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DATA ASSESSMENT
&
WATER RIGHTS/RESOURCE ANALYSIS OF:

HYDROGRAPHIC REGION #14
DEATH VALLEY BASIN

PREPARED FOR:

S.A.I.C.

BY:

THIEL ENGINEERING CONSULTANTS
P. O. BOX 70458
RENO, NEVADA 89570-0458

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EXECUTIVE SUMMARY

The proposed Nuclear Waste Repository at Yucca Mountain is located north of hydrographic Basin #230 within the Jackass Flat portion of the Fortymile Canyon hydrographic basin (227A and 227B). This basin, is in part divided from the Amargosa Desert by an administrative divide and not by a defined hydrological or topographic divide. As a result, appropriations within one basin have an impact on appropriations in the other. The National Park Service has recognized this fact and has protested all recent applications to appropriate water within this area.

Thiel Engineering Consultants was retained by the Department of Energy to investigate the relative groundwater rights in the Death Valley Hydrographic Region (Region #14). The purposes of this analysis is to determine, on a regional basis, the appropriative status of all the underground water rights within seven of the nine basins that make up this region.

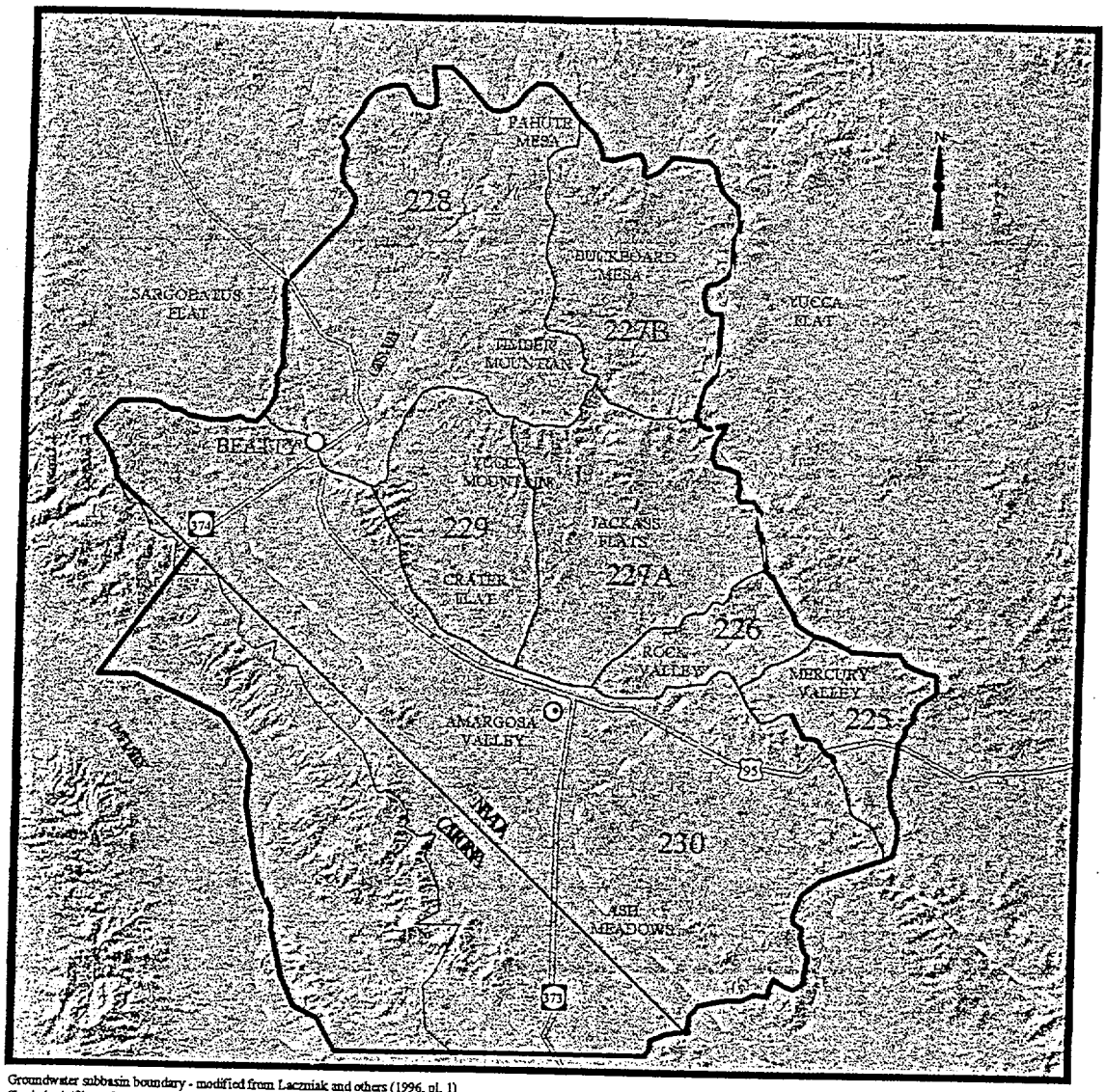
INTRODUCTION

The documentation provided in this report reviews the overall status of the Death Valley Hydrographic Region #14 and also reviews the status of seven of the nine contributing flow basins that make up this region and contribute to the Amargosa Desert. Basins 231 and 232, although technically a part of the Death Valley Hydrographic Region, are not adjacent to these seven basins, nor are they considered as a part of, or in direct contribution to, the flow regime that makes up this study area. The map on the next page illustrates the boundaries of the Death Valley Hydrographic Region along with each of the basins that make up this region. It also shows the repository boundaries as well as the well locations for the Yucca Mountain Project's water rights.

Perennial yield numbers were calculated from data obtained from the office of the State Engineer and from published reports by the USGS and others. The term "perennial yield" as used in this report, has been defined by Walker and Eakin (1963, p. 28) as "the maximum amount of water that can be withdrawn from the ground-water system for an indefinite period of time without causing a permanent depletion of the stored water or causing a deterioration in the quality of the water." This definition is used by the State Engineer's office.

Since the time when the reconnaissance reports were written analyzing the perennial yield of the hydrographic basins, the science and knowledge developed has changed the potential yields within these areas. More is known with regards to the hydrology and geo-hydrology of the contributing watersheds. At some point in the future, the amount of additional perennial yield available should be determined, but for the purposes of this investigation known data was used.

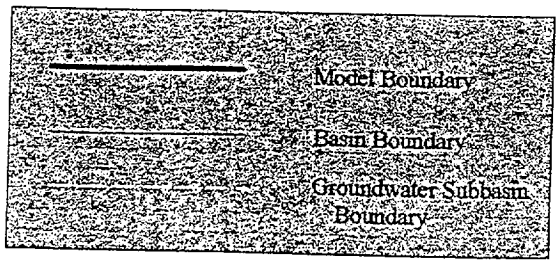
The perennial yield numbers were then compared to the amount of groundwater currently under appropriation in each basin as determined by the basin inventories. This comparison was made to determine if a particular basin was under or over appropriated. In addition, a review of appropriations vs. perennial yield was compared for the study area and reviewed for the basis of top-filing water rights appropriations for the repository use.



Groundwater subbasin boundary - modified from Laczniak and others (1996, pl. 1)
Shaded relief base from 1:250,000-scale Digital Elevation Model:

0 10 20 Miles

EXPLANATION



Death Valley Ground Water Region Map

BASIN INVENTORY AND YIELDS

The report provides data with regard to each of the following basins that are a part of the Death Valley Hydrographic Region (Region #14):

1. Basin 225 (Mercury Valley)
2. Basin 226 (Rock Valley)
3. Basin 227A (Fortymile Canyon - Jackass Flat)
4. Basin 227B (Fortymile Canyon - Buckboard Mesa)
5. Basin 228 (Oasis Valley)
6. Basin 229 (Crater Flats)
7. Basin 230 (Amargosa Desert)

Each basin listing is provided independently to show the perennial yield, committed groundwater resource and pending groundwater applications (both changes and new appropriations). Appropriation quantities are further broken down by the manner of use.

Multiple figures for the perennial yield of each basin is a result of the different source documentation cited. These include USGS/DWR Reconnaissance Reports 14 (Walker & Eakin, 1963) and 54 (Rush, 1970) as well as the State of Nevada Water Planning Report #3 and Flow Map (Nevada State Engineer's Office, 1971). Each perennial yield figure is listed along with the associated report reference, which is located immediately below the perennial yield figure. All figures are listed in acre-feet annually (AFA). One acre-foot is equivalent to 325, 581 gallons.

BASIN INVENTORY AND YIELDS

REGION 14
SUMMARY OF BASINS 225-230

YIELDS (AFA):--

PERENNIAL YIELD: REFERENCES 1 & 4. 27,780; REF. 2. 60,500; REF. 3. 61,000

REFERENCE: 1. USGS RECON. 14, 2. WATER PLANNING RPT3, 3 FLOW MAP RPT3
4. USGS RECON. 54.

COMMITTED GROUND WATER--

RESOURCES (AFA): 30,647.61 **DATE:** 1/9/99

IRRIGATION: 19,473.90 (CER); 2,062.67 (PER)
STOCK: 19.42 (CER)
MUNICIPAL, Q/M: 905.34 (CER); 1,340.59 (PER)
MINING: 951.43 (CER); 4,155.12 (PER.)
COMMERCIAL: 29.30 (CER); 231.11 (PER)
INDUSTRIAL: 498.81 (PER)
OTHER: 19.36 (CER); 346.77 (PER)

PENDING APPLICATIONS (GROUND WATER)-- **DATE:** 1/9/99

CHANGES (AFA): 3,197.62
NEW APPLICATIONS (AFA): 9,531.92

IRRIGATION: 3,197.62 (CHG); 1,800 (NEW)
STOCK: 0
MUNICIPAL, Q/M: 40 (CHG); 2,852.34 (NEW)
MINING: 66.8 (CHG); 4,440.72 (NEW)
COMMERCIAL: 333.08 (CHG); 8 (NEW)
INDUSTRIAL: 430.0 (NEW)
OTHER: 0.86 (NEW)

COMMENTS: PORTIONS OF THESE BASINS ARE IN THE NEVADA TEST SITE.
BASIN 230 IS SHARED IN COMMON WITH CALIFORNIA.

WATER BASIN INVENTORY INPUT TABLE

HYDROGRAPHIC AREA NUMBER: 225 **REGION:** 14
HYDROGRAPHIC AREA NAME: MERCURY VALLEY
SUB-AREA: NONE

COUNTIES: NYE
NEAREST COMMUNITIES: INDIAN SPRINGS

DESIGNATED (Y/N): NO
PREFERRED USE: NONE
PREVIOUS DENIALS BASED ON WATER AVAILABILITY: NONE

BASIN INVENTORY AND YIELDS

PUMPAGE INVENTORY (AFA): NONE

YIELDS (AFA):--

PERENNIAL YIELD: REFERENCE 1. 250; REF. 2. 8,000; REF. 3. 8,000

REFERENCE: 1. USGS RECON. 54, 2. WATER PLANNING RPT3, 3. FLOW MAP RPT3

COMMITTED GROUND WATER--
RESOURCES (AFA): 0 **DATE:** 1/9/99

IRRIGATION: 0
STOCK: 0
MUNICIPAL, Q/M: 0
MINING: 0
COMMERCIAL: 0
INDUSTRIAL: 0
OTHER: 0

PENDING APPLICATIONS (GROUND WATER)-- **DATE:** 1/9/99
CHANGES (AFA): 0
NEW APPLICATIONS (AFA): 0

IRRIGATION: 0
STOCK: 0
MUNICIPAL, Q/M: 0
MINING: 0
COMMERCIAL: 0
INDUSTRIAL: 0
OTHER: 0

COMMENTS: BASIN IS IN THE NEVADA TEST SITE (NTS).
TOTALS DO NOT INCLUDE WITHDRAWALS FROM NTS AND AIR FORCE WELLS, UNDER FEDERAL RESERVE RIGHTS.

