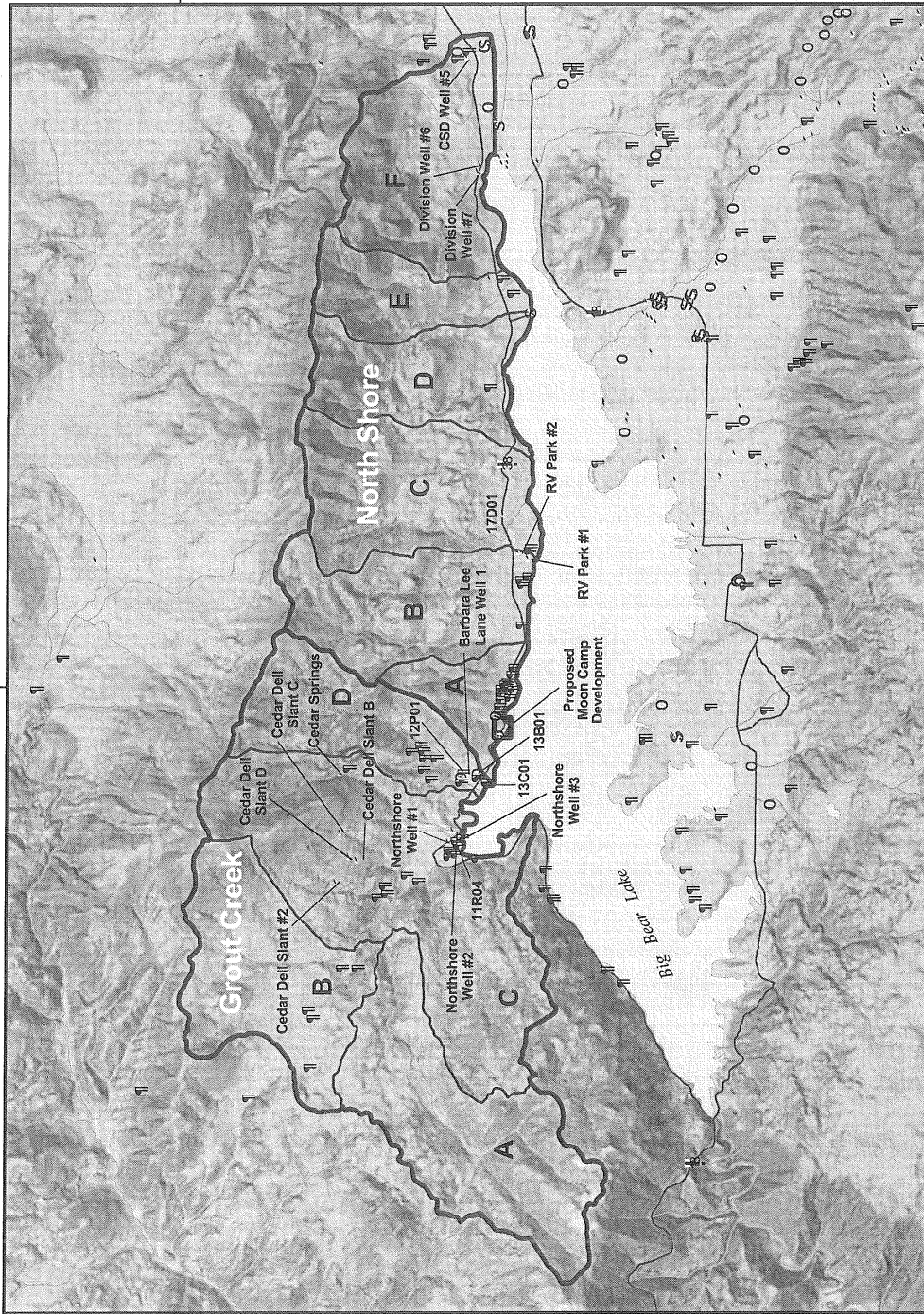




Prepared by: DWB

Map Projection:
UTM Zone 11, NAD27
Central Meridian: -117 degrees

GIS: projbbldwp_north_shore_per_yield_12-03-bbbldwp_northshore_12-03_fig.apr

NORTH SHORE AND GROUT CREEK TRIBUTARY SUBAREAS

EXPLANATION

Big Bear Lake Watershed Boundary
with Hydrologic Subunits

Tributary Subarea

Well Use Classification

Irrigation

Monitoring

Municipal

Private

Test Borehole

Test Well

Unknown

Well locations were determined from City of Big Bear
Lake Department of Water and Power, Big Bear
Community Services District records, and DWR
Well Drilling Logs.

Note: Only Municipal Wells in North Shore and
Grout Creek Subunits are labeled.

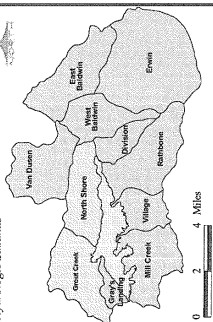
Road

Surface Water

Creek or River

Proposed Moon Camp
Development

Hydrologic Subunits



R.I.W. | R.I.E.

2-DEC-03

Figure 2

GEOSCIENCE
Support Services, Inc.
10000 Glenhurst, CA 95024
Tel: (925) 255-1400
E-mail: enr@geosciencewater.com

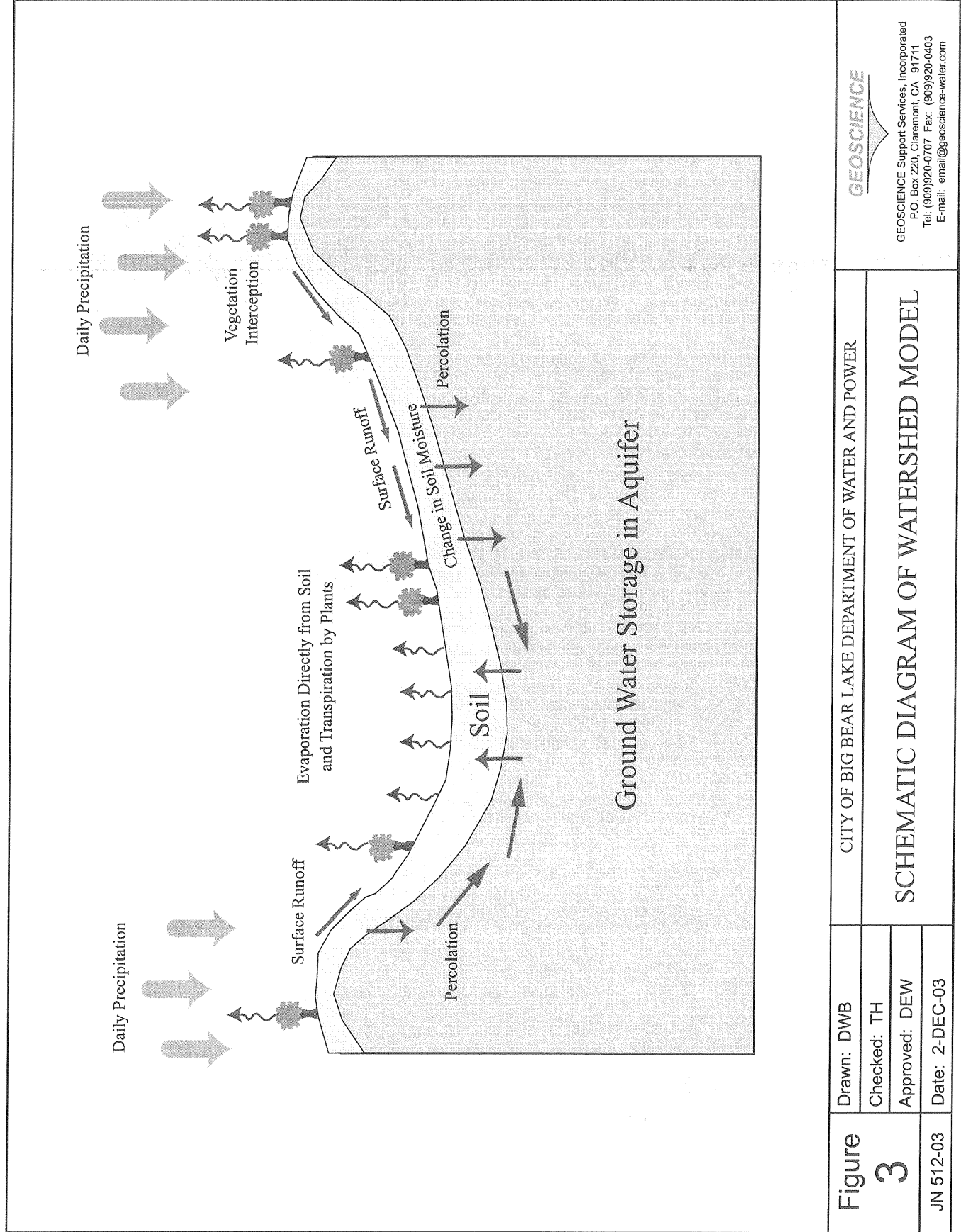
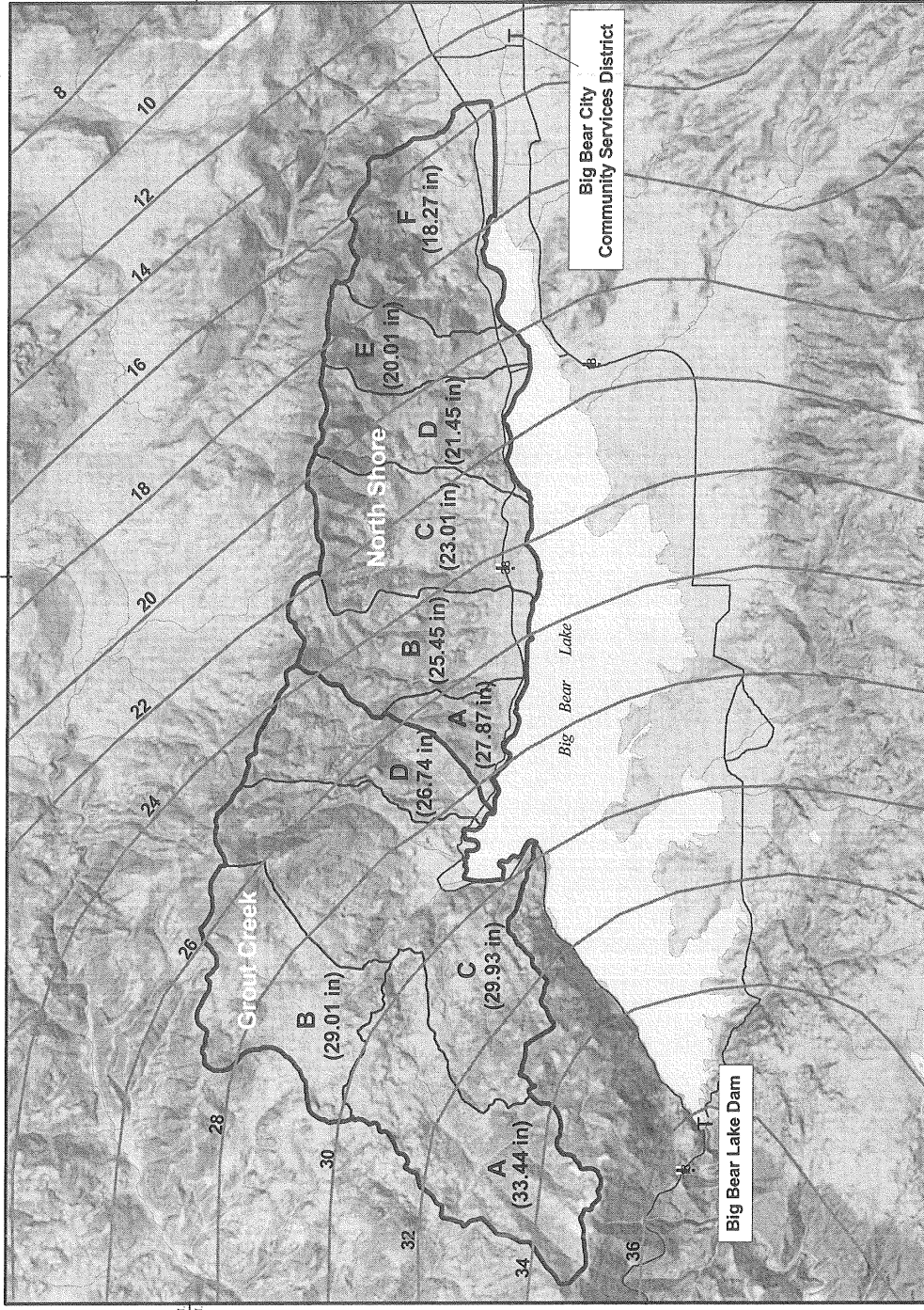


