 71	
36 59 10/116 45 30	11S/47E-18acb	Crystal	Tertiary igneous	2	Domestic	T&R, 71 M&E, 62	

Table 3.1.2.1.1-3. Springs, Seeps, and Phreatophyte Areas in the Hydrogeologic Study Area (continued)

Latitude/Longitude	Township, range & spring location #	Name[a]	Aquifer[b]	Discharge (gpm)	Use	Reference[c]	Comments
36 59 30/116 42 50	11S/47E-10ccb		Tertiary-Quaternary alluvium	ND	Stock	T&R, 71	
36 59 30/116 42 50	11S/47E-10ccb		Tertiary igneous	ND	Domestic	T&R, 71	
36 59 40/116 42 30	11S/47E-10bdd		Tertiary igneous	49	Irrigation	T&R, 71	
37 00 00/116 42 20	11S/47E-10ab-1	Goss	Tertiary igneous	50	Irrigation	T&R, 71	
37 00 20/116 42 30	11S/47E-03cdb-1		Tertiary igneous	40	Irrigation	T&R, 71	
37 00 30/116 42 30	11S/47E-04cad		Tertiary-Quaternary alluvium	10	Irrigation	T&R, 71	
37 00 50/116 43 50	11S/47E-04bb-1		ND	7	Domestic	T&R, 71	
37 01 40/117 43 20	10S/47E-33abc		Tertiary igneous	225	Irrigation	T&R, 71	
37 01 50/116 45 10	10S/47E-3laab-1		Tertiary-Quaternary alluvium	11	Irrigation	T&R, 71	
37 02 00/116 45 20	10S/47E-30d-1		ND	25	Domestic	T&R, 71	
37 04 30/116 41 30	10S/47E-14bab		Tertiary-Quaternary alluvium	100	Irrigation	T&R, 71	
37 37 10/116 43 40	04S/47E-04ca	Antelope	Tertiary alluvium	0.4	Unused	T&R, 71	

Table 3.1.2.1.1-3. Springs, Seeps, and Phreatophyte Areas in the Hydrogeologic Study Area (continued)

Latitude/Longitude	Township, range & spring location #	Name[a]	Aquifer[b]	Discharge (gpm)	Use	Reference[c]	Comments
36 59 40/116 51 20	11S/46E-08bdc	Mud	Tertiary-Quaternary alluvium	ND	Stock	T&R, 71	
	12S/47E-20bb1		ND	ND	Irrigation domestic	M&E, 62	
	11S/47E-7dc1		ND	ND	ND	M&E, 62	
	10S/47E-30d1		ND	25	Domestic, stock	M&E, 62	
	10S/47E-32dda		Quarternary	225	ND	W, 79	
Ash Meadows Subbasin							
36 26 00/116 18 30	17S/50E-35a1		Lower carbonate aquifer	140	ND	T&R, 71 W&T, 75	Ash Meadows
36 26 10/116 18 50	17S/50E-35b1		Lower carbonate aquifer	17	ND	T&R, 71 W&T, 75	Ash Meadows
36 27 50/116 19 00	17S/50E-23b1	(Five Springs area?)	Lower carbonate aquifer	193	ND	T&R, 71 W&T, 75 D&L, 76	Ash Meadows
36 28 00/116 19 30	17S/50E-22a1	Longstreet	Lower carbonate aquifer	1,042	ND	T&R, 71 W&T, 75	Ash Meadows
36 28 50/116 19 30	17S/50E-15a1	Rogers	Lower carbonate aquifer	736	ND	T&R, 71 W&T, 75	Ash Meadows
36 29 20/116 20 10	17S/50E-10c1	Bell(Soda)	Lower carbonate aquifer	79	ND	T&R, 71 W&T, 75	Ash Meadows

Table 3.1.2.1.1-3. Springs, Seeps, and Phreatophyte Areas in the Hydrogeologic Study Area (continued)

Latitude/Longitude	Township, range & spring location #	Name[a]	Aquifer[b]	Discharge (gpm)	Use	Reference[c]	Comments
36 29 20/116 20 30	17S/50E-09a1	Fairbanks	Lower carbonate aquifer	1,715	ND	T&R, 71 W&T, 75	Ash Meadows
	17S/50E-22ac	McGillivary	Lower carbonate aquifer	See comments	ND	D&L, 76	Ash Meadows flow reported in 1986 at 155 gpm; no flow in 1971, water level 5 ft. below outlet
	17S/50E-35acc	Scruggs	Lower carbonate aquifer	60	ND	D&L, 76	Ash Meadows
	17S/50E-35d1	School	Lower carbonate aquifer	6	ND	D&L, 76	Ash Meadows
	18S/50E-01ca	Collins	Lower carbonate aquifer	10	ND	D&L, 76	Ash Meadows
	18S/50E-12dc	Sink	Lower carbonate aquifer	See comments	ND	D&L, 76	Ash Meadows flow observed at 25 gpm in 1966, no flow observed in 1971
ND/ND	17S/50E-21ac	Cold	Lower carbonate aquifer	73	ND	D&L, 76	Ash Meadows
36 25 10/116 19 20	18S/50E-03a	Crystal Pool	Lower carbonate aquifer	2,820	ND	W&T, 75 T&R, 71	Ash Meadows
36 24 50/115 44 20	18S/55E-01d	Cold Creek	Tertiary-Quaternary alluvium	690	Domestic	T&R, 71	

Table 3.1.2.1.1-3. Springs, Seeps, and Phreatophyte Areas in the Hydrogeologic Study Area (continued)

Latitude/Longitude	Township, range & spring location #	Name[a]	Aquifer[b]	Discharge (gpm)	Use	Reference[c]	Comments
36 25 00/115 45 50	18S/55E-02a	Willow	Tertiary-Quaternary alluvium	340	ND	T&R, 71	
36 26 40/115 55 40	17S/54E-29d	Big Timber	Cambrian sedimentary	ND	ND	T&R, 71	
36 18 30/115 41 10	19S/56E-10c	Three	Cambrian limestone	21	ND	T&R, 71	Spring Mountains
36 19 10/115 40 40	19S/56E-03c	Scout Canyon	Ordovician limestone	11	ND	T&R, 71	Spring Mountains
31 21 30/116 16 20	18S/51E-30d	Last Chance	Lower carbonate aquifer	1	ND	T&R, 71 W&T, 75	Ash Meadows
36 21 50/116 15 40	18S/51E-29b		Lower carbonate aquifer	1	ND	T&R, 71 W&T, 75	Ash Meadows
36 21 50/116 16 10	18S/51E-30a1	Bole	Lower carbonate aquifer	12	ND	T&R, 71 W&T, 75	Ash Meadows
36 22 30/116 16 20	18S/51E-19a1	Big (Deep) (Ash Meadows)	Lower carbonate aquifer	1,036	ND	T&R, 71 W&T, 75	Ash Meadows
36 23 20/116 16 40	18S/51E-18b1	Jack Rabbit	Lower carbonate aquifer	587	ND	T&R, 71 W&T, 75	Ash Meadows
36 24 00/116 18 00	18S/50E-12c1		Lower carbonate aquifer	11	ND	T&R, 71 W&T, 75	Ash Meadows

Table 3.1.2.1.1-3. Springs, Seeps, and Phreatophyte Areas in the Hydrogeologic Study Area (continued)

Latitude/Longitude	Township, range & spring location #	Name[a]	Aquifer[b]	Discharge (gpm)	Use	Reference[c]	Comments
36 24 00/116 18 10	18S/50E-11d3	Davis Ranch (Bradford)	Lower carbonate aquifer	30	ND	T&R, 71 W&T, 75	Ash Meadows
36 24 10/116 18 10	18S/50E-11d2	Davis Ranch (Bradford)	Lower carbonate aquifer	5	ND	T&R, 71 W&T, 75	Ash Meadows
36 24 00/116 18 10	18S/50E-11d1	Davis Ranch (Bradford)	Lower carbonate aquifer	397	ND	T&R, 71 W&T, 75	Ash Meadows
36 24 10/116 16 10	18S/51E-07d1	King Pool (Point of Rock)	Lower carbonate aquifer	1,078	ND	T&R, 71 W&T, 75	Ash Meadows
36 24 10/116 16 10	18S/51E-07d4	(Point of Rock)	Lower carbonate aquifer	19	ND	T&R, 71 W&T, 75	Ash Meadows
36 24 10/116 16 10	18S/51E-07d3	Indian Rock (Point of Rock)	Lower carbonate aquifer	379	ND	T&R, 71 W&T, 75	Ash Meadows
36 24 10/116 16 10	18S/51E-07d2	Indian Rock (Point of Rock)	Lower carbonate aquifer	22	ND	T&R, 71 W&T, 75	Ash Meadows
36 24 10/116 16 20	18S/51E-07d5	(Point of Rock)	Lower carbonate aquifer	2	ND	T&R, 71 W&T, 75	Ash Meadows
36 25 30/116 17 30	17S/50E-36d1	Devil's Hole	Lower carbonate aquifer	See comments	ND	T&R, 71 W&T, 75 D&L, 76	Ash Meadows No discharge as flow. Cyprinodon diabolis habitat

Table 3.1.2.1.1-3. Springs, Seeps, and Phreatophyte Areas in the Hydrogeologic Study Area (continued)

Latitude/Longitude	Township, range & spring location #	Name[a]	Aquifer[b]	Discharge (gpm)	Use	Reference[c]	Comments
36 33 40/115 39 50	16S/56E-16b1	Indian	Tertiary-Quaternary alluvium	430	Domestic	T&R, 71	
36 34 30/115 43 40	16S/55E-11a	Cactus	Tertiary-Quaternary alluvium	0.5	Domestic	T&R, 71	
36 59 10/116 45 30	11S/57E	Quartz	ND	ND	ND	T&R, 71	
37 10 09/116 10 07	ND	Captain Jack	Tertiary igneous	0.2	Unused	T&R, 71	Perched
37 12 13/116 07 54	ND	Whiterock	Tertiary igneous	1.0	Unused	T&R, 71	Perched
37 14 23/116 02 30	ND	Tubb	Tertiary igneous	ND	Unused	T&R, 71	Perched
37 14 41/116 04 24	ND	Oak	Tertiary igneous	0.1	Unused	T&R, 71	Perched
37 31 40/115 56 00	05S-54E-08bc	White Blotch	Tertiary igneous	0.2	Unused	T&R, 71	
36 27 50/115 57 40	17S/53E-24a	Gold	Cambrian sedimentary	ND	ND	T&R, 71	
36 29 10/115 58 20	17S/53E-12c	Rock	Cambrian sedimentary	ND	ND	T&R, 71	
36 29 10/115 59 00	17S/53E-11d	Jaybird	Cambrian sedimentary	ND	ND	T&R, 71	
36 38 00/115 12 30	ND	Wiregrass	Ordovician dolomite	0.5	ND	T&R, 71	
36 38 50/115 13 50	ND	Pine	Ordovician dolomite	ND	ND	T&R, 71	
36 39 30/115 13 10	ND	Canyon	Ordovician dolomite	ND	ND	T&R, 71	

Table 3.1.2.1.1-3. Springs, Seeps, and Phreatophyte Areas in the Hydrogeologic Study Area (continued)

Latitude/Longitude	Township, range & spring location #	Name[a]	Aquifer[b]	Discharge (gpm)	Use	Reference[c]	Comments
36 40 50/115 10 40	ND	Sawmill	Ordovician dolomite	ND	ND	T&R, 71	
36 41 30/115 12 30	ND	Basin	Ordovician dolomite	ND	ND	T&R, 71	
36 42 20/115 00 50	ND	Perkins	Ordovician dolomite	ND	ND	T&R, 71	
36 42 30/115 11 00	ND	Yellow Jacket	Ordovician dolomite	ND	ND	T&R, 71	
36 42 30/115 14 20	ND	Whiterock	Ordovician dolomite	ND	ND	T&R, 71	
36 42 50/115 10 50	ND	Shalecut	Ordovician dolomite	ND	ND	T&R, 71	
36 43 00/115 10 50	ND	Bootleg	Ordovician dolomite	ND	ND	T&R, 71	

[a] Blank means the area is not named.
[b] When the discharging aquifer could be determined, it is listed; otherwise only the lithology is shown. The main source of the ground water discharging in the Furnace Creek Ranch area is believed to be the lower carbonate aquifer (Waddell et. al., page, 1984).
[c] P&K, 64 = Pistrang and Kunkel, 1964; M&E, 62 = Malmberg and Eakin, 1962; T&R, 71 = Thordarson and Robinson, 1971; W&T, 75 = Winograd and Thordarson, 1975; D&L, 76 = Dudley and Larson, 1976; M, 77 = Miller, 1977; W, 79 = White, 1979; W et al., 84 = Waddell et al., 1984; S&M, 64 = Schoff and Moore, 1964.
[d] ND = No data.
[e] NA = Not applicable.

