

per milk cow per day. This was done to see if water use should be reduced, as calculated in the "Worksheet for Determining Containment Facility Volumes" (Appendix A).

The volume of water generated for reuse in these areas was arrived at by multiplying the volume of milk produced per day in gallons, 7900, times 1.25, the number of gallons water required to pre-cool 1 gallon of milk. 9,875 gallons of water are required to pre-cool 7900 gallons of milk.

Milk Produced	7,900 Gallons	x	1.25 Gallons	=	9,875	Total Gallons water used to Pre-Cool
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Next, the amount of water generated by the pumps used for milking or cooling milk, which is cooled by water, is calculated. At the Desert View Dairy there are 2 Ice Machine Compressors that are cooled with water, each is 15-horse power. To calculate the amount of water used by the compressors you multiply 1.5 gallons, the number of gallons of water required to cool one horsepower per minute by the total horsepower, by the running time. The running time of these is about 60 to 75 percent of milking time per day. The milking and clean up time at the Desert View dairy is about 9 hours per milking. The milking itself is about 7 to 7.5 hours per the operator.

Ice Compressor #1	15	HP	x	1.5 Gallons	=	22.5	Gallons per HP
Ice Compressor #2	15	HP	x	1.5 Gallons	=	22.5	Gallons per HP
					=	45.0	Gallons per HP
Milking #1	7.5	Hours	x	60.0 Minutes	=	450.0	Minutes
Milking #2	7.5	Hours	x	60.0 Minutes	=	450.0	Minutes
					=	900.0	Minutes
					x	70%	Running Time
				Total Running Time	=	630.0	Minutes
				Total Running Time		630.0	Minutes
					x	45.0	Gallons per HP
						28,350	Total Gallons water used by Ice Compressors
Water used By Ice Compressors						28,350	Total Gallons
Water used to Pre-cool Milk					+	9,875	Total Gallons
Water Generated						38,225	Total Gallons

The total amount of water generated from the pre-cooler and two ice compressors is about 38,225 gallons of water. This water is diverted into the water tank for use in the sprinkler pen.

When you take the total of 38,225 gallons of water generated per day and divide it by 1100 milk cows, the result of 34.75 gallons gives you the total water used by each milking cow per day. There are two uses for the generated water, cooling of the milk and the wash pen, there is no need to reduce its current volume.

Nutrient volumes are calculated using animal units. At the Desert View Dairy there are a total of 1540 animal units. This value is based on the total number of animals having a 1000 lb. Body weight. The total nitrogen produced, 25% of which are not volatile, equals 93,641 lbs. per year. The total salts produced equals 900,668 lbs. per year. All liquid nutrients collected in liquid form are applied to the land. The application fields are on the Desert View Dairy. All tables and math for the nutrient production and utilization are in the Nutrient Production Worksheet, (refer to Appendix B). The property as described herein has capacity for all nutrients produced and collected in the liquid form. All such nutrients produced in liquid form are distributed and applied to farmland through a closed pipeline system.

### III. DESIGN

The Desert Dairy was originally contracted to comply by the Water Quality Enforcement Policy. This Engineered Waste Management Plan (EWMP) was prepared under the recommendations of the Statewide Water Quality Regulations for Dairies, Title 27.

Statewide Water Quality Regulations for Dairies requires the ability to containment the daily production of wastewater and storm water runoff from a 24-hour, 25-year storm.

In order to accommodate the guidelines, this report contains a set of calculations, which determine the amount of generated wastewaters and the 24-hour, 25-year storm.

The Engineered Wastewater Management Plan (EWMP) developed for the Desert View Dairy in February 2002 determined that the dairy has appreciable wastewater containment with it's application fields, but does not have appreciable capacity to hold the 24-hour, 25-year storm. The Desert View Dairy meets most of the requirements of the guidelines. In Table 1, wastewater volumes and the capacity of the application fields and lagoon are summarized.

Table 1

Total Days Required	24 HR/25YR	Storm
Total Milk house and Parlor Water Rate	3,410	gal per day
Total Wash Pen Rate	38,269	gal per day
Total Milk house and Wash Pen Rate	41,679	gal per day
Total Required Storm Water Volume	1.75	acre-ft
Total Manure Volume	0.04	acre-ft
Total Required Wash water Containment Volume (Directly applied to crop fields daily)	1.79	acre-ft
Total Required Storm water Containment Volume (24HR/25YR)	6.32	acre-ft
Total Available Volume	2.83	acre-ft
ADDITIONAL VOLUME REQUIRED	3.49	acre-ft

The data presented in this report was generated in the spreadsheets labeled "Worksheet for Determining Containment Facility Volumes" (Appendix A). The first page<sup>1</sup> details the current animal population and the daily wash water generated on the dairy. All numbers for milk house and wash pen water rates were generated from Rain Bird and Weather Tech Sprinkler Volume Ratings for single and double nozzles. An average of 5.05 Gallons per minute was used for single nozzles and 7.1 gallons per minute was used for double nozzles. These numbers were confirmed by timer or operator of the total run time of the wash pen sprinklers per cow pen and matched with research from the University of California Cooperative Extension Program for Dairies (see Appendix C).

The second page<sup>1</sup> shows the equivalent gallons per cow per day. This calculation was generated in response to the EWMP guidelines. The calculation on the second page<sup>1</sup> shows an accurate estimate of the volume of water used per cow per day on the Desert View Dairy.

Page two<sup>1</sup> also shows the total storm water accumulation generated on the dairy. Manure was also considered in the total volume calculations. The Total Required Containment Facility Volume is shown on the bottom of the second page<sup>1</sup>.

The Total Available Volume is shown on page three<sup>1</sup> for the Desert View Dairy. The Additional Volume Required was found by subtracting the Total Required Volume from the Current Capacity. In the case of the Desert View Dairy an additional volume 3.49 acre-ft. is required.

Also included on page three<sup>1</sup> is a calculation showing the total depth needed in the lagoon to contain the 24-hr, 25-yr storm. This calculation was developed to show how much depth should be left at the top of the lagoons to ensure that the 24-hr, 25-yr storm can be fully contained. This calculation also shows the maximum depth the pond can fill up to before pumping must be initiated. The calculation assumes that all storm water flows by gravity to the lagoon. In the case of the Desert View Dairy, to ensure capacity of the 24-hr, 25-yr storm, 30 feet must be maintained at the top of the lagoon. Shown below are two examples of wastewater lagoons. Figure 1 shows an optimum dairy lagoon that is able to contain all of the required wastewater and runoff volumes. Figure 2 shows a more common situation where two lagoons are used to split the total wastewater and runoff volumes. There should always be enough room in one lagoon to hold the 24-hr, 25-yr storm. By leaving enough room for the 24-hr, 25-yr storm, it eliminates dependency on the pump and eliminates potential spills due to pump failure. The calculation on the bottom of page three<sup>1</sup> shows exactly how much depth is needed at the top of the lagoon to ensure containment of the 24-hr, 25-yr storm.

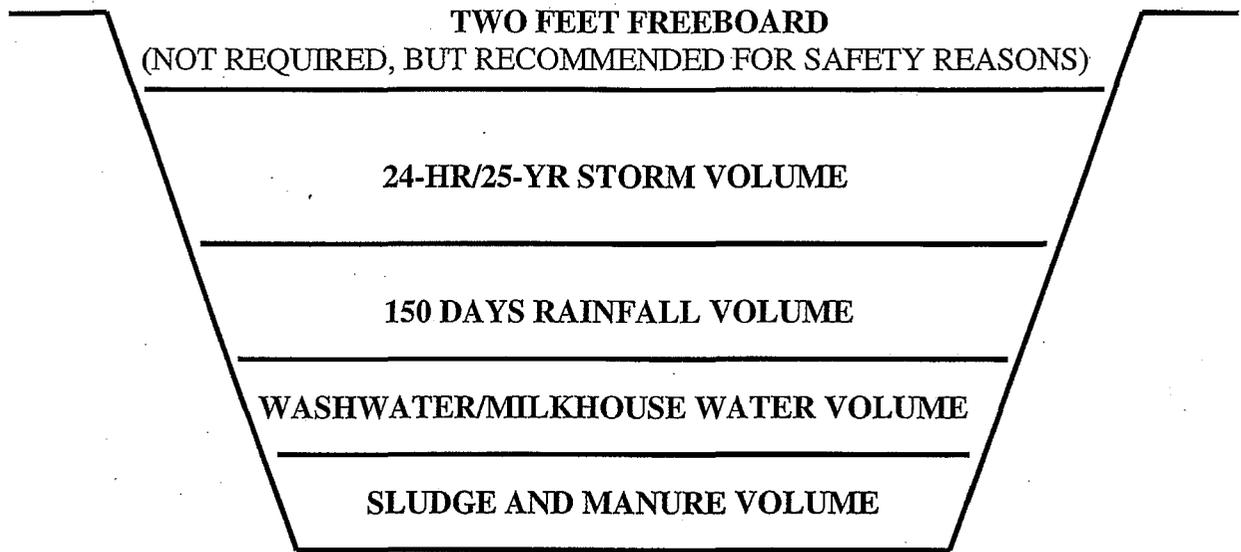


Figure 1. Cross-section of optimum dairy lagoon.