WATER BASIN INVENTORY INPUT TABLE

HYDROGRAPHIC AREA NUMBER: 226 **REGION:** 14
HYDROGRAPHIC AREA NAME: ROCK VALLEY
SUB-AREA: NONE

COUNTIES: NYE
NEAREST COMMUNITIES: AMARGOSA VALLEY

DESIGNATED (Y/N): NO
PREFERRED USE: NONE
PREVIOUS DENIALS BASED ON WATER AVAILABILITY: NONE

BASIN INVENTORY AND YIELDS

PUMPAGE INVENTORY (AFA): NONE

YIELDS (AFA):--
PERENNIAL YIELD: REFERENCE 1. 30; REF. 2. 8,000; REF. 3. 8,000

REFERENCE: 1. USGS RECON. 54, 2. WATER PLANNING RPT3, 3. FLOW MAP RPT3

COMMITTED GROUND WATER--
RESOURCES (AFA): 0 **DATE:** 1/9/99

IRRIGATION: 0
STOCK: 0
MUNICIPAL, Q/M: 0
MINING: 0
COMMERCIAL: 0
INDUSTRIAL: 0
OTHER: 0

PENDING APPLICATIONS (GROUND WATER)-- **DATE:** 1/9/99
CHANGES (AFA): 0
NEW APPLICATIONS (AFA): 0

IRRIGATION: 0
STOCK: 0
MUNICIPAL, Q/M: 0
MINING: 0
COMMERCIAL: 0
INDUSTRIAL: 0
OTHER: 0

COMMENTS: BASIN IS IN THE NEVADA TEST SITE (NTS)
TOTALS DO NOT INCLUDE WITHDRAWALS FROM NTS AND AIR FORCE WELLS, UNDER FEDERAL RESERVE RIGHTS.

WATER BASIN INVENTORY INPUT TABLE

HYDROGRAPHIC AREA NUMBER: 227 **REGION:** 14
HYDROGRAPHIC AREA NAME: FORTY-MILE CANYON
SUB-AREA: 227A- JACKASS FLATS

COUNTIES: NYE
NEAREST COMMUNITIES: AMARGOSA VALLEY / LATHROP WELLS

DESIGNATED (Y/N): NO
PREFERRED USE: NONE
PREVIOUS DENIALS BASED ON WATER AVAILABILITY: NONE

BASIN INVENTORY AND YIELDS

PUMPAGE INVENTORY (AFA): NONE

YIELDS (AFA):--

PERENNIAL YIELD: REFERENCE 1. 300 (EASTERN 1/3), 580 (WESTERN 2/3); REF. 2. 4,000; REF. 3. 4,000

REFERENCE: 1. USGS RECON. 54, 2. WATER PLANNING RPT3, 3. FLOW MAP RPT3

COMMITTED GROUND WATER--
RESOURCES (AFA): 502.22 **DATE:** 1/9/99

IRRIGATION: 0
STOCK: 17.22 (CER)
MUNICIPAL, Q/M: 0
MINING: 0
COMMERCIAL: 24.98 (CER); 13.69 (PER)
INDUSTRIAL: 430.19 (PER)
OTHER: 16.14 (Domestic: CER)

PENDING APPLICATIONS (GROUND WATER)-- **DATE:** 1/9/99
CHANGES (AFA): 0
NEW APPLICATIONS (AFA): 430.0

IRRIGATION: 0
STOCK: 0
MUNICIPAL, Q/M: 0
MINING: 0
COMMERCIAL: 0
INDUSTRIAL: 430.0
OTHER: 0

COMMENTS: BASIN IS IN THE NEVADA TEST SITE
TOTALS DO NOT INCLUDE WITHDRAWALS FROM NTS AND AIR FORCE WELLS, UNDER FEDERAL RESERVE RIGHTS.

WATER BASIN INVENTORY INPUT TABLE

HYDROGRAPHIC AREA NUMBER: 227 **REGION:** 14
HYDROGRAPHIC AREA NAME: FORTY-MILE CANYON
SUB-AREA: 227B- BUCKBOARD MESA

COUNTIES: NYE
NEAREST COMMUNITIES: AMARGOSA VALLEY / LATHROP WELLS

DESIGNATED (Y/N): NO
PREFERRED USE: NONE
PREVIOUS DENIALS BASED ON WATER AVAILABILITY: NONE

BASIN INVENTORY AND YIELDS

PUMPAGE INVENTORY (AFA): NONE

YIELDS (AFA):--

PERENNIAL YIELD: REFERENCE 1. 1,400; REF. 2. 3,600; REF. 3. 4,000

REFERENCE: 1. USGS RECON. 54, 2. WATER PLANNING RPT3, 3. FLOW MAP RPT3

COMMITTED GROUND WATER--
RESOURCES (AFA): 7.24 **DATE:** 1/9/99

IRRIGATION: 0
STOCK: 0
MUNICIPAL, Q/M: 0
MINING: 0
COMMERCIAL: 0
INDUSTRIAL: 7.24 (PER)
OTHER: 0

PENDING APPLICATIONS (GROUND WATER)-- **DATE:** 1/9/99
CHANGES (AFA): 0
NEW APPLICATIONS (AFA): 0

IRRIGATION: 0
STOCK: 0
MUNICIPAL, Q/M: 0
MINING: 0
COMMERCIAL: 0
INDUSTRIAL: 0
OTHER: 0

COMMENTS: BASIN IS IN THE NEVADA TEST SITE.
TOTALS DO NOT INCLUDE WITHDRAWALS FROM NTS AND AIR FORCE WELLS, UNDER FEDERAL RESERVE RIGHTS.

WATER BASIN INVENTORY INPUT TABLE

HYDROGRAPHIC AREA NUMBER: 228 **REGION:** 14
HYDROGRAPHIC AREA NAME: OASIS VALLEY
SUB-AREA: NONE

COUNTIES: NYE
NEAREST COMMUNITIES: BEATTY

DESIGNATED (Y/N): YES
PREFERRED USE: NONE
PREVIOUS DENIALS BASED ON WATER AVAILABILITY: NONE

BASIN INVENTORY AND YIELDS

PUMPAGE INVENTORY (AFA): NONE

YIELDS (AFA):--

PERENNIAL YIELD: REFERENCE 1. 1,000; REF. 2. 2,000; REF. 3. 2,000

REFERENCE: 1. USGS RECON. 54, 2. WATER PLANNING RPT3, 3. FLOW MAP RPT3

COMMITTED GROUND WATER--
RESOURCES (AFA): 1,701.14 **DATE:** 1/9/99

IRRIGATION: 74.6 (CER.); 400 (PER.)
STOCK: 2.2 (CER.)
MUNICIPAL, Q/M: 850.78 (CER.); 312.07 (PER.)
MINING: 0.86 (CER.)
COMMERCIAL: 3.62 (CER.); 7.00 (PER.)
INDUSTRIAL: 0
OTHER: 50.01 (REC – SUPPLEMENTAL TO SPRING RIGHT)

PENDING APPLICATIONS (GROUND WATER)-- **DATE:** 1/9/99
CHANGES (AFA): 0
NEW APPLICATIONS (AFA): 200

IRRIGATION: 200 (NEW)
STOCK: 0
MUNICIPAL, Q/M: 0
MINING: 0
COMMERCIAL: 0
INDUSTRIAL: 0
OTHER: 0

COMMENTS: PORTION OF THIS BASIN IS IN THE NEVADA TEST SITE & NELLIS AFB BOMBING & GUNNERY RANGE
TOTALS DO NOT INCLUDE WITHDRAWALS FROM NTS AND AIR FORCE WELLS, UNDER FEDERAL RESERVE RIGHTS.

WATER BASIN INVENTORY INPUT TABLE

HYDROGRAPHIC AREA NUMBER: 229 **REGION:** 14
HYDROGRAPHIC AREA NAME: CRATER FLAT
SUB-AREA: NONE

COUNTIES: NYE
NEAREST COMMUNITIES: LATHROP WELLS, BEATTY

DESIGNATED (Y/N): NO
PREFERRED USE: NONE
PREVIOUS DENIALS BASED ON WATER AVAILABILITY: NONE

BASIN INVENTORY AND YIELDS

PUMPAGE INVENTORY (AFA): NONE

YIELDS (AFA):--
PERENNIAL YIELD: REFERENCE 1. 220; REF. 2. 900; REF. 3. 1,000

REFERENCE: 1. USGS RECON. 54, 2. WATER PLANNING RPT3, 3. FLOW MAP RPT3

COMMITTED GROUND WATER--
RESOURCES (AFA): 1,160.83 **DATE:** 1/9/99

IRRIGATION: 0
STOCK: 0
MUNICIPAL, Q/M: 0
MINING: 144.34 (CER); 955.12 (PER)
COMMERCIAL: 0
INDUSTRIAL: 61.38 (PER)
OTHER: 0

PENDING APPLICATIONS (GROUND WATER)-- **DATE:** 1/99/99
CHANGES (AFA): 0
NEW APPLICATIONS (AFA): 0

IRRIGATION: 0
STOCK: 0
MUNICIPAL, Q/M: 0
MINING: 0
COMMERCIAL: 0
INDUSTRIAL: 0
OTHER: 0

COMMENTS: BASIN IS IN THE NEVADA TEST SITE & NELLIS AFB BOMBING & GUNNERY RANGE
TOTALS DO NOT INCLUDE WITHDRAWALS FROM NTS AND AIR FORCE WELLS, UNDER FEDERAL RESERVE RIGHTS.

WATER BASIN INVENTORY INPUT TABLE

HYDROGRAPHIC AREA NUMBER: 230 **REGION:** 14
HYDROGRAPHIC AREA NAME: AMARGOSA DESERT
SUB-AREA: NONE

COUNTIES: NYE
NEAREST COMMUNITIES: LATHROP WELLS, BEATTY

DESIGNATED (Y/N): YES
PREFERRED USE: NONE
PREVIOUS DENIALS BASED ON WATER AVAILABILITY: YES, IRRIGATION

BASIN INVENTORY AND YIELDS

PUMPAGE INVENTORY (AFA): SEE CHART **DATE:** 1985-1997

YIELDS (AFA):--

PERENNIAL YIELD: REFERENCE 1, 24,000; REF. 2, 34,000; REF. 3, 34,000

REFERENCE: 1. USGS RECON. 14, 2. WATER PLANNING RPT3, 3 FLOW MAP RPT3

COMMITTED GROUND WATER--

RESOURCES (AFA): 27,276.18 **DATE:** 1/9/99
IRRIGATION: 19,399.30 (CER.); 1662.67 (PER.)
STOCK: 0
MUNICIPAL, Q/M: 54.55 (CER.); 1,028.52 (PER.)
MINING: 806.24 (CER.); 3,813.80 (PER.)
COMMERCIAL: 0.70 (CER.); 210.42 (PER.)
INDUSTRIAL: 0
OTHER: 3.22 (Domestic: CER); 296.76 (Wildlife: PER)

PENDING APPLICATIONS (GROUND WATER)-- **DATE:** 1/9/99

CHANGES (AFA): 3,637.50
NEW APPLICATIONS (AFA): 8,901.92

IRRIGATION: 3,197.62 (CHG); 1,600 (NEW)
STOCK: 0
MUNICIPAL, Q/M: 40 (CHG); 2,852.34 (NEW)
MINING: 66.8 (CHG); 4,440.72 (NEW)
COMMERCIAL: 333.08 (CHG); 8 (NEW)
INDUSTRIAL: 0
OTHER: 0 (CHG); 0.86 (Wildlife: NEW)

COMMENTS: BASIN IS SHARED IN COMMON WITH CALIFORNIA.

GROUNDWATER PUMPAGE INVENTORIES FOR BASIN 230

The State Engineer's office conducts annual pumpage inventories of underground water rights within selected groundwater basins in the State of Nevada. Within Region 14, the only pumpage inventories performed are within the Amargosa Desert (Basin 230). This is due primarily to the fact that the major water appropriations (irrigation) within the entire Region 14 area are located in this basin and also due in part to the proximity of the Ash Meadows Wildlife Refuge and the Devil's Hole. Pumpage inventories provide the State Engineer with a means to gauge the use and non-use of water rights in the basin. Currently, inventories for Basin 230 exist for the years 1985 through 1997

The pumpage inventory data is illustrated in a table showing the annual pumpage (in acre-feet) broken down by type of use (irrigation, industrial, commercial, quasi-municipal/municipal and mining. Mining use is further broken down by the major mining operators in the basin. For the years 1989 through 1997, these amounts include water pumped from the California side of the border by American Borate.

As the table shows, the annual groundwater pumpage from Basin 230 has ranged from a low of 3912 acre-feet in 1989 to a high of 15035 acre-feet in 1995. The average annual pumpage has been 9187.7 acre-feet, of which, 7175.9 acre-feet represents irrigation use. Although the number of years of data in limited, the trends indicate that since Amargosa Resource, Inc., filed their appropriations in 1992, increases in irrigation pumpage have occurred while other types of uses have remained stable. This may be in response to the State Engineer's forfeiture proceedings against those irrigation rights that have not been used for many years. Alternatively, this may be reflective of the fact that development and increased agricultural demands are more prevalent now than within the last ten years.

GROUNDWATER PUMAPGE INVENTORIES FOR BASIN 230 (cont.)

To further illustrate the trends associated with the use of groundwater in Basin 230, a bar chart showing the annual pumpage of all underground waters within Basin 230. Annual pumpage is divided into three categories: irrigation, mining and total pumpage by year. The average pumpage is represented by a dashed line across the chart.