Table 3.1.2.1.2-1. Proposed and Existing Surface-Water Monitoring Sites

Site Number (Numbers in parentheses are former station designation numbers)	Status	Location	Nevada State Coordinates	Planned Configuration	Purpose
10251220 (SR1)	Existing crest stage site (Note all existing crest stage sites have rain gages) (Note all existing crest stage sites are scheduled to become full sites eventually)	Amargosa River near Beatty	N771,046 E472,861	Recording stage Crest stage Rain gauge	Monitor peak flow of runoff for the Amargosa River north of Beatty airport. Site has long-term record. Collect supplementary precipitation data.
10251248 (SR2)	Existing full site, stilling well (Note all existing full sites have recording stage gages, crest stage gages, and rain gages)	Unnamed tributary to Stockade Wash near Rattlesnake Ridge	N886,362 E617,007	Recording stage Crest stage Rain gauge	Monitor total runoff in a selected drainage of the Upper-Fortymile Wash watershed. Collect supplementary precipitation data. Sediment collection station.
10251250 (SR3)	Existing full site	Fortymile Wash at the Narrows	N777,832 E583,671	Recording stage Crest stage Rain gauge	Monitor total runoff above main tributary (Yucca Wash) to determine losses and gains of flow. Collect supplementary precipitation data.
10251252(SR4)	Existing crest stage site	Yucca Wash at mouth	N770,338 E579,875	Recording stage Crest stage Rain gauge	Monitor peak flow of runoff from large drainage contribution to Fortymile wash. Collect supplementary precipitation data.

Table 3.1.2.1.2-1. Proposed and Existing Surface-Water Monitoring Sites (continued)

Site Number (Numbers in parentheses are former station designation numbers)	Status	Location	Nevada State Coordinates	Planned Configuration	Purpose
(SR5)	Proposed full site	Sever Wash above confluence with Fortymile Wash	N753,750 E578,702	Recording stage Crest stage Rain gauge	Monitor peak flow of runoff from large drainage contribution to Fortymile Wash. Collect supplementary precipitation data.
10251255(SRI)	Existing full site	Fortymile Wash near Well J-13	N748,489 E577,904	Recording stage Crest stage Rain gauge	Monitor total runoff below major tributaries (Sever and Yucca Washes) to determine losses and gains of flow. Collect supplementary precipitation data.
10251256(SRI)	Existing crest stage site	Dune Wash near mouth	N743,718 E578,841	Recording stage Crest stage Rain gauge	Monitor peak flow of runoff from large drainage contributing to Fortymile Wash.
10251258(SRI)	Existing full site	Fortymile Wash near Amargosa Valley	N699,720 E566,798	Recording stage Crest stage Rain gauge	Monitor total runoff entering Amargosa Valley via Fortymile Wash. Collect supplementary precipitation data.
10251260(SR9)	Existing crest stage site, scheduled to soon be a full site	Tonopah Wash below Little Skull Mountain	N734,809 E600,560	Recording stage Crest stage Rain gauge	Monitor peak flow of runoff for major wash drainage Calico Hills and Jackass Flats. Collect supplementary precipitation data.
10251265(SR10)	Existing crest stage site	Cane Spring Wash Tributary	N749,285 E667,273	Recording stage Crest stage Rain gauge	Monitor peak flow of runoff for a selected drainage located peripheral to Yucca Mountain. Collect supplementary precipitation data.

Table 3.1.2.1.2-1. Proposed and Existing Surface-Water Monitoring Sites (continued)

Site Number (Numbers in parentheses are former station designation numbers)	Status	Location	Nevada State Coordinates	Planned Configuration	Purpose
10251270(SR11)	Existing crest stage site	Amargosa River Tributary near Mercury	N659,683 E666,419	Recording stage Crest stage Rain gauge	Monitor peak flow of runoff for a selected drainage located peripheral to Yucca Mountain. Site has long-term record. Collect supplementary precipitation data.
10251271(SR12)	Existing crest stage site	Amargosa River tributary #1 near Johnnie	N622,862 E664,349	Recording stage Crest stage Rain gauge	Monitor peak flow of runoff for a selected drainage located peripheral to Yucca Mountain. Site has long-term record. Collect supplementary precipitation data.
10251272(SR13)	Existing crest stage site	Amargosa River tributary #2 near Johnnie	N614,123 E674,205	Recording stage Crest stage Rain gauge	Monitor peak flow of runoff for a selected drainage located peripheral to Yucca Mountain. Site has long-term record. Collect supplementary precipitation data.
10248490(SR14)	Existing crest stage site	Indian Springs Valley tributary near Indian Springs	N662,332 E751,244	Recording stage Crest stage Rain gauge	Monitor peak flow of runoff for a selected drainage located peripheral to Yucca Mountain. Site has long-term record. Collect supplementary precipitation data.
10251215(SR15)	Existing full site, stilling well	Beatty Wash above confluence with Amargosa River	N434,422 E484,707	Recording stage Crest stage Rain gauge	Monitor total runoff from large drainage just north of Yucca Mountain contributing to Amargosa River. Collect supplementary precipitation data.

Table 3.1.2.1.2-1. Proposed and Existing Surface-Water Monitoring Sites (continued)

Site Number (Numbers in parentheses are former station designation numbers)	Status	Location	Nevada State Coordinates	Planned Configuration	Purpose
10251218(SR16)	Existing full site, stilling well	Amargosa River below Beatty	N774,886 E475,221	Recording stage Crest stage Rain gauge	Monitor total runoff at location where flow enters the Amargosa Valley. Collect supplementary precipitation data.
(SR17)	Proposed full site	Crater Flats Wash above Highway 95	N716,348 E535,414	Recording stage Crest stage Rain gauge	Monitor total runoff from large drainage west of Yucca Mountain at location where flow enters Amargosa Valley. Collect supplementary precipitation data.
(SR18)	Recently put in full site, no number yet	Amargosa River near State line	N595,782 E571,786	Recording stage Crest stage Rain gauge	Monitor total runoff above confluence with springflow associated with Ash Meadows. Collect supplementary precipitation data.
(SR19)	Recently put in full site, No number yet	Amargosa River near Eagle Mountain	N526,462 E588,107	Recording stage Crest stage Rain gauge	Monitor total streamflow below confluence with springflow associated with Ash Meadows. Collect supplementary precipitation data.
10251300(SR20)	Existing full site	Amargosa River at Tecopa	N400,129 E629,655	Recording stage Crest stage Rain gauge	Monitor total streamflow at location with previous long-term record. Collect supplementary precipitation data.

Table 3.1.2.1.2-1. Proposed and Existing Surface-Water Monitoring Sites (continued)

Site Number (Numbers in parentheses are former station designation numbers)	Status	Location	Nevada State Coordinates	Planned Configuration	Purpose
(PR1)	Precipitation site, No number yet, Rain gage in place, tipping bucket proposed	Exile Hille-central top of ridge	N765,152 E569,405	Rain gauge	Collect supplementary precipitation data near site of proposed surface facilities.
(PR2)	Precipitation site, No number yet, Rain gauge in place, tipping bucket proposed	North Fork Coyote Wash above proposed Exploratory Studies Facility site	N766,149 E563,064	Rain gage	Collect supplementary precipitation data near site of proposed Exploratory Studies Facility.
(PR3)	Precipitation site, No number yet, Rain gauge in place, tipping bucket proposed	Skull Mountain Pass at Jackass Flats road	N723,793 E627,134	Rain gauge	Collect supplementary precipitation data at site peripheral to Yucca Mountain.
(PR4)	Precipitation site, No number yet, Rain gage in place, tipping bucket proposed	Rock Valley at Jackass Flats road	N704,499 E651,738	Rain gauge	Collect supplementary precipitation data at site peripheral to Yucca Mountain.
10251262(PR5)	Precipitation site, Rain gauge in place, tipping bucket proposed	Rock Valley at Highway 95	N683,353 E604,820	Rain gauge	Collect supplementary precipitation data at site peripheral to Yucca Mountain.

Table 3.1.2.1.2-1. Proposed and Existing Surface-Water Monitoring Sites (continued)

Site Number (Numbers in parentheses are former station designation numbers)	Status	Location	Nevada State Coordinates	Planned Configuration	Purpose
(PR6)	Precipitation site, No number yet, Rain gauge in place, tipping bucket proposed	Stockade Pass above Area 12	N878,661 E635,657	Rain gauge	Collect supplementary precipitation data at site peripheral to Yucca Mountain.
(SF1)	Proposed full site	Pah Canyon Wash near confluence with Fortymile Wash	N798,672 E586,288	Recording stage Crest stage Rain gauge	Monitor total runoff from small drainage east of Fortymile Wash. Collect supplementary precipitation data.
(SF2)	Proposed full site	Fortymile Wash West of Shoshone Mountain	N825,821 E600,233	Recording stage Crest stage Rain gauge	Monitor total runoff above tributary (Pah Canyon Wash) to determine losses and gains of flow. Collect supplementary precipitation data.
10251249(SF3)	Existing full site	Stockade Wash above confluence with Fortymile Wash	N846,134 E596,432	Recording stage Crest stage Rain gauge	Monitor total runoff from large drainage entering Upper Fortymile Wash. Collect supplementary precipitation data.
10251243(SF4)	Existing full site with tipping bucket rain gage	East Cat Canyon Wash near confluence with Fortymile Wash	N843,995 E591,739	Recording stage Crest stage Rain gauge	Monitor total runoff from large drainage entering Upper Fortymile Wash. Collect supplementary precipitation data.

Table 3.1.2.1.2-1. Proposed and Existing Surface-Water Monitoring Sites (continued)

Site Number (Numbers in parentheses are former station designation numbers)	Status	Location	Nevada State Coordinates	Planned Configuration	Purpose
(SF5)	Proposed full site in 1994	Stockade Wash near Buckboard Mesa Road	N866,613 E609,884	Recording stage Crest stage Rain gauge	Monitor total runoff at a selected location within a large drainage to determine losses and gains of flow. Collect supplementary precipitation data.
(SF6)	Proposed full site	Fortymile Wash west of Scrugham Peak	N862,658 E676,775	Recording stage Crest stage Rain gauge	Monitor total runoff above major tributaries to determine losses and gains of flow. Collect supplementary precipitation data.
(SY1)	Proposed full site with flume	Upper reach of Wren Wash	N768,119 E560,662	Recording stage Crest stage Rain gauge Flume	Monitor total runoff to characterize flow in small drainage located above proposed site facilities. Collect supplementary precipitation data.
(SY2)	Proposed full site with flume	Unnamed wash near northern tip of Fran Ridge	N761,770 E576,158	Recording stage Crest stage Rain gauge Flume	Monitor total runoff from drainage located south of the proposed surface facilities and contributing to Sever Wash. Collect supplementary precipitation data.
(SY3)	Proposed full site with flume	Sever Wash near South tip of Alice Ridge	N762,164 E575,829	Recording stage Crest stage Rain gauge Flume	Monitor total runoff from drainage containing proposed surface facilities. Collect supplementary precipitation data.

Table 3.1.2.1.2-1. Proposed and Existing Surface-Water Monitoring Sites (continued)

Site Number (Numbers in parentheses are former station designation numbers)	Status	Location	Nevada State Coordinates	Planned Configuration	Purpose
(SY4)	Proposed full site with flume	Unnamed wash west of Fran Ridge along tracer of Paintbrush Canyon Fault	N759,239 E573,074	Recording stage Crest stage Rain gauge Flume	Monitor total runoff in upper part of tributary to Sever Wash to determine losses or gains to flow. Collect supplementary precipitation data.
10251254(SY5)	Existing crest-stage recorder, proposed full site, flume	Drill Hole Wash below confluence of Split Wash and WT2 Canyon	N760,921 E570,515	Recording stage Crest stage Rain gauge Flume	Monitor total runoff for drainage located south of proposed surface facilities to determine losses and gains of flow. Collect supplementary precipitation data.
(SY6)	Proposed full site with flume	Unnamed tributary near upper confluence of drainage between antler Ridge and Whale Back Ridge	N762,554 E562,718	Recording stage Crest stage Rain gauge Flume	Monitor total runoff for small drainage located within the repository block. Collect supplementary precipitation data.
(SY7)	Proposed full site with flume	Unnamed tributary near lower portion of Antler Ridge and Whaleback Ridge drainage	N760,824 E564,885	Recording stage Crest stage Rain gage Flume	Monitor total runoff in drainage to determine losses and gains of flows. Collect supplementary precipitation data.

