Docket Number: 0

FURNACE CREEK AREA AND TEXAS SPRING - COMMON PAPERS

Preliminary Docket Information

DOCKET INFORMATION FORM

Compiled by: Alexa Kreiling Date: 2/24/2025
Initial Docket Information Form ☒ Amendment # _____ (1,2,3 …)
Includes Confidential Content ☐

Park Unit: DEVA **Docket #:** 000 **Docket Title** Furnace Creek area and Texas Spring - Common Papers

Docket Type:
Select all applicable: ☐ PC/V (pre-code/vested) ☐ APP (appropriative) ☐ RIP (riparian)
☐ FRR (federal reserved right) ☐ PWR (public water reserve) ☐ ACQ (acquired)
☐ GW (groundwater) ☐ Own (ownership) ☐ Other _____

Region:
☐ NER & NCR ☐ IMR
☐ SER ☐ MWR
☐ IMR ☒ PWR
☐ AKR

Source:
☐ Groundwater ☐ Spring (When recognized by the State as separate from groundwater and surface water)
☐ Surface Water
☐ Direct Diversion ☐ Diversion to Storage ☐ Instream Flow
Name: _____

State: CA
County: Inyo

Owner: _____ (As listed by the State)

Application #: _____ **Date:** _____

Permit #: _____ **Date Issued:** _____

License / Certificate #: _____ **Priority Date:** _____

Ruling/Order/Decree #: _____ **Date Issued:** _____

Quantity: Rate: _____ Duty: _____
Units: ☐ cfs ☐ gpm ☐ afy ☐ other _____ Units: ☐ cfs ☐ gpm ☐ afy ☐ other _____

Use(s): ☐ Domestic ☐ Livestock ☐ Irrigation ☐ Municipal ☐ Industrial/Commercial ☐ Wildlife ☐ Instream ☐ other _____

POD Name / Location: _____ ☐ Multiple PODs (see water right)
Qtr: _____ Qtr: _____ Sec: _____ T: _____ R: _____ PM: _____
Latitude: _____ Longitude: _____
UTM _____ , _____ Datum: _____

POU Name / Location: _____ ☐ Multiple POUs (see water right)
Qtr: _____ Qtr: _____ Sec: _____ T: _____ R: _____ PM: _____
Latitude: _____ Longitude: _____
UTM _____ , _____ Datum: _____

Narrative / Remarks: Enter short narrative in the space below, attach additional page(s) as needed.

See Note-to-File dated May 3, 1996 for more information.

☐ Additional Page(s) Attached

NOTES TO THE FILE DEVA 03, 04, 05, 06, and 43 May 3, 1996

Dockets 03, 04, and 05 contain documentation on California State water right permits in the Furnace Creek area which were revoked.

Docket 06 contains documentation of a licensed water right from Texas Spring.

Docket 43 contains documentation of a water rights agreement between Fred Harvey and the National Park Service concerning water rights in the Furnace Creek area. Congress directed the National Park Service to work out an agreement with U.S. Borax (Fred Harvey's predecessor) concerning the water rights in the Furnace Creek area. The NPS's water rights in the Furnace Creek area are thought to be primarily Federal reserved water rights.

A folder, filed with the dockets, but not a docket, contains papers common to dockets 3, 4, 5, 6, and 43, including water use and need studies, maps, and documentation of Congress's inquiries into issues in the Furnace Creek area. Alien water right docket 42 contains documentation of Fred Harvey's water rights. The information in this folder and in the alien water right docket (in addition to that in particularly dockets 06 and 43) should be helpful if there is an adjudication of the water rights or a water rights conflict involving the NPS's water rights in the Furnace Creek area.

Alice Johns
Hydrologist
Water Rights Branch
Water Resources Division
National Park Service

This docket consists of supplimental data for the Furnace Creek - Texas Springs area (DEVA Water Right Dockets 3, 4, 5, and 6.)

07 OTHER

Death Valley National Park

FURNACE CREEK AREA AND TEXAS SPRING - COMMON PAPERS

Other Supporting Information

orig & three

Death Valley ~~Nat~~ National Monument
Furnace Creek Area
Supplemental Data, Water Right Dockets 3,4,5 & 6

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Part I LAND

1. Drawing NMDV 7100, Water Resources, Furnace Creek Area
2. Drawing NMDV, 2123 Revised March 14, 1958, Furnace Creek ~~Airport~~ Airport Site
3. Drawing NMDV 3115, Sheets I ~~to~~ to IV, Topographic, Furnace Creek Area, photographic reduction to scale of 1" = 1000'
4. ~~Sketch Map dated July 2, 1958, Surface Water of Furnace Creek 1857~~
5. Drawing NMDV 3115, Sheets I to VI, Topography, Furnace Creek Area, ~~photographically reduced to~~ photographic reductions to scale of 1" = 500'
6. Sketch Map dated July 2, 1958, Surface Water of Furnace Creek 1857
7. Act of July 2, 1958 (72 Stat. 295) To authorize the acquisition by exchange of certain properties within Death Valley National Monument, California, and for other purposes.

~~Map~~

Part II WATER RESOURCES

1. Test Well Report, Well No. 1, dated November 26, 1958 by Roscoe Moss Co.
2. Memorandum of November 28, 1958 ~~Speeds~~ Speeding to Superintendent, Report on the Furnace Creek Test Well

1 to 5

3. Data tables of spring flow, chemical analyses and test well
4. Memorandum of February 25, 1960 Kunkel to Whitworth transmitting data tables (Item II-3)
5. Memorandum of June 20, 1960, Spaulding to Acting Regional Chief of Operations, Ground-Water Analysis, Furnace Creek Area
6. Table Summary of Measurement of Water Diversion dated oct 7, 1960
7. Chart Water Diversion - Furnace Creek Area Drawing NMDV 2216 dated Oct 13, 1960
8. Memorandum of October 21, 1960 Merriam to Director discussing information requested by the director and transmitting table and chart (Items II 6 & 7)

Part III TRAVEL & WATER USE

1. Memorandum of June 20, 1956 Superintendent Binnewies to Regional Director providing data on water consumption, Texas Spring Campground
2. Table Water Demand Dated September 6, 1958
3. Memorandum of August 19, 1960, Spaulding to Regional Chief of Operations, Travel Analysis providing projections of travel to future years and with attachments
   (1) Chart Visitation Trends
   (2) Drawing NMDV 2214 Traffic Analysis
   (3) Tables I and II Tabulation of monthly vehicular travel

(4) Summary sheets of travel for the years 1954, 1955, 1956, 1957, 1958, 1959 and 1960 through May (7 sheets)

4. Memorandum of August 22, 1960, Spaulding to Acting Regional Chief of Operations: Water Use, Furnace Creek Area providing an estimate of future water needs of the National Park Serve and Hotel Company with attachments:

(1) Table I National Park Service, Irrigation, Mission 66 Development

(2) Table II National Park Service, Domestic Use Mission 66 for Peak Month of March

(3) Table III, Death Valley Hotel Company, Irrigation Use

(4) Table IV Death Valley Hotel Company - Domestic Use

(5) Table Anticipated Water Usage dated July 29, 1960

(6) Drawing NMDV 2215 entitled Furnace Creek Visitor Center, Irrigation dated August 19, 1960.

5. Water Meter Readings, Furnace Creek Area for 5 meters and reservoir (15 pages).
6. Memorandum of December 20, 1960. Superintendent Liles to Regional Director transmitting Water Meter Readings, Item III-5
7. Report "Water Use National Park Service Facilities in the Furnace Creek Area of Death Valley National Monument

Part IV WATER SYSTEM

1. Description of Water System. Texas Spring Campground prepared April 7, 1958

Part IV WATER SYSTEM

Water System

prepared April 7, 1958

WATER SYSTEM

Texas Spring Campground
Death Valley National Monument

GENERAL

The system serves Texas Spring Campground and the Indian Village. Prior to the establishment of Death Valley National Monument, the Pacific Coast Borax Company constructed and maintained a water system serving a tourist camp at the campground site. During the 1930s, under the CCC program, springs were improved, supply lines laid, a 20,000 gallon underground concrete reservoir constructed and distribution lines laid. In 1940, the springs serving the campground decreased in flow following improvement by the Borax Company of their existing Texas Spring tunnel. A pipeline extension was laid to connect the system with the Borax Company settling vault near the tunnel. The entire supply now comes from the Hotel Company system.

In 1955, the distribution lines within the campground were replaced, with the exception of the major portion of the main. In the same contract a new supply line was constructed from the Borax Company system to a point on the existing line 369 feet above the reservoir.

WATER RIGHTS

Appropriative Water Right Application 10,119, Permit 5755, was filed February 17, 1941 with the State of California. Details of the appropriation are filed in Death Valley Water Right Docket No. X-6

DRAWINGS

Drawings NMDV 2129A, Water System, Texas Spring Campground and NMDV 6979, National Park Service Diversions at Texas Springs and Furnace Creek Wash, show the system.

SOURCE

The present source is a diverting tunnel owned by the Death Valley Hotel Company, Ltd., driven to intercept the main flow of Texas Springs. The National Park Service supply line connects to the Hotel Company system at a settling box 280 feet from the tunnel portal. The maximum capacity of the diversion to the National Park Service system is unknown, but is more than 35 GPM, the quantity the Borax Company agreed to deliver free of charge and the quantity for which appropriative application was made.

SUPPLY MAINS

Approximately 2730 feet of 2½-inch and 370 feet of 3-inch dipped and wrapped steel pipe, with a capacity when new of 71 GPM, connect the reservoir with the source. The 3-inch line was laid about 1938 and the 2½-inch in 1955. Both are in good condition.

X

STORAGE

The reservoir is government owned, is located 1600 feet east of the campground at an elevation of 126 feet above sea level, is of reinforced concrete buried flush with ground level, and has a capacity of 20,000 gallons.

TREATMENT None

DISTRIBUTION SYSTEM

A main line runs from the storage reservoir through the campground to the Indian Village. The main consists of 9460 feet of 3-inch wrapped steel pipe laid in the 1930s and about 150 feet of 2½-inch dipped and wrapped steel pipe laid in 1955. The capacity of the main to the center of the campground is probably about 80 GPM. Fifty 1/2-inch faucets are provided throughout the compound connected to the main by 5956 lineal feet of 3/4-inch to 2-inch laterals. Approximately 1000 lineal feet of distribution lines to outside faucets serve the Indian Village.

2½-inch

COST OF SYSTEM

Portion Constructed in 1955 (construction cost)			
Supply line, 2½-inch,	2730 feet	$4911	
Distribution System, campground		6099	
			$11,010
Portion of old system retained (depreciated value)			
Supply line, 3-inch,	370 feet	$ 370	
Reservoir, 20,000 gal. concrete		2000	
Distribution Main, Reservoir to Indian Village,	9460 feet	4780	
Distribution System, Indian Village,	1000 feet	250	
			7,400
Engineering costs			1,000
Total present value of system			$19,410

CONSUMPTION (1956-1957)

Domestic - peak, 35 GPM, by Hersey meter
- average for 6 months, 5 GPM, estimated
Irrigation - average for 12 months, 5 GPM, estimated

L. Spaulding
April 7, 1958

X

Part III TRAVEL & WATER USE

Water Use and Travel

09-00-1961: water use and future water needs ; september, 1961

Copy No 3
Supplemental Data file
- WR Dockets 3, 4, 5, 6

National Park Service
Region Four

Report on

WATER USE
and
FUTURE WATER NEEDS

of

National Park Service Facilities in the Furnace Creek Area of Death Valley National Monument

L. S. Spaulding
Hydraulic Engineer
September, 1961

10-23
(November 1954)

UNITED STATES
DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

_____
(Area)

FILE CODE:

FROM:

TO:

IMPORTANT

This file constitutes a part of the official records of the National Park Service and should not be separated or papers withdrawn without express authority of the official in charge.

All Files should be returned promptly to the File Room.

Officials and employees will be held responsible for failure to observe these rules, which are necessary to protect the integrity of the official records.

U. S. GOVERNMENT PRINTING OFFICE 16—22371-3

09-00-1961: table of contents; september, 1961

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Death Valley National Monument

Furnace Creek Area

Water Use and Future Water Needs

CONCLUSIONS

Present consumptive water use of National Park Service facilities in the Furnace Creek Area as determined by this study varies from a monthly average of 4 gallons per minute during January to a monthly average of 24 gallons per minute during June.

Water requirements in future years have been estimated as follows:

	Water use, gallons per minute 1966	1970	1980
January (low)	11	13	19
June (peak)	271	327	435

The results of this study are summarized in greater detail in Table XII, Total Water Needs.

DEVELOPMENT

Park Service facilities for which water requirements have been calculated by this report are shown on Master Plan NMDV 3127A approved by Director Wirth, March 17, 1958. Irrigated areas are shown in greater detail on drawings NMDV 2220, Visitor Center, Water System, (8" x 10½" drawing) and NMDV 3217, Visitor Center, Site Development

Facilities and proposed irrigated areas include:

Visitor Center (4.83 acres irrigated)
Furnace Creek Campground (8.70 acres irrigated)
Texas Spring Campground (3.40 acres irrigated)

DOMESTIC USE

Estimates of future domestic water requirements are based on per capita use for the Furnace Creek Area developed by studies of actual water consumption for a period in November 1960 and for the month of March 1961 (Table XIII). Predictions of future travel were developed in the report "Travel Analysis, Death Valley National Monument" by L. S. Spaulding, submitted August 19, 1960 (A88, DEVA).

Per capita rates for the periods studied

Visitor Center Museum - Auditorium (Table XIII) 2.4 gallons per visit.
Texas Spring Campground (Table XIV) 16.0 gallons per person per day.

For the purpose of calculating future needs the figures 2.5 gallons per visit at the Visitor Center and 20 gallons per person per day at the campgrounds have been used in this report.

Predictions of future travel are:

	1966	1970 (130% of 1966)	1980 (180% of 1966)
Total Monument Travel, visits	500,000	650,000	900,000
Visitor Center, visits	200,000	260,000	360,000
Campgrounds, visitor-days	150,000	195,000	260,000

IRRIGATION

This report bases irrigation needs on monthly evaporation rates for the Cow Creek - Furnace Creek Area as published by the U. S. Weather Bureau. Evaporation rates for a three year period are averaged in Table VI indicating that evaporation from a standard pan is about 149 inches per year. A factor has been applied to the monthly evaporation rates to determine the monthly consumptive use of vegetation.

Table VIII shows monthly rates developed for Bermuda grass lawns, tamarisk and mesquite. Factors have been chosen so that the resulting use rates include transit losses and other losses incidental to irrigation.

Actual water consumption for irrigation of the Visitor Center patio has been calculated using meter readings for the months of January, February and March, 1961. A comparison of theoretical and actual use is as follows:

	Water Consumption, Inches	
	Theoretical	Actual
January	1.3	6.0
February	3.2	7.0
March	8.2	9.8

The foregoing comparison indicates that the theoretical estimates of irrigation requirements may be low, especially so in the winter months.

EXPLANATION OF TABLES

Table I-Daily Water Use

These seven sheets summarize the water meter records submitted by the Superintendent and combine certain readings to determine various purposes and locations of use. The data submitted by the Superintendent have been adjusted to make each daily reading cover a 24 hour period from 8 AM on the listed day to 8 AM on the following day.

Table II - Summary - Daily Water Use

This table summarizes on one sheet the monthly averages of Table I.

Table III - Present Domestic Water Use

This table presents average travel over the past few years taken from the travel report of August 19, 1960 (A88). Data for Texas Spring Campground Use (Column F) are from Table XIV. During March 1961 use of the presently undeveloped Furnace Creek averaged 20% of Texas Spring Campground. This ratio has been used to calculate use of the campground during other months of the year (Column H).

The right hand portion of the table shows current domestic water consumption using actual metered use where available and estimated quantities where meter records are lacking. It should be noted that Furnace Creek Campground Use (Column N) is abnormally low for campground use because water is availably only in the comfort station.

Water needed for air conditioning (Column R) is a very rough guess because meter records for the summer months were not available at the time of writing this report.

Table IV - Domestic Water Needs-1966.
Based on predicted future travel and on per capita rates of use water needs have been calculated for each month of the year 1966.

Table V - Domestic Water Needs - Present and Future.
This table combines Tables III and VI and expands these data to show domestic water needs by months for the years 1961, 1966, 1970 and 1980.

Table VI - Evaporation.
Monthly evaporation rates for Cow Creek (and Furnace Creek) published by the U. S. Weather Bureau are tabulated and averaged as a basis for irrigation consumptive use calculations.

Table VII - Temperature.
Monthly average maximum and minimum temperatures recorded at Cow Creek as published by the U. S. Weather Bureau for the years 1958, 1959 and 1960 have been tabulated and averaged as a basis for irrigation consumptive use calculations.

Table VIII - Irrigation Needs - Unit Consumptive Use.
Consumptive uses of lawn, tamarisk trees and mesquite trees have been calculated by applying factors to pan evaporation rates. Factors were selected by Spaulding guided by information that consumptive use exceeds pan evaporation during the growing season for the particular varieties, that mesquite is dormant in the winter months and that water use by tamarisk falls off when the average maximum temperature falls below 72° F.

Table IX - Theoretical 1961 Irrigation Needs.
Using actual areas planted at the Visitor Center during 1961, and using rates of consumptive use developed in Table VIII theoretical water needs have been calculated for each month of 1961.

Table X - 1966 Irrigation Needs.
Using areas proposed to be irrigated under the Master Plan and using consumptive use rates developed in Table VIII irrigation needs have been calculated for each month of 1966 for the Visitor Center and Campgrounds.

Table XI
This table summarizes irrigation data for 1961 and 1966 and expands these data to show irrigation needs for the years 1970 and 1980.

Table XII - Total Water Needs.
This table, showing the main results of this study, combines Table V and Table XI to show present and future water needs for both irrigation and domestic purposes.

Table XIII - Actual Water Use, March 1961.
This table tabulates water use and visitation at the Visitor Center to determine a per capita use rate. The rate for this month was 2.41 gallons per visit.

Table XIV - Texas Spring Campground - Travel
Actual campground use as reported in the visitor use report of August 19, 1960 has been tabulated as a basis for water use calculation of Table III.

TABLE I

DAILY WATER USE, Month of SEPT. 1960, Gallons per day

Death Valley National Monument **FURNACE CREEK AREA**

Sheet 1 of 7

A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	U	V	
	VISITOR CENTER								TOTAL thru MAIN METERS			TEXAS SPR. CAMPGR.			TOTAL CONSUMPTION					
DATE Sept. '60	EXHIBIT-AUDIT. BLDG.	ADMIN. BLDG.	PATIO IRRIGATION	FRONT LAWN & OTHER	TOTAL Domestic	TOTAL Irrigation & other	FURNACE CREEK CAMP-GROUND	INDIAN VILLAGE	High Flow	Low Flow	TOTAL	Domestic	Irrigation	TOTAL	Domestic	Irrigation & Other	TOTAL	CHANGE in STORAGE	DIVERSION from TEXAS SPRING	DATE
Source of Data	meter	meter	meter	M-(B,C,D,H,J)	B + C	D + E	meter	calc. by population	meter	meter	K + L	Q - P	estimate	T - M	Sum of F, H, J, N	G + P	V - U	Level gage	meter	
1																				1
2																				2
3																				3
4																				4
5																				5
6																				6
7																				7
8																				8
9																				9
10																				10
11																				11
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16																				16
17																				17
18																				18
19																				19
20																				20
21																				21
22																				22
23 FRI																				23
24 SAT																				24
25 SUN									6 day average											25
26 MON									3800	51,000	54,800								38,200	26
27 TUE																				27
28 WED																				28
29 THUR									2 day average											29
30 FRI									2,300	3900	6200								19,800	30
X 31																				31
TOTAL																				
AVG. DAY																				

09-00-1960: table of daily water use ; september, 1960

TABLE I

DAILY WATER USE, Month of OCTOBER, 1960, Gallons per day — Death Valley National Monument FURNACE CREEK AREA

A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	U	V	
DATE Oct. 60	VISITOR CENTER				TOTAL		FURNACE CREEK CAMP-GROUND	INDIAN VILLAGE	TOTAL thru MAIN METERS			TEXAS SPR. CAMPGR.			TOTAL CONSUMPTION			CHANGE in STORAGE	DIVERSION from TEXAS SPRING	DATE
	EXHIBIT-AUDIT. BLDG.	ADMIN. BLDG.	PATIO IRRIGATION	FRONT LAWN & OTHER	Domestic	Irrigation & other			High Flow	Low Flow	TOTAL	Domestic	Irrigation	TOTAL	Domestic	Irrigation & other	TOTAL			
Source of Data	meter	meter	meter	M-(B,C,D,N,J)	B + C	D + E	meter	calc. by population	meter	meter	K + L	Q - P	estimate	T - M	Sum of F, H, J, N	G + P	V - U	Level Gage	meter	
1 SAT																				1
2 SUN																				2
3 MON									1000	7900	8900								35,600	3
4 TUE																				4
5 WED																				5
6 THU									2700	12,900	15,600			-3600			12,000	+18,700	30,700	6
7 FRI																				7
8 SAT									2900	11,300	14,200			-7500			21,700	+8900	30,600	8
9 SUN																				9
10 MON									0	8600	8600			-1700			6900	+24,100	31,000	10
11 TUE									0	9700	9700			5200			14,900	+16,100	31,000	11
12 WED									3400	10,600	14,000			1700			15,700	+16,100	31,800	12
13 THU									1900	12,100	14,000			6600			20,600	+10,700	31,300	13
14 FRI									1300	15,800	17,100			-7400			9,700	+21,400	31,100	14
15 SAT									0	14,200	14,200			16,800			31,000	0	31,000	15
16 SUN									0	11,000	11,000			6000			17,000	+13,400	30,400	16
17 MON									2100	4900	7000			-4000			3000	+26,800	29,800	17
18 TUE									4800	7500	12,300			-2900			9400	+16,100	25,500	18
19 WED									0	3700	3700			12,300			16,000	+13,400	29,400	19
20 THU									1200	15,100	16,300			3200			19,500	+10,700	30,200	20
21 FRI									4200	20,100	24,300			-300			24,000	+5400	29,400	21
22 SAT									5500	17,000	22,500			6700			29,200	+2700	31,900	22
23 SUN																				23
24 MON									2600	23,300	25,900			4400			30,300	0	30,300	24
25 TUE																				25
26 WED									7200	22,400	29,600			3100			32,700	-2700	30,000	26
27 THU									5100	25,800	30,900			14,000			44,900	-10,700	34,200	27
28 FRI									5900	28,300	34,200			7400			41,600	-5400	36,200	28
29 SAT									10,100	28,800	38,900			9100			48,000	-13,400	34,600	29
30 SUN									4500	24,400	28,900			13,000			41,900	-5400	36,500	30
31 MON									11,900	26,400	38,300			3600			41,900	-10,700	31,200	31
TOTAL									94,000	468,700	562,700								995,900	
AVG. DAY									3000	15,100	18,100			4800			24,400	+6700	32,100	
									Σ = 93,300	462,600	555,900			124,500			635,900	174,000	987,900	

10-00-1960: table of daily water use ; october table of daily water , 1960

TABLE I

DAILY WATER USE, Month of November, 1960, Gallons per day

Death Valley National Monument
FURNACE CREEK AREA

Sheet 3 of 7.

(from noon of preceding day — midnight to midnight — from 8 AM of following day)

A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	U	V	
DATE Nov. '60	VISITOR CENTER				TOTAL		FURNACE CREEK CAMP-GROUND	INDIAN VILLAGE	TOTAL thru MAIN METERS			TEXAS SPR. CAMPGR.			TOTAL CONSUMPTION			CHANGE in STORAGE	DIVERSION from TEXAS SPRING	DATE
	EXHIBIT-AUDIT. BLDG.	ADMIN BLDG.	PATIO IRRIGATION	FRONT LAWN & OTHER	Domestic	Irrigation & other			High Flow	Low Flow	TOTAL	Domestic	Irrigation	TOTAL	Domestic	Irrigation & other	TOTAL			
Source of Data	meter	meter	meter	NA(B,C,D,N,J)	B + C	D + E	meter	calc. by population	meter	meter	K + L	Q - P	estimate	T - M	Sum of F,H,J,N	G + P	V - U	Level Gage	meter	
1 TUE									5300	33,800	39,100			9000			48,100	-16,100	32,000	1
2 WED									900	14,900	15,800			2000			17,800	+13,400	31,200	2
3 THU									9000	16,200	25,200			3900			29,100	+2700	31,800	3
4 FRI									1100	14,100	15,200			5400			20,600	+10,700	31,300	4
5 SAT									5600	16,900	22,500			7300			29,800	+2700	32,500	5
6 SUN									0	16,800	16,800			4800			21,600	+10,700	32,300	6
7 MON									0	10,600	10,600			5000			15,600	+16,100	31,700	7
8 TUE											20,500	7000	0	7000			27,500	+5100	32,600	8
9 WED											23,000	9600	0	9600			32,600	0	32,600	9
10 THU											40,800	10,200	0	10,200			51,000	-16,300	34,700	10
11 FRI	5870	200*			5900	8600*	1200*	200*			16,100	13,400	0	13,400	20,900	8600	29,500	+7600	37,100	11
12 SAT	10,470	200*			10,700	0	4600	200*			15,500	14,000	0	14,000	29,500	0	29,500	+10,700	40,200	12
13 SUN	4180	100*			4300	0	2500	200*			7000	12,300	0	12,300	19,400	0	19,400	+16,700	36,100	13
14 MON	960	180			1100	1700	200*	200*			3200	8600	0	8600	10,100	1700	11,800	+21,100	32,800	14
15 TUE	800	140			900	7000	200*	200*			8300	4900	0	4900	6200	7000	13,200	+18,900	32,100	15
16 WED	680	160			800	6400	200*	200*			7600	7200	0	7200	8400	6400	14,800	+16,600	31,400	16
17 THU	360	90			500	53,400	0*	200*			54,100	6200	0	6200	6900	53,400	60,300	-29,200	31,100	17
18 FRI	450	180			600				4700	2100	6800			9000			15,800	+16,100	31,900	18
19 SAT	690	100			800				0	1400	1400			5500			6900	+24,100	31,000	19
20 SUN	790	70			900				6800	9200	16,000			3700			19,700	+11,700	31,400	20
21 MON	500	120			600				3500	8600	12,100			5500			17,600	+13,400	31,000	21
22 TUE	350	110			500				3600	8700	12,300			5300			17,600	+13,400	31,000	22
23 WED	710	80			800				3800	30,000	33,800			5800			39,600	-8000	31,600	23
24 THU	4170	40			4200				3500	32,100	35,600			19,200			54,800	-16,100	38,700	24
25 FRI	6950	70			7000				4700	35,200	39,900			16,000			55,900	-16,100	39,800	25
26 SAT	7300	60			7400				4100	33,500	37,600			15,100			52,700	-13,400	39,300	26
27 SUN	1520	20			1500				0	23,400	23,400			8400			31,800	0	31,800	27
28 MON	380	60			400				1300	23,100	24,400			3100			27,500	+2700	30,200	28
29 TUE	450	90			500				0	22,200	22,200			3400			25,600	+5400	31,000	29
30 WED	880	80			1000				0	22,700	22,700			5800			28,500	+2700	31,200	30
31																				31
TOTAL Σ	48,460										629,500			236,600			866,200	+127,300	993,400	
AVG. DAY	2420	108			2520						20,980	9340		7890			28,870	+4240	33,110	
* assumed		2150			50,400				160,000	474,000	634,000	93,400		236,600			866,200	+119,930	993,400	

11-00-1960: table of daily water use; november, 1960

DAILY WATER USE, Month of December, 1960, Gallons per day

Death Valley National Monument — FURNACE CREEK AREA — TABLE I — Sheet 4 of 7

A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	U	V	A
DATE Dec. '60	VISITOR CENTER				TOTAL		FURNACE CREEK campground	INDIAN VILLAGE	TOTAL thru MAIN METERS			TEXAS SPR. CAMPGR.			TOTAL CONSUMPTION			CHANGE in STORAGE	DIVERSION from TEXAS SPRING	DATE
	EXHIBIT-AUDIT. BLDG.	ADMIN. BLDG.	PATIO IRRIGATION	FRONT LAWN & OTHER	Domestic	Irrigation & other			High Flow	Low Flow	TOTAL	Domestic	Irrigation	TOTAL	Domestic	Irrigation & other	TOTAL			
Source of Data	meter	meter	meter	N-(B,C,D,H,J)	B + C	D + E	meter	calc. by population	meter	meter	K + L	Q - P	estimate	T-M	Sum of F, H, J, N	G + P	V - U	Level Gage	meter	
1 Thu	320	60			380				0	22,400	22,400			1300			23,700	+5400	29,100	1
2 Fri	200	40			240				2900	5300	8200			5400			13,600	+16,100	29,700	2
3 Sat	310	10			320				0	2500	2500			2600			5100	+24,100	29,200	3
4 Sun	780	10			790				0	3900	3900			8100			12,000	+16,100	28,100	4
5 Mon	530	60			590				0	30,900	30,900			2000			32,900	-5400	27,500	5
6 Tue	130	80			210				300	26,600	26,900			1100			28,000	0	28,000	6
7 Wed	210	70			280				0	3400	3400			18,100			21,500	+6700	28,200	7
8 Thu	360	30			390				0	31,200	31,200			6000			37,200	-9400	27,800	8
9 Fri	480	60			540				4100	42,300	46,400			1500			47,900	-18,700	29,200	9
10 Sat	670	40			710				1200	32,500	33,700			3200			36,900	-8000	28,900	10
11 Sun	380	30			410				0	29,800	29,800			1500			31,300	-2700	28,600	11
12 Mon	170	30			200				1700	32,800	34,500			5800			40,300	-10,700	29,600	12
13 Tue	250	60			310				700	31,500	32,200			8000			40,200	-8000	32,200	13
14 Wed	500	50			550				9700	36,700	46,400			2700			49,100	-18,700	30,400	14
15 Thu	150	105			260				4600	28,800	33,400			1100			34,500	-5,400	29,100	15
16 Fri	210	50			260				7400	10,400	17,800			7500			25,300	+8000	33,300	16
17 Sat	350	15			370				600	2200	2800			5900			8700	+21,400	30,100	17
18 Sun	720	0			720				3500	5000	8500			3200			11700	+18,700	30,400	18
19 Mon	860	80			940				1800	5000	6800			7300			14,100	-16,100	30,200	19
20 Tue	780	60			840				0	3100	3100			10,900			14,000	+16,000	30,000	20
21 Wed	920	80			1000				400	7400	7800			22,500			30,300	0	30,300	21
22 Thu	620	90			710				4700	16,000	20,700			6300			27,000	+2700	29,700	22
23 Fri	1180	60			1240				0	24,700	24,700			5900			30,600	0	30,600	23
24 Sat	710	10			720				0	24,900	24,900			9000			33,900	-2700	31,200	24
25 Sun	1400	20			1420				2100	27,800	29,900			5400			35,300	-2700	32,600	25
26 Mon	1080	30			1110				0	11,800	11,800			18,000			29,800	+2700	32,500	26
27 Tue	1970	20			1990				0	27,000	27,000			10,900			37,900	-2700	35,200	27
28 Wed	2940	60			3000				0	14,000	14,000			19,000			33,000	+2700	35,700	28
29 Thu	3040	50			3090				10,800	46,000	56,800			9300			66,100	-32,200	33,900	29
30 Fri	2160	100			2260				0	39,300	39,300			9500			48,800	-13,400	35,400	30
31 Sat	2620	40			2660				800	43,900	44,700			15,400			60,100	-24,100	36,000	31
TOTAL	26,990	1500			28,490				57,600	670,300	727,900			234,400			962,300	-8000	954,300	
AVG. DAY	870	48			920				1860	21,600	23,500			7560			31,000	-260	30,700	
Σ	26,860	1500			28,510				57,300	669,100	726,400			234,400			960,800	-8100	952,700	

JOHN SPRUCE USGS TOPOGRAPHIC DAILY

12-00-1960: table of daily water use ; december, 1960

DAILY WATER USE, Month of January, 1961, Gallons per day

Death Valley National Monument — FURNACE CREEK AREA — Table I, Sheet 5 of 7

A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	U	V	
DATE Jan. '61	VISITOR CENTER				TOTAL		FURNACE CREEK CAMP-GROUND	INDIAN VILLAGE	TOTAL thru MAIN METERS			TEXAS SPR. CAMPGR.			TOTAL CONSUMPTION			CHANGE in STORAGE	DIVERSION from TEXAS SPRING	DATE
	EXHIBIT-AUDIT. BLDG.	ADMIN. BLDG.	PATIO IRRIGATION	FRONT LAWN & OTHER	Domestic	Irrigation & other			High Flow	Low Flow	TOTAL	Domestic	Irrigation	TOTAL	Domestic	Irrigation & other	TOTAL			
Source of Data	meter	meter	meter	N-(B,C,D,K,J)	B + C	D + E	meter	calc. by population	meter	meter	K + L	Q - P	estimate	T-M	Sum of F, H, J, N	G + P	V - U	Level Gage	meter	
1 Sun	2760	20			2780				0	14,300	14,300			9500			23,800	+ 10,800	34,600	1
2 Mon	1150	0			1150				7600	6200	13,800			2900			16,700	+ 13,400	30,100	2
3 Tue	380	50			430				0	600	600			3600			4200	+ 24,100	28,300	3
4 Wed	670	40			710				6700	2400	9100			2500			11600	+ 16,100	27,700	4
5 Thu	320	50			370				5900	6500	12,400			11,100			23,500	+ 5400	28,900	5
6 Fri	280	40			320				0	23,300	23,300			5200			28,500	0	28,500	6
7 Sat	420*	30*			450				100*	20,500*	20,600			7800			28,400	0	28,400	7
8 Sun	420*	30*			450				100*	20,600*	20,700			7800			28,500	0	28,500	8
9 Mon	340	80			420				0	20,400	20,400			8600			29,000	0	29,000	9
10 Tue	540	120			660				0	36,000	36,000			300			36,300	- 8000	28,300	10
11 Wed	580	120			700				12,300	42,900	55,200			5800			61,000	-32,200	28,800	11
12 Thu	550	70			620				0	10,200	10,200			4200			14,400	+ 16,100	30,500	12
13 Fri	150	60			210				0	7800	7800			4900			12,700	+ 16,100	28,800	13
14 Sat	480	0	Meter Installed Jan. 17		480				5500	19,400	24,900			1500			26,400	+ 2800*	29,200	14
15 Sun	630	20			650				13,800	16,800	30,600			1500			32,100	- 2800*	29,300	15
16 Mon	260	60			320				2100	15,700	17,800			5500			23,300	+ 5400	28,700	16
17 Tue	240	70	5400*		310				12,900	46,000	58,900			6300			65,200	-37,500	27,700	17
18 Wed	600	60	0*		660				10,700	32,500	43,200			5400①			31,200	0	31,200	18
19 Thu	600	60	900		660				1900	20,600	22,500			5400①			45,300	-16,100	29,200	19
20 Fri	400	30	0		430				0	8900	8900			5100			14,000	+ 16,100	30,100	20
21 Sat	300	40	0		340				0	10,800	10,800			2000①			8200	+ 21,400	29,600	21
22 Sun	1200	30	0		1230				600	19,600	20,200			2100①			26,900	+ 2700	29,600	22
23 Mon	600	50	3300		650				4200	17,400	21,600			1800			23,400	+ 5400	28,800	23
24 Tue	400	50	0		450				0	9700	9700			8100			17,800	+ 10,700	28,500	24
25 Wed	400	50	0		450				2500	26,500	29,000			5800			34,800	- 5400	29,400	25
26 Thu	500	80	7500		580				4300	23,600	27,900			5300			33,200	- 2700	30,500	26
27 Fri	500	80	0		580				0	21,100	21,100			3700			24,800	+ 5400	30,200	27
28 Sat	700	10	0		710				0	20,300	20,300			6500			26,800	+ 2700	29,500	28
29 Sun	900*	30*	0		930				0	51,400*	51,400			7200			58,600	- 28,500*	30,100	29
30 Mon	500*	100*	5700		600				5800	51,400*	57,200			1600			58,800	- 28,600*	30,200	30
31 Tue	500	60	0		560				0	50,700	50,700			7900			58,600	-28,600*	30,000	31
TOTAL from meter	18,270	1590	22,800		19,860				96,900	674,100	771,000			157,200			928,200	-16,100	912,100	
AVG. DAY	590	51	1520		640				3100	21,700	24,800			5100			29,900	- 500	29,400	

*assumed
① adjusted

18270 1590 22,800 19860 — 97,000 674,100 771,100 — 156,900 156,900 — 928,000 - 15,800 928,000 912,200

DAILY WATER USE, Month of February, 1961, Gallons per day

Death Valley National Monument — Table I, Sheet 6 of 7

FURNACE CREEK AREA

Quantity of water from 0 AM of named date to 0 AM of following day

A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	U	V	
DATE Feb. '61	VISITOR CENTER				TOTAL		FURNACE CREEK CAMP-GROUND	INDIAN VILLAGE	TOTAL thru MAIN METERS			TEXAS SPR. CAMPGR.			TOTAL CONSUMPTION			CHANGE in STORAGE	DIVERSION from TEXAS SPRING	DATE
	EXHIBIT-AUDIT. BLDG.	ADMIN. BLDG.	PATIO IRRIGATION	FRONT LAWN & OTHER	Domestic	Irrigation & other			High Flow	Low Flow	TOTAL	Domes-tic	Irri-gation	TOTAL	Domestic	Irrigation & other	TOTAL			
Source of Data	meter	meter	meter	Nr(B,C,D,H,J)	B + C	D + E	meter	calc. by population	meter	meter	K + L	Q - P	estimate	T - M	Sum of F, H, J, N	G + P	V - U	Level Gage	meter	
1 Wed	300	100	0		400				0	2500	2500			700			3200	+26,800	30,000	1
2 Thu	500	130	0		630				0	2200	2200			3100			5300	+24,100	29,400	2
3 Fri	400	70	0		470				0	2200	2200			2600			4800	+24,100	28,900	3
4 Sat	500	40	0		540				0	2800	2800			16,500			19,300	+10,700	30,000	4
5 Sun	800	40	6200		840				10,200	40,800	51,000			3900			54,900	-24,100	30,800	5
6 Mon	700	80	800		780				5400	24,500	29,900			5200			35,100	-5400	29,700	6
7 Tue	500	310	0		810				5900	22,700	28,600			5200			33,800	-2700	31,100	7
8 Wed	400	80	0		480				0	18,400	18,400			5300			23,700	+8000	31,700	8
9 Thu	700	80	13,800		780				20,200	25,500	45,700			3900			49,600	-18,700	30,900	9
10 Fri	400	60	0		460				0	17,700	17,700			12,600			30,300	+2700	33,000	10
11 Sat	1500	30	0		1530				0	18,600	18,600			6600			25,200	+8000	33,200	11
12 Sun	2700	40	0		2740				0	19,400	19,400			9200			28,600	+5400	34,000	12
13 Mon	800	80	0		880				0	16,400	16,400			6700			23,100	+8000	31,100	13
14 Tue	800	60	2400		860				10,400	20,700	31,100			5900			37,000	-5400	31,600	14
15 Wed	500	80	0		580				0	15,900	15,900			3500			19,400	+10,700	30,100	15
16 Thu	800	60	0		860				0	29,900	29,900			5000*			45,400	-16,100	29,300	16
17 Fri	600	70	7100		670				5800	41,400	47,200			5100*			41,800	-10,700	31,100	17
18 Sat	1000	40	0		1040				0	31,300	31,300			4900			36,200	-5400	30,800	18
19 Sun	900	40	8100		940				23,600	36,700	60,300			6300			66,600	-34,800	31,800	19
20 Mon	600	50	6000		650				800	12,300	13,100			4700			17,800	+13,400	31,200	20
21 Tue	600	70	0		670				15,500	19,200	34,700			3600			38,300	-8000	30,300	21
22 Wed	900	30	100		930				0	9800	9800			4800			14,600	+16,100	30,700	22
23 Thu	700	160	1400		860				0	10,400	10,400			3100			13,500	+16,100	29,600	23
24 Fri	400	50	7100		450				3700	11,600	15,300			13,700			29,000	+2700	31,700	24
25 Sat	1400	30	0		1430				0	10,100	10,100			4200			14,300	+18,700	33,000	25
26 Sun	1200	50	0		1250				0	8500	8500			1900			10,400	+18,700	29,100	26
27 Mon	400	50	0		450				7600	29,800	37,400			2300			39,700	-10,700	29,000	27
28 Tue	500	90	1600		590				600	25,400	26,000			7800			33,800	-2700	31,100	28
29																				29
30																				30
31																				31
TOTAL per meter	21,500	2070	54,600		23,570				109,500	526,700	636,200			158,300			794,500	+69,700	864,200	
AVG. DAY	770	74	1950		840				3900	18,800	22,700			5700			28,400	+2500	30,900	

*adjusted: 21,500 2070 54,600 — 23,570 / 23,510 — 109,700 526,700 636,400 / 636,400 — 158,500 / 158,300 — 794,700 69,500 864,200

02-00-1961: table of daily water use ; feburary, 1961

DAILY WATER USE, Month of March, 1961, Gallons per day — Death Valley National Monument — FURNACE CREEK AREA

Table I
Sheet 7 of 7

A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	U	V	
DATE Mar. '61	VISITOR CENTER				TOTAL		FURNACE CREEK CAMPGROUND	INDIAN VILLAGE	TOTAL thru MAIN METERS			TEXAS SPR. CAMPGR.			TOTAL CONSUMPTION			CHANGE in STORAGE	DIVERSION from TEXAS SPRING	DATE
	EXHIBIT-AUDIT. BLDG.	ADMIN. BLDG.	PATIO IRRIGATION	FRONT LAWN & OTHER	Domestic	Irrigation & other			High Flow	Low Flow	TOTAL	Domestic	Irrigation	TOTAL	Domestic	Irrigation & other	TOTAL			
Source of Data	meter	meter	meter	N-(B,C,D,H,J)	B + C	D + E	meter	calc. by population	meter	meter	K + L	Q - P	estimate	T - M	Sum of F, H, J, N	G + P	V - U	Level Gage	meter	
1 Wed	500	80	3300	13,000	580	16,300	8200	200*	2500	22,800	25,300	3500	3000*	6500	12,500	19,300	31,800	0	31,800	1
2 Thu	400	60	400	10,300	460	10,700	1400	200*	2600	10,200	12,800	2700	6000*	8700	4800	16,700	21,500	+8000	29,500	2
3 Fri	600	80	0	6900	680	6900	200	200*	0	8000	8000	3600	8000*	11,600	4700	14,900	19,600	+10,700	30,300	3
4 Sat	1900	10	7100	8800	1910	15,900	41,600	200*	4100	55,500	59,600	5200	9000*	14,200	48,900	24,900	73,800	-40,200	33,600	4
5 Sun	2000	40	1500	16,200	2040	17,700	31,500	200*	10,100	41,300	51,400	9500	0*	9500	43,200	17,700	60,900	-26,800	34,100	5
6 Mon	600	80	0	9400	680	9400	6900	200*	0	17,200	17,200	4200	3000*	7200	12,000	12,400	24,400	+8000	32,400	6
7 Tue	500	130	2100	12,900	630	15,000	100	200*	6300	9600	15,900	5500	0*	5500	6400	15,000	21,400	+10,700	32,100	7
8 Wed	500	80	2200	12,400	580	14,600	0	200*	7700	7700	15,400	4500	3000*	7500	5300	17,600	22,900	+8000	30,900	8
9 Thu	600	40	900	3300	640	4200	0	200*	0	5000	5000	5700	0*	5700	6500	4200	10,700	+21,400	32,100	9
10 Fri	500	30	7200	4000	530	11,200	100	200*	3700	8300	12,000	6300	3000*	9300	7100	14,200	21,300	+10,700	32,000	10
11 Sat	1800	70	0	3500	1870	3500	300	200*	0	5900	5900	7500	16,000*	23,500	9900	19,500	29,400	+5400	34,800	11
12 Sun	1700	10	0	46,400	1710	46,400	200	200*	0	48,500	48,500	11,700	0*	11,700	13,800	46,400	60,200	-26,800	33,400	12
13 Mon	600	60	5700	34,200	660	39,900	200	200*	10,000	31,000	41,000	7500	0*	7500	8600	39,900	48,500	-16,100	32,400	13
14 Tue	700	60	0	14,300	760	14,300	200	200*	0	15,500	15,500	6100	0*	6100	7300	14,300	21,600	+10,700	32,300	14
15 Wed	800	50	1200	15,600	850	16,800	100	200*	0	18,000	18,000	6000	3000*	9000	7200	19,800	27,000	+5400	32,400	15
16 Thu	1000	50	0	23,600	1050	23,600	100	200*	0	25,000	25,000	5200	4000*	9200	6600	27,600	34,200	0	34,200	16
17 Fri	600	40	9100	23,200	640	32,300	100	200*	3800	29,400	33,200	7300	7000*	14,300	8200	39,300	47,500	-13,400	34,100	17
18 Sat	1500	30	0	23,200	1530	23,200	300	200*	0	25,200	25,200	5700	0*	5700	7700	23,200	30,900	+2700	33,600	18
19 Sun	1600	30	5400	29,500	1630	34,900	100	200*	10,400	26,400	36,800	7300	0*	7300	9200	34,900	44,100	-10,700	33,400	19
20 Mon	500	40	0	21,200	540	21,200	100	200*	0	22,000	22,000	6500	0*	6500	7300	21,200	28,500	+2700	31,200	20
21 Tue	1200	50	1000	17,200	1250	18,200	200	200*	1900	18,000	19,900	6000	0*	6000	7700	18,200	25,900	+5400	31,300	21
22 Wed	600	50	7100	27,300	650	34,400	0	200*	11,300	24,000	35,300	3500	3000*	6500	4400	37,400	41,800	-10,700	31,100	22
23 Thu	900	100	0	29,200	1000	29,200	100	200*	0	30,500	30,500	4400	6000*	10,400	5700	35,200	40,900	-8000	32,900	23
24 Fri	600	70	3200	34,400	670	37,600	200	200*	8300	30,400	38,700	4100	6000*	10,100	5200	43,600	48,800	-16,100	32,700	24
25 Sat	3500	600	300	22,600	4100	22,900	1000	200*	3400	24,800	28,200	9100	9000*	18,100	14,400	31,900	46,300	-8000	38,300	25
26 Sun	6100	50	500	6600	6150	7100	1300	200*	0	14,800	14,800	17,000	0*	17,000	24,700	7100	31,800	+8000	39,800	26
27 Mon	6800	80	6800	7800	6880	14,600	1000	200*	4000	18,700	22,700	19,400	0*	19,400	27,500	14,600	42,100	-2700	39,400	27
28 Tue	6900	90	0	9000	6990	9000	1000	200*	0	17,200	17,200	16,500	0*	16,500	24,700	9000	33,700	+5400	39,100	28
29 Wed	5600	90	0	7200	5690	7200	900	200*	200	13,800	14,000	13,600	0*	13,600	20,400	7200	27,600	+10,700	38,300	29
30 Thu	4500	60	10,100	25,300	4560	35,400	700	200*	10,900	30,000	40,900	15,800	0*	15,800	21,300	35,400	56,700	-18,700	38,000	30
31 Fri																				31
TOTAL																				
AVG. DAY	1840	77	2500	17,310	1920	19,810	3260	200	3370	21,830	25,200	7680	2970	10,650	13,060	22,780	35,840	-2140	33,700	
△ Mar. 1-30 incl	55,300	2310	75,100	519,300	57,610	594,400	97,900	6000	101,100	654,800	755,900	230,400	89,000	319,400	391,900	683,400	1075,300	-64,300	1,011,000	
*assumed	55,600	2310	75,100	516,500	57,910	592,600	98,100	6000	101,200	654,700	755,900	230,400	89,000	319,400	391,900		1075,800	-64,300	1,011,500	