Groundwater Pumpage Inventory (Amargosa Desert, Basin 230)

(Figures in acre-feet)

YEAR	IRRIGATION	IRRIGATION (NO PERMITS OR CERTIFICATES)	INDUSTRIAL	COMMERCIAL**	QUASI-MUNICIPAL AND DOMESTIC**	INDUSTRIAL-MINERAL VENTURES	AMERICAN BORATE	BARRICK* BULL FROG	TOTAL	REMARKS
85	5807	2665	950	20	230	---	---	---	9672	
86	5552.9	1000	---	10	125	284	266	---	7237.9	
87	4500	1200	---	10	125	298	10	---	6137	
88	2666	312	---	10	125	569	427	---	4109	
89	1266	300	---	10	125	525	888	807	3921	AB 662 CA
90	4603	350	---	10	125	383.6	503.09	1832.6	7807.39	AB 662 CA
91	4542	225	---	10	100	335	115	620	5947	AB 94 CA
92	5711	50	---	10	100	347.5	306	1639	8163.5	AB 207 CA
93	8558.8	150	---	10	100	495	512	1474	11300	AB 314 CA
94	8892	1085	---	10	100	340	377	1791	12595	AB 267CA
95	10839	1515	---	10	100	349	431	1791	15035	AB 192 CA
96	9263	1780	---	285***		272	747	1266	13613	AB 539 CA
97	9349	1105	---	942***		251	666	1589	13902	AB 539 CA

Maximum annual pumpage (1985-1997): **15035**

Minimum annual pumpage (1985-1997): **3921**

Average annual irrigation pumpage (1985-1997): **7175.9**

Average annual pumpage (1985-1997): **9187.7**

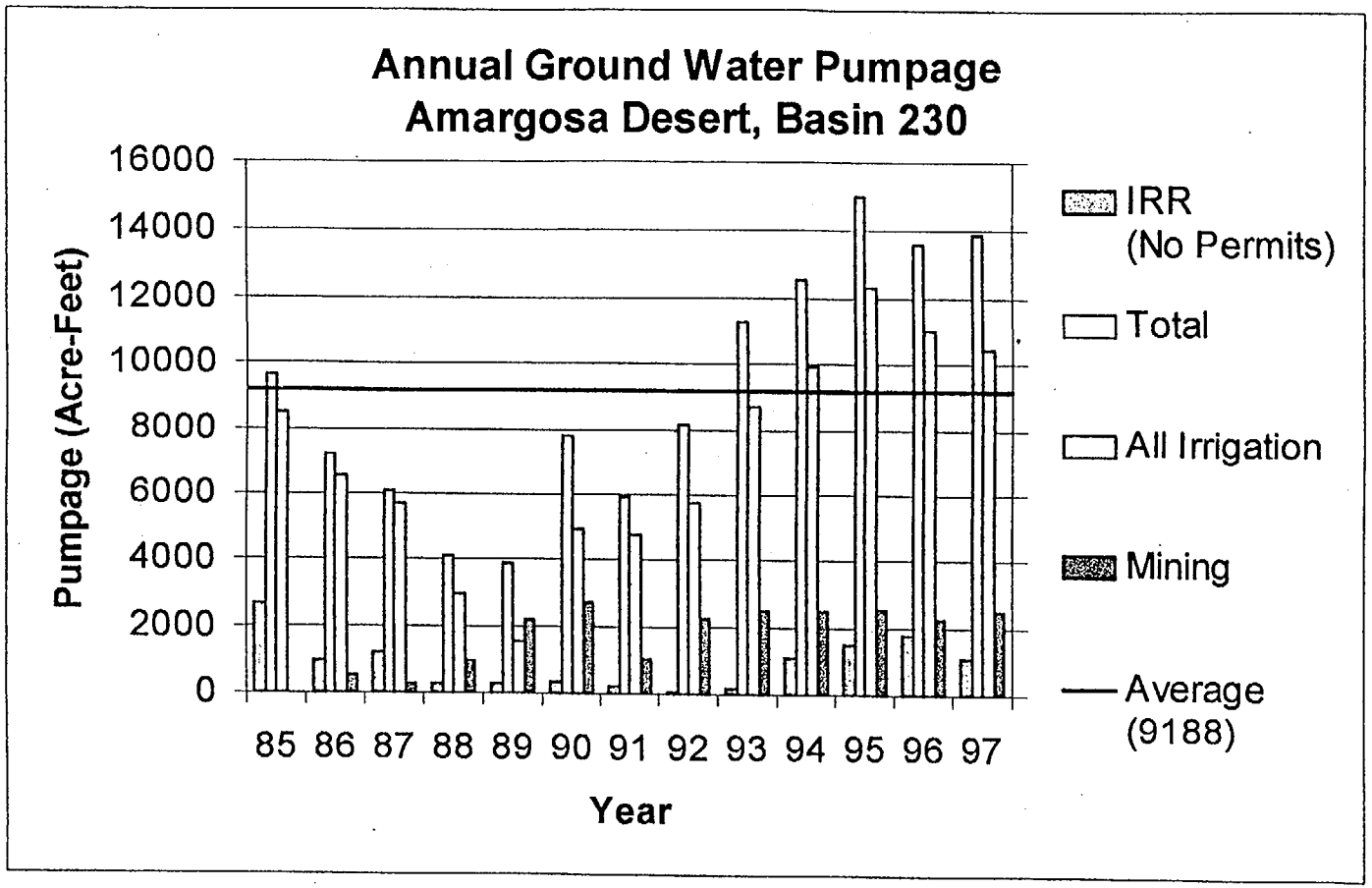
Estimated average recharge based on 30% of average annual irrigation pumpage (1985-1997): **2152.8**

Average pumpage without permits (1985-1997): **902.9**

* Formerly operated by St. Joe's Minerals.
AB---American Borate.

** Numbers are estimated.
CA---Pumped from California side included in the totals.

***Includes other pumpage.



Comparison of Groundwater Uses in Amargosa Desert

SUMMARY OF DOE YUCCA MOUNTAIN PROJECT WATER RIGHTS

A summary of the water rights associated with the DOE's Yucca Mountain Project (YMP) is provided with this report. This summary provides a status of the water right permits approved for site characterization. The quantity of water of each of the appropriations, the diversion rates, well I.D., proof filings and expiration dates, where applicable, are all included within this summary.

At the present, the total combined duty of the seven water right permits is 430.19 acre-feet. Of this amount 368.81 acre-feet is withdrawn from the Jackass Flat Groundwater Basin (Basin 227A) and 61.38 acre-feet is from the Crater Flat Groundwater Basin (Basin 229). These permits were all issued for Industrial use which is further described as consisting of water for road construction, dust suppression, tunnel and pad construction, testing, culinary and domestic uses.

With the exception of Permit 57375, all of these permits will expire in the year 2002. Three of the permits (58827, 58828 and 58829) are identified as being used on the C-Well portion of the project. These permits will expire on December 31, 2000.

Summary of DOE Yucca Mountain Project Water Rights

As of January, 1999

PERMIT	SOURCE WELL ID	DIVER-SION RATE (CFS)	DUTY (AFA)	USE	PROOF OF COMPLE-TION	PROOF OF BENEFICIAL USE DUE DATE	CHANGES
57373	J-12	0.000	0.00	IND	FILED 12/7/92	EXPIRES 4/9/2002	
57374	J-13	0.800	430.19	IND	FILED 12/7/92	EXPIRES 4/9/2002	
57375	VH-1	1.000	61.38	IND	FILED 12/7/92	4/9/98	45984
57376	J-13	0.200	94.83	IND	FILED 12/7/92	EXPIRES 4/9/2002	52338
58827	UE-25C#1 (C-WELL)	0.900	430.19	IND	EOT FILED 3/13/98	EXPIRES 12/31/2000	
58828	UE-25C#3 (C-WELL)	0.900	430.19	IND	FILED 3/8/96	EXPIRES 12/31/2000	
58829	UE-25C#2 (C-WELL)	0.900	430.19	IND	FILED 3/13/98	EXPIRES 12/31/2000	
64451T	SD-6	0.333	19.00	OTH	--	EXPIRES 1/11/2000	57373

NOTES:

1. The total combined duty under all these permits shall not exceed 430.19 acre-feet annually.

2. Point of diversion for Permit 57375 is in Crater Flat (Basin 229). The points of diversion for the remaining permits are in Jackass Flat (Basin 227A).

3. EOT stands for Extension of Time. This is a request filed with the State Engineer's office to extend the time for filing the Proof of Completion of Work.

4. Permits 57373 – 57373 and 58827 – 58829 were issued for industrial (IND) purposes. Temporary Permit 64451T was issued for other (OTH) purposes.

SUMMARY OF BASIN ABSTRACTS (GROUNDWATER)

Abstracts of the underground water rights within each of the studied basins were obtained from the State Engineer's office. At present, only five of the basins studied have water rights appropriated through the office of the State Engineer. Although there are wells constructed and operated under the auspices of the Nevada Test Site, U.S. Air Force, and other governmental agencies, these rights are not included in the balances maintained by the State Engineer. As such it is impossible to quantify the amounts used under these reserved rights. Thus these figures have not been included in this analysis.

Of the abstracts available, these were reviewed and corrections made to them as necessary to ensure the maximum accuracy possible. All existing and pending groundwater applications were listed on this report. To avoid over counting or "double-dipping" of water rights, those rights that are supplemental (i.e. multiple rights irrigate the same land or serve the same customer) were quantified and not added to the total appropriations. Pending applications that change existing rights (either the point of diversion or manner and place of use) were also included but these amounts were not added to the quantity under appropriation.

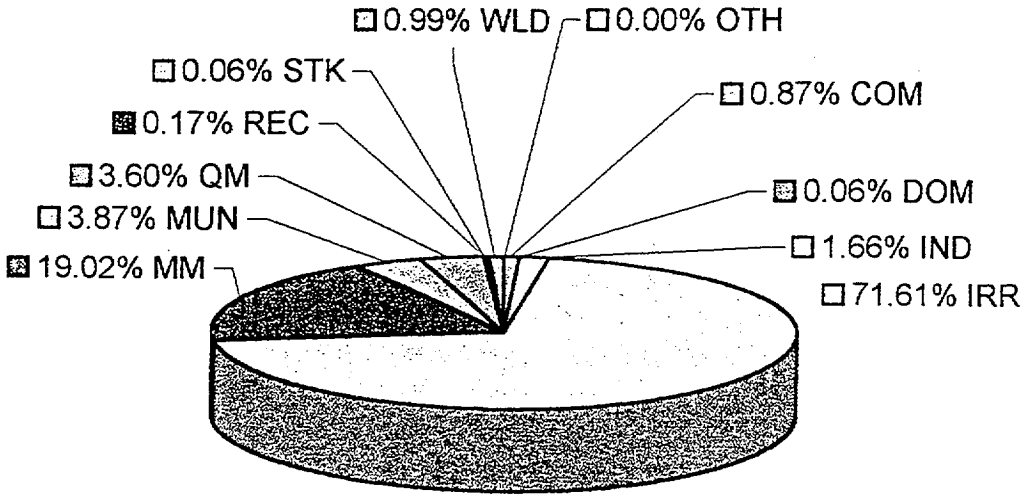
These abstracts were then finalized and the total quantity of water right appropriated for each basin determined. It is important to note that not only are existing appropriations given, but pending appropriations and changes to existing appropriations are also listed. These figures were then utilized in the Basin Inventory and Yields portion of this report to provide a comparison with the amount of perennial yield resources vs. the committed groundwater resources for each basin and within the entire region.

The appropriations for Basins 225 through 230 as determined by the abstracts are summarized on a table located at the beginning of this section.