Figure 3	Drawn: DWB	CITY OF BIG BEAR LAKE DEPARTMENT OF WATER AND POWER	 GEOSCIENCE Support Services, Incorporated P.O. Box 220, Claremont, CA 91711 Tel: (909)920-0707 Fax: (909)920-0403 E-mail: email@geoscience-water.com
	Checked: TH		
	Approved: DEW		
	Date: 2-DEC-03		
JN 512-03	SCHEMATIC DIAGRAM OF WATERSHED MODEL		



EXPLANATION

- 26 Average Annual Precipitation (in.)
1870 - 1970
(Source: San Bernardino County
Flood Control District)
- Big Bear Lake Watershed Boundary
with Hydrologic Subunits
- A Tributary Subarea
- (33.44 in) Tributary Subarea Weighted Mean
Annual Precipitation (in.)
- T Weather Station
San Bernardino County Flood
Control District
- Road
- Surface Water
- Creek or River

GEOSCIENCE

GEOSCIENCE SUPPORT SERVICES, INC.
P.O. Box 220, Claremont, CA 91711
Tel: (909) 395-1100
E-mail: email@geosciencewater.com

0 0.5 1 Miles

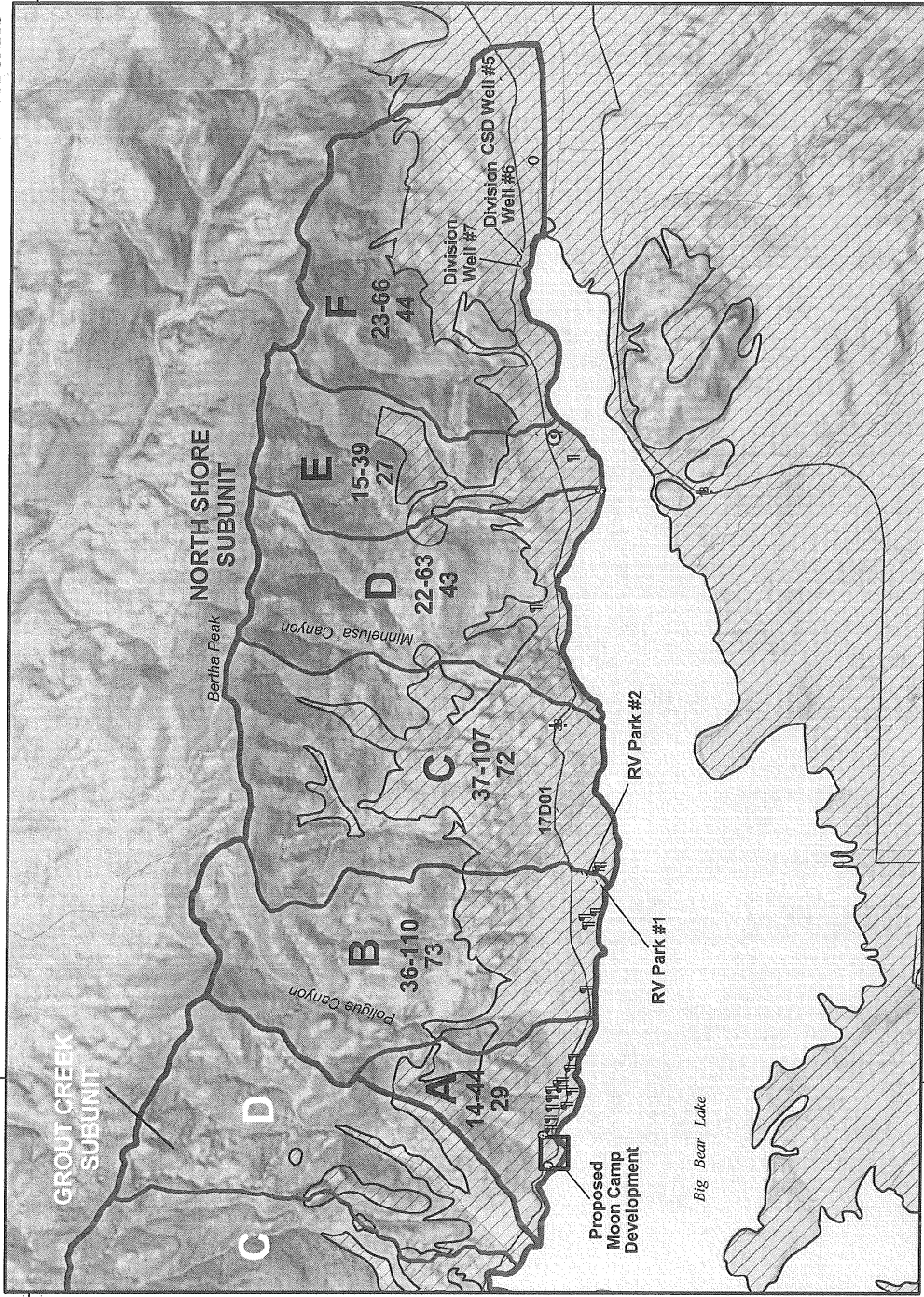
Map Projection:
UTM Zone 11, NAD27
Central Meridian: -117 degrees

GIS project\bdw_north_shore_per_yield_12-03\bdw_northshore_12-03_fig.apr

Figure 4

CITY OF BIG BEAR LAKE
DEPARTMENT OF WATER AND POWER

FOCUSED GEOHYDROLOGIC EVALUATION OF THE MAXIMUM PERENNIAL YIELD
OF THE NORTH SHORE AND GROUT CREEK HYDROLOGIC SUBUNITS



**NORTH SHORE
HYDROLOGIC SUBUNIT
WITH TRIBUTARY
SUBAREAS AND
AVERAGE ANNUAL
GROUND WATER
RECHARGE ESTIMATES**

EXPLANATION

Big Bear Lake Watershed Boundary
with Hydrologic Subunits

Tributary Subarea

Tributary Subarea Modeled Estimated Average
Annual Ground Water Recharge

15-44 Watershed Model Range (acre-ft/yr)
30 Watershed Modeled Average (acre-ft/yr)

Well Use Classification

Irrigation Π Private
Monitoring $\circ$ Test Borehole
Municipal $\circ$ Test Well

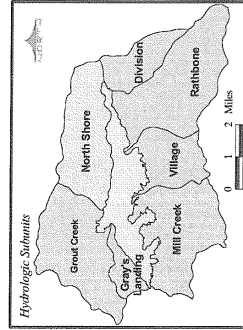
Road

Surface Water

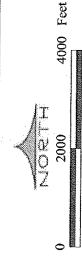
Creek or River

Proposed Moon Camp
Development

Alluvial / Bedrock Boundary
(Patterned Area is Alluvium)



2-DEC-03



Well locations were determined from City of Big Bear Lake Department of Water and Power,
Big Bear City Community Services District records, and DWR Well Drilling Logs.
Note: Only Municipal Wells are labeled.