03-00-1961: table of daily water use ; march, 1961

TABLE II

SUMMARY
AVERAGE DAILY WATER USE · Gallons per day

Death Valley National Monument
FURNACE CREEK AREA

Sheet 1 of 1
L. Spaulding
Sept. 5, 1961

A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	U	V	
MONTH	VISITOR CENTER						FURNACE CR.	INDIAN	TOTAL thru MAIN METER			TEXAS SPR. CAMPGR.			TOTAL CONSUMPTION			CHANGE in STORAGE	DIVERSION from TEXAS SPRING	MONTH
	EXHIBIT AUDIT. BLDG.	ADMIN. BLDG.	PATIO Irrigation	FRONT LAWN & OTHER	TOTAL Domestic B+C	TOTAL Irrigation & other	Camp-ground	VILLAGE	High Flow	Low Flow	TOTAL	Domes-tic	Irri-gation	TOTAL	Domestic	Irrigation & other	TOTAL			
Source of data	meter	meter	meter	M less the sum BCDHJ	~~M less the sum BCDHJ~~	D + E	meter	est.	4" meter	1½" meter	K + L	Q - P	estimate	T - M	Sum of F.H.J.N	G + P	V - U	level gage	meter	
1960 AUG.	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	AUG
SEP.	*	*	*	*	*	*	*	*	*	*	42,400 (3)	*	*	*	*	*	*	*	33,600 (3)	SEP
OCT.	*	*	*	*	*	*	*	*	3000	15,100	18,100	*	*	4800	*	*	24,400	+6700	32,100	OCT
NOV.	2420 (4)	108 (4)	*	*	2520	11,000 (1)	1270 (1)	200	*	*	21,000	9340 (2)	*	7890	*	*	28,900	+4200	33,100	NOV
DEC.	870	48	*	*	920	*	*	*	1900	21,600	23,500	*	*	7560	*	*	31,000	- 300	30,700	DEC
Average last Qtr. '60																				
1961 JAN.	590	51	1520	*	640	*	~~3100~~ *	*	3100	21,700	24,800	*	*	5100	*	*	29,900	- 500	29,400	JAN
FEB.	770	74	1950	*	840	*	*	*	3900	18,800	22,700	*	*	5700	*	*	28,400	+2500	30,900	FEB
MAR	1840	77	2500	17,300	1920	19,800	3260	200	3370	21,800	25,200	7680	2970	10,650	13,060	22,780	35,840	-2100	33,700	MAR
APR.																				
MAY																				
JUN																				
JUL																				
AUG																				
SEP																				
OCT																				
NOV																				
DEC																				
Average 1961																				

① 7 day average during '49er encampment
② 10 " " " " "
③ 8 day average

* Quantity not recorded
④ 20 day average

00-00-0000: summary of monthly water use tables

TABLE III
PRESENT (1960 - 1961)

L. Spaulding
Sept. 6, 1961

DOMESTIC WATER USE — FURNACE CREEK AREA

A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R
MONTH	TRAVEL visits per month, visitor days/month								WATER CONSUMPTION. Gal. per month						
	VISITS TO MONUMENT		VISITS TO VISITOR CENTER		TEXAS SPR. CAMPGROUND		FURNACE CR. CAMPGROUND		VISITOR CENTER		CAMPGROUNDS		INDIAN VILLAGE	TOTAL	AIR CONDITIONING
	VISITS	% of annual total	(Year-end) VISITS (4or-4 E)	% of annual	VISITOR-DAYS	% of annual	VISITOR-DAYS (25% of F)	% of annual	MUSEUM - AUDIT-ORIUM (2.5 x A)	ADMIN.	TEXAS SPRING (20 x F)	FURNACE CREEK (20 x H)		Gallons per mo.	Gal per month
JANUARY	27,400 ①	8.5	11,000 *		4200 ②	9.4	840 *		18,100	1530 ⑤	84,000	8500 *	6000 *	112,400	
FEBRUARY	36,000 ①	10.3	14,400 *		5500 ③	12.3	1100 *		21,500	2070 ⑤	110,000	3300 *	6000 *	142,900	
MARCH	48,900 ①	13.3	19,600 *		9690 ④	21.6	2823 ⑤		47,200	2390 ⑤	31,000	4500	6000 *	257,700	-
APRIL	44,100 ①	12.9	17,600 *		4600 ⑤	10.3	920 *		44,000 **	2000 *	92,000	2800 *	5000 *	145,800 **	3000 *
MAY	21,800 ①	6.4	8700 *		660 ⑤	1.0	90 *		21,800 **	2000 *	9200	300 *	1000 *	34,300 **	30,000 *
JUNE	15,700 ①	4.6	6300 *		70 ⑤	0.2	10 *		15,100 **	2000 *	1400	— *	— *	19,100 **	150,000 *
JULY	12,300 ①	3.9	5300 *		10 ⑤	—	— *		13,200 **	2000 *	200	— *	— *	16,400 **	150,000 *
AUGUST	16,100 ①	4.7	6400 *		30 ⑤	0.1	— *		14,000 **	2000 *	600	— *	— *	18,600 **	120,000 *
SEPTEMBER	18,800 ①	5.5	7500 *		80 ⑤	0.2	20 *		18,700 **	2000 *	1600	100 *	3000 *	25,400 **	90,000 *
OCTOBER	28,100 ①	8.2	11,200 *		870 ⑤	1.9	170 *		28,000 **	2000 *	17,400	1500 *	6000 *	52,900 **	30,000 *
NOVEMBER	41,700 ①	12.2	16,700 *		12,980 ⑤	29.0	2600 *		41,500	2000 *	259,600	7800 *	6000 *	317,200	
DECEMBER	29,600 ①	8.7	11,800 *		6820 ⑤	14.1	1260 *		27,000	1500 ⑤	124,400	3800 *	6000 *	164,700	
TOTAL	341,500	100	136,500		44,810	100	9830		313,000	23,600	896,200	29,600	44,000	1306,400	760,000

① 5 year average 1957 - 1961
② 4 year average 1957 - 1960
③ 6 year average 1955 - 1960
④ 5 year average 1955 - 1959
⑤ Actual use 1961
⑥ Actual use 1960
⑦ Data from memo of August 19, 1960 "Travel Analysis" Spaulding to Reg. Ch. of Opr. (A-88)
⑧ Est. 33⅓% of Monument visitors visit Visitor Center plus 18% increase in travel over 57-61 avg.
⑨ Average per capita use = 120 gpd according to study during '60 49er encampment
= 16 gpd during March 1961
⑩ Average per capita use = 3.1 gpd during March 1961

* Estimated (Accurate data unavailable at time of preparation of table)
** Does not include air conditioning water use

09-06-1961: present domestic water use; september 06, 1961

00-00-0000: domestic water needs ; , 1966

TABLE IV

DEATH VALLEY NATIONAL MONUMENT
FURNACE CREEK AREA

DOMESTIC WATER NEEDS
Predicted for 1966

Predicted visits to Monument, 1966 (A88, DEVA, August 19, 1960) 500,000 visits.
Predicted visits to Visitor Center, 40% of total visits to Monument.
Predicted campground use, Texas Spring and Furnace Creek Campgrounds (A88, DEVA, August 19, 1960) 150,000 visitor days.
Predicted monthly variation - same as 1957 - 1961 - average (See Table III).

	1966 TRAVEL			1966 WATER USE, VISITOR CENTER			GALLONS PER MONTH	
Month	Monument Visits	Visitor Center Visits 40% of Monument	Campgrounds VisitorDays	Museum-Auditorium 2.5 gal/ visit	Administration 150% of 1961	Air Conditioning 120% of 1961	CAMPGROUNDS 20 gallons per visitor day	TOTAL
Jan.	40,000	16,000	14,000	40,000	2,400	--	282,000	324,000
Feb.	52,500	21,000	18,400	52,500	3,100	--	368,000	424,000
Mar.	71,500	28,600	32,400	71,500	3,600	--	648,000	723,000
Apr.	64,500	25,800	15,500	64,500	3,000	36,000	310,000	414,000
May	32,000	12,800	1,500	32,000	3,000	108,000	30,000	173,000
Jun.	23,000	9,200	300	23,000	3,000	180,000	6,000	212,000
Jul.	14,500	5,800	--	14,500	3,000	180,000	--	198,000
Aug.	23,500	9,400	100	23,500	3,000	144,000	2,000	173,000
Sept.	27,500	11,000	300	27,500	3,000	108,000	6,000	145,000
Oct.	41,000	16,400	2,900	41,000	3,000	36,000	58,000	138,000
Nov.	61,000	24,400	43,500	61,000	3,000	--	870,000	934,000
Dec.	43,500	17,400	21,200	43,500	2,300	--	424,000	470,000
TOTAL	500,000	200,000	150,000	500,000	35,400	910,000	3,000,000	4,445,000

08-19-1960: domestic water needs ; august 19, 1960

TABLE V

DEATH VALLEY NATIONAL MONUMENT
FURNACE CREEK AREA

DOMESTIC WATER NEEDS

Present and Future

Predicted 1970 water use equals 130% of 1966 use (See A88, DEVA, August 19, 1960).
Predicted 1980 water use equals 180% of 1966 use (See A88, DEVA, August 19, 1960).

PREDICTED WATER USE, Gallons per Month and Gallons per Minute

Month	1961 Table III Gallons per month	1961 Table III Average gpm	1966 Table IV Gallons per month	1966 Table IV Average gpm	1970 130% of 1966 Gallons per month	1970 130% of 1966 Average gpm	1980 180% of 1966 Gallons per month	1980 180% of 1966 Average gpm
Jan.	112,000	2.5	324,000	7.3	420,000	9.4	580,000	13.0
Feb.	143,000	3.5	424,000	10.5	550,000	13.6	760,000	18.8
Mar.	258,000	5.8	723,000	16.2	940,000	21.1	1,300,000	29.1
Apr.	176,000	4.1	414,000	9.6	540,000	12.5	750,000	17.3
May	124,000	2.8	173,000	3.9	220,000	4.9	310,000	6.9
June	169,000	3.9	212,000	4.9	280,000	6.5	380,000	8.8
July	165,000	3.7	198,000	4.4	260,000	5.8	360,000	8.1
Aug	139,000	3.1	173,000	3.9	220,000	4.9	310,000	6.9
Sep.	115,000	2.7	145,000	3.4	190,000	4.4	260,000	6.0
Oct.	83,000	1.9	138,000	3.1	180,000	4.0	250,000	5.6
Nov.	317,000	7.3	934,000	21.6	1,210,000	28.0	1,680,000	38.9
Dec.	165,000	3.7	470,000	10.5	610,000	13.7	850,000	19.0
Year	2,066,000	3.9	4,445,000	8.5	5,770,000	11.0	8,000,000	15.2

09-00-1961: evaporation table; september, 1961

TABLE VI

EVAPORATION
Cow Creek - Furnace Creek Area

Evaporation from Standard Weather Bureau type pan of 4 foot diameter
Data from "Climatological Data, California"
published by U. S. Department of Commerce

EVAPORATION, INCHES

Month	1958	1959	1960	1961	Average
Jan		4.02	2.72	2.88	3.2
Feb		5.66	5.38	5.82	5.6
Mar	Pan installed	10.92	9.90	9.94	10.2
Apr	April 19, 1958	13.79	14.17	14.31	14.1
May	17.98	17.13	16.65	22.82*	18.6
June	21.71	21.03	21.36	25.17	22.3
July	22.44	21.26	22.71		22.1
Aug	19.16	19.84	21.51		18.2
Sept	17.90	13.48	14.69		15.4
Oct	11.09	10.96	10.09		10.7
Nov	6.70	4.97	3.72		5.1
Dec	3.68	3.82	4.31	----	3.9
Year		146.88	147.21		149.4

*Pan moved to Furnace Creek from Cow Creek

09-00-1961: temperature table; september, 1961

TABLE VII

TEMPERATURE

Cow Creek - Furnace Creek

(Cow Creek temperatures have been used (prior to 1961) rather than Greenland Ranch in that reading# of the Cow Creek weather station probably has been done with greater care.)

average monthly maximums and minimums

Month	1958		1959		1960		Average	
	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
Jan	43.5	68.7	46.3	69.1	40.0	61.4	43.3	66.2
Feb	51.4	74.7	48.3	71.3	46.5	71.2	48.7	72.4
Mar	53.4	75.7	59.3	86.2	58.9	86.2	57.1	82.7
Apr	62.1	89.1	69.2	96.9	66.6	93.8	65.0	93.3
May	75.5	104.8	73.1	98.1	72.2	101.4	73.6	101.4
Jun	81.1	109.7	85.7	113.7	87.7	115.7	83.8	113.0
Jul	87.5	115.2	92.9	120.2	91.1	119.5	90.5	118.3
Aug	90.0	117.0	86.6	113.8	88.2	116.2	88.3	115.7
Sept	81.2	108.5	76.1	102.7	79.4	109.9	78.9	107.0
Oct	68.4	96.9	67.6	95.7	65.0	92.5	67.0	95.0
Nov	49.0	76.0	50.1	78.8	50.3	74.4	49.8	76.4
Dec	43.1	69.1	44.1	66.8	42.0	66.2	43.1	67.4

TABLE VIII

IRRIGATION NEEDS
UNIT CONSUMPTIVE USE

Unit Consumptive Use = Factor x Pan Evaporation

Factor depends on plant variety, growing season, temperature, density of growth. Factors have been selected by Spaulding based on data in T. W. Robinson's letter of April 6, 1955 to B. F. Manbey concerning consumptive use at Saratoga Springs, Death Valley.

Month	CLIMATOLOGICAL DATA (Tables VI & VII) Temperature Average Minimum	Temperature Average Maximum	Pan Evaporation Inches per month	UNIT CONSUMPTIVE USE, INCHES OF WATER PER MONTH Lawn Factor	Lawn Inches	Tamarisk Factor	Tamarisk Inches	Mesquite Factor	Mesquite Inches
Jan	43.3	66.2	3.2	0.4	1.3	0.2	0.6	0.0	0
Feb	48.7	72.4	5.6	0.6	3.4	0.5	2.8	0.3	1.7
Mar	57.7	82.7	10.2	0.8	8.2	0.8	8.2	0.5	5.1
Apr	66.0	93.3	14.1	1.0	14.1	1.0	14.1	0.8	11.3
May	73.6	101.4	18.6	1.1	20.5	1.2	23.3	1.0	18.6
Jun	83.8	113.0	22.3	1.2	26.8	1.2	26.8	1.0	22.3
Jul	90.5	118.3	22.1	1.1	24.3	1.2	26.5	1.0	22.1
Aug	88.3	115.7	18.2	1.1	20.0	1.2	21.8	1.0	18.2
Sep	78.9	107.0	15.4	1.0	15.4	1.2	18.5	0.8	12.3
Oct	67.0	95.0	10.7	0.8	8.6	1.0	10.7	0.6	6.4
Nov	49.8	76.4	5.1	0.6	3.1	0.8	4.1	0.2	1.0
Dec	43.1	67.4	3.9	0.4	1.6	0.2	0.8	0.0	0
Year			149.4		147.3		157.2		119.0

TABLE IX

THEORETICAL 1961 IRRIGATION NEEDS

Area Irrigated (See Drawing NMDV 2220, Report of 1/24/61)

Patio Lawn, Trees and Pool - Total	6,290 acre
Front Lawn	0.76
Trees and shrubs between parking areas	0.14
	1.19 acres

Consumptive use in acre feet per month = $\frac{1.19}{12}$ x Unit Use

Month	UNIT USE (Table VIII) Inches per month (lawn factor)	CONSUMPTIVE USE Acre Feet per month	Gallons per month	Gallons per minute
Jan	1.3	0.1	33,000	1
Feb	3.4	0.3	98,000	2
Mar	8.2	0.8	260,000	6
Apr	14.1	1.4	460,000	11
May	20.5	2.0	650,000	15
Jun	26.8	2.7	880,000	20
Jul	24.3	2.4	750,000	17
Aug	20.0	2.0	650,000	15
Sept	15.4	1.5	490,000	11
Oct	8.6	0.9	290,000	6
Nov	3.1	0.3	98,000	2
Dec	1.6	0.2	65,000	1
Year, Total or Average	147.3	14.6	4,750,000	9

TABLE X

1966 IRRIGATION NEEDS

Irrigated Areas based on data in Water Use Report of August 22, 1960 (154)

Month	VISITOR CENTER 4.83 acres lawn, mesquite, tamerisk, and palm		CAMPGROUNDS 12.10 acres mesquite and tamerisk		TOTAL IRRIGATION NEEDS	
	Average Unit Use Table VIII Inches per Month	Acre Feet per month	Average Unit Use Table VIII Inches per Month	Acre Feet per month	Acre Feet per month	Gallons per month
Jan	0.6	0.2	0.3	0.3	0.5	160,000
Feb	2.8	1.1	2.3	2.3	3.4	1,110,000
Mar	8.0	3.2	6.8	6.8	10.0	3,260,000
Apr	14.0	5.6	12.8	12.8	18.4	6,000,000
May	21.0	8.5	21.2	21.2	29.7	9,700,000
June	26.0	10.5	24.8	24.8	35.3	11,500,000
July	25.0	10.1	24.5	24.5	34.6	11,300,000
Aug	21.0	8.5	20.2	20.2	28.7	9,400,000
Sept	16.0	6.4	15.5	15.5	21.9	7,100,000
Oct	9.5	3.8	8.7	8.7	12.5	4,070,000
Nov	3.5	1.4	2.6	2.6	4.0	1,300,000
Dec	0.8	0.3	0.4	0.4	0.7	230,000
Year	148.2	59.6	138.9	140.1	199.7	65,130,000

TABLE XI

1961, 1966, 1970 and 1980 IRRIGATION NEEDS

IRRIGATION NEEDS, Gallons per Month and Average Gallons per Minute

Month	Theoretical 1961 Table IX		1966 Table X		1970 120% of 1966		1980 160% of 1966	
	Gallons per month	Average gpm	Gallons per month	Average gpm	Gallons per month	Average gpm	Gallons per month	Average gpm
Jan	33,000	1	160,000	4	190,000	4	260,000	6
Feb	98,000	2	1,110,000	27	1,330,000	33	1,780,000	44
Mar	260,000	6	3,260,000	73	3,900,000	87	5,200,000	116
Apr	460,000	11	6,000,000	139	7,200,000	167	9,600,000	222
May	650,000	15	9,700,000	217	11,600,000	260	15,500,000	347
Jun	880,000	20	11,500,000	266	13,800,000	320	18,400,000	426
Jul	750,000	17	11,300,000	253	13,600,000	304	18,100,000	405
Aug	650,000	15	9,400,000	210	11,300,000	253	15,000,000	336
Sept	490,000	11	7,100,000	164	8,500,000	197	11,400,000	264
Oct	290,000	6	4,070,000	91	4,900,000	110	6,500,000	145
Nov	98,000	2	1,300,000	30	1,560,000	36	2,080,000	48
Dec	65,000	1	230,000	5	280,000	6	370,000	8
Year	4,750,000	9	65,130,000	124	78,100,000	149	104,200,000	198

TABLE XII

Death Valley National Monument
Furnace Creek Area

TOTAL WATER NEEDS

Present and Future

Summary of Tables V and XI

Average Monthly Water Needs, Gallons per Minute

Month	1961			1966			1970			1980		
	Domestic	Irrigation	Total	Domestic	Irrigation	Total	Domestic	Irrigation	Total	Domestic	Irrigation	Total
Jan	3	1	4	7	4	11	9	4	13	13	6	19
Feb	4	2	6	11	27	38	14	33	47	19	44	63
Mar	6	6	12	16	73	89	21	87	98	29	116	145
Apr	4	11	15	10	139	149	13	167	180	17	222	139
May	3	15	18	4	217	221	5	260	265	7	347	354
Jun	4	20	24	5	266	271	7	320	327	9	426	435
[illegible]	4	17	21	4	253	257	6	304	310	8	405	413
[illegible]	3	15	18	4	210	214	5	253	258	7	336	343
Sept	3	11	14	3	164	167	4	197	201	6	264	270
Oct	2	6	8	3	91	94	4	110	114	6	145	151
Nov	7	2	9	22	30	53	28	36	64	39	48	97
Dec	4	1	5	11	5	16	14	6	20	19	8	27
Year	4	9	13	9	124	133	11	149	160	15	198	213

00-00-0000: present and furture irrigation needs ; , 1961

TABLE XIII

VISITOR CENTER - MUSEUM AND AUDITORIUM
ACTUAL WATER USE

March, 1961

Day	Water Consumption Gallons	No. of Visits	Use per visit Gallons
March 1, Wed.	500	293	1.7
2, Thurs.	400	292	1.4
3, Fri.	600	294	2.0
4, Sat.	1,900	819	2.3
5, Sun.	2,000	849	2.4
6, Mon.	600	235	2.6
7, Tue.	500	233	2.1
8, Wed.	500	223	2.2
9, Thurs.	600	266	2.2
10, Fri.	500	204	2.5
11, Sat.	1,800	750	2.4
12, Sun.	1,700	903	1.9
13, Mon.	600	294	2.0
14, Tue.	700	317	2.2
15, Wed.	800	405	2.0
16, Thurs.	1,000	339	2.9
17, Fri.	600	299	2.0
18, Sat.	1,500	839	1.8
19, Sun.	1,600	836	1.9
20, Mon.	500	325	1.5
21, Tues.	1,200	514	2.3
22, Wed.	600	235	2.6
23, Thurs.	900	338	2.7
24, Fri.	600	332	1.8
25, Sat.	3,500	1,260	2.8
26, Sun.	6,100	1,848	3.3
27, Mon.	6,800	2,148	3.2
28, Tue.	6,900	2,502	2.8
29, Wed.	5,600	2,873	1.9
30, Thurs.	4,500	2,050	2.2
31, Fri.	--	--	--
Average - March 1-30 incl.	1,840	767	2.41
Weekday average	1,600	674	2.37
Sat & Sun average	2,513	1,013	2.48
Ratio of weekday to monthly average	0.87	0.88	0.98
Ratio of Sat & Sun to monthly average	1.37	1.33	1.03

TABLE XIV

Texas Spring Campground - Travel Visitor Days
from August 19, 1960 report (A88)

	1960	1959	1958	1957	1956	1955	Average
Jan	4,178	6,002	6,473	646?	2,040	2,297	4,198
Feb	6,824	9,600	6,392	2,223	3,043	4,900	5,497
Mar		16,974	8,361	6,464	12,454	4,185	9,688
Apr		2,572	14,839	1,216	2,440	1,916	4,597
May		566	398	150	604	604	464
Jun		141	30	5	120	60	71
July		--	32	5	15	15	12
Aug		10	20	60	30	14	27
Sept		83	100	100	45	75	80
Oct		1,089	1,385	694	785	408	872
Nov		10,460	16,790	22,491	3,110	12,050	12,980
Dec		6,637	8,234	8,118	2,355	6,259	6,321
Year		54,134	63,054	42,172	26,996	32,783	44,807

ACTUAL WATER CONSUMPTION - Domestic Purposes
March, 1961

March 1 - 30 incl. Visitor days	14,430
March 1 - 30 incl. domestic water used	230,400 gallon

Average per capita use: 16.0 gallons per person per day

00-00-0000: department of the interior cover sheet

10-23
(November 1954)

UNITED STATES
DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

_____
(Area)

FILE CODE:

FROM:

TO:

IMPORTANT

This file constitutes a part of the official records of the National Park Service and should not be separated or papers withdrawn without express authority of the official in charge.

All Files should be returned promptly to the File Room.

Officials and employees will be held responsible for failure to observe these rules, which are necessary to protect the integrity of the official records.

U. S. GOVERNMENT PRINTING OFFICE 16—22371-3

UNITED STATES
DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
Death Valley National Monument
Death Valley, California

IN REPLY REFER TO:

L54

April 27, 1961

RECEIVED
NPS REGION FOUR OFFICE
MAY 2 '61

	SURNAME	DATE
REG. DIR.		
ASST. R.D.		
✓ OPERATIONS	Rowe	
ADMIN.		
RECREATION		
INTERP.		
RANGER ACT		

✓ Spaulding LSS 5/8
✓ Whetworth has seen
✓ Manbey BFM 5/8

Memorandum

To: Regional Director, Region Four

From: Acting Superintendent, Death Valley

Subject: Water Meter Readings, Furnace Creek Area - Death Valley
March 1961

Attached are copies of meter readings for the period of March 1 through March 31, 1961 for the following meters:

NPS reservoir (500,000) depth gauge readings
Four inch meter (NPS) on Visitor Center Line
One and one-half inch meter on Visitor Center Line
One and one-half inch meter - Museum and Auditorium
One inch meter - Administrative Building
Two inch meter to Visitor Center and Administrative Building Lawn
Furnace Creek Campground Comfort Station - 1½ inch meter
Two inch meter (PCB) on Texas Spring to Texas Spring Campground line

Robert A. Fleming
Acting Superintendent

In duplicate

Attachment

Copy to: WASO, w/attachment

1" = 2680 gal

Water Level In 500,000 Gallon Reservoir - Furnace Creek

Date	Time	Adj	Depth of Water	Δ"	ΔGal.
3/1/61	8:20A		15' 3"	0	0
/2	8:35A		15' 3"	+3"	+8000
/3	8:35A		15' 6"	+4	+10,700
/4	8:30A		15' 10"	-15	-40,200
/5	8:45A	OK	14' 7"	-10	-26,800
/6	9:30A	OK	13' 9"	+3	+8000
/7	9:05A	OK	14' 0"	+4	+10,700
/8	9:15A	OK	14' 4"	+3	+8000
/9	8:45A	OK	14' 7"	+9	+24,100
/10	11:10A	-2700 →	15' 4"	+3	+8000
/11	9:50A	+2700 →	15' 7"	+2	+5400
/12	9:00A	OK →	15' 9"	+10	-26,800
/13	8:25A	OK →	14' 11"	-6	-16,100
/14	8:30A		14' 5"	+4	+10,700
/15	9:00A		14' 9"	+2	+5400
3/16	8:40A	OK	14' 11"	0	0
/17	8:25A		14' 11"	-5	-13,400
/18	8:45A		14' 6"	+1	+2700
/19	8:40A		14' 7"	-4	-10,700
/20	9:35A		14' 3"	+1	+2700
/21	8:35A		14' 4"	+2	+5400
/22	9:25A		14' 6"	-4	-10,700
/23	9:15A		14' 2"	-3	-8000
/24	8:35A		13' 11"	-6	-16,100
/25	10:00A	OK →	13' 5"	-3	-8000
/26	8:55A	OK →	13' 2"	+3	+8000
/27	8:00A	OK →	13' 5"	-1	-2700
/28	8:45A		13' 4"	+2	+5400
/29	8:15A		13' 6"	+4	+10,700
/30	9:15A		13' 10"	-7	-18,700
/31	8:25A		13' 3"		

Net 3/1 to 3/31 -24" =

Four Inch Meter On Visitor Center Line

Date	Time	Time Interval	Meter Reading (Cu. Ft.)	Cu. Ft. Used	Gallons Used	Rate of Use (GPM)
2/28	8:20A		0181070			
		1435		80	600	0.04
3/1	8:15A		0181150			
		1415		340	2540	0.18
/2	8:25A		0181490			
		1445		350	2620	0.18
/3	8:30A		0181840			
		1435		0		
/4	8:25A		0181840			
		1455		550	4110	0.28
/5	8:40A		0182390			
		1485		1350	10100	0.68
/6	9:25A		0183740			
		1410		0		
/7	8:55A		0183740			
		1415		840	6280	0.43
/8	9:05A		0184580			
		1410		1030	7700	0.55
/9	8:35A		0185610			
		1520		0		
/10	9:55A		0185610			
		1370		490	3670	0.27
/11	8:45A		0186100			
		1450		0		
/12	8:55A		0186100			
		1400		0		
/13	8:15A		0186100			
		1450		1340	10020	0.69
/14	8:25A		0187440			
		1465		0		
/15	8:50A		0187440			

Gal per Day

Four Inch Meter On Visitor Center Line (Cont'd)

Date	Time	Time Interval	Meter Reading (Cu. Ft.)	Cu. Ft. Used	Gallons Used	Rate of Use (GPM)	
		1420		0			
3/16	8:30A		0187440				
		1425		0			
/17	8:15A		0187440				
		1455		510	3820	0.26	
/18	8:30A		0187950				
		1445		0			
/19	8:35A		0187950				
		1495		1390	10400	0.70	
/20	9:30A		0189340				
		1380		0			
/21	8:30A		0189340				
		1485		250	1870	0.13	
/22	9:15A		0189590				
		1455		1510	11300	0.78	
/23	9:30A		0191100				
		1485		0			
/24	8:45A		0191100				
		1525		1170	8750 - 500	0.57	8300
/25	10:10A		0192270				
		1385		400	2990 + 500	0.22	3400
/26	9:05A		0192670				
		1380		0			
/27	8:05A		0192670				
		1455		540	4040	0.28	
/28	8:20A		0193210				
		1445		0			
/29	8:25A		0193210				
		1500		20	150	0.01	
/30	9:25A		0193230				
		1390		1450	10850	0.78	
/31	8:35A		0194680				

One and One-half Inch Meter On Visitor Center Line

Date	Time	Time Interval	Meter Reading (Gallons)	Gallons Used	adj	Rate of Use (GPM)	Adjusted GPD
2/28	8:20A		03790900				
		1435		25,200	+ 100	17.56	25,300
3/1	8:15A		03816300				
		1450		23,000	- 200	15.86	22,800
/2	8:25A		03839300				
		1435		10,100	+ 100	7.04	10,200
/3	8:30A		03849400				
		1435		8,000	—	5.57	8000
/4	8:25A		03857400				
		1455		55,700	- 200	38.28	55,500
/5	8:40A		03913100				
		1485		42,500	- 1200	28.62	41,300
/6	9:25A		03955600				
		1410		16,600	4600	11.77	17,200
/7	8:55A		03972200	9800			
		1450		~~26,000~~	- 200	~~17.93~~	9600
/8	9:05A		03982000				
		1410		7,500	+ 200	5.32	7700
/9	8:35A		03989500				
		1520		5,300	- 300	3.49	5000
/10	9:55A		03994800				
		1370		7,900	+ 400	5.77	8300
/11	8:45A		04002700				
		1450		5,900	—	4.07	5900
/12	8:55A		04008600				
		1400		47,300	+ 1200	33.79	48,500
/13	8:15A		04055900				
		1450		31,200	- 200	21.52	31,000
/14	8:25A		04087100				
		1465		15,800	- 300	10.78	15,500
/15	8:50A		04102900				

One and One-half Inch Meter On Visitor Center Line (Cont'd)

Date	Time	Time Interval	Meter Reading (Gallons)	Gallons Used		Rate of Use (GPM)	Adjusted GPD
		1420		17,800	+200	12.54	18,000
3/16	8:30A		04120700				
		1425		24,800	+200	17.40	25,000
/17	8:15A		04145500				
		1455		29,700	-300	20.41	29,400
/18	8:30A		04175200				
		1445		25,300	-100	17.51	25,200
/19	8:35A		04200500				
		1495		27,400	+1000 ✓	18.33	26,400
/20	9:30A		04227900				
		1380		21,100	+900 ✓	15.29	22,000
/21	8:30A		04249000				
		1485		18,600	-600 ✓	12.53	18,000
/22	9:15A		04267600				
		1455		24,200	-200	16.63	24,000
/23	9:30A		04291800				
		1395		29,600	+900 ✓	21.22	30,500
/24	8:45A		04321400				
		1525		32,200	-1800 ✓	21.11	30,400
/25	10:10A		04353600				
		1375		23,600	+1200 ✓	17.16	24,800
/26	9:05A		04377200				
		1380		14,100	+700 ✓	10.22	14,800
/27	8:05A		04391300				
		1455		18,900	-200	12.99	18,700
/28	8:20A		04410200				
		1445		17,200	—	11.90	17,200
/29	8:25A		04427400				
		1500		14,400	-600 ✓	9.60	13,800
/30	9:25A		04441800				
		1385		29,300	+700 ✓	21.16	30,000
3/31	8:35A		04471100				

One and One-half Inch Meter - Museum and Auditorium

Date	Time	Time Interval	Meter Reading (Gallons)	Amount Used	Adj	Rate of Use	No. of Visits	Use Per Visit (Gallons)
2/28	7:45A		00029300					
		1455		500		.344	257	1.9
3/1	8:00A		00029800					
		1450		500		.345	293	1.7
/2	8:10A		00030300					
		1470		400		.272	292	1.4
/3	8:40A		00030700					
		1445		600		.415	294	2.0
/4	8:45A		00031300					
		1390		1800	+100	1.295	819	2.2
/5	7:55A		00033100					
		1430		2000		1.399	849	2.4
/6	7:45A		00035100					
		1440		600		.417	235	2.6
/7	7:45A		00035700					
		1440		500		.347	233	2.1
/8	7:45A		00036200					
		1440		500		.347	223	2.2
/9	7:45A		00036700					
		1550		700	-100	.452	266	2.6
/10	9:35A		00037400					
		1365		400	+100	.293	204	2.0
/11	8:20A		00037800					
		1425		1800		1.263	750	2.4
/12	8:05A		00039600					
		1420		1700		1.197	903	1.9
/13	7:45A		00041300					
		1450		600		.414	294	2.0
/14	7:55A		00041900					
		1445		700		.484	317	2.2
/15	8:00A		00042600					

One and One-half Inch Meter - Museum and Auditorium (Cont'd)

Date	Time	Time Interval	Meter Reading (Gallons)	Amount Used Adj	Rate of Use	No. of Visits	Use Per Visit (Gallons)
		1425		800	.561	405	2.0
3/16	7:45A		00043400				
		1435		1000	.697	339	2.9
/17	7:40A		00044400				
		1460		600	.411	299	2.0
/18	8:00A		00045000				
		1440		1500	1.042	837	1.8
/19	8:00A		00046500				
		1490		1700 -100	1.141	836	2.0
/20	8:50A		00048200				
		1385		500	.361	325	1.5
/21	7:55A		00048700				
		1430		1200	.839	514	2.3
/22	7:45A		00049900				
		1450		600	.414	235	2.6
/23	7:55A		00050500				
		1430		900	.629	338	2.7
/24	7:45A		00051400				
		1620		700 -100	.432	332	2.1
/25	10:45A		00052100				
		1355		3400 +100	2.509	1260	2.7
/26	9:20A		00055500				
		1380		5900 +200	4.275	1848	3.2
/27	8:20A		00061400				
		1415		6700 +100	4.735	2148	3.1
/28	7:55A		00068100				
		1430		6900 -	4.825	2502	2.8
/29	7:45A		00075000				
		1500		5800 -200	3.867	2873	2.0
/30	8:45A		00080800				
		1380		4300 +200	3.116	2050	2.1
/31	7:45A		00085100				

One Inch Meter - Administrative Building

Date	Time	Time Interval	Meter Reading (Gallons)	Gallons Used	Rate of Use (GPM)
2/28	7:40A		0006700		
		1455		90	.062
3/1	7:55A		0006790		
		1450		80	.055
/2	8:05A		0006870		
		1420		60	.042
/3	8:45A		0006930		
		1385		80	.058
/4	7:50A		0007010		
		1440		10	.007
/5	7:50A		0007020		
		1430		40	.028
/6	7:40A		0007060		
		1440		80	.056
/7	7:40A		0007140		
		1440		130	.090
/8	7:40A		0007270		
		1440		80	.056
/9	7:40A		0007350		
		1555		50 - 10	.032
/10	9:35A		0007400		
		1365		20 + 10	.015
/11	8:20A		0007420		
		1420		70	.049
/12	8:00		0007490		
		1420		10	.007
/13	7:40A		0007500		
		1450		60	0.41
/14	7:50A		0007560		
		1440		60	.042
/15	7:50A		0007620		

One Inch Meter - Administrative Building (Cont'd)

Date	Time	Time Interval	Meter Reading (Gallons)	Gallons Used	Rate of Use (GPM)
		1430		50	.035
3/16	7:40A		0007670		
		1445		50	.035
/17	7:45A		0007720		
		1455		40	.027
/18	8:00A		0007760		
		1435		30	.021
/19	7:55A		0007790		
		1490		30	.020
/20	8:45A		0007820		
		1385		40	.029
/21	7:50A		0007860		
		1430		50	.035
/22	7:40A		0007910		
		1450		50	.034
/23	7:50A		0007960		
		1430		100	.070
/24	7:40A		0008060		
		1620		90 -20	.056
/25	10:40A		0008150		
		1355		590 +10	.435
/26	9:15A		0008740		
		1390		40 +10	.029
/27	8:25A		0008780		
		1410		80	.057
/28	7:50A		0008860		
		1430		90	.063
/29	7:40A		0008950		
		1500		100 -10	.067
/30	8:40A		0009050		
		1380		50 +10	.036
/31	7:40A		0009100		

Two Inch Meter To Visitor Center and Administration Building Lawn

Date	Time	Time Interval	Meter Reading (Gallons)	Gallons Used	Rate of Use (GPM)
2/28	7:35A		00075800		
		1425		1600	1.12
3/1	7:50A		00077400		
		1450		3300	2.28
/2	8:00A		00080700		
		1425		400	0.28
/3	7:45A		00081100		
		1435		0	0
/4	7:40A		00081100		
		1460		7100	4.86
/5	8:00A		00088200		
		1415		1500	1.06
/6	7:35A		00089700		
		1440		0	0
/7	7:35A		00089700		
		1440		2100	1.46
/8	7:35A		00091800		
		1440		2200	1.53
/9	7:35A		00094000		
		1555		900 ?	0.58
/10	9:30A		00094900		
		1360		7200 ?	5.29
/11	8:10A		00102100		
		1420		0	0
/12	7:50A		00102100		
		1425		0	0
/13	7:35A		00102100		
		1465		5700	3.89
/14	8:00A		00107800		
		1420		0	0
/15	7:40A		00107800		

Two Inch Meter To Visitor Center and Administration Building Lawn (Cont'd)

Date	Time	Time Interval	Meter Reading (Gallons)	Gallons Used	Rate of Use (GPM)
	1435	1435	00109000	1200	0.84
3/16	7:35A	1440	00109000	0	0
/17	7:35A	1435	00118100	9100	6.34
/18	7:30A	1455	00118100	0	0
/19	7:45A	1495	00123500	5400	3.61
/20	8:40A	1440	00123500	0	0
/21	8:40A	1375	00124500	1000	0.73
/22	7:35A	1450	00131600	7100	4.90
/23	7:45A	1430	00131600	0	0
/24	7:35A	1620	00134800	3200 ?	1.98
/25	10:35A	1375	00135100	300	0.22
/26	9:25A	1385	00135600	500	0.36
/27	8:30A	1395	00142400	6800	4.87
/28	7:45A	1430	00142400	0	0
/29	7:35A	1500	00142400	0	0
/30	8:35A	1380	00152500	10100	7.32
/31	7:35A				

Furnace Creek Campground Comfort Station - 1½" Meter

Date	Time	Time Interval	Meter Reading (Gallons)	Gallons Used	Rate of Use (GPM)	*No. Persons Camping	Use Per Person (Gallons)
3/1	11:25A		00000000				
		1440		8300 -100	5.763	19	436.8
/2	11:25A		00008300				
		1250		1300 +100	1.040	26	50.0
/3	8:15A		00009600				
		1435		200	0.139	32	6.3
/4	8:10A		00009800				
		1435		41600	28.990	122	341.0
/5	8:05A		00051400				
		1430		31500	22.028	19	1657.9
/6	7:55A		00082900				
		1460		6900	4.726	16	431.3
/7	8:15A		00089800				
		1430		100	0.070	19	5.3
/8	8:05A		00089900				
		1440		0	0	6	0
/9	8:05A		00089900				
		1545		0	0	6	0
/10	9:50A		00089900				
		1365		100	0.073	16	6.3
/11	8:35A		00090000				
		1420		300	0.211	166	1.8
/12	8:15A		00090300				
		1425		200	0.140	42	4.8
/13	8:00A		00090500				
		1450		200	0.138	22	9.1
/14	8:10A		00090700				
		1460		200	0.137	13	15.4
/15	8:30A		00090700				
		1425		100	0.070	22	4.5
/16	8:15A		00090800				
		1430		100	0.070	27	3.7

* No. persons equals tents and/or trailers multiplied by 3.2. Excessive water use on 1st, 4th, 5th, and 6th believed caused by sticking flush valve.

Furnace Creek Campground Comfort Station - 1½" Meter (Cont'd)

Date	Time	Time Interval	Meter Reading (Gallons)	Gallons Used	Rate of Use (GPM)	No. Persons Camping	Use Per Person (Gallons)
3/17	8:05A		00090900				
		1505		100	0.066	16	6.3
/18	9:10A		00091000				
		1390		300	0.216	80	3.8
/19	8:20A		00091300				
		1495		100	0.067	19	5.3
/20	9:15A		00091400				
		1420		100	0.070	35	2.9
/21	8:55A		00091500				
		1445		200	0.138	29	6.9
/22	9:00A		00091700				
		1420		0	0	10	0
/23	8:40A		0009170				
		1400		100	0.071	16	6.3
/24	8:00A		00091800				
		1610		200	0.124	67	3.0
/25	10:50A		00092000				
		1365		1000	0.733	221	4.5
/26	9:35A		00093000				
		1380		1200 + 100	0.870	480	2.5
/27	8:35A		000942000				
		1420		1000	0.704	464	2.2
/28	8:15A		00095200				
		1420		1000	0.704	435	2.3
/29	7:55A		00096200				
		1495		1000 - 100	0.669	189	5.3
/30	8:50A		00097200				
		1440		700	0.486	189	3.7
/31	8:50A		00097900				

2823

omitting use & visits on March 1, 2, 4, 5, 6, 14

per capita use = $\frac{8100 \text{ gal}}{2608 \text{ visits}}$ = 3.1 gal per person per day

Two Inch Meter (PCB) on Line Texas Spring To Texas Spring Campground

Date	Time	Time Interval	Meter Reading (Gallons)	Amount Used (Gallons)	Rate of Use GPM	*No. Persons Cmpg T.S.C/grd GPD
2/28	8:30A		29987900			
		1440		31100	21.60	
3/1	8:30A		30019000			144
		1450		32000 - 200	22.07	31,800
/2	8:40A		30051000			189
		1440		29500 —	20.49	29,500
/3	8:40A		30080500			214
		1440		30300 —	21.04	30,300
/4	8:40A		30110800			349
		1450		33800 -200	23.31	33,600
/5	8:50A		30144600			698
		1490		35300 -1200	23.69	34,100
/6	9:40A		30179900			234
		1410		31700 +700	22.48	32400
/7	9:10A		30211600			237
		1450		32300 -200	22.28	32,100
/8	9:20A		30243900			250
		1410		30300 + 600	21.49	30,900
/9	8:50A		30274200			294
		1575		35100 -3000	22.29	32,100
/10	11:05A		30309300			307
		1310		29100 +2900	22.21	32,000
/11	8:55A		30338400			461
		1450		35000 -200	24.14	34,800
/12	9:05A		30373400			797
		1405		32600 +800 +200	23.20	33,400
/13	8:30A		30406000			480
		1450		32600 -200	22.48	32,400
/14	8:40A		30438600			400
		1470		33000 -700	22.45	32,300
/15	9:10A		30471600			314

Two Inch Meter (PCB) on Line Texas Spring To Texas Spring Campground (Cont'd)

Date	Time	Time Interval	Meter Reading (Gallons)	Amount Used (Gallons)	Rate of Use GPM	*No. Persons Cmpg T.S.C/grd
		1415		31800 +600	22.47	32,400
3/16	8:45A		30503400			320
		1425		33900 + 300	23.79	34,200
/17	8:30A		30537300			400
		1460 +20		34600 -500	23.70	34,100
/18	8:50A		30571900			461
		1445 +05		33700 -100	23.32	33,600
/19	8:55A		30605600			528
		~~1430~~ 1490		34500 -1100	24.13	33,400
/20	9:45A		30640100			403
		1375 1385		29800 +1400	21.67	31,200
/21	8:40A		30669900			310
		1490 +50		32300 -1000	21.68	31,300
/22	9:30A		30702200			218
		1420 -20		30700 + 400	21.62	31,100
/23	9:10A		30732900			250
		1400 -40		32000 +900	22.86	32,900
/24	8:30A		30764900			221
		1525 +85		34700 -2000	22.75	32,700
/25	9:55A		30799600			467
		1375 -65		36600 +1700	26.62	38,300
/26	8:50A		30836200			1232
		1380 -60		38200 +1600	27.68	39,800
/27	7:50A		30874400			1286
		1490 +50		40700 -1300	27.32	39,400
/28	8:40A		30915100			1152
		1410 -30		38300 + 800	27.16	39100
/29	8:10A		30953400			1046
		1500 +60		39900 -1600	26.60	38,300
/30	9:10A		30993300			768
		1390 -50		36700 +1300	26.40	38000
/31	8:20A		31030000			768
						15,198

* Number of persons camping equals number of tent and trailers multiplied by 3.2.

UNITED STATES
DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
Death Valley National Monument
Death Valley, California

IN REPLY REFER TO:

L54

April 27, 1961

RECEIVED
NPS REGION FOUR OFFICE
MAY 2 '61

	SURNAME	DATE
REG. DIR.		
ASST. R.D.		
OPERATIONS		
ADMIN.		
RECREATION		
INTERP.		
RANGER ACT		

5/8
✓ Spaulding LS's
✓ Whitworth has seen
✓ Manbeck B/Fm 5/8

Memorandum

To: Regional Director, Region Four

From: Acting Superintendent, Death Valley

Subject: Water Meter Readings, Furnace Creek Area - Death Valley
February 1961

Attached are copies of meter readings for the period of February 1 through February 28, 1961 for the following meters:

NPS reservoir (500,000 gallons) depth gauge readings
Four inch meter (NPS) on Visitor Center Line
One and one-half inch meter on Visitor Center Line
One and one-half inch meter - Museum and Auditorium
One inch meter - Administrative Building
Two inch meter to Visitor Center and Administrative Building Lawn
Two Inch meter (PCB) on Texas Spring to Texas Spring Campground line.