SUMMARY OF APPROPRIATIONS - BASINS 225 - 230

MANNER OF USE	225	226	227A	227B	228	229	230	225-230
COMMERCIAL	0.00	0.00	38.67	0.00	10.62	0.00	211.12	260.41
DOMESTIC	0.00	0.00	16.14	0.00	0.00	0.00	3.22	19.36
INDUSTRIAL	0.00	0.00	430.19	7.24	0.00	61.38	0.00	498.81
IRRIGATION	0.00	0.00	0.00	0.00	474.60	0.00	21061.97	21536.57
MINING & MILLING	0.00	0.00	0.00	0.00	0.86	1099.45	4620.04	5720.35
MUNICIPAL	0.00	0.00	0.00	0.00	1162.85	0.00	0.00	1162.85
QUASI-MUNICIPAL	0.00	0.00	0.00	0.00	0.00	0.00	1083.07	1083.07
RECREATION	0.00	0.00	0.00	0.00	50.01	0.00	0.00	50.01
STOCK WATER	0.00	0.00	17.22	0.00	2.20	0.00	0.00	19.42
WILD LIFE	0.00	0.00	0.00	0.00	0.00	0.00	296.76	296.76
OTHER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALL	**0.00**	**0.00**	**502.22**	**7.24**	**1701.14**	**1160.83**	**27276.18**	**30647.61**

Committed Water Rights In Basins 225-230



BASIN 227A, JACKASS FLATS
Sort by Application Number

SOURCE: GROUNDWATER

DATE: 1/9/99

APP. NUMBER	BASE RIGHT	STATUS	FILING DATE	USE	DIV. (CFS)	CERTS	DUTY (AFA PERMITS	APPL.	REMARKS
11141		CER	07/19/1944	STK	0.008	5.65			
12729		CER	11/22/1948	STK	0.010	11.57			
18528		CER	01/19/1960	COM	0.034	24.98			
21593		CER	10/31/1963	DOM	0.022	16.14			
57373		PER	04/02/1992	IND	1.000		430.19		Total combined duty of Permits 57373
57374		PER	04/03/1992	IND	1.000		430.19 (S)		through 57376 & 58827 through 58829 is
57376	52338	PER	04/04/1992	IND	0.200		94.83 (S)		not to exceed 430.19 AF. annually
58827		PER	05/13/1993	IND	0.900		430.19 (S)		Permits 57373, 57374 & 57376 will
58828		PER	05/14/1993	IND	0.900		430.19 (S)		expire in 4/2002. Permits 58828, 58827,
58829		PER	05/15/1993	IND	0.900		430.19 (S)		58829 will expire on 12/31/2000
60705	18528	PER	12/14/1994	COM	0.019		13.69		
63263		RFP	07/22/1997	IND	1.000			430	Applications 63263 through 63267 were
63264		RFP	07/22/1997	IND	1.000			430 (S)	filed to replace the existing DOE permits
63265		RFP	07/22/1997	IND	0.900			430 (S)	that expire in the years 2000 & 2002.
63266		RFP	07/22/1997	IND	0.900			430 (S)	
63267		RFP	07/22/1997	IND	0.900			430 (S)	
64451T	57373	PER	09/17/1998	OTH	0.330		19 (S)		Supplemental to existing DOE rights
				TOTALS		58.34	443.88	430.00	

TOTAL APPROPRIATIONS (PERMITS AND CERTIFICATES) 502.22
TOTAL DOE APPROPRIATION IS 430.19 AFA

BASIN 227A, JACKASS FLATS

Sort by Manner of Use

SOURCE: GROUNDWATER

DATE: 1/9/99

APP. NUMBER	BASE RIGHT	STATUS	FILING DATE	USE	DIV. (CFS)	CERTS	DUTY (AFA PERMITS	APPL.	REMARKS
18528		CER	01/19/1960	COM	0.034	24.98			
60705	18528	PER	12/14/1994	COM	0.019		13.69		
					TOTAL	24.98	13.69		
21593		CER	10/31/1963	DOM	0.022	16.14			
					TOTAL	16.14			
57373		PER	04/02/1992	IND	1.000		430.19		Total combined duty of Permits 57373
57374		PER	04/03/1992	IND	1.000		430.19 (S)		through 57376 & 58827 through 58829 is
57376	52338	PER	04/04/1992	IND	0.200		94.83 (S)		not to exceed 430.19 AF. annually
58827		PER	05/13/1993	IND	0.900		430.19 (S)		Permits 57373, 57374 & 57376 will
58828		PER	05/14/1993	IND	0.900		430.19 (S)		expire in 4/2002. Permits 58828, 58827,
58829		PER	05/15/1993	IND	0.900		430.19 (S)		58829 will expire on 12/31/2000
63263		RFP	07/22/1997	IND	1.000			430	Applications 63263 through 63267 were
63264		RFP	07/22/1997	IND	1.000			430 (S)	filed to replace the existing DOE permits
63265		RFP	07/22/1997	IND	0.900			430 (S)	that expire in the years 2000 & 2002.
63266		RFP	07/22/1997	IND	0.900			430 (S)	
63267		RFP	07/22/1997	IND	0.900			430 (S)	
					TOTAL		430.19	430.00	
64451T	57373	PER	09/17/1998	OTH	0.330		19 (S)		Supplemental to existing DOE rights
					TOTAL		0		
11141		CER	07/19/1944	STK	0.008	5.65			
12729		CER	11/22/1948	STK	0.010	11.57			
					TOTAL	17.22			
					TOTALS	58.34	443.88	430.00	

TOTAL APPROPRIATIONS (CERTIFICATES AND PERMITS) 502.22

BASIN 228, OASIS VALLEY
Sort by Application Number

SOURCE: GROUNDWATER

DATE: 1/9/99

APP. NUMBER	BASE RIGHT	STATUS	FILING DATE	USE	DIV. (CFS)	CERT.	DUTY (AFA) PERMIT	APPL.	REMARKS
6725		CER	07/31/1922	STK	0.001	1.10			
9606		CER	07/04/1932	STK	0.002	1.10			
12075		CER	11/15/1947	IRR	0.070	20.40			
12489		CER	06/10/1948	IRR	0.220	54.20			
20890		CER	12/12/1969	MUN	0.170	123.04			Permits 20890, 22838,22839,38126, 52044,
22838		CER	11/04/1965	MUN	0.290	209.93			52045, and 57257 not to exceed 1,162.81 AFA
22839		CER	11/04/1965	MUN	0.523	378.60			District, with Permitted Duty of 1162.81 AFA
38126		CER	05/29/1979	MUN	0.450	139.21			
44236		CER	08/05/1981	M/M	0.090	0.86			
47342		CER	10/21/1983	COM	0.020	3.62			
52044		PER	04/27/1988	MUN	1.000		312.07		
52045		CER	04/27/1988	MUN	0.334	69.91 (S)			Supplemental (see Permit 20890, et al)
54224		PER	12/07/1989	REC	1.250		50.01		Supplemental to Permit 54223 (spring right)
57257		PER	03/03/1992	IRR	2.000		325.00 (S)		Supplemental (See permit 20890, et al)
61079		RFP	03/28/1995	IRR	0.450			200.00	
61704	42473	PER	11/21/1995	IRR	2.000		400.00		
62264		PER	06/25/1996	COM	0.200		5.00		
62558		PER	11/01/1996	COM	0.090		2.00		
				TOTALS		932.06	769.080	200.000	

TOTAL APPROPRIATIONS (PERMITS AND CERTIFICATES) 1,701.14

BASIN 228, OASIS VALLEY
Sort by Use

SOURCE: GROUNDWATER

DATE: 1/9/99

APP. NUMBER	BASE RIGHT	STATUS	FILING DATE	USE	DIV. (CFS)	CERT.	DUTY (AFA) PERMIT	APPL.	REMARKS
47342		CER	10/21/1983	COM	0.020	3.62			
62264		PER	06/25/1996	COM	0.200		5.00		
62558		PER	11/01/1996	COM	0.090		2.00		
					TOTAL	3.62	7.00		
12075		CER	11/15/1947	IRR	0.070	20.40			
12489		CER	06/10/1948	IRR	0.220	54.20			
57257		PER	03/03/1992	IRR	2.000		325.00 (S)		Supplemental (See permit 20890, et al)
61079		RFP	03/28/1995	IRR	0.450			200.00	
61704	42473	PER	11/21/1995	IRR	2.000		400.00		
					TOTAL	74.60	400.00	200.00	
44236		CER	08/05/1981	M/M	0.090	0.86			
					TOTAL	0.86			
20890		CER	12/12/1969	MUN	0.170	123.04			Permits 20890, 22838,22839,38126, 52044,
22838		CER	11/04/1965	MUN	0.290	209.93			52045, and 57257 not to exceed 1,162.81 AFA
22839		CER	11/04/1965	MUN	0.523	378.60			District, with Permitted Duty of 1162.81 AFA
38126		CER	05/29/1979	MUN	0.450	139.21			
52044		PER	04/27/1988	MUN	1.000		312.07		
52045		CER	04/27/1988	MUN	0.334	69.91 (S)			Supplemental (see Permit 20890, et al)
					TOTAL	850.78	312.07		
54224		PER	12/07/1989	REC	1.250		50.01		Supplemental to Permit 54223 (spring right)
					TOTAL		50.01		
6725		CER	07/31/1922	STK	0.001	1.10			
9606		CER	07/04/1932	STK	0.002	1.10			
					TOTAL	2.20			
					TOTALS	932.06	769.08	200.00	

TOTAL APPROPRIATIONS (PERMITS AND CERTIFICATES) 1,701.14

BASIN 229, CRATER FLAT
Sort by Application Number

SOURCE: GROUNDWATER

DATE: 1/9/99

APPL'N NUMBER	BASE RIGHT	STATUS	FILING DATE	USE	DIV. (CFS)	CERTS	DUTY (AFA) PERMITS	APPL.	REMARKS
48436	41447	PER	09/26/1984	M/M	0.593		429.67		
51555		CER	11/12/1987	M/M	0.245	8.07			
52347		PER	07/26/1988	M/M	1.000		153.45		
52847		CER	01/05/1989	M/M	0.691	136.26			
57375	45984	PER	04/02/1992	IND	1.000		61.38		
59124		PER	08/11/1993	M/M	0.450		10.00		
60985		PER	03/03/1995	M/M	0.500		362.00		Total combined duty of Permits 51555, 52847,
60986		PER	03/03/1995	M/M	0.500		362 (S)		60985 - 60991, 62375 not to exceed 645.7 AFA
60987		PER	03/03/1995	M/M	0.500		362 (S)		
60988		PER	03/03/1995	M/M	0.500		362 (S)		
60989		PER	03/03/1995	M/M	0.500		362 (S)		
60990		PER	03/03/1995	M/M	0.500		362 (S)		
60991		PER	03/03/1995	M/M	0.500		362 (S)		
62375	60992	PER	08/09/1996	M/M	0.500		362 (S)		
						144.33	1,016.50		

TOTAL APPROPRIATIONS (CERTIFCATES & PERMITS) 1,160.83

BASIN 229, CRATER FLAT
Sort by Use

SOURCE: GROUNDWATER

DATE: 1/9/99

APPL'N NUMBER	BASE RIGHT	STATUS	FILING DATE	USE	DIV. (CFS)	CERTS	DUTY (AFA) PERMITS	APPL.	REMARKS
57375	45984	PER	04/02/1992	IND	1.000		61.38		
					TOTAL		61.38		
48436	41447	PER	09/26/1984	M/M	0.593		429.67		
51555		CER	11/12/1987	M/M	0.245	8.07	"		
52347		PER	07/26/1988	M/M	1.000		153.45		
52847		CER	01/05/1989	M/M	0.691	136.26			
59124		PER	08/11/1993	M/M	0.450		10.00		
60985		PER	03/03/1995	M/M	0.500		362.00		Total combined duty of Permits 51555, 52847, 60985 - 60991, 62375 not to exceed 645.7 AFA
60986		PER	03/03/1995	M/M	0.500		362 (S)		
60987		PER	03/03/1995	M/M	0.500		362 (S)		
60988		PER	03/03/1995	M/M	0.500		362 (S)		
60989		PER	03/03/1995	M/M	0.500		362 (S)		
60990		PER	03/03/1995	M/M	0.500		362 (S)		
60991		PER	03/03/1995	M/M	0.500		362 (S)		
62375	60992	PER	08/09/1996	M/M	0.500		362 (S)		
					TOTAL	144.33	955.12		
					TOTALS	144.33	1016.5		