Table 3.1.2.1.2-1. Proposed and Existing Surface-Water Monitoring Sites (continued)

Site Number (Numbers in parentheses are former station designation numbers)	Status	Location	Nevada State Coordinates	Planned Configuration	Purpose
(SY8)	Existing full site, flume proposed, no number yet	Upper split Wash	N764,170 E562,857	Recording stage Crest stage Rain gage Flume	Monitor total runoff in small drainage located south of proposed underground facilities. Collect supplementary precipitation data.
(SY9)	Proposed full site	Split Wash between Antler Ridge and Live Yucca Ridge	N761,991 E566,136	Recording stage Crest stage Rain gauge Flume	Monitor total runoff in drainage located south of proposed underground facilities to determine losses or gains of flow. Collect supplementary precipitation data.
(SY10)	Proposed full site with flume	Unnamed tributary near upper portion of small drainage just north of Peak Yucca Mountain Ridge	N767,076 E562,010	Recording stage Crest stage Rain gauge Flume	Monitor total runoff in small drainage located north of proposed underground facilities. Collect supplementary precipitation data.
(SY11)	Proposed full site with flume	Unnamed tributary near lower portion of small drainage just north of Dead Yucca Ridge	N767,080 E563,064	Recording stage Crest stage Rain gauge Flume	Monitor total runoff in drainage located north of proposed underground utilities to determine losses or gains of flow. Collect supplementary precipitation data.

Table 3.1.2.1.2-1. Proposed and Existing Surface-Water Monitoring Sites (continued)

Site Number (Numbers in parentheses are former station designation numbers)	Status	Location	Nevada State Coordinates	Planned Configuration	Purpose
(SY12)	Proposed full site with flume	Upper Drill Hole Wash	N772,220 E559,762	Recording stage Crest stage Rain gauge Flume	Monitor total runoff in small drainage located northwest of proposed underground facilities. Collect supplementary precipitation data.
(SY13)	Proposed full site with flume	Teacup Wash above confluence with Drill Hole Wash	N772,984 E561,341	Recording stage Crest stage Rain gauge Flume	Monitor total runoff in drainage contributing to Drill Hole Wash. Collect supplementary precipitation data.
(SY14)	Proposed full site with flume	Upper Pagany Wash	N773,295 E563,018	Recording stage Crest stage Rain gauge Flume	Monitor total runoff of small drainage in the upper reach of Pagany Wash. Collect supplementary precipitation data.
102512533(SY15)	Existing full site and tipping bucket rain gauge, flume proposed	Pagany Wash near Well UZ-4	N768,379 E567,386	Recording stage Crest stage Rain gauge Flume	Monitor total runoff at location above proposed surface facilities to determine losses and gains of flow. Collect supplementary precipitation data.
(SY16)	Proposed full site with flume	Pagany Wash near northern tip of Exile Hill	N767,791 E570,101	Recording stage Crest stage Rain gauge Flume	Monitor total runoff of location adjacent to proposed surface facilities to determine losses or gains of flow. Collect supplementary precipitation data.

Table 3.1.2.1.2-1. Proposed and Existing Surface-Water Monitoring Sites (continued)

Site Number (Numbers in parentheses are former station designation numbers)	Status	Location	Nevada State Coordinates	Planned Configuration	Purpose
(SY17)	Proposed full site with flume	Upper Solitario Canyon	N766,974 E557,324	Recording stage Crest stage Rain gauge Flume	Monitor total runoff for drainage located west of Yucca Crest and proposed underground facilities. Collect supplementary precipitation data.
(SY18)	Proposed full site with flume	Middle Solitario Canyon	N761,751 E556,001	Recording stage Crest stage Rain gauge Flume	Monitor total runoff at location west of Yucca Crest to determine losses or gains of flow. Collect supplementary precipitation data.
(SY19)	Proposed full site with flume	Lower Solitario Canyon	N755,946 E554,574	Recording stage Crest stage Rain gauge Flume	Monitor total runoff at mouth of Solitario Canyon west of Yucca Ridge to determine losses or gains of flow. Collect supplementary precipitation data.
(SY20)	Proposed full site with flume	North Branch of Ghost Dance Wash	N755,991 E562,765	Recording stage Crest stage Rain gauge Flume	Monitor total runoff in small drainage contributing to Dune Wash. Collect supplementary precipitation data.
(SY21)	Proposed full site with flume	South Branch of Ghost Dance Wash	N756,186 E563,144	Recording stage Crest stage Rain gauge Flume	Monitor total runoff in small drainage contributing to Dune Wash. Collect supplementary precipitation data.

Table 3.1.2.1.2-1. Proposed and Existing Surface-Water Monitoring Sites (continued)

Site Number (Numbers in parentheses are former station designation numbers)	Status	Location	Nevada State Coordinates	Planned Configuration	Purpose
(SY22)	Proposed full site with flume	Dune Wash west of Boundary Ridge	N751,846 E565,166	Recording stage Crest stage Rain gauge Flume	Monitor total runoff at location to determine losses or gains of flow. Collect supplementary precipitation data.
(SY23)	Proposed full site with flume	Dune Wash above confluence with Fortymile Wash	N744,913 E574,519	Recording stage Crest stage Rain gauge Flume	Monitor total runoff for large drainage contribution to Fortymile Wash. Collect supplementary precipitation data.
No number yet	Existing crest stage, rain gauge site	Cane Springs Wash near Cane Springs tributary	No information available	Recording stage Crest stage Rain gauge	Monitor peak runoff. Collect supplemental precipitation data.
10251242	Existing full site	Fortymile Wash above confluence of East Cat Canyon	No information available	Recording stage Crest stage Rain gauge	Monitor total runoff. Collect supplemental precipitation data.

Table 3.1.2.1.4-1. Flood Records at Selected Crest-Stage Sites

Station #	Station Name	Water year[a]	Peak discharge (cubic meters per second)[b]
1	Penoyer Valley Tributary near Tempiute, Nevada Station No. 10247860. Drainage Area = 3.83 km2 Peak discharge per unit area for maximum flood recorded = 0.96 $(m^3/s^2)/km^2$ (i.e., 3.68 m^3/s / 3.83 km^2 = 0.96 $(m^3/s^2)/km^2$)	1964 1965 1966 1967 1968 1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980	0.00 .06 .00 .00 3.68 1.27 .99 .00 .93 .00 .00 .06 .02 .01 .00 .01 .01
2	Indian Springs Valley Tributary near Indian Springs, Nevada Station No. 10247890. Drainage Area = 75.1 km^2 Peak discharge per unit area for maximum flood recorded = 0.19 $(m^3/s^2)/km^2$	1964 1965 1966 1967 1968 1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980	.01 3.40 .01 .14 .02 .71 .00 .34 14.10 .01 .02 .06 .08 2.83 .00 .03 .02

Table 3.1.2.1.4-1 Flood Records at Selected Crest-Stage Sites
(Continued)

Station #	Station Name	Water year[a]	Peak discharge (cubic meters per second)[b]
3	Amargosa River Tributary near Mercury, Nevada Station no. 10251270. Drainage Area - 284.9 km^2 Peak discharge per unit area for maximum flood recorded = 0.34 $(m^3/s^2)/km^2$	1963 1964 1965 1966 1967 1968 1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980	.28 1.13 1.95 .57 17.00 97.10 1.70 6.79 2.55 43.60 5.24 .08 .02 .00 .68 .00 .68 .00
4	Amargosa River Tributary No. 1 near Johnnie, Nevada Station No. 10251271. Drainage Area = 5.72 km^2 Peak discharge per unit area for maximum flood recorded = 1.73 $(m^3/s^2)/km^2$	1967 1968 1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980	2.68 5.49 .02 9.91 2.55 .17 2.77 .11 .28 .08 2.09 .31 .00 .00

Table 3.1.2.1.4-1 Flood Records at Selected Crest-Stage Sites
(Continued)

Station #	Station Name	Water year[a]	Peak discharge (cubic meters per second)[b]
5	Amargosa River Tributary No. 2 near Johnnie, Nevada Station No. 10250272. Drainage Area = 6.45 km^2 Peak discharge per unit area for maximum flood recorded = 0.55 $(m^3/s^2)/km^2$	1968 1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980	3.54 .06 .08 .00 .01 .00 .00 .14 .06 .08 .03 .00 .00
6	Amargosa River Tributary near Beatty, Nevada Station No. 10251220. Drainage Area = 1,217 km^2 Peak discharge per unit area for maximum flood recorded = 0.37 $(m^3/s^2)/km^2$	1964 1965 1966 1967 1968 1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979	.71 .57 .00 119.00 2.55 453.00 .00 .00 .00 .51 .00 11.7 2.83 .05 18.40 .00

Table 3.1.2.1.4-1 Flood Records at Selected Crest-Stage Sites
(Continued)

Station #	Station Name	Water year[a]	Peak discharge (cubic meters per second)[b]
7	Sarcobatus Flat Tributary, Nevada Station No. 10249050. Drainage Area = 96.1 km^2 Peak discharge per unit area for maximum flood recorded = 0.02 $(m^3/s^2)/km^2$	1961 1962 1963 1964 1965 1966 1967 1968 1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980	.37 .14 .00 .00 1.08 .00 .28 .71 .82 .00 .03 .00 .17 .00 .42 .17 .03 .02 .02 1.78
8	Palmetto Wash Tributary, near Lida, Nevada Station No. 10249850. Drainage Area = 12.25 km^2 Peak discharge per unit area for maximum flood recorded = 0.45 $(m^3/s^2)/km^2$	1967 1968 1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980	.45 .51 5.46 .59 .70 .01 .00 .00 .00 .03 .01 .01 --- .01

Table 3.1.2.1.4-1 Flood Records at Selected Crest-Stage Sites
(Continued)

Station #	Station Name	Water year[a]	Peak discharge (cubic meters per second)[b]
9	Stonewall Flat Tributary, near Goldfield, Nevada Station No. 10248970. Drainage Area = 1.37 km^2 Peak discharge per unit area for maximum flood recorded = 3.10 $(m^3/s^2)/km^2$	1964 1965 1966 1967 1968 1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979	.03 .23 .03 1.02 1.75 4.25 .00 .00 .03 .03 .00 .00 .03 .01 .00 .01
10	Big Smokey Valley Tributary, near Blair Junction, Nevada Staton No. 10249680. Drainage Aage = 29.5 km^2 Peak discharge per unit area for maximum flood recorded = 0.16 $(m^3/s^2)/km^2$	1961 1962 1963 1964 1965 1966 1967 1968 1969 1970 1971 1972 1973 1974 1975	2.55 .00 .06 .00 .00 .20 .03 .04 .34 .00 .00 1.78 .40 .00 .02

Table 3.1.2.1.4-1 Flood Records at Selected Crest-Stage Sites
(Continued)

Station #	Station Name	Water year[a]	Peak discharge (cubic meters per second)[b]
		1976	2.26
		1977	4.81
		1978	.00
		1979	.00
11	San Antonio Wash Tributary, Nevada	1965	.03
		1966	.00
	Station No. 10249135.	1967	.11
		1968	.03
	Drainage Area = 8.86 km^2	1969	.06
		1970	.62
	Peak discharge per unit area for maximum	1971	.00
	flood recorded = 2.11 $(m^3/s^2)/km^2$	1972	18.70
		1973	.20
		1974	.00
		1975	.00
		1976	.00
		1977	.03
		1978	.00
		1979	.01
		1980	.00
12	Saulsbury Wash, near Tonopah, Nevada	1962	.28
		1963	.00
	Station No. 10249180.	1964	.00
		1965	.00
		1966	1.16
		1967	.28

Table 3.1.2.1.4-1 Flood Records at Selected Crest-Stage Sites
(Continued)

Station #	Station Name	Water year[a]	Peak discharge (cubic meters per second)[b]
	Peak discharge per unit area for maximum flood recorded = 0.07 $(m^3/s^2)/km^2$	1968	.06
		1969	9.62
		1970	.06
		1971	.00
		1972	.76
		1973	.08
		1974	.00
		1975	.00
		1976	2.55
		1978	3.40
		1979	.25
		1980	.00

a A water year extends from October 1 through September 30.

b Robert Squires (U. S. Geological Survey, written communication, 1982) reported discharge values in cubic feet per second; these have been converted to cubic meters per second and rounded to three significant digits.

Table 3.1.2.1.5-1. Christensen and Spahr Flash Flood Model*

Return Period, years	Flow Equation, cfs	Range of Applicability
10	$Q= 392\ A^{0.66}E^{-1.02}L^{-0.33}$	$0.2 < A < 100$
25	$Q= 1{,}810\ A^{0.61}E^{-1.14}L^{-0.70}$	$2 < E < 10$
50	$Q= 4{,}860\ A^{0.58}E^{-1.21}L^{-0.94}$	$1 < L < 7$
100	$Q= 11{,}900\ A^{0.55}E^{-1.28}L^{-1.16}$	

With A = drainage area, mi^2
E = mean basin altitude, in thousands of feet
L = latitude of basin minus 35°

* Modified from Christensen and Spahr, p. 7, 1980.