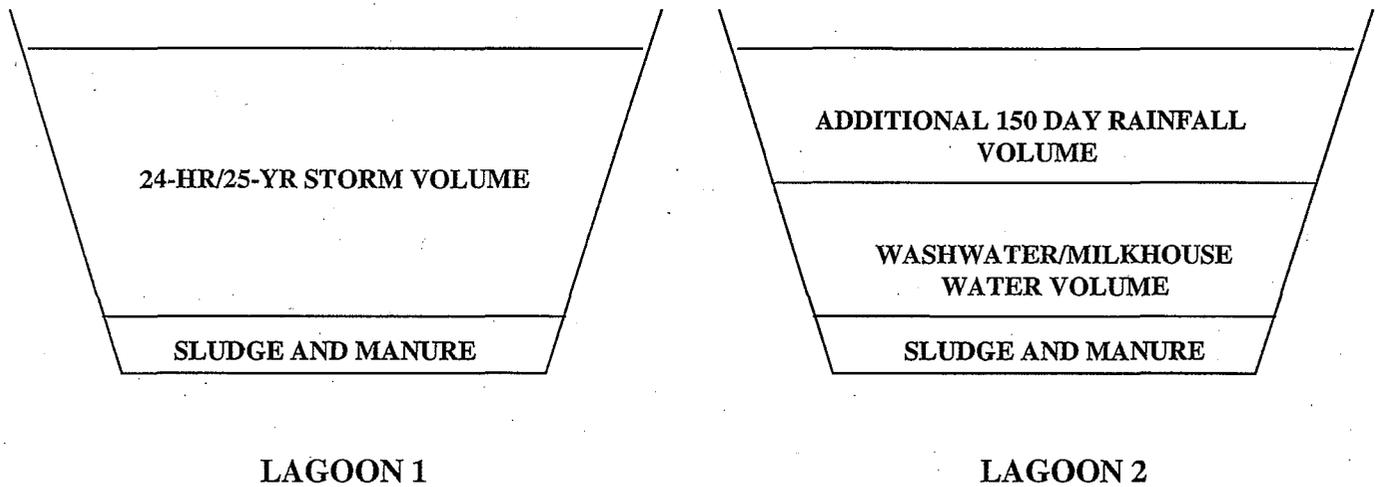


Figure 2. Cross sections of typical dairy lagoons with split volumes.

It is concluded that the Desert Views Dairy meets most of the requirements of the guidelines to Water Quality Enforcement Policy and the Statewide Water Quality Regulations for Dairies, Title 27. However it was shown that the dairy is not capable of the storage required for 24-hr, 25-yr storm. The following recommendations should be performed to meet all the requirements of the guidelines to Statewide Water Quality Regulations for Dairies.

**Recommendations:**

1. All waters, i.e. nutrient laden waters, barn generated waters, and/or storm water run-off from manured area's are to be applied to fields with that are planted with cultivated crops for harvest.
2. Dry manure is to be applied to fields at agronomic rates. (Refer to Nutrient Product worksheet, Appendix B)
3. Construct an additional lagoon to the north of the second column of corrals (refer to plot plan). This lagoon will contain all of the 24-hr, 25-yr storm runoff from the first and second columns of corrals. The lagoon should be constructed to a size of 210' long x 100' wide x 10' wide based upon 2:1 slopes. (Refer to "Proposed" calculations in Appendix A.)

**IV. PLOT (SITE) PLAN**

Please see Plot Plan at the end of this report. (Plate 1 & 2)

## V. WATER TABLES AND WELL LOG INFORMATION:

At this area of San Bernardino County there are two different ground water boundaries in the vicinity of this site, the Mojave River ground water basin and the Morongo ground water basin. The Mojave Water Agency monitors this data. The ground water flow in the vicinity of the Desert View Dairy is generally northwest from the Mojave River towards the Harper Dry Lake. The available ground water data from the USGS shows that the dairy is on the edge of a high point in the ground water table. Ground water flow southeast of the dairy is generally northeast along the path of the Mojave River. But the ground water drops off to the northwest resulting in the northwesterly groundwater flow under the dairy. The ground water under the dairy is at an elevation of approximately 2084 feet according to measurements taken in 2300. The elevation in 1998 was 6 feet lower at 2078 feet. The elevation of the water table southeast of the dairy, near the Mojave River is about 2116.

There is some water quality data available on the USGS website. This data shows that the combined nitrate and nitrate nitrogen concentrations in well 27F1, which is two miles due west of the dairy, has increased from around 1.2 mg/l in 1990 to between 2 and 3 mg/l in 2000.

The information on well location and ground water levels was taken from a 1998 USGS report on the ground water elevations and from the USGS website. (See Appendix I, Water tables for the report, map and other reference material.)

## VI. COMPACTION

For construction and/or replacement of berms, the following procedures should be followed:

- A. Over excavate the soil to 1'-2' below original ground before building berms.
- B. Place backfill and fill materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers. Backfill and fill materials should be completely free from manure.
- C. Uniformly moisten sub grade and each subsequent fill or backfill layer before compaction to within 2 percent of optimum moisture content.
  1. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
  2. Remove and replace, or scarify and air-dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.
- D. The excavation shall be backfilled and compacted to a relative compaction of no less than 90 percent. A Soils Engineer will need to be hired to ensure 90% compaction.

## VII. OPERATION AND MAINTENANCE

The basic maintenance objectives are to ensure the reliable storage and disposal of accumulated wastewater and waste solids. To achieve this, there are several tasks that must be accomplished on a routine basis:

- Disposal of accumulated wastewater
- Measurement of accumulated waste solids
- Removal and disposal of accumulated waste solids
- Repair and maintenance of dikes and berms
- Maintenance of site grading
- Weed Abatement
- Record keeping

### Accumulated Wastewater Disposal

It is important that the water level in the wastewater holding ponds be properly maintained so that the ponds can provide the required storage capacity during wet weather periods. The California Regional Water Quality Control Board - (CRWQCB) has developed specific standards for the handling and storage of wastewater and storm water collected from the

dairy operations. This portion of the Engineered Waste Management Plan describes the recommended maintenance procedures for the wastewater holding ponds to ensure compliance with CRWQCB standards.

In order to meet the requirements of the CRWQCB, the following general guidelines should be followed in disposing of wastewater in the ponds:

- Empty ponds just prior to the start of the wet weather season (November 1st) to ensure maximum capacity for the winter months. If stagnant water remains at the bottom of the ponds below the reach of the pumps, portable pumps should be used to remove all wastewater before the start of the wet season.
- Take advantage of dry weather periods during the annual wet weather period to dispose of accumulated wastewater. Fields must be properly prepared with crop and monitored to prevent overflow from application areas onto adjacent properties.
- Start to empty ponds at end of wet weather season (March 31st) to maximize percolation and to maintain capacity in the lagoons.

General Equipment Maintenance. Pumps, pipelines and all pertinent equipment used in the handling of wastewater must be routinely checked and serviced to ensure proper operation:

- Check all wastewater distribution and application equipment weekly to ensure proper operation condition.
- Check and service motors and pump valves three times a year. Portable replacement pumps should be available in case of a pump failure. If portable pumps are not available on-site, a rental company phone number should be posted with high visibility for all employees. Rental company phone numbers are also listed on the last page of this report.
- Check transmission pipes for proper condition.
- Take inventory of spare parts and check sources of emergency repair.

Dry Weather Disposal. Following the annual wet weather months, wastewater accumulated in the ponds should be disposed of in a timely manner in preparation of the coming wet weather months. The following guidelines should be followed for wastewater disposal during dry weather conditions:

- Apply wastewater to each of the application fields to receive wastewater on a rotational basis.
- Wastewater should be applied to fields in a manner so that all wastewater will percolate and evaporate. Wastewater should be applied to all parts of the field to improve proper utilization by all crops and to prevent stagnant wastewater.
- Avoid having the fields completely flooded. The best results occur under proper agronomic applications. If stagnant wastewater develops, a portable pump or other measures should be used to help spread the water and prevent insect breeding conditions.

Wet Weather Disposal. During the wet weather months, there may be weeks of dry weather available to dispose of accumulated wastewater. Take advantage of every opportunity to reduce the wastewater levels in the holding basins/lagoons so that in the event of a large storm the chances of overflow and inadvertent runoff are reduced. The following guidelines should be followed for wastewater disposal during wet weather months:

- Apply wastewater to each of the application areas on a rotational basis.
- Apply wastewater in a manner so that all wastewater will be distributed throughout the whole field. Fields should be watered so that all parts of the field receive wastewater. This will help prevent stagnant wastewater and allow proper agronomic applications.
- Observe the wastewater levels in the application areas on a daily basis. Apply additional wastewater only if it is agronomic ally proper and if a large storm is not eminent.
- Do not flood the fields and leave standing water for any period of time unless it has so been designated.

### **Accumulated Solids Removal and Disposal**

Solids contained in the dairy-generated wastewater and in the storm water will naturally settle and accumulate in the bottom of the holding basins/lagoons. The settled solids will reduce the holding capacity of the ponds. To maintain holding pond storage capacity, solids must be routinely checked and periodically removed. The frequency of solids removal will depend on how quickly solids accumulate in the ponds.

Solids Removal. Remove accumulated solids 1<sup>st</sup> by agitation and pumping, 2<sup>nd</sup> by dredging, and 3<sup>rd</sup> by draining and scraping. If dredging is used, ensure that dredging runoff and excess wastewater taken from the ponds is contained and returned to the ponds. Lagoon solids should be removed *every summer* to ensure full capacity in the lagoons before the start of the next winter season.

Solids Disposal. Solids removed from the ponds can be applied to application areas on-site or must be hauled off-site to farm ground for land application. Solids from lagoon applied to application areas should be tilled and mixed into the native soils shortly after application.

### **Levee, Berm and Dike Maintenance**

The integrity of pond berms, levees, and dikes must be maintained. Follow these guidelines to ensure proper maintenance of the levees and berms:

- Check pond dikes, levees, and berms a minimum of two times per year for erosion and settlement, and repair as necessary (one inspection to occur just prior to the rainy season).