TOTAL APPROPRIATIONS (CERTIFCATES & PERMITS) 1,160.83

BASIN 230, AMARGOSA DESERT
Sort by Application Number

SOURCE: GROUNDWATER

DATE: 1/9/99

APP NUMBER	BASE RIGHT	STATUS	USE	FILING DATE	DIV. (CFS)	DUTY (AFA) CERT.	PERMIT	APPL.	REMARKS
13574		CER	DOM	12/19/1950	0.01	3.22			
14054		CER	IRR	02/18/1952	1.52	127.00			
14059		CER	IRD	02/20/1952	2.567	320.00			62.8 acres supplemental to Permit 27813
15410		CER	IRR	11/27/1953	2.5	800.00			
15702		CER	IRD	06/11/1954	1	175.00			
15881		CER	IRD	12/06/1954	0.845	253.1 (S)			Supplemental to Permit 49947
15893		CER	IRR	12/13/1954	3.5	603.00			Remaining Balance - chngd by Permit 62918
15929		CER	IRR	12/29/1954	2.228	231.00			Amount reflects non-supplemental Portion
16047		CER	IRR	02/07/1955		22.02			
16178		CER	IRD	03/08/1955	2.6	20.00			
16545		CER	IRD	06/02/1955	2.5	109.90			
16562		CER	IRD	06/13/1955	2.2	525.12			
17137		CER	IRR	01/03/1957		100.00			50 A/F reinstated on appeal
17241		CER	IRD	04/15/1957		790.00			Total Comb. Duty w/Permits 15929 & 29649 = 1421 AFA
17348		CER	IRR	08/08/1957	0.313	75.00			
17404		CER	IRR	10/02/1957	2.5	800.00			
17417		CER	IRR	10/14/1957	2	229.10			
17657A01		CER	IRR	09/09/1958	0.707	182.24			Remaining balance after change applications
17657A02		CER	IRR	09/09/1958	0.04	10.00			
17657A03		CER	IRR	09/09/1958	0.04	10.00			Total Combined Duty with Permit 26442
17694		CER	IRR	10/29/1958	2	95.00			See ruling #4496 dated 2/14/97
18222		CER	IRR	08/10/1959	5.4	1342.50			
18764		CER	IRR	04/28/1960	4.01	357.00			
18772		CER	IRR	04/29/1960	3.01	99.18			See ruling #4190, dated 3/8/96
19034		CER	IRR	07/18/1960	2.5	515.00			Total Combined Duty with Permit 21584
19197		CER	IRR	09/12/1960	3.442	74.62			Amount remaining - Under appeal.
19448		CER	IRD	01/16/1961	0.63	185.01			
19916	14076	CER	IRR	06/12/1961	2.5	800.00			
19917	14074	CER	IRR	06/12/1961	2.5	800.00			Total Combined Duty with Permit 22761
20162		CER	IRR	11/21/1961	0.57	120.00			See Ruling #4497, dated 2/14/97
20352	14147	CER	IRD	03/08/1962	3.5	1169.50			
20355		CER	IRR	03/09/1962	1.4	18.02			
20411		CER	IRD	04/16/1962	0.818	125.10			See Ruling #4498, dated 2/14/97
21584		CER	IRR	10/15/1963	1.51	515 (S)			Supplemental to Permit 19034
22140	14523	CER	IRR	07/21/1964	1.92	40.00			See Ruling 4349, dated 5/8/96
22141	14522	CER	IRR	07/22/1964	0.8	106.00			
22233		CER	IRR	08/30/1964	1	190.00			
22746	14066	CER	IRR	08/31/1965	2.5	800.00			
22761		CER	IRR	09/07/1965	0.28	202.65 (S)			Supplemental to Permit 19917
22941	17507	CER	QM	01/27/1966	0.25	0.68			

BASIN 230, AMARGOSA DESERT
Sort by Application Number

APP NUMBER	BASE RIGHT	STATUS	USE	FILING DATE	DIV. (CFS)	DUTY (AFA) CERT.	PERMIT	APPL.	REMARKS
23797	19217	CER	IRR	04/11/1967	1.35	400.00			
24585	21952	CER	IRR	07/17/1968	0.75	118.75			
24725	18880	CER	IRR	10/21/1968	2.7	777.45			
24729	19374	CER	IRR	10/23/1968	3.12	250.00			
24763	22556	CER	IRR	11/18/1968	0.59	93.30			
25099	19217	CER	IRR	06/09/1969	1.22	13.60			
25636	20039	CER	IRR	05/28/1970	1.3	94.04			
25742	19217	CER	IRR	08/06/1970	0.14	17.50			
25743	19217	CER	IRR	08/06/1970	0.14	17.50			
25744	19217	CER	IRR	08/06/1970	0.21	22.50			
26152		CER	IRR	06/02/1971	1	60.00			
26283	22274	CER	IRD	08/31/1971	2.2	680.25			
26442		CER	IRR	12/17/1971		2.5 (S)			Supplemental to Permit 18764
26673		CER	QM	04/19/1972	0.004	1.01(S)			Supplemental to Permit 40448.
26718	24763	CER	IRR	05/12/1972		18.9 (S)			Supplemental to Permit 29069
27812		CER	MM	10/04/1973		232.00			
27813	26632	CER	IRR	10/04/1973	1.08	628.00			
28062		PER	QM	02/05/1974			41.37		Total Combined Duty with Permit 45061
28777		CER	QM	10/07/1974	0.1	8.50			
28828	20162	CER	IRR	10/25/1974		65.70			
29069		CER	IRR	12/19/1974	0.24	30.90			Total Combined Duty with Permit 26718
29451		CER	MM	06/16/1975		5 (S)			Supplemental to Permit 27812
29452		CER	MM	06/16/1975		5 (S)			Supplemental to Permit 27812
29521		CER	IRR	07/01/1975	0.16	25.00			
29649		CER	IRR	09/17/1975	1.215	578.00			Portion supplemental to Permit 15929
30411		CER	IRR	07/22/1976	2.67	606.45			
31204		CER	IRR	03/21/1977	0.125	22.78			
31727		CER	IRR	05/16/1977	0.16	25.00			
32279		CER	COM	06/24/1977	0.1	0.61			
35592		PER	QM	07/05/1978	0.5		9.45		
36584	17657A04	CER	IRR	01/31/1979	0.04	10.00			
38127	33010	CER	IRR	05/10/1979	1.667	583.33			
38363	33010	CER	IRR	06/18/1979	1.666	583.35			
40448		PER	QM	02/04/1980	4		234.71		
40954	19197	CER	IRR	03/26/1980	0.178	47.69			
42171	15881	PER	IRR	08/25/1980	0.275		150.00		
43524	29650	CER	IRR	04/13/1981	1.454	628.00			
43873	38771	CER	IRR	06/11/1981	1.667	545.38			
44741		RFA	WLD	10/29/1981	0.005			0.86	
45061	28062	PER	QM	11/16/1981	1.13		172.63		Supplemental to Permit 28062
45162		CER	QM	12/29/1981	0.446	9.76			
45163		CER	QM	12/29/1981	0.446	9.76 (S)			Supplemental to Permit 45162
45360		RFP	MM	02/22/1982	0.357			258.50	

BASIN 230, AMARGOSA DESERT
Sort by Application Number

APP NUMBER	BASE RIGHT	STATUS	USE	FILING DATE	DIV. (CFS)	DUTY (AFA) CERT.	PERMIT	APPL.	REMARKS
45361		RFP	QM	02/22/1982	0.123			89.07	
45740		CER	QM	06/02/1982	0.02	3.38			
46218		CER	COM	10/13/1982	0.019	0.092			
46748	17657A01	CER	IRR	03/21/1983	0.16	33.68			
47205	38430	PER	QM	08/29/1983	0.2		36.99		
47223		PER	QM	09/01/1983	0.2		36.99 (S)		Supplemental to Permit 47205
47528		PER	COM	12/21/1983	0.5		10.83		
48477		RFA	QM	10/09/1984	0.12			86.86	
48478		RFA	MM	10/09/1984	0.36			258.13	
48479		CER	MM	10/09/1984	0.26	142.68			Total Combined Duty of Permits 47479- 47483
48480		CER	MM	10/09/1984	0.31	93.97			not to exceed 567.6 AFA
48481		CER	MM	10/09/1984	0.51	178.74			
48482		CER	MM	10/09/1984	0.3	82.49			"
48483		CER	MM	10/09/1984	0.27	76.36			
49220	16544	CER	IRR	07/24/1985	0.89	73.5			
49804		CER	QM	03/31/1986	0.01	0.12			
49885	15881	CER	IRR	05/20/1986	0.25	65			
49947	15881	CER	IRR	06/26/1986	1.75	281.9			
50385		CER	QM	12/01/1986	0.1	30.88			
51841		PER	MM	02/19/1988	4.46		3200.00		Total Combined Duty of Permits 51841-51848
51842		PER	MM	02/19/1988	0.89		645.23 (S)		not to exceed 3200 AFA
51843		PER	MM	02/19/1988	4.46		3200 (S)		
51844		PER	MM	02/19/1988	4.46		3200 (S)		
51845		PER	MM	02/19/1988	4.46		3200 (S)		
51846		PER	MM	02/19/1988	5.46		3200 (S)		
51847		PER	MM	02/19/1988	4.46		3200 (S)		
51848		PER	MM	02/19/1988	2.46		1572 (S)		
51879		PER	QM	03/01/1988	1		431.85		Supplemental to Permit 51879
51880		PER	QM	03/01/1988	1		431.85 (S)		
51915		PER	COM	03/11/1988	1		9.70		
52616	49317	PER	IRR	10/19/1988	0.205		150.00		
52663		RFA	QM	10/27/1988	0.25			68.72	
52887		RFP	MM	01/26/1989	1			724.09	
53009		RFP	QM	03/13/1989	0.026			18.48	
53181	28062	PER	QM	04/25/1989	0.08		57.91 (S)		Supplemental to Permit 53182
53182	45061	PER	QM	04/25/1989	0.65		99.28		Total Combined Duty with Permit 53181
53189	16562	PER	COM	04/27/1989	0.3		74.89		
53596	25552	PER	WLD	06/30/1989	2.137		296.76		
54271		CER	QM	12/22/1989	0.06	1.23			
55156	25099	CER	IRR	08/07/1990	0.24	25.00			
56781		RFA	QM	09/27/1991	0.2			7.67	
57304	15410	RFA	IRR	03/16/1992	2.5			800.00	
58268	51848	PER	MM	10/27/1992	2		1448 (S)		Supplemental to Permits 51841-51848.

BASIN 230, AMARGOSA DESERT
Sort by Application Number

APP NUMBER	BASE RIGHT	STATUS	USE	FILING DATE	DIV. (CFS)	DUTY (AFA) CERT.	PERMIT	APPL.	REMARKS
58857		RFP	MM	05/21/1993	4.46			3200.00	Applications 58857through 58864 were filed by
58858		RFP	MM	05/21/1993	4.46			3200 (S)	Barrick Bullfrog to replace the water rights
58859		RFP	MM	05/21/1993	4.46			3200 (S)	under Permits 51841-51848 which will
58860		RFP	MM	05/21/1993	4.46			3200 (S)	expire in 2009. Total combined duty is
58861		RFP	MM	05/21/1993	4.46			3200 (S)	3200 AFA.
58862		RFP	MM	05/21/1993	4.46			3200 (S)	
58863		RFP	MM	05/21/1993	4.46			3200 (S)	
58864		RFP	MM	05/21/1993	4.46			3200 (S)	
59180		PER	COM	08/26/1993	0.07		5.00		
59181	25099	RFA	IRR	08/26/1993	0.35			17.50	Duty under 25099 is 13.60 AFA.
59277		RFP	IRR	09/23/1993	3			800.00	
59352		RFP	QM	10/29/1993	1.56			1129.57	
59400	22140	RFA	COM	11/29/1993	0.028			4.00	
59729	29649	RFA	COM	01/28/1994	0.105			50.00	
60150	18772	PER	IRR	06/23/1994	0.153		50.00		
60162	17657A01	PER	IRR	06/27/1994	0.106		10.00		
60386	17657A01	PER	IRR	08/24/1994	0.156		40.00		
60431	17657A01	PER	IRR	09/09/1994	0.039		10.00		
60433	17657A01	CER	IRR	09/12/1994	0.039	10.00			
60434	17657A01	PER	IRR	09/12/1994	0.039		10.00		
60435	17657A01	PER	IRR	09/12/1994	0.039		10.00		
60437	17657A01	CER	IRR	09/12/1994	0.039	10.00			
60438	17657A01	RFA	IRR	09/12/1994	0.156			40.00	
60439	17657A01	PER	IRR	09/12/1994	0.141		36.32		
60440	17657A01	PER	IRR	09/13/1994	0.02		5.08		
60441	17657A01	RFA	IRR	09/13/1994	0.078			20.00	
60442	17657A01	PER	IRR	09/13/1994	0.023		6.00		
60443	17657A01	PER	IRR	09/13/1994	0.02		5.08		
60450	36584	CER	IRR	09/14/1994	0.024	5.44			
60451	17657A01	PER	IRR	09/14/1994	0.039		10.00		
60455	17657A01	PER	IRR	09/14/1994	0.078		20.00		
60462	17657A01	PER	IRR	09/14/1994	0.039		10.00		
60463	17657A01	PER	IRR	09/14/1994	0.039		10.00		
60464	17657A01	PER	IRR	09/14/1994	0.039		10.00		
60466	17657A01	PER	IRR	09/14/1994	0.039		10.00		
60468	17657A01	PER	IRR	09/14/1994	0.035		9.08		
60469	17657A01	PER	IRR	09/14/1994	0.039		10.00		
60471	36584	CER	IRR	09/14/1994	0.016	4.00			
60472	17657A01	PER	IRR	09/14/1994	0.039		10.00		
60473	17657A01	PER	IRR	09/14/1994	0.025		6.44		
60474	17657A01	PER	IRR	09/14/1994	0.02		5.08		
60479	17657A01	PER	IRR	09/15/1994	0.039		10.00		
60480	17657A01	PER	IRR	09/15/1994	0.156		40.00		