Table 3.1.2.1.6-1. Chemical Composition of Watercourses Adjacent to Yucca Mountain

Parameter	(1) Flood sample Fortymile Wash at road M[b]	(2) Flood sample Fortymile Wash at road W[b]	(3) Flood sample Fortymile Wash above Drill Hole Wash[b]	(4) Flood sample Drill Hole Wash at mouth[b]	(5) Flood sample Fortymile Wash at J-12[b]	(6) Flood sample Busted Butte Wash[b]	(7) Stream sample Carson Slough[c]	(8) Stream sample Amargosa River near Eagle Mountain
Latitude	36°49'07"	36°49'04"	36°49'08"	36°49'11"	36°49'51"	36°47'49"	~36°25'	~36°13'
Longitude	116°23'47"	116°23'47"	116°23'46"	116°23'52"	116°23'51"	116°23'51"	~116°21'	116°22'50"
Date	7/22/84	8/15/84	8/14/84	8/14/84	8/14/84	8/14/84	1958	1958?
Specific conductance, field (micro-siemens per cm at 25°C	--[d]	170	70	100	59	120	937	1,860
Specific conductance, laboratory (micro-siemens per cm at 25°C	201	859	198	218	100	217	--	--
pH, field	--	8	8.4	8.3	8.2	8.3	8.5	8.8
pH, laboratory	7.4	7.4	7.5	7.8	7	7.8	--	--
Temperature (°C)	--	21.5	--	--	--	--	10	4.4
Calcium (Ca)	24	31	8.1	9.5	6.7	12	40	24

Table 3.1.2.1.6-1. Chemical Composition of Watercourses Adjacent to Yucca Mountain (continued)

Parameter	(1) Flood sample Fortymile Wash at road M[b]	(2) Flood sample Fortymile Wash at road W[b]	(3) Flood sample Fortymile Wash above Drill Hole Wash[b]	(4) Flood sample Drill Hole Wash at mouth[b]	(5) Flood sample Fortymile Wash at J-12[b]	(6) Flood sample Busted Butte Wash[b]	(7) Stream sample Carson Slough[c]	(8) Stream sample Amargosa River near Eagle Mountain
Magnesium (Mg)	3.3	2.9	0.9	1.3	0.7	1.8	26	29
Sodium (Na)	8.1	8.2	4.1	8.6	2.4	7	125	344
Potassium (K)	7.8	9.1	5.6	7.4	6.3	8.1	16	40
icarbonate (HCO3)	--	--	--	--	--	--	362	542
Carbonate (CO3)	--	--	--	--	--	--	10	33
Alkalinity as CaCO3, lab	73	75	36	42	26	47	--	--
Chloride (Cl)	3.7	1.4	1.3	2.2	2	1.7	40	123
Sulfate (SO4)	10	10	6.2	13	6.3	7.9	122	277
Fluoride (F)	0.2	0.2	<0.1	0.3	<0.1	0.3	2	2.8
Silica (SiO_2)	25	24	8.7	20	4.5	23	28	26
Arsenic (µg/L as As)	2	2	<1	2	<1	3	0.0	2

Table 3.1.2.1.6-1. Chemical Composition of Watercourses Adjacent to Yucca Mountain (continued)

Parameter	(1) Flood sample Fortymile Wash at road M[b]	(2) Flood sample Fortymile Wash at road W[b]	(3) Flood sample Fortymile Wash above Drill Hole Wash[b]	(4) Flood sample Drill Hole Wash at mouth[b]	(5) Flood sample Fortymile Wash at J-12[b]	(6) Flood sample Busted Butte Wash[b]	(7) Stream sample Carson Slough[c]	(8) Stream sample Amargosa River near Eagle Mountain
Iron (µg/L as Fe)	110	77	18	100	28	200	210	450
Manganese (µg/L as Mn)	3.3	5	11	6	22	10	0.0	0.0
Strontium (µg/L as Sr)	100	100	34	66	31	86	1,800	800
Lithium (µg/L as Li)	6	7	6	14	5	17	--	--
Iodide (I)	0.009	0.005	0.003	0.002	0.004	0.003	--	--
Bromide (Br)	0.049	<0.01	<0.01	<0.01	<0.01	<0.01	--	--
Boron (B)	--	--	--	--	--	--	0.68	2.1
Dissolved solids (sum)	127	122	57	92	45	100	566	1,140

[a] Values for chemical constituents are in milligrams per liter unless otherwise indicated. Analyses by the U. S. Geological Survey, Denver, Colorado.
[b] Flood sample analyses (USGS) from WATSTORE files.
[c] Stream sample analyses from Hunt et al. (1966).
[d] – indicates no data.

Table 3.1.2.1.6-2 Chemical Analysis of Water from Selected Springs

(--, no data; NA, not applicable; mg/L, milligrams per liter; µS/cm, microsiemens per centimeter at 25 degrees Celsius; oC, degrees Celsius)

Site #	Site Name	Latitude	Longitude	Data Source	Aquifer	Use	Date	Specific conductance (µS/cm)	Field pH (units)	Laboratory pH (units)	Temperature (oC)	Calcium (mg/L)	Magnesium (mg/L)
1	Ash Tree Spring 17S/49E-35ddd	36o25'35"	116o 24'42"	(1), USGS	Qal	--	3/6/74	365	8.0	7.9	18.0	14	4.4
2	Big Spring 18S/51E-19a	36o22'29"	116o 16'26"	USGS	Qal/Pzc	IRR	11/21/66	a 769	--	7.6	--	44	19
3	Bole Spring 18S/51E-30a	36o21'47"	116o 16'21"	(4)	--	--	7/27/62	a 776	--	7.1	22.2	38	19
4	Crystal Spring 18S/50E-03a	36o25'15"	116o 19'19"	USGS	Qal	IRR	11/20/66	a 658	--	8.2	--	40	20
5	Devils Hole 17S/50E-36ccd	36o25'32"	116o 17'27"	(2), USGS	Pzc	PS	12/9/66	a 677	--	8.1	33.5	50	24
6	Fairbanks Spring 17S/50E-09adc	36o29'36"	116o 20'30"	USGS	QTal	IRR	8/2/72	660	7.6	7.2	-	47	20
7	Jack Rabbit Spring 18S/51E-18b	36o23'24"	116o 16'41"	USGS	Qal/Pzc	IRR	4/6/71	2,590	--	8.0	26.2	120	75
8	Longstreet Spring 17S/50E-22aba	36o28'04"	116o 19'30"	USGS	Qal/Pzc	IRR	11/18/66	a 669	--	8.2	--	48	19

Table 3.1.2.1.6-2 Chemical Analysis of Water from Selected Springs (continued)

Site #	Site Name	Latitude	Longitude	Data Source	Aquifer	Use	Date	Specific conductance (µS/cm)	Field pH (units)	Labora-tory pH (units)	Tempera -ture (°C)	Calcium (mg/L)	Magne-sium (mg/L)
9	Point of Rocks Springs (King)	36°24'02"	116° 16'25"	USGS	Pzc	IRR	11/21/66	a 680	--	7.6	--	48	21
10	Point of Rocks Springs Rock	36°24'05"	116° 15'15"	USGS	Qual	IRR	11/21/66	a 674	--	7.7	--	46	21
11	Rogers Spring 17S/50E-15a1	36°28'40"	116° 19'20"	USGS	Qal	IRR	11/20/66	a 677	--	7.6	--	47	21
12	Soda Spring 17S/50E--10c--1	36°29'22"	116° 20'10"	USGS	Qal	IRR	11/19/66	a 772	--	7.7	--	36	17
13	Spring 17S/50E-23bbc	36°27'36"	116° 19'04"	USGS	Qal	Unused	11/20/66	a 691	--	7.6	--	48	22
14	Spring 18S/49E-Olaba Clay Camp	36°25'30"	116° 23'50"	(1), USGS	QTal	Unused	4/6/71	680	8.6	8.0	17.5	24	12
15	Badwater Spring Death Valley	36°13'50"	116° 46'10"	(1)	--	--	1/30/59	a 35000	--	7.5	11.5	830	95
16	Daylight Spring 13S/46E-35aba	36°47'25"	116° 56"10"	USGS	Tv	--	11/19/72	250	7.5	6.5	--	25	6.1

Table 3.1.2.1.6-2 Chemical Analysis of Water from Selected Springs (continued)

Site #	Site Name	Latitude	Longitude	Data Source	Aquifer	Use	Date	Specific conductance (µS/cm)	Field pH (units)	Laboratory pH (units)	Temperature (°C)	Calcium (mg/L)	Magnesium (mg/L)
17	Eagle Borax Spring 24N/1E-15DS1	36°12'05"	116 °51'55"	(1)	--	--	11/--/54	a 7730	--	7.1	--	610	270 18
18	Hidden Spring in Black Mtn	36°04'25"	116° 36'10"	(1)	--	--	4/7/67	a 265	--	7.8	13.0	5.7	1.2
19	Hole-in-the-Rock Spring Ca.	36°44'37"	116° 58'00"	USGS	Qal	Unused	11/19/72	2030	8.1	7.5	--	91	120
20	Klare Spring 13S/45E-04LS1	36°50'34"	117° 05'35"	(1)	--	--	11/17/68	a 880	--	7.8	22.5	44	24
21	Lemonade Spring in Black Mtn	36°17'42"	116° 42'30"	(1)	--	--	11/18/68	a 800	--	7.1	12.0	2.2	2.1
22	Mesquite Spring 11S/42E-26	36°57'50"	117° 21'50"	(2)	PS	--	3/1/65	a 1240	7.7	7.9	22.0	30	13
23	Navel Spring 26N/2E-13FS1	36°22'50"	116° 42'20"	(1)	QTf	--	5/16/74	a 1030	--	8.2	23.0	30	11
24	Nevares Spring	36°30'44"	116° 49'14"	WAT STORE	--	--	4/22/82	a 1010	7.3	7.8	38.5	44	21

Table 3.1.2.1.6-2 Chemical Analysis of Water from Selected Springs (continued)

Site #	Site Name	Latitude	Longitude	Data Source	Aquifer	Use	Date	Specific conductance (µS/cm)	Field pH (units)	Laboratory pH (units)	Temperature (°C)	Calcium (mg/L)	Magnesium (mg/L)
25	Palm Tree Spring 14S/45E-30BS1	36°43'09"	°07'50"	(1)	Qts/Tc	--	5/15/74	a 2210	--	8.1	18.5	58	65
26	Surprise Spring 11S/443E-18ES2	37°00'12"	117° 20'30"	(1)	--	--	1/21/67	a 710	--	7.9	20.0	7.3	1.3
27	Texas Spring	36°27'28"	116° 50'11"	WAT STORE	--	--	4/22/82	a 964	7.9	8.1	31.0	38	20
28	Travertine Spring	36°26'27"	116° 49'49"	WAT STORE	--	--	14/22/82	a 970	7.4	7.9	35.0	36	19
29	Willow Spring near Gold Valley	36°03'02"	116° 41'20"	(1)	--	--	1/12/66	a 729	--	7.8	20.0	60	14
30	Butte Spring (Tubb Spring)	37°14'50"	116° 04'00"	(7), USGS	Tos	Unused	11/10/60	a 272	--	7.8	15.0	21	2.4
31	Cane Spring	36°47'50"	116° 05'30"	USGS	Tv	Unused	3/25/71	a 493	6.9	7.8	10.5	44	12
32	Captain Jack Spring	37°10'20"	116° 09'32"	(2)	Tos	Unused	5/01/59	a 188	--	6.9	13.3	3.2	.0
33	Indian Spring (Belted Range)	37°26'35"	116° 06'06"	(3)	Tos	Unused	5/01/58	a 358	--	7.2	10.0	42	7.8
34	Oak Spring North Yucca Flat	37°14'30"	116° 03'50"	(7)	Tos	Unused	4/28/58	a 241	--	7.5	12.8	18	4.9

Table 3.1.2.1.6-2 Chemical Analysis of Water from Selected Springs (continued)

Site #	Site Name	Latitude	Longitude	Data Source	Aquifer	Use	Date	Specific conductance (µS/cm)	Field pH (units)	Labora-tory pH (units)	Tempera -ture (oC)	Calcium (mg/L)	Magne-sium (mg/L)
35	Rainer Spring	37o11'22"	116o 11'43"	(2)	Tos	Unused	9/18/57	a 346	--	8.3	16.1	7.2	1.0
36	Tippipah Spring Yucca Flat	37o02'40"	116o 12'25"	WAT STORE	Tv	UNused	8/6/80	a 215	6.9	--	13.0	5.1	.4
37	Topopah Spring Calico Hills	36o56'21"	116o 16'14"	(3)	Tos	Unused	3/25/58	a 114	--	6.9	11.7	7.2	1.0
38	Whiterock Spring	37o12'09"	116o 07'52"	USGS	Tv	Unused	7/31/72	241	7.7	6.2	18.0	3.8	0
39	Beatty Spring 12S/47E-05cda	36o55'07"	116 44'37"	(1), USGS	Tv	DOM	7/3/67	534	8.2	7.9	24.0	13	2.8
40	Burro Hot Spring 11S/47E-16dcd	36o58'26"	116o 43'17"	(1), USGS	Tv	Unused	2/5/74	268	--	7.8	36.5	18	.5
41	Crystal Spring 11S/47E-18acb	36o59'06"	116o 45'30"	USGS	Tv	Unused	7/5/67	355	7.7	7.5	24.0	22	3.5
42	Goss Spring 11S/47E-10db	36o59'40"	116o 42'25"	EPA	--	IRR	1/21/75	a 700	--	7.1	16.0	4.8	5.3