- Check pond dikes, levees, and berms a minimum of two times per year for rodent damage, and repair as necessary (one inspection to occur just prior to the rainy season).
- If immediate repairs must be made, compacted soil should be used to fill all cracks and holes until further repair can be performed.
- Apply suitable rodent control measures for widespread or frequent rodent damage. These may include Anti-Coagulant Bait, Trapping or Fumigation. Pest Control Specialists should be contacted before using any of these methods.

### **Site Grading Maintenance**

Site grading must be maintained to ensure proper drainage patterns across the dairy. The goal is to minimize the amount of water contaminated with manure and flowing into the holding ponds and to prevent contaminated wastewater from running off-site. The following guidelines should be followed to maintain site grading:

- Ensure that all wastewater generated by the daily dairy operations flows to the wastewater holding ponds. Re-grade as needed.
- Clean and repair buried drain lines as needed.
- Ensure that rainfall collected from cow holding pens, feed storage areas, and other manured areas flows to the holding ponds or containment areas. Re-grade as needed.
- Check the condition of containment walls and berms surrounding the cow-confined areas, and repair as necessary.
- Ensure that storm water from off-site areas is diverted away from holding pens and other manured areas.
- Ensure that storm water from other off-site areas does not drain into the holding ponds.

### **Weed Abatement**

Weed abatement measures such as pesticides and clearing and grubbing should be used to control weeds in fields, lagoons, wastewater transport channels, and wastewater access paths. Clearing manure out of lagoons once a year and discing fields at a minimum of once a year will help ensure weed abatement.

## Maintenance and Operations Records

Keep records of all maintenance activities for future reference.

<u>Maintenance Activity</u>		<u>Frequency</u>
Holding Basin/Lagoon Levels	Pond Depth in Feet	Weekly
Holding Basin/Lagoon General Inspection	Berm and Lagoon Wall Stability	Weekly
Wastewater distribution/ Application Equipment	Pump/Pipe/Ditch Inspection	Weekly
Rainfall Totals	Days of Rain & Inches of Rainfall	Daily/Monthly
Solids Level	Solids Depth in Feet	Annually
Wastewater Application	Wastewater Depth in Inches	Daily
Wastewater Application	Days Applied & Approximate Volume	Weekly
Lagoon Solids Removal/Disposal	Days Removed & Volume Removed	Annually
Corral Solids Removal/Disposal Annually	Days Removed & Volume Removed	Semi-
Dikes and Berms Maintenance Annually	Damage Found & Date Repairs Made	Semi-
Site Grading Maintenance	Improvements Made & Date	Annually
Equipment Maintenance Annually	Service and Repair Records & Dates	Semi-

Daily inspections should be made upon all ponds, berms and wastewater distribution and application equipment following the first significant rain event of each winter season. These daily inspections should continue until large rain events cease in the spring.

Should an unauthorized discharge be made from the facility, the dairy operator should follow the guidelines described in Statewide Water Quality Regulations for Dairies

Emergency phone numbers are located on the next page of this report.

## **Emergency Spill Plan**

In the case of an emergency spill on the dairy, these directions should be followed.

First, the Regional Water Quality Control Board should be contacted if a spill occurs. At least one of these people should be contacted in the case of a spill.

Regional Water Quality Control Board  
Chief of the Dairy Units

Should a pump or piece of equipment break down, these numbers should be used to pursue emergency temporary equipment.

Below is a list of spare parts that could be used in the case of an emergency spill.

## VIII. GLOSSARY

<b>AFO</b>	-	-	Animal Feeding Operation
<b>BMP</b>	-	-	Best Management Practices
<b>Board</b>	-	-	See CRWQCB, SAR
<b>CAFO</b>	-	-	Concentrated Animal Feeding Operation
<b>Catastrophic Rainfall:</b>			Any single event which would total the volume of the 25 year, 24 hour storm event; this could include tornadoes, hurricanes or other catastrophic conditions which could cause overflow due to winds or mechanical damage.
<b>CFR</b>	-	-	Code of Federal Regulations
<b>Chronic Rain fall:</b>	-	-	A series of wet weather conditions which would not provide opportunity for dewatering and which total the volume of the 25 year, 24 hour storm event.
<b>CNMP</b>	-	-	Comprehensive Nutrient Management Plan
<b>CRWQCB</b>	-	-	California Regional Water Quality Control Board
<b>CWA</b>	-	-	Clean Water Act
<b>Discharger</b>	-	-	Persons discharging, or proposing to discharge, dairy wastes or other similar kinds of wastes from an existing dairy or related facility in any manner that may affect water quality.
<b>EWMP</b>	-	-	Engineered Waste Management Plan
<b>NPDES</b>	-	-	National Pollutant Discharge Elimination System
<b>Process Wastewater:</b>			Water directly or indirectly used in the operation of a feedlot for any or all of the following: Spillage or overflow from animal or poultry watering systems
<b>Regional Board:</b>	-	-	See CRWQCB, SAR
<b>Run-on</b>	-	-	Storm water that occurs off-site, but enters the CAFO
<b>SAR</b>	-	-	Santa Ana Region
<b>SWRCB</b>	-	-	State Water Resources Control Board
<b>TDS</b>	-	-	Total Dissolved Solids
<b>TMDL</b>	-	-	Total Maximum Daily Load
<b>USDA</b>	-	-	United States Department of Agriculture
<b>USEPA</b>	-	-	United States Environmental Protection Agency
<b>Washwater</b>	-	-	Water used to wash cows prior to milking, milk equipment & milk barn

# APPENDIX A

## WORKSHEET FOR DETERMINING CONTAINMENT FACILITY VOLUME

WORKSHEET FOR DETERMINING CONTAINMENT FACILITY

NAME OF FACILITY = Desert View Dairy Hinkley DATE = 2/6/2002  
 NAME OF OPERATOR = Paul Ryken 37501 Mountain View Road Hinkley, Ca. PHONE = 760-253-1089

STORAGE CAPACITY AVAILABLE FOR NUMBER DAYS= 1 Days  
 TOTAL ACRES OF PROPERTY= 179 Acres  
 DAIRY SITE CORRALS, LAGOONS, FEED LANES, Etc.= 20.21 Acres  
 ACREAGE LEFT FOR ROW CROP AND ROADS= 158.79238 Acres  
 0 Acres  
 0 Acres

ANIMAL UNITS							
	MILK COWS	DRY COWS	BRED HEIFERS	HEIFERS 1 yr / breed	CALVES 3 m to 1 yr.	BABY CALVES	OTHERS BULL'S Etc.
ANIMAL NUMBERS (N)	1100	210	50	0	0	0	0
AVERAGE WEIGHT (W)	1400	1400	1100	775	450	150	0
ANIMAL POUNDS	1540000	294000	55000	0	0	0	0
UNITS = N X W / 1000	1540	294	55	0	0	0	0
<b>TOTAL ALL ANIMAL UNITS</b>							<b>1889</b>

MILK HOUSE AND PARLOR WATER VOLUME					
	GALLONS PER MILKING	# MILKINGS PER DAY	NUMBER COWS	TOTAL GAL. PER DAY	TOTAL CU/FT PER DAY
Bulk Tank or Milk Tank Wash Volume	80	2		160	21.39
Pipeline Wash Volume	150	2		300	40.11
Milkhouse Parlor Floor Wash (pressure hose)	525	2		1050	140.37
Cow Prep Wash (drop hoses per cow)	0.25	2	1100	550	73.53
Miscellaneous Equipment (buckets etc.)	150	2		300	40.11
Miscellaneous Wash (wash / drip pen hose etc.)	525	2		1050	140.37
<b>TOTAL DAILY MILK HOUSE AND PARLOR WATER USE</b>				<b>3410</b>	<b>455.88</b>

WASH PEN / HOLDING PEN WATER VOLUME					
		# MILKINGS PER DAY	TOTAL GAL. PER DAY	TOTAL CU/FT PER DAY	
Number of Holding Pen Sprinklers	77				
Duration of Sprinkler Wash Cycle (minutes)	5				
Number of Wash Cycles (cow pens or strings)	7				
Sprinkler Flow Rate (gallons per minute per sprinkler)	7.1				
<b>TOTAL WASH PEN WATER USE (gal per day)</b>		<b>19134.5</b>	<b>2</b>	<b>38269</b>	<b>286252.12</b>

WASHWATER VOLUME			
Milkhouse and Wash Pen (gallons per day)	41679		
Available Days for Containment Facility to Hold		per day	1
<b>TOTAL WASHWATER VOLUME GENERATED</b>		<b>Gallons</b>	<b>41679.00</b>
		<b>Cu. Ft.</b>	<b>5572.06</b>
		<b>Acre Feet</b>	<b>0.13</b>
			<b>0.13</b>

**EQUIVELENT GALLONS PER COW PER DAY**

gal per day	# cows	gal per milk cow day	37.89
41679	1100		

**FRESH WATER USED FOR FLUSHING FEED LANES OR PARLORS**

	gallon each	times day	TOTAL GALLONS
Fresh Water from Well or Any Other Source of Fresh Water (gallons)	0	0	0
Recycled Water that Has Not Already Been Accounted For (gallons)	0	0	0
<b>TOTAL ADDITIONAL GALLONS OF WATER USED FOR FLUSH</b>			<b>0</b>