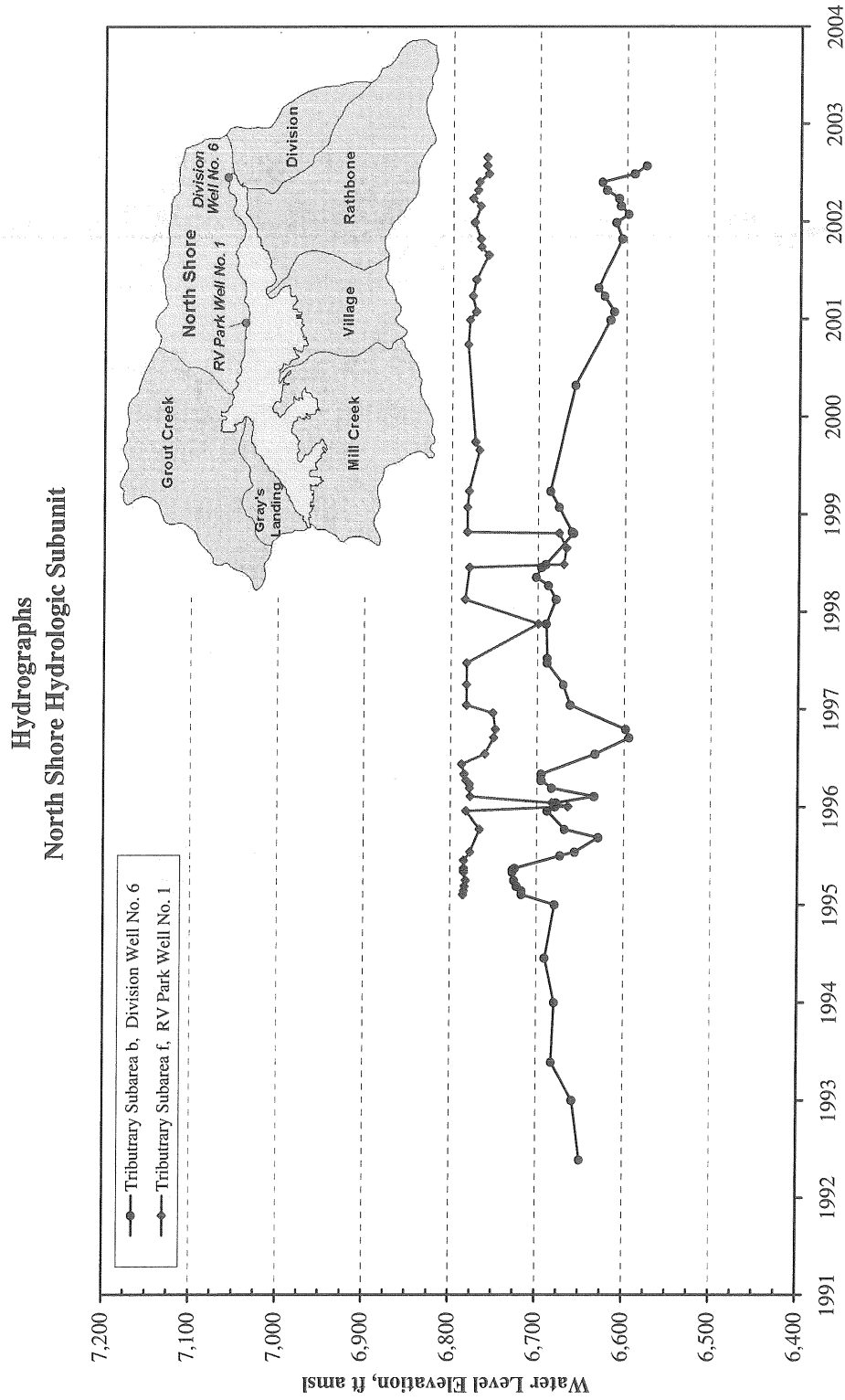
Map Projection:
UTM Zone 11, NAD27
Central Meridian: -117 degrees
GIS: projbbshwp_north_shore_per_yield_12-03-bbbshwp_northshore_12-03_fig.apr

Figure 5

GEOSCIENCE

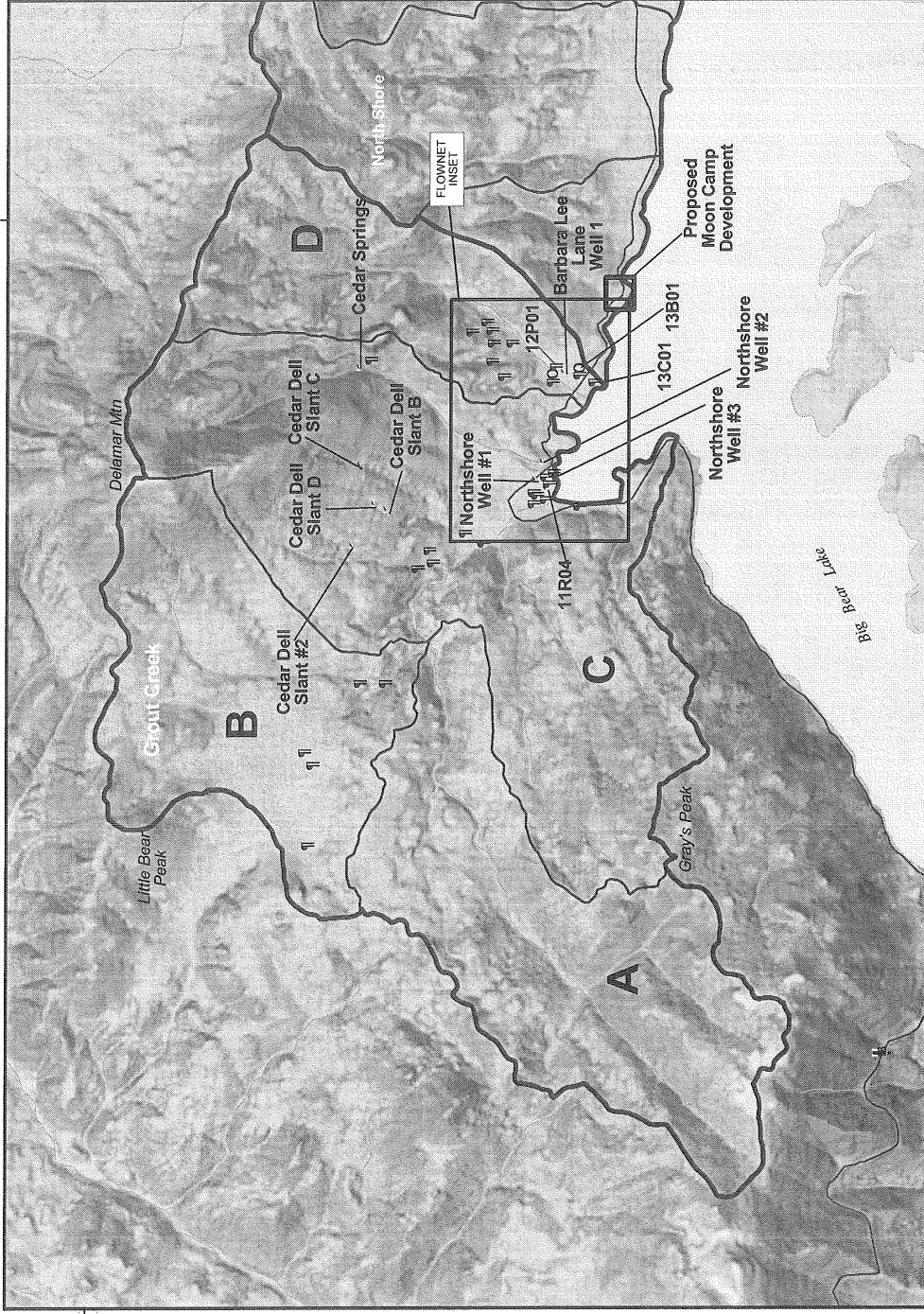
GEOSCIENCE SUPPORT SERVICES, INC.
P.O. Box 220, Claremont, CA 91711
Tel: (909) 820-0307 Fax: (909) 820-0405
E-mail: info@geosciencewells.com

City of Big Bear Lake Department of Water and Power
 Focused Geohydrologic Evaluation of the Maximum Perennial Yield
 of the North Shore and Grout Creek Hydrologic Subunits



Source of Data: City of Big Bear Lake Department of Water and Power

Figure 6



Prepared by: DWB

Map Projection:
UTM Zone 11, NAD27
Central Meridian: -117 degrees
GIS: proj385dwg_north_shore_per_yield_12-03385dwg_northshore_12-03_fig.apr

GROUT CREEK HYDROLOGIC SUBUNIT WITH TRIBUTARY SUBAREAS

EXPLANATION

Big Bear Lake Watershed Boundary
with Hydrologic Subunits

A Tributary Subarea

Well Use Classification

Municipal

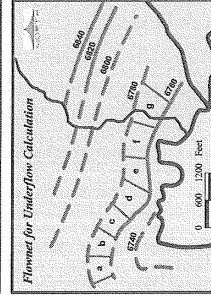
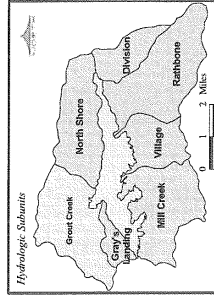
Private

Test Well

Well locations were determined from City of Big Bear
Lake Department of Water and Power, Big Bear City
Community Services District records, and DWR
Well Drilling Logs.

Note: Only Municipal Wells are labeled.

Proposed Moon Camp
Development



GEOSCIENCE

GEOSCIENCE Support Services, Inc.
10000 S. Highway 101, Suite 100
San Diego, CA 92108
Tel: (619) 444-0007 Fax: (619) 444-0009
E-mail: ess@geosciencewater.com

2-DEC-03

R.I.W. | R.I.E.

0 2000 4000 Feet

NORTH

2-DEC-03

R.I.W. | R.I.E.