BASIN 230, AMARGOSA DESERT
Sort by Application Number

APP NUMBER	BASE RIGHT	STATUS	USE	FILING DATE	DIV. (CFS)	DUTY (AFA) CERT.	PERMIT	APPL.	REMARKS
61080	29649	PER	COM	03/28/1995	0.105		50.00		
61205	17340	PER	IRR	05/05/1995	0.5		89.50		
61219	53596	PER	QM	05/10/1995	0.003		2.24		
61412	41860	PER	MM	07/19/1995	0.89		613.80		
61413	42637	PER	MM	07/19/1995	0.89		613.8 (S)		Supplemental to Permit 61412
61576		RFP	QM	09/27/1995	2			1447.98	
62115	29649	RFA	COM	05/09/1996	0.555			264.00	
62116	29649	RFA	COM	05/09/1996	0.555			264 (S)	Supplemental to Permit 62115
62309	22140	RFA	COM	07/17/1996	0.033			5.00	
62322	25636	RFA	IRR	07/24/1996	0.325			50.00	
62326	29521	APP	COM	07/26/1996	1			5.00	
62327		RFP	COM	07/26/1996	1			8	
62366	19197	RFA	IRR	08/08/1996	0.078			7.02	Applications 62366 through 62373 were filed
62367	19197	RFA	IRR	08/08/1996	0.078			14.52	to change portions of Permit 19197 to comply
62368	19197	RFA	IRR	08/08/1996	0.078			7.02	with a court order on forfeiture. The total duty
62369	19197	RFA	IRR	08/08/1996	0.078			12.02	requested is 81.64 AF, compared with the
62370	19197	RFA	IRR	08/08/1996	0.054			14.52	court ordered duty of 74.62 A/F. Forfeiture of
62371	19197	RFA	IRR	08/08/1996	8			7.02	Permit 19197 has been appealled to the State
62372	19197	RFA	IRR	08/08/1996	0.078			7.02	Supreme Court.
62373	19197	RFA	IRR	08/08/1996	0.046			12.5	
62411	18772	PER	IRR	08/28/1996	0.303		100		
62412	18772	PER	IRR	08/28/1996	0.078		7.02		
62413	18772	PER	IRR	08/28/1996	0.021		7.02		
62464	18772	RFA	IRR	09/19/1996	0.078			8.14	
62465	17657	RFA	IRR	09/19/1996	0.025			8.14	
62529		RFP	IRR	10/24/1996	3			800.00	
62637	17348	RFA	IRR	12/05/1996	0.12			75.00	
62918	15893	PER	IRR	03/13/1997	0.86		197.00		
62919	30411	PER	IRR	03/13/1997	0.525		148.55		
63010	17173	RFA	IRR	04/08/1997	0.195			50.00	
63082	14078	PER	IRR	05/05/1997	2.5		157.60		Abrogates balance of Permit 14078
63140	16178	RFA	IRR	05/22/1997	0.22			20.00	
63143	20411	RFA	QM	05/27/1997	0.1			40	
63151	26283	PER	IRR	05/29/1997	0.2		71.85		
63152	26283	PER	IRR	05/29/1997	0.066		24		
63153	26283	PER	IRR	05/29/1997	0.071		23.9		
63174	26442	PER	IRR	06/11/1997	1.000		94.50		
63232	17657A03	RFA	IRR	07/08/1997	0.04			10	
63233	20411	RFA	IRR	07/08/1997	0.23			36.4	
63234	20411	RFA	IRR	07/08/1997	0.11			18.2	
63235	20411	RFA	IRR	07/08/1997	0.11			18.2	
63236	20411	RFA	IRR	07/08/1997	0.23			36.4	
63250	22140	PER	IRR	07/17/1997	0.31		43.97		Abrogates a portion of Permit 22140

BASIN 230, AMARGOSA DESERT
Sort by Application Number

APP NUMBER	BASE RIGHT	STATUS	USE	FILING DATE	DIV. (CFS)	DUTY (AFA) CERT.	PERMIT	APPL.	REMARKS
63407	61205	PER	COM	08/29/1997	0.179		50		
63408	60449	PER	COM	08/29/1997	0.039		10		
63565	60449	PER	IRR	11/14/1997	0.096		24.68		
63566	60465	PER	IRR	11/15/1997	0.039		10		
63567	60470	PER	IRR	11/16/1997	0.039		10		
63568	60475	PER	IRR	11/17/1997	0.039		10		
63715	60474	RFA	COM	01/06/1998	0.02			5.08	
64169		APP	QM	05/27/1998	0.25			3.99	
64369	17657A01	APP	IRR	08/04/1998	0.78			20	
64456	14059	APP	MM	09/17/1998	0.55			66.8	
64457	27813	APP	IRR	09/17/1998	1.08			628	
64489	17241	APP	IRR	09/29/1998	2.45			790	
64490	15929	APP	IRR	09/29/1998	1.114			200	
64491	24729	APP	IRR	09/29/1998	3.12			250	
64552	17657A01	APP	IRR	10/27/1998				20	
						20264.01	7012.17	12539.42	Total of RFA does not include change apps.

Total Appropriations (Certificates + Permits): 27276.18

BASIN 230, AMARGOSA DESERT
Sort by Use

SUMMARY OF BASIN ABSTRACT

SOURCE: GROUNDWATER

DATE: 1/9/99

APP NUMBER	BASE RIGHT	STATUS	USE	FILING DATE	DIV. (CFS)	DUTY (AFA) CERT.	PERMIT	APPL.	REMARKS
32279		CER	COM	06/24/1977	0.1	0.61			
46218		CER	COM	10/13/1982	0.019	0.09			
47528		PER	COM	12/21/1983	0.5		10.83		
51915		PER	COM	03/11/1988	1		9.70		
53189	16562	PER	COM	04/27/1989	0.3		74.89		
59180		PER	COM	08/26/1993	0.07		5.00		
59400	22140	RFA	COM	11/29/1993	0.028			4.00	
59729	29649	RFA	COM	01/28/1994	0.105			50.00	
61080	29649	PER	COM	03/28/1995	0.105		50.00		
62115	29649	RFA	COM	05/09/1996	0.555			264.00	
62116	29649	RFA	COM	05/09/1996	0.555			264 (S)	Supplemental to Permit 62115
62309	22140	RFA	COM	07/17/1996	0.033			5.00	
62326	29521	APP	COM	07/26/1996	1			5.00	
62327		RFP	COM	07/26/1996	1			8	
63407	61205	PER	COM	08/29/1997	0.179		50		
63408	60449	PER	COM	08/29/1997	0.039		10		
63715	60474	RFA	COM	01/06/1998	0.02			5.08	
					TOTAL	0.70	210.42	341.08	
13574		CER	DOM	12/19/1950	0.01	3.22			
					TOTAL	3.22			
14059		CER	IRD	02/20/1952	2.567	320.00			62.8 acres supplemental to Permit 27813
15702		CER	IRD	06/11/1954	1	175.00			
15881		CER	IRD	12/06/1954	0.845	253.1 (S)			Supplemental to Permit 49947
16178		CER	IRD	03/08/1955	2.6	20.00			
16545		CER	IRD	06/02/1955	2.5	109.90			
16562		CER	IRD	06/13/1955	2.2	525.12			
17241		CER	IRD	04/15/1957		790.00			Total Comb. Duty w/Permits 15929 & 29649 = 1421 AFA
19448		CER	IRD	01/16/1961	0.63	185.01			
20352	14147	CER	IRD	03/08/1962	3.5	1169.50			
20411		CER	IRD	04/16/1962	0.818	125.10			See Ruling #4498, dated 2/14/97
26283	22274	CER	IRD	08/31/1971	2.2	680.25			
14054		CER	IRR	02/18/1952	1.52	127.00			
15410		CER	IRR	11/27/1953	2.5	800.00			
15893		CER	IRR	12/13/1954	3.5	603.00			Remaining Balance - chngd by Permit 62918
15929		CER	IRR	12/29/1954	2.228	231.00			Amount reflects non-supplemental Portion
16047		CER	IRR	02/07/1955		22.02			
17137		CER	IRR	01/03/1957		100.00			50 A/F reinstated on appeal
17348		CER	IRR	08/08/1957	0.313	75.00			

17404		CER	IRR	10/02/1957	2.5	800.00			
17417		CER	IRR	10/14/1957	2	229.10			
17694		CER	IRR	10/29/1958	2	95.00			See ruling #4496 dated 2/14/97
18222		CER	IRR	08/10/1959	5.4	1342.50			
18764		CER	IRR	04/28/1960	4.01	357.00			
18772		CER	IRR	04/29/1960	3.01	99.18			See ruling #4190, dated 3/8/96
19034		CER	IRR	07/18/1960	2.5	515.00			Total Combined Duty with Permit 21584
19197		CER	IRR	09/12/1960	3.442	74.62			Amount remaining - Under appeal.
19916	14076	CER	IRR	06/12/1961	2.5	800.00			
19917	14074	CER	IRR	06/12/1961	2.5	800.00			Total Combined Duty with Permit 22761
20162		CER	IRR	11/21/1961	0.57	120.00			See Ruling #4497, dated 2/14/97
20355		CER	IRR	03/09/1962	1.4	18.02			
21584		CER	IRR	10/15/1963	1.51	515 (S)			Supplemental to Permit 19034
22140	14523	CER	IRR	07/21/1964	1.92	40.00			See Ruling 4349, dated 5/8/96
22141	14522	CER	IRR	07/22/1964	0.8	106.00			
22233		CER	IRR	08/30/1964	1	190.00			
22746	14066	CER	IRR	08/31/1965	2.5	800.00			
22761		CER	IRR	09/07/1965	0.28	202.65 (S)			Supplemental to Permit 19917
23797	19217	CER	IRR	04/11/1967	1.35	400.00			
24585	21952	CER	IRR	07/17/1968	0.75	118.75			
24725	18880	CER	IRR	10/21/1968	2.7	777.45			
24729	19374	CER	IRR	10/23/1968	3.12	250.00			
24763	22556	CER	IRR	11/18/1968	0.59	93.30			
25099	19217	CER	IRR	06/09/1969	1.22	13.60			
25636	20039	CER	IRR	05/28/1970	1.3	94.04			
25742	19217	CER	IRR	08/06/1970	0.14	17.50			
25743	19217	CER	IRR	08/06/1970	0.14	17.50			
25744	19217	CER	IRR	08/06/1970	0.21	22.50			
26152		CER	IRR	06/02/1971	1	60.00			
26442		CER	IRR	12/17/1971		2.5 (S)			Supplemental to Permit 18764
26718	24763	CER	IRR	05/12/1972		18.9 (S)			Supplemental to Permit 29069
27813	26632	CER	IRR	10/04/1973	1.08	628.00			
28828	20162	CER	IRR	10/25/1974		65.70			
29069		CER	IRR	12/19/1974	0.24	30.90			Total Combined Duty with Permit 26718
29521		CER	IRR	07/01/1975	0.16	25.00			
29649		CER	IRR	09/17/1975	1.215	578.00			Portion supplemental to Permit 15929
30411		CER	IRR	07/22/1976	2.67	606.45			
31204		CER	IRR	03/21/1977	0.125	22.78			
31727		CER	IRR	05/16/1977	0.16	25.00			
36584	17657A04	CER	IRR	01/31/1979	0.04	10.00			
38127	33010	CER	IRR	05/10/1979	1.667	583.33			
38363	33010	CER	IRR	06/18/1979	1.666	583.35			
40954	19197	CER	IRR	03/26/1980	0.178	47.69			
42171	15881	PER	IRR	06/25/1980	0.275		150.00		
43524	29650	CER	IRR	04/13/1981	1.454	628.00			