Robert A. Fleming
Robert A. Fleming
Acting Superintendent

In duplicate

Attachment

Copy to: WASO, w/attachment

1" = 2680 gal

Water Level In 500,000 Gallon Reservoir - Furnace Creek

Date	Time	Depth of Water			Gall.	Date	Time	Depth of Water			gal
2/1/61	8:35A	13'	1"	+10	+26,800	2/15	8:15A	15'	0"	+4	+10,700
/2	8:40A	13"	11"	+9	+24,100	/16	8:20A	15'	4"	-6	-16,100
/3	8:45A	14'	8"	+9	+24,100	/17	8:05A	14'	10"	-4	-10,700
/4	8:30A	15'	5"	+4	+10,700	/18	8:20A	14'	6"	-2	-5400
/5	8:15A	15'	9"	-9	-24,100	/19	8:15A	14'	4"	-13	-34,800
/6	8:15A	15'	0"	-2	-5400	/20	8:20A	13'	3"	+5	+13,400
/7	8:20A	14'	10"	-1	-2700	/21	8:35A	13'	8"	-3	-8000
/8	8:30A	14'	9"	+3	+8000	/22	8:35A	13'	5"	+6	+16,100
/9	8:35A	15'	0"	-7	-18,700	/23	8:55A	13'	11"	+6	+16,100
/10	8:15A	14'	5"	+1	+2700	/24	8:25A	14'	5"	+1	+2700
/11	8:45A	14'	6"	+3	+8000	/25	8:35A	14'	6"	+7	+18,700
/12	8:25A	14'	9"	+2	+5400	/26	8:50A	15'	1"	+7	+18,700
/13	8:25A	14'	11"	+3	+8000	/27	8:20A	15'	8"	-4	-10,700
/14	8:25A	15'	2"	-2	-5400	/28	8:25A	15'	4"	-1	-2700
						3/1		15'	3		

Four Inch Meter On Visitor Center Line

Date	Time	Time Interval	Meter Reading (Cu. Ft.)	Cu. Ft. Used	Gallons Used	Rate of Use (GPM)
1/31/	8:25A		0166510			
		1440		0		
2/1	8:25A		0166510			
		1450		0		
/2	8:35A		0166510			
		1445		0		
/3	8:40A		0166510			
		1425		0		
/4	8:25A		0166510			
		1425		0		
/5	8:10A		0166510			
		1435		1360	10170	0.71
/6	8:05A		0167870			
		1445		720	5390	0.37
/7	8:10A		0168590			
		1445		790	5910	0.41
/8	8:25A		0169380			
		1445		0		
/9	8:30A		0169380			
		1420		2700	2020 0	1.42
/10	8:10A		0172080			
		1470		0		
/11	8:40A		0172080			
		1415		0		
/12	8:15A		0172080			
		1445		0		
/13	8:20A		0172080			
		1435		0		
/14	8:15A		0172080		10,400	
				1390	~~2980~~	
2/15			0173470			

Four Inch Meter on Visitor Center Line (Cont'd)

Date	Time	Time Interval	Meter Reading (Cu. Ft.)	Cu. Ft. Used	Gallons Used	Rate of Use (GPM
/15	8:10A		0173470			
		1445		0		
/16	8:15A		0173470			
		1425		0		
/17	8:00A		0173470			
		1455		770	5760	0.40
/18			0174240			
		1435		0		
/19	8:10A		0174240			
		1440		3160	23640	1.64
/20	8:10A		0177400			
		1460		100	750	0.05
/21	8:30A		0177500			
		1440		2070	15480	1.08
/22	8:30A		0179570			
		1460		0		
/23	8:50A		0179570			
		1410		0		
/24	8:20A		0179570			
		1450		490	3670	0.25
/25	8:30A		0180060			
		1455		0		
/26	8:45A		0180060			
		1410		0		
/27	8:15A		0180060			
		1445	0181070	1010	7560	0.52
/28	8:20A		~~0181070~~			
				80	600	
3/1			181150			

One and One-half Inch Meter On Visitor Center Line

Date	Time	Time Interval	Meter Reading (Gallons)	Gallons Used	Rate of Use (GPM)
1/31	8:25A		03238900		
		1440		50,700	35.21
2/1	8:25A		03289600		
		1450		2,500	1.72
/2	8:35A		03292100		
		1435		2,200	1.53
/3	8:40A		03294300		
		1425		2,200	1.54
/4	8:25A		03296500		
		1425		2,800	1.96
/5	8:10A		03299300		
		1435		40,800	28.43
/6	8:05A		03340100		
		1445		24,500	16.96
/7	8:10A		03364600		
		1455		22,700	15.60
/8	8:25A		03387300		
		1445		18,400	12.73
/9	8:30A		03405700		
		1420		25,500	17.96
/10	8:10A		03431200		
		1470		17,700	12.04
/11	8:40A		03448900		
		1415		18,600	13.14
/12	8:15A		03467500		
		1445		19,400	13.43
/13	8:20A		03486900		
		1435		16,400	11.43
/14	8:15A		03503300		

3524000

One and One-half Inch Meter On Visitor Center Line (Cont'd)

Date	Time	Time Interval	Meter Reading (Gallons)	Gallons Used	Rate of Use (GPM)
		1435		20,700	14.43
2/15	8:10A		03524000		
		1445		15,900	11.00
/16	8:15A	1425	03539900		
		1925 X		29,900	20.98
/17	8:00A		03569800		
		1455		41,400	28.45
/18	8:15A		03611200		
		1435		31,300	21.81
/19	8:10A		03642500		
		1440		36,700	25.49
/20	8:10A		03679200		
		1400		12,300	8.42
/21	8:30A		03691500		
		1440		19,200	13.33
/22	8:30A		03710700		
		1460		9,800	6.71
/23	8:50A		03720500		
		1410		~~20,400~~ adj to 10,400 adj to 11,600	~~14.47~~
/24	8:20A		03740900 ? say 03739090		
		1450		~~11,600~~ 1600	~~8.00~~
/25	8:30A		03742500		
		1455		10,100	6.94
/26	8:45A		03752600		
		1410		8,500	6.03
/27	8:15A		03761100		
		1445		29,800	20.62
/28	8:20A		03790900		
3/1			3816300	25,~~800~~	

Σ from 2/1 to 3/1 incl = 526,700

One and One-half Inch Meter - Museum and Auditorium

Date	Time	Time Interval	Meter Reading (Gallons)	Amount Used	Rate of Use	No. of Visits	Use Per Visit (Gallons)
1/31	7:50A		00007800				
		1445		500	.346		
2/1	7:55A		00008300				
		1440		300	.208	146	2.1
/2	7:55A		00008600				
		1475		500	.339	171	2.9
/3	8:30A		00009100				
		1400		400	.286	136	2.9
/4	7:50A		00009500				
		1445		500	.346	498	1.0
/5	7:55A		00010000				
		1430		800	.559	515	1.6
/6	7:45A		00010800				
		1450		700	.483	162	4.3
/7	7:55A		00011500				
		1440		500	.347	196	2.6
/8	7:55A		00012000				
		1440		400	.278	205	2.0
/9	7:55A		00012400				
		1430		700	.490	278	2.5
/10	7:45A		00013100				
		1450		400	.276	234	1.7
/11	7:55A		00013500				
		1440		1500	1.042	873	1.7
/12	7:55A		00015000				
		1435		2700	1.882	923	2.9
/13	7:50A		00017700				
		1435		800	.557	352	2.3
/14	7:45A		00018500				

One and One-half Inch Meter - Museum and Auditorium (Cont'd)

Date	Time	Time Interval	Meter Reading (Gallons)	Amount Used	Rate of Use	No. of Visits	Use Per Visit (Gallons)
		1440		800	.556	275	2.9
2/15	7:45A		00019300				
		1450		500	.345	270	1.9
/16	7:55A		00019800				
		1425		800	.561	308	2.6
/17	7:40A		00020600				
		1440		600	.417	223	2.7
/18	7:40A		00021200				
		1450		1000	.690	625	1.6
/19	7:50A		00022200				
		1435		900	.627	558	1.6
/20	7:45A		00023100				
		1440		600	.417	275	2.2
/21	7:45A		00023700				
		1455		600	.412	325	1.8
/22	8:00A		00024300				
		1475		900	.610	472	1.9
/23	8:35A		00025200				
		1410		700	.496	266	2.6
/24	8:05A		00025900				
		1425		400	.281	344	1.2
/25	7:50A		00026300				
		1475		1400	.949	727	1.9
/26	8:20A		00027700				
		1410		1200	.851	468	2.6
/27	7:50A		00028900				
		1425		400	.281	192	2.1
/28	7:45A		00029300				

500

3/1

One Inch Meter - Administrative Building

Date	Time	Time Interval	Meter Reading (Gallons)	Gallons Used	Rate of Use (GPM)
1/31	7:45A		0004660		
		1445		60	.042
2/1	7:50A		0004720		
		1440		100	.064
/2	7:50A		0004820		
		1480		130	.088
/3	8:30A		0004950		
		1405		70	.050
/4	7:55A		0005020		
		1435		40	.028
/5	7:50A		0005060		
		1430		40	.028
/6	7:40A		0005100		
		1450		80	.055
/7	7:50A		0005180		
		1440		310	.215
/8	7:50A		0005490		
		1440		80	.056
/9	7:50A		0005570		
		1430		80	.056
/10	7:40A		0005650		
		1450		60	.041
/11	7:50A		0005710		
		1440		30	.021
/12	7:50A		0005740		
		1435		40	.028
/13	7:45A		0005780		
		1435		80	.056
/14	7:40A		0005860		

One Inch Meter - Administrative Building (Cont'd)

Date	Time	Time Interval	Meter Reading (Gallons)	Gallons Used	Rate of Use (GPM)
	1440	1440		60	.042
2/15	7:40A		0005920		
		1450		80	.055
/16	7:50A		0006000		
		1435		60	.042
/17	7:45A		0006060		
		1440		70	.049
/18	7:45A		0006130		
		1435		40	.028
/19	7:40A		0006170		
		1440		40	.028
/20	7:40A		0006210		
		1440		50	.035
/21	7:40A		0006260		
		1455		70	.048
/22	7:55A		0006330		
		1475		30	.020
/23	8:30A		0006360		
		1410		~~160~~ 160	.043
/24	8:00A		0006520		
		1430		50	.035
/25	7:50A		0006570		
		1455		30	.021
/26	8:05A		0006600		
		1420		50	.035
/27	7:45A		0006650		
		1435		50	.035
/28	7:40A		0006700		
				90	

3/1

Two Inch Meter To Visitor Center and Administration Building Lawn

Date	Time	Time Interval	Meter Reading (Gallons)	Gallons Used	Rate of Use (GPM)
1/31	7:40A		00022800		
		1445		0	0
2/1	7:45A		00022800		
		1440		0	0
/2	7:45A		00022800		
		1485		0	0
/3	8:30A		00022800		
		1400		0	0
/4	7:50A		00022800	0	0
		1435		0	0
/5	7:45A		00022800		
		1430		6200	4.34
/6	7:35A		00029000		
		1450		800	0.55
/7	7:45A		00029800		
		1440		0	0
/8	7:45A		00029800		
		1440		0	0
/9	7:45A		00029800		
		1435		13800	9;62
/10	7:40A		00043600		
		1450		0	0
/11	7:50A		00043600		
		1430		0	0
/12	7:40A		00043600		
		1440		0	0
/13	7:40A		00043600		
		1435		0	0
/14	7:35A		00043600		

Two Inch Meter To Visitor Center and Administration Building Lawn (Cont'd)

Date	Time	Time Interval	Meter Reading (Gallons)	Gallons Used	Rate of Use (GPM)
		1440		2400	1.67
2/15	7:35A		00046000		
		1450		0	0
/16	7:45A		00046000		
		1430		0	0
/17	7:35A		00046000		
		1440		7100	4.93
/18	7:35A		00053100		
		1440		0	0
/19	7:35A		00053100		
		1440		8100	5.62
/20	7:35A		00061200		
		1440		6000	4.17
/21	7:35A		00067200		
		1455		0	0
/22	7:50A		00067200		
		1475		100	0.07
/23	8:25A		00067300		
		1420		1400	0.99
/24	8:05A		00068700		
		1420		7100	5.00
/25	7:45A		00075800		
		1455		0	0
/26	8:00A		00075800		
		1420		0	0
/27	7:40A		00075800		
		1435		0	0
/28	7:35A		00075800		

Two Inch Meter (PCB) on Line Texas Spring To Texas Spring Campground (Cont'd)

Date	Time	Time Interval	Meter Reading (Gallons)	Amount Used (Gallons)	Rate of USe GPM	*No. Persons Cmpg T.S.C/grd
		1430		31600	22.10	
2/15	8:20A		29590200			195
		1445		30100	20.83	
/16	8:25A		29620300			246
		1425		29300	20.56	
/17	8:10A		29649600			211
		1455		31100	21.37	
/18	8:25A		29680700			294
		1435		30800	21.46	
/19	8:20A		29711500			330
		1445		31800	22.01	
/20	8:25A		29743300			285
		1460		31200	21.37	
/21	8:45A		29774500			221
		1435		30300	21.11	
/22	8:40A		29804800			224
		1460		30700	21.03	
/23	9:00A		29835500			214
		1410		29600	20.99	
/24	8:30A		29865100			214
		1450		31700	21.86	
/25	8:40A		29896800			282
		1455		33,000	22.68	
/26	8:55A		29929800			499
		1415		29100	20.57	
/27	8:30A		29958900			176
		1440		29000	20.14	
/28	8:30A		29987900			163

* Number persons camping equals number tents and trailers multiplied by 3.2.

UNITED STATES
DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
Death Valley National Monument
Death Valley, California

IN REPLY REFER TO:

L54

February 6, 1961

RECEIVED
NPS REGION FOUR OFFICE
FEB 8'61

	SURNAME	DATE
REG. DIR.		
ASST. R.D.		
OPERATIONS		
ADMIN.		
RECREATION		
INTERP.		
RANGER ACT		

Whitworth
Spaulding
LSS 2/8

Memorandum

To: Regional Director, Region Four

From: Superintendent, Death Valley

Subject: Water Meter Readings, Furnace Creek Area - Death Valley

Attached are copies of meter readings for the period of January 1 to January 31, 1961 for the following meters:

2" meter (PCB) on Texas Spring Line

4" meter (NPS) on Visitor Center Line

1½" meter (NPS) on Visitor Center Line

NPS reservoir (500,000 gallons) depth gauge readings

1" meter Administrative Building

1½" meter Museum and Auditorium

2" meter Visitor Center Patio and lawn

Granville B. Liles
Superintendent

In duplicate

Attachment

Copy to: WASO w/attachment

Two Inch Meter on Line Texas Spring to Texas Spring Campground

Date	Time	Time Interval	Meter Reading (Gallons)	Gallons Used	Rate of Use (GPM)	
1/16	8:30A		28681600			
		1450		29,300	20.21	
/15	8:20A		28652300			
		1435		29,200	20.35	
/14	8:25A		28623100			
		1445		28,800	19.93	
/13	8:20A		28594300			
		1445		30,500	21.11	
/12	8:15A		28563800			
		1440		28,800	20.00	
/11	8:15A		28535000			
		1435		28,300	19.72	
/10	8:20A		28506700			
		1450		29,000	20.00	
/9	8:10A		28477700			28,500
/8		2880		56,900	19.76	28,400
/7	8:10A		28420800			
		1440		28,500	19.79	
/6	8:10A		28392300			
		1435		28,900	20.14	
/5	8:15A		28363400			
		1425		27,700	19.44	
/4	8:30A		28335700			
		1445		28300	19.58	
/3	8:25A		28307400			
		1435		30,100	20.98	
/2	8:30A		28277300			
		1450		34,600	23.86	
1/1	8:20A		28242700			
		1450		36,300	25.03	36,000
12/31	8:10A		28206400			

Two Inch Meter on Line Texas Spring to Texas Spring Campground (cont'd)

Date	Time	Time Interval	Meter Reading (Gallons)	Gallons Used	Rate of Use (GPM)	
1/31	8:40A		29124800			30,200 30,100
/30		2905		60,300	20.76	
/29	8:15A		29064500			
		1415		29,500	20.85	
/28	8:40A		29035000			
		1450		30,200	20.83	
/27	8:30A		29004800			
		1460		30,500	20.89	
/26	8:10A		28974300			
		1410		29,400	20.85	
/25	8:40A		28945900			
		1430		28,500	19.93	
/24	8:50A		28917400			
		1420		28,800	20.28	
/23	9:10A		28888600			
		1320		27,100	20.53	29,600
/22	11:10A		28861500			
		1605		33,000	20.56	29,600
/21	8:25A		28828500			
		1450		30,100	20.76	
/20	8:15A		28798400			
		1425		29,200	20.49	
/19	8:30A		28769200			
		1435		31,200	21.74	
/18	8:35A		28738000			
		1435		27,700	19.30	
/17	8:40A		28710300			
		1450		28,700	19.79	

Four Inch Meter on Visitor Center Line

Date	Time	Time Interval	Meter Reading (Cu. Ft.)	Cu. Ft. Used	Gallons Used	Rate of Use (GPM)	
		1445		280	2,094.55	1.45	
1/16	8:20A		0160500				
		1450		1,840	13,764.16	9.49	
/15	8:10A		0158660				
		1435		730	5,460.78	3.81	
/14	8:15A		0157930				
		1445		0	0	0	
/13	8:10A		0157930				
		1450		0	0	0	
/12	8:00A		0157930				
		1440		1,650	12,342.86	8.57	
/11	8:00A		0156280				
		1430		0	0	0	
/10	8:10A		0156280				
		1455		0	0	0	
/9	7:55A		0156280				
/8		2875		30	224.42	0.08	
/7	8:00A		0156250				
		1440		0	0	0	
/6	8:00A		0156250				
		1440		790	5,909.61	4.10	
/5	8:00A		0155460				
		1425		~~900~~ 6730	~~6,730~~	~~0~~	
/4	8:15A		0154560				
		1445		0	0	0	
/3	8:10A		0154560				
		1435		1,010	7,555.32	5.27	
/2	8:15A		0153550				
		1450		0	0	0	
1/1	8:05A		0153550				
		1445		110	822.86	0.57	820
12/31	8:00A		0153440				

Four Inch Meter on Visitor Center Line (cont'd)

Date	Time	Time Interval	Meter Reading (Cu. Ft.)	Cu. Ft. Used	Gallons Used	Rate of Use (GPM)
1/31	8:25A		0166510			
/30		2905		770	5,760.00	1.98
/29	8:00A		0165740			
		1410		0	0	0
/28	8:30A		0165740			
		1450		0	0	0
/27	8:20A		0165740			
		1465		570	4,263.90	2.91
/26	7:55A		0165170			
		1410		330	2,468.57	1.75
/25	8:25A		0164840			
		1430		0	0	0
/24	8:35A		0164840			
		1420		560	4,189.09	2.95
/23	8:55A		0164280			
		1320		80	598.44	0.45
/22	10:55A		0164200			
		160		0	0	0
/21	8:15A		0164200			
		1450		0	0	0
/20	8:05A		0164200			
		1430		260	1,944.94	1.36
/19	8:15A		0163940			
		1430		1,430	10,697.14	7.48
/18	8:25A		0162510			
		1440		1,730	12,941.30	8.99
1/17			0160780			

One and one-half inch Meter on Visitor Center Line

Date	Time	Time Interval	Meter Reading (Gallons)	Gallons Used	Rate of Use (GPM)	
1/16	8:20A		02863400			
		1450		16,800	11.59	
/15	8:10A		02846600			
		1435		19,400	13.52	
/14	8:15A		02827200			
		1445		7,800	5.40	
/13	8:10A		02819400			
		1450		10,200	7.03	
/12	8:00A		02809200			
		1440		42,900	29.79	
/11	8:00A		02766300			
		1430		36,000	25.17	
/10	8:10A		02730300			
		1465		20,400	13.92	
/9	7:45A		02709900			
/8		2865		41,100	14.35	
/7	8:00A		02668800			
		1440		23,300	16.18	
/6	8:00A		02645500			
		1440		6,500	4.51	
/5	8:00A		02639000			
		1425		2,400	1.68	
/4	8:15A		02636600			
		1445		600	0.42	
/3	8:10A		02636000			
		1435		6,200	4.32	
/2	8:15A		02629800			
		1450		14,300	9.86	
1/1	8:05A		02615500			
		1445		44,100	30.52	43,900
12/31	8:00A		02571400			

One and one-half inch Meter on Visitor Center Line (cont'd)

Date	Time	Time Interval	Meter Reading (Gallons)	Gallons Used	Rate of Use (GPM)	
1/31	8:25A		03238900			
1/30		2905		102,800	35.39	
/29	8:00A		03136100			
		1401		20,300	14.40	
/28	8:30A		03115800			
		1450		21,100	14.55	
/27	8:20A		03094700			
		1465		23,600	16.11	
/26	7:55A		03071100			
		1410		26,500	18.79	
/25	8:25A		03044600			
		1430		9,700	6.78	
/24	8:35A		03034900			
		1420		17,400	12.25	
/23	8:55A		03017500			
		1320		19,600	14.85	21,400
/22	10:55A		02997900			
		1600		10,800	6.75	9700
/21	8:15A		02987100			
		1450		8,900	6.14	
/20	8:05A		02978200			
		1430		20,600	14.41	
/19	8:15A		02957600			
		1430		32,500	22.73	
/18	8:25A		02925100			
		1440		46,000		
1/17	8:25A		02879100			
		1445		15,700	10.87	

2680 gal per inch

Water Level - Visitor Center Reservoir (500,000 Gallons)

Date	Time	Depth of Water	Change	Gal	Date	Time	Depth of Water	Change	Gal
12/31/60	8:05A	14' 4"	-9"	-24,120 gal	1/16	8:25A	15' 6"	+2"	+5400 gal
1/1	8:10A	13' 7"	+4	+10,800	/17	8:30A	15' 8"	-14	-37,500
/2	8:22A	13' 11"	+5	+13,400	/18	8:30A	14' 6"	0	0
/3	8:17A	14' 4"	+9	+24,100	/19	8:25A	14' 6"	-6	-16,100
/4	8:25A	15' 1"	+6	+16,100	/20	8:10A	14' 0"	+6	+16,100
/5	8:10A	15' 7"	+2	+5400	/21	8:20A	14' 6"	+8	+21,400
/6	8:05A	15' 9"	0	0	/22	11:00A	15' 2"	+1	+2700
/7	8:05A	15' 9"	0	0	/23	8:40A	15' 3"	+2	+5400
/8					/24	8:40A	15' 5"	+4	+10,700
/9	8:00A	15' 9"	0	0	/25	8:30A	15' 9"	-2	-5400
/10	8:15A	15' 9"	-3	-8000	/26	8:00A	15' 7"	-1	-2700
/11	8:05A	15' 6"	-12	-32,200	/27	8:25A	15' 6"	+2	+5400
/12	8:05A	14' 6"	+6	+16,100	/28	8:35A	15' 8"	+1	+2700
/13	8:15A	15' 0"	+6	+16,100	/29	8:05A	15' 9"		
/14	8:20A	15' 6"			/30			-32"	-85,700
/15			0	0	2/1	8:35 A	13'-1"		
1/16									

One Inch Meter - Administrative Building

Date	Time	Time Interval	Meter Reading (Gallons)	Gallons Used	(GPM) Rate of Use
1/16	8:05A		0003860		
		1460		20	.0137
/15	7:45A		0003840		
		1450		0	0
/14	7:35A		0003840		
		1430		60	.0420
/13	7:45A		0003780		
		1445		70	.0484
/12	7:40A		0003710		
		1435		120	.0836
/11	7:45A		0003590		
		1435		120	.0836
/10	7:50A		0003470		
		1445		80	.0554
/9	7:45A		0003390		
/8		2885		60	.0208
/7	7:40A		0003330		
		1430		40	.0280
/6	7:50A		0003290		
		1450		50	.0345
/5	7:40A		00032̶40		
		1435		40	.0279
/4	7:45A		0003200		
		1440		50	.0347
/3	7:45A		0003150		
		1425		0	0
/2	8:00A		0003150		
		1455		20	.0137
1/1/61	7:45A		0003130		
		1440		40	.0278 40
12/21/61	7:45A		0003090		

One Inch Meter - Administrative Building (cont'd)

Date	Time	Time Interval	Meter Reading (Gallons)	Gallons Used	(GPM) Rate of Use
1/31	7:45A		0004660		
/30		2880		130	.0451
/29	7:45A		0004530		
/28	8:05A	1420	0004520	10	.0070
/27	7:40A	1465	0004440	80	.0546
/26	7:40A	1440	0004360	80	.0556
/25	7:45A	1435	0004310	50	.0348
/24	7:40A	1445	0004260	50	.0346
/23	8:25A	1390	0004210	50	.0360
/22	10:25A	1320	0004180	30	.0227
/21	7:55A	1590	0004140	40	.0252
/20	7:55A	1440	0004110	30	.0208
/19	7:45A	1450	0004050	60	.0414
/18	7:40A	1445	0003990	60	.0415
1/17	7:45A	1435	0003920	70	.0488
		1420		60	.0423

One and one-half Inch Meter - Museum and Auditorium

Date	Time	Time Interval	Meter Reading (Gallons)	Gallons Used	Rate of Use (GPM)
12/31/60	7:47		2162640		
		1443		2,630	1.8226
1/1/61	7:50A		2160010		
		1455		2,760	1.8969
/2	8:05A		2157250		
		1425		1,150	.8070
/3	7:50A		2156100		
		1440		380	.2639
/4	7:50A		2155720		
		1435		670	.4669
/5	7:45A		2155050		
		1440		320	.2222
/6	7:45A		2154730		
		1440		280	.1944
/7	7:45A		2154450		
/8		2875		840	.2922
/9	7:40A		2153610		
		1455		340	.2337
/10	7:55A		2153270		
		1435		540	.3763
/11	7:50A		2152730		
		1435		580	.4042
/12	7:45A		2152150		
		1445		550	.3806
/13	7:50A		2151600		
		1430		150	.1049
/14	7:40A		2151450		
		1450		480	.3310
/15	7:50A		2150970		
		1460		630	.1831
/16	8:10A		2150340		
		1420		260	.1831

2620

One and one-half Inch Meter - Museum and Auditorium (cont'd)

Date	Time	Time Interval	Meter Reading (Gallons)	Gallons Used	Rate of Use (GPM)
1/17	7:50A		2150080		
		1600		40	.0250
Old Meter removed	10:30A		2150040		
New Meter instal.	11:30A		00000000		
		1215		200	.1646
1/18	7:45A		00000200		
		1445		600	.4152
/19	7:50A		00000800		
		1440		600	.4167
/20	7:50A		00001400		
		1450		400	.2759
/21	8:00A		00001800		
		1590		300	.1887
/22	10:30A		00002100		
		1320		1,200	.9091
/23	8:30A		00003300		
		1425		600	.4211
/24	7:45A		00003900		
		1445		400	.2768
/25	7:50A		00004300		
		1435		400	.2787
/26	7:45A		00004700		
		1445		500	.3460
/27	7:50A		00005200		
		1455		500	.3436
/28	8:05A		00005700		
		1425		700	.4912
/29	7:50A		00006400		
/30		2880		1,400	.4861

Two Inch Meter To Visitor Center Patio and Administration Building Lawn

Date	Time	Time Interval	Meter Reading (Gallons)	Gallons Used	Rate of Use (GPM)
1/31	7:40A		00022800		
1/30		2880		5,700	1.98
/29	7:40A		00017100		
		1420		0	0
/28	8:00A		00017100		
		1460		0	0
/27	7:40A		00017100		
		1445		7,500	5.19
/26	7:35A		00009600		
		1435		0	0
/25	7:40A		00009600		
		1445		0	0
/24	7:35A		00009600		
		1395		3,300	2.37
/23	8:20A		00006300		
		1340		0	0
/22	10:00A		00006300		
		1565		0	0
/21	7:55A		00006300		
		1445		0	0
/20	7:50A		00006300		
		1425		900	.63
/19	8:05A		00005400		
		1295		5,400	4.17
1/17	10:30A		00000000	New Meter Installed.	

Folder DEVA Docket 3,4,5,6 Suppl. Part III

UNITED STATES
DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
Death Valley National Monument
Death Valley, California

IN REPLY REFER TO:
L54

February 1, 1961

RECEIVED
NPS REGION FOUR OFFICE
FEB 3'61

	SURNAME	DATE
REG. DIR.		
ASST. R.D.		
✓ OPERATIONS		
ADMIN.		
RECREATION		
INTERP.		
RANGER ACT		

Memorandum

To: Regional Director, Region Four

From: Superintendent, Death Valley

Whitworth
Spaulding 2/6

Subject: Water Meter Readings, Furnace Creek Area, Death Valley

Attached are copies of meter readings for the period of December 1 to December 31 for the following meters:

2" meter (PCB) on Texas Spring Line

4" meter (NPS) on Visitor Center Line

1½" meter (NPS) on Visitor Center Line

NPS reservoir (500,000 gallons) depth gauge readings

Granville B. Liles
Granville B. Liles
Superintendent

In duplicate

Attachments

Copy to: WASO w/attachments

Two Inch Meter on Line Texas Spring to Texas Spring Campground

Date	Time	Time Interval	Meter Reading (Gallons)	Gallons Used	Rate of Use (GPM)	GPD
		1435		29,000	20.21	29,100
12/15	8:40A		27695400			
		1445		30,900	21.38	30,400
/14	8:35A		27664500			
		1445		32,300	22.35	32,200
/13	8:30A		27632200			
		1440		29,600	20.56	29,600
/12	8:30A		27602600			
		1405		27,900	19.86	28,600
/11	9:05A		27574700			
		1445		29,000	20.07	28,900
/10	9:00A		27545700			
		1485		30,100	20.27	29,200
/ 9	8:15A		27515600			
		1335		25,800	19.33	27,800
/ 8	10:00A		27489800			
		1430		28,000	19.58	28,200
/ 7	10:10A		27461800			
		1550		30,100	19.42	28,000
/ 6	8:20A		27431700			
		1435		27,400	19.09	27,500
/ 5	8:25A		27404300			
		1425		27,800	19.51	28,100
/ 4	8:40A		27376500			
		1455		29,500	20.27	29,200
/ 3	8:25A		27347000			
		1425		29,400	20.63	29,700
/ 2	8:40A		27317600			
		1445		29,200	20.21	29,100
12/ 1	8:35A		27288400			
		1380		29,900	21.67	31,200
11/30	9:35A		27258500			

Date	Time	Time Interval	Meter Reading (Gallons)	Gallons Used	Rate of Use (GPM)	GPD
12/31	8:10A		28206400			
		1440		35,400	24.58	35,400
/30	8:10A		28171000			
		1410		34,600	23.54	33,900
/29	8:40A		28136400			
		1445		35,800	24.78	35,700
/28	8:35A		28100600			
		1445		35,300	24.43	35,200
/27	8:30A		28065300			
		1415		31,900	22.54	32,500
/26	8:55A		28033400			
		1460		33,000	22.60	32,600
/25	8:35A		28000400			
		1415		30,600	21.63	31,200
/24	9:00A		27969800			
		1490		31,700	21.28	30,600
/23	8:10A		27938100			
		1415		29,200	20.64	29,700
/22	8:35A		27908900			
		1440		30,300	21.04	30,300
/21	8:35A		27878600			
		1410		29,400	20.85	30,000
/20	9:05A		27849200			
		1405		30,900	21.99	30,200
/19	8:40A		27818300			
		1450		30,600	21.10	30,400
/18	8:30A		27787700			
		1430		29,900	20.91	30,100
/17	8:40A		27757800			
		1445		33,400	23.11	33,300
12/16	8:35A		27724400			

Four Inch Meter On Visitor Center Line

Date	Time	Time Interval	Meter Reading (Cu. Ft.)	Cu. Ft. Used	Gallons Used	Rate of Use (GPM)	GPD
		1450		1,000	7,480.52	5.16	7400
12/16	8:20A		0149260				
		1445		620	4,637.92	3.21	4600
/15	8:15A		0148640				
		1440		1,300	9,724.68	6.75	9700
/14	8:15A		0147340				
		1440		100	748.05	0.52	700
/13	8:15A		0147240				
		1440		230	1,720.52	1.19	1700
/12	8:15A		0147010				
		1415		0		0	-
/11	8:40A		0147010				
		1435		160	1196.88	0.83	1200
/10	8:45A		0146850				
		1480		570	4,263.90	2.88	4100
/ 9	8:05A		0146280				
		1340		0		0	0
/ 8	9:45A		0146280				
		1435		0		0	0
/ 7	9:50A		0146280				
		1550		50	374.03	0.24	300
/ 6	8:00A		0146230				
		1445		0		0	0
/ 5	7:55A		0146230				
		1405		0		0	0
/ 4	8:30A		0146230				
		1460		0		0	0
/ 3	8:10A		0146230				
		1420		380	2,842.60	2.00	2900
/ 2	8:30A		0145850				
		1455		0		0	0
12/ 1	8:15A		0145850				
		1435		0		0	0
11/30	8:20A		0145850				

Date	Time	Time Interval	Meter Reading (Cu. Ft.)	Cu. Ft. Used	Gallons Used	Rate of Use (GPM)	GPD
12/31	8:00A		0153440				
		1440		0		0	0
/30	8:00A		0153440				
		1420		1,430	10,697.14	7.53	10,800
/29	8:20A		0152010				
		1410		0		0	0
/28	8:50A		0152010				
		1475		0		0	0
/27	8:15A		0152010				
		1415		0		0	0
/26	8:40A		0152010				
		1465		280	2,094.55	1.43	2100
/25	8:15A		0151730				
		1415		0		0	0
/24	8:40A		0151730				
		1480		0		0	0
/23	8:00A		0151730				
		1415		620	4,637.92	3.28	4700
/22	8:25A		0151110				
		1445		50	374.03	0.26	400
/21	8:20A		0151060				
		1410		0		0	0
/20	8:50A		0151060				
		1470		250	1,870.13	1.27	1800
/19	8:20A		0150810				
		1445		470	3,515.84	2.43	3500
/18	8:15A		0150340			0.42	600
		1425		80	598.44	~~4.20~~	~~6000~~
12/17	8:30A		0150260				
				7590			

Σ =

One and one-half inch Meter on Visitor Center Line

Date	Time	Time Interval	Meter Reading (gallons)	Gallons Used	Rate of Use (GPM)	GPD
12/16	8:20A		02306200			
		1445		28,900	20.00	28,800
/15	8:15A		02277300			
		1440		36,700	25.49	36,700
/14	8:15A		02240600			
		1440		31,500	21.88	31,500
/13	8:15A		02209100			
		1440		32,800	22.78	32,800
/12	8:15A		02176300			
		1415		29,200	20.64	29,800
/11	8:40A		03147100			
		1435		32,400	22.58	32,500
/10	8:45A		02114700			
		1480		43,500	29.39	42,300
/ 9	8:05A		02071200			
		1340		29,000	21.64	31,200
/ 8	9:45A		02042200			
		1435		3,400	2.37	3400
/ 7	9:50A		02038800			
		1550		28,600	18.45	26,600
/ 6	8:00A		02010200			
		1440		30,900	21.46	30,900
/ 5	8:00A		01979300			
		1410		3,750	2.66	3900
/ 4	8:30A		01975550			
		1460		2,550	1.75	2500
/ 3	8:10A		01973000			
		1420		5,200	3.66	5300
/ 2	8:30A		01967800			
		1455		22,600	15.53	22,400
12/ 1	8:15A		01945200			
		1435		22,650	15.78	22,700
11/30	8:20A		01922550			

check Month of November

12/1 8:15 AM 1945,200

10/31 1:05 PM 1436,700

508,500 ← ck →

Σ gal used = 508,500

Date	Time	Time Interval	Meter Reading (Gallons)	Gallons Used	Rate of Use (GPM)	(GPD)
12/31	8:00A		02571400			
		1440		39,300	27.29	39,300
/30	8:00A		02532100			
		1420		45,400	31.97	46,000
/29	8:20A		02486700			
		1410		13,700	9.72	14,000
/28	8:50A		02473000			
		1475		27,700	18.78	27,000
/27	8:15A		02445300			
		1415		11,600	8.20	11,800
/26	8:40A		02433700			
		1465		28,300	19.32	27,800
/25	8:15A		02405400			
		1415		24,500	17.31	24,900
/24	8:40A		02380900			
		1480		25,400	17.16	24,700
/23	8:00A		02355500			
		1415		15,700	11.10	16,000
/22	8:25A		02339800			
		1445		7,400	5.12	7400
/21	8:20A		02332400			
		1410		3,400	2.41	3100
/20	8:50A		02329000			
		1470		5,100	3.47	5000
/19	8:20A		02323900			
		1445		5,000	3.46	5000
/18	8:15A		02318900			
		1425		2,200	1.54	2200
12/17	8:30A		02316700			
		1450		10,500	7.24	10,400

Water Level - Visitor Center Reservoir (500,000 gallons)

Date	Time	Depth of Water	Change	GPD
11/30	8:25A	13' 9"		
12/ 1	8:30A	13' 10"	+1"	+2700
/ 2	8:35A	14' 0"	+2"	+5400
/ 3	8:15A	14' 6"	+6"	+16,100
/ 4	8:35A	15' 3"	+9"	+24,100
/ 5	8:10A	15' 9"	+6"	+16,100
/ 6	8:07A	15' 7"	-2"	-5400
/ 7	10:00A	15' 7"	0	0
/ 8	9:52A	15' 9½"	+2½"	+6700
/ 9	8:10A	15' 6"	-3½"	-9400
/10	8:50A	14' 11"	-7"	-18,700
/11	8:50A	14' 8"	-3"	-8000
/12	8:20A	14' 7"	-1"	-2700
/13	8:25A	14' 3"	-4"	-10,700
/14	8:27A	14' 0"	-3"	-8000
/15	8:25A	13' 5"	-7"	-18,700
12/16	8:25A	13' 3"	+3"	+8000
/17	8:35A	13' 6"	+8"	+21,400
/18	8:25A	14' 2"	+7"	+18,700
/19	8:30A	14' 9"	+6"	+16,100
/20	8:55A	15' 3"	+6"	+16,100
/21	8:30A	15' 9"	0	0
/22	8:30A	15' 9"	+1"	+2700
/23	8:05A	15' 10"	0	0
/24	8:50A	15' 10"	-1"	-2700
/25	8:25A	15' 9"	-1"	-2700
/26	8:45A	15' 8"	+1"	+2700
/27	8:25A	15' 9"	-1"	-2700
/28	8:45A	15' 8"	+1"	+2700
/29	8:30A	15' 9"	-12"	-32,200
/30	8:05A	14' 9"	-5"	-13,400
/31	8:05A	14' 4"		

One Inch Meter - Administrative Building

Date	Time	Time Interval	Meter Reading (Gallons)	Gallons Used	Rate of Use (GPM)
12/16	7:55A		0002365		
		1445		105	.0727
/15	7:50A		0002260		
		1445		50	.0346
/14	7:45A		0002210		
		1435		60	.0418
/13	7:50A		0002150		
		1435		30	.0209
/12	7:55A		0002120		
		1410		30	.0213
/11	8:25A		0002090		
		1435		40	.0279
/10	8:30A		0002050		
		1480		60	.0405
/ 9	7:50A		0001990		
		1345		30	.0223
/ 8	9:25A		0001960		
		1430		70	.0490
/ 7	9:35A		0001890		
		1555		80	.0514
/ 6	7:40A		0001810		
		1440		60	.0417
/ 5	7:40A		0001750		
		1430		10	.0070
/ 4	7:50A		0001740		
		1440		10	.0069
/ 3	7:50A		0001730		
		1415		40	.0283
/ 2	8:15A		0001690		
		1469		60	.0408
12/ 1	7:46A		0001630		
		1441		80	.0555
11/30	7:45A		0001550		

80

One Inch Meter - Administrative Building

Date	Time	Time Interval	Meter Reading (Gallons)	Gallons Used	Rate of Use (GPM)
12/~~31~~	7:45A		0003090		
		1440		100	.0694
/30	7:45A		0002990		
		1420		50	.0352
/29	8:05A		0002940		
		1460		60	.0411
/28	7:45A		0002880		
		1440		20	.0139
/27	7:45A		0002860		
		1440		30	.0208
/26	7:45A		0002830		
		1440		20	.0139
/25	7:45A		0002810		
		1125		10	.0089
/24	1:00P		0002800		
		1755		60	.0342
/23	7:45A		0002740		
		1445		90	.0623
/22	7:40A		0002650		
		1430		80	.0559
/21	7:50A		0002570		
		1440		60	.0417
/20	7:50a		0002510		
		1435		80	.0557
/19	7:55A		0002430		
		1440		0	0
/18	7:55A		0002430		
		1440		15	.0104
12/17	7:55A		0002415		
		1440		50	.0347

One and one-half Inch Meter - Museum and Auditorium

Date	Time	Time Interval	Meter Reading (Gallons)	Gallons Used	Rate of Use (GPM)	GPD
11/30/	7:50A		2187880			
		1440		880	.6111	880
12/ 1	7:50A		2187000			
		1455		325	.2234	320
/ 2	8:05A		2186675			
		1429		195	.1365	200
/3	7:54A		2186480			
		1441		310	.2151	310
/ 4	7:55A		2186170			
		1430		780	.5455	780
/ 5	7:45A		2185390			
		1442		530	.3675	530
/ 6	7:47A		2184860			
		1553		140	.0901	130
/ 7	9:40A		2184720			
		1430		210	.1469	210
/ 8	9:30A		2184510			
		1405		350	.2491	360
/ 9	8:55A		2184160			
		1417		470	.3317	480
/10	8:32A		2183690			
		1438		670	.4659	670
/11	8:30A		2183020			
		1410		370	.2624	380
/12	8:00A		2182650			
		1435		170	.1185	170
/13	7:55A		2182480			
		1435		250	.1742	250
/14	7:50A		2182230			
		1445		500	.3460	500
/15	7:55A		2181730			

One and One-half Inch Meter - Museum and Auditorium

Date	Time	Time Interval	Meter Reading (Gallons)	Gallons Used	Rate of Use (GPM)
		1435		145	.1010
12/16	7:50A		2181585		
		1445		215	.1488
/17	7:55A		2181370		
		1440		350	.2431
/18	7:55A		2181020		
		1445		720	.4983
/19	8:00A		2180300		
		1435		860	.5993
/20	7:55A		2179440		
		1440		780	.5417
/21	7:55A		2178660		
		1430		920	.6434
/22	7:45A		2177740		
		1435		620	.4321
/23	7:40A		2177120		
		1765		1180	.6686
/24	1:05P		2175940		
		1125		710	.6311
/25	7:50A		2175230		
		1440		1,400	.9722
/26	7:50A		2173830		
		1440		1,080	.7500
/27	7:50A		2172750		
		1440		1,970	1.3681
/28	7:50A		2170780		
		1460		2,940	2.0137
/29	8:10A		2167840		
		1410		3,040	2.1560
/30	7:40A		2164800		
		1443		2,160	1.4969
12/31	7:47A		2162640		

Death Valley National Monument
Death Valley, California

L54 December 20, 1960

Memorandum

To: Regional Director, Region Four

From: Superintendent, Death Valley

Subject: Water Meter Readings, Furnace Creek Area, Death Valley

Attached are copies of meter readings for the period of September 23 to November 30 for the following meters:

2" meter (PCB) on Texas Spring Line

4" meter (NPS) on Visitor Center Line

1½" meter (NPS) on Visitor Center Line

NPS reservoir (500,000 gallons) depth gauge readings

Also attached are meter readings for the period November 17 - 30 for the meters recently installed in the museum and administrative building.