Table 3.1.2.1.6-2 Chemical Analysis of Water from Selected Springs (continued)

Site #	Site Name	Latitude	Longitude	Data Source	Aquifer	Use	Date	Specific conductance (µS/cm)	Field pH (units)	Labora-tory pH (units)	Tempera -ture (°C)	Calcium (mg/L)	Magne-sium (mg/L)
43	Indian Springs 11S/46E-26dcc	36°56'40"	116° 47'30"	(1), USGS	Tv	DOM	7/3/67	316	7.9	7.4	21.0	6.3	1.0
44	Mud Spring 11S/46E-08bdc	36°59'40"	116° 51'20"	USGS	Qal	Stock	7/6/67	416	7.8	7.4	19.5	5	2.1
45	Peacock R. Spr. 10S/47E-31aab	37°01'51"	116° 45'17"	(1), USGS	Qal	DOM/ IND	7/5/67	597	7.6	7.7	19.5	23	4.3
46	Spring 10S/47E-14bab	37°04'27"	116° 41'24"	(1), USGS	Qal	IRR	7/5/67	a 701	8.1	7.8	29.0	7.5	.3
47	Spring 10S/47E-32dda	37°01'11"	116° 44'00"	(1), USGS	Qal	DOM	7/5/67	593	7.6	7.7	22.0	30	5.4
48	Spring 10S/47E-33aab	37°01'49"	116° 43'07"	(1), USGS	Tv	DOM/ IRR	7/5/67	889	7.8	7.6	22.0	26	4.5
49	Spring 11S/47E-03cdb	37°00'20"	116° 42'30"	(1), USGS	Tv	DOM/ IND	7/5/67	562	8.2	7.7	23.0	16	1.1
50	Spring 11S/47E-04cad	37°00'30"	116° 43'30"	(1), USGS	Qal	DOM	7/6/67	1100	7.7	7.8	21.0	26	4.5

Table 3.1.2.1.6-2 Chemical Analysis of Water from Selected Springs (continued)

Site #	Site Name	Latitude	Longitude	Data Source	Aquifer	Use	Date	Specific conductance (µS/cm)	Field pH (units)	Laboratory pH (units)	Temperature (°C)	Calcium (mg/L)	Magnesium (mg/L)
51	Spring 11S/47E-10bcc	36°59'45"	116° 42'51"	(1), USGS	Tv	DOM	7/6/67	742	7.6	7.7	18.5	14	.4
52	Spring 11S/47E-10caa	36°59'42"	116° 42'25"	(1). USGS	Tv	IRR	7/6/67	915	8.1	8.1	24.0	14	.7
53	Spring 11S/47E-10ccb	36°59'24"	116° 42'53"	(1), USGS	Qal	DOM	7/6/67	616	8.3	8.1	21.0	12	.9
54	Spring 11S/47E-21aba	36°58'21"	116° 43'10"	(1), USGS	Qal	DOM	7/4/67	735	7.6	7.8	41.0	13	.5
55	Spring 11S/47E-21acc(Well)	36°58'03"	116° 43'21"	(1), USGS	Qal	IRR	7/4/67	1110	7.7	8.0	31.5	23	2.9
56	Spring 11S/47E-21dbb2	36°57'56"	116° 43'20"	USGS	Qal	DOM	7/4/67	1180	7.9	8.2	26.0	26	3.1
57	Spring 11S/47E-28dac	36°57'00"	116° 43'00"	(1), (2) USGS	Qal	IRR	7/4/67	1110	9.1	8.9	21.0	10	3.3
58	Spring 11S/47E-33bac	36°56'31"	116° 43'43"	(1), USGS	Tv	DOM	7/4/67	538	8.2	7.0	34.0	8.7	.1
59	Spring 11S/47E-20bbb	36°53'06"	116° 45'00"	(1), USGS	Qal	DOM? IND	7/23/67	1210	7.7	8.0	18.5	27	3.6
60	Upper Indian Springs	36°57'05"	116° 48'19"	(1), USGS	Tv	DOM	7/3/67	291	8.7	7.8	26.5	.0	.4

Table 3.1.2.1.6-2 Chemical Analysis of Water from Selected Springs (continued)

Site #	Site Name	Sodium (mg/L)	Potassium (mg/L)	Alkalinity as HCO_3 (mg/L)	Sulfate (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Silica (mg/L)	Nitrate (mg/L)	Phosphate (mg/L)	Lithium (mg/L)	Strontium (mg/L)	Dissolved solids (mg/L)	Anion-cation balance (percent)
1	Ash Tree Spring 17S/49E-35ddd	d 46	8.0	b 155	40	6.5	2.3	82	1.5	0.21	0.06	0.21	286	5.9
2	Big Spring 18S/51E-19a	97	8.7	318	105	25	1.4	28	0.20	0.00	0.12	1.2	480	0.1
3	Bole Spring 18S/51E-30a	106	9.2	306	113	27	1.0	33	1.0	0.00	0.17	0.60	500	1.1
4	Crystal Spring 18S/50E-03a	72	8.6	278	81	22	1.7	25	0.00	0.00	0.09	0.97	432	0.3
5	Devils Hole 17S/50E-36ccd	65	7.6	310	76	20	1.6	22	0.20	--	0.09	0.89	423	1.2
6	Fairbanks Spring 17S/50E-09adc	69	7.9	301	85	22	2.5	22	0.00	0.00	0.10	0.89	434	1.8
7	Jack Rabbit Spring 18S/51E-18b	330	19	248	820	240	17	23	14	0.00	0.18	3.2	2050	1.8
8	Longstreet Spring 17S/50E-22aba	69	7.8	300	75	17	1.8	22	0.40	0.00	0.18	0.92	419	0.7
9	Point of Rocks Springs (King)	67	7.1	304	76	21	2.0	22	0.20	0.00	0.08	0.92	408	0.3

Table 3.1.2.1.6-2 Chemical Analysis of Water from Selected Springs (continued)

Site #	Site Name	Sodium (mg/L)	Potassium (mg/L)	Alkalinity as HCO_3 (mg/L)	Sulfate (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Silica (mg/L)	Nitrate (mg/L)	Phosphate (mg/L)	Lithium (mg/L)	Strontium (mg/L)	Dissolved solids (mg/L)	Anion-cation balance (percent)
10	Point of Rocks Springs Rock	68	7.5	304	78	21	1.5	22	0.20	0.00	0.08	1.1	412	0.7
11	Rogers Spring 17S/50E-15a1	69	7.8	302	78	21	1.5	23	0.00	0.00	0.09	0.90	412	0.2
12	Soda Spring 17S/50E--10c--1	110	10	330	93	27	2.0	35	--	--	0.10	0.76	488	0.1
13	Spring 17S/50E-23bbc	68	7.7	310	80	21	2.5	22	0.20	0.00	0.08	0.94	417	0.7
14	Spring 18S/49E-Olaba Clay Camp	95	19	263	100	18	2.9	73	--	--	0.15	0.65	484	1.5
15	Badwater Spring Death Valley	8050	330	110	2800	11400	9.8	26	--	--	--	--	c 23000	3.2
16	Daylight Spring 13S/46E-35aba	17	1.5	107	16	11	.2	14	2.1	--	0.01	0.18	164	2.4
17	Eagle Borax Spring 24N/1E-15DS1	760	28	320	1400	1800	1.2	42	.7	--	--	--	c 5130	.7

Table 3.1.2.1.6-2 Chemical Analysis of Water from Selected Springs (continued)

Site #	Site Name	Sodium (mg/L)	Potassium (mg/L)	Alkalinity as HCO_3 (mg/L)	Sulfate (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Silica (mg/L)	Nitrate (mg/L)	Phosphate (mg/L)	Lithium (mg/L)	Strontium (mg/L)	Dissolved solids (mg/L)	Anion-cation balance (percent)
18	Hidden Spring in Black Mtn	50	5.0	110	21	15	.6	59	.6	--	--	--	c 212	.2
19	Hole-in-the-Rock Spring Ca.	200	11	353	710	130	.5	12	.17	0.03	.12	1.3	1580	1.8
20	Klare Spring 13S/45E-04LS1	130	4.9	360	140	31	5.0	20	.60	--	--	--	572	.0
21	Lemonade Spring in Black Mtn	180	7.4	260	79	64	.8	57	13	--	--	--	c 533	3.4
22	Mesquite Spring 11S/42E-26	230	13	b 435	160	80	3.8	58	0.0	.01	.16	.33	804	.1
23	Navel Spring 26N/2E-13FS1	160	8.4	300	100	76	2.0	18	31	--	--	--	590	1.7
24	Nevares Spring	150	11	b 340	170	38	3.6	27	--	--	.02	1.1	c 634	1.7
25	Palm Tree Spring 14S/45E-30BS1	340	23	670	360	210	1.5	37	2.2	--	--	--	c 1430	1.8

Table 3.1.2.1.6-2 Chemical Analysis of Water from Selected Springs (continued)

Site #	Site Name	Sodium (mg/L)	Potassium (mg/L)	Alkalinity as HCO_3 (mg/L)	Sulfate (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Silica (mg/L)	Nitrate (mg/L)	Phosphate (mg/L)	Lithium (mg/L)	Strontium (mg/L)	Dissolved solids (mg/L)	Anion-cation balance (percent)
26	Surprise Spring 11S/443E-18ES2	150	7.6	230	93	46	1.9	64	1.7	--	--	--	c 484	.6
27	Texas Spring	150	11	330	170	37	4.3	33	--	--	.17	1.2	c 628	.6
28	Travertine Spring	140	10	330	160	40	4.4	32	--	--	.17	1.1	c 606	2.0
29	Willow Spring near Gold Valley	67	5	360	88	57	.5	--	--	--	--	--	c 365	13.2
30	Butte Spring (Tubb Spring)	34	6.0	139	12	12	0.4	30	0.80	12	--	--	185	0.2
31	Cane Spring	46	6.9	247	34	23	.8	65	6.2	--	0.02	.13	347	0.8
32	Captain Jack Spring	47	2.2	95	25	4.0	.4	43	--	1.2	--	--	178	1.1
33	Indian Spring (Belted Range)	17	4.8	148	36	12	.4	61	--	--	--	--	c 254	0.9
34	Oak Spring North Yucca Flat	22	6.4	116	14	9.0	.3	57	--	.10	--	--	180	0.8
35	Rainer Spring	66	4.0	158	18	14.0	.6	65	.60	2.2	--	.20	250	0.1

Table 3.1.2.1.6-2 Chemical Analysis of Water from Selected Springs (continued)

Site #	Site Name	Sodium (mg/L)	Potassium (mg/L)	Alkalinity as HCO_3 (mg/L)	Sulfate (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Silica (mg/L)	Nitrate (mg/L)	Phosphate (mg/L)	Lithium (mg/L)	Strontium (mg/L)	Dissolved solids (mg/L)	Anion-cation balance (percent)
36	Tippipah Spring Yucca Flat	40	3.1	b 92	19	8.0	.3	48	--	--	--	.01	191	.7
37	Topopah Spring Calico Hills	14	6.4	48	15	3.0	.3	50	2.0	.90	--	--	123	.6
38	Whiterock Spring	44	5.2	79	28	10	.5	47	1.5	--	.03	.03	208	1.1
39	Beatty Spring 12S/47E-05cda	106	5.8	b 196	70	26	3.8	60	0.05	0.00	0.11	0.08	408	1.8
41	Crystal Spring 11S/47E-18acb	50	3.6	b 143	22	21	.6	45	13	.00	.06	.09	261	3.2
44	Mud Spring 11S/46E-08bdc	75	3.2	b 125	10	34	.9	53	2.1	.00	.06	.06	287	7.2
45	Peacock R. Spr. 10S/47E-31aab	100	7.9	b 232	53	42	2.5	75	1.2	.00	.08	.23	443	1.4
46	Spring 10S/47E-14bab	143	8.1	b 212	83	51	4.2	57	.10	.00	.17	.04	458	1.2

Table 3.1.2.1.6-2 Chemical Analysis of Water from Selected Springs (continued)

Site #	Site Name	Sodium (mg/L)	Potass-ium (mg/L)	Alkalin-ity as HCO_3 (mg/L)	Sulfate (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Silica (mg/L)	Nitrate (mg/L)	Phos-phate (mg/L)	Lithium (mg/L)	Stront-ium (mg/L)	Dis-solved solids (mg/L)	Anion-cation balance (per-cent)
47	Spring 10S/47E-32dda	137	.1	b 314	96	37	2.2	62	.0	.00	.11	.42	530	1.7
48	Spring 10S/47E-33aab	169	9.0	b 304	103	68	4.3	54	.20	.00	.11	.19	601	.5
49	Spring 11S/47E-03cdb	122	4.8	b 188	90	45	2.9	47	.70	.00	.15	.10	430	1.2
50	Spring 11S/47E-04cad	223	8.7	b 388	129	80	5.1	62	.40	.00	.15	.35	722	.6
51	Spring 11S/47E-10bcc	156	7.1	b 294	91	42	4.6	51	.40	.00	.18	.07	522	1.7
52	Spring 11S/47E-10caa	196	2.3	b 306	109	54	6.1	38	.20	.00	.22	.21	599	2.0
53	Spring 11S/47E-10ccb	124	4.6	b 185	82	45	2.7	50	1.4	.00	.16	.13	422	1.2
54	Spring 11S/47E-21aba	150	7.7	b 228	116	35	6.1	70	.10	.00	.25	.10	516	.9