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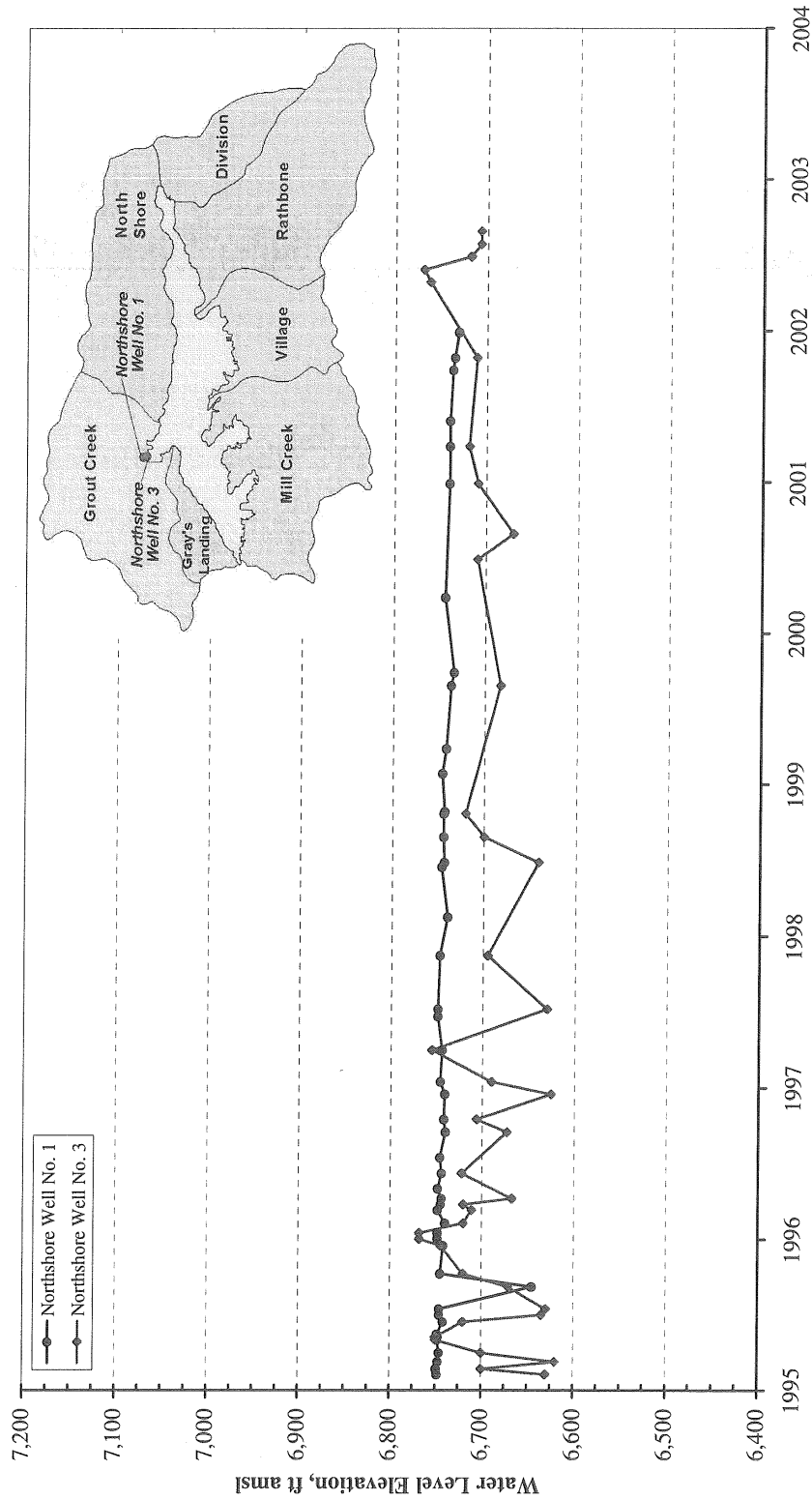
2-DEC-03

R.I.W. | R.I.E.

0 2000 4000 Feet</

City of Big Bear Lake Department of Water and Power
 Focused Geohydrologic Evaluation of the Maximum Perennial Yield
 of the North Shore and Grout Creek Hydrologic Subunits

Hydrographs
 Grout Creek Hydrologic Subunit

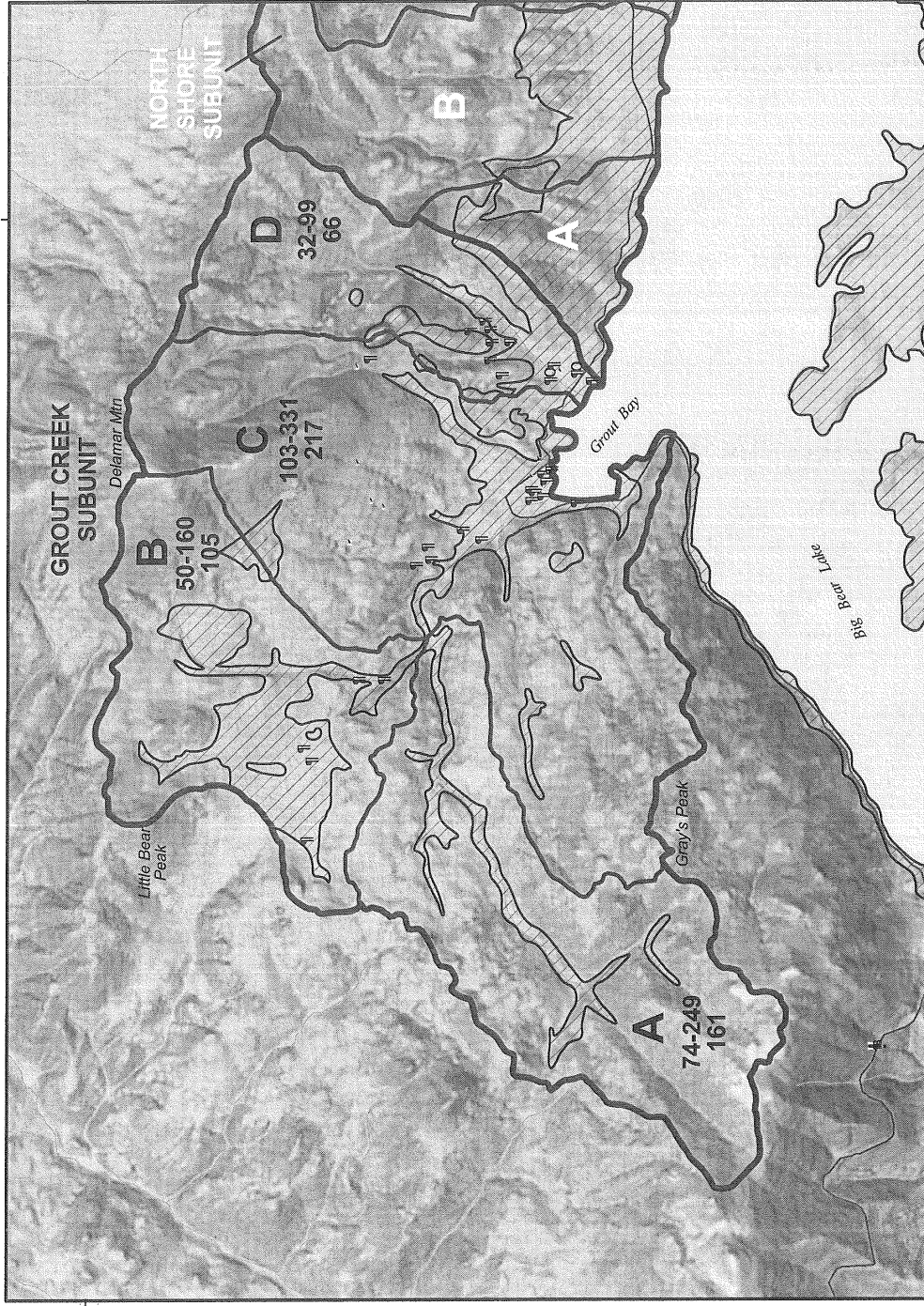


Source of Data: City of Big Bear Lake Department of Water and Power

Figure 8

**CITY OF BIG BEAR LAKE
DEPARTMENT OF WATER AND POWER**

**FOCUSED GEOHYDROLOGIC EVALUATION OF THE MAXIMUM PERENNIAL YIELD
OF THE NORTH SHORE AND GROUT CREEK HYDROLOGIC SUBUNITS**



**GROUT CREEK
HYDROLOGIC SUBUNIT
WITH TRIBUTARY
SUBAREAS AND
AVERAGE ANNUAL
GROUND WATER
RECHARGE ESTIMATES**

EXPLANATION

Big Bear Lake Watershed Boundary
with Hydrologic Subunits

A

Tributary Subarea

Tributary Subarea Modeled Estimated Average
Annual Ground Water Recharge

74-249 Watershed Model Range (acre-ft/yr)

161 Watershed Modeled Average (acre-ft/yr)

Well Use Classification

Municipal

Private

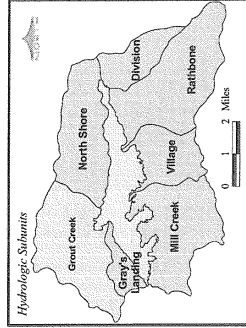
Test Well

Road

Surface Water

Creek or River

Alluvial / Bedrock Boundary
(Patterned Area is Alluvium)



Prepared by: DWB

Map Projection:
UTM Zone 11, NAD27
Central Meridian: -117 degrees
GIS: projshdw_north_shore_per_yield_12-03shdw_northshore_12-03_fig.apr

Well locations were determined from City of Big Bear Lake Department of Water and Power,
Big Bear City Community Services District records, and DWR Well Drilling Logs.
Note: Only Municipal Wells are labeled.

0 2000 4000 Feet
NORTH

2-DEC-03

Figure 9

GEOSCIENCE
GEOSCIENCE Support Services, Inc.
10000 N. Main Street, Suite 100
Lake Arrowhead, CA 92646
Tel: (909) 962-0037 Fax: (909) 962-0403
Email: email@geoscience-water.com

TABLES

GEOSCIENCE Support Services, Inc.

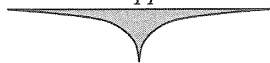


Table 1

**Summary of Annual Precipitation
 Big Bear Lake Dam Weather Station**

Year	Annual Precipitation
	[inches]
1950	20.4
1951	39.2
1952	51.5
1953	13.3
1954	47.3
1955	30.3
1956	22.1
1957	49.9
1958	43.9
1959	31.3
1960	28.4
1961	18.6
1962	37.6
1963	32.0
1964	28.5
1965	64.1
1966	35.1
1967	44.6
1968	17.0
1969	85.0
1970	32.5
1971	37.2
1972	15.5
1973	36.1
1974	33.1
1975	23.2
1976	31.9
1977	32.1
1978	59.8
1979	34.9
1980	61.3
1981	16.7
1982	34.4
1983	56.9
1984	18.0

Table 1

**Summary of Annual Precipitation
 Big Bear Lake Dam Weather Station**

Year	Annual Precipitation
	[inches]
1985	16.8
1986	33.0
1987	29.3
1988	24.2
1989	14.1
1990	17.0
1991	38.5
1992	45.1
1993	73.8
1994	31.6
1995	46.9
1996	40.5
1997	26.9
1998	46.9
1999	13.2
2000	24.7
2001	9.2
2002	38.1
AVERAGE	34.6

Source: San Bernardino County Flood Control District.