43873	38771	CER	IRR	06/11/1981	1.687	545.38			
46748	17657A01	CER	IRR	03/21/1983	0.16	33.63			
49220	18544	CER	IRR	07/24/1985	0.69	73.5			
49885	15881	CER	IRR	05/20/1986	0.25	65			
49947	15881	CER	IRR	06/26/1986	1.75	261.9			
52616	49317	PER	IRR	10/19/1988	0.205		150.00		
55156	25099	CER	IRR	08/07/1990	0.24	25.00			
57304	15410	RFA	IRR	03/18/1992	2.5			800.00	
59181	25099	RFA	IRR	08/28/1993	0.35			17.50	Duty under 25099 is 13.60 AFA.
59277		RFP	IRR	09/23/1993	3			800.00	
60150	18772	PER	IRR	06/23/1994	0.153		50.00		
60162	17657A01	PER	IRR	06/27/1994	0.106		10.00		
60386	17657A01	PER	IRR	08/24/1994	0.156		40.00		
60431	17657A01	PER	IRR	09/09/1994	0.039		10.00		
60433	17657A01	CER	IRR	09/12/1994	0.039	10.00			
60434	17657A01	PER	IRR	09/12/1994	0.039		10.00		
60435	17657A01	PER	IRR	09/12/1994	0.039		10.00		
60437	17657A01	CER	IRR	09/12/1994	0.039	10.00			
60438	17657A01	RFA	IRR	09/12/1994	0.156			40.00	
60439	17657A01	PER	IRR	09/12/1994	0.141		36.32		
60440	17657A01	PER	IRR	09/13/1994	0.02		5.08		
60441	17657A01	RFA	IRR	09/13/1994	0.078			20.00	
60442	17657A01	PER	IRR	09/13/1994	0.023		6.00		
60443	17657A01	PER	IRR	09/13/1994	0.02		5.08		
60450	36584	CER	IRR	09/14/1994	0.024	5.44			
60451	17657A01	PER	IRR	09/14/1994	0.039		10.00		
60465	17657A01	PER	IRR	09/14/1994	0.078		20.00		
60462	17657A01	PER	IRR	09/14/1994	0.039		10.00		
60463	17657A01	PER	IRR	09/14/1994	0.039		10.00		
60464	17657A01	PER	IRR	09/14/1994	0.039		10.00		
60466	17657A01	PER	IRR	09/14/1994	0.039		10.00		
60468	17657A01	PER	IRR	09/14/1994	0.035		9.08		
60469	17657A01	PER	IRR	09/14/1994	0.039		10.00		
60471	36584	CER	IRR	09/14/1994	0.016	4.00			
60472	17657A01	PER	IRR	09/14/1994	0.039		10.00		
60473	17657A01	PER	IRR	09/14/1994	0.025		6.44		
60474	17657A01	PER	IRR	09/14/1994	0.02		5.08		
60479	17657A01	PER	IRR	09/15/1994	0.039		10.00		
60480	17657A01	PER	IRR	09/15/1994	0.156		40.00		
61205	17340	PER	IRR	05/05/1995	0.5		89.50		
62322	25633	RFA	IRR	07/24/1996	0.325			50.00	
62366	19197	RFA	IRR	08/08/1996	0.078			7.02	Applications 62366 through 62373 were filed
62367	19197	RFA	IRR	08/08/1996	0.078			14.52	to change portions of Permit 19197 to comply
62368	19197	RFA	IRR	08/08/1996	0.078			7.02	with a court order on forfeiture. The total duty
62369	19197	RFA	IRR	08/08/1996	0.078			12.02	requested is 81.64 AF, compared with the

62370	19197	RFA	IRR	08/08/1996	0.054			14.52	court ordered duty of 74.62 A/F. Forfeiture of
62371	19197	RFA	IRR	08/08/1996	8			7.02	Permit 19197 has been appealled to the State
62372	19197	RFA	IRR	08/08/1996	0.078			7.02	Supreme Court.
62373	19197	RFA	IRR	08/08/1996	0.046			12.5	
62411	18772	PER	IRR	08/28/1996	0.303		100		
62412	18772	PER	IRR	08/28/1996	0.078		7.02		
62413	18772	PER	IRR	08/28/1996	0.021		7.02		
62464	18772	RFA	IRR	09/19/1996	0.078			8.14	
62465	17657	RFA	IRR	09/19/1996	0.025			8.14	
62529		RFP	IRR	10/24/1996	3			800.00	
62637	17348	RFA	IRR	12/05/1996	0.12			75.00	
62918	15893	PER	IRR	03/13/1997	0.86		197.00		
62919	30411	PER	IRR	03/13/1997	0.525		148.55		
63010	17173	RFA	IRR	04/08/1997	0.195			50.00	
63082	14078	PER	IRR	05/05/1997	2.5		157.60		Abrogates balance of Permit 14078
63140	16178	RFA	IRR	05/22/1997	0.22			20.00	
63151	26283	PER	IRR	05/29/1997	0.2		71.85		
63152	26283	PER	IRR	05/29/1997	0.066		24		
63153	26283	PER	IRR	05/29/1997	0.071		23.9		
63174	26442	PER	IRR	06/11/1997	1.000		94.50		
63232	17657A03	RFA	IRR	07/08/1997	0.04			10	
63233	20411	RFA	IRR	07/08/1997	0.23			36.4	
63234	20411	RFA	IRR	07/08/1997	0.11			18.2	
63235	20411	RFA	IRR	07/08/1997	0.11			18.2	
63236	20411	RFA	IRR	07/08/1997	0.23			36.4	
63250	22140	PER	IRR	07/17/1997	0.31		43.97		Abrogates a portion of Permit 22140
63565	60449	PER	IRR	11/14/1997	0.096		24.68		
63566	60465	PER	IRR	11/15/1997	0.039		10		
63567	60470	PER	IRR	11/16/1997	0.039		10		
63568	60475	PER	IRR	11/17/1997	0.039		10		
64369	17657A01	APP	IRR	08/04/1998	0.78			20	
64457	27813	APP	IRR	09/17/1998	1.08			628	
64489	17241	APP	IRR	09/29/1998	2.45			790	
64490	15929	APP	IRR	09/29/1998	1.114			200	
64491	24729	APP	IRR	09/29/1998	3.12			250	
64552	17657A01	APP	IRR	10/27/1998				20	
17657A01		CER	IRR	09/09/1958	0.707	182.24			Remaining balance after change applications
17657A02		CER	IRR	09/09/1958	0.04	10.00			
17657A03		CER	IRR	09/09/1958	0.04	10.00			
					TOTAL	19399.30	1662.67	4797.62	
27812		CER	MM	10/04/1973		232.00			
29451		CER	MM	06/16/1975		5 (S)			Supplemental to Permit 27812
29452		CER	MM	06/16/1975		5 (S)			Supplemental to Permit 27812
45360		RFP	MM	02/22/1982	0.357			258.50	

48478		RFA	MM	10/09/1984	0.36			258.13	
48479		CER	MM	10/09/1984	0.26	142.68			Total Combined Duty of Permits 47479- 47483
48480		CER	MM	10/09/1984	0.31	93.97			not to exceed 567.6 AFA
48481		CER	MM	10/09/1984	0.51	178.74			
48482		CER	MM	10/09/1984	0.3	82.49			
48483		CER	MM	10/09/1984	0.27	76.36			
51841		PER	MM	02/19/1988	4.46		3200.00		Total Combined Duty of Permits 51841-51848
51842		PER	MM	02/19/1988	0.89		645.23 (S)		not to exceed 3200 AFA
51843		PER	MM	02/19/1988	4.46		3200 (S)		
51844		PER	MM	02/19/1988	4.46		3200 (S)		
51845		PER	MM	02/19/1988	4.46		3200 (S)		
51846		PER	MM	02/19/1988	5.46		3200 (S)		
51847		PER	MM	02/19/1988	4.46		3200 (S)		
51848		PER	MM	02/19/1988	2.46		1572 (S)		
52887		RFP	MM	01/26/1989	1			724.09	
58268	51848	PER	MM	10/27/1992	2		1448 (S)		Supplemental to Permits 51841-51848.
58857		RFP	MM	05/21/1993	4.46			3200.00	Applications 58857through 58864 were filed by
58858		RFP	MM	05/21/1993	4.46			3200 (S)	Barrick Bullfrog to replace the water rights
58859		RFP	MM	05/21/1993	4.46			3200 (S)	under Permits 51841-51848 which will
58860		RFP	MM	05/21/1993	4.46			3200 (S)	expire in 2009. Total combined duty is
58861		RFP	MM	05/21/1993	4.46			3200 (S)	3200 AFA.
58862		RFP	MM	05/21/1993	4.46			3200 (S)	
58863		RFP	MM	05/21/1993	4.46			3200 (S)	
58864		RFP	MM	05/21/1993	4.46			3200 (S)	
61412	41860	PER	MM	07/19/1995	0.89		613.80		
61413	42637	PER	MM	07/19/1995	0.89		613.8 (S)		Supplemental to Permit 61412
64456	14059	APP	MM	09/17/1998	0.55			66.8	
					TOTAL	806.24	3813.80	4507.52	
22941	17507	CER	QM	01/27/1966	0.25	0.68			
26673		CER	QM	04/19/1972	0.004	1.01(S)			Supplemental to Permit 40448.
28062		PER	QM	02/05/1974			41.37		Total Combined Duty with Permit 45061
28777		CER	QM	10/07/1974	0.1	8.50			
35592		PER	QM	07/05/1978	0.5		9.45		
40448		PER	QM	02/04/1980	4		234.71		
45061	28062	PER	QM	11/16/1981	1.13		172.63		Supplemental to Permit 28062
45162		CER	QM	12/29/1981	0.446	9.76			
45163		CER	QM	12/29/1981	0.446	9.76 (S)			Supplemental to Permit 45162
45361		RFP	QM	02/22/1982	0.123			89.07	
45740		CER	QM	06/02/1982	0.02	3.38			
47205	38430	PER	QM	08/29/1983	0.2		36.99		
47223		PER	QM	09/01/1983	0.2		36.99 (S)		Supplemental to Permit 47205
48477		RFA	QM	10/09/1984	0.12			86.86	
49804		CER	QM	03/31/1986	0.01	0.12			
50385		CER	QM	12/01/1986	0.1	30.88			

BASIN 230, AMARGOSA DESERT
Sort by Use

51879		PER	QM	03/01/1988	1		431.85		Supplemental to Permit 51879
51880		PER	QM	03/01/1988	1		431.85 (S)		
52663		RFA	QM	10/27/1988	0.25			68.72	
53009		RFP	QM	03/13/1989	0.026			18.48	
53181	28062	PER	QM	04/25/1989	0.08		57.91 (S)		Supplemental to Permit 53182
53182	45061	PER	QM	04/25/1989	0.65		99.28		Total Combined Duty with Permit 53181
54271		CER	QM	12/22/1989	0.06	1.23			
56781		RFA	QM	09/27/1991	0.2			7.67	
59352		RFP	QM	10/29/1993	1.56			1129.57	
61219	53596	PER	QM	05/10/1995	0.003		2.24		
61576		RFP	QM	09/27/1995	2			1447.98	
63143	20411	RFA	QM	05/27/1997	0.1			40	
64169		APP	QM	05/27/1998	0.25			3.99	
					TOTAL	54.55	1028.52	2892.34	
44741		RFA	WLD	10/29/1981	0.005			0.86	
53596	25552	PER	WLD	06/30/1989	2.137		296.76		
					TOTAL		296.76	0.86	
					TOTALS	20264.01	7012.17	12539.42	

SUMMARY OF REPORTS AND OTHER INFORMATION

The balance of the information contained in this analysis consists of summaries of relevant reports, publications and testimony from State Engineer hearings pertaining to the Death Valley Hydrographic Region. These include the following:

1. USGS/DWR Reconnaissance Report 54 (Rush, 1970)
2. Nevada Water Planning Report 3 (State Engineer's Office 1971)
3. USGS/DWR Reconnaissance Report 14 (Walker & Eakin, 1963)
4. Testimony of William Dudley (State Engineer's Hearing for Permit 52338, 1991)
5. Hydrogeologic Inferences from Driller's Logs and from Gravity and Resistivity Surveys in the Amargosa Desert, Southern Nevada (Oatfield & Czarnecki, 1991)
6. Selection of Geohydrologic Boundaries for Groundwater Flow Models, Yucca Mountain, Nevada (Downey, et al, 1990)
7. State Engineer's Ruling #4327 – Rayrock Mining (State Engineer's Office1996)
8. Ground-water Conditions in Amargosa Desert, Nevada-California, 1952-87 (Kilroy, 1991)

SUMMARY OF REPORTS AND OTHER REFERENCES

Summary of Reconnaissance Report 54

Three regional ground-water flow systems are identified: the Ash Meadows system, the Pahute Mesa system and the Sarcobatus Flat system. Ground water in the Ash Meadows system flows generally southward to Ash Meadow to discharge at springs, by evapotranspiration, and possibly by subsurface outflow across a fault barrier to the south end of the Pahute Mesa system in the Amargosa Desert. The Pahute Mesa system flows generally southward to discharge largely by evapotranspiration in the Amargosa Desert. Ground water is believed to flow southwestward from Cactus Flat to Sarcobatus Flat where it is largely discharged by evapotranspiration. Some of the water in the first two systems may move southwestward as underflow to Death Valley through the carbonate rocks of the Funeral Range.

The estimated **average annual recharge** and **discharge** for the Ash Meadows regional system is 33,000 and at least 17,000 acre-feet, respectively; for the Pahute Mesa regional system these estimates are 11,000 and 9,000 acre-feet, respectively. For the Ash Meadows and Pahute Mesa systems, which join in the Amargosa Desert, *the computed excess of recharge over discharge of some 18,000 acre-feet per year may flow southwestward to Death Valley, assuming that no substantial errors in the estimates exist.* Recharge from precipitation is estimated by using a method described by Eakin and others (1951). The method assumes that a percentage of the average annual precipitation recharges the ground water reservoirs. According to Blankennagel and Weir (1970), a crude refinement of the estimation of the average annual recharge to the northern half of Pahute Mesa ground water system is on the order of 8,000 acre-feet, which is slightly smaller than the estimate of the recharge for the entire system in the report. For the Ash Meadows system, recharge averages only about 2 percent of the total precipitation; for the Pahute Mesa system, about 1 percent.