Table 3.1.2.1.6-2 Chemical Analysis of Water from Selected Springs (continued)

Site #	Site Name	Sodium (mg/L)	Potassium (mg/L)	Alkalinity as HCO_3 (mg/L)	Sulfate (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Silica (mg/L)	Nitrate (mg/L)	Phosphate (mg/L)	Lithium (mg/L)	Strontium (mg/L)	Dissolved solids (mg/L)	Anion-cation balance (percent)
55	Spring 11S/47E-21acc(Well)	2321	8.5	372	159	69	6.0	60	.0	.00	.27	.23	750	0.4
56	Spring 11S/47E-21dbb2	246	8.2	b 396	167	72	6.0	54	.0	.00	.28	.26	803	.6
57	Spring 11S/47E-28dac	249	8.8	b 360	169	68	6.4	45	.0	.00	.29	.10	721	.7
58	Spring 11S/47E-33bac	112	2.4	b 178	70	27	3.8	46	.10	.00	.14	.03	339	.4
59	Spring 12S/47E-20bbb	254	10	b 392	184	77	5.8	66	.0	.00	.10	.15	803	.5
60	Upper Indian Springs	59	1.7	b 116	14	14	.4	44	1.2	.00	.04	.03	222	.7

Table modified from USGS OFR 90-355, P. W. McKinley, M. P. Long, and L. V. Benson

Table 3.1.2.1.7-1. Quality of Texas Spring and Nevares Spring Water in Death Valley National Monument, California and Indian Springs Water, Beatty, Nevada[a].

Parameter	Texas Spring	Nevares Spring, Cow Creek	Indian Springs, Beatty, NV
Arsenic	<0.05	0.016	0.01
Barium	<0.1	0.010	
Cadmium	<0.010	0.003	
Chromium (Hexavalent)	<0.05	<0.005	
Lead	<0.05	<0.020	
Mercury	<0.002	<0.001	
Nitrate-Nitrogen	0.10	<0.01	
Selenium	<0.01	<0.004	
Silver	<0.05	<0.003	
Fluoride	1.20	1.32	0.4
Calcium	26.9	--	2.
Chloride	40.5	38.1	15.
Copper	<0.01	<0.003	
Iron	0.04	0.097	0.05
Magnesium	0.14	--	0.
Manganese	0.05	<0.003	0.08
Sodium	156.	--	46.
Sulfate	180.	96.	27.
Zinc	0.09	0.088	
Alkalinity in mg/l at CaCO3	540.	--	
Total Dissolved Solids	500.	808.	171.
pH (in pH units)	7.9	--	8.3
Potassium			1.
Bicarbonate			113.

aAll units are in parts per million except where noted. From French, p. 17 and 22, 1984.

Table 3.1.2.2.1.2-1. Summary of Estimates of Annual Ground-Water Inflow, Recharge, and Outflow (All values in thousands of acre-feet per year); abstracted from Table 1 of Dettinger (1992)

Unit	Sub-surface Inflow	Local Recharge	Sub-Surface Outflow	Source of Estimates
Amargosa Desert	20	2	20	Walker and Eakin, 1963
Crater Flat	2	0	2	Rush, 1970; Rush et al., 1971
Emigrant	0	3	3	Rush, 1970; Rush et al., 1971
Indian Springs	22	10	32	Rush, 1970; Rush et al., 1971
Jackass Flat and Buckboard Mesa	6	2	8	Rush, 1970; Rush et al., 1971
Mercury and Rock	33	0	33	Rush, 1970; Rush et al., 1971
Pahrump	0	42	18	Harrill, 1986
Three Lakes	5	8	13	Rush, 1970; Rush et al., 1971
Tikaboo	6	6	12	Rush, 1970; Winograd and Friedman, 1972
Yucca and Frenchman Flats	32	1	33	Rush, 1970; Rush et al., 1971

Table 3.1.2.2.2-1 -- Summary of selected wells monitored for water levels at Yucca Mountain.
[Water-level altitude is 1988 average value unless otherwise indicated]

Local-well Number	Latitude	Longitude	Altitude of well casing (m)	Water-level altitude (m)	Drilled depth (m)	Open interval depth (m)	Geologic member or unit at water table
USW WT-1	36°49'16"	116°26'56"	1,201.11	730.40	515	471-515	Calico Hills[5]
USW WT-2	36°50'23"	116°27'18"	1,301.13	730.71	628	571-628	Prow Pass
UE-25 WT #3	36°47'57"	116°24'58"	1,030.11	729.57	348	301-348	Bullfrog
UE-25 WT #4	36°51'40"	116°26'03"	1,169.21	730.70	482	439-482	Calico Hills[5]
UE-25 WT #6	36°53'40"	116°26'46"	1,314.78	1,035.10	383	281-383	Do.
USW WT-7	36°49'33"	116°28'57"	1,196.88	775.70	491	421-491	Topopah Spring
USW WT-10	36°48'25"	116°29'05"	1,123.40	775.92	431	348-431	Do.
USW WT-11	36°46'49"	116°28'02"	1,094.11	730.72	441	364-441	Do.
UE-25 WT #12	36°46'56"	116°26'16"	1,074.74	729.52	399	345-399	Do.
UE-25 WT #13	36°49'43"	116°23'51"	1,032.51	728.98	354	303-354	Do.
UE-25 WT #14	36°50'32"	116°24'35"	1,076.05	729.71	399	346-399	Do.
UE-25 WT #15	36°51'16"	116°23'38"	1,082.94	729.24	415	354-415	Do.
UE-25 WT #16	36°52'39"	116°25'34"	1,210.63	738.32	521	473-521	Calico Hills[5]
UE-25 WT #17	36°48'22"	116°26'26"	1,124.06	729.64	443	394-443	Prow Pass
UE-25 WT #18	36°52'07"	116°26'42"	1,336.32	730.80[1]	623	607-623	Calico Hills[5]
UE-25b #1	36°51'08"	116°26'23"	1,200.73	730.66[2]	1,220	471-1,199	Do.
UE-25c #2	36°49'45"	116°25'43"	1,132.2	729.95[3]	914	416-914	Do.
UE-25c #3	36°45'46"	116°25'44"	1,132.3	730.10[3]	914	417-753	Do.
USW G-3	36°49'05"	116°28'01"	1,480.47	730.56	1,533	751-1,533	Tram
USW H-1	36°51'57"	116°27'12"	1,303.10	730.95[2]	1,829	573-673	Prow Pass
USW H-3	36°49'42"	116°28'00"	1,483.47	731.72[2]	1,219	752-1,114	Tram
USW H-4	36°50'32"	116°26'54"	1,248.74	730.33[2]	1,219	518-1,181	Prow Pass
USW H-5	36°51'22"	116°25'55"	1,478.94	775.47[2]	1,219	704-1,091	Bullfrog
USW H-6	36°50'49"	116°28'55"	1,302.06	775.96[2]	1,220	562-752	Prow Pass
USW VH-1	36°47'32"	116°30'07"	963.23	779.46	762	185-762	Tiva Canyon
J-12	36°45'54"	116°23'24"	954.54	728.00[4]	347	226-347	Topopah Spring
J-13	36°48'28"	116°23'40"	1,011.47	728.45	1,063	283-1,063	Do.

[1]Water-level altitude based on 1992 data. Data not available for 1988.
[2]Water-level altitude based on 1989 data. Data not available for 1988.
[3]Calico Hills - abbreviation of tuffaceous beds of Calico Hills.
[4]Water-level altitude for uppermost interval of well. Other interval(s) also monitored.
[4]Water-level altitude based on 1990 data. Data not available for 1988.
Ervin and Others (1993)
[INN 3.1.2.2.2-1]

Table 3.1.2.2.3-1 Pumping Response Data for the Lower Carbonate Aquifer

Ref	Well	Stratigraphic Unit	thickness (m)	Apparent Transmissivity (m^2/d)			Apparent Hydraulic Conductivity (m/d)			Remarks
				SP.CAP.	DD	REC	SP.CAP.	DD	REC	
1	67-73	Bonanza King	86	99	248	658	1.16	2.90	7.69	Full tested thickness
	67-73	Bonanza King	25					9.94	26.3	Producing horizon only
1	67-68	Bonanza King, Nopah (?)	304	75	485	1068	0.25	1.60	3.52	Full tested thickness
			206				0.36	2.35	5.18	Producing horizons only
1	66-75	Nopah	230	50	137	335	0.22	0.60	1.46	Full tested thickness
			156				0.32	0.88	2.15	Producing horizons only
1	88-66	Pogonip	266	9	16	66	0.03	0.06	0.25	Full tested thickness
	88-66	Pogonip	72				0.12	0.22	0.92	Producing horizons only
2	UE-25P#1	Lone Mtn Dolomite & Roberts Mtns formation	508		111			0.22		Full tested thickness
2	UE-25P#1	Lone Mtn Dolomite	12		10			0.83		1338-1350 m(?)
	UE-25P#1	Lone Mtn Dolomite	<10		59			>5.90		1350-1360 m(?)
	UE-25P#1	Lone Mtn Dolomite	190		33			0.17		1360-1550 m depth
		Lone Mtn Dolomite & Roberts Mtns formation	255		6			0.02		1550-1805 m depth
1	79-69a	Carrara (Upper)	49	11,180			228			Highest T reported by 1

1 Winograd and Thordarson, 1975, p.C22
2 Craig and Robison, 1984
[INN 3.1.2.2.3-1]

Table 3.1.2.2.3-2 Pumping Response Data for the Welded-Tuff Aquifer

Ref.	Well	Stratigraphic Unit	Thickness (m)	Apparent Transmissivity (m^2/d)		Apparent Hydraulic Conductivity (m/d)		Remarks
				Drawdown	Recovery	Drawdown	Recovery	
1	J-13	Topopah Spring	118.9	120		1.01		303.6-422.5 m depth Stallmas's Method
1	J-13	Topopah Spring	118.9	850		7.15		303.6-422.5 m depth Straight-line early slope
2	UE-25P#1	Crater Flat, Lithic Ridge, Older Tuffs	919	26	18	0.03	0.02	Test 1, 382-1301 m depth Straight-line early slope
2	UE-25P#1	Crater Flat, Lithic Ridge, Older Tuffs	919	60		0.07		Test 1, 382-1301 m depth Second straight-line segment
2	UE-25P#1	Prow Pass	<30	14		0.47		Main production zone
3	USW VH-1	Paintbrush, Calico Hills, Crater Flat	578.9	450	2200	0.78	3.80	Test 3 & 4; T estimated from specific capacity and harmonic fluctuations
3	USW VH-1	Paintbrush, Calico Hills, Crater Flat	578.9	1000		1.73		Test 5; T estimated from specific capacity
3	USW VH-1	Paintbrush, Crater Flat	578.9	2200		3.80		Test 1; Brown's Method (Average of 2 determinations)
4	UE-25b#1	Calico Hills, Crater Flat	749	340		0.45		Thiem Equation ; UE-25a#1 used as observation well
5	USW H-1	Crater Flat (Prow Pass)	116	151 157	183	1.30 1.35	1.58	Theis method 572-688 m depth Straight-line 572-688 m depth
5	USW H-1	Crater Flat (Prow Pass, Bullfrog, Tram)	1142	0.98,0.60 1.6, 0	1.0, 0.41	6.9×10^{-4} (Avg) 9.9×10^{-4} (Avg)	6.2×10^{-4} (Avg)	Theis method 687-1829 m depth Straight-line 687-1829 m depth
6	USW H-3	Crater Flat (Mostly Tram), Lithic Ridge	465	0.4	0.5			754-1219 m depth; Brown's Method and straight-line method

Table 3.1.2.2.3-2 Pumping Response Data for the Welded-Tuff Aquifer (continued)

Ref.	Well	Stratigraphic Unit	Thickness (m)	Apparent Transmissivity (m^2/d)		Apparent Hydraulic Conductivity (m/d)		Remarks
				Drawdown	Recovery	Drawdown	Recovery	
6	USW H-3	Crater Flat (Mostly Tram), Lithic Ridge	397	1.0				822-1219 m depth, Theis Method
7	USW H-4	Crater Flat, some Lithic Ridge	700	200	790	0.29	1.1	519-1219 m depth; straight-line and Theis recovery methods
8	USW H-5	Crater Flat, (Bullfrog, Tram and Dacitic (?) Lava	515	34	57	0.07	0.11	Theis drawdown, straight-line recovery 704-1219 m depth
8	USW H-5	Bullfrog	146	34	57	0.23	0.39	690-836 m depth Main production zone, assuming 100% from this zone
9	USW H-6	Crater Flat; underlying tuffs and lavas	694	240	230	0.35	0.33	Dual-porosity model, drawdown from Test 1, recovery from Test 2
9	USW H-6	Crater Flat; underlying tuffs and lavas	694	470		0.68		Recharge-boundary model, average of Tests 1 & 2
9	USW H-6	Tram member	11	76		6.9		753-834 m depth isolated; all production assumed to be from 777 & 778 m
9	USW H-6	Bullfrog member	15	*	**			608-645 m depth isolated; all production assumed to be from 616-631 m