**Summary of Annual Evaporation Data
 Big Bear City Community Services District Weather Station**

Year	Annual Pan Evaporation
	[inches]
1993	39.0
1994	44.6
1995	44.6
1996	37.1
1997	46.6
1998	NA
1999	NA
2000	NA
2001	NA
2002	NA
AVERAGE	42.4

Source: San Bernardino County Flood Control District.
 NA = Data not available

City of Big Bear Lake Department of Water and Power
 Focused Geohydrologic Evaluation of the Maximum Perennial Yield
 of the North Shore and Grout Creek Hydrologic Subunit Tributary Subareas

HSPF Watershed Model Input Parameters

Name	Definition	Units	Range of Values					
			Typical			Possible		
			MINIMUM	MAXIMUM	AVERAGE	MINIMUM	MAXIMUM	AVERAGE
LZSN	Lower Zone Nominal Soil Moisture Storage	inches	3.0	8.0	5.5	2.0	15.0	8.5
INFILT	Index to Infiltration Capacity	in/hr	0.01	0.25	0.13	0.001	0.50	0.2505
LSUR	Length of overland flow	feet	200	500	350	100	700	400
KVARY	Variable ground water recession	1/inches	0.0	3.0	1.5	0.0	5.0	2.5
AGWRC	Base ground water recession	none	0.92	0.99	0.955	0.85	0.999	0.9245
PETMAX	Temperature below which evapotranspiration is reduced	deg. F	35.0	45.0	40	32.0	48.0	40
PETMIN	Temperature below which evapotranspiration is set to zero	deg. F	35.0	35.0	35	30.0	40.0	35
INFEXP	Exponent in infiltration equation	none	2.0	2.0	2	1.0	3.0	2
INFILD	Ratio of maximum/mean infiltration capacities	none	2.0	2.0	2	1.0	3.0	2
DEEPPFR	Fraction of ground water inflow to deep recharge	none	0.0	0.20	0.1	0.0	0.50	0.25
BASETP	Fraction of remaining evapotranspiration from baseflow	none	0.0	0.05	0.025	0.0	0.20	0.1
AGWETP	Fraction of remaining evapotranspiration from active ground water	none	0.0	0.05	0.025	0.0	0.20	0.1
CEPSC	Interception storage capacity	inches	0.03	0.20	0.115	0.01	0.40	0.205
UZSN	Upper zone nominal soil moisture storage	inches	0.10	1.0	0.55	0.05	2.0	1.025
NSUR	Manning's n (roughness) for overland flow	none	0.15	0.35	0.25	0.05	0.50	0.275
INTFW	Interflow inflow parameter	none	1.0	3.0	2	1.0	10.0	5.5
IRC	Interflow recession parameter	none	0.5	0.7	0.6	0.3	0.85	0.575
LZETP	Lower zone evapotranspiration parameter	none	0.2	0.7	0.45	0.1	0.9	0.5

Source: Environmental Protection Agency (2000)

Note: Average values of EPA's typical ranges and possible ranges were used for North Shore and Grout Creek Tributary Subareas watershed models.

Table 3

**North Shore Hydrologic Subunit
 Annual Production**

	City of Big Bear Lake Department of Water and Power Wells				
	Division Well No.6	Division Well No.7	RV Park No.1	RV Park No.2	TOTAL
	[acre-ft]	[acre-ft]	[acre-ft]	[acre-ft]	[acre-ft]
1976	41.0	-	-	-	41.0
1977	380.0	-	-	-	380.0
1978	276.0	-	-	-	276.0
1979	298.0	-	-	-	298.0
1980	316.0	-	-	-	316.0
1981	380.0	-	-	-	380.0
1982	357.0	-	-	-	357.0
1983	426.0	-	-	-	426.0
1984	293.0	-	-	-	293.0
1985	234.0	-	-	-	234.0
1986	207.0	-	-	-	207.0
1987	-	-	-	-	-
1988	-	-	-	-	-
1989	43.6	52.5	-	-	96.1
1990	129.0	109.4	-	-	238.5
1991	21.3	203.5	-	-	224.8
1992	15.3	196.8	-	-	212.0
1993	21.6	232.6	6.2	1.1	261.4
1994	74.3	200.2	4.2	5.1	283.9
1995	45.5	130.2	4.8	8.9	189.4
1996	98.4	125.0	5.9	9.1	238.4
1997	144.7	171.5	7.0	8.8	332.1
1998	31.6	133.1	9.0	3.3	176.9
1999	80.5	184.8	12.7	4.5	282.6
2000	105.6	188.3	11.0	5.4	310.4
2001	145.6	216.9	12.0	6.1	380.6
2002	173.8	170.8	11.0	6.2	361.8
Average*	92.2	175.3	8.4	5.8	281.7

Source of data: Boyle Engineering (1987).

City of Big Bear Lake Department of Water and Power (2003).

* Average for 1993 through 2002

Summary of Watershed Model Results
 North Shore Tributary Subareas

[1] Tributary Subarea	[2] Area [acres]	[3] Annual Precipitation [inches]	[4] Average Ground Water Recharge Typical EPA Parameter Range [acre-ft/yr]	[5] Annual Average Ground Water Recharge Possible EPA Parameter Range [acre-ft/yr]	[6] Annual Ground Water Recharge [acre-ft/yr]
A	247	27.87	14	44	29
B	720	25.45	36	110	73
C	828	23.01	37	107	72
D	558	21.45	22	63	43
E	392	20.01	15	39	27
F	814	18.27	23	66	44
Total	3,559	-	147	429	288

[1] North Shore Tributary Subarea within the North Shore Hydrologic Subunit (see Figure 5).

[2] Area of North Shore Tributary Subarea in the North Shore Hydrologic Subunit.

[3] Average annual precipitation based on period of record from 1870 to 1970. (San Bernardino County Flood Control District).

[4] Maximum annual perennial yield based on EPA's HSPF Watershed Model used with the average of suggested typical parameter range where estimation of the model input parameter was not possible (see Table 3).

[5] Maximum annual perennial yield based on EPA's HSPF Watershed Model used with the average of suggested possible parameter range where estimation of the model input parameter was not possible (see Table 3).

[6] Average of EPA's Typical and Possible Parameter Ranges; $[6] = ([4] + [5]) / 2$.

Table 5

**Ground Water Recharge as Percent Infiltration of Weighted Average Annual Precipitation
 North Shore Tributary Subareas**

[1] Tributary Subarea	[2] Area (acres)	[3] Annual Precipitation (inches)	[4] Annual Ground Water Recharge at 3% of Annual Precipitation (acre-ft)	[5] Annual Ground Water Recharge at 5% of Annual Precipitation (acre-ft)	[6] Annual Ground Water Recharge at 7% of Annual Precipitation (acre-ft)
A	247	27.9	17	29	40
B	720	25.5	46	76	107
C	828	23.0	48	79	111
D	558	21.5	30	50	70
E	392	20.0	20	33	46
F	814	18.3	37	62	87
Total	3,559	-	197	329	461

[1] North Shore Tributary Subarea within the North Shore Hydrologic Subunit (see Figure 5).

[2] Area of North Shore Tributary Subarea in the North Shore Hydrologic Subunit.

[3] Average annual precipitation based on period of record from 1870 to 1970. (San Bernardino County Flood Control District).

[4] Annual Ground Water Recharge Based on Average Precipitation for North Shore Tributary Subareas; $0.03 * [2] * [3] / 12$.

[5] Annual Ground Water Recharge Based on Average Precipitation for North Shore Tributary Subareas; $0.05 * [2] * [3] / 12$.

[6] Annual Ground Water Recharge Based on Average Precipitation North Shore Tributary Subareas; $0.07 * [2] * [3] / 12$.

Table 6

City of Big Bear Lake Department of Water and Power
 Focused Geohydrologic Evaluation of the Maximum Perennial Yield
 of the North Shore and Grout Creek Hydrologic Subunit Tributary Subareas

Grout Creek Hydrologic Subunit
 Annual Production

City of Big Bear Lake Department of Water and Power Wells												
	Barbara Lee Lane Well No.1 [acre-ft]	Northshore Well No.1 [acre-ft]	Northshore Well No.2 [acre-ft]	Northshore Well No.3 [acre-ft]	Cedar Dell Slant B [acre-ft]	Cedar Dell Slant C [acre-ft]	Cedar Dell Slant D [acre-ft]	Cedar Dell Slant #2 [acre-ft]	Cedar Spring [acre-ft]	TOTAL [acre-ft]		
1980	-	66.0	7.1	19.0	27.5	27.5	-	-	49.1	196.1		
1981	-	128.9	4.0	18.7	16.6	16.6	-	-	41.1	225.8		
1982	-	100.0	2.1	19.0	12.4	12.4	-	-	38.0	184.1		
1983	-	132.9	2.1	15.0	17.0	17.0	-	-	45.1	229.2		
1984	-	50.0	1.0	18.1	16.6	16.6	-	-	37.1	139.4		
1985	-	92.1	1.0	30.1	19.5	19.5	-	-	27.0	189.1		
1986	-	63.8	0.9	18.1	19.5	19.5	-	-	19.0	140.8		
1987	-	-	-	-	-	-	-	-	-	-		
1988	-	-	-	-	-	-	-	-	-	-		
1989	5.2	63.2	1.4	3.9	5.2	5.2	-	5.17	0.0	89.2		
1990	3.1	106.6	2.4	6.3	9.0	9.0	-	9.01	0.0	145.4		
1991	0.0	89.4	1.8	6.0	10.5	10.5	-	10.50	5.5	134.2		
1992	0.0	82.5	0.9	8.1	6.9	6.9	-	6.94	20.8	133.1		
1993	0.0	68.8	0.1	9.8	21.6	21.6	-	21.62	38.6	182.2		
1994	0.0	64.4	0.0	12.6	14.7	14.7	-	14.69	30.9	152.0		
1995	0.0	40.7	0.0	8.6	17.2	17.2	-	17.25	43.2	144.3		
1996	0.0	66.3	0.0	9.3	11.5	11.5	-	11.51	27.4	137.5		
1997	0.0	71.7	0.0	9.1	9.5	9.5	-	9.50	19.8	129.2		
1998	0.0	63.8	0.0	6.6	5.7	5.7	-	5.69	32.5	119.9		
1999	0.0	68.2	0.0	5.3	14.1	14.1	-	14.14	20.1	136.0		
2000	0.0	63.4	0.0	5.5	0.0	20.1	-	20.10	17.9	127.1		
2001	0.0	68.1	0.0	7.9	0.0	0.0	-	35.1	14.9	126.0		
2002	0.0	80.3	0.0	10.5	0.0	0.0	-	23.3	10.6	124.7		
AVERAGE*	0.6	71.2	0.5	7.8	9.0	10.4	-	14.6	20.2	134.3		

Source of data: BBDWP, Boyle Engineering (1987).