/s/ Granville B. Liles
Granville B. Liles
Superintendent

In duplicate

Attachments

Copy to: WASO w/attachments

Two Inch Meter on Line Texas Spring to Texas Spring Campground

Date	Time	Time Interval	Meter Reading (Gallons)	Gallons Used	Rate of Use (GPM)	GPD
10/19	1:12P		25882500			
		1219		24,870	20.40	29,400
/18	4:53P		25857630			
		1513		26,780	17.70	25,500
/17	3:40P		25830850			
		1527		31,550	20.66	29,800
/16	2:13P		25799300			
		1493		31,500	21.10	30,400
/15	1:20P		25767800			
		1447		31,100	21.49	31,000
/14	1:13P		25736700			
		1438		31,000	21.56	31,100
/13	1:15P		25705700			
		1440		31,240	21.69	31,300
/12	1:15P		25674460			
		1430		31,560	22.07	31,800
/11	1:25P		25642900			
		1465		31,500	21.50	31,000
/10	1:00P		25611400			
		1472		31,600	21.47	31,000
/ 9	12:28P		25579800			
		2848		60,400	21.21	30,600
/ 7	1:00P		25519400			
		1702		36,300	21.33	30,700
/ 6	8:38A		25483100			
		7200		178,000	24.72	35,600
10/ 1			25305100			
		2880		39,700	13.78	19,800
9/29			25265400			
		8640		229,100	26.52	38,200
/23			25036300			

Date	Time	Time Interval	Meter Reading (Gallons)	Gallons Used	Rate of Use (GPM)	
11/ 6	2:45P		26461650			
		1537		34,450	22.41	32,300
/ 5	1:08P		26427200			
		1413		31,850	22.54	32,500
/ 4	1:35P		26395350			
		1463		31,850	21.77	31,300
/ 3	1:12P		26363500			
		1442		31,800	22.05	31,800
/ 2	1:10P		26331700			
		1425		30,900	21.68	31,200
11/ 1	1:25P		26300800			
		1435		31,900	22.23	32,000
10/31	1:30P		26268900			
		1365		30,400	22.27	32,100
/30	2:45P		26238500			
		1498		38,000	25.37	36,500
/29	1:47P		26200500			
		1468		35,200	23.98	34,600
/28	1:19P		26165300			
		1455		36,600	25.15	36,200
/27	1:04P		26128700			
		1419		33,700	23.75	34,200
/26	1:25P		26095000			
		1420		29,550	20.81	30,000
/25	1:45P		26065450			
		4355		91,550	21.02	30,300
/22	1:10P		25973900			
		1420		31,450	22.15	31,900
/21	1:30P		25942450			
		1455		29,650	20.38	29,400
10/20	1:15P		25912800			
		1443		30,300	21.00	30,200

Date	Time	Time Interval	Meter Reading (Gallons)	Gallons Used	Rate of Use (GPM)	GPD
11/22	8:40A		26983350			
		1450		31,250	21.55	31,000
/21	8:30A		26952100			
		1435		31,300	21.81	31,400
/20	8:35A		26920800			
		1460		31,450	21.54	31,000
/19	8:15A		26889350			
		1430		31,650	22.13	31,900
/18	8:25A		26857700			
		1320		29,700	22.50	32,400
/17	10:25A		26828000			
		1280		26,500	20.70	29,800
/16	1:05P		26801500			
		1420		31,500	22.18	32,000
/15	1:25P		26770000			
		1452		32,700	22.52	32,400
/14	1:13P		26737300			
		1408		33,100	23.51	33,900
/13	1:45P		26704200			
		1480		38,700	26.15	37,700
/12	1:05P		26665500			
		1420		39,000	27.46	39,600
/11	1:25P		26626500			
		1420		35,000	24.65	35,500
/10	1:45P		26591500			
		1463		34,700	23.72	34,200
/ 9	1:22P		26556800			
		1426		32,300	22.65	32,600
/ 8	1:36P		26524500			
		1456		33,000	22.66	32,600
11/ 7	1:20P		26491500			
		1355		29,850	22.03	31,700

Date	Time	Time Interval	Meter Reading (Gallons)	Gallons Used	Rate of Use (GPM)	
11/30	9:35A		27258500			
		1420		30,550	21.51	31,000
/29	8:55A		27227450			
		1430		30,050	21.01	30,200
/28	9:05A		27197900			
		1365		30,100	22.05	31,800
/27	10:20A		27167800			
		1565		42,700	27.28	39,300
/26	8:15A		27125100			
		1460		40,300	27.60	39,800
/25	8:35A		27084800			
		1430		38,400	26.85	38,700
/24	8:45A		27046400			
		1450		31,750	21.90	31,600
11/23	8:55A		27014650			
		1455		31,300	21.51	31,000

Four Inch Meter On Visitor Center Line

Date	Time	Time Interval	Meter Reading (Cu. Ft.)	Cu. Ft. Used	Gallons Used	Rate of Use (GPM)	GPD
10/19	1:00P		0115250				
		1215		0	0	0	0
/18	4:45P		0115250				
		1515		680	5,087	3.36	4800
/17	3:30P		0114570				
		1505		290	2,169	1.44	2100
/16	2:25P		0114280				
		1520		0	0	0	—
/15	1:05P		0114280				
		1445		0	0	0	—
/14	1:00P		0114280				
		1440		170	1,272	0.88	1300
/13	1:00P		0114110				
		1440		260	1,945	1.35	1900
/12	1:00P		0113850				
		1425		450	3,366	2.36	3400
/11	1:15P		0113400				
		1470		0	0	0	—
/10	12:45P		0113400				
		1445		0	0	0	—
/ 9	12:40P		0113400				
		2875		780	5,835	2.03	2900
/ 7	12:45P		0112620				
		1675		420	3,142	1.88	2700
/ 6	8:50A		0112200				
		7200		650	4,862	.68	1000
10/ 1			0111550				
		2880		620	4,638	1.61	2300
9/29			0110930				
		8640		3,050	22,816	2.64	3800
9/23			0107880				

Date	Time	Time Interval	Meter Reading (Cu. Ft.)	Cu. Ft. Used	Gallons Used	Rate of Use (GPM)	
11/ 5	12:55P		0126670				
		1415		730	5,461	3.86	5600
/ 4	1:20P		0125940				
		1460		150	1,122	0.77	1100
/ 3	1:00P		0125790				
		1450		1,220	9,126	6.29	9000
/ 2	12:50P		0124570				
		1420		120	898	0.63	900
11/ 1	1:10P		0124450				
		1445		715	5,349	3.70	5300
10/31	1:05P		0123735				
		1445		1,600	11,969	8.28	11,900
/30	1:00P		0122135				
		1407		590	4,414	3.14	4500
/29	1:33P		0121545				
		1468		1,370	10,248	6.98	10,100
/28	1:05P		0120175				
		1455		795	5,947	4.09	5900
/27	12:50P		0119380				
		1418		670	5,012	3.53	5100
/26	1:12P		0118710				
		1419		965	7,219	5.09	7200
/25	1:33P		0117745				
		4358		1,045	7,817	1.79	2600
/22	12:55P		0116700				
		1418		720	5,386	3.80	5500
/21	1:17P		0115980				
		1457		570	4,264	2.93	4200
10/20	1:00P		0115410				
		1440		160	1,197	0.83	1200

Date	Time	Time Interval	Meter Reading (Cu. Ft.)	Cu. Ft. Used	Gallons Used	Rate of Use (GPM)	
11/21	8:15A		0142570				
		1445		910	6,807	4.71	6800
/20	8:10A		0141660				
		1445		0	0	0	0
/19	8:05A		0141660				
		1435		620	4,638	3.23	4700
/18	8:10A		0141040				
		1445		8,190	61,265	42.40	61,100
/17	8:05A		0132850				
		1160		30	224	0.19	300
/16	12:45P		0132820				
		1415		500	3,740	2.64	3800
/15	1:10P		0132320				
		1455		580	4,339	2.98	4300
/14	12:55P		0131740				
		1410		120	898	0.64	900
/13	1:25P		0131620				
		1480		0	0	0	0
/12	12:45P		0131620				
		1410		0	0	0	0
/11	1:15P		0131620				
		1420		3,020	22,591	15.91	22,900
/10	1:35P		0128600				
		1465		900	6,732	4.60	6600
/ 9	1:10P		0127700				
		1425		500	3,740	2.62	3800
/ 8	1:25P		0127200				
		1475		530	3,965	2.69	3900
/ 7	12:50P		0126670				
		1355		0	0	0	—
11/ 6	2:15P		0126670				
		1520		0	0	0	

Date	Time	Time Interval	Meter Reading (Cu. Ft.)	Cu. Ft. Used	Gallons Used	Rate of Use (GPM)	
11/30	8:20A		0145850				
		1430		0	0	0	—
/29	8:30A		0145850				
		1430		170	1,272	0.89	1300
/28	8:40A		0145680				
		1375		0	0	0	—
/27	9:45A		0145680				
		1540		580	4,339	2.82	4100
/26	8:05A		0145100				
		1420		615	4,601	3.24	4700
/25	8:25A		0144485				
		1435		465	3,478	2.42	3500
/24	8:30A		0144020				
		1435		500	3,740	2.61	3800
/23	8:35A		0143520				
		1455		480	3,591	2.47	3600
11/22	8:20A		0143040				
		1445		470	3,516	2.43	3500

One and one-half inch Meter on Visitor Center Line

Date	Time	Time Interval	Meter Reading (Gallons)	Gallons Used	Rate of Use (GPM)	
10/19	1:00P		01159300			
		1215		3,100	2.55	3700
/18	4:45P		01156200			
		1515		7,850	5.18	7500
/17	3:30P		01148350			
		1504		5,150	3.42	4900
/16	2:26P		01143200			
		1526		11,680	7.65	11,000
/15	1:00P		01131520			
		1440		14,220	9.88	14,200
/14	1:00P		01117300			
		1440		15,780	10.96	15,800
/13	1:00P		01101520			
		1440		12,120	8.42	12,100
/12	1:00P		01089400			
		1425		10,500	7.37	10,600
/11	1:15P		01078900			
		1470		9,900	6.73	9700
/10	12:45P		01069000			
		1445		8,650	5.99	8600
/ 9	12:40P		01060350			
		2875		22,650	7.88	11,300
/ 7	12:45P		01037700			
		1675		15,000	8.96	12,900
/ 6	8:50A		01022700			
		7200		39,600	5.50	7900
10/ 1			00983100			
		2880		7,800	2.71	3900
9/29			00975300			
		8640		306,000	35.42	51,000
9/23			00669300			

Date	Time	Time Interval	Meter Reading (Gallons)	Gallons Used	Rate of Use (GPM)	
11/ 6	2:15P		01550400			
		1520		17,800	11.71	16,800
/ 5	12:55P		01532600			
		1415		16,600	11.73	16,900
/ 4	1:20P		01516000			
		1460		14,300	9.79	14,100
/ 3	1:00P		01501700			
		1450		16,350	11.28	16,200
/ 2	12:50P		01485350			
		1420		14,700	10.35	14,900
11/ 1	1:10P		01470650			
		1445		33,950	23.49	33,800
10/31	1:05P		01436700			
		1445		26,500	18.33	26,400
/30	1:00P		01410200			
		1406		22,850	16.25	24,400
/29	1:34P		01387350			
		1469		29,350	19.98	28,800
/28	1:05P		01358000			
		1455		28,550	19.62	28,300
/27	12:50P		01329450			
		1418		25,400	17.91	25,800
/26	1:12P		01304050			
		1418		22,050	15.55	22,400
/25	1:34P		01282000			
		4359		70,600	1.62	* 23,300
/22	12:55P		01211400			
		1418		16,750	11.81	17,000
/21	1:17P		01194650			
		1457		20,300	13.93	20,100
10/20	1:00P		01174350			
		1440		15,050	10.45	15,100

Date	Time	Time Interval	Meter Reading (Gallons)	Gallons Used	Rate of Use (GPM)	
11/22	8:20A		01714000			
		1445		8,600	5.95	8600
/21	8:15A		01705400			
		1445		9,200	6.37	9200
/20	8:10A		01696200			
		1445		1,400	0.97	1400
/19	8:05A		01694800			
		1435		2,050	1.43	2100
/18	8:10A		01692750			
		1445		26,200	18.13	26,100
/17	8:05A		01666550			
		1160		2,650	2.28	3300
/16	12:45P		01663900			
		1415		2,800	1.98	2900
/15	1:10P		01661100			
		1455		3,320	2.28	3300
/14	12:55P		01657780			
		1410		3,380	2.40	3500
/13	1:25P		01654400			
		1480		12,000	8.11	10,700
/12	12:45P		01642400			
		1410		16,400	11.63	16,700
/11	1:15P		01626000			
		1420		12,300	8.66	12,500
/10	1:35P		01613700			
		1465		19,450	13.28	19,100
/ 9	1:10P		01594250			
		1425		17,200	12.07	17,400
/ 8	1:25P		01577050			
		1475		16,650	11.29	16,200
11/ 7	12:50P		01560400			
		1355		10,000	7.38	10,600

Date	Time	Time Interval	Meter Reading (Gallons)	Gallons Used	Rate of Use (GPM)	
11/30	8:20A		01922550			
		1430		22,100	15.45	22,200
/29	8:30A		01900450			
		1430		22,950	16.05	23,100
/28	8:40A		01877500			
		1375		22,300	16.22	23,400
/27	9:45A		01855200			
		1540		35,800	23.25	33,500
/26	8:05A		01819400			
		1420		34,700	24.44	35,200
/25	8:25A		01784700			
		1435		32,000	22.30	32,100
/24	8:30A		01752700			
		1435		29,900	20.84	30,000
11/23	8:35A		01722800			
		1455		8,800	6.05	8700

Volume of 1" of rise = $\frac{\pi 27^2}{12} \times 7.28 = 2680$ gal

Water Level - Visitor Center Reservoir (500,000 gallons)

Date	Time	Elapsed min.	Depth of Water *	Change
10/6	8:30A		5' 1"	+ 18,700
/7	12:52P		5' 8"	+ 26,800
/9	12:20P		6' 6"	+ 24,100
/10	12:50P		7' 3"	+16,100
/11	1:20P		7' 9"	+16,100
/12	1:07P		8' 3"	+10,700
/13	1:09P		8' 7"	+21,400
/14	1:07P		9' 3"	—
/15	1:14P		9' 3"	+13,400
/16	2:08P		9' 8"	+26,800
/17	3:35P		10' 6"	+16,100
/18	4:48P		11' 0"	+13,400
/19	1:07P		11' 5"	+10,700
/20	1:07P		11' 9"	+5400
/21	1:25P		11' 11"	+2700
/22	1:00P		12' 0"	—
/25	1:40P		12' 0"	-2700
/26	1:19P		11' 11"	-10,700
/27	1:00P		11'7"	-5400
/28	1:12P		11' 5"	-13,400
/29	1:40P		11' 0"	-5400
/30	1:10P		10' 10"	-10,700
10/31	1:15P		10' 6"	-16,100
11/1	1:18P		10' 0"	+13,400
/2	1:00P		10' 5"	+2700
/3	1:05P		10' 6"	+10,700
/4	1:30P		10' 10"	+2700
/5	1:00P		10' 11"	

Date	Time	Depth of Water *	
11/6	2:25P	11' 3"	+10,700
/7	1:00P	11' 9"	+16,100
/8	1:32P	11' 11"	+5400
/9	1:15P	12' 1"	+5400
/10	1:40P	12' 0"	-2700
/11	1:20P	11' 7"	-13,400
/12	12:50P	11' 11"	+10,700
/13	1:40P	12' 3"	+10,700
/14	1:05P	12' 11"	+21,400
/15	1:20P	13' 6"	+18,700
/16	12:50P	14' 1"	+18,700
/17	10:15A	14' 4"	+8000
/18	8:15A	12' 9"	-50,900
/19	8:10A	13' 3"	+16,100
/20	8:20A	14' 0"	+24,100
/21	8:25A	14' 4"	+11,700
/22	8:30A	14' 9"	+13,400
/23	8:45A	15' 2"	+13,400
/24	8:37A	14' 11"	-8000
/25	8:30A	14' 5"	-16,100
/26	8:10A	13' 11"	-16,100
/27	9:55A	13' 6"	-13,400
/28	9:50A	13' 6"	-0
/29	8:40A	13' 7"	+2700
11/30	8:25A	13' 9"	+5400

* Full Depth = 16'

One Inch Meter - Administrative Building

Date	Time	Time Interval	Meter Reading (Gallons)	Gallons Used	Rate of Use (GPM)	GPD
11/30	7:45A		0001550			
		1425		85	.0596	86
/29	8:00A		0001465			
		1445		55	.0381	55
/28	7:55A		0001410			
		1435		20	.0139	20
/27	8:00A		0001390			
		1450		60	.0414	60
/26	7:50A		0001330			
		1415		65	.0459	67
/25	8:15A		0001265			
		1460		45	.0308	44
/24	7:55A		0001220			
		1440		80	.0556	80
/23	7:55A		0001140			
		1440		105	.0729	105
/22	7:55A		0001035			
		1440		115	.0799	115
/21	7:55A		0000920			
		1430		70	.0490	71
/20	8:05A		0000850			
		1457		105	.0721	104
/19	7:48A		0000745			
		1433		175	.1221	176
/18	7:55A		0000570			
		1345		70	.0520	75
/17	9:30A		0000500			

One and one-half Inch Meter - Museum and Auditorium

Date	Time	Time Interval	Meter Reading (Gallons)	Gallons Used	Rate of Use (GPM)	GPD
11/17	9:35A		2212460			
		1335		335	.2509	362
/18	7:50A		2212125			
		1435		445	.3101	450
/19	7:45A		2211680			
		1445		690	.4776	690
/20	7:50A		2210990			
		1450		790	.5448	790
/21	8:00A		2210200			
		1440		500	.3472	500
/22	8:00A		2209700			
		1440		350	.2431	350
23	8:00A		2209350			
		1440		710	.4931	710
/24	8:00A		2208640			
		1450		4,190	2.8897	4170
/25	8:10A		2204450			
		1415		6,830	4.8269	6950
/26	7:45A		2197620			
		1460		7,400	5.0685	7300
/27	8:05A		2190220			
		1435		1,510	1.0523	1520
/28	8:00A		2188710			
		1445		380	.2630	380
/29	8:05A		2188330			
		1425		450	.3158	450
/30	7:50A		2187880			

01-24-1961: report on water use furnace creek area contents ; january 24, 1961

January 24, 1961

L 54

Memorandum

To: Regional Chief of Operations, Region Four

From: Hydraulic Engineer Spaulding, Region Four

Subject: Report on Water Use, Furnace Creek Area, Death Valley National Monument

Attached is one copy of a report of water use by National Park Service facilities in the Furnace Creek Area during the '49er Encampment and dedication of the Visitor Center in November, 1960. The report is based on data taken by the writer during a trip to Death Valley and on meter readings supplied by Superintendent Liles' memorandum of December 20.

Significant results of the water use study are:

1. The quantity of water the Park Service is able to draw from Texas Spring easily met the needs during the period of peak travel.

2. Storage capacity is adequate for present uses.

3. The quantity of water the Service is able to draw through its system is restricted to less than 35 gpm by an old, small diameter pipeline.

The report provides per capita rates of water use for predicting future needs and makes recommendations for further study and for construction to increase the capacity of the system to 35 gpm.

Luis Spaulding
Hydraulic Engineer

CLEARED FOR DISTRIBUTION:

_____
Asst Regional Director Date

00-00-0000: general and summary of results ; january 24, 1961

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NATIONAL PARK SERVICE
REGION FOUR

Report on WATER USE

National Park Service Facilities in the Furnace Creek Area of Death Valley National Monument

for a period of peak travel in November, 1960

L. S. Spaulding
Hydraulic Engineer

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Travel

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Appendix B-Metered Water Use

B-1 Texas Spring Diversion

B-2 Storage in 500,000 gallon Reservoir

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B-4 Visitor Center Exhibit - Auditorium Wing

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Appendix C- Daily Water Use - Calculation Sheets

Appendix D- Maps

NMDV - 2220 Visitor Center - Water System

NMDV - 2219 Water System - Furnace Creek Area

00-00-0000: summary of water use durring 1960 '49er emcampment ; january 11, 1961

GENERAL

This is a report on water used by National Park Service facilities in the Furnace Creek area during the annual Death Valley '49er, Inc., encampment which started the evening of Thursday, November 10, 1960 and concluded at noon on Sunday, November 13, 1960. The Death Valley Visitor Center was dedicated on Saturday, November 12, an event which drew a large attendance. A special study of water use was made during this period of peak travel to determine rates of usage for domestic purposes as a basis for predicting future needs. To gather data the writer made a trip to Death Valley November 7 to 17. A summary of the data collected and results obtained are presented herein.

SUMMARY OF RESULTS

The existing Texas Spring supply was adequate to meet the needs of National Park Service facilities in the Furnace Creek Area during the Death Valley '49er Encampment and Dedication of the Visitor Center. In fact, water was added to storage during the three days of peak travel. The suspension of irrigation during the days of peak travel accounts for the surplus. Accurate data on irrigation needs were not obtained as the study did not cover a period of normal irrigation operation.

Average use during three full days of the encampment, November 11-13, was as follows:

	Gallons	
	Per Minute	Per Day
Visitor Center, Exhibit-Auditorium, domestic use	4.8	6,841
Visitor Center, Administrative Wing, domestic use	0.1	167
Visitor Center, Irrigation, Friday (suspended Saturday and Sunday) *(1/3 of rates added for total)	6.0 *	8,500 *
Furnace Creek Campground, domestic use	1.9	2,803
Texas Spring Campground, domestic use	9.2	13,239
Campgrounds, Irrigation (suspended Friday, Saturday and Sunday)	---	---
Indian Village (assumed use)	0.1	200
Added to Storage 500,000 gallon reservoir	8.1	11,683
Total Diversion from Texas Spring	26.2	37,800

00-00-0000: chart of population and water use ; january 11, 1961

This study has determined that water was consumed at the following unit rates during the encampment:

Visitor Center, domestic use	2.6	gallons per visit
Texas Spring Campground, domestic use	20	gallons per person per day

Water consumption and population are shown in greater detail on the table and the chart which follow this page.

- Column B of the table shows daily water use delivered by the interior water system of the museum wing of the Visitor Center.

- Column C shows the daily travel to the Visitor Center, being the count of people entering the lobby during regular hours plus the attendance at the Naturalist's evening slide talk.

- Column D shows average domestic water use per visit to the Visitor Center.

- Column E shows the quantity of water assumed to have been used from the interior water system for lawn sprinkling. This use was required for watering the lawn inside the front wall of the Visitor Center pending repair of the underground sprinkler system.

- Column F shows water use of the administrative wing of the Visitor Center.

- Column G shows irrigation use for the patio and front lawns and for irrigation ditches between the parking areas.

- Column H shows water use by the one comfort station in the undeveloped Furnace Creek Campground.

- Column J shows the population camping in the vicinity of the Furnace Creek Campground comfort station.

- Column K shows the average water use of the comfort station per person camping in the vicinity.

- Column L shows the total water delivered to the Visitor Center area, comfort station at the Furnace Creek Campground and the Indian Village.

-Columns M, N & P show the water consumed in Texas Spring Campground, the camp population and the per capita use, respectively.

- Column Q shows the total water consumed through National Park Service facilities in the Furnace Creek Area.

- Column R shows the daily change in storage in the 500,000 gallon reservoir.

- Column S shows the daily National Park Service diversion from the Texas Spring source.

01-11-1961: water system ; january 11, 1961

Death Valley National Monument - Furnace Creek Area

TABLE I SUMMARY OF WATER USE DURING 1960 '49er ENCAMPMENT

November 1960

L. Spaulding 1-11-61

A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T
DATE	DAILY WATER CONSUMPTION, gallons - midnight to midnight														CHANGE IN STORAGE 500,000 gallon Reservoir	DIVERSION from Texas Spring	COMMENTS
	VISITOR CENTER						FURNACE CREEK CAMPGROUND			TOTAL thru main meters in vault	TEXAS SPRING CAMPGROUND			TOTAL CONSUMPTION			
	Museum - Auditorium (excluding irrigation)			Irrigat. from Museum system	Admin. Wing	Irrigation Patio & Lawns	Gallons per Day	Camp Population	Gal. per person per day		Gallons per Day	Camp Population	Gal. per person per day				
1960	Gal.	Visits	Gal. per Visit	Gallons	Gallons	Gallons				Gallons per Day				Gallons	Gallons + or -	Gallons per Day	
Tue. Nov 8	①	257		①	①	①		①		20,500	7000			27,500	+5100	32,600	
Wed. Nov 9	①	656		①	①	①		none		23,000	9600	374	26	32,600	even	32,600	
Thur. Nov 10	①	1006		①	①	①		99		40,800	10,200	477	21	51,000	-16,300	34,700	1st event of Encampment Thur. evening
Fri, Nov 11	5869	2180	2.7	300*	200*	8300*	1231*	246	5*	16,100	13,400	624	22	29,500	+7600	37,100	
Sat, Nov 12	10,474	4352	2.4	none	200*	none	4636③	864	5	15,510	13,980	752	19	29,490	+10,740	40,230	Dedication of Visitor Center
Sun Nov 13	4180	1373	3.0	none	100*	none	2543③	746	3	7023	12,337	739	17	19,360	+16,710	36,070	last day of '49er Encampment
Mon, Nov 14	960	376	2.5	200*	179	1472④	200*	32	6	3211	8559	400	21	11,770	+21.050	32,820	
Tue Nov 15	797	442	1.8	②	140	6967③	200*	29	7	8304	4906	314	16	13,210	+18,880	32,090	
Wed Nov 16	682	394	1.7	②	160	6418③	150*	19	8	7610	7190	314	23	14,800	+16,570	31,370	
Thur, Nov 17	363			②	90	53,408③	none*	none		54,061	6239	316	20	60,300	-29,170	31,130	Irrigation lines opened to maintain use at capacity of 2-inch supply line
TOTAL OR AVERAGE	Nov. 11 to 16 23,962	9117	incl. 2.6		Average Nov 14-17 142					average 19,612	average 9601	Nov 9-17 479	incl. 20	average 28,953	average +5118	average 34,071	
SOURCE OF DATA	Appendix C	Appendix A-2	Calc.	Field Book No. 98	Appendix B-5 adjusted	Field Book No. 98	calculated See Note No. 3	Appendix A-1	Col. H / Col. J	Appendix C	Col. Q - L	Appendix A-1	Col. M / Col. N	Col. S - R	Appendix C	Appendix C	

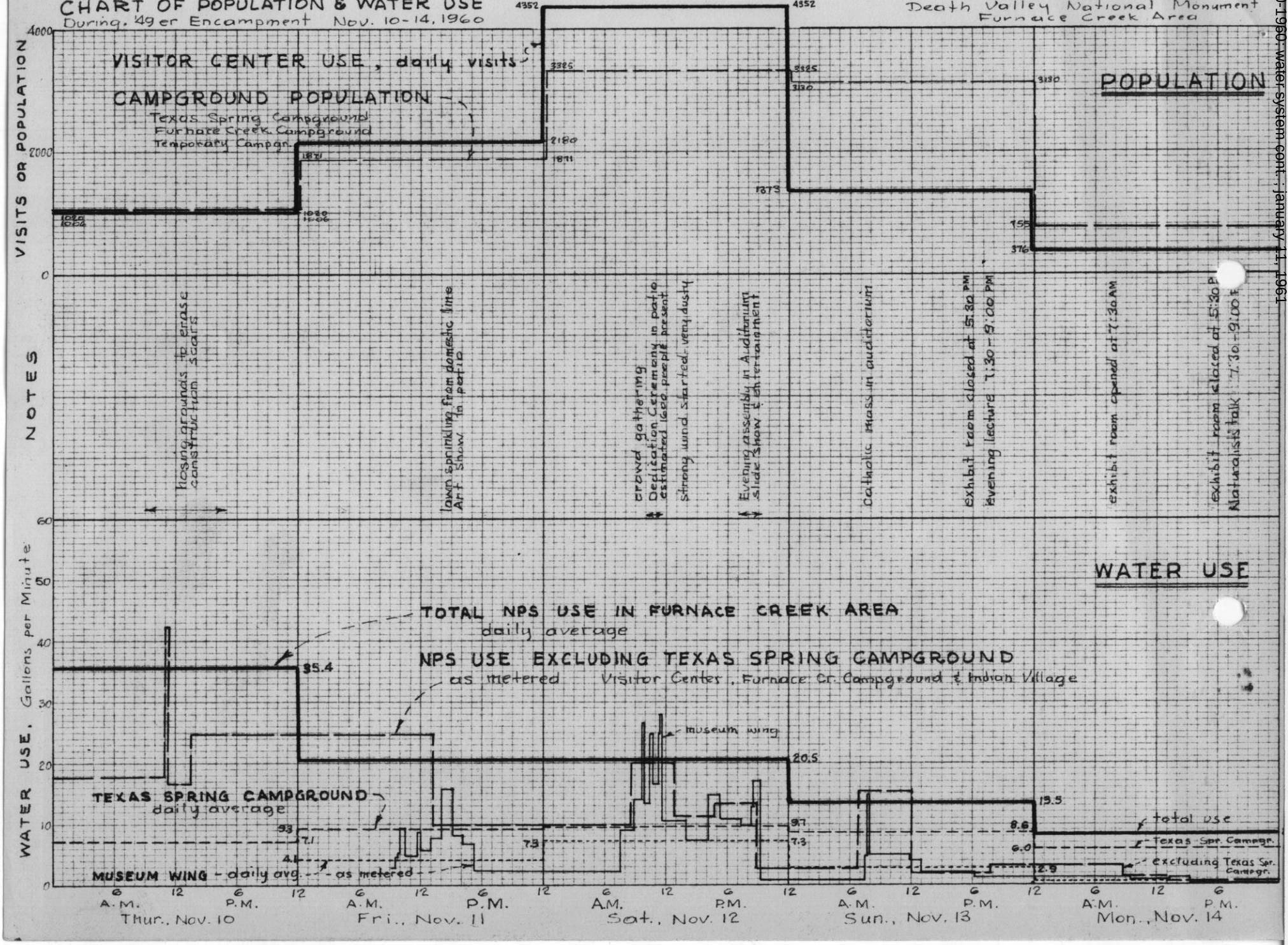
NOTES

* Assumed
① Not recorded
② Lawn sprinkling from hose bibb on Museum Wing system - believed to be none on particular day - but if any is included with museum use
③ Not metered - Calculated by subtracting sum of known use including 200 gpd Indian Village use from main metered use
④ Patio lawn sprinkling before 8 AM - calculated from Sparling meter readings less known and assumed use.

CHART OF POPULATION & WATER USE

During '49er Encampment Nov. 10-14, 1960

Death Valley National Monument
Furnace Creek Area



11-10-1960: water system cont.; january 11, 1961

WATER SYSTEM

The water system is illustrated by drawings NMDV 2219 and NMDV 2220 attached to this report.

The source of water is the Death Valley Hotel Company's Texas Spring tunnel. The Park Service system diverts from the company system at a concrete settling box covered by a metal shed, the take out point being just upstream from the Company's measuring weir.

Water is carried from the diversion point to a 20,000 gallon buried concrete reservoir through 2,730 feet of 2-1/2 inch pipe and 370 feet of 3 inch pipe. The discharge end of the pipe is fitted with a float controlled valve which shuts off the inflow when the reservoir is filled. Midway on this line a 2 inch Neptune water meter, installed by the Death Valley Hotel Company records National Park Service diversion. The elevation of the water level in the 20,000 gallon reservoir when full is about +124.

From the 20,000 gallon reservoir the water is carried by a 3 inch main (laid in the 1930's) to the vicinity of the lower comfort station in Texas Spring Campground. The main then reduces to 401 feet of 2-1/2 inch pipe (laid in 1955) through the lower campground and connects to an old 2 inch main. Numerous laterals in the campground serve fifty water stations, each station having two hosebibbs and two comfort stations having a total of eleven tank type flush toilets. From the lower end of the campground water is carried 1,000 feet in the old 2 inch main to a buried concrete valve vault. A six inch main laid in 1960 runs 3,310 feet from the vault uphill to a 500,000 gallon ground level steel tank sixteen feet in height, the elevation of the bottom of the tank being + 62. The 6 inch main at the tank is fitted with a Cla-Val altitude control valve which shuts inflow to the reservoir when it is filled.

Water for use at the Visitor Center, Furnace Creek Campground and the Indian Village is drawn from the supply line at the point where the 2 inch line from Texas Spring Campground joins the 6 inch line, the junction point being enclosed in a valve vault. Water passes through 4 inch and 1-1/2 inch pressure reducing valves operating in parallel. The 4 inch valve remains closed when demand is low and opens for large flows. A 4 inch Sparling meter measures the flow in the 4 inch branch and a 1-1/2 inch Neptune meter measures the flow in the 1-1/2 inch branch. Downstream from the meters and within the vault the parallel branches rejoin to supply water to the Visitor Center and Furnace Creek Campground through a 6 inch main and to the Indian Village through an old 2 inch main. (Some records show the latter line as 2-1/2 inch, other records show 3 inch.)

The above mentioned 6 inch main is 2,250 feet in length from the vault to a point near the Visitor Center at which the main branches to circle the Visitor Center. The 6 inch main continues for 1,086 feet to the vicinity of a comfort station in the undeveloped Furnace Creek Campground.

Four laterals including a 1-1/4 inch line to 778 square feet of lawn within a walled in space serve sprinkling systems watering 33,678 square feet of lawn between the exhibit-auditorium building and the parking area. Two laterals provide for irrigation flow in ditches bordering the parking areas and tees in the 6 inch main have been provided for future laterals to irrigation ditches. Visitor Center domestic use is supplied by two 2-1/2 inch laterals, one to each wing of the Center, the laterals being fitted with pressure reducing valves located in vaults near the buildings. The lateral serving the exhibit - auditorium wing provides water for restrooms containing 10 fixtures fitted with flush valves, for an inside drinking water cooler, an outside drinking fountain, janitor's service sink, three outside hose bibbs (the two hose bibbs outside the mechanical room are not metered) and for make up water for two evaporative cooling towers for the air conditioning systems. This use is measured by a 1-1/2 inch meter located in the building's mechanical room.

Domestic use of the administrative wing, measured by a 1-inch meter in the mechanical room, includes one drinking water cooler-heater, rest rooms containing three fixtures with flush valves, janitor's service sink, dark room sink, boiler make up for hot water heating of the entire Visitor Center, make up water for an evaporative cooling tower on the air conditioning system, humidifiers for the naturalist's workroom and for one outside hose bibb. (The hose bibb outside the mechanical room is not on this meter.)

Each wing of the Visitor Center contains a 2-1/2 inch fire line separate from the service lines.

A 3 inch lateral from the 6 inch main provides irrigation water for the patio, for lawn sprinkling bordering the administration wing on the west and north and makeup water for the patio pool. Vegetation receiving water from this lateral is shown on map 2220 in the appendix and totals 10,741 square feet of lawn, 4 olive trees and 5 palms. The area of the pool is 1,600 square feet. Provision has been made for installing a 2 inch meter on the 3 inch lateral.

A lateral, presently not metered separately, serves the one comfort station in Furnace Creek Campground. This facility contains six fixtures with flush valves, 4 lavatories and a service sink for public use. No other water service is provided in the presently undeveloped campground.

TRAVEL

Details of travel provided by the Monument records are contained in Appendix A. Appendix A-1 lists daily campground population from November 9 to 17 with a breakdown between tent and trailer campers and for three areas, namely, Texas Spring Campground, temporary campground on the old airstrip between the Ranch and Texas Spring Campground and, lastly, Furnace Creek Campground.

Appendix A-2 lists daily visitor use of the Visitor Center from November 1 to 16.

Appendix A-3 lists, to the extent records were made, of hourly rates of people entering the lobby on November 10 and 11.

Traffic counters measuring travel on the main entrance roads were read by the Monument staff on Thursday, November 10 and again late on Sunday, November 13. These readings indicate that travel to the Monument during the 3 day period totaled 14,120 people. A comparison with travel to the Visitor Center from midday November 10 through November 13 totaling 8,408 visits (Appendix A-2) indicates that travel to the Visitor Center was 60 per cent of total Monument travel.

METERED WATER USE

Appendix B provides data on water use measured by 5 meters and on water in storage as measured by the level gage on the 500,000 gal. reservoir. Storage in the 20,000 gallon reservoir is presumed to be constant, the system being such that the reservoir remains full except when irrigation of Texas Spring Campground draws down the storage. The data of Appendix B have been adjusted to daily rates by calculations shown in Appendix C. In calculating visitor use of water no deduction from metered rates have been made for cooling towers, boiler makeup and other incidental uses. These other uses are considered to have been insignificant.

Some water use rates shown by the data are as follows:

1. Peak rate of diversion from Texas Spring (for a 4-1/2 hour period Saturday AM, November 12) — 31.5 gpm

2. Peak rate of use through the 6 inch main (All use at Visitor Center, F.C. Campground and Indian Village for a 58 minute period on November 17) (Irrigation lines opened as test) — 148 gpm

3. Peak rates of domestic use at Visitor Center

   a. Short periods of less than 1 minute on Saturday, November 12, following dedication — 60 gpm

   b. Seven minute period following Dedication, November 12. — 28 gpm

   c. 2-1/2 hour period of Dedication, Saturday, November 12, (1600 to 2000 people in attendance) — 17.3 gpm

   d. Peak daily rate - Saturday, November 12 — 7.3 gpm

4. Water use per person using Visitor Center restroom, Saturday, November 12 (20 people in 4 minutes using 100 gallon) — 5 gal per person

5. Texas Spring Campground - peak day domestic use, Saturday, November 12 (864 people) — 9.7 gpm

Raw data are contained in Death Valley Field Book No. 98.

CAPACITY OF PIPELINES

A test was made of the capacity of the 2-1/2 inch and 3 inch line from Texas Spring to the 20,000 gallon reservoir and meter records have been used to determine the capacity of the pipeline varying from 3 inch to 2 inch running from the 20,000 gallon reservoir through Texas Spring Campground to the connection with the six inch main, and thence to the 500,000 gallon reservoir. Results are as follows:

Pipeline	Capacity, gpm
Texas Spring to 20,000 gallon reservoir	41
20,000 gallon reservoir to 500,000 gallon reservoir	20

Flow in the second pipeline (joining the two reservoirs) apparently is restricted by friction through about 1,000 feet of old 2 inch steel pipe. Head loss through this section at 20 gpm is estimated to be 28 feet using a friction coefficient, C, of 80 compared to the available head between the two reservoirs of about 44 feet when the big tank is nearly full. (A flow of 35 gpm would require a head differential of 78 feet over this section.) With the present system the maximum flow which can be drawn from the 20,000 gallon reservoir is 20 gpm plus the use within Texas Spring Campground, the combined use reaching 31.5 gpm during the period of study.

A suggested improvement is to replace the 1,000 feet of 2 inch line with 2-1/2 or 3 inch pipe. It is estimated that this would increase the capacity of the system to 35 or more gallons per minute.

RECOMMENDATIONS

This report provides detailed data on water use for a short period of peak travel. A complete determination of water needs particularly irrigation needs requires that data be collected over a longer period of time and for all seasons of the year. The following recommendations are made to provide these data. The first recommendation is for increasing the capacity of the supply system so that full use of 35 gallons per minute is possible.

1. Replace 1,000 feet of old 2 inch main from Texas Spring Campground to the valve vault on the 6 inch main with 3 inch pipe.

2. Continue reading meters weekly throughout the 1961 calendar year. Read meters early each Monday morning to provide data coincident with travel weeks.

3. Read meters daily throughout March and April of 1961 to obtain more detailed data during the months of peak travel. Read meters early each morning (before opening of Visitor Center) to obtain data coincident with travel days.

4. Record travel to Visitor Center, population of Texas Spring Campground and population of Furnace Creek Campground summarized Monday through Sunday of each week to coincide with periods of water measurement.

5. Record Visitor Center travel and Campground populations daily for the months of peak travel, March and April, 1961.

6. Install a 2 inch meter on the 3 inch line irrigating the Visitor Center patio.

7. Install a 1-1/2 inch meter on the 2 inch line serving the Furnace Creek Campground comfort station.

Appendix A-1

FURNACE CREEK AREA

CAMPGROUND USE DURING '49 ENCAMPMENT

November 1960

(Data from Superintendents memorandum of Nov. 28, 1960)

L. Spaulding 12-20-60

DATE 1960	CAMPGROUND USE, Number of People						
	TEXAS SPRING CAMPGROUND		TEMPORARY CAMP OLD AIRSTRIP		FURNACE CR. CAMPGR. (Undeveloped - near Comsta)		TOTAL POPULATION
	TENTS	TRAILERS	TENTS	TRAILERS	TENTS	TRAILERS	
Wed. Nov. 9	128	246	-	99	-	-	473
Thur. Nov. 10	227	250	-	444	99	-	1020
Fri Nov 11	288	336	25	976	221	25	1871
Sat Nov 12	368	384	32	1677	768	96	3325
Sun Nov 13	355	384	25	1620	698	48	3130
Mon Nov 14	160	240	-	323	32	-	755
Tue Nov 15	77	237	-	-	29	-	343
Wed Nov 16	77	237	-	-	19	-	333
Thur Nov 17	73	243	-	-	-	-	316

Appendix A-2

Furnace Creek Visitor Center
Visitor Use November 1 - 16, 1960

Data from Naturalist's Log

Legend

"Visitor Center Travel" -- People entering lobby by front entrance excluding attendance at evening talk.

"Audio-Visual" -- Attendance at automatic slide show - number is included on "Visitor Center Travel."

"Evening Talk" -- Attendance at Naturalist's evening talk in Auditorium - museum normally closed. This number is not included in "Visitor Center Travel."

"Total Visitor Use" -- Sum of "Visitor Center Travel" and "Evening Talk."

Date	Visitor Center Travel	Audio Visual	Evening Talk	Total Visitor Use	Comments
Tue., Nov 1	105	46	92	197	Exhibit Room open 7:30 AM - 5:30 PM
Wed., Nov 2	121	74	116	237	
Thur., Nov 3	122	67	114	236	
Fri., Nov 4	143	97	42	185	
Sat., Nov 5	231	152	109	340	
Sun., Nov 6	230	117	--	230	
Mon., Nov 7	219	55	88	307	
Tue., Nov 8	154	49	103	257	
Wed., Nov 9	243	437	413	656	
Thur., Nov 10	616	340	390	1,006	
Fri., Nov 11	1,680	919	500	2,180	
Sat., Nov 12	4,352	744	(included in Visitor Center Travel)	4,352	Exhibit Room open 7:30 AM - 9:30 PM Evening Assembly of 49 Encampment held in Auditorium.
Sun., Nov 13	943	205	430	1,373	Exhibit Room open 7:39 AM - 5:30 PM
Mon., Nov 14	211	113	165	376	" " " "
Tue., Nov 15	252	144	190	442	" " " "
Wed., Nov 16	236	83	158	394	" " " "

11-00-1960: hourly rate of visits to exhibit room ; november, 1960

Appendix A-3

Furnace Creek Visitor Center

Travel

Hourly Rate of Visits to Exhibit Room

during '49er Encampment

November, 1960

(from Museum Attendant's log - incomplete record)

Date	Hours	Visits during Period	Cumulative Visits
Thursday, Nov. 10	7:30 - 8:30 AM	18	18
	8:30 - 10:00 AM	46	64
	10:00 - 11:00 AM	99	163
	11:00 - 12:00 Noon	~~86?~~ } 84	~~159~~
	12:00 - 1:00 PM	~~83?~~	247
	1:00 - 2:00 PM	64?	311
	2:00 - 3:00 PM	40?	351
	3:00 - 4:00 PM	55	406
	4:00 - 4:30		
	(Total for day recorded as.....616)		
Friday, Nov. 11	7:30 - 10:00 AM	235	235
	10:00 - 11:00 AM	256	491
	11:00 - 1:00 PM	177	668
	(Record discontinued)		

Appendix B-1

METERED WATER USAGE

Sheet 1 of 1

LOCATION			METER			
Park	Area	Meter Location	Size	Make	Serial No.	Units
DEATH VALLEY	Furnace Creek	2½" Texas Spr. Supply line	2" owned & installed by Hotel Co.	Neptune	12489558	Gal.

DATE	TIME	READING Gallons	RATE AT READING GPM	ELLAPSED TIME	USAGE Gal.	AVERAGE RATE gpm	COMMENTS
Mon. Nov. 7	1:20 P	26,491,500	22.0				
Tue. Nov. 8	1:36 P	26,524,500	22.7	1456	33,000	22.7	
Wed. Nov. 9	1:22 P	26,556,800		1426	32,300	22.6	
Thur. Nov. 10	1:45 P	26,591,500		1463	34,700	23.7	
Fri. Nov 11	1:25 P	26,626,500		1420	35,000	24.6	
Sat. Nov 12	8:10 A	26,656,400	30	~~1045~~ 1125	~~29,900~~ 29,900	26.6	
" "	12:35 P	26,664,750	30	265	8 350	31.5	
" "	1:05 P	26,665.500		30	750	25.0	
" "	4:43 P	26,671,810	25	218	6310	28.9	
" "	9:03 P	26,679,000	30	260	7190	27.6	
Sun. Nov 13	7:10 A	692,500	30	607	13,500	22.3	
" "	12:15 P	701,710	30	305	9210	30.2	
" "	12:30 P	702,297		15	587	39.2	
" "	12:37 P	702,584		7	287	41.0	Test of capacity of line (2½") diverting from Hotel Co. system opened float valve in 20,000 gal. reservoir wide open. RESULT: Capacity = 41.0 GPM
" "	1:45 P	704,200		68	1616	23.8	
" "	7:02 P	712,360	25	317	8160	25.7	
Mon. Nov. 14	9:00 A	731,000	30	838	18,640	22.2	
" "	1:13 P	737.320	26	253	6320	25.0	
Tue, Nov. 15	8:09 A	762,790	27	1136	25,470	22.4	
" "	1:25 P	770,000		316	7210	22.8	
" "	9:16 P	780,530		471	10,530	22.4	
Wed, Nov. 16	8:23 A	794,280	25	667	13,750	20.6	
" "	1:05 P	801,500		282	7220	25.6	
Thur. Nov 17	7:49 A	825,800	26	1124	24,300	21.6	
" "	~~11:00 A~~	~~829,600~~		156	2200	14.2	2" line below campground shut off about 1 hour
" "	10:25 A	828,000					
" "	11:28 A	829,600	20	63	1600	25.4	
" "	2:58 P	834,280	26	210	4680	22.3	
Fri Nov 18	8:25 A	857.700		1047	23,420	22.4	

Appendix B-2

WATER IN STORAGE

~~METERED WATER USAGE~~

Sheet 1 of 1

LOCATION			METER			
Park	Area	Meter Location	Size	Make	Serial No	Units
DEATH VALLEY	Furnace Creek	500,000 gal. Reservoir	Depth Gage	(16'-0" high steel tank)		1" = 2600 g

DATE	TIME	Depth of Water READING Ft. - In.	~~RATE AT READING~~ STORAGE Gal.	ELLAPSED TIME min.	CHANGE ~~USAGE~~ + or − gal.	AVERAGE RATE gpm	COMMENTS
Mon. Nov 7	1:00 P	11'-9"					Vol. recalculated 6/1/61
Tue, Nov. 8	1:32 P	11'-11"		1472	+5200	+3.53	1" = 2680 gal
Wed. Nov 9	1:15 P	12'-1"		1423	+5200	+3.65	for 27' Radius
Thur. Nov 10	11:25 A	11'-10"		1330	-7800	-5.87	3% error
" "	1:40 P	12'-0"		135	+5200	+38.5	← impossible rate
Fri, Nov 11	1:20 P	11'-7"		1420	-13000	-9.15	1:40 P reading made by maint. crew - may have rounded off to 12' resulting in excess inflow rate - or 11:25 A reading by Spaulding may have been of a stuck slide - est. 11.25 rdg. should have been about 12'-2"
Sat. Nov 12	8:54 A	11'-11"		1174	+10,400	+8.85	
" "	12:45 P	11'-10.5"		231	-1,300	-5.63	
" "	4:37 P	11'-11.2"		232	+1,820	-7.85	
" "	8:55 P	11'-11.4"		258	+520	+2.01	
Sun, Nov 13	7:05 A	12'-3.6"		610	+10,900	+18.05	
" "	12:09 A	12'-3.7"		304	+260	+0.85	
" "	6:56 P	12'-5"		407	+3,380	+8.30	
Mon. Nov 14	8:50 A	12'-7.4"		834	+6,240	+7.50	
" "	1:05 P	12'-11"		255	+9,360	+36.6	impossible rate
Tue, Nov 15	8:04 A	13-6.3"		1139	+18,990	+16.7	
" "	10:05 A	13'-5"		121	-3,380	-28.1	
" "	1:20 P	13'-6"		195	+2,600	+13,3	
" "	9:12 P	13'-9.6"		472	+9,360	+19.8	
Wed. Nov 16	8:18 A	14'-1.0"		666	+8,840	+13,3	
" "	12:50 P	14'-1"		272	—	0.0	
Thur, Nov. 17	7:45 A	14'-7.5"		1135	+16,900	+14.9	
" "	10:15 A	14'-4"		150	-9,100	-60.5	
" "	11:22 A	14'-4.0"		67	—		
Fri, Nov 18	8:15 A	12'-9"		1253	-49,400	-39.4	
		12/144 D	+ 1960	+ 15		15,555	

Appendix B-3

METERED WATER USAGE

Sheet 1 of 1

LOCATION			METER			
Park	Area	Meter Location	Size	Make	Serial No.	Units
DEATH VALLEY	Furnace Creek	Vault on 6" Main	4" 1 1/2"	Sparling – Neptune –	43843 14303358	Sparling - CF Neptune - Gal.