**VOLUME OF ANIMAL MANURE THAT IS TO BE CONTAINED IN LIQUID FORM**

	total animal units	freestall's flush 80%	open corrals flush 60%	freestall's scrape 10%	open corral's scrape 10%	cubic feet for collection of liquid manure
Number of Milk Cow Animal Units	1540	1687.84	1265.88	210.98	<b>210.98</b>	<b>210.98</b>
Number of Dry Cow Animal Units	294	322.22	241.67	40.28	<b>40.28</b>	<b>40.28</b>
Number Bred Heifers Animal Units	55	60.28	45.21	7.54	<b>7.54</b>	<b>7.54</b>
Number of Heif. 1yr to breed A / U	0	0.00	0.00	0.00	<b>0.00</b>	<b>0.00</b>
Number of Heif. 3 m to 1 yr A / U	0	0.00	0.00	0.00	<b>0.00</b>	<b>0.00</b>
Number of Day Calves to 3 m A/U	0	0.00	0.00	0.00	<b>0.00</b>	<b>0.00</b>
<b>CUBIC FEET NEEDED FOR ANIMAL WASTE</b>	<b>1889</b>	<b>2070.34</b>	<b>1552.76</b>	<b>258.79</b>	<b>258.79</b>	<b>258.79</b>

**TOTALS OF ALL MANURE CONSIDERATION**

1	days times	258.79	<b>cubic feet</b>	<b>258.79</b>
			<b>gallons</b>	<b>1936</b>
			<b>acre feet</b>	<b>0.01</b>

**REQUIRD STORM WATER STORAGE VOLUME**

Average Rain fall for Area in Inches for days =	1	Area is for	37501 Mountain View Road H	0.75
Evaporation = Department of Water Resource (inches) (winter months) for area				0
<b>TOTAL INCHES FOR CONTAINMENT FOR AREA</b>				<b>0.75</b>

**RUNOFF VOLUME NORMAL WINTER RAIN EVENTS WATERS**

	square feet	coeff	acres	square/feet
Concrete surface area draining into lagoons for containment	64944	100%	1.49	64944.00
Roofed surface areas draining into lagoons for containment	0	100%	0.00	0.00
Square feet of the surface areas of the lagoons and basins	18900	100%	0.43	18900.00
Corral surface areas that drain into lagoon for containment	796400	35%	6.40	278740.00
Any other surface areas that must or do drain into lagoons	0	13%	0.00	0.00
<b>TOTAL SQUARE FEET OF SURFACE RUNOFF</b>	<b>880244</b>		net runoff in sq. feet	<b>362584.00</b>
<b>ACREAGE OF DAIRY OPERATIONS (MANURED AREAS)</b>	<b>20.21</b>		net runoff in acres	<b>8.32</b>

**TOTAL ALL REQUIRD STORM WATER STORAGE VOLUME**

<b>Gallons</b>	169508.02
<b>Cu. Ft.</b>	22661.50
<b>Acre Feet</b>	0.52

**25 YEAR 24 HOUR STORM PRODUCES**

37501 Mountain View Road Hinkley, Ca.	coeff %	5.00
<b>GALLONS</b>	75.00%	<b>2057570</b>
<b>CUBIC FEET AT COEFFICIENT OF</b>	75.00%	<b>275076</b>
<b>ACRE FEET AT COEFFICIENT OF</b>	75.00%	<b>6.32</b>

	gallons	number day	cubic feet	cu./ft # day	total acre ft
<b>WASTEWATER GENERATED BREAKDOWN</b>	daily	1	daily	1	1
MILK HOUSE,PREP, AND FLOOR WASH	3410.0	3410.0	455.88	455.9	0.01
WASH PEN SPRINKLERS	38269.0	38269.0	5116.18	5116.2	0.12
FLUSH WATER USED (FRESH WATER)	0.0	0.0	0.00	0.0	0.00
MANURE CONSIDERATION FOR STORAGE	1956.6	1956.6	261.58	261.6	0.01
AVERAGE WINTER RAIN EVENTS	1412.6	1412.6	188.85	188.8	0.00
25 YEAR 24 HOUR STORM EVENT		2057570.4		275076.3	6.32
<b>TOTALS</b>	<b>45048</b>	<b>2102619</b>	<b>6022.5</b>	<b>281099</b>	<b>6.45</b>

<b>WASHWATER AND STORM WATER TOTAL VOLUME</b>		daily	1
<b>TOTALS FOR ALL EVENTS EXCEPT 25 YEAR 24 HOUR STORM FOR CONTAINMENT FROM NOVEMBER THROUGH MARCH</b>		<b>Gallons</b>	<b>45,048 45048.192</b>
		<b>Cu. Ft.</b>	<b>6,022 6022.4856</b>
		<b>Acre Feet</b>	<b>0.14 0.1382627</b>

<b>TOTAL FOR ONLY WHAT 25 YEAR 24 HOUR STORM EVENT WILL PRODUCE AND CAPACITY IT MUST ALWAYS BE AVAILABLE FOR FULL CONTAINMENT LAGOON NEEDS TO MAINTAIN</b>		<b>Gallons</b>	<b>2057570</b>
		<b>Cu. Ft.</b>	<b>275076</b>
		<b>Acre Feet</b>	<b>6.32</b>
172.50	52.5	9056	30.37
			275076.25
<b>Lagoon depth in feet needed = 30.37</b>			

<b>TOTAL CAPACITY AVAILABLE FOR STORAGE OF WASTEWATER</b>								
	Lenght	Width	Depth	Slopes	Freeboard	Square Feet	Cubic Feet	acre feet
Lagoon # 1	210.00	90.00	10.00	3.75	0.00	18900	90563	2.08
Lagoon # 2	0.00	0.00	0.00	1.00	0.00	0	0	0.00
Lagoon # 3	0.00	0.00	0.00	1.00	0.00	0	0	0.00
Lagoon # 4	0.00	0.00	0.00	1.00	0.00	0	0	0.00
Lagoon # 5	0.00	0.00	0.00	1.00	0.00	0	0	0.00
Lagoon # 6	0.00	0.00	0.00	0.00	0.00	0	0	0.00
Lagoon # 7	0.00	0.00	0.00	0.00	0.00	0	0	0.00
<b>TOTALS</b>						<b>18900</b>	<b>90563</b>	<b>2.08</b>

number days	lagoon sq / ft days	daily evap. Inches	total cu/ft evap.	acre ft evaporation				
1.00	18900.00	0.021984	34.62	0.00				
		DAILY GAL.	CU/FT DAILY			DAILY GAL.	CU/FT DAILY	
		milkhouse prep & floor wash	3410.0	455.9		manure considiration	1956.6	261.58
		wash pen sprinklers	38269.0	5116.18		average winter rain	1412.6	188.85
		fresh water used for flush	0.0	0.00		25 year 24 hour event	0.0	0.00

Math used for lagoon capacity from Regional Water Quality Central Region								
B1=(L)(W)		B2=[(D*S*2)][W-(D*S*2)]		M=[L-(S*D)][W-(S*D)]				
Length (ft)	Width (ft)	Depth (ft)	slope (H:V)	B1	B2	M	Cubic feet	Acre feet
210.00	90.00	10.00	3.75	18900	18900	9056.25	123375	2.83
0.00	0.00	0.00	1.00	0	0	0	0	0.00
0.00	0.00	0.00	1.00	0	0	0	0	0.00
0.00	0.00	0.00	1.00	0	0	0	0	0.00
0.00	0.00	0.00	1.00	0	0	0	0	0.00
0.00	0.00	0.00	0.00	0	0	0	0	0.00
0.00	0.00	0.00	0.00	0	0	0	0	0.00
				18900.00	18900.00	9056.25	123375.00	2.83



**EQUIVELENT GALLONS PER COW PER DAY**

gal per day	# cows	gal per milk cow day	37.89
41679	1100		

**FRESH WATER USED FOR FLUSHING FEED LANES OR PARLORS**

	gallon each	times day	TOTAL GALLONS
Fresh Water from Well or Any Other Source of Fresh Water (gallons)	0	0	0
Recycled Water that Has Not Already Been Accounted For (gallons)	0	0	0
<b>TOTAL ADDITIONAL GALLONS OF WATER USED FOR FLUSH</b>			<b>0</b>

**VOLUME OF ANIMAL MANURE THAT IS TO BE CONTAINED IN LIQUID FORM**

	total animal units	freestall's flush 80%	open corrals flush 60%	freestall's scrape 10%	open corral's scrape 10%	cubic feet for collection of liquid manure
Number of Milk Cow Animal Units	1540	1687.84	1265.88	210.98	210.98	210.98
Number of Dry Cow Animal Units	294	322.22	241.67	40.28	40.28	40.28
Number Bred Heifers Animal Units	55	60.28	45.21	7.54	7.54	7.54
Number of Heif. 1yr to breed A / U	0	0.00	0.00	0.00	0.00	0.00
Number of Heif. 3 m to 1 yr A / U	0	0.00	0.00	0.00	0.00	0.00
Number of Day Calves to 3 m A/U	0	0.00	0.00	0.00	0.00	0.00
<b>CUBIC FEET NEEDED FOR ANIMAL WASTE</b>	<b>1889</b>	<b>2070.34</b>	<b>1552.76</b>	<b>258.79</b>	<b>258.79</b>	<b>258.79</b>

**TOTALS OF ALL MANURE CONSIDERATION**

1	days times	258.79	<b>cubic feet</b>	<b>258.79</b>
			<b>gallons</b>	<b>1936</b>
			<b>acre feet</b>	<b>0.01</b>

**REQUIERD STORM WATER STORAGE VOLUME**

Average Rain fall for Area in Inches for days =	1	Area is for	37501 Mountain View Road H	0.75
Evaporation = Department of Water Resource (inches) (winter months) for area				0
<b>TOTAL INCHES FOR CONTAINMENT FOR AREA</b>				<b>0.75</b>