City of Big Bear Lake Department of Water and Power (2003).

* Average for 1989 through 2002

Table 7

Summary of Watershed Model Results
 Grout Creek Tributary Subareas

[1] Tributary Subarea	[2] Area (acres)	[3] Annual Precipitation (inches)	[4] Average Ground Water Recharge Typical EPA Parameter Range (acre-ft/yr)	[5] Annual Average Ground Water Recharge Possible EPA Parameter Range (acre-ft/yr)	[6] Annual Ground Water Recharge (acre-ft/yr)
A	1,074	33.44	74	249	161
B	850	29.01	50	160	105
C	1,668	29.93	104	331	217
D	592	26.74	32	99	66
Total	4,184	-	260	839	549

- [1] Grout Creek Tributary Subarea within the Grout Creek Hydrologic Subunit (see Figure 7).
 [2] Area of Grout Creek Tributary Subarea in the Grout Creek Hydrologic Subunit.
 [3] Average annual precipitation based on period of record from 1870 to 1970. (San Bernardino County Flood Control District).
 [4] Maximum annual perennial yield based on EPA's HSPF Watershed Model used with the average of suggested typical parameter range where estimation of the model input parameter was not possible (see Table 3).
 [5] Maximum annual perennial yield based on EPA's HSPF Watershed Model used with the average of suggested possible parameter range where estimation of the model input parameter was not possible (see Table 3).
 [6] Average of EPA's Typical and Possible Parameter Ranges; $[6] = ([4] + [5]) / 2$.

Table 8

**Ground Water Recharge as Percent Infiltration of Weighted Average Annual Precipitation
 Grout Creek Tributary Subareas**

[1] Tributary Subarea	[2] Area (acres)	[3] Annual Precipitation (inches)	[4] Annual Ground Water Recharge at 3% of Annual Precipitation (acre-ft)	[5] Annual Ground Water Recharge at 5% of Annual Precipitation (acre-ft)	[6] Annual Ground Water Recharge at 7% of Annual Precipitation (acre-ft)
A	1,074	33.44	90	150	209
B	850	29.01	62	103	144
C	1,668	29.93	125	208	291
D	592	26.74	40	66	92
Total	4,184	-	316	526	737

[1] Grout Creek Tributary Subarea within the Grout Creek Hydrologic Subunit (see Figure 7).

[2] Area of Grout Creek Tributary Subarea in the Grout Creek Hydrologic Subunit.

[3] Average annual precipitation based on period of record from 1870 to 1970. (San Bernardino County Flood Control District).

[4] Annual Ground Water Recharge Based on Average Precipitation for Grout Creek Tributary Subareas; $0.03 * [2] * [3] / 12$.

[5] Annual Ground Water Recharge Based on Average Precipitation for Grout Creek Tributary Subareas; $0.05 * [2] * [3] / 12$.

[6] Annual Ground Water Recharge Based on Average Precipitation for Grout Creek Tributary Subareas; $0.07 * [2] * [3] / 12$.

Table 9

APPENDIX A
North Shore and Grout Creek Hydrologic Subunits
Well Information Summary

GEOSCIENCE Support Services, Inc.



**City of Big Bear Lake Department of Water and Power
Focused Geohydrologic Evaluation of the Maximum Perennial Yield of the North Shore and Grout Creek Hydrologic Subunit Tributary Subareas**

Well Information Summary - North Shore and Grout Creek Hydrologic Subunits

State Well Number	Well Name	Owner	Type	Orienta- tion	Date Completed	Total Depth [feet]	Casing Diameter [inches]	Well Status	Perforated Interval [feet]	Surface Elevation [feet]	Driller Log	Yield [gpm]	Specific Capacity [gpm/ft]	Hydrologic Subunit
2N/01E-11N01	CSD Well #5	BBCCSD	Municipal	Vertical	1980	157	4	Inactive (1986)	65 - 145	6,766	Yes	165	NA	North Shore
2N/01E-15A	Boring #8	BBCCSD	Municipal	Vertical	1981	585	NA	Abandoned (1981)	NA	6,760	Yes	NA	Variable	North Shore
2N/01E-15C07	Division Well #7	BBDWP	Municipal	Vertical	1986	400	14	Active	50 - 400	6,744	Yes	625	NA	North Shore
2N/01E-15C10	Division Well #6	BBDWP	Municipal	Vertical	1973	400	0-50 = 30 0-400 = 14	Active	50 - 400	6,744	Yes	NA	NA	North Shore
2N/01E-18H01	RV Park #1	BBDWP	Municipal	Vertical	1966	183	8.625	Active	123 - 183	NA	Yes	NA	NA	North Shore
2N/01E-18H05	RV Park #2	BBDWP	Municipal	Vertical	1990	400	8	Active	100 - 400	NA	Yes	NA	NA	North Shore
2N/01W-11A01	Cedar Dell Slant D	BBDWP	Municipal	Horizontal	1964	204	NA	Abandoned	NA	NA	No	NA	NA	Grout Creek
2N/01W-11A02	Cedar Dell Slant C	BBDWP	Municipal	Horizontal	1959	149	NA	Active	NA	NA	No	NA	NA	Grout Creek
2N/01W-11B01S	Cedar Dell Slant #2	BBDWP	Municipal	Horizontal	1998	287	0-126 = 2 126-2870 = 1.75	Active	126 - 287	NA	Yes	75	NA	Grout Creek
2N/01W-11H01	Cedar Dell Slant B	BBDWP	Municipal	Horizontal	1959	122	NA	Inactive	NA	NA	No	NA	NA	Grout Creek
2N/01W-11R01	Northshore Well #1	BBDWP	Municipal	Vertical	1940	NA	NA	Active	NA	NA	No	NA	NA	Grout Creek
2N/01W-11R02	Northshore Well #2	BBDWP	Municipal	Vertical	1968	305	6.625	Inactive (1993)	NA	NA	No	NA	NA	Grout Creek
2N/01W-11R03	Northshore Well #3	BBDWP	Municipal	Vertical	1970	590	6.625	Active	NA	6,780	Yes	NA	NA	Grout Creek
2N/01W-12C01	Cedar Springs	BBDWP	Municipal	Vertical	1966	385	NA	Active	NA	NA	No	NA	NA	Grout Creek
2N/01W-12P03	Barbara Lee Lane Well 1	BBDWP	Municipal	Vertical	1986	172	10	Inactive (1990)	50 - 170	6,800	Yes	NA	NA	Grout Creek

Appendix A

Sources: City of Big Bear Lake Department of Water and Power
Big Bear City Community Services District
Department of Water Resources
San Bernardino County of Environmental Health Services

15.12 Correspondence

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MAR 05 2002



**BIG BEAR AREA
REGIONAL WASTEWATER AGENCY**
P.O. Box 517, 122 Palomino Drive, Big Bear City, CA 92314-0517
(909) 584-4018 • FAX (909) 585-4340
Email: info@bbarwa.org • Internet: www.bbarwa.org

February 28, 2002

San Bernardino County Land Use Services Department/Planning Division
385 N. Arrowhead Avenue
San Bernardino, CA 92415-0182

Attention: Tracy Creason

Subject: Notice of Preparation of Environmental Impact Report for RCK Properties,
Tentative Tract No. 16136

The Big Bear Area Regional Wastewater Agency (BBARWA) would like to reaffirm the following: BBARWA has a 10" sewer force main located in the shoulder along the south side of North Shore Drive that passes through Tentative Tract 16136. This force main conveys raw sewage from the County of San Bernardino CSA 53-B sewage collection system to the BBARWA Wastewater Treatment Plant. BBARWA is requesting that the following conditions be placed on this project to protect public health and safety:

1. The Conditional Use Permit should require that the project developer relocate the BBARWA 10" force main by installing new pipe so that it is aligned in the south shoulder along the new location of North Shore Drive. The 10" force main in the new North Shore Drive alignment will allow BBARWA access to maintain and repair the sewer force main. The force main should not pass through proper lots within the proposed tract.
2. Air release valves are located at high elevation points along the force main. Air that is vented from the system may cause odors due to hydrogen sulfide gas that develops seasonally due to low sewage flows and long detention times. BBARWA treats the upstream sewage to minimize odors; however, additional measures should be taken to control nuisance odors due to the close proximity to the tract. The Conditional Use Permit should require that the developer install air release valves and vaults at high elevation points on the new force main. Air release vaults should be large enough to enclose 55-gallon drum carbon filters to control odors.

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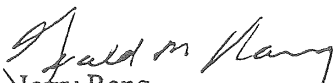
3. Require that the developer submit plans to BBARWA for approval, including the above items, to meet BBARWA requirements.

BBARWA would also like to comment on Section XVI, UTILITIES AND SERVICE SYSTEMS, SUBSTANTIATION a) on page 32 of the ENVIRONMENTAL CHECKLIST FORM. The last sentence reads, "Therefore, the only alternative to connecting to the public sewer system is an on-site wastewater treatment plant..." If the developer should choose to pursue this alternative, you and the developer should be aware that BBARWA has a Joint Powers Agreement and Operating Agreements with its three member agencies (Collecting Agencies), the City of Big Bear Lake, the Big Bear City Community Services District and the County of San Bernardino on behalf of County Service Area 53-B. Operating Agreement #1, Section 3.05, Other Treatment Plant Works, puts restrictions on the construction and operation of wastewater treatment works by the Collecting Agencies within Big Bear Valley. The section reads, "...none of the Collecting Agencies shall construct, install, acquire or operate any plant, enterprise, works or facilities, of any nature whatsoever for the treatment or disposal of any sewage or wastewater from any area whether within or without its service area, without the consent of BBARWA; nor shall any of the Collecting Agencies contract with any agency other than BBARWA for such treatment and disposal. During the term of this agreement all sewage and wastewater collected by the sewage collection system of each of the Collecting Agencies shall be transported and delivered to the Regional System for treatment and disposal therein."