1 Thordarson, 1983
2 Craig and Robinson, 1984
3 Thordarson and Howells, 1987
4 Lahoud, et al., 1984
5 Rush, et. al., 1984
6 Thordarson and others, 1985
7 Whitfield and others, 1985
8 Robinson and Craig, 1991
9 Craig and Reed, 1991

* No lope in straight-line portion of drawdown curve, suggesting substantial transmissivity
** Anomalously rapid recovery; no analysis by Craig and Reed (1991)

Table 3.1.2.2.3-3 Results of analysis using the finite-conductivity, vertical-fracture model

Method	Ration of fracture conductivity to fracture half-length ($\mu m^2/m$)	Fracture half-length (meters)	Fracture conductivity ($\mu m^2/m$)	Calculated fracture conductivity (dimensionless)
PUMPING TEST 3				
Curve match	13.9	210	2,926	111 π
Linear flow	--	205	--	--
RECOVERY TEST 3				
Linear flow	--	133	--	--
PUMPING TEST 4				
Curve match	19.3	292	5,638	154 π
Bilinear flow	--	≥434	4,128	81 π
Linear flow	--	235	--	--
RECOVERY TEST 4				
Curve match	17.8	269	4,772	141 π
Bilinear flow	--	≥380	3,016	70 π
Linear flow	--	164	--	--

[--, not determined; ≥, equal to or greater than]
Robinson and Craig, 1991
[INN 3.1.2.2.3-3]

Table 3.1.2.2.8-1. Perennial Yield, Total Appropriations and Actual Water used for 1985 in the Hydrographic Areas Making up the Oasis Valley Subbasin

Hydrographic Area[a] Water Use Number/Name	yield (AFY)[b]	Perennial appropriations[c]	Total in 1985	Comments
147 Gold Flat	1,900	NA[d]	ND[e]	NTS
228 Oasis Valley Designated		2,000	1,528.72	Minor[f]
Subbasin totals	3,900		1,528.72	Minor

[a] Hydrographic areas are shown on Figure 8.3.1.2.2.8-1.
[b] Data from Scott et al., pg. 22, 66, 1971. AFY = Acre-feet per year.
[c] Tabulated from preliminary abstracted filed with the Office of the Nevada State Engineer.
[d] Not applicable.
[e] No data.
[f] Data from Giampaoli, p. 3, 1986.

Table 3.1.2.2.8-2. Nevada Test Site Water Wells Located in Ash Meadows Subbasin[a]

Area Number	Well	Pumping Rate (gpm)[b]	Unit Source[c]	Treatment Required	Total withdrawals for 1985, in gal (acre-feet)[d]
1	UE1t	270	ND[e]	None	5,594,200 (17.2)
2	2	165	Lower carbonate aquifer (?)[f]	None	20,630,500 (63.3)
3	A	160	Valley fill	Chlorination	39,182,300 (120.2)
5	5b	240	Valley fill	None	61,107,800 (187.5)
5	5c	325	Valley fill	None	61,170,400 (187.7)
5	UE5c	350	ND	None	4,319,000 (13.3)
6	C	270	Lower carbonate aquifer (?)	None	26,162,900 (80.3)
6	C-1	280	Lower carbonate aquifer (?)	None	26,170,300 (80.3)
6	4	650	ND	None	41,815,300 (128.3)
15	UE15d	270	Tuff	Chlorination	ND
16	UE16d	194	ND	None	15,605,000 (47.9)
22	Army Well-1	530	Lower carbonate aquifer (?)	Chlorination	53,916,700 (165.4)

[a] Data from Witherill, pg. 82-97, 1986 unless otherwise noted.
[b] gpm = gallons per minute. To convert to cubic meters per second, multiply by 6.31×10^{-5}.
[c] Based on information provided in Claassen, pg. 15-102, 1973, and Winograd and Thordarson, plate 2b, 1975.
[d] To convert gallons to cubic meters, multiply by 3.785×10^{-3}.
[e] ND = No data.
[f] (?) = uncertain.

Table 3.1.2.2.8-3. Perennial Yield, Total Appropriations, and Actual Water Use for 1985 in the Hydrographic Areas Making up the Ash Meadows Subbasin

Hydrographic Area[a] Number	Hydrographic Area Name	Perennial yield (AFY)[b]	Existing appropriations (AFY)[c]	Water Use in 1985 (AF)[d]	Comments
158A	Emigrant Valley (Groom Lake)	2,500	59.8	ND[e]	
158B	Emigrant Valley (Papoose Lake)	<10	0	0	
159	Yucca Flat	350	NA[f]	537.5	Nevada Test Site (NTS)
160	Frenchman Flat	100	NA	388.5	NTS
161	Indian Springs Valley	500	754.98	679.0[g]	
168	Three Lakes Valley (N)	4,000	11.48	ND	
169A	Tikaboo North	2,600	21.72	ND	
169B	Tikaboo South	4,000	ND	ND	
211	Three Lakes Valley (S)	5,000	ND	100[g,h]	
225	Mercury Valley	8,000	NA	165.4	NTS
226	Rock Valley	8,000	320.0	ND	
227A (East)	Fortymile Canyon (Jackass Flats)	2,000	NA	0	NTS
Subbasin totals		**37,060**	**1,167.98**	**1,870.4**	

[a] Hydrographic areas are shown on Figure 3.1.2.2.8-2.
[b] Data from Scott et al., pg. 22-26, 1971. AFY = acre-feet per year. To convert to cubic meters per year multiply by 1.23×10^3.
[c] Tabulated from preliminary abstracts filed with the Office of the Nevada State Engineer.
[d] AF = acre-feet.
[e] ND = No data.
[f] NA = Not applicable.
[g] Data from Giampaoli pg. 2, 1986.
[h] Estimated use at Indian Springs Correctional Center.

Table 3.1.2.2.8-4. Public Water Suppliers in the Community of Amargosa Valley[a, b]

Supplier	Type	Population Served
American Borate Trailer Park	Community	300
Amargos Water Company (IMV)	Community	45
Embrey's Trailer Park	Community	45
Mountain View Apartments and Shopping Center	Community	75
Amargosa Elementary School	Single User	c
Amargosa Senior Citizen's Center	Single User	c
Coach House Bar	Single User	c
Roadside Park 801NY	Single User	c
Water-N-Hole	Single User	c

[a] Source: SAIC, pg. 3-6, 1986.
[b] Wells are located in the southern portion of the Alkali Flat-Furnace Creek Ranch subbasin and in the southwestern portion of the Ash Meadows subbasin.
[c] In general these systems serve a transient population of at least 25 persons per day.

Table 3.1.2.2.8-5. Nevada Test Site Water Wells Located in Alkali Flat-Furnace Creek Ranch Subbasin[a]

Area Number	Well	Pumping Rate (gpm)[b]	Unit Source[c]	Treatment Required	Total withdrawals for 1985, in gal (acre-feet)[d]
18	8	400	Tuff	None	63,683,000 (195.4)
19	19	360	Tuff (?)[e]	None	114,467,200 (351.2)
20	U20a-2	340	Tuff	None	20,165,900 (61.9)
25	J-12	815	Tuff	None	25,049,800 (76.9)
25	J-13	680	Tuff	None	37,811,000 (116.0)

[a] Data from Witherill, pg. 82-97, 1986 unless otherwise noted.
[b] gpm = gallons per minute. To convert to cubic meters per second, multiply by 6.31×10^{-5}.
[c] Based on information provided in Claassen, pg. 22-37, 111-133, 1973, and Winograd and Thordarson, plate 2b, 1975.
[d] To convert gallons to cubic meters, multiply by 3.785×10^{-3}.
[e] (?) = uncertain.

Table 3.1.2.2.8-6. Perennial Yield, Total Appropriations and Actual Water Used for 1985 in the Hydrographic Areas Making up the Alkali Flat-Furnace Creek Ranch Subbasin

Hydrographic Number	Area[a] Name	Perennial Yield (AFY)[b]	Total Appropriations[c]	Water Use in 1985[d]	Comments
227A	Fortymile Canyon (Jackass Flats)	2,000	320.0	192.9	Yucca Mountain site
227B	Fortymile Canyon (Buckboard Mesa)	3,600	NA[e]	0	
228	Oasis Valley	1,000	1.10	ND[f]	
229	Crater Flat	900	2533.48[g]	2533.48	
230	Amargosa Desert	24,000	71,613.66	9,672.0[h]	Over-appropriated; designated
147	Gold Flat	1,900	ND	292.4	NTS
157	Kawich Valley	2,200	ND	0	
173A	Railroad Valley (southern part)	ND	ND	ND	
Subbasin Totals		35,600	74,468.24	12,690.78	

[a] Hydrographic areas are shown on Figure 3.1.2.2.8-2.
[b] Data from Scott et al., pg. 22, 23, 26, 1971. AFY = Acre-feet per year. To convert to cubic meters per year, multiply by 1.23×10^3.
[c] Tabulated from preliminary abstracts filed with the Office of the Nevada State Engineer.
[d] Data from Giampaoli, pg. 2-7, 1986. AF = acre-feet. to convert to cubic meters, multiply by 1.23×10^3.
[e] NA = not applicable.
[f] ND = no data.
[g] Appropriations for mining and milling may exceed the perennial yield because (1) appropriations for mining activities are for short-term use and (2) mining and milling applications are considered preferred water uses by the State Engineer.
[h] Data from Coache, pg. 1, 1986.

Table 3.1.2.2.9-1. Water Use Estimate for Yucca Mountain Site Characterization Project (modified from State of Nevada, Exhibit #40, 1992)

Activity	**Estimated Water Use (1991) (m^3)**
ESF Construction/Operation	4.63×10^5
Surface-Based Testing	4.69×10^4
Dust Control/Construction	7.30×10^5
TOTAL	**1.24×10^6**

RADIOACTIVE WASTE MANAGEMENT

Table 3.1.2.3.1-1 - *Summary of selected wells monitored for water levels at Yucca Mountain.*
[Water-level altitude is 1988 average value unless otherwise indicated]

Local-well number	Latitude	Longitude	Altitude of well casing (meters)	Water-level Altitude (meters)	Drilled Depth (meters)	Open interval depth (meters)	Geologic member or unit at water table
USW WT-1	36°49'16"	116° 26'56"	1,201.11	730.40	515	471-515	Calico Hills[5]
USW WT-2	36°50'23"	116° 27'18"	1,301.13	730.71	628	571-628	Prow Pass
UE-25 WT #3	36°47'57"	116° 24'58"	1,030.11	729.57	348	301-348	Bullfrog
UE-25 WT #4	36°51'40"	116°26'03"	1,169.21	730.70	482	439-482	Calico Hills[5]
UE-25 WT #6	36°53'40"	116° 26'46"	1,314.78	1,035.10	383	281-383	Do.
USW WT-7	36° 49'33"	116° 28'57"	1,196.88	775.70	491	421-491	Topopah Spring
USW WT-10	36°48'25"	116° 29'05"	1,123.40	775.92	431	348-431	Do.
USW WT-11	36°46'49"	116° 28'02"	1,094.11	730.72	441	364-441	Do.
UE-25 WT #12	36°46'56"	116° 26'16"	1,074.74	729.52	399	345-399	Do.
UE-25 WT #13	36° 49'43"	116°23'51"	1,032.51	728.98	354	303-354	Do.
UE-25 WT #14	36°50'32"	116° 24'35"	1,076.05	729.71	399	346-399	Do.
UE-25 WT #15	36° 51'16"	116° 23'38"	1,082.94	729.24	415	354-415	Do.
UE-25 WT #16	36° 52'39"	116° 25'34"	1,210.63	738.32	521	473-521	Calico Hills[5]
UE-25 WT #17	36° 48'22"	116° 26'26"	1,124.06	729.64	443	394-443	Prow Pass
UE-25 WT #18	36° 52'07"	116° 26'42"	1,336.32	730.8[1]	623	607-623	Calico Hills[5]
UE-25b #1	36° 51'08"	116° 26'23"	1,200.73	730.66[2]	1,220	471-1,199	Do.
UE-25c #2	36° 49'45"	116° 25'43"	1,132.2	729.95[3]	914	416-914	Do.
UE-25c #3	36° 45'46"	116° 25'44"	1,132.3	730.10[3]	914	417-753	Do.
USW G-3	36° 49'05"	116° 28'01"	1,480.47	730.56	1,533	751-1,533	Tram
USW H-1	36° 51'57"	116° 27'12"	1,303.10	730.95[3]	1,829	573-673	Prow Pass
USW H-3	36°49'42"	116° 28'00"	1,483.47	731.72[2]	1,219	752-1,114	Tram
USW H-4	36°50'32"	116° 26'54"	1,248.74	730.33[2]	1,219	518-1,181	Prow Pass
USW H-5	36°51'22"	116° 25'55"	1,478.94	775.47[2]	1,219	704-1,091	Bullfrog
USW H-6	36°50'49"	116° 28'55"	1,302.06	775.96[2]	1,220	562-752	Prow Pass
USW VH-1	36° 47'32"	116° 33'07"	963.23	779.46	762	185-762	Tiva Canyon
J-12	36°45'54"	116° 23'24"	954.54	728.0[4]	347	226-347	Topopah Spring
J-13	36°48'28"	116° 23'40"	1,011.47	728.45	1,063	283-1,063	Do.