DATE 1960	TIME	READING SPARLING Cu. Ft.	~~DATE~~ READING NEPTUNE Gal.	ELLAPSED TIME minutes	USAGE Gal.	AVERAGE RATE GPM	COMMENTS
Mon, Nov. 7	12:50 P	126,670	1560,400				
				1475	21,064	14.3	lawn Sprinkling
Tue, Nov. 8	1:25 P	127,200	1577,500	1425	20,490	14.4	lawn Sprinkling
Wed, Nov. 9	1:10 P	127,700	1594,250	1310	23,269	17.8	lawn sprinkling
Thur. Nov. 10	11:00 A	128,387 ?	1612,380 ?	13	550	42.3	lawn sprinkling
" "	11:13 A	128,387 ?	1612, 930 ?	142	2363	16.7	(one or more errors in basic data for Thur. Nov. 10)
" "	1:35 P	128.600 ?	1613,700 ?	1420	34,840	24.8	Hosing grounds to erase scars
Fri, Nov. 11	1:15 P	131,620	1626,000	1167	11,555	9.9	
Sat. Nov. 12	8:42 A	131,622	1637,540	243	4875	20.0	
" "	12:45 P	131.620 (sic)	1642.400	249	2785	11.2	
" "	4:54 P	131,626	1645,170	234	3125	13.3	
" "	8:48 P	131,638	1648,280	607	1735	2.9	
Sun, Nov 13	6:55 A	131,630	1650,000	308	4722	15.3	
" "	12:03 P	131,633	1654,700	404	617	2.0	
" "	6:47 P	131,634	1655,510	833	2673	3.2	patio sprinkling before 8 AM 11/14
Mon, Nov. 14	8:40 A	131,740	1657,390	255	390	1.5	"
" "	12:55 P	131,740	1657,780	1143	470	0.7	
Tue, Nov. 15	7:58 A	131,740	1658,550	312	6885	22.1	
" "	1:10 P	132,320	1661,100	476	977	2.1	
" "	9:06 P	132,321	1662,070	667	460	0.7	
Wed. Nov 16	8:13 A	132,321	1662,530	272	5103	18.8	
" "	12:45 P	132,820	1663,900	1134	2547	2.2	
Thur., Nov. 17	7:39 A	132,849	1666,230	26	327	12.6	lawn sprinkling Thur A.M.
" "	8:05 A	132,850	1666,550	58	8584	148.0	(irrigation lines open as test) Thur. P.M.
" "	9:03 A	133,900	1667,280	1387	78,877	56.9	
Fri. Nov. 18	8:10 A	141,040	1692,750	1435	6688	4.7	
Sat. Nov 19	8:05 A	141,660	1694,800	1445	1400	1.0	
Sun. Nov 20	8:10 A	141,660	1696,200				
Σ	ellapsed time = 18,440 min	14,990 cf = 112,125 g	135,800	18,440	247,921		

Appendix B-4

METERED WATER USAGE

Sheet 1 of 2

LOCATION			METER			
Park	Area	Meter Location	Size	Make	Serial No	Units
DEATH VALLEY	Furnace Cr.	Visitor Center Museum Mech. Rm.	1 1/2"	Hersey	3448213	gpm

DATE 1960	TIME	READING gallons	RATE AT READING	ELLAPSED TIME minutes	USAGE gallons	AVERAGE RATE gpm	COMMENTS
Fri. Nov. 11	9:11 A	2235128					Meter installed (reverse rdg.)
	9:32	35067		21	61	2.9	1st day of 49er Encompment
	9:42	35 020		10	47	4.7	
	10:00	34 927		18	93	5.2	
	10:30	34 644		30	283	9.4	Restroom use 10:00 to 10:30 21 men - 27 women 283/48 = 5.9 g.
	11:35	34 327		65	317	4.9	audio-visual show each 1/2 hr.
	12:00	34 109		25	218	8.7	
	1:00 P	33 762		60	347	5.8	Cooling tower on intermittantly during afternoon
	2:00	33 294		60	468	7.8	
	3:06	32 253		66	1041	15.8	irrigation of front lawn inside wall using garden hose with sprinkler
	4:04	31 784		58	469	8.1	
	5:12 P	31 310		68	474	6.9	busy - art show in patio
Sat. Nov. 12	7:34 A	29 332		862	1978	2.3	quiet - not many visitors
	8:55	28 600		81	732	9.0	rest rooms open overnite
	9:43	27 930		48	670	14.0	
	9:49	27 770		6	160	26.7	Crowd gathering
	10:25	27 286		36	484	13.4	Dedication Ceremony start at 10 A
	10:46	26 766		21	520	24.8	Speeches & band playing estimate 1600 people in patio & audit.
	11:20	26 200		34	566	16.6	
	11:25	26 076		5	124	24.8	end of dedication 11:20 A.
	11:32 A	25 880		7	196	28.0	rate of use for 10 second periods varied from 18 to 60 gpm from 11:20 to 11:26 (16 to 60 gpm for 5 sec)
	1:59 P	24 320		147	1560	10.6	Restroom use 11:27 to 11:31 10 men & 10 women (4 x 24.8) ÷ 20 = 5 gal. per person
	4:07	23 382		128	938	7.3	strong wind start about 1 PM
	5:18	22 330		71	1052	14.8	
	7:20	21 000		122	1330	10.9	Cooling tower on intermittently
	8:19	20 430		59	580	9.8	Kodachrome show start at 7:20
	8:31	20 265		12	155	12.9	" " end at 8:19
	9:18	19 457		47	808	17.2	Singing program in audit. to 9:05
	9:25 P						30-50 people still in bldg.
				605	543	0.9	Visitor Center closed at 9:30 P rest rooms remain open
Sun. Nov. 13	7:23 A	18,914		22	107	4.9	Catholic mass in progress in audit. about 150 people in congregation
	7:45	18 807		4	58	14.5	mass over at 7:45
	7:49	18 749		244	1225	5.0	crowd dispersed
	11:53	16 524		66	272	4.1	
	12:59 P	16 252		305	682	2.2	last day of 49er Encamp.
	6:04 P	15 570		920	1131	1.2	Museum closed - restrooms open evening lecture in audit 7:30-9
Mon, Nov 14	9:24 A	14 439		229	188	0.8	Museum open 7:30 A to 5:30 P
	1:13 P	14 251		122	140	1.1	Illustrated taped lecture every hour
	3:15 P	14 111		987	261	0.26	Naturalist lecture 7:30 P - 9:00 P
Tue, Nov 15	7:42 A	13 850					

METERED WATER USAGE

LOCATION			METER			
Park	Area	Meter Location	Size	Make	Serial No. 3448213	Units

DATE 1960	TIME	READING gal	RATE AT READING	ELLAPSED TIME minutes	USAGE gallons	AVERAGE RATE gpm	COMMENTS
Tue, Nov 15	7:42 A	2 213,850					Museum open 7:30 A - 5:30 P
	2:80 P	13,615		398	335	0.84	
	7:30	13,248		310	267	0.86	
	8:47 P	13,177		77	71	0.92	Evening lecture 7:30 P - 8:37 P
Wed, Nov 16	8:00 A	13,170		673	7	0.01	190 people at lecture
Thur Nov 17	7:30 A	12,488		1410	682	0.48	11 - 13 people used restroom after lecture
" "	9:35 A	12,460		125	28	0.22	
Fri. Nov 18	7 50 A	12,125		1335	335	0.25	

Appendix B-5

METERED WATER USAGE

Sheet 1 of 1

LOCATION			METER			
Park	Area	Meter Location	Size	Make	Serial No.	Units
Death Valley	Furnace Creek	Administration Bldg. Mechanical Room	1"	Neptune	14981045	gallons

DATE 1960	TIME	READING gallons	RATE AT READING	ELLAPSED TIME minutes	USAGE gallons	AVERAGE RATE gpm	COMMENTS
Mon, Nov. 14	11:00 A	0					Meter installed at 11 AM
" "	11:11	8		11	8	0.73	
" "	11:14	52		4	44	11.0	test - flushed toilet 10 times in 1m 30s 42.5/1.5 = 28 gpm
" "	2:05 P	95		171	43	0.25	
" "	3:49 P	109		104	14	0.13	total use Nov. 14 - 17 480 - 43 = 437 gal in 2d 20h 27m = 2.85 day Average use = 153 gpd
Tue, Nov 15	7:40 A	179		951	70	0.07	
" "	2:17 P	250		397	71	0.18	
Wed. Nov 16	8:03 A	337		1066	87	0.08	
Thur. Nov 17	7:27 A	480		1404	143	0.10	
" "	9:30 A	500		123	20	0.16	
Fri. Nov 18	7:55 A	570		1345	70	0.05	hose bibb opened - drain water into sewer to keep stabilization pond full
Sat. Nov. 19	7:48 A	745		1433	175	0.12	

Appendix C

DAILY WATER USE - MIDNIGHT to MIDNIGHT

CALCULATIONS CONVERTING METERED USE TO DAILY RATES

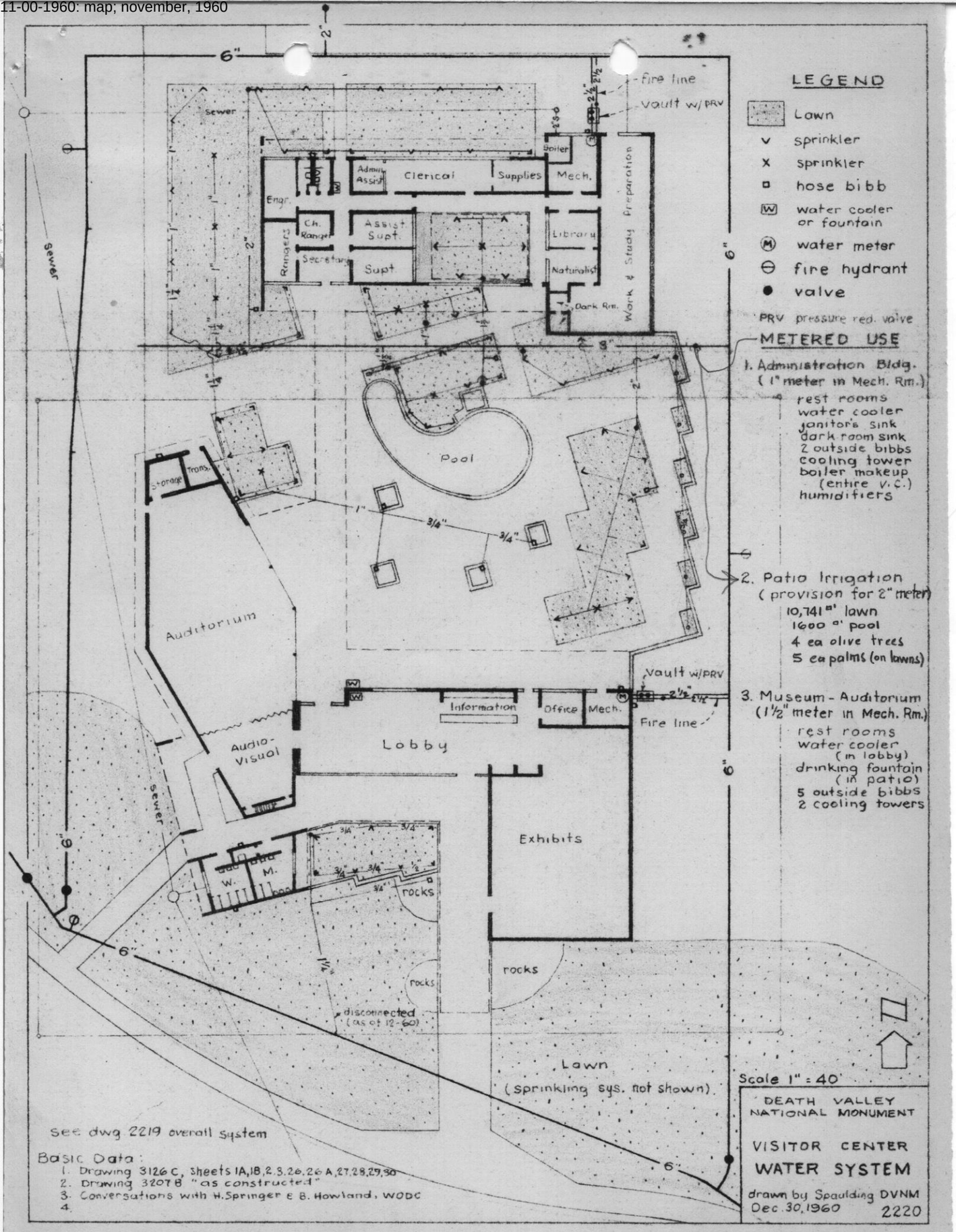
TEXAS SPRING DIVERSION - 2" Meter on 2½" line

DATA from APPENDIX B					CONVERSION TO DAILY RATES					
DATE 1960	TIME	ELLAPSED TIME minutes	RECORDED USE gallons	AVG. RATE gpm	COMMENTS	ELLAPSED TIME minutes	EST. RATE gpm	QUANTITY for Period gal.	QUANTITY for Day gal.	DAY
Mon. Nov 7	1:20 P									
Tue, Nov 8	midnight	1456	33,000	22.7		640	22.2	14,200		
" "	1:36 P					816	23	18,800	32,600	Tue, Nov 8
Wed, Nov 9	midnight	1426	32,300	22.6	(32,000-18,500)	624	22.1	13,800		
" "	1:22 P					802	23	18,500	32,600	Wed. Nov 9
Thur, Nov 10	midnight	1463	34,700	23.7	(34,700-20,600)	638	22.1	14,100		
" "	1:45 P					825	25	20,600	34,700	Thur, Nov 10
Fri, Nov 11	midnight	1420	35,000	24.6	(35,000-20,900)	615	22.9	14,100		
" "	1:25 P					805	26	20,900	37,100	Fri, Nov 11
Sat. Nov 12	midnight	1125	29,900	26.6	(29,900-13,700)	635	25.5	16,200		
" "	8:10 A					490	28	13,700		
" "	9:03 P	773	22,600			773		22,600	40,230	Sat, Nov 12
Sun, Nov 13	midnight	607	13,500	22.3		177	22.3	3930		
" "	7:10 A					430	22.3	9570		
" "	7:02 P	712	19,860			712		19,860	36,070	Sun, Nov 13
Mon, Nov 14	midnight	838	18,640	22.3		298	22.3	6640		
" "	9:00 A					540	22.3	12,000		
" "	1:13 P	253	6320	25.0		253		6320	32,820	Mon. Nov 14
Tue, Nov 15	midnight	1136	25,470	22.4		647	22.4	14,500		
" "	8:09 A					489	22.4	10,970		
" "	9:16 P	787	17,740			787		17,740	32,090	Tue, Nov 15
Wed, Nov 16	midnight	667	13,750	20.6		164	20.6	3380		
" "	8:23 A					503	20.6	10,370	31,370	Wed, Nov 16
Thur, Nov 17	midnight	1406	31,520	22.4		937	22.4	21,000		
" "	7:49 A					469	22.4	10,520		
	2:58 P	429	8480			429		8480	31,130	Thur, Nov 17
Fri, Nov 18	midnight	1047	23,420	22.4		542	22.4	12,130		
" "	8:25 A					505	22.4	11,290		
TOTAL		15,545	366,200	23.6		15,545		366,200	340,710	
CHANGES IN RESERVOIR STORAGE										
			Change, g.							
Mon, Nov 7	1:00 P									
Tue, Nov 8	midnight	1472	+ 5200	+ 3.5		660	+ 3.5	+ 2400		
" "	1:32 P					812	+ 3.5	+ 2800	+ 5100	Tue, Nov 8
Wed Nov 9	midnight	1423	+ 5200	+ 3.7		628	+ 3.7	+ 2300		
" "	1:15 P					795	+ 3.7	+ 2900	even	Wed Nov 9
Thur Nov 10	midnight	1330	- 7800	- 5.9	(possible error: use was heavier Thur. AM than Wed PM)	645	- 4.9	- 2900		
" "	11:25 A					685	- 7.2	- 4900		
" "	1:40 P	135	+ 5200	+38.5?	impossible rate error in data	135	+ 38.5	+ 5200	-16,300	Thur. Nov 10
Fri, Nov 11	midnight	1420	- 13,000	- 9.2	see Fri. A.M Heavy use (13,000-3600)	620	- 26.8	-16,600		

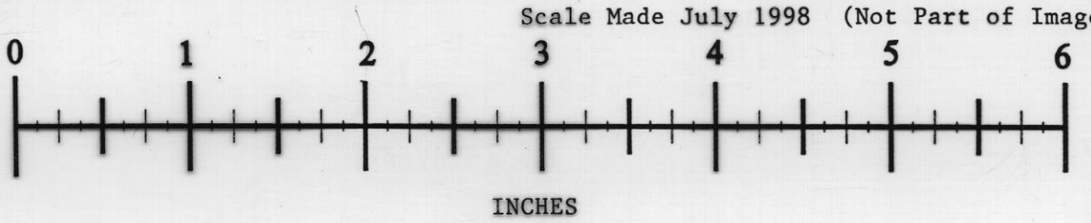
DATA from APPENDIX B					CONVERSION TO DAILY RATES					
DATE	TIME	ELLAPSED TIME minutes	RECORDED USE gallons	AVG. RATE gpm	COMMENTS	ELLAPSED TIME minutes	EST. RATE gpm	QUANTITY for Period gal.	QUANTITY for Daily gal.	DAY
CHANGE IN STORAGE (cont.)										
Fri. Nov 11	midnight									
" "	1:20 P				{est. 1 hr loss @ 150 gpm " 740 min gain @ 17 net gain 12600-9000 (10,400-6400)	800	← see note	+ 3600	+7600	Fri. Nov 11
Sat. Nov 12	midnight	1174	+10,400	+ 8.9		640	(+6.3)	+ 4000		
" "	8:54 A				{domestic use only est 8 gpm, net gain gain to tank = 20-8	534	+ 12	+ 6400		
" "	8:55 P	721	+1040			721		+ 1040	+10,740	Sat. Nov 12
Sun. Nov 13	midnight	610	+10,900	+ 17.9		185	+ 17.9	+ 3300		
	7:05 A					425	+ 17.9	+ 7600		
	6:56 P	711	+3640			711		+ 3640	+16,710	Sun Nov 13
Mon. Nov 14	midnight	834	+6240	+ 7.5	assumed rate	304	+ 10	+ 5470		
" "	8:50 A				{sprinkling before 8 AM (6240-5470)	530	← see	+ 770		
" "	1:05 P	255	+ 9360			255		+ 9360	+21,050	Mon Nov 14
Tue. Nov 15	midnight	1139	+18,990	+ 16.7		655	+ 16.7	+10,920		
" "	8:04 A					484	+ 16.7	+ 8,070		
" "	9:12 P	788	+ 8580			788		+ 8580	+18,880	Tue Nov 15
Wed. Nov 16	midnight	666	+ 8830	+ 13.3		168	+ 13.3	+ 2230		
" "	8:18 A					498	+ 13.3	+ 6600		
" "	12:50 P	272	even			272	—	even	+16,570	Wed Nov 16
Thur. Nov 17	midnight	1135	+16,900	+ 14.9		670	+ 14.9	+9970		
" "	7:45 A					465	+ 14.9	+ 6930		
" "	11:22 A	217	- 9,100	- 60.5		217	- 60.5	- 9100	- 29,170	Thur Nov 17
Fri. Nov 18	midnight	1253	- 49,400	- 39.4	irr. opened 2 PM Say 600 min @ 45.1 gpm	758	see note	-27,000		
" "	8:15 A				est 49,400 gal in 1095 minutes	495	- 45.1	-22,400		
		15,555	+31,180			15,555		+31,180	+51,180	
FLOW THRU METERS IN VAULT					ON 6" Main		4" Sparling & 1½ Neptune			
Mon Nov 7	12:50 P									
Tue Nov 8	midnight	1475	21,064	14.3		670	14.3	9607		
" "	1:25 P					805	14.3	11,457	20,500	Tue Nov 8
Wed Nov 9	midnight	1425	20,490	14.4		635	14.4	9043		
" "	1:10 P					790	14.4	11,447	23,000	Wed Nov 9
Thur. Nov 10	midnight	1310	23,269	17.8	basic data contains unresolved error (sum of 22 gpm plus 5.9 from Storage ≠ 17.8)	650	17.8	11,553		
" "	11:00 A					660	17.8	11,716		
" "	1:35 P	155	2913	18.8		155	18.8	2913	40,800	Thur Nov 10
Fri. Nov 11	midnight	1420	34,890	24.8	est 3 hrs heavy use Thur. PM (3/4 of 34,890)	625	(41.8)	26,171		
" "	1:15 P				est 1 hr heavy use Fri. AM (1/4 of 34,890)	795	(11.0)	8719		
Sat. Nov 12	midnight	1167	11,555	9.9	net 11,555 - 4174	645	(11.4)	7381	16,100	Fri Nov 11
" "	8:42 A				see storage calc. est domestic 8 gpm	522	8.0	4174		
" "	8:48 P	726	10,785	1.5		726	1.5	10,785	15,510	Sat Nov 12
Sun. Nov 13	midnight	607	1735	2.9		192	2.9	551		
" "	6:55 A					415	2.9	1184		
" "	6:47 P	712	5539	7.8		712	7.8	5539	7023	Sun Nov 13
Mon Nov 14	midnight	833	2673	3.2	see Mon. A.M. est. domestic @ 1 gpm	313	1.0	300		

DATA from APPENDIX B					CONVERSION TO DAILY RATES					
DATE	TIME	ELLAPSED TIME minutes	RECORDED USE Gallons	AVG. RATE gpm	COMMENTS	ELLAPSED TIME minutes	EST. RATE gpm	QUANTITY for PERIOD gallons	QUANTITY for DAY gallons	DAY
FLOW	THRU	METERS IN		VAULT	ON 6" MAIN (cont.)					
Mon. Nov 14	midnight	See previous sheet			Sprinking before 8AM (2673 - 300) see Sun B	520	See (4.6)	2373		
" "	8:40A	255	390	1.5		255	1.5	390	3211	Mon Nov 14
"	12:55P					665	0.7	448		
Tue, Nov 15	midnight	1143	770	0.7		478	0.7	322		
	7:58A	788	7862	10.0		788	10.0	7862	8304	Tue Nov 15
	9:06P					174	0.7	120		
Wed. Nov 16	midnight	667	460	0.7		493	0.7	340		
	8:13A	272	5103	18.8		272	18.8	5103	7610	Wed Nov 16
	12:45P				(2547 - 380) see Thur A	675	see note (3.2)	2167		
Thur. Nov 17	midnight	1134	2547	2.2	assumed rate	459	(0.6)	380		
	7:39A	84	8911	104		84	104	8911	54,061	Thur Nov 17
	9:03A				irr. lines opened @ 7:39 est. 597 m @ 10 gpm plus 800 m @ 69.8 "	897	see (48.8)	44,770		
Fri Nov 18	midnight	1387	78,877	56.9	(78,077 - 2970) in 1090 m	490	See (69.6)	34,107		
" "	8:10A									
		15,560	239,833			15,560		239,833	196,119	
VISITOR CENTER - EXHIBIT					- AUDITORIUM		1½" Hersey Meter Appendix B-			
Fri, Nov 11	midnight									
" "	9:11A	481	3818	7.9	est. rate	551	(1.5)	827		
" "	5:12P					481	7.9	3818	6169	Fri. Nov 11
Sat. Nov 12	midnight	862	1978	2.3	(1978 - 454) see Sat A	408	(3.7)	1524		
" "	7:34A	824	9875	12.0	est 454 m @ 1.0	454	(1.0)	454		
" "	9:18P					824	12.0	9875	10,474	Sat Nov 12
Sun, Nov 13	midnight	605	543	0.9		162	0.9	145		
" "	7:23A	641	3344	5.2		443	0.9	398		
" "	6:04P					641	5.2	3344	4180	Sun Nov 13
Mon, Nov 14	midnight	920	1131	1.2		356	1.2	438		
	9:24A	351	328	0.9		564	1.2	693		
	3:15P					351	0.9	328	1160	Mon Nov 14
Tue, Nov 15	midnight	987	261	0.26		525	0.26	139		
" "	7:42A	785	673	0.85		462	0.26	122		
" "	8:47P					785	0.85	673	797	Tue Nov 15
Wed. Nov 16	midnight	673	7	0.01		193	0.01	2		
" "	8:00A					480	0.01	5	682	Wed Nov 16
Thur Nov 17	midnight	1410	682	0.48	(682 - 5)	960	see (0.7)	677		
" "	7:30A	125	28	0.22	est 450 m @ .01	450	(0.01)	5		
" "	9:35A					125	0.22	28	363	Thur Nov 17
Fri Nov 18	midnight	1335	335	0.25	(335 - 5)	865	see (0.38)	330		
" "	7:50A				est. rate	470	(0.01)	5		
Σ		9999	23.003	2.3		10,550		23,830	23,825	

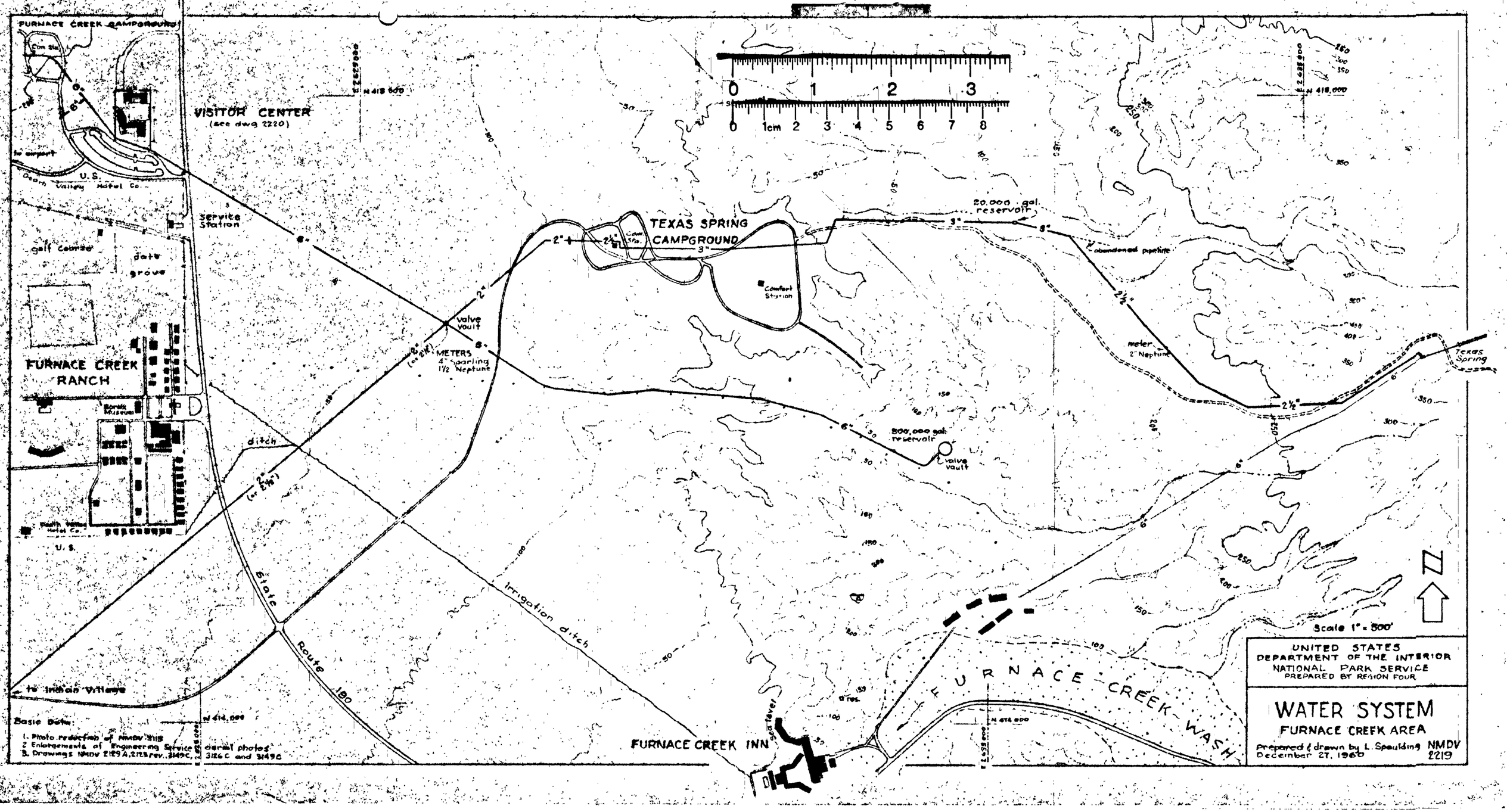
11-00-1960: map; november, 1960



Scale Made July 1998 (Not Part of Image)



00-00-0000: water system - furnace creek area



Copy made for WR Docket 3,4,5,6 Supplemental Data file

Spaulding L55

Whitworth

~~Manbey~~ BFM.

~~Wesso~~ (later)

~~Maier~~ Allen Morrison

~~(Quist)~~

UNITED STATES
DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

August 22, 1960

IN REPLY REFER TO:
L 54

Memorandum

To: Acting Regional Chief of Operations, Region Four

From: Hydraulic Engineer Spaulding, Region Four

Subject: Water Use, Furnace Creek Area, Death Valley National Monument

Herewith is my estimate future water needs of National Park Service and Hotel Company facilities at Furnace Creek.

FILE COPY

The needs are as follows:

	Water Consumption, Gallons per Minute			
	1960	1966	1970	1980
National Park Service	41 (.09)	236 .53	285 .64	383 .85
Death Valley Hotel Co.	1640 (3.66)	2110 4.71	2190 4.89	2350 5.25
	3.75	5.24	5.53	6.10

The above quantities are derived from Tables I, II, III and IV, which are attached. Also attached are a table of previous calculation, and a print of drawing NMDV 2215, Furnace Creek Visitor Center - - Irrigation showing vegetation included in irrigation calculations.

Water consumption for 1960 has been estimated as follows:

Irrigation - Present vegetation at Visitor Center
(3.2 acres requiring 31.6 Acre feet per year)
Summer rate will be twice annual average or
$2X \frac{31.6}{12} = 5.27$ A.F. per month = 39.6 gpm

Domestic use - Visitor Center (not complete for all of 1960)
(Office staff, air conditioning, janitorial and reduced summer visitation) = 1.4

Rate during May, June, July and August =41 gpm

Rate during rest of year will be less. Rate during peak visitation month of March, 1961 probably will be about 14 gallons per minute domestic use and about 20 gallons per minute for irrigation of present vegetation for a total of 34 gallons per minute.

Basic data for this estimate has been submitted by separate memoranda as follows:

1. Analysis of water use, Oasis Headquarters, Joshua Tree National Monument, August 18, 1960 (D 5039).

2. Memorandum of August 19, Spaulding to Regional Chief of Operations, Subject "Travel Analysis, Death Valley National Monument, (A 88).

Leon Spaulding

Hydraulic Engineer

Attachments (6)

Copy to: Director (w/attachments)
Supt., Death Valley (w/attachments)
Chief, WODC (2)(w/attachments)
Chief, Water Resources Section (w/attachmets)

CLEARED FOR DISTRIBUTION:

Regional Director 8/25/60 Date

bc: Maier

LSSpaulding:lq

TABLE I

NATIONAL PARK SERVICE — IRRIGATION - MISSION 66 DEVELOPMENT

Item	Area Sq.Ft.	Density per cent	Area Acres	Annual Rate Acre ft. per acre	Acre Ft. per year
VISITOR CENTER					
Existing Vegetation:					
Lawn	12,600	100	.289	12	2.45
Mesquite	67,080	100	1.540	10	15.40
Athel	37,600	100	.863	10	8.63
Date Palm	9,680	100	.222	10	2.22
Other	10,745	100	.247	8	2.47
Pool	1,580	100	.036	12	0.43
Total Existing			3,197		31.60
Proposed Additional Vegetation:					
Lawn	20,000	100	.460	12	5.52
Trees & Shrubs	96,000	50	1.100	10	11.00
Pond	3,200	100	.073	12	0.88
Total Proposed			1.633		17.40
Visitor Center total			4,830		49.00
Furnace Creek Campground					
Trees and Shrubs	1,500,000	25	8.70	10	87.0
Texas Spring Campground					
Trees and Shrubs	1,500,000	10	3.40	10	34.0
Furnace Creek Residential ~~75,000~~		~~25~~	~~0.43~~	FSS 1/24/61	
Lawns, Trees, Shrubs	75,000	25	0.43	10	4.30

TABLE I (Cont'd)

Indian Village - None

School (on Hotel Company System)

SUMMARY

Location	Irrigated Area, Acres	Annual Rate AF per yr	GPM	cfs	Peak Rate GPM	cfs
Visitor Center	4.83	49.0	30	.068	61	.136
Furnace Creek Campground	8.70	87.0	54	.120	108	.240
Texas Spring Campground	3.40	34.0	21	.047	42	.094
Furnace Creek Residential Area	(4.30) 0.43	4.3	3	.006	5	.012
Indian Village	None	None	-	--	-	--
School	None	None	-	--	-	--
	FSS 1/24/61 (21.23) 17.36	174.3	108	.241	216	.482
Future Demand - 1970 (120% of 1966)			130	.290	259	.579
Future Demand - 1980 (160% of 1966)			173	.386	346	.770

TABLE II

NATIONAL PARK SERVICE — DOMESTIC USE - MISSION 66
(Calculated for month of Peak Visitation (March)

Visitor Center	Gallons per month	Avg.Gals. per day	GPM	cfs
Visitor Use 46,000 visits @ 2.5 gpd	115,000	3,700	2.6	.0057
Office Staff 500 man-days @ 10 gpd	5,000	160	0.1	.0002
Janitorial - cleaning restrooms & walks 300 gpd	9,000	300	0.2	.0005
Air conditioning, average 5 hours per day @ 8 gpm	74,000	2,400	1.7	.0037
Dust Laying	3,100	100	0.1	.0002
Total Visitor Center	206,100	6,660	4.7	.0103
Campgrounds				
25,000 camper days @ 25 gpd	625,000	20,200	14.0	.0313
Furnace Creek Residential Area				
12 residents @ 200 gpd	74,000	2,400	1.7	.0037
Indian Village				
None				
School				
On Hotel Company System				
Total Domestic Use - March, 1966	905,100	29,260	20.40	.0453
Predicted Use March, 1970 (130% of 1966)			26	.059
Predicted Use March, 1980 (180% of 1966)			37	.073
Average Use, 1966 (1/2 of March rate)			10	.023
Average Use, 1970 (130% of 1966)			13	.030
Average Use, 1980 (180% of 1966)			19	.042

TABLE III

DEATH VALLEY HOTEL COMPANY, IRRIGATION USE

(Areas of Ranch and Inn under irrigation in 1957 per colored print of drawing NMDV 7100)

Vegetation	Area at 100% density acres	Annual Consumption Acre Feet per acre	Annual Consumption Acre Feet per year	June Consumption (twice annual average cfs	June Consumption (twice annual average GPM
Date Palm	28.96	10	290	.802	359
Bermuda Grass -Golf Course	34.29	12	411	1.136	509
Bermuda Grass - Pasture	7.16	12	85	.235	105
Tamarisk - Groves	9.68	10	97	.268	119
Tamarisk - Rows	8.87	10	89	.246	110
Tamarisk and/or Mesquite scattered	18.53	10	185	.512	229
Inn Garden, palm, oleander, grass	1.41	12	17	.047	21
Field Crops, Alfalfa, corn	4.09	12	49	.135	60
Ponds	3.41	12	41	.113	51
	116.40		1264	3.494	1563
Estimated 1960 use (105% of 1957)			1328	3.67	1640
Estimated 1966 use (golf course doubled in size) (135% of 1957)			1710	4.72	2110
Estimated 1970 use (140% of 1957)			1770	4.89	2190
Estimated 1980 use (150% of 1957)			1900	5.25	2350

08-22-1960: table 4; domestic use; august 22, 1960

TABLE IV

DEATH VALLEY HOTEL COMPANY - DOMESTIC USE

Year	Annual Occupancy Guest Days	Annual Use Gallons	Peak Month Use, March 290% of monthly average Gallons per month.	GPM	Cfs
1960	70,000 @ 50 gpd	3,500,000	850,000	19	.043
1966	115,000 @ 50 gpd	5,750,000	1,420,000	32	.071
1970	127,000 @ 50 gpd	6,350,000	1,560,000	35	.078
1980	180,000 @ 50 gpd	9,000,000	2,210,000	50	.110

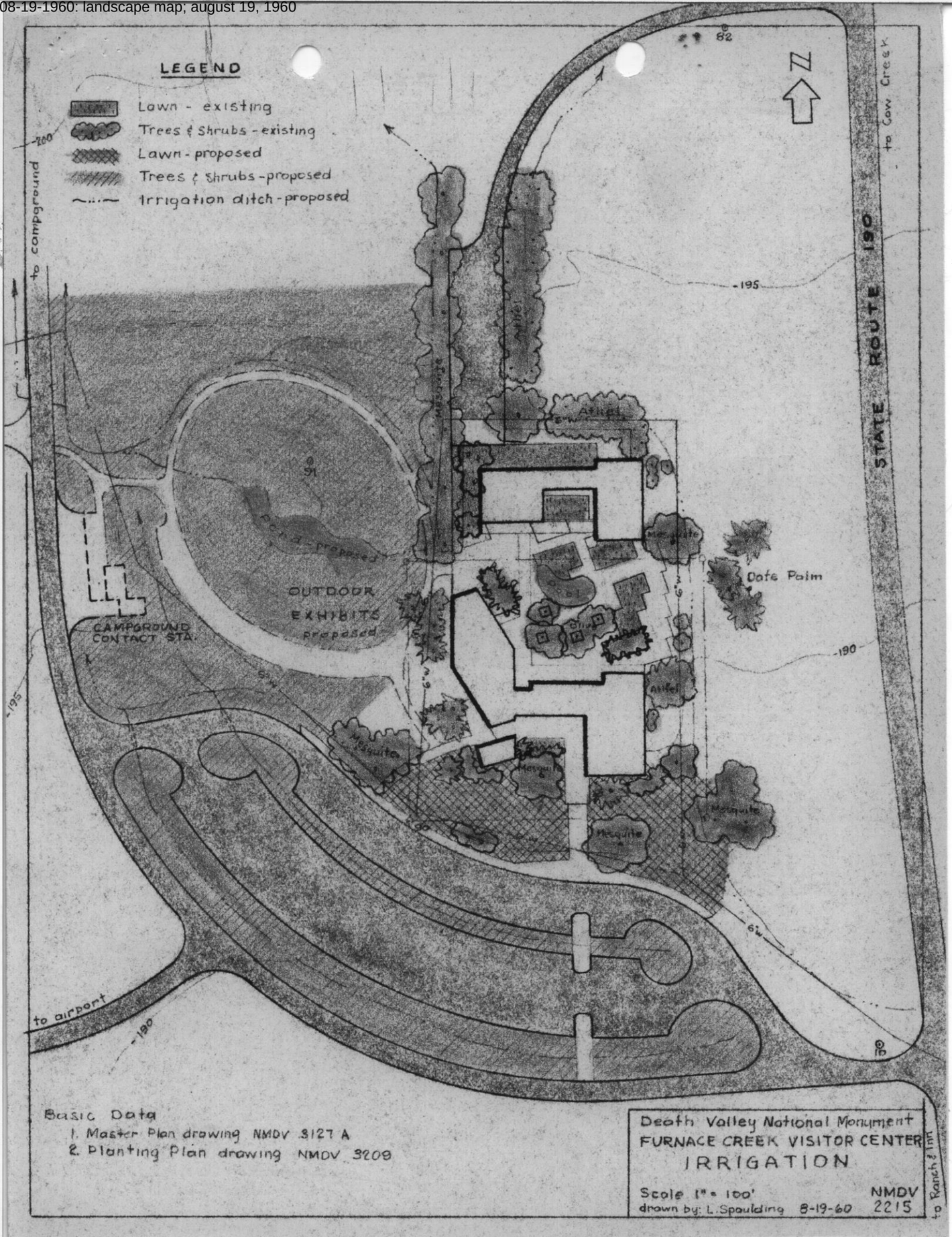
ANTICIPATED WATER USAGE - NPS INSTALLATIONS AT FURNACE CREEK
Summary of Estimates of Water Demand

L. Spaulding 7-29-60

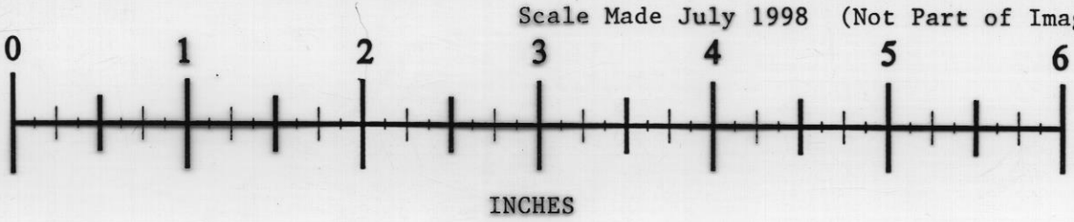
FACILITY	WATER DEMAND, Cubic Feet per Second Date of Estimate - Estimator - Reference									
	1940 - 1941 Dunn Appl's. {10,001 10,002 10,118	Sept. 9, 1958 Spaulding L-54, memo of Sept. 9, 1958 with attachment		Sept. 15, 1958 Dunn L-54, memo of Sept. 19, 1958 Price to Reg. Dir.		Sept. 25, 1958 Binnewies uncoded memo of Sept. 25, 1958 "Const. of Visitor Ctr.	Oct. 3, 1958 Sparks, WODC D 5039 memo of Oct. 17, 1958 Hunenberg to WODC		April 22, 1959 WODC D 5039 memo of Apr. 22, 1959 Smith to Reg. Dir.	
		Average	Peak Day	Average ④	Peak Month ⑤		Average	Peak Day	Constant	Peak
VISITOR CENTER										
Domestic	0.081 ①		.156	.013	.030		.009	.085		.085
Irrigation	0.058 ②	.125				"much less"	.057		.060	.060
FURNACE CREEK CAMPGROUND										
Domestic	-		.078	.006	.015		.007	.051		.051
Irrigation	-	.875				"much less"				
FURNACE CREEK RESIDENTIAL										
Domestic	-	.004	.004	.001	.001		.002	.002	.002	.002
Irrigation	-	.025								
TEXAS SPRING CAMPGROUND										
Domestic	0.110		.016	.001	.003		-	-	-	-
Irrigation	0.495	.374					-	-	-	-
INDIAN VILLAGE										
Domestic	0.068	.004	.004	.004	.004		.006	.006	.006	.006
Irrigation	0.275	.025								
SCHOOL										
Domestic	0.001									
Irrigation	0.021									
ALFALFA FIELD - Irrigation	0.500									
TOTAL DOMESTIC	0.260		.258	.026	.052 (Peak Day .209)		.024	.144		.144
TOTAL IRRIGATION	1.349	1.424				"much less"	.057		.060	.060
TOTAL	1.609						.081			.204

07-29-1960: anticipated water usage; july 29, 1960

08-19-1960: landscape map; august 19, 1960



Scale Made July 1998 (Not Part of Image)



UNITED STATES
DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
August 19, 1960

~~Spaulding~~ LSS
~~Carpenter~~ TJC
~~Whitworth~~
~~Manbey~~ BFM
~~Wooky~~ JMW
~~Maier~~ Hen
~~[illegible]~~

IN REPLY REFER TO:
A88
Denv

Memorandum

To: Regional Chief of Operations, Region Four

From: Hydraulic Engineer Spaulding, Region Four

Subject: Travel Analysis, Death Valley National Monument

FILE COPY

Attached are tables and charts analyzing travel records of Death Valley National Monument and predicting future trends. The analysis was made to provide basic data for estimating present and future water needs at the Furnace Creek Visitor Center, but also will be useful for other purposes requiring travel data.

The attachments are:

1. Chart titled "Visitation Trends - Usage of Furnace Creek Facilities."

2. Drawing NMDV 2214, "Travel Analysis - Average Vehicular Travel, 1957-1959."

3. Tables I and II, Tabulation of monthly vehicular travel by entrances for the years 1957, 1958, and 1959.

4. Summary Sheets of travel for the years 1954, 1955, 1956, 1957, 1958, 1959, and 1960, through May (7 sheets).

Attachment 1 is a plot of Monument visitation and of usage of Furnace Creek facilities including camper day-use of Texas Spring campground, guests at Furnace Creek Ranch and Inn, visits to the Borax Company Museum, and attendance at Naturalists' talks. The curves have been projected to the year 1980, guided by a population projection of eleven Southern California counties, but modified by limiting capacities of the Visitor Center and of overnight facilities.

On the basis of the projection, the following prediction of future visitation and use may be made:

	1960	1966	1970	1980
Total Monument Visitation, visitor days	520,000	850,000	1,180,000	1,426,000
Total Monument Visitation, visits	345,000	500,000	675,000	750,000
Furnace Creek Visitor Center, visits	100,000	275,000	340,000	450,000
Furnace Creek and Texas Spring Campgrounds, visitor days	70,000	150,000	195,000	277,000

Attachment 2 is a map with charts showing the average daily number of vehicles travelling on six entrance roads for each month of the year.

Attachments 3 and 4 are tabulations of basic data showing monthly vehicular travel by entrances, visitor use of paid facilities, and of campgrounds and attendance at activities.

L. J. Spaulding
Hydraulic Engineer

Attachments

Copy to: Director, with attachments
Chief, WODC (2), with attachments
Supt., Death Valley, with attachments
Chief, Water Resources Section, WASO, with attachments

Cleared for Distribution:

Regional Director / Date
8/25/60

LSSpaulding:lq

DEATH VALLEY NATIONAL MONUMENT

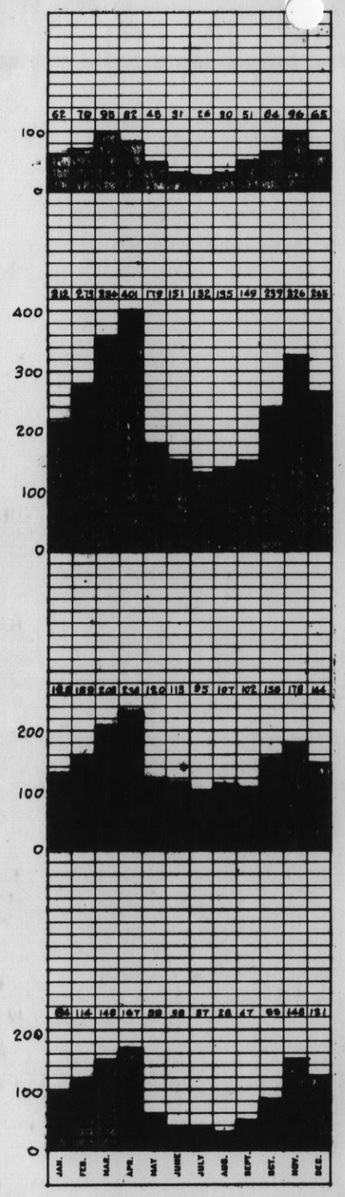
CALIFORNIA AND NEVADA

Ranger Station
Radiator Water
Campground
Secondary Campground

Paved Road
Gravel Road
Dirt Road
Monument Boundary

SCALE IN MILES 0 4 8 12

Note: Mileage is shown between stars



MONUMENT ROUTE 5
Boundary to Scotty's Castle

STATE ROUTE 190
Emigrant Junction to Sand Dune Junction (sum of traffic entering and leaving via Towne's Pass and Wildrose)

STATE ROUTE 190
Boundary to Emigrant Junction

MONUMENT ROUTE 8
Wildrose Entrance to Emigrant Junction

SCOTTY'S CASTLE ACCOMMODATIONS MEALS, SERVICE STATION

NEVADA CALIFORNIA

UBEHEBE CRATER

Mesquite Spring Elev. 2,000'

Tin Mtn. Elev. 8,900'

LAST CHANCE RANGE

Cottonwood Mts.