Please contact me if you have any questions.

Sincerely,

BIG BEAR AREA REGIONAL
WASTEWATER AGENCY


Jerry Rang
Plant Superintendent

C: Wilson So, So and Associates



So & Associates Engineers Inc.

Final -
San Bernardino
Rancho
County

16209 KAMANA RD., SUITE 100 • P.O. BOX 1712 • APPLE VALLEY, CA 92307 • PHONE (760) 242-2365 FAX (760) 242-3083

March 13, 2002

137.0020-18

City of Big Bear Lake
Department of Water & Power
PO BOX 1929
Big Bear Lake, CA 92315-1929

Attention: Ms. Dottie Saville
General Manager

Reference: Water Feasibility Study for Tentative Tract 16136 (APN# 0304-091-12,13 and 0304-082-04, Moon Camp Project)

Dear Ms. Saville:

In response to City of Big Bear Lake Department of Water and Power (DWP) request and authorization, our staff has completed a system review and hydraulic analysis to prepare the water feasibility study for Tentative Tract 16136. We are pleased to submit this Final Report (DRAFT) for your review and approval.

A. PROJECT DESCRIPTION

The proposed project is a housing development located in the Northeast 1/4 of Section 13, Township 2 North and Range 1 West. The proposed project will consist of 92 single family housing lots as shown in Figure 1-B. Each residential lot will be considered as one equivalent dwelling unit (EDU). The average day demand (ADD) and maximum day demand (MDD), based on the number of EDUs is estimated to assess the impact to the existing water system.

Water Demand: Using information from the water production and water sales, the average day water demand per EDU is approximately 450 gallons per day per EDU (gpd/EDU) for the Fawnskin area. The max-day demand as considered takes into consideration that water usage occurs over an 8 to 10 hour period each day.

$$\begin{aligned}\text{Average day demand (ADD)} &= 92 \text{ EDU} \times 450 \text{ gpd/EDU} \\ &= 41,400 \text{ gpd} \\ \text{Maximum day demand (MDD)} &= 2.5 \times \text{ADD} / 1,440 \text{ minutes per day} \\ &= 103,500 \text{ gpd (72.0 gallons per minute)}\end{aligned}$$



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Fire Flow Requirements: The existing water distribution system was originally designed for about 750 gpm fire flow for two hours. The current requirement per the County Fire Department for the Fawskin area is between 1,000 gpm and 1,500 gpm depending on the building square footage. The fire flow may be further increased to 1,750 gpm in the future. As such, the water distribution system was analyzed to handle the maximum day demand of the proposed development plus fire flow up to 1,500 gpm.

Water Supply and Storage Requirements: The State Health Department requires storage to account for one peak day usage. The DWP typically experiences one peak day during a summer holiday when tourists and part-time residents become full-time users. The coefficient of 450 gpd/EDU and corresponding max-day demand is representative of that day and is the basis for calculating the water supply and storage required for the proposed project as presented in prior discussions and shown below:

Domestic water supply requirement (Max. Day)	= 72.0	gallons per minute
Operational Storage = (0.3 x MDD)	= 31,050	gallons
Emergency Storage = (1.0 x MDD)	= 103,500	gallons
Subtotal (without fire storage)	= 134,550	gallons
Fire Storage (1,500 gpm x 2 hours)	= 180,000	gallons

Based on proposed project development requirements (at MDD), two new well(s) will be required to provide a minimum of 72.0 gallons per minute. Developer will be required to deposit funds with DWP for new well construction unless a proven source of supply is provided by the developer at locations satisfactory to DWP and not exceeding sub-basin safe-yields. It is our understanding that the developer is proposing to drill/equip two wells to DWP standards and dedicate these production wells to the Department. Further, within the proposed tract, no individual private irrigation wells will be permitted.

B. WATER DISTRIBUTION SYSTEM REVIEW

The proposed tract is located near the southeast side of Fawnskin which receives water from Cline Miller Reservoir based on the computer simulations. Figure 1-A attached shows the existing distribution piping system near the proposed development and the recommended extension pipeline layout. Referencing the hydraulic grade line of 6,957 feet elevation at Cline Miller Reservoir and the approximate ground elevation at project site from 6,780 to 6,800 feet, the minimum static pressure at the proposed parcel should be around 68 psi.

Under maximum day demands plus residential fire flow of up to 1,500 gpm, the minimum residual pressure of 20 psi can be met, based on the existing hydraulic pipeline model. However, the existing



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Cline-Miller reservoir is an old 100,000 gallon concrete reservoir which will not be sufficient to serve the proposed project. The existing site has limited room for a new tank without demolishing the old tank and/or securing additional property. Therefore, we are recommending that the old concrete reservoir be replaced with a new 300,000 to 400,000 gallon storage reservoir. The developer will be required to advance funds towards construction of the new reservoir and 12-inch transmission pipeline.

C. ESTIMATED COST OF SYSTEM IMPROVEMENTS

On-Site Facilities: The owner or developer of Tentative Tract 16136 will be entirely responsible for all costs of internal facilities. On site distribution pipeline must be 8-inches diameter minimum. All site facilities (plumbing, piping, etc) must also meet the requirements of CBBL-DWP, and San Bernardino County Building & Safety Department.

Off-site Facilities: The property owner or developer is responsible for advancing funds towards the construction of a new reservoir (300,000 gallons minimum) at Cline-Miller and the associated 12-inch pipeline. The estimated probable project costs are as follows:

- Construction of a 300,000 gallon (min.) replacement reservoir = \$120,000 *
 - Construction of about 2,780 lineal feet of 12-inch pipeline = \$250,000
 - Allowance for project contingency, engineering, and administration = \$111,100
 - Estimated total probable project cost = \$481,100.
- *DWP may participate to make it a 400,000 gallon tank.

Water Supply Source: As discussed earlier, the project developer is in the process of drilling/equipping two wells to meet the project's max-day demand.

Connection Fee: The proposed project is required to pay the DWP connection fee (currently \$4,086/EDU) in order to mitigate the project's impact on the existing water system. Based on the estimated 92 EDUs referenced in this report, the total project connection fee is estimated as follows:

$$92 \text{ EDU's} \times \$4,086/\text{EDU} = \$375,912.$$

Because the project developer is proposing to drill/equip wells to DWP standards, and will be required to advance funds towards constructing a new reservoir and off-site pipeline, waiver for components of the normal connection fee (source, storage, transmission) discussed above should be discussed with DWP. Any other component of the above \$4,086/EDU connection fee will be paid when the developer applies for connection and water service to the DWP system. Additional fees such as plan check, inspection, and monthly user fees are determined by the DWP at the time of application for service.



So & Associates Engineers Inc.

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(760) 242-2365 • FAX (760) 242-3083

D. SUMMARY

The proposed project (Tentative Tract 16136) can be served by the Department's water system in the Fawnskin area provided that the project developer meets with the following requirements:

- Submit water plans (on-site) for review/approval by DWP to make sure that water mains do not conflict with the BBARWA 10-inch sewer force main (which will be relocated at developer's cost).
- Drill and equip the two supply wells to DWP standards and dedicate these facilities and water rights to DWP. Within the proposed tract, no individual private irrigation wells will be permitted.
- Advance funds towards constructing new reservoir and pipeline improvement at Cline-Miller (with an estimated project cost at \$481,100) and dedicate these facilities to the Department of Water & Power. If other parcels of land can be benefited by the off-site improvements based on review by DWP's engineer, a "reimbursement agreement" will be considered by DWP.
- Pay other component (except source, storage, and transmission) of the connection fee to DWP at the time of application for water service for specific subdivided parcels.
- Pay plan check, inspection, and water meter installation charges as discussed in this feasibility study report.
- DWP encourages low water usage landscape designs (turf limitation) to achieve water conservation. This may in turn lower the water supply demand. The developer is required to submit landscaping plans for review with DWP.

Information provided in this letter report is valid for a period of one year from the date of the Final Feasibility Report. The above water connection fee and estimated improvement costs will be subject to further inflationary adjustment depending on commencement and completion of the project. We trust that information in this report will be helpful to both the DWP and the project developer.

Very Truly Yours,

Wilson F. So., P.E.
Project Engineer

DEPARTMENT OF WATER AND POWER



MAR 22 2002

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March 20, 2002

Tracy Creason
Senior Associate Planner
Land User Services Department
County of San Bernardino
385 North Arrowhead Ave.
San Bernardino, CA 92415-0182

RE: TENTATIVE TRACT MAP 16136 (aka Moon Camp)

Dear Ms. Creason:

I have attached a copy of the "Water Feasibility Study" for the above-mentioned project. The feasibility study was prepared by our engineer and outlines what improvements need to be made in order for our Department to serve water to this project

Section VIII (b) of the initial study (Hydrology and Water Quality) noted "no impact". This should be marked as "Potentially Significant Impact". Section. VIII Substantiation (b) also notes that "the project does not include any on-site wells"; however, there are actually two wells on-site which must be drilled/equipped and productive (and dedicated to DWP) in order for us to serve this project.

Ground Water supplies are limited in Big Bear Valley; therefore, those issues should be addressed when preparing the EIR.

Please let me know if you have any additional questions.