**RUNOFF VOLUME NORMAL WINTER RAIN EVENTS WATERS**

	square feet	coeff	acres	square/feet
Concrete surface area draining into lagoons for containment	64944	100%	1.49	64944.00
Roofed surface areas draining into lagoons for containment	0	100%	0.00	0.00
Square feet of the surface areas of the lagoons and basins	38900	100%	0.89	38900.00
Corral surface areas that drain into lagoon for containment	796400	35%	6.40	278740.00
Any other surface areas that must or do drain into lagoons	0	13%	0.00	0.00
<b>TOTAL SQUARE FEET OF SURFACE RUNOFF</b>	<b>900244</b>	net runoff in sq. feet		<b>382584.00</b>
<b>ACREAGE OF DAIRY OPERATIONS (MANURED AREAS)</b>	<b>20.67</b>	net runoff in acres		<b>8.78</b>

**TOTAL ALL REQUIERD STORM WATER STORAGE VOLUME**

<b>Gallons</b>	<b>178858.02</b>
<b>Cu. Ft.</b>	<b>23911.50</b>
<b>Acre Feet</b>	<b>0.55</b>

**25 YEAR 24 HOUR STORM PRODUCES**

37501 Mountain View Road Hinkley, Ca.	coeff %	5.00
<b>GALLONS</b>	75.00%	<b>2104320</b>
<b>CUBIC FEET AT COEFFICIENT OF</b>	75.00%	<b>281326</b>
<b>ACRE FEET AT COEFFICIENT OF</b>	75.00%	<b>6.46</b>

	gallons	number day	cubic feet	cu./ft # day	total acre ft
<b>WASTEWATER GENERATED BREAKDOWN</b>	daily	1	daily	1	1
MILK HOUSE, PREP, AND FLOOR WASH	3410.0	3410.0	455.88	455.9	0.01
WASH PEN SPRINKLERS	38269.0	38269.0	5116.18	5116.2	0.12
FLUSH WATER USED (FRESH WATER)	0.0	0.0	0.00	0.0	0.00
MANURE CONSIDERATION FOR STORAGE	1956.6	1956.6	261.58	261.6	0.01
AVERAGE WINTER RAIN EVENTS	1490.5	1490.5	199.26	199.3	0.00
25 YEAR 24 HOUR STORM EVENT		2104320.4		281326.3	6.46
<b>TOTALS</b>	<b>45126</b>	<b>2149446</b>	<b>6032.9</b>	<b>287359</b>	<b>6.60</b>

WASHWATER AND STORM WATER TOTAL VOLUME		daily	1
<b>TOTALS FOR ALL EVENTS EXCEPT 25 YEAR 24 HOUR STORM FOR CONTAINMENT FROM NOVEMBER THROUGH MARCH</b>		<b>Gallons</b>	<b>45,126 45126.109</b>
		<b>Cu. Ft.</b>	<b>6,033 6032.9023</b>
		<b>Acre Feet</b>	<b>0.14 0.1385018</b>

<b>TOTAL FOR ONLY WHAT 25 YEAR 24 HOUR STORM EVENT WILL PRODUCE AND CAPACITY IT MUST ALWAYS BE AVAILABLE</b>		<b>Gallons</b>	<b>2104320</b>
		<b>Cu. Ft.</b>	<b>281326</b>
FOR FULL CONTAINMENT LAGOON NEEDS TO MAINTAIN		<b>Acre Feet</b>	<b>6.46</b>
190.00	150	28500	9.87
		281326.25	<b>Lagoon depth in feet needed = 9.87</b>

TOTAL CAPACITY AVAILABLE FOR STORAGE OF WASTEWATER								
	Lenght	Width	Depth	Slopes	Freeboard	Square Feet	Cubic Feet	acre feet
Lagoon # 1	210.00	90.00	10.00	2.00	0.00	18900	133000	3.05
Lagoon # 2	210.00	100.00	10.00	2.00	0.00	21000	152000	3.49
Lagoon # 3	0.00	0.00	0.00	1.00	0.00	0	0	0.00
Lagoon # 4	0.00	0.00	0.00	1.00	0.00	0	0	0.00
Lagoon # 5	0.00	0.00	0.00	1.00	0.00	0	0	0.00
Lagoon # 6	0.00	0.00	0.00	0.00	0.00	0	0	0.00
Lagoon # 7	0.00	0.00	0.00	0.00	0.00	0	0	0.00
<b>TOTALS</b>						<b>39900</b>	<b>285000</b>	<b>6.54</b>

number days	lagoon sq / ft days	daily evap. Inches	total cu/ft evap.	acre ft evaporation		
1.00	39900.00	0.021984	73.10	0.00		
		DAILY GAL.	CU/FT DAILY		DAILY GAL.	CU/FT DAILY
		milkhouse prep & floor wash	3410.0	455.9	manure considiration	1956.6 261.58
		wash pen sprinklers	38269.0	5116.18	average winter rain	1490.5 199.26
		fresh water used for flush	0.0	0.00	25 year 24 hour event	0.0 0.00

Math used for lagoon capacity from Regional Water Quality Central Region								
B1=(L)(W)		B2=[(D*S*2)][W-(D*S*2)]		M=[L-(S*D)][W-(S*D)]				
Length (ft)	Width (ft)	Depth (ft)	slope (H:V)	B1	B2	M	Cubic feet	Acre feet
210.00	90.00	10.00	2.00	18900	18900	13300	151666.6667	3.48
210.00	100.00	10.00	2.00	21000	21000	15200	171333	3.93
0.00	0.00	0.00	1.00	0	0	0	0	0.00
0.00	0.00	0.00	1.00	0	0	0	0	0.00
0.00	0.00	0.00	1.00	0	0	0	0	0.00
0.00	0.00	0.00	0.00	0	0	0	0	0.00
0.00	0.00	0.00	0.00	0	0	0	0	0.00
				39900.00	39900.00	28500.00	323000.00	7.42

<b>DEPTH IN STORAGE AREA-1 NEEDED TO HOLD 24 HR, 25 YR STORM</b>		
<i>75% Runoff Coeff</i> <sup>3</sup>	Total Required Storm Water Volume <sup>2</sup>	<b>95,630</b>
	Total Area of Lagoon 1	<b>18,900</b>
<b>Total Depth Needed at Top of Lagoon to Hold 24 HR, 25 Year Storm</b>		<b>6</b>

<sup>2</sup> Total Required Storm Water Volume during a 24 hour, 25 year storm is calculated based on Total Sq. feet of Dairy Operations multiplied by an alternate Runoff Coeff<sup>3</sup>.

<b>DEPTH IN STORAGE AREA-2 NEEDED TO HOLD 24 HR, 25 YR STORM</b>		
<i>75% Runoff Coeff</i> <sup>3</sup>	Total Required Storm Water Volume <sup>2</sup>	<b>186,009</b>
	Total Area of Lagoon 2	<b>21,000</b>
<b>Total Depth Needed at Top of Lagoon to Hold 24 HR, 25 Year Storm</b>		<b>9</b>

<sup>2</sup> Total Required Storm Water Volume during a 24 hour, 25 year storm is calculated based on Total Sq. feet of Dairy Operations multiplied by an alternate Runoff Coeff<sup>3</sup>.

# **APPENDIX B**

## **WORKSHEET FOR DETERMINING NUTRIENT LEVELS**

# NUTRIENT PRODUCTION

Owner name **Paul Ryken** Date of this report **2/10/02**  
 Dairy name **Desert View Dairy** Phone **760-253-1089** Fax **0**  
 St. Address **Mountain View Road** cell **0**  
 City and State **Hinkley, Ca.** (percent used in nitrogen left in liquid equals (< 60 days= 50% >60 days= 25%)) **0.25**

**This Control Panel is to be used only for this nutrient report information**

animal #'s	m/c	d/c	b/h	h 1y/breed	h 4m / 1y	baby calves	others ??	85% of mature
	1100	187	210	50	0	0	0	1094

**Conditions and collection practices used =**

	animal numbers	freestall flush	open corral flush	freestall scrape	open corral scrape
Milk Cows	1100	0	0	0	1100
Dry Cows	187	0	0	0	187
Bred Heifers	210	0	0	0	210
Heifers 1 year to Breeding	50	0	0	0	50
Heifers 4 months to 1 year	0	0	0	0	0
Baby Calves day old to 4 months	0	0	0	0	0
Others Bulls etc.	0	0	0	0	0

	total acres planted	tons	lb's nitrogen per acre year	Average lbs salts per acre	total nitrogen for crop acres	total salts for all crop acres
<b>Total acres, nitorgen &amp; salts Lbs</b>	<b>56</b>	<b>0</b>	<b>325.00</b>	<b>2,000</b>	<b>18,200</b>	<b>112,000</b>

*This equals the Total all Nitrogen and Salts Collected in Liquid Form Per Year*

	nitrogen	salts
	8949	97984
<i>Difference between nutrients in liquid form less crop usage (+ # is long &amp; - # is short in nutrients)</i>	<b>-9251</b>	<b>-14016</b>
<i>Acres needed to balance nutrient supply contained in liquid form, a plus number in this area means that, that many more acres are needed to utilize nutrients in liquid, a minus number in this, means that many acres in excess</i>	<b>-28.47</b>	<b>-7.01</b>
<i>Equals total generated, collected and contained in liquid, from this operation used practices:</i>	8949	97984
<i>Percent of nutrients and solids removed after any treatment or separation has been implemented</i>	<b>15.00%</b>	<b>15.00%</b>
<i>Volume of nutrients removed after any separation or treatment has been implemented</i>	1342	14698
<i>Balance that should be left for use in crops or land applications after treatments if any are used</i>	7606	83286
<i>Difference between nutrients in liquid form less crop usage (+ # is long &amp; - # is short in nutrients)</i>	<b>-10594</b>	<b>-28714</b>
<i>Acres needed to balance nutrient supply contained in liquid form, a plus number in this area means that, that many more acres are needed to utilize nutrients in liquid, a minus number in this, means that many acres in excess</i>	<b>-32.60</b>	<b>-14.36</b>