GRAPEVINE RANGER STATION

GRAPEVINE MTNS.

Mt. Palmer Elev. 7,600'

Klare Spring

Titus Canyon

Leadfield

ONE WAY

Midway Well

DEATH VALLEY

Ubehebe Peak Elev. 5,707'

STOVE PIPE WELLS HOTEL ACCOMMODATIONS MEALS SERVICE STATION

Stovepipe Wells

Sand Dunes

EMIGRANT RANGER STATION

Devils Cornfield

Mosaic Canyon

Tucki Mtn.

Skidoo

Emigrant Spring

Detloff Millsite

PANAMINT SPRINGS RESORT

Towne's Pass Elev. 4,956'

To Keeler 25 Miles

Lake Peak 45 Mi

PANAMINT RANGE

PANAMINT VALLEY

Aguereberry Pt. Elev. 6,279'

WILD ROSE RANGER STATION

Wild Rose Peak Elev. 7,600'

Charcoal Kilns

Mahogany Flat Elev. 8,200'

Wild Rose Canyon

Trail (7 Miles)

Telescope Peak Elev. 11,049

WILD ROSE STATION CABINS, RESTAURANT SERVICE STATION

To Trona 40 Mi

To Tonopah 93 Miles

Bullfrog

Rhyolite

Beatty

DAYLIGHT PASS WATER

Elev. 4,300'

AMARGOSA DESERT

Chloride Cliff

Keane Wonder Mill

FURNACE CREEK INN AND RANCH
TEXAS SPRING CAMPGROUND
HOTELS, CABINS, STORES
TELEGRAPH, TELEPHONE
MUSEUM, CORRALS
SERVICE STATION

MONUMENT HEADQUARTERS

FURNACE CREEK FUNERAL MTNS

Lathrop Wells

To Las Vegas & Hoover Dam 84 Mi

Harmony Borax Works

Mustard Canyon

Zabriskie Point

Golden Canyon

20-Mule-Team Canyon

Pyramid Peak

Mushroom Rock

Artists Palette Artists Drive

Ryan

Devils Golf Course

Salt Pools

BADWATER

Natural Bridge

Tule Spring

Shorty Well

Dantes View Elev. 5,475'

Eagle Borax Works

Bennetts Well

279.8 Feet Below Sea Level near Lowest Point in Western Hemisphere

Gravel Wells

BLACK MTNS.

Smith Mtn. Elev. 5,900'

Sea Level

Ashford Mill

Jubilee Pass

Mahogany Flat

Death Valley Junction

NEVADA CALIFORNIA

To Baker 84 Mi

To Shoshone 5 Mi
Las Vegas 95 Mi

Saratoga Springs

To Baker

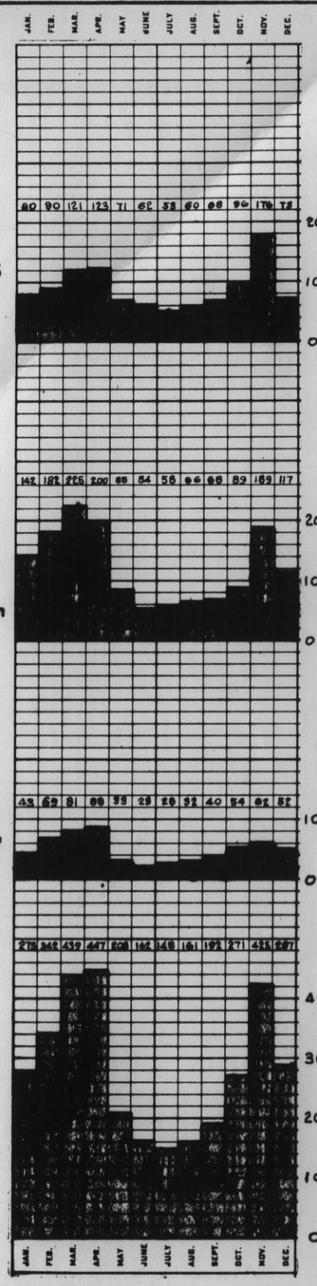
Avawatz Mtns.

MONUMENT ROUTE 6
Boundary to Hellsgate

STATE ROUTE 190
Boundary to Ryan Junction

MONUMENT ROUTE 1
Near Ashford Mill (sum of traffic on Salsberry Pass Entrance and Saratoga Springs Entrance roads)

TOTAL MONUMENT



VICINITY MAP



NOTE:

1. Traffic volume is sum of vehicles entering plus vehicles leaving (except monument total which is one-half the sum)
2. Basic data are from monthly travel records, January 1957 to December 1959 filed in the Chief Ranger's office.
3. Traffic was measured by automatic counters located as indicated by the symbol ⊂.
4. Local traffic within Monument, not crossing counters is not included.

National Park Service
Death Valley National Monument

TRAFFIC ANALYSIS

Average Vehicular Travel 1957—1959

prepared by L. Spaulding — NMDV
August 5, 1960 — 2214

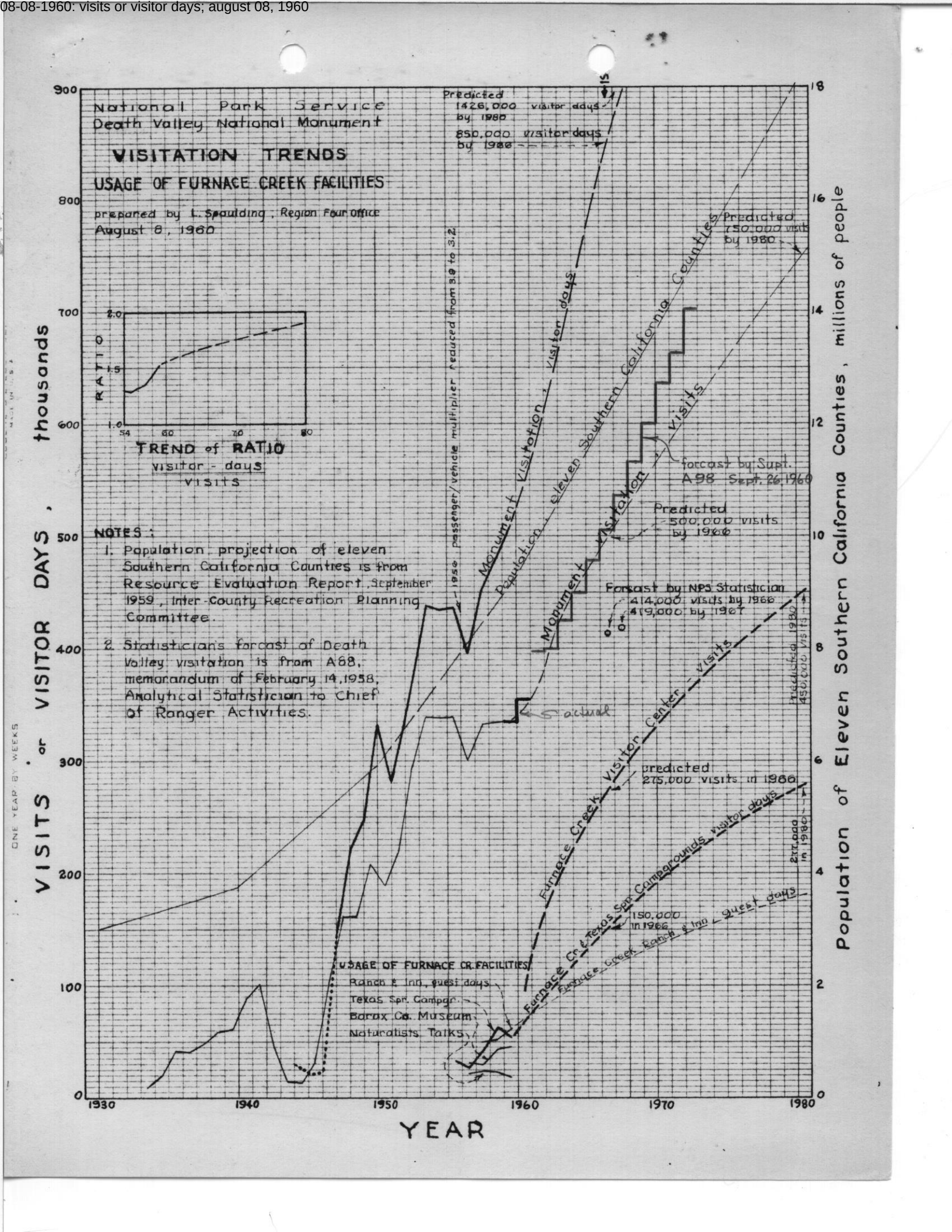
JULY 1958 N. M. D. V. 7009

Scale Made July 1998 (Not Part of Image)

0 1 2 3 4 5 6

08-05-1960: traffic analysis map; august 05, 1960

08-08-1960: visits or visitor days; august 08, 1960



ANALYSIS OF VEHICULAR TRAVEL - Death Valley National Monument

prepared by L. Spaulding Aug. 3, 1960

TABLE I Monthly vehicular travel by entrances, average for the years 1957, 1958 & 1959

ENTRANCE (Counter Location)	MONTHLY TRAVEL, ½ x (vehicles entering plus vehicles leaving)												
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR TOTAL
FURNACE CREEK (Ryan Jct.)	2198	2549	3494	2995	1315	814	899	1016	1014	1377	2833	1813	22,321
SALSBERRY PASS SARATOGA SPR. (Ashford Jct.)	673	963	1252	1327	513	351	430	493	599	834	928	807	9176
TOWNE'S PASS (Towne's Pass)	1978	2223	3223	3510	1866	1699	1471	1657	1535	2417	2675	2227	26,487
DAYLIGHT PASS (Hellsgate)	1245	1256	1869	1840	1097	923	819	926	1123	1495	2642	1135	16,371
WILDROSE (Wildrose Entrance)	1457	1592	2290	2508	912	565	573	439	708	1283	2214	1883	16,424
SCOTTY'S CASTLE (Scotty's Castle)	953	982	1474	1232	745	466	405	462	761	986	1437	1015	10,916
OTHER { Wingate Wash, Mengel Pass, Hunter Mtn., Sand Spgs., Saline Valley }													
MONUMENT TOTAL	8503	9565	13,608	13,412	6447	4817	4595	4994	5740	8397	12,730	8888	101,698

TABLE II Annual vehicular travel by entrances 1954 to 1959

ENTRANCE	ANNUAL TRAVEL, ½ x (vehicles entering plus vehicles leaving)						
	1954	1955	1956	1957	1958	1959	YEARLY AVG. (1957-1959)
FURNACE CREEK (Ryan Jct.				22,780	20,793	23,390	22,321
SALSBERRY PASS SARATOGA SPR. (Ashford Jct.)				8595	8575	10,357	9176
TOWNE'S PASS (Towne's Pass)	27,193			25,555	25,719	28,188	26,487
DAYLIGHT PASS (Hellsgate)				16,897	17,267	14,949	16,371
WILDROSE (Wildrose Entr.)	9730			14,400	17,779	17,092	16,424
SCOTTY'S CASTLE (Scotty's Castle)				11,251	11,251	10,245	10,916
OTHER { Wingate Wash, Mengel Pass, Hunter Mtn., Sand Spr., Saline Valley }	—	—	NOT RECORDED				—
MONUMENT TOTAL			93,108	99,478	101,395	104,221	101,698

08-03-1960: analysis of vehicle travel; august 03, 1960

Death Valley National Monument 1960 TRAVEL By Months

Vehicles, Visitors or Visitor Days

LINE NO.	TYPE OF USE		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
1	VEHICLES by entrance	Furnace Creek	2349	3435											
2		Ashford	532	764											
3		Towns Pass	1591	2640	2620	4050	1950	1560							
4		Daylight Pass	1431	2477	2150	2690	1550	1160							
5		Wild Rose	1634	2553											
6		Scotty's Castle	960	1801											
7		TOTAL	8497	13,670	12,150	15,900	7080	4990							
8															
9	VISITORS from Form 10-157	Bus													
10		Airplane	159	182	89	65	20		1		13	32			
11		Private Veh.	27,904	43,744	12,085	15,927	7,057	4,992	3,207	5,091	6209	9,000			
12		Other										1000 MOTOR CYCLES			
13		TOTAL	27,349	43,926	38,877	50,966	22,634	15,974	10,264	16,291	19,897	30,630	44,183	33,140	355,892
14															
15	PAID FACILITIES Visitor Days	Wild Rose Sta.	171	109											
16		Stovepipe Wells	1189	1571											
17		Furnace Cr. Inn	2000	3430											
18		Furnace Cr. Ranch	5007	7089											
19		Scotty's Castle													
20		TOTAL													
21		Form 10-157 2a16	8709	12,570	16,709	8130	1076	246							
22	CAMPGROUNDS Visitor Days	Texas Spring	4178	6824											
23		Emigrant Dist.	341	1061											
24		Grapevine District: Mesquite													
25		Midway	294	1578											
26		Daylight													
27		Miscellaneous	908	4760											
28		TOTAL	5723	14,123	11,011	13,344	1664	367							
29															
30	TOTAL VISITOR DAYS	lines 13 + 20 + 28													
31		from Form 10-157	41,779	70,619	66,597	72,440	25,374	16,590	10,676	17,153	20,588	39,942	83,732	54,920	520,410
32	ACTIVITIES Visitors	Castle Tours													
33		Furnace Cr. Museum	5899	8386	6440	8,401	—	—	—						
34		Naturalist Talks	4206	7012	7251	4,572	—	—	—						
35		Registration, HQ													

00-00-0000: 1960 travel table

Death Valley National Monument 1959 TRAVEL By Months

Vehicles, Visitors or Visitor Days

LINE NO.	TYPE OF USE		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
1	VEHICLES by entrance	Furnace Creek	2492	2562	3688	1269	1298	740	1290	1014 (2)	1135	1649	3788	2465	23,390
2		Ashford	1058	1250	1566	1016	(1) 582	526	676	681	661	726	966	649	10,357
3		Towns Pass	2573	2199	4159	2378	1640	2038	1563	1814	1931	2735	3028	2124	28,188
4		Daylight Pass	1219	1200	1845	1280	1035	868	514	604	1264	1849	2383	840	14,949
5		Wild Rose	1859	1573	2988	1610	774	649	498	485	736	1496	2719	1705	17,092
6		Scotty's Castle	809	801	1441	848	641	371	350 (3)	541	1045	1100	1208	1090	10,245
7		TOTAL	10,010	9585	15,735	8402	5970	5192	4847	5139	6772	9555	14,092	8673	104,221
8		Form 10-157 L.	10,010	9585	15,735	8402									
9	VISITORS from Form 10-157	Bus		178	928										1106
10		Airplane	452	68	219	120	17	96	13	—	28	54	142	85	1254
11		Private Veh.	32,032	30,672	50,362	26 886	18,904	16,614	15,970	16,444	21,610	30 576	45 094	28,394	333,318
12		other	—	—	—	—	—	—	—	—	—	—	—	—	—
13		TOTAL	32,484	30,918	51,509	27,006	18,921	16,670	15,983	16,444	21,648	30,630	45,236	28,479	335,678
14		Form 10-157 S.					18,909								335,666
15	PAID FACILITIES Visitor Days	Wild Rose Sta.	94	86	116	76	108	54	18	25	90	84	98	112	971
16		Stovepipe Wells	1476	1430	2084	1132	48	—	—	—	110	745	1361	1453	9839
17		Furnace Cr. Inn	2721	3078	3612	(5) 1933	—	—	—	—	—	—	2165	2138	15,647
18		Furnace Cr. Ranch	3766	7276	T (4) 2654 C 11,689	T (4) 1241 C 4678	—	168 (4)	—	—	85	1170	5733	6008	46,318
19		Scotty's Castle	517	494	570	868	337	189	69	157	331	499	371	371	4223
20		TOTAL	10,579	12,364	20,625	9378	493	366	87	182	616	2498	9728	10,082	76,998
21		Form 10-157	10,304	12,230	20,645	9580	624	357	355	94	442	2414	9856	10,082	77,083
22	CAMPGROUNDS Visitor Days	Texas Spring	6002	9600	16,974	2572	566	141		10	83	1089	10,460	6637	54,134
23		Emigrant Dist	Closed 630	Closed 940	0-2 1544	0-26 838	0-21 245	0-20 352	0-14 806	0-26 281	0-19 223	0-20 572	1608	1260	9611
24		Grape-vine Mesquite													
25		Grape-vine Midway	795	522	1240	325	314	79	Closed	32	12	582	2405	563	6869
26		Grape-vine Daylight													
27		Miscellaneous	867	1719	9863	40	24	—	—	—	—	360	9795 (115)	2153	24,936
28		TOTAL	8294	12,781	30,032	3775	1149	473 (00)	806	323	318	2603	24,385	10613	95,550
29															
30	TOTAL VISITOR DAYS	lines 15+20+28	51,357	56,063	102,166	40,159	20,563	17,509	16,576	16,949	22,632	35,731	79,347	49,174	508,226
31		from Form 10-157	51,146	55,929	102,184	40,361	20,672	17,496	16,644	16,761	22,468	35,647	79,475	49,174	508,259
32	ACTIVITIES Visitors	Castle Tours	7654	8909	15,476	7023	2950	1154	911	1308	2154	4426	10,149	7588	69,892
33		Furnace Cr. Museum	4612	4557	9364	5470	—	—	—	—	—	—	9660	11,961	45,574
34		Naturalist Talks	2773	5498	4565	922	—	—	—	21	—	162	2580	4718	19239
35		Registration, HQ													

(1) Thorndike from Dunn-Loss memo 6-54 Nov 27, 1959 (included in Emigrant Dist)
(2) E. to W.
(3) T. to C.
(4) T. to C.
(5) estimated by U.S.S. 8/1/60

Death Valley National Monument 1958 TRAVEL By Months

Vehicles, Visitors or Visitor Days

LINE NO.	TYPE OF USE		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
1	VEHICLES by entrance	Furnace Creek	2050	2000	3254	3548	1145	754	631	675	950	1359	2667	1760	20,793
2		Ashford	526	698	1127	1430	582	67	295	192	490	888	1167	1113	8575
3		Towns Pass	1982	1865	2975	4042	1794	1345	1268	1429	1663	2318	2774	2264	25,719
4		Daylight Pass	1250	814	1808	2286	1030	835	1050	1073	1000	1378	3128	1615	17,267
5		Wild Rose	1535	1662	2316	3600	1065	565	779	458	697	1273	2036	1743	17,779
6		Scotty's Castle	1068	1057	1577	1491	735	500	467	382	539	832	1650	963	11,251
7		TOTAL	8,411	8,096	13,057	16,397	6,351	4,066	4,490	4,209	5,339	8,048	13,423	9508	101,395
8			~	~	~	~	~	~	4,491	~		8,050			101,537
9	VISITORS from Form 10-157	Bus	150	370	480	620	60	—	—	—	—	—	450	460	2,590
10		Airplane	123	95	154	520	20	14	2	10	32	38	—	—	1,008
11		Private Veh.	28,597	27,524	44,393	52,470	20,323	13,011	14,371	13,468	17,085	25,753	42,953	30,425	330,373
12		Other						75	3		34	48	91	78	329
13		TOTAL	28,870	27,989	45,027	53,610	20,403	13,100	14,376	13,478	17,151	25,839	43,494	30,963	334,300
14															
15	PAID FACILITIES Visitor Days	Wild Rose Sta.	63	41	75	120	40	53	127	26	20	17	61	67	710
16		Stovepipe Wells	1150	1362	2250	1625	105	closed			87	342	1269	1440	9630
17		Furnace Cr. Inn	2137	3048	3614	8925①	0	closed for the Summer					1655	1211	13,665
18		Furnace Cr. Ranch	5795	5846	8617		175	closed			30	1187	4633	5576	38,784
19		Scotty's Castle	564	590	703	699	284	126	44	59	130	299	②(300)	342	4140
20		TOTAL	9,709	10,887	15,259	11,369	604	178	171	85	267	1,845	7918	8636	66,929
21			9,259	10,857	15,190	11,373	340	238	1236	90	1941	1496	7,917		
22	CAMPGROUNDS Visitor Days	Texas Spring	6473	6392	8361	14,839	398	30	32	20	100	1385	16,790	8234	63,054
23		Emigrant Dist.	168	165	1224	958	484	115	134	185	266	270	Mike to 63 1526	Torrodike to 995	6490
24		Grapevine District: Mesquite	350	450	1000	600	150	40	44	35	25	120	655	405	4494
25		Grapevine District: Midway				500	25				15	50			
26		Grapevine District: Daylight									20	10			
27		Miscellaneous												3600	3600
28		TOTAL	6,991	7,007	10,585	16,897	1057	185	210	240	426	1835	18,971	13,234	77,638
29			~	~	~	~	~	~	~	~	~	~	~	~	~
30	TOTAL VISITOR DAYS	lines 13 + 20 + 28	45,570	45,883	70,871	81,876	22,064	13,463	14,757	13,803	17,844	29,519	70,383	52,833	478,867
31		from Form 10-157	45,520	45,853	70,758	81,880	21,780	13,338	15,822	13,788	17,773	29,350	70,382	52,655	478,899
32	ACTIVITIES Visitors	Castle Tours	7,221	8,150	13,938	13,211	2900	1447	1017	928	1240	3330	②(10,000)	8342	71,224
33		Furnace Cr. Museum	4,938	5,323	7,100	9,228	c	losed for the			Summer		8661	6209	42,148
34		Naturalist Talks	3,227	5,050	6,419	3,400	Discontinued for the				summer		2505	3322	23,921
35		Registration, HQ.													5000

① Total Inn & Ranch - est 2000 at Inn
② Data not available - quantity shown estimated by Spaulding

00-00-0000: 1958 travel

1957 TRAVEL By Months Vehicles, Visitors & Visitor Days

			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
1	VEHICLES By Entrance	Furnace Cr.	2052	3086	3539	4168	1502	947	775	1360	957	1124	2045	1225	22,780
2		Ashford	434	940	1082	1535	376	459	318	607	645	888	651	660	8595
3		Towns Pass	1379	2605	2536	4110	2163	1714	1575	1728	1011	2218	2222	2294	25,555
4		Daylight Pass	1265	1753	1906	1953	1225	1064	892	1101	1106	1258	2415	959	16,897
5		Wild Rose	976	1541	1565	2315	896	481	442	373	692	1079	1888	2152	14,400
6		Scotty's	983	1088	1405	1356	858	527	397	464	699	1027	1454	993	11,251
7															
8		TOTAL	7089	11,013	12,033	15,437	7020	5192	4399	5633	5110	7594	10675	8283	99,478 ①
9		Form 10-157 I.	7089	11,013	12,033	15,437	7020	5192	4399	5633	5110	7594	10675	8283	109,478
10	VISITORS (From Form 10-157)	Bus	175	210	97	280	70	35	–	41	37	35	650	410	2040
11		Airplane	37	54	91	98	19	2	4	7	49	17	234	108	720
12		Private Veh.	22685	35241	38,506	52,485	23868	17653	14957	19,152	17,374	24,300 ①	36,295	28,152	330,668
13		Other	–	–	–	–	–	–							
14		TOTAL	22,897	35,505	38,694	52,863	23957	17690	14961	19,200	17,460	24,352	37,179	28,670	333,428
15															
16	PAID FACILITIES Overnight Guests	Wild Rose Sta	26	52	100	96	89	27	14	12	38	72	75	93	694
17		Stovepipe Wells	850	1463	1997	1992	322	Closed			84	1030	1500	1485	10,723
18		Furnace Cr. Inn	2165	2848	3392	1865	Closed for the Summer						1657	1781	13,708
19		Furnace Cr. Ranch	3611	5792	7208	6643	Closed for the Summer					1707	5859	5491	36,311
20		Scotty's Castle ①	424	470	755	580	446	119	97	130	222	596	512	514	4865
21		TOTAL ①	7076	10625	13452	11,176	857	146	111	142	344	3405	9603	9364	66,301
22	CAMPGROUNDS Visitor Days	Texas Spring	646	2223	6464	1216	150	5	5	60	100	694	22,491	8118	42,172
23		Emigrant District: Thorndike	~~153~~	~~310~~	~~217~~	~~1552~~	~~211~~	~~50~~	~~60~~	~~68~~	~~266~~	~~472~~	~~1734~~	~~333~~	~~5426~~
24		Mahogany													
25		Grapevine District: Mesquite	~~315~~	~~450~~	260	669	75	75	20	25	50	75	~~730~~	~~250~~	~~3634~~
26		Midway				500	25	25	5	30	30	25			
27		Daylight													
28		Miscellaneous	150	300	215	400	100								1165
29		TOTAL	1264	3283	7156	4337	561 ①	155	90	183	446	1266	24,955	8701	52,397 ①
30	TOTAL VISITOR DAYS (14+29)		31,237	49,413	59,302	68,376	25,375	17,991	15,162	19,525	18,250	29,023	71,737	46,735	452,126 ①
31	ATTENDANCE	Castle Tours	4688	8555	10,304	12,967	3080	1156	927	1202	1776	4549	8001	6711	63,916
32		F.C. Museum	3262	4264	6111	7898	Closed for the Summer					1231	6672		29,438
33		Naturalist Talks	2745	5330	5397	5497	0	–	–	–	–	0	2180	3224	24,173
34		Registration, H.Q.													4000

① Does not agree with Form 10-157

Death Valley National Monument 1956 TRAVEL By Months

Vehicles, Visitors or Visitor Days

LINE NO.	TYPE OF USE		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
1	VEHICLES by entrance	Furnace Creek													
2		Ashford													
3		Towns Pass													
4		Daylight Pass													
5		Wild Rose													
6		Scotty's Castle													
7		TOTAL													
8															
9	VISITORS from Form 10-157	Bus	73	58	155	70	90	65	30	30	0	35	50	175	831
10		Airplane	119	64	149	180	15	2	2	4	2	35	88	97	747
11		Private Veh.	30,299	31,843	47,948	30,538	19,693	14,671	14,073	13,184	12,570	22,656	32,483	30,582	298,535
12		Other		2		4			1	12					19
13		TOTAL	30,486	31,967	48,252	30,792	19,798	14,738	14,106	13,230	12,572	22,726	32,621	30,854	300,132
14															
15	PAID FACILITIES Visitor Days	Wild Rose Sta.													
16		Stovepipe Wells													
17		Furnace Cr. Inn													
18		Furnace Cr. Ranch													
19		Scotty's Castle						318	78	180	248	500	470	437	2231
20		TOTAL	8010	10,986	15,248	7085	1029	339	181	101	304	2202	8378	8883	62,746
21															
22	CAMPGROUNDS Visitor Days	Texas Spring	2040	3043	12,454	2440	604	120	15	30		785	3110	2355	26,996
23		Emigrant Dist.						60	50	35		25	250	390	760
24		Grape-vine District Mesquite	65	300	150	195	25	30	0			150	500	508	2398
25		Grape-vine District Midway	25		275	150	5	15	0	5					
26		Grape-vine District Daylight													
27		Miscellaneous	217	100	500	270	240			12		10	300	300	1949
28		TOTAL	2347	3443	13,379	3055	874	225	65	82	45	970	4160	3553	32,103
29			~	~	~	~	~	~	~	~		~	~	~	
30	TOTAL VISITOR DAYS	lines 13 + 20 + 28													
31		from Form 10-157	40,843	46,396	76,869	40,932	19,701	15,302	14,352	13,413	12,921	25,898	45,159	43,290	395,076
32	ACTIVITIES Visitors	Castle Tours						2254	2209	1491	1385	3779	7535	7462	26,115
33		Furnace Cr. Museum	4396	5676	11,082	Closed for the Summer						1121	3649	5161	32,085
34		Naturalist Talks	3,015	4300	6,185	0	—	—	—	—	—	0	4362	3565	21,427
35		Registration, HQ													

00-00-0000: 1956 travel

Death Valley National Monument · 1955 TRAVEL By Months — Vehicles, Visitors or Visitor Days

LINE NO.	TYPE OF USE		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
1	VEHICLES by entrance	Furnace Creek													
2		Ashford													
3		Towns Pass	1249	2045											
4		Daylight Pass													
5		Wild Rose	809	1740											
6		Scotty's Castle													
7		TOTAL													
8															
9	VISITORS from Form 10-157	Bus													
10		Airplane													
11		Private Veh.													
12		Other													
13		TOTAL	29,311	31,158	45,549	54,082	28,272	18,607	17,404	12,650	14,038	21,500	34,610	30,726	337,907
14															
15	PAID FACILITIES Visitor Days	Wild Rose Sta.													
16		Stovepipe Wells													
17		Furnace Cr. Inn													
18		Furnace Cr. Ranch													
19		Scotty's Castle													
20		TOTAL													
21															
22	CAMPGROUNDS Visitor Days	Texas Spring	2297	4900	4185	1916	604	60	15	14	75	408	12,050	6259	32,783
23		Emigrant Dist.					75	60	12	16	5	60	150		378
24		Grapevine District — Mesquite	36	25	82	509	65	23	0					110	850
25		Grapevine District — Midway												180	180
26		Grapevine District — Daylight													
27		Miscellaneous	149	268	75	579	260	36	31	42	6	30	677		2153
28		TOTAL	2482	5193	4342	3004	1004	179	58	72	86	498	12,877	6,549	36,344
29															
30	TOTAL VISITOR DAYS	lines 13 + 20 + 28													
31		from Form 10-157													437,166
32	ACTIVITIES Visitors	Castle Tours													
33		Furnace Cr. Museum													
34		Naturalist Talks													
35		Registration, HQ													

00-00-0000: 1955 travel

Death Valley National Monument 1954 TRAVEL By Months — Vehicles, Visitors or Visitor Days

LINE NO.	TYPE OF USE		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
1	VEHICLES by entrance	Furnace Creek													
2		Ashford													
3		Towns Pass	1840	2440	3700	3705	2100	1825	1,204	2,143	3296	1830	1745	1,365	27,193
4		Daylight Pass													
5		Wild Rose	630	810	950	950	550	470	570	826	463	901	836	1774	9730
6		Scotty's Castle													
7		TOTAL	6909	10,561	9726	10,454	6,773	4608	3513	5583	4764	6990	9222	7836	86,934
8															
9	VISITORS from Form 10-157	Bus													
10		Airplane													
11		Private Veh.													
12		Other													
13		TOTAL	21,199	42,683	38,820	41,253	26,416	17,791	13,701	21,833	18,591	22,341	37,253	30,750	337,631
14															
15	PAID FACILITIES Visitor Days	Wild Rose Sta.													
16		Stovepipe Wells													
17		Furnace Cr. Inn													
18		Furnace Cr. Ranch													
19		Scotty's Castle													
20		TOTAL													
21															
22	CAMPGROUNDS Visitor Days	Texas Spring													
23		Emigrant Dist.													
24		Grapevine District — Mesquite													
25		Grapevine District — Midway													
26		Grapevine District — Daylight													
27		Miscellaneous													
28		TOTAL													
29															
30	TOTAL VISITOR DAYS	lines 18 + 20 + 28													
31		from Form 10-157													
32	ACTIVITIES Visitors	Castle Tours													
33		Furnace Cr. Museum													
34		Naturalist Talks													
35		Registration, HQ													

00-00-0000: 1954 travel

09-09-1958: water demand chart ; september 09, 1958

WATER DEMAND

FURNACE CREEK - NPS DEVELOPMENT - MISSION 66

transmitted with memo of 9-9-58 (L-54) L. Spaulding 9-6-58

Area	USE	POPULATION Peak Day 1966	IRRIGATED AREA (1966) Acres	RATE OF WATER USE	WATER DEMAND PEAK Gal. per Day	PEAK Gal. per Min.	PEAK Sec. Ft.
Museum - Admin.	Domestic①	10,000		10 gal/person	100,000	70	.156
	Irrigation		5	1 SF per 40A.	81,000	56	.125
	Total				181,000	126	.281
Furnace Creek Campground	Domestic	1000		50 G/Per./Day	50,000	35	.078
	Irrigation		35	1 S.F per 40 A.	~~265,000~~ 566,000	~~382~~ 393	~~.851~~ .875
	Total				~~315,000~~ 616,000	~~417~~ 428	~~.929~~ .953
Furnace Creek - Residential (3 Residences)	Domestic	12		200 GPD/Person	2400	2	.004
	Irrigation		1	1 SF per 40 A.	16,000	11	.025
	Total				18,000	13	.029
Texas Spring Campground	Domestic	200		50 GPD/Person	10,000	7	.016
	Irrigation		15	~~1~~ 1 SF/40 Ac.	~~242,000~~ 242,000	168	.374
	Total				~~252,000~~ 252,000	175	.390
Indian Village	Domestic	50		50 GPM/Person	2500	~~2500~~ 2	.004
	Irrigation		1	1 SF/40 Ac.	16,000	11	.025
	Total				19,000	13	.029
Total - (this condition would never occur)					~~785,000~~ 1086,000	~~744~~ 755	~~1.658~~ 1.682
Maximum Use - (Full irrigation plus 10% domestic)							
	Domestic (10% of total domestic .258 cfs)				17,000	12	0.026
	Irrigation (Summer months)				921,000	639	1.424
	Total				938,000	651	1.450

① Includes air conditioning demand (8 GPM per Ralph Thornally 9-9-58)

In reply refer to:
D5039

June 20, 1956

Memorandum

To: Regional Director, Region Four

From: Superintendent, Death Valley NM

Subject: Data concerning per capita water consumption

Regional Office memorandum No. 56-66 requested data on water consumption and sewage flow to be sent to the Public Health Service.

The following is the only reliable data on water consumption in Death Valley:

Location: Texas Spring Campground
Meter: 2" Neptune meter at NPS diversion next to Pacific Coast Borax Company. Sand trap at Texas Spring tunnel.
Date: Tuesday, March 27, to Friday, March 30, 1956 (Easter Week)

Facilities Served: 2 Comfort Stations containing:
16 water closets
1 urinal (single)
6 lavatories

50 3/4" hydrants in campground
5 (est.) hydrants in Indian Village
80 house trailers - 25% with hose connection to hydrants

Population: Campground - 300 to 500 people
Indian Village - 20 people (no interior plumbing or flush toilets)

Water Used: Tuesday, March 27, 1956, 8:00 A.M., 33 GPM
Friday, March 30, 1956 11:15 A.M., 10 GPM
3 day average - 62,830 gal. in 75 hrs. 14 GPM
Average per capita rate - 50 gal. per day

Fred W. Binnewies
Superintendent

LSS/FWB/dtm

Part II WATER RESOURCES

Water Resources

10-23-1960: letter to the director concerning water rights ; october 23, 1960

Copy made for Supplemental Data file Death Valley Watermark later

October 21, 1960

L 54

Memorandum

To: Director

From: Regional Director, Region Four

Subject: Water Rights, Furnace Creek Area, Death Valley

Your memorandum of May 31 stated that it was your feeling that any resolution of water rights needs of this Service and the Death Valley Hotel Company requires accurate information as to:

1. Total available supply of water, estimated as nearly as possible to "dry" years.

2. Present and anticipated amount that will be required by this Service and the company.

3. Whether there are waters available that have not been known to exist at the Furnace Creek Area.

The memorandum further states that until these essential facts are known, there does not appear to be a sound basis on which to go ahead with development of further water resources at Furnace Creek.

You requested us to discuss the matter of testing with Mr. Kunkel, after which we were asked to give our recommendations for further test operations. Upon receipt of our report you would decide the testing program to be undertaken and would expect this office to work out a draft of suggested understanding with the company as to special conditions to insure that the testing would not interfere with normal company operations.

At the same time it was expected that the company would submit its independent statement of water use and claims before any attempt was made to resolve as between the company and the Service an equitable division of the known water supply.

Under date of July 21 we forwarded you a copy of Mr. Kunkel's memorandum of July 15 in which he stated that the total available supply of water over a long term was estimated to be 5.6 cfs and that he considered the quantity of "waters available that have not been known to exist in the Furnace Creek Area" as probably very small. Mr. Kunkel's figure of 5.6 cfs includes Nevares Springs, several small undeveloped spring and seeps and loss by evapotranspiration. Mr. Kunkel believes that additional testing of the well and trench is unwarranted.

A report of the determination of water use was transmitted to you August 29. In this memorandum we stated that subject to possible further confirmation of relative rates of water use, we believed that data contained in the reports attached thereto could be used as a basis for estimating probable future water needs of the National Park Service, and its facilities at Furnace Creek.

We also stated that we believe the estimates for the hotel company could be used for estimating purposes. However, we do believe that the best source of current and proposed use for the hotel company would be from their figures, which can probably be obtained more readily by your office than by either the Monument or this office.

For information purposes we are enclosing a chart entitled "Water Diversion Furnace Creek Area" (drawing NMDV-2216) and a summary of measurements from which the chart was plotted. The chart shows discharges for the period from January 1956 to January 1960 of individual sources as well as the combined total as they varied with time. Mr. Knaebel's estimate of 5.6 cfs exceeds the totals shown on the chart and summary. This difference is the amount of water from Nevares Springs plus the flow of small springs and the amount lost by evapotranspiration.

We believe that with this additional information all the data requested in your memorandum of May 31 have now been sent to your office. We do not believe that further testing is required. Will you please review the data referred to in this memorandum, together with the attachments and advise us as to whether any additional steps should be taken in connection with this matter.

(SIGN) [illegible]

Regional Director

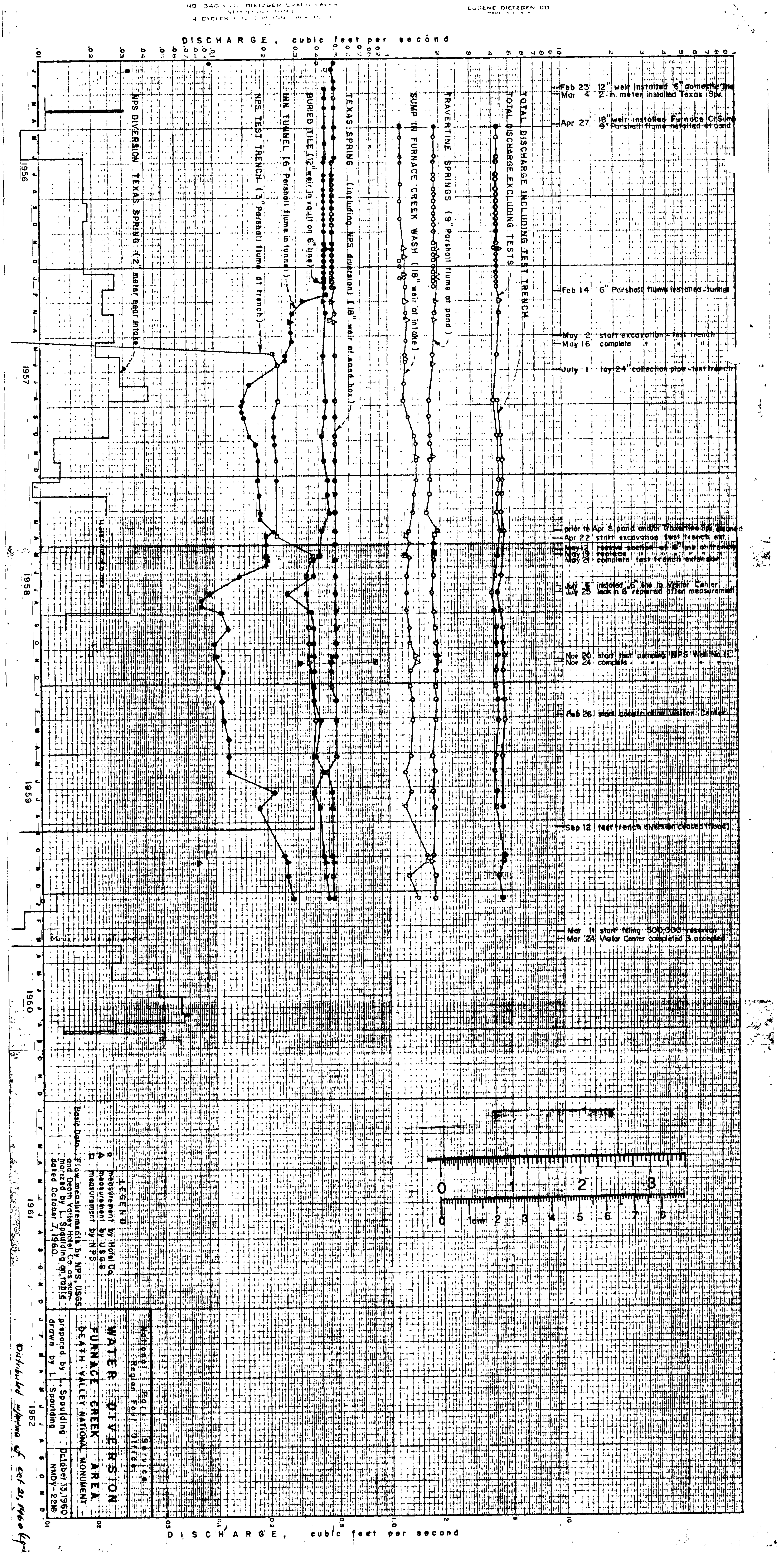
Attachments

Copy to: Supt., Death Valley
Chief, WODC (2)

bc: Spaulding

GFWhitworth:vp:lq

00-00-0000: water discharge/ year - water diversion



Death Valley National Monument
Furnace Creek Area
SUMMARY OF MEASUREMENT OF WATER DIVERSION

Measured by USGS, Pacific Coast Borax Co. & NPS 1956-1960

Region 4 office
L. Spaulding
October 7, 1960
Sheet 1 of 2

DATE	DISCHARGE, Cubic Feet per Second (USGS Source Designation)									TOTAL INCL. TESTS
	TRAVERTINE SPRINGS	SUMP IN FURNACE CR. WASH 27/1-2681	BURIED TILE 27/1-2682	INN TUNNEL 27/1-22H1	TEXAS SPRINGS 27/1-2381 HOTEL CO. DIVERSION	TEXAS SPRINGS 27/1-2381 NPS DIVERSION	TOTAL DIVERSION HOTEL CO.	TOTAL DIVERSION NPS	TESTS NPS TRENCH 27/1-2683	TESTS NPS WELL	
1956					.404	.097		.097			
Jan 6					.451	.033		.033			
Jan 18						.501					
Feb 9						.011[p] .031[f]		.011[p]			
Mar 28			.442			.501 .008[p]	4.29[j]	.008[p]			4.30[j]
Apr 29											
Jun 21	1.88	1.196	.442			.501	4.29[j]	.018[p]			4.30[j]
Jul 1											
Nov 20	1.88	1.196	.437			.501 .018[p]	4.28[j]	.018[p]			4.30[j]
Nov. 28	1.94[a]	1.26[a]	.45[a]			.501	4.41[j]				4.48[j]
Nov. 28	1.86	1.196	.437		.485	.018[p]	4.26[j]	.018[p]			4.28[j]
Dec 1	1.94[a]										
Dec 10	1.86	1.196	.437			.501	4.26[j]				4.28[j]
Dec 12	1.92[a]	1.26[a]									
Dec. 30-31	1.86	1.196	.437		.485	.018[p]	4.26[j]	.018[p]			4.28[j]
1957											
Jan 10	1.86	1.196	.437			.501	4.26[j]				4.29[j]
Jan 15	1.94[a]	1.26[a]									
Jan 18	1.86	1.196	.437		.485	.027[p]	4.26[j]	.027[p]			4.29[j]
Jan 22	1.94[a]				.48[a]						
Jan 26	1.86	1.196	.437		.485		4.26[j]				4.29[j]
Feb 5		1.283									
Feb 6	1.88		.442			.501					
Feb 18				.45							
Mar. 1	1.90[a]	1.28[a]	.43[a]	.33[a]	.48[a]	.023[p]	4.42[a]	.023[p]			4.44
Mar 21	1.88	1.283	.442	.285		.501	4.39[m]				4.41
Apr. 1		1.283	.442			.501					
Apr 3	1.88[a]	1.30[a]			.47[a]						
Apr. 5				.28[a]	.50[a]	.027[p]		.027[p]			
Apr 23				.28[v]							
May 9	1.82	1.283	.442	.285		.501	4.31[n]				4.33[m]
Jun 4	1.82	1.27	.430	.260		.501 .021[p]	4.26	.021[p]	.22[b]		4.28[m]
Jun 11				.26[v]							
Jun 20	1.82[a]	1.28[a]				.029[p]		.029[p]	.236		
Jul 24	1.78	1.239	.421	.160		.501 .042[p]	4.07	.042[p]			4.34
Aug. 22	1.74	1.24	.442	.148			4.04		.236		4.31
Sep 1		1.30		.146[v]							
Sept 11				.148[v]		.025[p]		.025[p]			
Sep 20	1.72	1.305	.437	.150		.501	4.09		.222		4.36
Oct 23	1.76	1.42	.419	.160		.501	4.24		.222		4.48
Nov 6	1.76	1.46	.419	.174		.501	4.30		.226		4.54
Nov 29	1.82[a]	1.46[a]				.012[p]		.012[p]			
Dec 5	1.76	1.462	.430	.180		.501	4.32		.23		4.56
1958						.013[p]		.013[p]			
Jan 9	1.76	1.462	.453	.180		.501	4.35		.23		4.59
Jan 27				.180		.009[p]		.009[p]			
Feb 4	1.74	1.417	.453	.182		.501	4.28				4.52[m]
Mar 6	1.68	1.439	.465	.185		.024[p]	4.25	.024[p]			4.50[m]
Mar 16				.186[v]							
Apr 8	1.94	1.327	.419	.220		.501	4.39[h]				4.64[n]

DATE	TRAVERTINE SPRINGS	BUMP IN FURNACE CREEK WASH	BURIED TILE	INN TUNNEL	TEXAS SPRINGS		TOTAL DIVERSION		TESTS		TOTAL INCL. TESTS
					HOTEL CO.	NPS	HOTEL CO.	NPS	NPS TRENCH	NPS WELL	
1958											
Apr 15	1.86[b]	1.28[b]		.20[b]		4/8 .501 .026[p]		.026[p]	.231[b]		
Apr 30	4/29 1.82	1.327		5/1 .200							
May 16	1.82[b]		(diverted to test trench)						.786[d]		
May 20	1.82[b]	1.26[b]	.407[b]	.20[b]			4.17[q]		.371[b]		4.56[q]
May 26			5/27 .373[b]						.361[b]		
May 27	1.82	1.327	.373	.204		.501	4.20[s]				4.58[t]
Jun 5 Jun 25	1.82	1.283	.373	.20[v] .140		.501 .032[p]	4.09	.032[p]	.34		4.46
Jul 25	1.78	1.283	.266	.095		.501 .033[p]	3.89	.033[p]	.34		4.27
Aug 6-17 Aug 27	1.82	1.283	.361	.085[v] .110	8/26	.501 .014[p]	4.05	.014[p]	.35		4.43
Sep 25	1.86	1.327	.373	.120		.501	4.17		.35		4.53
Oct 21	1.88	1.327	.373	.100		.501	4.16[k]		.35		4.53[k]
Nov. 13	1.88	1.417	.373	.102		.501	4.25[s]				4.63[s]
Nov. 13	1.92[a]	1.42[a]		.10[a]		.47[a]			.35[a]		
Nov. 21-23										.84[b]	
Nov 24	1.92[a]	1.46[a]				.47[a]			.35[a]	.31 to .84[b]	
Dec 9	1.88	1.327	.373	.113		.468	4.14[k]		.36		4.52
1959											
Jan 6	1.86	1.327	.373	.105		.468	4.11[k]				4.49[u]
Jan 29	1.88	1.372	.373	1/28 .110		.501	4.22[k]		.50[e]		4.60[u]
Mar 4	1.86	3/5 1.372	.407	.113		.501	4.23[k]		2/5 .38		4.63
Apr 6				.120							
May 6	1.78	1.33	.38	.12		.50	4.09[k]		.37		4.48
Jun 3	1.82	1.24	.42	.12		.44	4.02[k]				
Jul 9	1.78	1.33	.37	7/8 .22	7/8	.47	4.15[k]				
Aug 6	1.82	1.24	.40	.18		.47	4.09[k]		.46[e]		4.47[u]
Sep 12									of		
Oct 29	1.78	1.65	.42	10/28 .25		.47	4.55[k]				4.57
Nov. 9	1.78[ag] 1.72[ah]	1.65[a]	.43[a]	.26[a]		.40[a] .08[a]	4.46[a]	.08[a]			4.54[a]
Dec 4	1.82	1.28	.43	.26		.47	4.24[k]				4.26
1960											
Jan 12	1.82	1.46	.44	.28	1/11	.47 .012	4.46	.01			4.47

00-00-0000: summary of measurement of water diverson, notes

NOTES

a. Measurement by U. S. Geological Survey.

b. Measurement by National Park Service.

c. Average flow 3 days during Easter week, Tuesday - Friday, March 27-30, 1956, meter read by Spaulding.

d. Includes flow from 6" domestic line (Buried Tile).

e. Value probably too high because of growth of vegetation. Value of 0.36 substituted for arriving at total.

f. Test trench washed full of sand and gravel by flash flood on September 12, 1959. Water previously diverted from test trench into Hotel Company ditch thereafter remained in the underflow of Furnace Creek Wash.

g. Growth of tules in pool above flume, restricted flow and caused erroneous reading.

h. Growth of tules removed.

j. Total using 0.28 for Inn Tunnel.

k. Total using .02 for NPS diversion from Texas Spring.

m. Total using 0.23 for test trench diversion.

n. Total using .02 for NPS at Texas Spring and 0.23 for test trench.

p. Average between meter readings.

q. Total using 0.48 for Hotel Co. diversion at Texas Spring and .02 NPS.

s. Total using .03 for NPS diversion at Texas Spring.

t. Total using .03 for NPS diversion at Texas Spring and 0.35 at test trench.

u. Total using .02 for NPS diversion at Texas Spring and 0.36 at test trench.

v. Value from stage recorder chart.