[1]Water-level altitude based on 1992 data. Data not available for 1988.
[2]Water-level altitude for uppermost interval of well. Other interval(s) also monitored.
[3]Water-level altitude based on 1989 data. Data not available for 1988.
[4]Water-level altitude based on 1990 data. Data not available for 1988.
[5]Calico Hills-abbreviation of tuffaceous beds of Calico Hills.

[INN 3.1.2.3.1-1]

Table 3.1.2.3.7-1 Environmental isotope data for groundwater samples from the tuff aquifers under the exploratory block and its immediate area[a]

Well designation[b]	Collection date	δD (o/oo SMOW)[c]	$\delta^{18}0$ (o/oo SMOW)[c]	$\delta^{13}C$ (o/oo PDB)[d]	^{14}C (pmc)[e]	HTO (TU)[f]
UE-25b#1	08/07/81	-99.5	-13.4	-10.7	--[g]	--
UE-25b#1	09/09/81	-101.0	-13.4	-10.7	16.7	<62.0
UE-25b#1	07/20/82	-99.5	-13.5	-8.6	18.9	0.6
USW G-4	12/09/82	-103.0	-13.8	-9.1	22.0	--
USW H-1	10/20/80	-103.0	-13.4	--	19.9	<6.0
USW H-1	12/08/80	-101.0	-13.5	-11.4	23.9	<6.0
USW H-3	03/14/84	-101.0	-13.9	-4.9	10.5	0.6
USW H-4	05/17/82	-104.0	-14.0	-7.4	11.8	<3.0
USW H-5	07/03/82	-102.0	-13.6	-10.3	18.2	<62.0
USW H-5	07/26/82	-102.0	-13.6	-10.3	21.4	<62.0

[a]Source: Benson and McKinley (1985).
[b]Well locations indicated in Figure 3-32.
[c]δD amd $\delta^{18}0$ are reported in parts per thousand relative to Standard Mean Ocean Water (SMOW) standard.
[d]$\delta^{13}C$ is reported in parts per thousand relative to Peedee belemnite carbonate (PDB) standard.
[e]^{14}C activity is reported as a percent of the modern carbon (pmc) standard.
[f]T is reported in tritium units (TU).
[g]-- indicates no data.

Table 3.1.2.3.9-1 Pumping Test and Water-level Data for Wells J-12 and J-13 from 1960 through 1969[a]

Date of pumping test	Water level (m) Datum: MSL[b]	Specific capacity ($(m^3/d)/m$)	Pumping rate (m^3/d)	Draw-down (m)	Duration of test (h)
WELL J-12					
01/27/60	727.6	--[c]	--	--	--
11/01/60	--	1,700	2,080	1.2	2
08/22/62	726.7	1,000	2,110	2.10	1
07/27/65	--	2,800	2,020	0.73	83
07/25/68	727.0	220	4,250	19.54	1
08/24/68[d]	727.3	850	4,880	5.78	5
04/21/69	727.3	1,600	4,850	3.02	4
WELL J-13					
02/18/64	728.5	420	3,800	9.11	3
02/18/64	727.9	310	2,800	12.31	96
03/31/64	729.4	--	--	--	--
04/21/69	728.2	540	3,640	6.77	4

[a]Modified from Claassen (1973).
[b]MSL = mean sea level.
[c]-- indicates no data.
[d]Well bore cleaned and deepened to 347.2 m. Test data indicated downhole sloughing, resulting in decreased hydraulic conductivity. Original total depth: 270.4m.

Table 3.1.2.3.9-2 Water Production from Wells J-12 and J-13 from 1983 through 1985 [a,b]

	1983		1984		1985	
Well	Gallons	Acre-feet[c]	Gallons	Acre-feet	Gallons	Acre-feet
J-12	25,498,500	78.2	26,058,400	80.0	25,049,800	76.9
J-13	42,148,700	129.3	40,349,300	123.8	37,811,000	116.0
Total	67,647,200	207.5	66,407,700	203.8	62,860,800	192.9

[a]Production figures are for water year, October 1 through September 30.
[b]Source: Witherill (1986).
[c]To convert from acre-feet to cubic meters, multiply by 1233.489.

Table 3.1.2.3.9-3 Pumpage from Well J-13 for Site Characterization Purposes, As Reported to the State Engineer

1992	
July	609,000 gal
August	559,500 gal
September	673,800 gal
October	770,500 gal
November	812,500 gal
December	779,500 gal
Total	3,036,300 gal
1993	
January	886,000 gal
February	2,090,600 gal
March	2,459,300 gal
April	2,696,200 gal
May	2,145,300 gal
June	2,455,900 gal
July	1,983,500 gal
August	2,323,800 gal
September	2,842,774 gal
October	2,939,000 gal
November	2,191,400 gal
December	1,143,600 gal
Total	26,157,374 gal
1994	
January	1,549,600 gal
February	738,900 gal
March	2,689,800 gal
Total (YTD)	4,978,300 gal

Table 3.1.4.1.1-1. List of All Active Regional Weather Stations, Managing Agency, Parameters Measured, Location, Sampling and Averaging Frequency, and Date Installed [INN 3.1.4.1.1-2]

Table 3.1.4.1.1.2.1-1 Temperature Data for Sites at and Around Yucca Mountain [INN 3.1.4.1.1.2.1-1]

Table 3.1.4.1.1.2.2-1 Precipitation Located in the Vicinity of Yucca Mountain [INN3.1.4.1.1.2.2-1]

Table 3.1.4.1.1.2.3-1. Relative Humidity Data for Yucca Flat, Nevada (1962-1971)

Month	Relative Humidity (%)			
	Hour (Pacific Standard Time)			
	0400	1000	1600	2200
January	67	49	35	60
February	67	45	32	56
March	58	31	23	44
April	52	27	21	38
May	46	22	17	31
June	39	19	14	26
July	40	20	15	28
August	44	23	16	30
September	43	21	17	32
October	46	24	19	36
November	61	39	31	52
December	68	50	41	64
Annual	53	31	23	41

Source: Bowen and Egami (1983)

Table 3.1.4.1.1.2.3-2 Summary of Various Relative Humidity Data in the Vicinity of Yucca Mountain [INN 3.1.4.1.1.2.3-1]

Table 3.1.4.1.1.2.3-3 Wet Bulb Depression Data in Relation to Ambient Temperature and Humidity Values [INN 3.1.4.1.1.2.3-2]

Table 3.1.4.1.1.2.5.1-1 Yucca Flat Upper Air Data for 1,524 m Above Mean Sea Level (328 m above ground level)[a]

Direction[b]	%	Winter Avg. speed (m/s)	%	Spring Avg. speed (m/s)	%	Summer Avg. speed (m/s)	%	Fall Avg. speed (m/s)	%	Annual Avg. speed (m/s)
N	21.8	5.6	9.8	5.7	3.2	5.9	13.5	6.3	14.2	5.8N

[a] Calculated from Quiring (1968)
[b] Winds blow from indicated direction
[c] NA = not applicable
[INN 3.1.4.1.1.2.5.1-1]

Table 3.1.4.1.1.2.5.1-2 Yucca Flat Upper Air Data for 1,829 m Above Mean Sea level (633 m above ground level)[a]

Direction[b]	%	Winter Avg. speed (m/s)	%	Spring Avg. speed (m/s)	%	Summer Avg. speed (m/s)	%	Fall Avg. speed (m/s)	%	Annual Avg. speed (m/s)
N	21.8	5.6	9.8	5.7	3.2	5.9	13.5	6.3	14.2	5.8N

[a] Calculated from Quiring (1968)
[b] Winds blow from indicated direction
[c] NA = not applicable
[INN 3.1.4.1.1.2.5.1-2]

Table 3.1.4.1.1.2.5.1-3 Summary Data for Upper Air Winds [INN 3.1.4.1.1.2.5.1-3]

Table 3.1.4.1.1.2.6-1 Monthly Atmospheric Pressure, Means, and Extremes

Atmospheric Pressure (in. Hg)	Mean	Monthly Std Dev	Mean Daily Range	Extremes		Highest Daily Range	Adjusted to Sea Level Extremes		
				High	Low		Mean	High	Low

[INN 3.1.4.1.1.2.6-1]

Table 3.1.4.1.1.2.7-1 Monthly and Daily Average Insolation [INN 3.1.4.1.1.2.7-1]

Table 3.1.4.1.1.2.8-1 Frequency of Occurrence of Hail at Yucca Mountain
[INN 3.1.4.1.1.2.8-6]

Table 3.1.4.1.1.2.8-2 Frequency of Occurrence of Fog and Sandstorms at Yucca Mountain [INN 3.1.4.1.1.2.8-7]

Table 3.1.4.1.1.2.9-1 Annual Extreme Wind Speed at 30 ft. (9.1 m) Above Ground Level and Probability of Occurrence for Yucca Flat, Nevada[a]

Probability of occurrence in 1 year	Fastest mile[b] mph	m/s
0.5	48	21
0.2	55	25
0.1	61	27
0.02	75	33
0.01	82	37

[a] Source: Quiring (1968).
[b] Fastest mile is defined as an average highest wind velocity as 1 mi of air passes the measurement point.

[INN 3.1.4.1.1.2.9-1]

Table 3.1.4.1.1.2.9-2 Extreme Wind Speeds and Probability of Occurrence at Yucca Mountain [INN 3.1.4.1.1.2.9-1]

Table 3.1.4.1.1.2.9-3 Historical Peak Wind Gusts Data for Yucca Flat, Nevada [INN 3.1.4.1.1.2.9-1]

Table 3.1.4.1.1.2.9-4 Measured Temperature Extremes at Yucca Mountain [INN 3.1.4.1.1.2.9-2]

Table 3.1.4.1.1.2.9-5 One and 24-hour Maximum Precipitation and Associated Probabilities of Occurrence [INN 3.1.4.1.1.2.9-3]

Table 3.1.4.1.2-1 List of Meteorological Monitoring Site Locations [INN 3.1.4.1.2-1]

Table 3.1.4.1.2-2. Meteorological Parameters Monitored and Measurement Height (m) at Each Station (With Accuracy)

Site ID	Horizontal Wind Speed	Wind Direction	Air Temp.	ΔTemp.	Dewpoint Temp.	Relative Humidity	Barometric Pressure	Precip.	Solar radiation	Vertical Wind Speed
SAIC 1	10 & 60	10 & 60	2	10 & 2	2	n/a	1	1	2	10
SAIC 2	10	10	2	10 & 2	n/a	2	1	1	2	10
SAIC 3	10	10	2	10 & 2	n/a	2	1	1	2	10
SAIC 4	10	10	2	10 & 2	n/a	2	1	1	2	10
SAIC 5	10	10	2	10 & 2	n/a	2	1	1	2	10
SAIC 6	10	10	2	10 & 2	n/a	2	1	1	2	10
SAIC 7	10	10	2	10 & 2	n/a	2	1	1	2	10
SAIC 8	10	10	2	10 & 2	n/a	2	1	1	2	10
SAIC 9	10	10	2	10 & 2	n/a	2	1	1	2	10
Accuracy	(1)	± 5°	±0.5 C°	±0.1 C°	±1.5 C° (3)	(4)	± 3 mb	± 10%	± 5%	(1)
USGS 1	3	3	2			2		0.5	2	
USGS 2	3	3	2			2		0.5	2	
USGS 3	3	3	2			2	1	0.5	2	
USGS 4	3	3	2			2		0.5	2	
USGS 5	3	3	2			2		0.5	2	
Accuracy	(2)	± 5°	± 1 C°			± 5%	± 0.1 kPa	± 2%	± 5%	

NOTES: n/a not applicable:
(1) For speeds <5 m/s: ± 0/25 m/s; for speeds > 5 m/s ± 5 percent o speed
(2) For speeds <5 m/s: ± 0.5 m/s; for speeds > 5 m/s: ± 10 percent of speed
(3) Only applies at temperatures - 30° to +30° C
(4) For RH < 40 percent: for RH > 40 percent, use RH equivalent to dewpoint ± 1.5°C

Table 3.1.4.1.3-1 Significant Features of Stability Distributions [INN 3.1.4.1.3-2]