**TOTAL NUTRIENT OF SALTS AND NITROGEN PRODUCTION AT THIS DAIRY LIQUID AND SOLID FORMS**

TOTAL NITROGEN	ANIMAL UNITS	DAILY LB'S PER ANIMAL UNIT	TOTAL DAILY POUNDS	% USED AFTER VOLATILIZATION	TOTAL DAILY POUNDS	DAYS IN YEAR OR USED IN TOTAL	YEAR TOTAL
MILK COW ANIMAL UNITS	1540.00	0.56	862.40	25.00%	215.60	365	78694.00
DRY COW ANIMAL UNITS	261.80	0.45	117.81	25.00%	29.45	365	10750.16
OTHER ANIMAL UNITS	269.75	0.45	121.39	25.00%	30.35	365	11076.61
<b>TOTAL NITROGEN YEAR</b>	<b>2071.55</b>		<b>1101.60</b>		<b>275.40</b>		<b>100520.77</b>
						<b>CROP USAGE=</b>	<b>18200</b>
						<b>BALANCE=</b>	<b>82321</b>

TOTAL SALTS PRODUCED	ANIMAL UNITS	DAILY LB'S PER ANIMAL UNIT	TOTAL DAILY POUNDS	% USED AFTER VOLATILIZATION	TOTAL DAILY POUNDS	DAYS IN YEAR OR USED IN TOTAL	TOTAL YEAR
MILK COW ANIMAL UNITS	1540.00	1.296	1995.84	100.00%	1995.84	365	728482
DRY COW ANIMAL UNITS	261.80	1.296	339.29	100.00%	339.29	365	123842
OTHER ANIMAL UNITS	269.75	1.296	349.60	100.00%	349.60	365	127603
<b>TOTAL SALTS PER YEAR</b>	<b>2071.55</b>		<b>2684.73</b>		<b>2684.729</b>		<b>979926</b>
						<b>CROP USAGE</b>	<b>112000</b>
						<b>BALANCE</b>	<b>867926</b>

**NUTRIENT PRODUCTION**

**NUTRIENT PRODUCTION OF NITROGEN AND SALTS**

Paul Ryken  
Mountain View Road

Desert View Dairy  
Hinkley, Ca.

2/10/02  
760-253-1089

animal type	total animals		average lb's		number animals in freestalls		animal #'s in open corrals		freestalls and open corrals	
	in herd at site		per animal		with flush	animal units	with flush	animal units	with no flush	animal units
<b>Holsteins</b>										
milk cows	1100		1400		0	0.0	0	0.0	1100	1540.0
dry cows	187		1400		0	0.0	0	0.0	187	261.8
bred heif.	210		1099		0	0.0	0	0.0	210	230.8
heif 1y/bred	50		775.6		0	0.0	0	0.0	50	38.8
heif. 4m / 1y	0		449.4		0	0.0	0	0.0	0	0.0
babies / 4-m	0		149.8		0	0.0	0	0.0	0	0.0
<b>Inventory</b>	<b>1547</b>		<b>Totals =</b>		<b>0</b>	<b>0.0</b>	<b>0</b>	<b>0.0</b>	<b>1547</b>	<b>2071.4</b>

**NITROGEN PRODUCED:**

(use 25% nitrogen retained after 60 days storage in lagoon and 50% for less then 59 days storage)

**25.00%**

**Milk Cows:**

<b>0</b>	<b>Equals number of milk cows housed in freestall housing with flush system:</b>							<b>25.00%</b>	
	milk cow	nitrogen day	total nitrogen	in what form	% retained	total retained	25% >60 days	all production	
	animal units	per animal unit	per day	it's collected	in what form	in what form	50% <60 days	for 365 days	
0	0.0	0.56	0.00	<b>In Liquid=</b>	80.00%	0.00	0.00	0.00	
				<b>In Solids=</b>	20.00%	0.00	0.00	0.00	
Milk Cow Total equals=		0.56	0.00	<b>Totals all=</b>	100.00%	0.00	0.00	0.00	

<b>0</b>	<b>Equals number of milk cows housed in open corrals with a flush system:</b>							<b>25.00%</b>	
	milk cow	nitrogen day	total nitrogen	in what form	% retained	total retained	25% >60 days	production for	
	animal units	per animal unit	per day	it's collected	in what form	in what form	50% <59 days	the 365 days	
0	0.0	0.56	0.00	<b>In liquid=</b>	60.00%	0.00	0.00	0.00	
				<b>In Solids=</b>	40.00%	0.00	0.00	0.00	
Milk cow totals equals=		0.56	0.00	<b>Totals all=</b>	100.00%	0.00	0.00	0.00	

<b>1100</b>	<b>Equals number of milk cows in freestall or open corral housing with no flush:</b>							<b>25.00%</b>	
	milk cow	nitrogen day	total nitrogen	in what form	% collected	total retained	25% >60 days	production for	
	animal units	per animal unit	per day	it's collected	in what form	in what form	50% <59 days	the 365 days	
1100	1540.0	0.56	862.40	<b>In liquid=</b>	10.00%	86.24	21.56	7869.4	
				<b>In Solids=</b>	90.00%	776.16	194.04	70824.6	
Milk cow totals equals=		0.56	862.40	<b>Totals all=</b>	100.00%	862.40	215.60	78694.00	

**Milk Cow nitrogen totals for the 365 days = In liquid form retained in pounds equals = 7869.40**  
**Produced and generated in Solids equals= 70824.60**

Acres of crop ground needed for the utilization of the nitrogen collected and retained in the liquid form

150 lbs=	52.46	250 lbs=	31.48	325 lbs=	24.21	400 lbs=	19.67
200 lbs=	39.35	275 lbs=	28.62	350 lbs=	22.48	425 lbs=	18.52
225 lbs=	34.98	300 lbs=	26.23	375 lbs=	20.99	450 lbs=	17.49

<b>Milk Cow Salts totals for A/Units</b>	<b>1540</b>	freestall/flush	open lot/flush	all/scrape	per day	365 days
<b>Salts average in the liquid form equals=</b>		0.00	0.00	199.58	199.58	<b>72848</b>
<b>Salts average in the dry form equals =</b>		0.00	0.00	1796.26	1796.26	<b>655633</b>
<b>acres needed single crop from liquid only=</b>	<b>36.42</b>	<b>for double crop liquid only =</b>		<b>24.28</b>		

**NUTRIENT PRODUCTION**

**Dry Cows:**

<b>0</b>	<b>Number of dry cows in freestall housing with flush system:</b>							<b>25.00%</b>	
	dry cow	nitrogen day	total nitrogen	in what form	% collected	total daily lb's	25%>60 days	production for	
dry cows	animal units	per animal unit	per day	it's collected	in what form	in what form	50%<59 days	the 365 days	
0	0.0	0.45	0.00	<b>In liquid=</b>	80.00%	0.00	0.00	0.00	
				<b>In solids=</b>	20.00%	0.00	0.00	0.00	
Dry cow totals equal=		0.45	0.00	<b>Totals all=</b>	100.00%	0.00	0.00	0.00	

<b>0</b>	<b>Number dry cows open corrals with flush system:</b>							<b>25.00%</b>	
	dry cow	nitrogen day	total nitrogen	in what form	% collected	total daily lb's	25%>60 days	production for	
dry cows	animal units	per animal unit	per day	it's collected	in what form	in what form	50%<59 days	the 365 days	
0	0.0	0.45	0.00	<b>In liquid=</b>	60.00%	0.00	0.00	0.00	
				<b>In solids=</b>	40.00%	0.00	0.00	0.00	
Dry Cows Total equals=		0.45	0.00	<b>Totals all=</b>	100.00%	0.00	0.00	0.00	

<b>187</b>	<b>Number dry cows housed in freestalls or open corrals with no flush:</b>							<b>25.00%</b>	
	dry cow	nitrogen day	total nitrogen	in what form	% collected	total daily lb's	25%>60 days	production for	
dry cows	animal unit	per animal unit	per day	it's collected	in what form	in what form	50%<59 days	the 365 days	
187	261.8	0.45	117.81	<b>In liquid=</b>	10.00%	11.78	2.95	1075.02	
				<b>In solids=</b>	90.00%	106.03	26.51	9675.15	
Dry cow totals equals=		0.45	117.81	<b>Totals all=</b>	100.00%	117.81	29.45	10750.16	

<b>Dry Cow Nitrogen Totals for the 365 days = In liquid form retained in pounds equals= 1075.02</b>								
<b>Produced and generated in solid form equals= 9675.15</b>								
Acres of crop ground needed for the utilization of the nitrogen collected and retained in the liquid form								
150 lbs=	7.17	250 lbs=	4.30	325 lbs=	3.31	400 lbs=	2.69	
200 lbs=	5.38	275 lbs=	3.91	350 lbs=	3.07	425 lbs=	2.53	
225 lbs=	4.78	300 lbs=	3.58	375 lbs=	2.87	450 lbs=	2.39	
<b>Dry Cow Salts Totals for A/Units</b>		<b>261.8</b>	freestall/flush	open lot/flush	all/scrape	per day	365 days	
Salts average in the liquid form equals=			0.00	0.00	33.93	33.93	<b>12384.19</b>	
Salts average in the dry form equals=			0.00	0.00	305.36	305.36	<b>111457.68</b>	
acres needed single crop from liquid only=			<b>6.19</b>	for double crop farm ground=		<b>4.13</b>		