REFERENCES - - SOURCE OF DATA

1. Pistrang and Kunkel, "A Brief Geologic and Hydrologic Reconnaissance of the Furnace Creek Wash Area, Death Valley National Monument, California," U. S. Geological Survey, Long Beach, 1958 and 1960 editions.

2. List of Borax Company measurements attached to Superintendent Binnewies' memorandum of May 15, 1959 (L54).

3. Summary of measurements by Spaulding and others attached to Regional Chief of Operations' memorandum of June 16, 1958 (L54).

4. Lists of United States Borax and Chemical Corporations' readings and photo copies of recorder charts transmitted with Superintendent Binnewies' memorandum of October 6, 1958 (Alien Water Right, Docket No. 42.)

06-20-1960: letter to acting regional chief concerning ground-water analysis ; june 20, 1960

Copy made for Supplemental Data File, Dockets 34, 56
155
~~Spaulding~~
Whitworth
Mater

UNITED STATES
DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

June 20, 1960

IN REPLY REFER TO:
L 54

Memorandum

To: Acting Regional Chief of Operations

From: Hydraulic Engineer Spaulding, Region Four

Subject: Ground-Water Analysis, Furnace Creek Area, Death Valley NM

At your request I prepared an outline of possible tests to determine the total water available in the Furnace Creek Area. The tests are presented in the body of this memorandum. A supporting analysis together with notes and drawing NMDV 2213 is attached. On the basis of my analysis I concluded that it may be possible to measure the total water passing through the area by two independent methods. One method is to measure the incoming water by an extensive pumping test on the assumption that all water first passes through the synclinal aquifer. The other method is to measure all water being discharged from the area on the assumption that nearly all the water eventually is transpired by vegetation or is evaporated from the floor of the valley. Tests No. 1 and No. 2 outlined below have been devised to determine the quantity of water by these two methods. Two other tests, No. 3 and No. 4 have been added to provide subsidiary data.

FILE COPY

Test No. 1 to determine directly the recharge to the synclinal aquifer. This test would measure the inflow by pumping from the aquifer at a rate high enough to cause lowering of the water table to the degree that all normal discharge from the aquifer ceases. Cessation would occur when the water table dropped below all outlets, some of which may have no surface indication. In effect, removal of a large percentage of water in storage in the aquifer is contemplated by this test.

Test procedure would be to start pumping at a relatively low pumping rate of, say, 1000 gallons per minute and to pump continuously at this rate until the water table stabilizes. The pumping rate would then be increased and continued at a higher rate until the water table again stabilizes. This process would be continued until a pumping rate was reached above which the water table would fail to stabilize. Recharge to the aquifer could be equated to the highest pumping rate at which stabilization could be attained. Relating recharge to climatological factors in order to determine "dry" year discharge may require additional pumping or extended observation of related spring discharge.

It is difficult to predict in advance the rate at which pumping must be done or the length of time required. However, on the assumptions suggested by the attached analysis that recharge to the synclinal aquifer is between the limits of 1 cfs and 10 cfs and that the volume in storage is 35,000 acre feet, pumping at 15 cfs. continuously for 2 to 5 years would be required to reduce aquifer storage by 50 percent (equivalent to drawing down the water table about 30 feet throughout the aquifer). The estimated cost of construction and operation facilities required for this test are:

Construction	Estimated Cost
16 additional wells	$ 64,000
17 pumps with 30 hp electric motors	43,000
8,000 ft 8" to 18" diameter pipe and measuring device	80,000
Generating Plant with two 500 KW generators	120,000
Total	$307,000

Operation (for 2 - 5 years)	Estimated Cost
Operation of Power Plant @ $300 per day (2-1/2 ¢ per Kwhr)	$220,000 - $550,000
Operation and maintenance of pumps and care of water @ $50.00 per day	36,000 - 90,000
Total	$256,000 - $640,000

Total Cost of Test:

$563,000 to $947,000

This test, if successful in measuring the water, might completely disrupt all present water supplies and it appears the test could be of immense cost both in construction and in operation. On the other hand, the magnitude of the test and the effect upon other diversions would be reduced if it proves out that the synclinal aquifer is hydrologically separate or down gradient from Travertine and Texas Springs.

Test No. 2 to determine evapotranspiration from Furnace Creek Fan and Valley Floor. A field investigation would be required to determine transpiration rates of mesquite and other phreatophytes on the Furnace Creek Fan, the evaporation rate from mud flats on the valley floor bordering the Fan and the limits of the area of evapotranspiration to which water passing through the Furnace Creek area contributes. It is suggested that the U. S. Geological Survey provide a plan of investigation designed to produce the following results:

1. Provide transpiration rates for the various phreatophytes on the Furnace Creek Fan with quantitative data on variables such as density of growth, temperature, humidity and depth to water.

2. Provide evaporation rates for open water, mud flats and other areas of evaporation on the valley floor.

3. Provide areal extent of various classes of phreatophytes and surfaces of evaporation within the area supplied by water from the Furnace Creek area.

4. Provide data on the chemical quality of water appearing on the Fan and valley floor with data on the relationship of phreatophytes and water quality.

5. Provide rates of evapotranspiration of each class of vegetation and of bare ground in the developed area of Furnace Creek Ranch and the areal extent of each class.

It is estimated that the cost of such an investigation and report would be from $15,000 to $20,000.

This method, that of calculating evapotranspiration, was used in my analysis presented by the attached map, table and notes to arrive at a very rough estimate of the total water available. In this analysis the Furnace Creek area has been divided into zones according to geologic structure. Evaporation and transpiration from those zones into which all water in the area eventually discharges was calculated. These end results gave data from which water passing through each of the contributing zones could be roughly estimated. The net recharge to the entire area (and the net discharge) has been found by this rough analysis to be 8.1 cubic feet per second. Very rough calculations show a total of 224,000 acre feet of water in storage including poor quality water in the valley floor. It is estimated that the total amount of water available for use may be between 8 and 11 cubic feet per second which quantity could be increased temporarily by pumping from storage. This quantity is more than the net recharge because of the possibility of re-using return water.

Test No. 2 contemplates a refinement of the procedure used in my brief analysis.

Test No. 3 to determine ground-water discharge from Furnace Creek Wash. On the safe assumption that all ground-water leaving Furnace Creek Wash is flowing in the underground channel of the Wash, the quantity may be measured by excavating a trench to bed rock at the mouth of the Wash near Furnace Creek Inn. This would require an excavation 300 feet long and 20 to 40 feet deep. The estimated cost of such a test is $20,000 to $30,000. Trenches located up the Wash probably would be inconclusive in that no proof would be had of water entering in seams between such an upstream trench and the mouth of the Wash. I believe that the amount of water involved is not large and that the test would add only slightly to defining the total water supply.

Test No. 4 to measure the size of aquifers. An accurate determination of the amount of water in storage in the various ground water bodies in the Furnace Creek would require an extensive program of drilling and testing. However, such data probably is not necessary as it may be possible to determine perennial yield using only a rough determination of the quantity in storage.

In outlining the above tests cognizance was taken of the several hypotheses explaining possible sources and routes of water appearing in the Furnace Creek area. I refer to the hypothesis with four variations presented in the Pistrang-Kunkel report which considers precipitation within the tributary drainage area to be the source and to an alternate hypothesis advanced by Charles Hunt suggesting that the origin of the water may be a common source with water appearing at Ash Meadows and the Pahrump Valley.

Lewis S. Spaulding
Hydraulic Engineer

Attachments

LSSpaulding:lq

CLEARED FOR DISTRIBUTION:

T. W. Lewis 6/20/60
Assistant Regional Director Date

Distribution: Director
Chief, WODC
Superintendent, Death Valley

bc: Whitworth

NOTE : This analysis presents a method of determining water quantities even though results shown are not definitive.

DEATH VALLEY NATIONAL MONUMENT
FURNACE CREEK AREA
GROUND WATER ANALYSIS

June 10, 1960 — L. Spaulding

LEGEND
zone — Refer to areas on attached dwg. NMDV 2213
(5.5) — Figure in parenthesis is rough estimate
① — Refers to test required for accurate quantity
a — Lower case letter refers to attached notes

A	B	C	D	E	F	G	H	J	K	L	M	N	P
ZONE	FORMATION	RECHARGE to ZONE		STORAGE in ZONE		DISCHARGE from ZONE						AVAILABLE WATER	
		Source of Recharge	Quantity cfs	Acquifer size, depth, specific yield	Water Volume Acre Feet	SPRINGS TUNNELS SUMPS cfs	Evapotranspiration Vegetation Area & Rate	Q cfs	Ground-water Zone receiving discharge	Q cfs	Total Discharge cfs	perennial good quality cfs	probable limits cfs
I	Travertine Springs Texas Springs lower wash	Ground Water from Zone II from Zone VIII from distant source and/or F.C. Watershed total	(≤5.5) (none) (≤5.5) (5.5) a		negl.	4.5 b		0.5 b	Zone III Zone IV	③ (0.3) g (0.2) g (0.5) c	(5.5)	(5.2) d	5.0 - 5.4
II	Synclinal Aquifer	Ground Water from Furnace Creek watershed from distant source total	① (≤6.3) e (≤6.3) e	(5900) acres (60) ft. deep sp. yield (10%)	④ (35,000)	none		none	Zone I Zone V Zone VI Zone VII	(≤5.5) (none) f (≤0.8) v (none) (≤6.3)	(≤6.3)	(0.3) w	0 - 0.6
III	Furnace Creek Fan South portion	Ground Water from Zone I from zones V & IX from F.C. watershed from distant source total	(0.3) g (1.1) k (1.4) k	3600 acres (100) ft deep sp. yield (10%)	④ (36,000)	none	mesquite n (46 A. @ 5 ft/yr.) other phreatophytes (40 A. @ 2 ft/yr.) ② total	(0.3) h (0.1) h (0.4) h	Zone X	(1.0) j (1.0) j	(1.4)	(0.6) m	0.1 - 1.1
IV	Furnace Creek Fan North portion	Ground water from Zone I from Zone V from F.C. drainage from distant source Return water from Ranch & Inn total	(0.2) g (0.1) k (3.6) n (3.9) k	2000 acres (100) ft deep Sp. yield (10%)	④ (20,000)	none	mesquite & tamerisk (20 acres @ 6 ft/yr) other phreatophytes (20 acres @ 2') Ranch & Inn ② total	(0.2) (0.1) — n (0.3) h	Zone X	(3.6) j (3.6) j	(3.9)	(1.8) p	0 - 2.8
V	Furnace Creek Formation North Extension	Ground water from Zone II and/or VI from other Source z	(0.1) r		negl.	none	negligible	negl.	Zone IV	(0.1) s	(0.1)	(none)	
VI	North Alluvium	Ground Water from Funeral Mts. from distant Source total	(≤0.8) (≤0.8) (0.8) k	(4700) acres (10) ft deep Sp. yield (10%)	④ (5000)	.01 b	negligible	negl.	Zone X	(0.8) j (0.8) j	(0.8)	(0.2) t	0 - 0.4
VII	Nevares Springs Cow Creek	Ground Water from Armagosa Mts. from distant source Return Water NPS Hq. (1.9) k	(1.7) k (0.2) n		negl.	0.7 u	growth at Nevares Spr. (30 acres @ 5') growth at NPS Hq. ②	(0.2) — n (0.2)	Zone X	(1.2) j (1.2) j	(1.9) u	(0.8)	0.7 - 1.0
VIII	Furnace Creek Wash	Ground Water Zones II & IX	negl.		negl.	none	none	none	Zone I	(none)	(none)	none	
IX	Furnace Creek Formation	Rainfall	negl.		negl.	none	none	none	Zones I, III & VIII	none	none	none	
X	Valley Floor	Ground Water from Zone III from Zone IV from Zone VI from Zone VII from other Source total	(1.0) (3.6) (0.8) (1.2) (none) (6.6) x	(6400) acres (200) ft deep Sp. yield (10%)	④ (128,000)	none	(A) mud (1200) A @ .6' (B) water (200) A @ 12' mud (400) A @ .6' (C) water (40) A @ 12' mud (100) A @ .6' (D) water (60) A @ 12' mud (200) A @ .6' ②	(1.0) (3.6) (0.8) (1.2) (6.6)	limits of Zone X Selected so that there is no ground water discharge from the zone	none	(6.6)	none	
	NET or TOTAL	(net)	(8.1) aa		(224,000)	5.2	②	(8.0)	(net)	none	(8.1) x	(8.9) y	8 - 11

06-10-1960: ground_water analysis: June 10, 1960

FURNACE CREEK AREA
GROUND WATER ANALYSIS

NOTES

a. Recharge to Zone 1

Total recharge was determined indirectly by equating to discharge (column M). Source of ground-water flowing into Zone 1 may be (1) Zone II, or (2) Furnace Creek drainage, or (3) a distant source, or (4) a combination of two or more of the first three.

b. Discharge from springs, tunnels and sumps and evapotranspiration are from the Pistrang-Kunkel report of 1958.

c. Ground water discharge from Zone 1 was determined by Spaulding's analysis of effects of NPS test trench upon Inn Tunnel diversion. Inasmuch as the removal by the test trench of 0.35 cfs from the underflow of Furnace Creek resulted in a 2/3 reduction in the Inn tunnel diversion (reduced from a flow of 0.3 cfs to a flow of 0.1 cfs), it follows that the total underflow is in the order of 150% to 200% of the original Inn tunnel diversion or about 0.5 cfs.

d. Available water in Zone 1. Total available water (5.2 cfs) as estimated roughly by Spaulding is equal to spring, tunnel and sump diversion (4.5 cfs) plus 80% of underflow of wash now leaving below the Inn tunnel (0.4 cfs) and 60% of present evapotranspiration loss (0.3 cfs.).

e. Recharge to Zone II. This quantity has been determined indirectly by equating with discharge. Measuring directly probably would require long term pumping at a high rate (Test 1).

f. Ground-water discharge from Zone II into Zone V. Spaulding assumed there is no groundwater discharge into Zone V unless it be flow in deep conduits on the basis that Zone V is an extension of the impermeable Furnace Creek formation.

g. Ground-water recharge to Zones III and IV. Values shown have been estimated on the basis that recharge from Zone 1 spreads uniformly under the fan, 60% to Zone III and 40% to Zone IV.

h. Evapotranspiration from Zones III, IV and X. Rough estimates shown were made on basis of data obtained in telephone conversation with Mr. T. W. Robinson on June 7.

j. Ground-water discharge from Zones III, IV, VI and VII. The values shown were estimated roughly by Spaulding as the quantities flowing into Zone X(A) and X(B), X(C) and X(D) and equal to the evaporation from open water and mud flats. (See Column J, Zone X). Test 2 would be required to produce an accurate figure.

k. Recharge to Zones III, IV, VI, VII and X. Values of total recharge were arrived at indirectly by equating with total discharge (Column M). Quantities from each source were equated to discharge from upgradient zone where known with balance put into recharge from zones where no direct calculation was possible.

m. Available water Zone III. Value shown was estimated as equal to 50% of remaining inflow to Zone III after deducting 0.2 cfs for water collected in Zone 1. This water may not be of quality suitable for domestic use.

n. Evapotranspiration and Returned water Zones IV and VI. To avoid duplication evapotranspiration of water on developed areas at Furnace Creek Ranch and Inn and at Cow Creek has not been included with discharge from the place of use. It was considered that this imported water was consumed before reaching ground-water. However, a portion of the water imported to developed areas was added to recharge as return water.

Consumptive use and return water has been caluclated roughly as follows:

Furnace Creek Ranch and Inn, Zone IV

Total water applied (imported from Zone 1)	4.4 cfs
Less water exported from Zone IV (human use)	0.1
	4.3
Less Consumptive use	
Domestic use - (assume equivalent amount returned to Zone)	--
Evapotranspiration ranch and Inn	
120 acres @ 10 ft per year = 1200 AF =	1.7
Return water	3.6 cfs

Cow Creek Zone VII

Total water applied (imported from Nevares Springs)	0.6 cfs
Less evapotranspiration from developed area	
12 acres @ 10 ft per year = 120 AF =	0.2
Less evaporation of surplus water	0.2
Return water	0.2

p. Available water in Zone IV. The value shown assumes that 50% of the return water from Furnace Creek Ranch could be collected and is of satisfactory quality.

r. Recharge to Zone V. Determined indirectly being equal to total discharge. (Column M).

s. Discharge in Zone V. Value shown was determined indirectly being the remainder of recharge to Zone IV after other sources were allowed for.

t. Water available from Zone VI. Estimated by Spaulding to be 0 to 50% of ground-water passing through the Zone.

u. Spring discharge and total discharge from Zone VII. Spring discharges as measured by Spaulding (See L-54, attachment to Johnson's memo of January 22, 1958 to Director). Two tenths of a cubic foot per second of the spring flow is estimated to be returned to ground water below the Cow Creek development (see Note n). The net total discharge from Zone VII is the spring flow (0.7) less return water (0.2) plus evapotranspiration (0.2) plus ground water discharge (1.2) totaling 1.9 cfs.

v. Discharge from Zone II into Zone VI. Value cannot be greater than quantity of water passing through Zone VI into Zone X(C) where quantity has been roughly calculated by rate of evapotranspiration (See Zone X, Column J.).

w. Water available from Zone II. Very rough estimate by Spaulding being not more than 75% of the water estimated as discharging from Zone II into Zone VI and none of water discharging from Zone II into Zone 1. According to this analysis taking more from Zone II would deduct from Zone 1 with no net gain.

x. Total discharge from Furnace Creek Area. Amount is total of evapotranspiration (8.0 cfs) plus 0.1 cfs exported from the area through human use. This quantity is equal to the total recharge to the area (Column B).

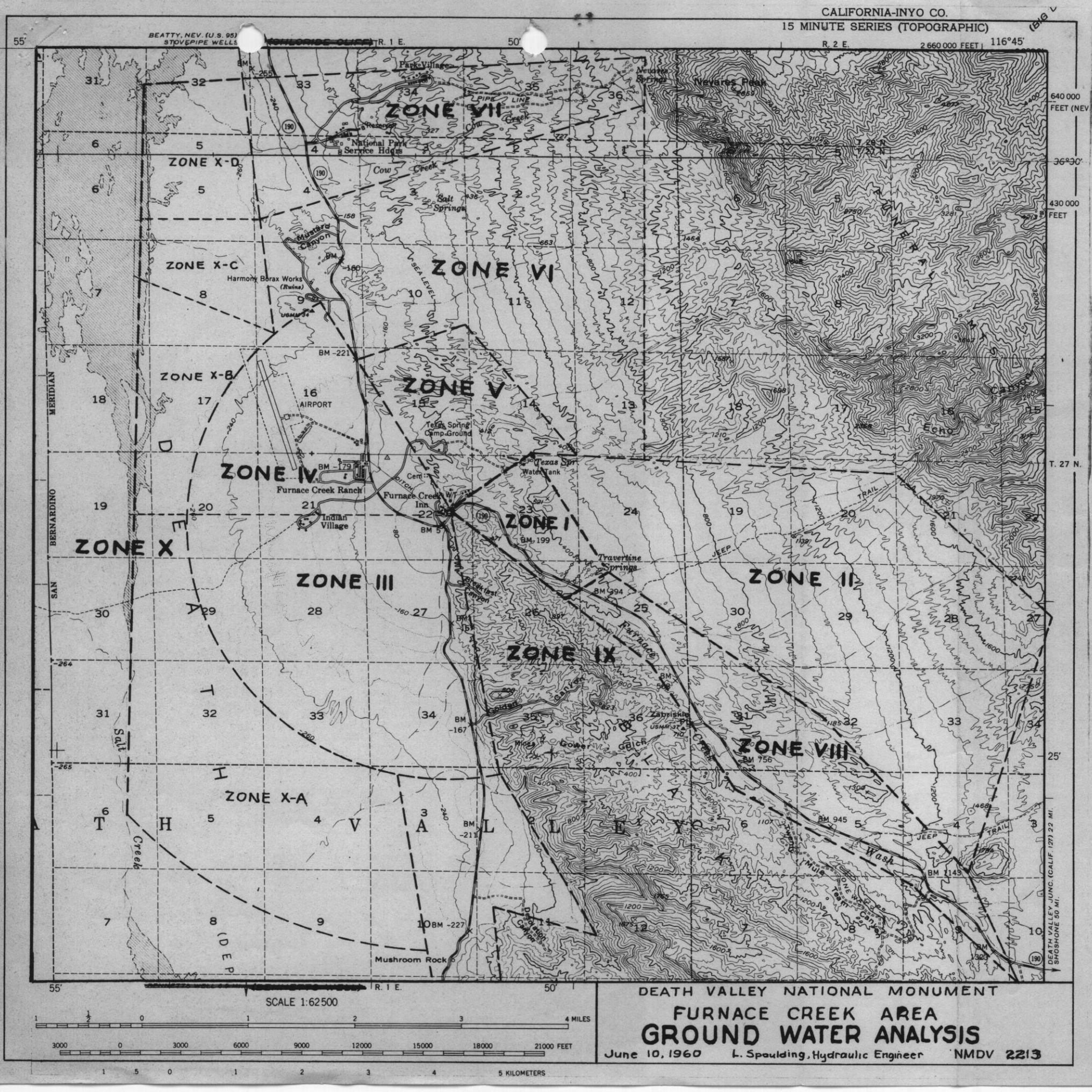
y. Total available water in Furnace Creek Area. Sum of rough calculations shows 8.9 cfs available of which 1.6 cfs is re-used water.

z. Recharge to Zone V. Other sources may be (1) return water from Texas Spring Campground or (2) underground conduits leading from the Furnace Creek watershed or (3) from distant sources.

aa. Total Recharge to Furnace Creek Area. Total is the sum of Recharge to Zone I (5.5) plus recharge to Zone V(0.1) plus recharge to Zone VI (0.8) plus recharge to Zone VII excluding re-use (1.7) giving a total of 8.1 cubic feet per second. This quantity is equal to the total discharge from the area (Column M).

06-10-1960: map on ground water analysis; june 10, 1960

CALIFORNIA-INYO CO.
15 MINUTE SERIES (TOPOGRAPHIC)



SCALE 1:62500

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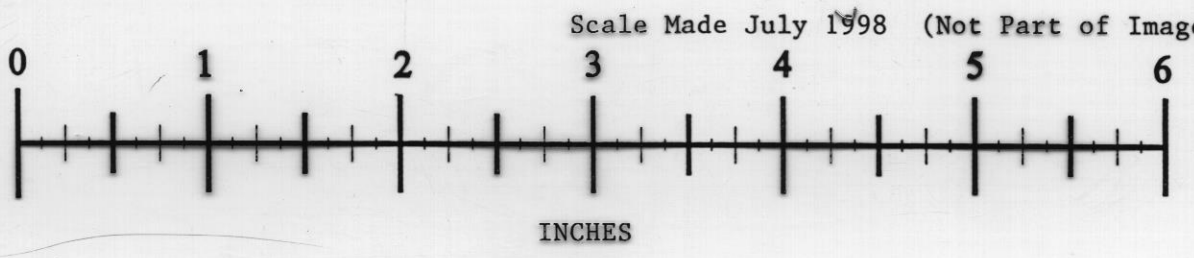
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DEATH VALLEY NATIONAL MONUMENT

FURNACE CREEK AREA
GROUND WATER ANALYSIS

June 10, 1960 L. Spaulding, Hydraulic Engineer NMDV 2213

Scale Made July 1998 (Not Part of Image)



02-25-1960: enclosed are 2 copies of data tables; february 25, 1960

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
Water Resources Division
Ground Water Branch
221 Redondo Avenue
Long Beach 3, California

IN REPLY REFER TO: WR-4 L54 Death Valley

	SURNAME	DATE
SUB. DIR.		
ASST. R.D.		
OPERATIONS		
ADMIN.		
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3/7 LSS Spaulding Whitworth

February 25, 1960

copy of memo made for Supplemental file - WR 3,4,5,6 attachments filed in Docket 3,4,5,6 Supplement

To: G. F. Whitworth, Acting Regional Chief of Operations
National Park Service, Region Four
San Francisco, Calif.

From: Geologist in Charge, U. S. Geological Survey
Ground Water Branch, Long Beach, Calif.

Subject: Furnace Creek Wash area, Death Valley National Monument

Through: H. D. Wilson, Jr.
District Engineer, USGS

Enclosed are two copies of data tables which include all records of spring flow, chemical analyses of water , and data for the Park Service test well. These tables contain all data collected by the Geological Survey and the U. S. Borax and Chemical Corp. through January 12, 1960. These data were collected in accordance with an agreement between the National Park Service and Geological Survey and, in part, duplicate earlier material supplied to the Park Service.

In addition to the above, we are enclosing two copies of the U. S. Geological Survey administrative report entitled "Report on Exploratory Drilling at Death Valley National Monument, Inyo County, Calif.," by Fred Kunkel, 1959. Plate 2 of this report shows the locations of the springs and test wells listed in the tables of data.

Fred Kunkel

Fred Kunkel

FK/lm
cc: H. D. Wilson, Jr., DE, USGS

Region Four
transmitted with Kuckels
memo of 2/25/60
L 54 DEVA

Table 1.--Data on points of ground-water discharge

USGS number: For description of Geological Survey numbering system see section on discharge-point numbering system.

Name: Each point of ground-water discharge inventoried by the Geological Survey is identified and is shown on figure 2.

Type of discharge: P phreatophyte area, no observed surface flow; S seep, flow too small to measure; F flow, measurable amount either from spring or artificial diversion; W well.

Altitude: Except where otherwise noted, the altitudes given are approximate, and are interpolated from Geological Survey topographic maps having an 80-foot contour interval.

Flow: The rate of flow, where measured or estimated, is given in cubic feet per second (cfs). The methods for determining the rate of flow are indicated as follows: Fm Parshall flume; Wr rectangular weir; B bucket and stopwatch; Est estimated by cross-sectional area and velocity of flow using a floating object and stopwatch.

Temperature: The temperatures given are in degress Fahrenheit, measured at the point of discharge.

Table 1.--Data on points of ground-water discharge--Continued

USGS number [1]	Name	Type of discharge	Altitude (feet)	Date measured	Flow (cfs)	Temperature (°F)
T. 27 N., R. 1 E.						
27/1- 3A1	Cow Spring (undeveloped)	F	200	3- 5-57	0.04 Est	81
3B1	Undeveloped spring	P	240	-	-	-
3K1	Salt Spring (undeveloped)	S	100	-	-	-
3P1	do.	F	0	12- 1-56	.01 Est	73
14N1	Undeveloped spring	P	170	-	-	-
14P1	do.	P	240	-	-	-
14Q1	do.	P	400	-	-	-
22H1	USBCC [2] tunnel, Furnace Creek Inn	F	50	3- 1-57	.33 Fm	91½
23B1	Texas Spring (tunnel)	F	380	1-22-57	.50 Wr	91
23B2	Undeveloped spring	P	400	-	-	-
23B3	do.	P	400	-	-	-
23B4	do.	P	400	-	-	-
23F1	do.	F	160	2-28-57	.01 Est	80
23G1	do.	P	400	-	-	-
23G2	do.	P	400	-	-	-
23J1	do.	P	410	-	-	-
23J2	do.	P	410	-	-	-
23K1	do.	S	410	-	-	-
23K2	do.	F	400	-	.01 Est	-
23L1	do.	S	160	-	-	-

Table 1.--Data on points of ground-water discharge--Continued

USGS number 1/	Name	Type of discharge	Altitude (feet)	Date measured	Flow (cfs)	Temperature (°F)
T. 27 N., R. 1 E.--Continued						
27/1-23L2	Undeveloped spring	P	160	-	-	-
23L3	do.	S	160	-	-	-
23P1	NPS well dug in Furnace Creek Wash, depth of well 19.0 feet	W	200	Depth to water, in feet, below land surface		
				11-27-56	15.09	
				2-28-57	15.71	
				3- 7-57	15.57	
				6-19-57	dry at 19 feet	
23Q1	Undeveloped spring	S	320	-	-	-
23Q2	do.	S	320	-	-	-
23Q3	do.	F	320	12-17-56	.01 Est	72
23Q4	do.	S	320	-	-	-
23Q5	do.	S	320	-	-	-
23Q6	do.	S	320	-	-	-
23R1	Travertine Spring	F	400	1-19-57	.68 Wr	92
23R2	Undeveloped spring	P	410	-	-	-
23R3	do.	P	410	-	-	-
24N1	do.	S	400	-	-	-

Table 1.--Data on points of ground-water discharge--Continued

USGS number 1/	Name	Type of discharge	Altitude (feet)	Date measured	Flow (cfs)	Temperature (°F)
T. 27 N., R. 1 E.--Continued						
27/1-25D1	Travertine Spring	F	400			92
25D2	do.	S	400	1-19-57	0.23 Wr	-
26A1	do.	F	330			89
26A2	do.	F	320	12-16-56	.5 Est	91½
26A3	do.	F	320	12-13-56	.001 Est	89
26A4	do.	F	320	12-13-56	.01 Est	94
26A5	do.	F	320	11-28-56		95½
26A6	do.	F	330	11-28-56	.6 Est	94
26A7	do.	F	330	11-28-56		85
26B1	Sump in Furnace Creek Wash, USBCC	F	280	11-28-56	1.26 Wr	92
26B2	Buried tile in Furnace Creek Wash, USBCC	F	250	11-28-56	.45 Wr	-
26B3	Park Service trench	F 3/	250	6-20-56	.24 Fm	-
26B4	Undeveloped spring	S	320	-	-	-
26B5	do.	S	320	-	-	-
T. 28 N., R. 1 E.						
28/1-34M1	Undeveloped spring	P	0	-	-	-
34N1	do.	S	10	12- 1-56	-	73½
34N2	do.	P	80	-	-	-

Table 1.--Data on points of ground-water discharge--Continued

USGS number 1/	Name	Type of discharge	Altitude (feet)	Date measured	Flow (cfs)	Temperature (°F)
T. 28 N., R. 1 E.--Continued						
28/1-34P1	Undeveloped spring	P	100	-	-	-
35E1	do.	P	380	-	-	-
35G1	do.	P	500	-	-	-
35K1	do.	S	520	3- 4-57	-	76
35N1	do.	F	380	3- 5-57	0.01 Est	a78
36G1	Nevares Springs area 1, north part, of Robinson (written communication)	F	b937	12-14-56	.60 Fm	104
36G2	Nevares Springs area 1, point B, of Robinson (written communication)	F	b896	12-14-56	.05 B	102
36K1	Nevares Springs area 2, of Robinson (written communication)	S	b920	12-14-56	-	69
36M1	Nevares Springs area 3, point E, of Robinson (written communication)	F	b720	12-14-56	.07 B	78

Table 1.--Data on points of ground-water discharge--Continued

USGS number 1/	Name	Type of discharge	Altitude (feet)	Date measured	Flow (cfs)	Temperature (°F)
T. 28 N., R. 1 E.--Continued						
28/1-36M2	Nevares Springs area 4, point D, of Robinson (written communication)	F	b745	12-14-56	-	84

1. For locations of discharge points see figure 2. For explanation of numbering system see section on discharge-point numbering system. For index of ground-water discharge points by areas see table 2.

2. U. S. Borax and Chemical Corp.

3. Trench destroyed by flash flood in September 1959.

a. Measurement 10 feet from source.

b. Altitude from Robinson (written communication).

02-25-1960: table 2--geological survey numbers for ground-water discharge points , feburary 25, 1960

Table 2.--Geological Survey numbers for ground-water discharge points by areas

Travertine Springs			
(Diverted into USBCC irrigation system)			
27/1-23R1	27/1-26A1	27/1-26A4	27/1-26A7
25D1	26A2	26A5	
25D2	26A3	26A6	
Undeveloped springs, seeps, and phreatophyte areas in area of Travertine-Texas Springs			
27/1-14N1	27/1-23G1	27/1-23L2	27/1-23Q6
14P1	23G2	23L3	23R2
14Q1	23J1	23Q1	23R3
23B2	23J2	23Q2	24N1
23B3	23K1	23Q3	26B4
23B4	23K2	23Q4	26B5
23F1	23L1	23Q5	
U. S. Borax and Chemical Corp. tunnel (Texas Spring)			
27/1-23B1			
Sump in Furnace Creek Wash			
27/1-26B1			

Table 2.--Geological Survey numbers for ground-water discharge points by areas--Continued

Buried tile in Furnace Creek Wash
27/1-26B2
Furnace Creek Inn tunnel
27/1-22H1
NPS well in Furnace Creek Wash
27/1-23P1
NPS trench in Furnace Creek Wash
27/1-26B3
Nevares Springs
28/1-36G1 28/1-36K1 28/1-36M2
36G2 36M1
Cow Spring
(undeveloped)
27/1-3A1

Table 2.--Geological Survey numbers for ground-water discharge points by areas--Continued

Undeveloped springs, seeps, and phreatophyte areas in area of Cow Creek		
27/1- 3B1	28/1-34N2	28/1-35G1
28/1-34M1	34P1	35K1
34N1	35E1	35N1
Salt Springs (undeveloped)		
27/1-3K1		
3P1		

Table 3.--Periodic measurements of ground-water discharge in the Furnace Creek Wash area

(Discharge in cubic feet per second. Measurements by U. S. Borax and Chemical Corp., except as indicated.)

27/1-23B1. Texas Spring tunnel. Measurement in settling box by 18-inch rectangular weir.

1926a	b0.28	Dec. 31, 1956	c0.48	June 25, 1958	0.50
Jan. 9, 1941	a.38	Jan. 10, 1957	c.48	July 25	.50
Feb. 9, 1956	.50	18	c.48	Aug. 26	.50
23	.50	22	c d.48	27	.50
Mar. 8	.50	26	c.48	Sept. 25	.50
Apr. 29	.50	Feb. 5	c.48	Oct. 21	.50
May 17	.50	6	.50	Nov. 13	.47
June 21	.50	Mar. 1	c d.48	13	d.47
July 1	c.48	21	.50	24	d.47
22	c.48	Apr. 5	c d.47	Dec. 9	.47
Aug. 1	c.48	5	d.50	Jan. 6, 1959	.47
17	c.48	June 4	.50	29	.50
26	c.48	Aug. 22	.50	Mar. 4	.50
Sept. 7	c.48	Sept. 20	.50	May 6	.50
18	c.48	Oct. 23	.50	June 3	.44
28	c.48	Nov. 6	.50	July 8	.47
Oct. 8	c.48	Dec. 5	.50	Aug. 6	.47
18	c.48	Jan. 9, 1958	.50	Oct. 29	.47
Nov. 1	c.48	Feb. 4	.50	Nov. 9	c d.40
20	c.48	Mar. 6	.50	9	d.48
30	c.48	Apr. 6	.50	Dec. 4	.47
Dec. 10	c.48	30	.50	Jan. 11, 1960	.47
20	c.48	May 27	.50		

Table 3.--Periodic measurements of ground-water discharge in the Furnace Creek Wash area--Continued

27/1-22H1. Furnace Creek Inn tunnel. Measurement in tunnel by 6-inch Parshall flume.

Feb. 18, 1957	0.45	Mar. 6, 1958	0.18	Jan. 28, 1959	0.11
Mar. 1	d.33	Apr. 8	.22	Mar. 4	.11
1	.33	30	.20	Apr. 6	.12
21	.28	May 27	.24	May 6	.12
Apr. 5	d.28	June 25	.14	June 3	.12
June 4	.26	July 25	.10	July 8	.22
Aug. 22	.15	Aug. 26	.11	Aug. 6	.18
Sept.20	.15	Sept.25	.12	Oct. 28	.25
Oct. 23	.16	Oct. 21	.10	Nov. 9	d.26
Nov. 6	.17	Nov. 13	.10	Dec. 4	.26
Dec. 5	.18	13	d.10	Jan. 12, 1960	.28
Jan. 9, 1958	.18	Dec. 9	.11		
Feb. 4	.18	Jan. 6, 1959	.10		

Table 3.--Periodic measurements of ground-water discharge in the Furnace Creek Wash area--Continued

27/1-23R1, 25D1, 25D2, and 26A1-7; combined flow. Travertine Springs. Measured below pool by 9-inch Parshall flume.

Apr.	29, 1956	1.88	Jan.	18, 1957	1.86	May	14, 1958	d1.86
May	17	1.88		22	d1.94		27	1.82
June	21	1.88		26	1.86	June	25	1.82
July	1	1.86	Feb.	5	1.86	July	25	1.78
	22	1.86	Mar.	1	d1.90	Aug.	27	1.82
Aug.	1	1.86		1	1.90	Sept.	25	1.86
	17	1.86		21	1.88	Oct.	21	1.88
	26	1.86	Apr.	3	d1.88	Nov.	13	1.88
Sept.	7	1.86	June	4	1.82		13	d1.92
	18	1.86		20	d1.82		24	d1.92
	28	1.86	Aug.	22	1.74	Dec.	9	1.88
Oct.	8	1.86	Sept.	20	1.72	Jan.	6, 1959	1.86
	18	1.86	Oct.	23	1.76		29	1.88
Nov.	1	1.86	Nov.	6	1.76	Mar.	3	1.86
	20	1.86		29	d1.76	May	6	1.78
	28	d1.94	Dec.	5	1.76	June	3	1.82
	30	1.86	Jan.	8, 1958	1.76	July	9	1.78
Dec.	1	d1.94	Feb.	4	1.74	Aug.	6	1.82
	10	1.86	Mar.	6	1.68	Oct.	29	1.78
	12	d1.92	Apr.	8	e1.94	Nov.	9	d f1.78
	20	1.86					9	d g1.72
	31	1.86		29	1.82	Dec.	4	1.82
Jan.	10, 1957	1.86				Jan.	12, 1960	1.82

Table 3.--Periodic measurements of ground-water discharge in the Furnace Creek Wash area--Continued

27/1-26B1. Sump in Furnace Creek Wash. Measurement at outlet of settling box by 18-inch rectangular weir.

Jan. 9, 1941	a0.97	Jan. 15, 1957	d1.26	May 27, 1958	1.33
Apr. 29, 1956	1.20	18	1.20	June 25	1.28
May 17	1.20	26	1.20	July 25	1.28
June 21	1.20	Feb. 5	1.20	Aug. 27	1.27
July 1	1.20	Mar. 1	d1.28	Sept.25	1.33
22	1.20	1	1.28	Oct. 21	1.33
Aug. 17	1.20	21	1.30	Nov. 13	1.42
26	1.20	Apr. 3	d1.30	13	d1.42
Sept. 7	1.20	June 4	1.27	24	d1.46
18	1.20	20	d1.28	Dec. 9	1.33
28	1.20	Aug. 22	1.24	Jan. 6, 1959	1.33
Oct. 8	1.20	Sept. 1	1.30	29	1.37
18	1.20	Oct. 23	1.42	Mar. 5	1.37
Nov. 1	1.20	Nov. 6	1.46	May 6	1.33
20	1.20	29	d1.46	June 3	1.24
28	d1.26	Dec. 5	1.46	July 9	1.33
30	1.20	Jan. 9, 1958	1.46	Aug. 6	1.24
Dec. 10	1.20	Feb. 4	1.42	Oct. 29	1.65
12	d1.26	Mar. 6	1.44	Nov. 9	d1.65
20	1.20	Apr. 8	1.33	Dec. 4	1.28
31	1.20	30	1.33	Jan. 12, 1960	1.46
Jan. 10, 1957	1.20	May 14	d1.28		

02-25-1960: table 3--periodic measurements of ground-water discharge, cont. ; feburary 25, 1960

Table 3.--Periodic measurements of ground-water discharge in the Furnace Creek Wash area--Continued

27/1-26B2. Buried tile in Furnace Creek Wash. Measured at outlet of settling box by 12-inch rectangular weir.

Feb. 23, 1956	0.44	Nov. 30, 1956	0.44	May 27, 1958	0.37
Mar. 8	.44	Dec. 10	.44	June 25	.37
25	.44	20	.44	July 25	.27
Apr. 29	.44	31	.44	Aug. 27	.36
May 17	.44	Jan. 10, 1957	.44	Sept. 25	.37
June 21	.44	18	.44	Oct. 21	.37
July 1	.44	26	.44	Nov. 13	.37
22	.44	Feb. 5	.44	Dec. 9	.37
Aug. 1	.44	Mar. 1	d.43	Jan. 6, 1959	.37
17	.44	21	.44	29	.37
26	.44	June 4	.43	Mar. 5	.41
Sept. 7	.44	Aug. 22	.44	May 6	.38
18	.44	Sept. 20	.44	June 3	.42
28	.44	Oct. 23	.42	July 9	.37
Oct. 8	.44	Dec. 5	.43	Aug. 6	.40
18	.44	Jan. 9, 1958	.45	Oct. 29	.42
Nov. 1	.44	Feb. 4	.45	Nov. 9	d.43
20	.44	Mar. 6	.47	Dec. 4	.43
28	d.45	Apr. 8	.42	Jan. 12, 1960	.44

Table 3.--Periodic measurements of ground-water discharge in the Furnace Creek Wash area--Continued

27/1-26B3. Trench in Furnace Creek Wash. Measured by 3-inch Parshall flume. Trench destroyed by flash flood in September 1959.

June 20, 1957	d0.24	Mar. 6, 1958	0.23	Nov. 13, 1958	d0.35
Aug. 22	.24	Apr. 8	.23	24	d.35
Sept. 20	.22	May 1	(h)	Dec. 9	.36
Oct. 23	.22	27	.36	Jan. 29, 1959	j.50
Nov. 6	.23	June 25	.34	Mar. 5	.38
29	d.23	July 25	.34	May 6	.37
Dec. 5	.23	Aug. 27	.35	Aug. 6	j.46
Jan. 9, 1958	.23	Sept. 25	.35		
Feb. 4	.23	Oct. 21	.35		

27/1-23R1. Travertine Spring

Measurement in ditch near source by 18-inch rectangular weir		Measurement in ditch about $\frac{1}{4}$ mile from source by 18-inch rectangular weir	
Jan. 19, 1957	0.68	Jan. 19, 1957	0.60
Feb. 26	.60	Feb. 26	.59
Mar. 7	.64	Mar. 7	.59
Apr. 3	.60	Apr. 3	.57
June 20	weir destroyed	June 20	.53

Table 3.--Periodic measurements of ground-water discharge in the Furnace Creek Wash area--Continued

27/1-25D1 and 26A1. Travertine Springs

Measurement in ditch above area of dense phreatophyte growth by 90° V-notch weir		Measurement in ditch below area of dense phreatophyte growth by 90° V-notch weir	
Jan. 19, 1957	0.23	Jan. 19, 1957	0.23
Feb. 26	.23	Feb. 26	.23
Mar. 7	.23	Mar. 7	.23
Apr. 3	.22	Apr. 3	.22
June 20	.23	June 20	.23

28/1-36G1. Nevares Spring

Measurement in ditch near source by 3-inch Parshall flume		Measurement in ditch about 0.2 mile downstream from source; point A of Robinson (written communication) 1/	
Nov. 28, 1956	.60	Oct. 15, 1951	.526
30	.61	17	.526
Dec. 14	.59	19	.526
Jan. 21, 1957	.60	Nov. 30, 1956	.47
		Dec. 1	.47
		14	.47

1. Measurements for 1951 by 12-inch rectangular weir by Robinson (written communication). Measurements for 1956 by 3-inch Parshall flume. Apparent change in discharge may be due to change in measuring device.