Very truly yours,

Dottie Saville
General Manager

G/CorresAdmin/MoonCampInitStdy



BIG BEAR AREA REGIONAL WASTEWATER AGENCY

P.O. Box 517, 122 Palomino Drive, Big Bear City, CA 92314-0517

(909) 584-4018 • FAX (909) 585-4340

Email: info@bbarwa.org • Internet: www.bbarwa.org

June 18, 2002

Michael Harden
Environmental Analyst
RBF CONSULTING
14725 Alton Parkway
Irvine, CA 92618-2027

Subject: Moon Camp Environmental Impact Report

Dear Mr. Harden:

This is in response to your letter dated June 6, 2002 and the attached Sewer Service Questionnaire for the Moon Camp Residential Subdivision – Tentative Tract Map No. 16136 Environmental Impact Report. The following is a response to your questions:

1. The proposed project would connect to the County Service Area 53B (CSA 53B) sewer system as addressed in the CSA 53B Sewer Feasibility Study report prepared on September 27, 2002. Sewage from the CSA 53B system would be transported via the Big Bear Area Regional Wastewater Agency (BBARWA) North Shore Interceptor/Force Main system to the regional wastewater treatment plant.

At this time, we anticipate that there will be sufficient capacity for the proposed project. Our Consulting Engineer will verify the capacity by developing a computer model for capacity analysis of the North Shore Interceptor System starting July 1, 2002. The dry weather capacity of the wastewater treatment plant is 4.8 million gallons per day. The annual average influent flow to the treatment plant for 2001 was 2.1 million gallons per day.

2. Refer to the CSA 53B Sewer Feasibility Study report. Since the exact development housing floor plan was not available to the CSA 53B engineer performing the feasibility study, 92 equivalent dwelling units were assumed for the project. A unit wastewater flow coefficient of 215 gpd/EDU (average basis) was typically estimated for the CSA 53B area, with the total average daily flow at 19,780 gallons per day.
3. Implementation of the proposed project would present a significant increase in the service demand based on the estimated flow of 19,780 gallons per day, which represents an

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increase of approximately 25% of the current average daily dry weather flow of 80,000 gallons per day.

4. If CSA 53B should approve the project, BBARWA is capable of providing service through its interceptor sewer and regional treatment plant, provided that all required connection fees are paid in full.
5. I addressed other significant project impacts and requirements for the proposed Conditional Use Permit in my letter to Tracy Creason of the San Bernardino County Land Use Services Department/Planning Division, dated February 28, 2002 (enclosed). This included the relocation of the 10" force main and the installation of new air release vaults with odor control units to control potential nuisance odors. The project developer must submit plans for the above mitigation measures to BBARWA for approval. The project developer will be required to pay all costs related to the mitigation measures.

One other thought, is the potable water supply adequate for this project?

6. The project developer will be required to pay all applicable CSA 53B and BBARWA connection fees as determined by the San Bernardino County Special Districts. Standby fees may be required for unimproved parcels within 200 feet of the available sewer system. The project developer must pay all costs related to the mitigation measures in response No. 5 above.

If you have any questions or require additional information, please contact me at (909) 584-4032, ext. 1#.

Sincerely,
BIG BEAR AREA REGIONAL
WASTEWATER AGENCY


Jerry Rang
Plant Superintendent

Attachments

CC: Tom Sutton, CSA 53B
Dottie Saville, Dept. of Water & Power
Wilson So, So & Associates

BOARD OF TRUSTEES

Dr. Larry Poland
 Phil Hamilton
 Mrs. Kathleen Campbell-Kite
 Gary Thielholdt
 Dr. Ken Turney
 Mr. Ronald Peavy
 Superintendent

Bear Valley Unified School District

Educating for Success

BEAR VALLEY SCHOOLS

Big Bear Elementary
 Big Bear High School
 Big Bear Middle School
 Glen Martin Elementary
 North Shore Elementary
 Chautauqua High School
 Baldwin Lane Elementary

❖ P.O. Box 1529 ❖ 42271 Moonridge Road ❖ Big Bear Lake, CA 92315 ❖ (909) 866-4631 ❖ Fax (909) 866-2040 ❖

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JUN 20 2002

RBF CONSULTING

**SCHOOL FACILITIES QUESTIONNAIRE
 MOON CAMP RESIDENTIAL SUBDIVISION –
 TENTATIVE TRACT MAP NO. 16136
 ENVIRONMENTAL IMPACT REPORT
 RESPONSES**

1. Please list the name and address of all elementary, junior high and high schools that are available to serve the project site.

North Shore Elementary School
765 North Stanfield
P.O. Box 1887
Big Bear Lake, California 9215

Big Bear Middle School
41275 Big Bear Boulevard
P.O. Box 1607
Big Bear Lake, California 92315

Big Bear High School
351 North Maple Lane
P.O. Box 1708
Big Bear Lake, California 92315

2. What is the current enrollment of each school in the vicinity of the project, and what is the maximum capacity of each school?

	<u>Current Enrollment</u>	<u>Maximum Capacity</u>
North Shore Elementary School	614	588
Big Bear Middle School	575	408
Big Bear High School	921	697

3. What is the distance of each school to the project site?

North Shore Elementary School **3.0 miles**
Big Bear Middle School **4.5 miles**
Big Bear High School **8.0 miles**

**ENVIRONMENTAL IMPACT REPORT
RESPONSES**

June 18, 2002

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4. What are the average student generation rates per dwelling unit for the proposed project at each school level? Will new facilities be required?

The average student generation rate per dwelling unit as calculated in the most recent "Developer Fee Justification and Impact Analysis," October 2000, is .20 students per unit.

The three schools identified do not have adequate school housing capacity, and replacement facilities are required.

5. Do you anticipate that project implementation would result in the need for physical additions to your school district (*i.e.*, construction of new school facilities)?

Currently the District does need new school facilities to meet the demand of inadequately housed students.

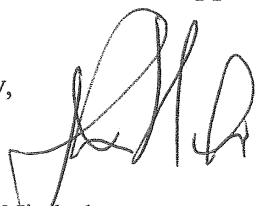
6. Is there any other relevant information regarding significant project impacts?

There is no other relevant information regarding project impacts.

7. Are there any assessment fees or other required or recommended mitigation measures for the project? If so, please explain.

Consistent with the Government Code, the District does collect Developer Fees for all residential and commercial projects within the school district. These fees would be calculated and applied at the time of the construction permit approval.

Sincerely,



Dr. John Niederkorn
Director of Business

JN/sc

G:\Reports\School Facilities Questionnaire Response 6-18-02



GARY PENROD, SHERIFF

RECEIVED

JUN 24 2002



June 28, 2002

RBF CONSULTING

Big Bear Station
P.O. Box 2803
Big Bear Lake, CA. 92315
(909) 866-0100

Michael Harden, Environmental Analyst
R.B.F. Consulting
P.O. Box 57057
Irvine, CA. 92619-7057

SUBJECT: Moon Camp Environmental Impact Report

Dear Mr. Harden:

In response to your request on the Environmental Impact Report, we have reviewed the tentative track map for the proposed 95 lot track #16136 (Moon Camp Residential subdivision).

The Big Bear Sheriff's Station is located at 477 Summit Blvd., Big Bear Lake, CA. 92315, six miles east of the proposed project site. The station is functionally organized into two distinct groups to serve the citizens of the Big Bear Valley. The station serves as host to the City of Big Bear Lake's contract law enforcement services, personnel, as well as staff to serve the unincorporated area. Additionally, a Type I jail facility is housed within the County building. We have nine patrol deputies, twenty-four coverage assigned to unincorporated area, one detective, and support personnel.

The Big Bear Station unincorporated population is estimated at 15,800. These numbers were taken from the population estimates from the State of California demographics cities and counties as of January 1, 2001. The average response time for emergency type calls, the average response time for emergency type calls is 6.97 minutes within the jurisdiction. Total average response time in the unincorporated areas 28.59 minutes. The response types and times may vary plus or minus depending on the number of calls for service received. We handled 9,028 calls for service in the unincorporated area of Big Bear Valley from January 1, 2000 to January 1, 2001. This information was collected from the Sheriff's Crime Analysis Unit.

The anticipated impact the Department may incur as the result of this type of development are the following: Increase response to burglar alarm calls, general criminal investigations, missing or lost persons, emergency medical calls, thefts from boats, and vandalism. Also, concerns for proper road signage, street lights, residence addresses posted, snow conditions, snow removal from residential roadways, coordination with the California Highway Patrol, and CALTRANS for road closures and/or traffic accidents, private roadways within the development or will the roadways be turned over to the county for responsibility and maintenance?

BRP

Michael Harden
June 18, 2002
Page 2

Speed limits posted per the California Vehicle Code, within the residential area, and accessibility through the gated entry.

The San Bernardino County Development Code will also address issue or concerns that will affect this type of proposed project.

Should you have any questions that we may help you with, please call me at the Big Bear Sheriff's Station, (909) 866-0100.

Sincerely,

A handwritten signature in cursive script, reading "Bobby R. Phillips".

Bobby R. Phillips, Captain
Big Bear Station Commander

DAD:BRP:mj

DEPARTMENT OF WATER AND POWER



June 28, 2002

Scott Magorien
RBF Consulting
14725 Alton Parkway
Irvine, CA 92618-2027

RE: MOON CAMP ENVIRONMENTAL IMPACT REPORT

Dear Mr. Scott Magorien:

This is in regards to water service for the proposed Moon Camp Subdivision, Tentative Tract # 16136. This particular project is located at the west boundary of the North Shore subunit, which is just east of the Grout Creek subunit that feeds the town known as Fawnskin. I will be sending Michael Harden, from your company, answers to the questions outlined in his June 6 letter.

In regards to Question # 6, that you requested information on, I offer the following:

6) In March of 2002, our consulting engineer completed a feasibility Study. The feasibility Study estimates that, upon build out, this tract would create a demand of an average of 41,400 gallons per day, and a maximum day demand of 103,500 gallons per day. The DWP's most recent Master Plan was completed in 1997, prior to this proposed development.

There are two existing wells located on this proposed site, one on the south side of the highway, and one on the north side. Combined, these wells produce approximately 150 gallons per minute. DWP can serve this project provided the two wells be fully equipped to pump 150 gallons per minute, and are turned over to the DWP to incorporate into our water system.

Big Bear Valley is currently entering its fourth year of drought; therefore, our hydrogeologist has recommended that a controlled pump test, with a duration of 24 hours be completed, in addition to a full Title 22 water quality analysis. These tests would need to be coordinated through our consultant, Dennis Williams of Geo Science.

I apologize for the delay in getting this information to you. If you have any additional questions, please contact me at (909) 866-5050.

Sincerely,

Dottie Saville
General Manager

G/CorresAdmin/MooncampERIRBF6-02