**Replacement Stock Heifers etc.:**

**All replacement heifers:**

<b>0</b>	<b>Equals all replacement Heifers housed in freestalls with flush feed lanes:</b>							<b>25.00%</b>	
	bred heif.	nitrogen day	total nitrogen	in what form	% collected	total retained	25% >60 day	production	
bred heifers	animal units	per animal unit	per day	it's collected	in what form	in what form	50% <59 day	for 365 days	
0	0.0	0.45	0.00	<b>in liquid =</b>	80.00%	0.00	0.00	0.00	
average lbs=	ERR	per head in this group		<b>in solids =</b>	20.00%	0.00	0.00	0.00	
Replacement Total		0.45	0.00	<b>Total all =</b>	100.00%	0.00	0.00	0.00	

**NUTRIENT PRODUCTION**

**Replacement stock continued:**

<b>0</b>	<b>Equals all replacement Heifers housed in open corrals with flush feed lanes:</b>							25.00%
	bred heif.	nitrogen day	total nitrogen	in what form	% collected	total retained	25% >60 day	production
bred heifers	animal units	per animal unit	per day	it's collected	in what form	in what form	50% <59 day	for 365 days
0	0.0	0.45	0.00	<b>In liquid =</b>	60.00%	0.00	0.00	0.00
average lbs=	ERR	per head in this group		<b>In solids =</b>	40.00%	0.00	0.00	0.00
Replacement Total		0.45	0.00	<b>Totals all=</b>	100.00%	0.00	0.00	0.00

<b>260</b>	<b>Equals all replacement heifers housed in open corral or freestalls no flush:</b>							25.00%
	bred heif.	nitrogen day	total nitrogen	in what form	% collected	total retained	25% >60 day	production
bred heifers	animal units	per animal unit	per day	it's collected	in what form	in what form	50% <59 day	for 365 days
260	269.6	0.45	121.31	<b>In liquid=</b>	10.00%	12.13	3.03	1106.92
average lbs=	1036.807692	per head in this group		<b>In solids=</b>	90.00%	109.18	27.29	9962.30
Replacements Total		0.45	121.3065	<b>Totals all=</b>	100.00%	121.31	30.33	11069.22

<b>Replacement Stock Nitrogen totals for the 365 days=</b>				<b>Retained in liquid equals=</b>			<b>1106.92</b>
				<b>Produced in the solids=</b>			<b>9962.30</b>
<b>Replacement stock salts A/Units</b>	<b>269.57</b>	freestall/flush	open lot/flush	all/scrape	per day	365 days	
<b>Salts average in liquid form equals=</b>		0.00	0.00	34.94	34.94	<b>12751.74</b>	
<b>Salts average in dry solids form equals=</b>		0.00	0.00	314.43	314.43	<b>114765.65</b>	
<b>acres needed single crop from liquid only</b>			<b>6.38</b>	<b>for double crop liquid only</b>			<b>4.25</b>

<b>Totals to all the Nitrogen Produced on dairy operation:</b>								
<b>Total all Nitrogen= 89448.4</b>			<b>Nitrogen in liquid= 8948.67</b>			<b>Nitrogen in dry solids= 80499.75</b>		
lb's nitrogen generated or	pounds per acre	acres that are needed	pounds per acre	acres that are needed	pounds per acre	acres that are needed	pounds per acre	acres that are needed
produced in liquid form	150	59.66	250	35.79	350	25.57	450	19.89
per year	175	51.14	275	32.54	375	23.86	475	18.84
	200	44.74	300	29.83	400	22.37	500	17.90
<b>8948.67</b>	<b>225</b>	<b>39.77</b>	<b>325</b>	<b>27.53</b>	<b>425</b>	<b>21.06</b>	<b>550</b>	<b>16.27</b>

<b>SALTS PRODUCED:</b>		total salts	% collected	lb's per year	% collected	lb's per year
Totals for all animals or units at		per 365 day	in solid form	in the solids	in the liquid	in the liquid
100.00%		979841	90.00%	881856.8	10.00%	97984.1
<b>IN LIQUID=</b>			acres for salts @ 2000 lb's per acre = <b>48.99</b>		acres needed @ 3000 lb's per acre = <b>32.66</b>	
<b>IN SOLIDS=</b>			acres for salts @ 2000 lb's per acre = <b>440.93</b>		acres needed @ 3000 lb's per acre = <b>293.95</b>	
Salt loading & usage is based on 2000 lb's for single crop per acre per year such as cotton, alfalfa, etc. and 3000 lb's per acre per year for double crop such as corn, / wheat, / barley etc.						

**CROPS AND ACRES OF FARM GROUND ELIGIBLE TO RECEIVE WASTEWATER (owned or leased)**

Field crops usually raised as a double crop per acre per year:

Crops Planted and Raised	number acre farmed total	yield tons per acre	crop nitrogen requirement	salts per acre calculated	total Nitrogen per crop	total salts per crop
Corn (silage)	0	30	250	1500	0	0
Grain Sorgum	0	4	250	1500	0	0
Oats	0	1.6	115	1500	0	0
Wheat	0	3	175	1500	0	0

**NUTRIENT PRODUCTION**

<b>Field crops usually raised as a single crop per acre per year:</b>						
Barley	0	2.5	160	2000	0	0
Canola (whole plant)	0	2	240	2000	0	0
Corn (grain)	0	5	240	2000	0	0
Cotton (lint)	0	1.5	180	2000	0	0
Rice	0	3.5	110	2000	0	0
Safflower	0	2	200	2000	0	0
Sugar Beets	0	30	255	2000	0	0
<b>Vegetable crops usually raised as a double crop per acre per year:</b>						
Asparagus	0	1.5	95	1500	0	0
Brocoli	0	4	80	1500	0	0
Cababage	0	35	270	1500	0	0
Celery	0	75	280	1500	0	0
Lettuce	0	20	95	1500	0	0
<b>Vegetable crops usually raised as single crop:</b>						
Beans (snap)	0	???	175	2000	0	0
Potatoes (irish)	0	25	270	2000	0	0
Squash	0	10	85	2000	0	0
Sweet Potatoes	0	15	155	2000	0	0
Tomatoes	0	30	180	2000	0	0
<b>Fruit and Nut crops usually single crop per acre per year:</b>						
Almonds	0	15	200	2000	0	0
Apples	0	15	120	2000	0	0
Cantaloupes	0	30	220	2000	0	0
Grapes	0	15	125	2000	0	0
Oranges	0	30	265	2000	0	0
Peaches	0	15	95	2000	0	0
Pears	0	15	85	2000	0	0
Prunes	0	15	90	2000	0	0
<b>Forage crops usually raised as double crop per acre per year:</b>						
Sorghum/Sudan grass	56	8	325	2000	18200	112000
Vetch	0	7	390	1500	0	0
<b>Forage crops usually raised as single crop per acre per year:</b>						
Alfalfa	0	8	480	2000	0	0
Bromegrass	0	5	220	2000	0	0
Clovergrass	0	6	300	2000	0	0
Orchardgrass	0	6	300	2000	0	0
Timothy	0	4	150	2000	0	0
Bent Grass	0	2.5	225	2000	0	0
Bermuda Grass	0	24	225	2000	0	0
<b>Total acres, nitorgen &amp; salts Lbs.</b>	<b>56</b>		<b>325.00</b>	<b>2000.00</b>	<b>18200</b>	<b>112000</b>

<i>This equals the Total all Nitrogen and Salts Collected in Liquid Form Per Year</i>	nitrogen	salts
	<b>8949</b>	<b>97984</b>
<i>Difference between nutrients in liquid form less crop usage (+ # is long &amp; - # is short in nutrients)</i>	<b>-9251</b>	<b>-14016</b>
<i>Equals total generated, collected and contained in liquid, from this operation used practices:</i>	8948.67	97984.09
<i>Percent of nutrients and solids removed after any treatment or separation has been implemented</i>	15.00%	15.00%
<i>Volume of nutrients removed after any separation or treatment has been implemented</i>	1342.30	14697.61
<i>Balance that should be left for use in crops or land applications after treatments if any are used</i>	<b>7606</b>	<b>83286</b>
<i>Difference between nutrients in liquid form less crop usage (+ # is long &amp; - # is short in nutrients)</i>	<b>-10594</b>	<b>-28714</b>

# APPENDIX C

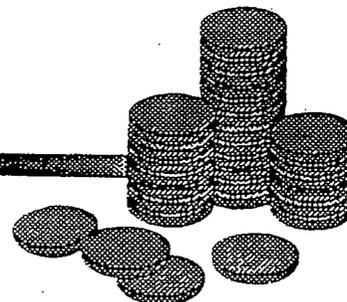
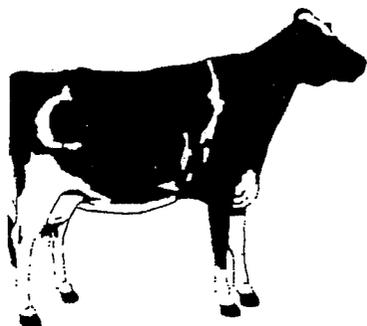
## MILKHOUSE AND WASH PEN VOLUME ESTIMATION DATA

University of California

Cooperative Extension



# Dairy Manure Management Series



## PLANING AND DESIGNING DAIRY WASTE STORAGE FACILITIES Alison Van Eenennaam<sup>1</sup>

A dairy waste management system must be planned, designed and managed to:

- Prevent water pollution
- Control odors
- Eliminate breeding places for insects
- Provide a convenient and efficient operation for the dairy owner/operator
- Require minimal investment, maintenance and operational costs
- Meet legal requirements.

Proper management of manure and waste water ensures further benefits in providing a healthy atmosphere for the animals. A facility that is clean, dry and free of manure provides a less desirable environment for disease organisms to thrive.

The purposes of this document are to:

- ▶ detail the factors to consider in designing a waste management storage facility;
- ▶ outline the major factors to be considered when designing dairy waste holding ponds; and
- ▶ provide an example of how to size a dairy manure holding pond.