Table 3.--Periodic measurements of ground-water discharge in the Furnace Creek Wash area--Continued

a. Estimated by National Park Service.

b. Discharge from Texas Spring prior to construction of tunnel.

c. Does not include Park Service diversion to campground.

d. Measurement by Geological Survey.

e. Spring cleaned out.

f. Growth of "tules" in pool above flume.

g. Growth of "tules" removed.

h. Trench enlarged.

j. Value probably too high owing to growth of vegetation.

02-25-1960: table 4--total estimated rate of ground-water discharge in 1956-57 ; feburary 25, 1960

Table 4.--Total estimated rate of ground-water discharge in 1956-57 in the Furnace Creek Wash area

(All values from table 3, except as indicated)

Name or general location of discharge point	Flow (cubic feet per second)
Furnace Creek drainage area	
Travertine Springs diverted to USBCC irrigation system: (27/1-23R1, 25D1, 25D2, 26A1, 26A2, 27/1-26A3, 26A4, 26A5, 26A6, 26A7)	1.9
Texas Spring tunnel 27/1-23B1	.5
Undeveloped springs, seeps, or phreatophyte areas (estimated)	.1
Evapotranspiration above points of measurement (estimated)	.5
Sump 27/1-26B1 in Furnace Creek Wash	1.3
Buried tile 27/1-26B2 in Furnace Creek Wash	.4
Furnace Creek Inn tunnel 27/1-22H1	.3
NPS well 27/1-23P1 in Furnace Creek Wash	0
Underflow to Death Valley	Unknown
Total flow, Furnace Creek drainage area, excluding underflow	5.0

Table 4.--Total estimated rate of ground-water discharge in 1956-57 in the Furnace Creek Wash area--Continued

Name or general location of discharge point	Flow (cubic feet per second)
Cow Creek drainage area	
Nevares Spring, 28/1-36G1	0.6
Cow Spring and other undeveloped springs	a.1
Underflow to Death Valley	Unknown
Total flow, Cow Creek drainage area, excluding underflow	.6
Combined flow, Furnace Creek and Cow Creek drainage areas, excluding unknown underflow to Death Valley	5.6

a. This is believed to be reemergent water from Nevares Spring and is not included in total.

Table 5.--Chemical analyses of spring waters in the Furnace Creek Wash area

Constituents: Constituents are in parts per million. All values are rounded to conform to the standards of the Geological Survey, Quality of Water Branch. Values preceded by the letter a were calculated by the Ground Water Branch and are approximate.

Dissolved solids: Residue on evaporation, analytically determined.

Sum of determined constituents: Arithmetic total, in parts per million, of all constituents determined, except for bicarbonate which is divided by 2.03 to obtain the carbonate equivalent.

Source of data: DPH, California Department of Public Health; DWR, California Department of Water Resources; NPS, U. S. National Park Service; USGS, U. S. Geological Survey, Quality of Water Branch.

Temperature: The temperature of the water is at the point of collection, in degrees Fahrenheit. For the temperature of the water at the point of discharge, see table 1.

00-00-0000: table 5--chemical anaysis of spring waters, cont.; 1955

Table 5.--Chemical analyses of spring waters in the Furnace Creek Wash area--Continued

USGS number	27/1-3A1	27/1-3K1
Date collected	4-8-55	12-1-56
Silica (SiO_2)	-	-
Iron (Fe)	-	-
Calcium (Ca)	45	-
Magnesium (Mg)	20	-
Sodium (Na)	146	-
Potassium (K)	10	-
Lithium (Li)	-	-
Bicarbonate (HCO_3)	345	-
Carbonate (CO_3)	0	-
Sulfate (SO_4)	178	-
Chloride (Cl)	37	180
Fluoride (F)	2.0	3.6
Nitrate (NO_3)	1.9	-
Boron (B)	.61	11
Dissolved solids	603	-
Sum of determined constituents	611	-
Hardness as $CaCO_3$	a195	46
Percent sodium (% Na)	60	-
Specific conductance (micromhos at 25°C)	702	2,360
pH	8.3	-
Temperature (°F)	100	-
Source of data	DWR	USGS
Lab./Field No.	P631-311	21083

Table 5.--Chemical analyses of spring waters in the Furnace Creek Wash area--Continued

USGS number	27/1-3P1	27/1-22H1	27/1-23B1		
Date collected	12-1-56	4-5-57	11-27-53	4-11-56	4-5-57
SiO_2	-	26	-	-	25
Fe	-	-	-	-	-
Ca	-	40	36	35	35
Mg	-	22	21	18	20
Na	-	180	160	154	155
K	-	13	11	12	12
Li	-	-	-	-	-
HCO_3	-	378	310	342	348
CO_3	-	0	17	-	0
SO_4	-	208	166	156	160
Cl	22,200	50	54	35	43
F	11	2.5	4.0	3.7	2.0
NO_3	-	0	0	1.9	0
B	327	1.6	1.0	.88	1.0
Dissolved solids	-	810	634	607	716
Sum	-	a729	623	584	a599
Hardness	214	a190	a176	a162	a170
% Na	-	a65	a65	65	a65
Micromhos	56,800	1,140	1,000	953	1,010
pH	-	7.6	8.5	7.8	7.9
°F	73	91½	-	87	91
Source of data	USGS	DWR	DWR	DWR	DWR
Lab./Field No.	21084	T369-2171	S206-3767	R1125-3696	T370-2122

Table 5.--Chemical analyses of spring waters in the Furnace Creek Wash area--Continued

USGS number	27/1-23R1, 25D1-2, 26A1-7		27/1-25D1	27/1-26B1
Date collected	4-22-54	4-11-56	3-25-54	4-11-56
SiO_2	-	-	43	-
Fe	-	-	-	-
Ca	38	36	26	40
Mg	20	19	22	20
Na	150	159	145	160
K	14	12	11	12
Li	-	-	.13	-
HCO_3	354	351	321	363
CO_3	0	0	-	0
SO_4	165	169	158	179
Cl	40	37	39	41
F	4.0	4.0	3.0	4.0
NO_3	1.0	3.7	0	2.9
B	.86	.88	0	1.5
Dissolved solids	593	616	-	644
Sum	606	613	605	639
Hardness	a177	a168	a155	a182
% Na	a63	65	a65	64
Micromhos	966	968	949	1,020
pH	8.1	7.7	8.0	7.5
°F	90	88	90	80
Source of data	DWR	DWR	USGS	DWR
Lab./Field No.	4226-2718	R1125-3697	-	R1126-3698

Table 5.--Chemical analyses of spring waters in the Furnace Creek Wash area--Continued

USGS number	28/1-34N1	28/1-36G1		28/1-36K1	Test well
Date collected	12-1-56	11-30-53	11-29-56	3-3-57	11-24-58
SiO_2	-	-	-	-	-
Fe	-	-	-	-	-
Ca	52	38	42	30	32
Mg	38	32	22	43	23
Na	253	250	138	408	140
K	16	15	12	30	11
Li	-	-	-	-	-
HCO_3	455	403	317	575	322
CO_3	0	10	0	0	0
SO_4	a352	307	173	a535	a157
Cl	74	77	34	101	40
F	4.4	4.0	2.9	2.0	1.0
NO_3	-	0	1.8	-	-
B	1.3	1.1	1.2	1.7	1.0
Dissolved solids	-	938	625	-	-
Sum	a1,010	932	583	a1,430	a569
Hardness	284	a227	192	250	176
% Na	64	a69	a59	75	62
Micromhos	1,580	1,420	-	2,120	955
pH	7.7	8.2	7.9	7.7	8.1
°F	74	-	104	69	97
Source of data	USGS	DWR	DPH	USGS	USGS
Lab./Field No.	21082	S194-3764	4449	21836	28599

Furnace Creek test well. National Park Service. Altitude about 580 ft. Cable-tool well drilled and gravel packed by Roscoe Moss Drilling Co. in November 1958. 14-inch casing, perforated with hydraulic perforator from 100 to 240 ft. Log by U. S. Geological Survey.

	Thickness (feet)	Depth (feet)
Pleistocene:		
Alluvium:		
Clay, silt, sand, and gravel. The gravel is up to 1 inch in diameter. Materials are quartzite, marble, and other metamorphic rocks derived from Funeral Range -------	50	50
Same material, somewhat cemented (harder drilling) ----------	20	70
Same material, finer (clay to gravel $\frac{1}{4}$ inch in diameter) much easier drilling ----------	45	115
Same material, particles up to 3/4-inch diameter. Fairly easy drilling (5 ft/hr) ----------	10	125
Same material, better sorted; majority of particles in 1/8-1/4 inch range. Drilling somewhat harder----------	30	155

Furnace Creek test well.--Continued

	Thickness (feet)	Depth (feet)
Pleistocene:--Continued		
Alluvium:--Continued		
Same material, particles up to 3/4-inch diameter	15	170
Same material, drilling somewhat harder	20	190
Fanglomerate:		
Clay, silt, sand, and gravel; trace of calcite "onyx" cementing material	20	210
Same material, gravel somewhat finer (1/8-1/4 inch range) larger proportion of rounded particles; calcite cement	5	215
Gravel, as above; abundance of calcite "onyx" cementing material. Harder drilling	15	230
Pliocene and Pleistocene(?):		
Lacustrine deposits:		
Gravel, somewhat finer (1/8-1/4 inch range) larger proportion of rounded particles; less "onyx." Abundant clay (brown). Easier drilling	15	245
Abundant clay; gravel as above, mostly cavings	5	250

The well was developed by surging and pumping on November 20, 1958, and the water level allowed to recover for a period of 8½ hours before test pumping was begun on November 21. Pumping was resumed at a rate of about 390 gpm (gallons per minute) with a resulting drawdown of 102 feet after a period of 72 hours. A summary of the drawdown and the subsequent recovery is given in the following table.

Date	Time (hour)	Pumping rate[1] (gpm)	Water level[2] (feet)	Drawdown (feet)	Specific capacity[3]
1958					
Nov. 20	7:50 a.m.	0	74.51	-	-
21	7:30 a.m.	0	74.61	-	-
24	8:00 a.m.	393	177	102	3.9
	8:25	351	172	97	3.6
	8:55	357	166	91	3.9
	9:10	320	142	67	4.8
	10:00	320	142	67	4.8
	10:05	250	121	46	5.4
	11:00	257	115	40	6.4
	11:15	205	101	26	7.9
	11:50	205	100	25	8.2
	12:10 p.m.	140	90	15	9.3
	12:25	140	90	15	9.3
	12:34:00	Pump off	-	-	-
	12:34:30		82		
	12:34:40		77		
	12:34:40		76.90		
	12:34:50		75		

Date	Time (hour)	Pumping rate[1] (gpm)	Water level[2] (feet)	Drawdown (feet)	Specific capacity[3]
1958					
Nov. 24	12:38:00 p.m.		75.88		
	12:40:00		75.64		
	12:50:00		75.56		
	1:05:00		75.52		
	3:15		75:38		
25	9:35 a.m.		75.10		
1959					
Nov. 8			75.18		

1. Pumping rates were measured with a pipe orifice using calibrations made by Purdue University for Layne and Bowler, Inc.

2. Water-level measurements in tenths and hundredths of a foot were made by steel tape and are below land-surface datum. Measurements in whole feet were made by air line.

3. Specific capacity is the yield of the well in gallons per minute per foot of drawdown of water level below the static or nonpumping level.

04-27-1961: water meter readings ; april 27, 1961

Two Inch Meter (PCB) on Line Texas Spring To Texas Spring Campground

Date	Time	Time Interval	Meter Reading (Gallons)	Amount Used (Gallons)	Rate of USE GPM	*No. Persons Cmpg T.S.C/gd
1/31	8:40A		29124800			
		1440		30000	20.83	
2/1	8:40A		29154800			163
		1445		30000	20.76	
/2	8:45A		29184800			160
		1445		29400	20.35	
/3	8:50A		29214200			141
		1425		28900	20.28	
/4	8:35A		29243100			211
		1425		30000	21.05	
/5	8:20A		29273100			301
		1445		30800	21.31	
/6	8:25A		29303900			195
		1440		29700	20.62	
/7	8:25A		29333600			163
		1455		31100	21.37	
/8	8:40A		29364700			163
		1445		31700	21.94	
/9	8:45A		29396400			224
		1415		30900	21.84	
/10	8:20A		29427300			243
		1470		33000	22.45	
/11	8:50A		29460300			384
		1420		33200	23.38	
/12	8:30A		29493500			659
		1445		34000	23.53	
/13	8:35A		29527500			269
		1435		31100	21.67	
/14	8:30A		29558600			246

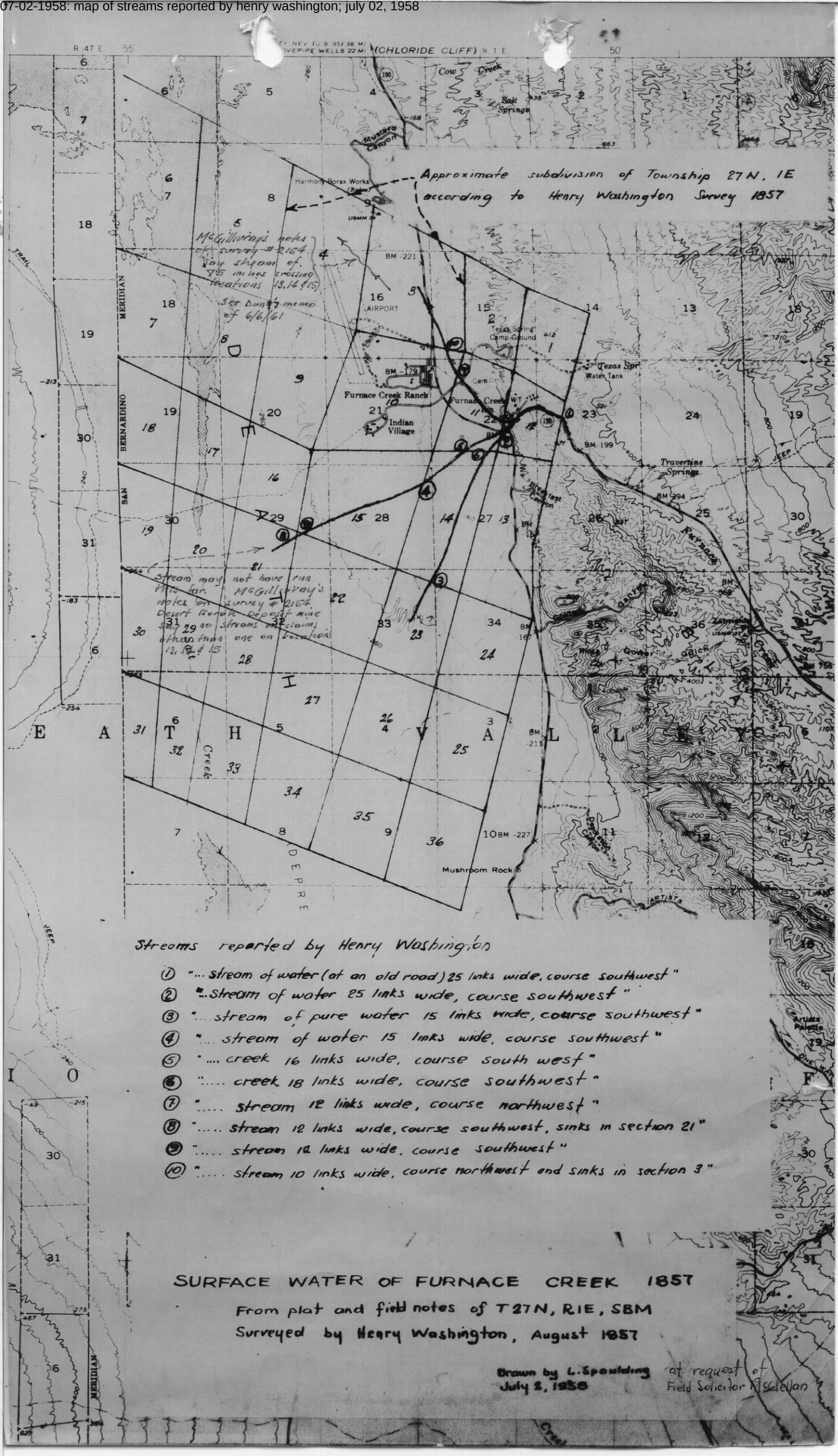
08 MAPMISC

Death Valley National Park

FURNACE CREEK AREA AND TEXAS SPRING - COMMON PAPERS

Maps and Miscellaneous Information

07-02-1958: map of streams reported by henry washington; july 02, 1958



Streams reported by Henry Washington

① "... Stream of water (at an old road) 25 links wide, course southwest"
② "... Stream of water 25 links wide, course southwest"
③ "... stream of pure water 15 links wide, course southwest"
④ "... stream of water 15 links wide, course southwest"
⑤ "... creek 16 links wide, course south west"
⑥ "..... creek 18 links wide, course southwest"
⑦ "..... stream 12 links wide, course northwest"
⑧ "..... stream 12 links wide, course southwest, sinks in section 21"
⑨ "..... stream 12 links wide, course southwest"
⑩ "..... stream 10 links wide, course northwest and sinks in section 3"

SURFACE WATER OF FURNACE CREEK 1857

From plat and field notes of T 27 N, R 1E, SBM
Surveyed by Henry Washington, August 1857

Drawn by L. Spaulding July 2, 1958 at request of Field Solicitor McClellan

Reduce this to exactly 6 inches

Instructions for photographic reduction

Reduce area within exterior grid lines to exactly 4 inches by 6 inches. This is a 1/5 scale reduction. Each of 6 sheets to be reduced.

2nd Scale Requested June 11, 1958 make area within grid lines 8" x 12"

Reduce to exactly 4 inches

E 2,630,000 E 2,631,000 E 2,632,000 E 2,633,000 E 2,634,000 E 2,635,000

N 419,000 N 418,000 N 417,000 N 416,000

DRY WASH

ES-33 44.38

ES-25 5044

ES-26 408.35 Flat Top Hill

C6-25 130.64

T27N R1E

Texas Spring Camp Ground

Comfort Station

Jeep Trail

Trail

Power Line

Pipeline

BRUSH

SCATTERED BRUSH

MATCH SHEET VI

MATCH SHEET III

MATCH SHEET II

REVISIONS

1°16'58"

200 0 200 400 600FT

UNITED STATES
DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
PREPARED BY
WODC
REGION FOUR

DRAWING NO NM DV-3115
TOPOGRAPHIC SHEET I OF

FURNACE CREEK AREA
DEATH VALLEY NATIONAL MONUMENT

Scale Made July 1998 (Not Part of Image)

0 1 2 3 4 5 6

6-11-1958; topographical map; June 11, 1958

CC-0000-0000: topographical map

E2,630,000 E2,631,000 E2,632,000 MATCH SHEET I E2,633,000 E2,634,000 E2,635,000

N415,000 N414,000 N413,000 N412,000

MATCH SHEET VI

MATCH SHEET III

MATCH SHEET VII

FURNACE CREEK INN

ES-40 252.70

ES-23 51.43

ES-42 42.53

ES-39 175.03

CULTIVATED

Trail

Pipeline

Cabins

BRUSH

SEC 24 T9N R6E
SEC 19 T9N R7E

190

UNITED STATES
DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
PREPARED BY
WODC
REGION FOUR

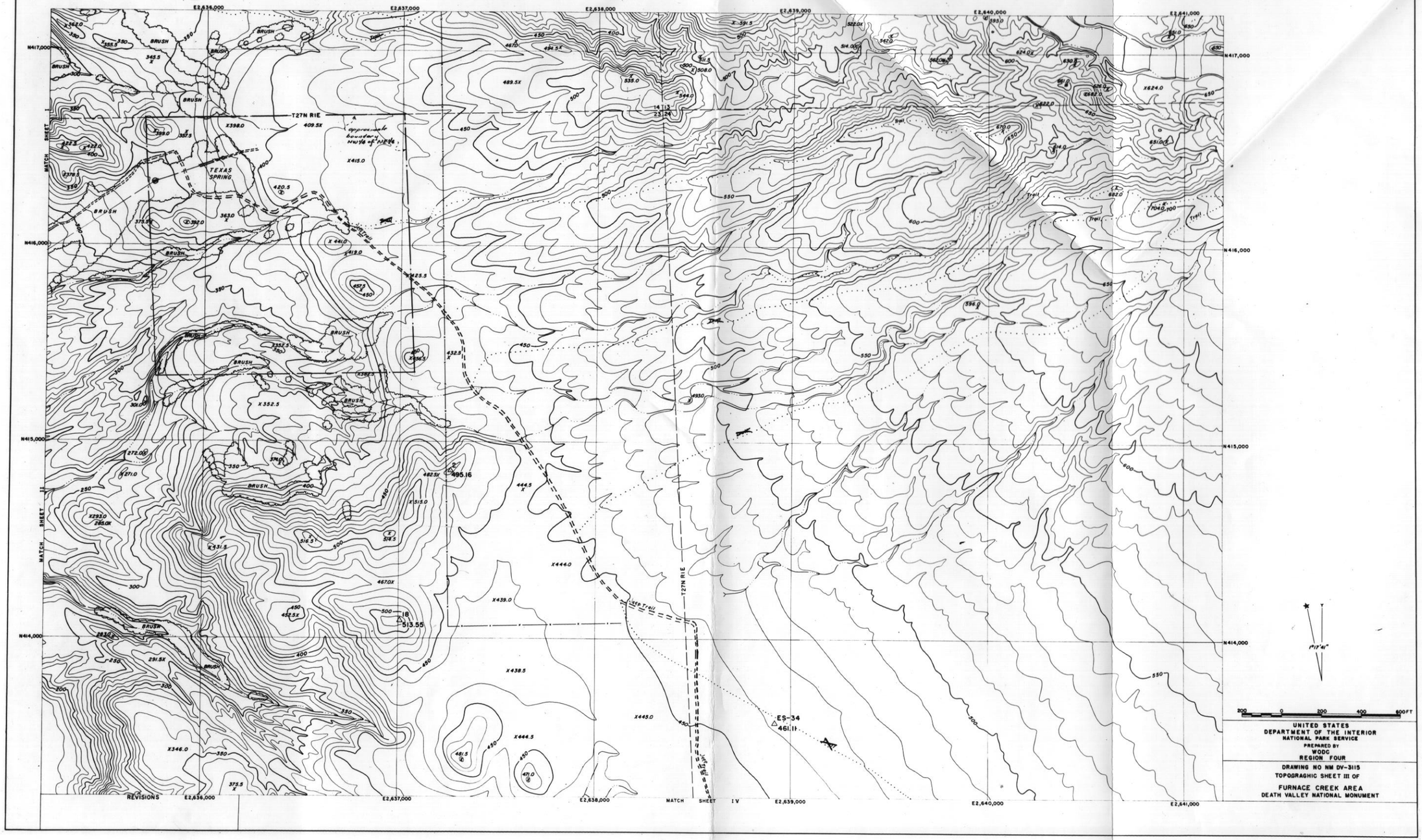
DRAWING NO NM DV-3115
TOPOGRAPHIC SHEET II OF

FURNACE CREEK AREA
DEATH VALLEY NATIONAL MONUMENT

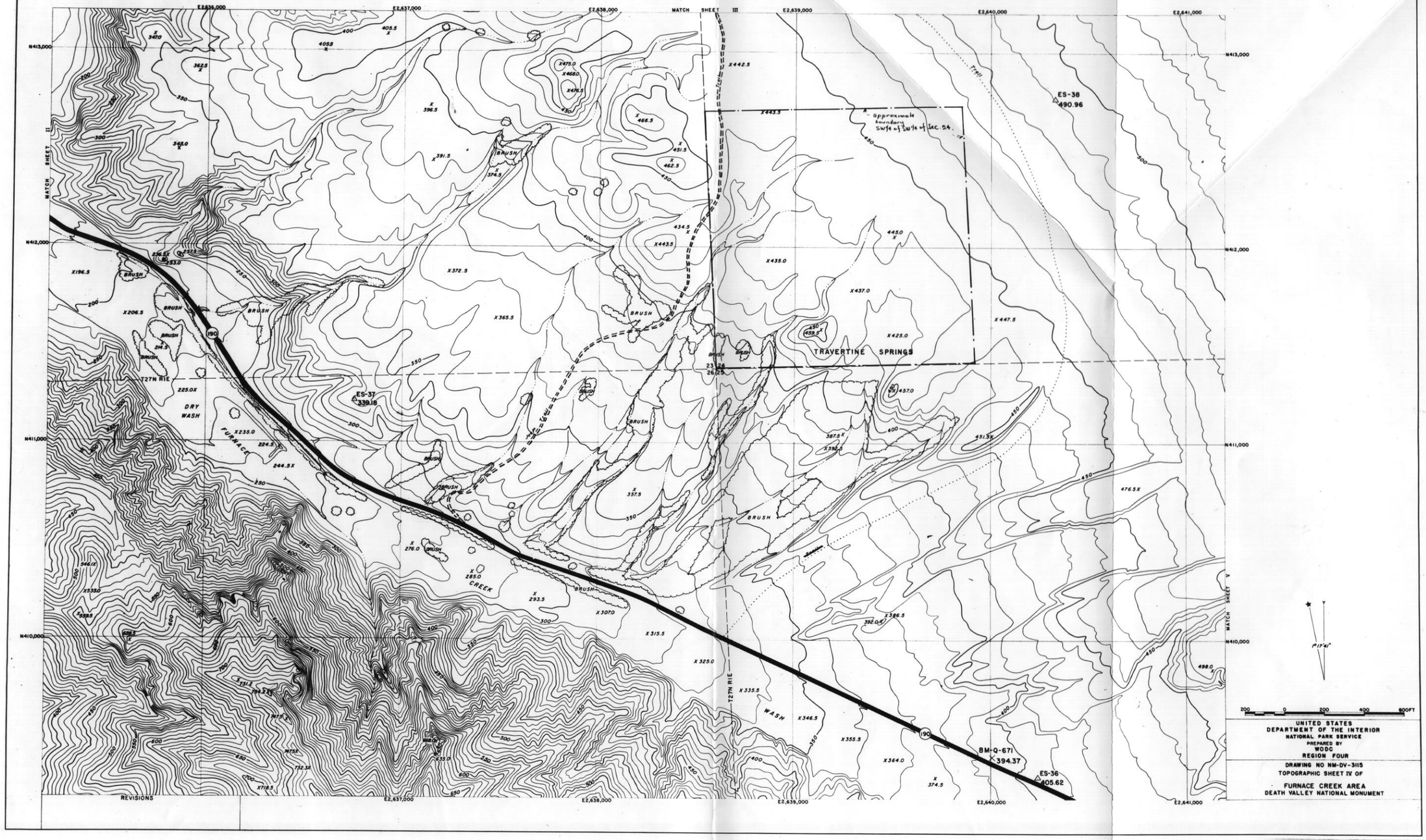
200 0 200 400 800FT

REVISIONS

CC-0000-0000: topographical map



3 3


E2,636,000
E2,637,000
E2,638,000
E2,639,000
E2,640,000
E2,641,000
N413,000
N412,000
N411,000
N410,000
MATCH SHEET II
MATCH SHEET III
MATCH SHEET V
ES-38
490.96
approximate boundary SW¼ of SW¼ of Sec. 24
TRAVERTINE SPRINGS
ES-37
339.18
ES-36
405.62
BM-Q-671
394.37
T27N R1E
T27N R1E
DRY WASH
FURNACE CREEK
WASH
BRUSH
REVISIONS
UNITED STATES
DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
PREPARED BY
WODC
REGION FOUR
DRAWING NO NM-DV-3115
TOPOGRAPHIC SHEET IV OF
FURNACE CREEK AREA
DEATH VALLEY NATIONAL MONUMENT
200 0 200 400 800FT

CC-0000-0000: topographical map

E2,642,000 E2,643,000 E2,644,000 E2,645,000 E2,646,000 E2,647,000

N411,000 N410,000 N409,000 N408,000

ES-41
559.76

ES-35
593.71

593.71X

MATCH SHEET IV

FURNACE CREEK WASH

REVISIONS

N 411,000 N 410,000 N 409,000 N 408,000

1° 18' 24"

200 0 200 400 800FT

UNITED STATES
DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

PREPARED BY
WODC
REGION FOUR

DRAWING NO NM-DV-3115
TOPOGRAPHIC SHEET V OF

FURNACE CREEK AREA
DEATH VALLEY NATIONAL MONUMENT

CC-0. Unknown author. 0000-0000: topographical map with furnace creek ranch

FURNACE CREEK RANCH

TRAILER PARK

INDIAN VILLAGE

ES-24 △ -144.23

ES-31 △ 193.53

ES-32 △ -134.88

SEC 21 T 27N R 11E
SEC 22 T 27N R 11E

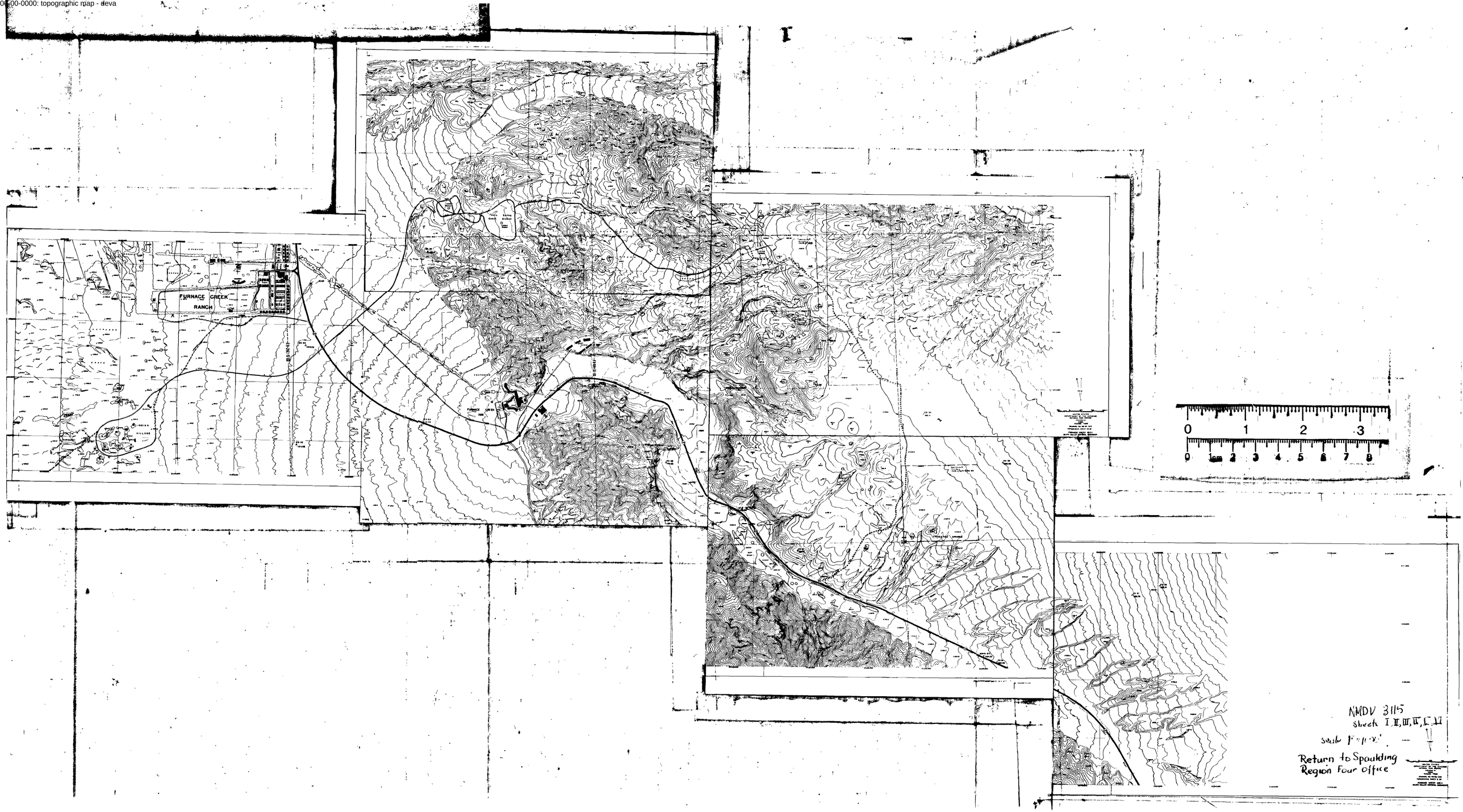
UNITED STATES
DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
PREPARED BY
WODC
REGION FOUR

DRAWING NO NM-DV-3115
TOPOGRAPHIC SHEET VI OF

FURNACE CREEK AREA
DEATH VALLEY NATIONAL MONUMENT

REVISIONS


00-00-0000: topographic map - deva



NMDV 3115
sheets I, II, III, IV, V, VI
scale 1" = 1 mi.

Return to Spaulding
Region Four office

00-00-0000: diagram of furnace creek airport site



DEATH VALLEY HOTEL COMPANY

DESERT BORATE DEPOSIT MINE

Patent 11541 18f

CD 61 CD 62 CD 60

U.S. Deeded 1958

APPROXIMATE BOUNDARY

Museum Site

DEATH VALLEY HOTEL COMPANY
2 Sec 15 Patent 5505 1884
2 Sec 15 Patent 5722 1885
E¼ Sec 21 Patent 588 1907

GOLF COURSE

DATE ORCHARD

RUNWAY

DIKE

N 418,000

N 416,000

N 414,000

FURNACE CREEK WASH

Easement "S" Sewer line

Easement "A" Ditch
Easement "C" Pipeline
Easement "S" Sewer

Easement "F" Power Line

Easement "D" 6" Pipeline

Point of Diversion
Neuschwander or Coleman
County Water Right Filings

DEATH VALLEY HOTEL COMPANY
FURNACE CREEK INN TRACT
Patent 1003913 1927

Tunnel

FURNACE CREEK INN

Point of Diversion
Robertson & Coleman
County Water Right
Fisling.

Reservoir

TEXAS SPRING CAMP GROUND

Point of Diversion
U.S. Water Right Application No. 10,119

TUNNEL

TEXAS SPRING

JEEP TRAIL

DEATH VALLE
HOTEL COMPANY
Patent 589 and/or 1300 1907

Abandoned NPS Residential and Utility Area Site

Test Wells

Easement "A" 12" Pipeline
Easement "B" Overflow Ditch
Easement "E" 6" Pipeline

DEATH VALLEY
HOTEL COMPANY
Patent 587 1907

TRAVERTINE SPRINGS

Easement "X" Alternate Pipeline

TEST WELL

Point of Diversion
U.S. Water Right Applications
Nos. 10,001, 10,002, 10,018

NPS Test Trench
Buried Tile DV Hotel Co
Sump DV Hotel Co

Easement "B" Pipelines and Ditches

ES-24 ES-25 ES-28 ES-31 ES-32 ES-33 ES-34 ES-37 ES-39 ES-40 ES-42

E 2,628,000 E 2,632,000 E 2,634,000 E 2,636,000 E 2,640,000

N 410,000

APPROPRIATIVE WATER RIGHTS

APPLICATION	PERMIT	LICENSE	SOURCE	QUANTITY	APPROPRIATOR	PRESENT OWNER	DATE OF PRIORITY
Vol. C. Page 369		Inyo County	Texas Spring	300 MI	R.Neuschwander	DV Hotel Co.	March 11, 1882
Vol. C. Page 370		Inyo County	Furnace Creek	500 MI	W.B. Robertson	" " "	March 11, 1882
Vol. E Page 160		Inyo County	Furnace Creek	500 MI	Wm. T. Coleman	" " "	May 13, 1885
Vol. E Page 161		Inyo County	Texas Spring	300 MI	Wm. T. Coleman	" " "	May 13, 1885
10,001	5738		Furnace Creek	1.00 cfs	United States	United States	Sept. 13, 1940
10,002	5739		" "	0.50 cfs	" "	" "	Sept. 13, 1940
10,118	5754		" "	0.85 cfs	" "	" "	Feb. 17, 1941
10,119	5755		Texas Spring	0.078 cfs	" "	" "	Feb. 17, 1941

IRRIGATED LANDS OF DEATH VALLEY HOTEL COMPANY

Lands at Furnace Creek Ranch and Furnace Creek Inn under irrigation during 1957 as indicated by aerial photography taken in November 1957.

Symbol	Vegetation	Total Area Acres	Density Percent	Area Reduced to 100% Density Ranch, acres	Inn, acres
	Date Palm Groves	85.96	100	85.96	-
	Golf Course - Bermuda Grass	36.29	100	36.29	-
	Pasture - Grass	17.16	100	7.16	-
	Tamarisk - Groves	14.66	50-75	9.66	-
	Tamarisk - Rows	8.97	100	8.47	0.50
	Tamarisk and/or Mesquite Scattered	-	Varies	15.83	0.30
	Inn Gardens, Palms, Grass, Oleander	2.41	100	-	2.41
	Field Crops, Alfalfa, Corn	4.09	100	4.09	-
	Ponds	3.41	100	1.41	2.00
			Total	174.29	2.11

Total Area of Furnace Creek Ranch Tract south of the airport road .... 180.7 Acres

BASIC DATA: - REDUCTION OF DWG. No. NM-DV 3115
- ENLARGEMENT OF AERIAL PHOTOS BY ENGINEERING SERVICE
- DRAWING No. NM-DV 6967
- CALIFORNIA STATEWIDE GRID ZONE IV
- PISTRANG - KUNKLE REPORT 1958
Drawn by A. La Riviere

LEGEND

Key Color
Brown — Property Lines - Approximate
Tract Lines
Orange — ℄ Of Easements - Approximate granted to Borax Consolidated, Limited 1955
Section Lines - Approximate
Subdivision Lines - Approximate
Public Water Reserve - Approximate as established 1913
Green — Portion of Public Water Reserve Restored to Entry by Executive Order of Feb. 21, 1927
Tracts desired by Death Valley Hotel Company in exchange for tracts F, G & H

PR2 Phreatophyte area, no observed surface flow
KI Seeps, flow too small to measure
PR Springs with measurable amount of flow

Spring numbers as assigned by USGS
Letter after discharge point indicates position in section thus:

D	C	B	A
E	F	G	H
M	L	K	J
N	P	Q	R

0 1 2 3
0 1cm 2 3 4 5 6 7 8

0' 500' 1000' 1500' 2000'
SCALE IN FEET
CONTOUR INTERVAL 10' & 50'

N

WATER RESOURCES
FURNACE CREEK AREA
DRAWING No. NM-DV 7100
DEATH VALLEY NATIONAL MONUMENT

UNITED STATES
DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
PREPARED BY
ENGINEERING BRANCH
REGION FOUR
JUNE 1958

00-00-0000: furnace creek area - water measurements

T.27N., R.1E., S.B.M.

FURNACE CREEK RANCH

HOTEL

SITE

TEXAS SPRINGS

WARM SPRINGS

P.C.B. CO.

Probable Ackerman Survey.

* Note added by Dunn in June 1958
A. Vaeth Dunn 1/25/61

SCALE OF FEET

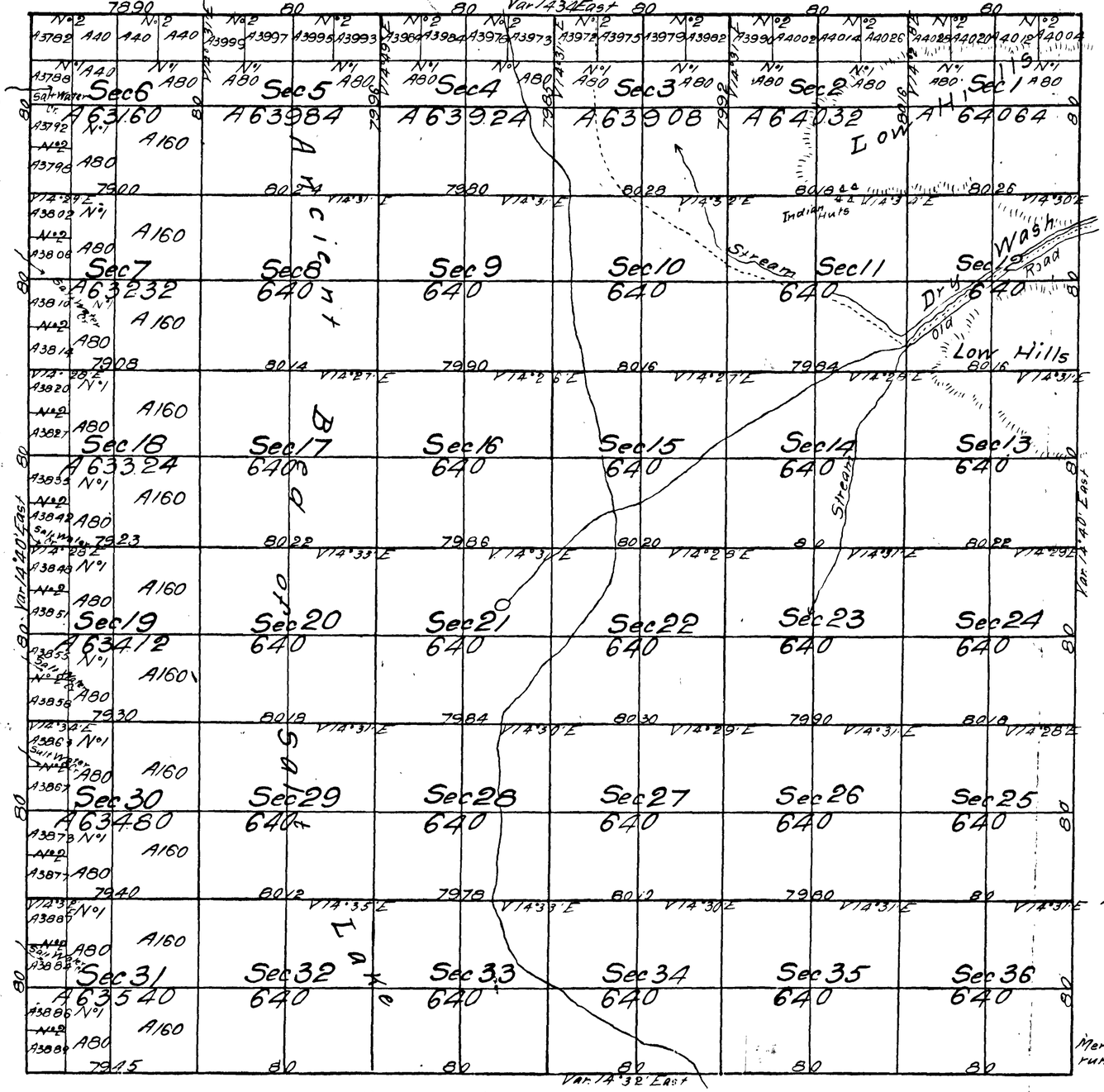
NOTE:- Elevations are in standing figures and refer to Sea Level, being marked — where below.
Corner indicated thus ■ is marked by 4"x4" post.
Corner indicated thus • is marked by stake, 4' long, scribed with letter shown hereon and set in a mound of earth or stone, 2' high.

WATER MEASUREMENTS

No.	Date 1926 May	Time	Temp.	E.L.E.	Sec. Ft.	Remarks
1	14	7:30 am	85°	-173	1.700	Main Ditch at entrance to Furnace Creek Ranch.
	14	11:15 am	99		1.680	Larger flows measured thru 12" rectangular weir and
	14	5:30 pm	88		1.660	smaller flows thru 90° V notch.
2	11	7:30 pm	98	13	.002	Stream from gully ½ mi. N. of Texas Sp. Alkaline. N.G.
3	11	2:00 pm	98	37	.140	Ditch from Texas Sps. Station 200' above tank.
4	12	5:00 pm	87	340	.280	Only 50% of flow of Texas Sp. (No. 4) reaching tank
5	12	4:30 pm	88	346	.001	at upper end of pipe line. High velocity of water
6	12	4:10 pm	89	365	.001	cuts banks of ditch allowing water to spread and
7	12	3:50 pm	90	342	.002	waste.
8	12	3:30 pm	91	346	.002	Springs 5, 6, 7, 8 drain into Furnace Creek, but all water sinks below surface within 1000 ft. from source.
9	11	11:30 am	96	238	.006	Measurements 9 to 18 inclusive, omitting 13, give a
10	11	10:45 am	94	237	.008	total of 1.899 Sec. Ft. below the last spring,
11	11	10:00 am	92	256	.515	neglecting losses between that point and the
12	11	9:00 am	88	319	.002	several points of measurement. The loss be-
13	11	8:30 am	86	311	.056	tween here and the ranch is about 10%, the
14	11	8:00 am	84	302	.492	distance being 2¼ miles.
15	10	4:45 pm	87	303	.018	
16	10	4:30 pm	88	298	.006	
17	10	3:00 pm	92	306	.286	
18	10	2:00 pm	95	306	.566	
19	10	1:00 pm	96	310	.103	
20	10	11:00 am	94	325	.044	
21	10	9:20 am	89	397	.090	.08 Sec. Ft. of the flow at this point (21) sinks in the marsh
22	10	9:00 am	88	385	.050	below, only .01 Sec. Ft. of it reaching the ditch. Ditch
23	10	10:00 am	91	394	.002	at 21 should be connected with the ditch running
						S.E. to 22. This would increase flow in main ditch
						.081 Sec. Ft. making total of 1.98 Sec. Ft. at mouth of
						lowest feeder.

Transmitted with Dunn's memo of Jan 26, 1961 (1.54)

Township N.° 27 North Range N.° 1 East San Bernardino Meridian.



Surveys Designated	By whom Surveyed	Date of Contract	Amount of Surveys	When Surveyed
Township lines	Henry Washington	October 15th 1856	Mls Chs Lks 23 78 35	1857
Section "	" "	" "	39 77 56	"

Aggregate Area of Public Lands (Surveyed) 2300060 Ac

Meridians not otherwise noted run at a Variation of 14°40' E

The above Map of Township N.° 27 North Range N.° 1 East San Bernardino Meridian is strictly conformable to the field notes of the Surveys thereof on file in this Office which have been examined and approved.
Surveyor General's Office,
San Francisco California,
March 19th 1858.

J. W. Mandeville
Surveyor General, California

DEPARTMENT OF THE INTERIOR,
GENERAL LAND OFFICE.
Washington, D. C. Sept. 30, 1907.
I hereby certify that this is a true copy of the plat of official survey of the lands to which it relates, on file in this office.

H. A. Simonds
Recorder, General Land Office.

E.H.C.

51 802

1 National Park Service

147

00-00-0000: note to the file re: map '51 802' (deva doc# 0220)

NOTE TO THE FILE

March 24, 1999
JSA

Docket DEVA-SUPP

Docket Ø, Document 0220

Re: DEVA ~~Docket No. 220~~, MapMisc Section, Map "51 802", no title (dated as approved on 3/19/1858; true and certified copy date of 10/30/1907)

The map that was scanned at WRB in 1999 had a black background with blue and red ink notations across it. Those markings identified topography/vegetation conditions at various locations. The ink notations arel not visible on the scanned copy but can be seen by retrieving the map filed in the original docket folder.

Docket Information

Number of Documents in Docket : 219

Documents Dated from : 09-30-1907 to 02-24-2025

Docket Compiled: 6/5/2025