Jackass Flat (eastern one third): Estimated recharge is 300 acre-feet.
(western two thirds): 580 acre-feet
Rock Valley: 30 acre-feet.
Mercury Valley: 250 acre-feet.
Crater Flat: 200 acre-feet.
Oasis Valley: 1,000 acre-feet.
Buckboard Mesa: 1,400 acre-feet

Most natural discharge of ground water from the area is by regional subsurface outflow to Ash Meadows, Amargosa Desert, Sarcobatus Flat, Oasis Valley, and possibly Death Valley. All depths to water are too great for local discharge by phreatophytes (greater than 50 feet) or by appreciable evaporation from bare-soil areas (greater than 15 feet).

It is reported that during the 12-month period ending March 31, 1970, approximately 1,700 acre-feet of groundwater water was pumped on the Nevada Test Site.

For the Ash Meadows and Pahute Mesa systems, the estimated average annual discharge as measured in Amargosa Desert totals at least 24,000 acre-feet. Pistrang and Kunkel (1964, P. Y11) estimated that about 4,000 acre-feet of discharge in the Furnace Creek Wash area (southwest of Amargosa Desert), not including any subsurface flow to the floor of Death Valley. Based on their recharge calculations (p. Y20), probably only a few hundred acre-feet of recharge could be generated in the Furnace Creek watershed. Therefore, much of the 4,000 acre-feet of discharge in the Furnace Creek Wash area may be from the Amargosa Desert. Moreover, additional quantities of groundwater may flow from the Amargosa Desert to the valley floor of Death Valley to discharge largely by evaporation.

Summary of Nevada's Water Planning Report 3

This report is a hydrologic summary for the State and presents average annual precipitation, average growing seasons, surface water runoff, ground water recharge, **perennial yields**, and system yields for 232 hydrographic areas of the State. The report also includes an inter-basin flow map, which shows estimated amounts of surface and ground water flow between hydrographic areas, both natural and human-made. The map also shows annual runoff, perennial yield and ground water storage in the top 100 feet of saturated deposits.

The perennial yields, recharge to ground water from precipitation, ground water evapotranspiration, ground water inflow and groundwater out flow for basins 225-230 from the report are listed below.

Basin No.	Basin Name	Perennial Yield	Recharge	G.W. E.T.	G.W. Inflow	G.W. Outflow
225	Mercury valley	8,000	250	0	16,000	17,000
226	Rock Valley	8,000	30	0	17,000	17,000
227A	Jackass Flat	4,000	900	0	7,200	8,100
227B	Buckboard Mesa	3,600	1,400	0	5,800	7,200
228	Oasis Valley	2,000	1,000	2,000	2,500	1,500
229	Crater Flat	900	220	0	1,500	1,700
230	Amargosa Desert	34,000	600	24,000	44,000	19,000

**Figures are in acre-feet (annual average)

The perennial yields for basins 225-230 from the flow map are [Basin No. (perennial yield)]:

225 (8,000), 226 (8,000), 227A (4,000), 227B (4,000), 228 (2,000), 229 (1,000), and 230 (34,000).

The report points out that the figures shown in those tables as well as the accompanying map are estimates, which are useful for broad planning and general

information, but not necessarily suitable as a source of information for local or detailed planning.

It should be pointed out that numbers in the Water Planning Report 3 have errors. One example is that on page 26, the "BASIN TOTAL" of the "Water Budget" column for the Death Valley Basin is listed as 62,000. This figure should be 97,900 if the figures for individual hydrographic areas are correct. The figures on the flow map are rounded to the nearest 1,000 acre feet.

Summary of Reconnaissance Report 14

This report titled "Geology and ground water of Amargosa Desert" was prepared by George E. Walker and Thomas E. Eakin in 1963. Hugh A. Shamberger (Director of Department of Conservation and Natural Resources) in his Foreword for the report wrote "The situation strongly suggests that a planned withdrawal of ground-water in excess of the estimated annual recharge may be reasonable and desirable." This situation includicates that there is a very large quantity of ground water in storage in the Amargosa Desert area, that the acreage of good agricultural land is limited, and that only a modest annual withdrawal of the stored water would be necessary to permit development of the total area of desirable agricultural land.

The estimated irrigation requirements in 1962 would have been about 3,000 acre-feet. Pumpage for domestic or public supply did not exceed 100 acre-feet.

The tentative perennial yield for Amargosa Desert hydrographic area is **24,000** acre-feet a year, which is based on the estimate of natural discharge (Native vegetation: 11,500; Evaporation: 12,000; and Outflow: 500).

On page 20, the authors wrote: "There is a definite possibility that this estimate [recharge from precipitation] is low because the high proportion of permeable Paleozoic carbonate rocks in the Spring Mountains may result in an above-average percentage of precipitation being recharge."

Summary of the Testimony of Dudley, William W.
(State Engineer's Hearing for Permit 52338)

1, Hydrogeologic study area

Dudley shows three subbasins in the northeastern part of the Death Valley groundwater basin. The three subbasins are: (1) the Alkali Flat-Furnace Creek Wash subbasin (formerly called the Pahute Mesa subbasin), which contains Yucca Mountain and Well J-13; (2) the Oasis Valley subbasin from which a small amount of water flows through the Amargosa River narrows at Beatty and into the west-central part of the Alkali Flat-Furnace Creek Wash subbasin; and (3) the large Ash Meadows subbasin, which lies to

the east of the Alkali Flat-Furnace Creek Wash subbasin.

The dominant aquifer in the Ash Meadows subbasin is the "lower carbonate aquifer". In the other two subbasins, the dominant flow is in volcanic rocks and valley-fill deposits that overlie the Paleozoic or older rocks.

Most of the ground water discharge from the subbasins is by evapotranspiration at the principal discharge areas --- Oasis Valley, Alkali Flat, and Ash Meadows. However, any of the three subbasins, and perhaps all three, **may contribute** water that seeps through the Funeral Mountains to discharge at springs in Death Valley.

2. Hydrostratigraphic section

The four units of principal interest are:
(1) The Quaternary valley-fill deposits (which form the principal aquifer in the Amargosa Desert but are generally above the water table to the north of the Amargosa Desert).
(2) The Tertiary volcanic rocks, within which the water table occurs throughout the upper and central parts of the Oasis Valley and Alkali Flat subbasins, including at Yucca Mountain and Well J-13. Permeable zones are related to fracturing and faults.
(3) The lower carbonate aquifer. A drill hole have penetrated the Silurian rocks just east of Yucca Mountain, and the lower carbonate aquifer may underlie the Yucca Mountain area.
(4) The Lower clastic aquitard, which limits the depth of active ground water flow and impedes lateral movement where it occurs at shallow depths due to tectonic structures. (*Dudley later provided maps which show the deep carbonate structure range and cross-sections.)

3. Latest Precambrian through mid-Paleozoic paleogeography

Regional perspective (part of one of the regional ground water flow systems in the larger region).

4. Precipitation, recharge area and discharge area

Emphasis is put on regional and local topography.

Dudley points out "Major surface drainages that concentrate storm or snowmelt runoff in ephemeral channels (above the water table) probably provide important recharge in lower areas adjacent to the uplands. Fortymile Wash and probably also Topopah Wash serve this function in Jackass Flats and northern Amargosa Desert. The Amargosa River south of Beatty also is an ephemeral channel that provides infiltration during extreme floods.

5. Hydrogeology and boundary of the Ash Meadows subbasin

The eastern boundary should be moved as much as 15 miles to the west, and the

western boundary probably should be moved to the east somewhat based on Dudley's interpretation of potentiometric and geologic data and other workers' suggestion. Winograd proposed significant inflow to the Ash Meadows subbasin from Pahranagat Valley in the northeast.

6. Regional flow paths

7. Potentiometric map (around J-13)

8. Preliminary composite potentiometric-surface map (Yucca Mountain)

   Showing a cross-section line through J-13 in the northwest direction.

9. Conceptual hydrogeologic cross section, Solitario Canyon to Well J-13.

He mentions that hydraulic and goethermal data from UE-25p#1 provide evidence about the hydraulic relation of the lower carbonate aquifer to the overlying volcanic rocks.

10 & 11. Interpretive geologic section in the vicinity of drill hole UE-25p#1 and variation of hydraulic head and water temperature with depth in drill hole UE-25p#1.

Temperature increase with depth and an about 20 meters higher head in the Fran Ridge fault zone.

12 Graph of temperature vs. depth at UE-25p#1

13. A map showing lines of profiles passing test wells near Yucca Mountain.

14. Profiles and temperature vs. depth.

Dudley points out that the J-13 profile indicates low heat flow in the deep part of the hole, which suggests that the carbonate aquifer does lie below, though at considerable depth

15. Temperature at water table (contour) shows elevated temperatures along the N-S trending fault zones both east and west of Yucca Mountain.

16. Quaternary normal faults near Yucca Mountain

Anisotropic transmissivity (Southward strike of faults and strata)

17. Potentiometric levels on pre-Tertiary rocks

Showing that probably the head in the carbonate rocks beneath Well J-13 would be about 745 meters---about 17 m higher than the head in the Topopah Spring aquifer.

18. Spotted Range – Mine Mountain structural zone

A zone of northeast-southwest striking faults would tend to deflect flow southwestward.

19a,b Map of structure and geology of pre-Tertiary rocks

The **Paleozoic rocks** beneath and south of the Yucca Mountain area are **tilted generally northward**. Inversely, in the southward direction, the lower carbonate aquifer thins and the lower clastic aquitard rises. The aquifer is probably removed completely by erosion at about the latitude of Lathrop Wells.

20. Simplistic hydrogeologic map and cross-section

Support 19. Points out that the structurally elevated lower clastic aquitard is probably somewhat leaky because of the faults in the area.

21. Generalized geologic section along flow path approaching Ash Meadows

The lower carbonate aquifer is hydraulically continuous from near Mercury to the Devils Hole Hills.

22a. Topography of Ash Meadows and vicinity (around Devils Hole)

22b. Contours of the water table

23. Location of spring line and pumping units in Ash Meadows

The water from all springs and all productive wells in eastern Ash Meadows is clearly derived from the lower carbonate aquifer, based on its chemistry and temperature. Development of water in pumping unit E itself had no discernible effects southeast of unit E. Unit D is isolated from the north by poor hydraulic connection to unit E and from the west by western Ash Meadows.

Units A, B, and C are isolated from the central Amargosa Desert by western Ash Meadows.

24. Mean daily water levels in Devils Hole and approximate monthly pumpage

Pumpage is for the wells within 2.3 miles of Devils Hole, and the pumping rate during 1971 and 1972 is about 7.6 cfs.

Summary of "Hydrogeologic Inferences From Drillers' Log and From Gravity and Resistivity Surveys in the Amargosa Desert, Southern Nevada" by Oatfield and Czarnecki (1991)

This paper provides contours for fractions of coarse-grained sediments, apparent alluvial thickness, and depth to ground water. It also provides a hydrogeologic section. The authors conclude that it is suggested that there is hydraulic barrier near the center of the Amargosa Desert.

Quote from "Selection of Geohydrologic Boundaries for Ground-Water Flow Models, Yucca Mountain, Nevada" by Downey, et al (1990)

When the authors summarize flow regime in and between the shallower aquifer and the deeper aquifer in the southern Nevada/Death Valley, California region, they write, "most of the hydrologic boundaries of the regional aquifer system in the Yucca Mountain region are geologically complex and probably cannot be determined accurately with currently available financial resources." (p.725)

Quotes from "State Engineer's Rayrock Mine Water Ruling"

To date [April 23, 1996] "no one has been able to specifically define the boundaries of the overall area of the Death Valley Groundwater Flow System; thus, regional scale uncertainties exist at to the boundaries of the overall flow system."

—— Ruling #4327 page 7

"It is recognized that while on paper it appears that a certain quantity of water rights are appropriated, in fact, it may be that the actual quantity of water actually pumped from the basin can be significantly less."

—— Ruling #4327 page 16.

Summary of "Ground-Water Conditions in Amargosa Desert, Nevada-California, 1952-87" by Kilroy (1991)

This report documents the ground water potentiometric surface in Amargosa Desert as of 1987. Preliminary interpretation of water-level changes, vertical hydraulic gradients and the effects of pumping on groundwater flow are also included. The author mentions that the Ash Meadows fault appears to be a leaky dam to flow from the northeast along the Spotted Range-Mine Mountain fault zone.

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