<sup>1</sup>University of California Cooperative Extension Postdoctoral Associate.

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**TABLES**

**Table 1.** Waste produced daily by a 1,000 pound dairy cow and where it is deposited (2).

Area	Percent	Cubic Feet
Housing area	40	.548
Feeding area	45	.617
Holding pen	10	.137
Milk parlor	5	.068
Total cubic feet/1,000 lb cow		1.370

**Table 2.** Volume of milkhouse and parlor water (2, and D. Johnson, NRCS, pers. comm.).

Washing operation	Water Volume
Bulk Tank	
Automatic, 3 cycle wash	60 to 110 gal/wash
Manual wash	30 to 50 gal/wash
Pipeline	
In parlor (volume is higher for long flat barns)	75 to 150 gal/wash
Milkhouse and parlor floors	300 to 700 gal/wash
Pail milkers	30 to 40 gal/wash
Miscellaneous equipment	30 gal/day
Cow preparation wash	
Automatic	1 to 4.5 gal/wash/cow
Manual	.25 to .5 gal/wash/cow
Holding pen (sprinklers)	5 gal/min/head (dependent upon nozzle size & pressure)

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# APPENDIX D

## RAINFALL DATA

# BARSTOW , CALIFORNIA ( (040519) )

## 1961-1990 Monthly Climate Summary

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	59.70	61.50	67.50	75.00	83.60	91.10	96.10	94.50	89.10	80.20	63.30	54.00	76.00
Average Max. Temperature (F)	35.00	38.50	42.00	45.90	51.80	58.00	61.60	60.30	55.30	47.60	38.20	34.20	47.50
Average Total Precipitation (in.)	1.48	1.58	1.20	0.72	0.22	0.08	0.01	0.04	0.20	0.35	1.01	1.02	7.91

Unofficial values based on averages/sums of smoothed daily data. Information is computed from available daily data during the 1961-1990 period. Smoothing, missing data and observation-time changes may cause these 1961-1990 values to differ from official NCDC values. This table is presented for use at locations that don't have official NCDC data. No adjustments are made for missing data or time of observation. Check NCDC normals table for official data.

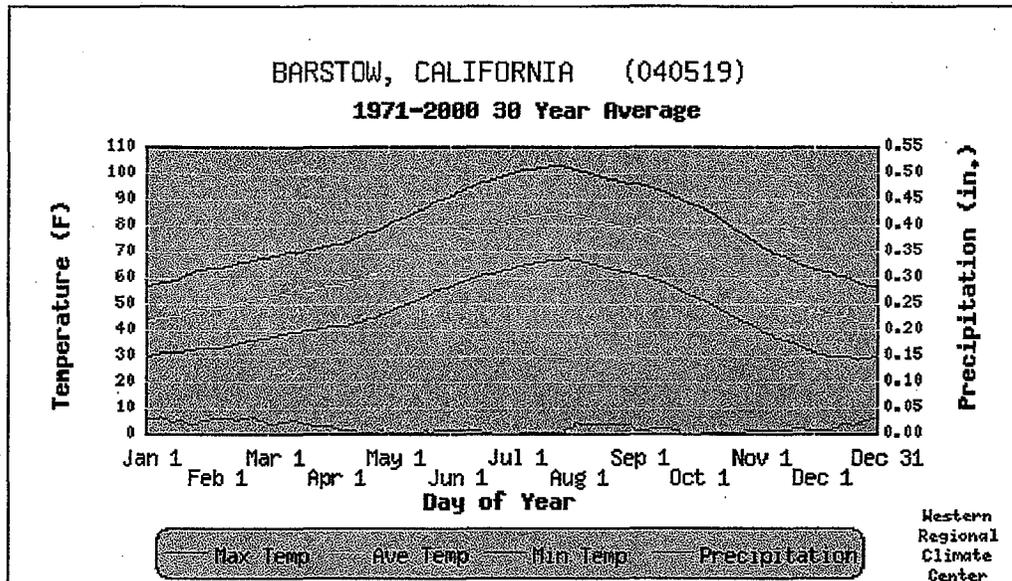
Western Regional Climate Center, [wrc@dr.edu](mailto:wrc@dr.edu)

### Total Rainfall Winter Months:

November	December	January	February	March	Total						
1.01	+	1.02	+	1.48	+	1.58	+	1.20	=	6.29	inches

# BARSTOW, CALIFORNIA

## 1971 - 2000 Temperature and Precipitation



Data is smoothed using a 29 day running average.

- - Max. Temp. is the average of all daily maximum temperatures recorded for the day of the year between the years 1971 and 2000.
- - Ave. Temp. is the average of all daily average temperatures recorded for the day of the year between the years 1971 and 2000.
- ▲ - Min. Temp. is the average of all daily minimum temperatures recorded for the day of the year between the years 1971 and 2000.
- ◆ - Precipitation is the average of all daily total precipitation recorded for the day of the year between the years 1971 and 2000.

**APPENDIX E**

**EVAPORATION DATA**

Winter (5) Months Evaporation Rate for **Bakus Ranch**

*This data is provided by the  
State of California,*

		202	mm
		110	mm
		76	mm
		73	mm
add	+	<u>95</u>	mm
		556	mm
multiply	x	<u>0.03937</u>	
		21.89	in.
divide	/	<u>12.00</u>	
		1.82	ft.

**November**

**December**

**January**

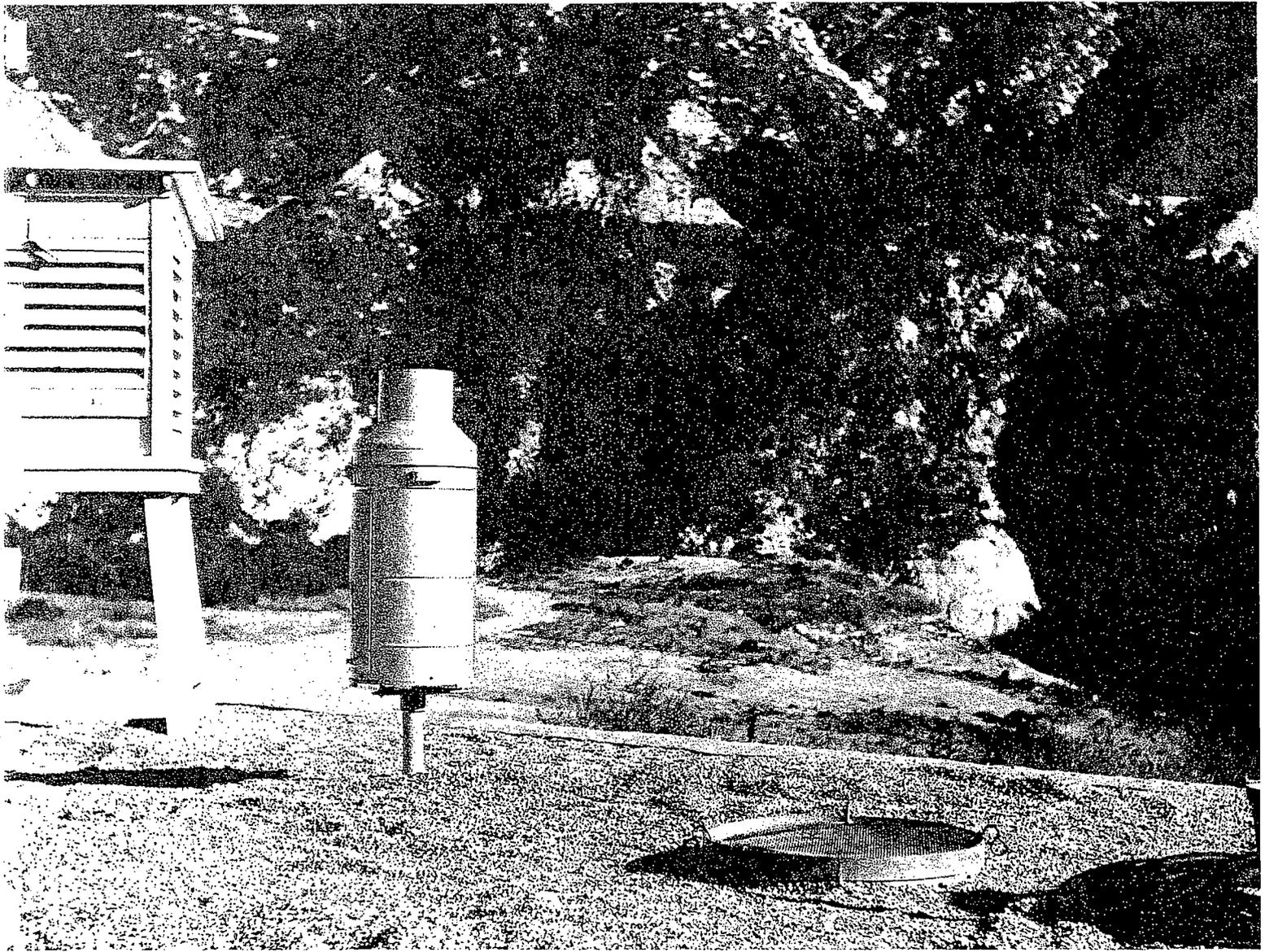
**February**

**March**

Total winter months evap. rate in millimeters  
convert to inches

Total winter months evap. rate in inches  
*inches in a foot*

Total winter months evaporation rate in feet



State of California  
The Resources Agency

Department of  
Water Resources



# Evaporation from Water Surfaces in California

Bulletin 73-79  
November 1979

**Department of  
Water Resources**

**Bulletin 73-79**

# **Evaporation from Water Surfaces in California**

**November 1979**

**(Reprinted April 1980)**

**Huey D. Johnson**  
Secretary for Resources

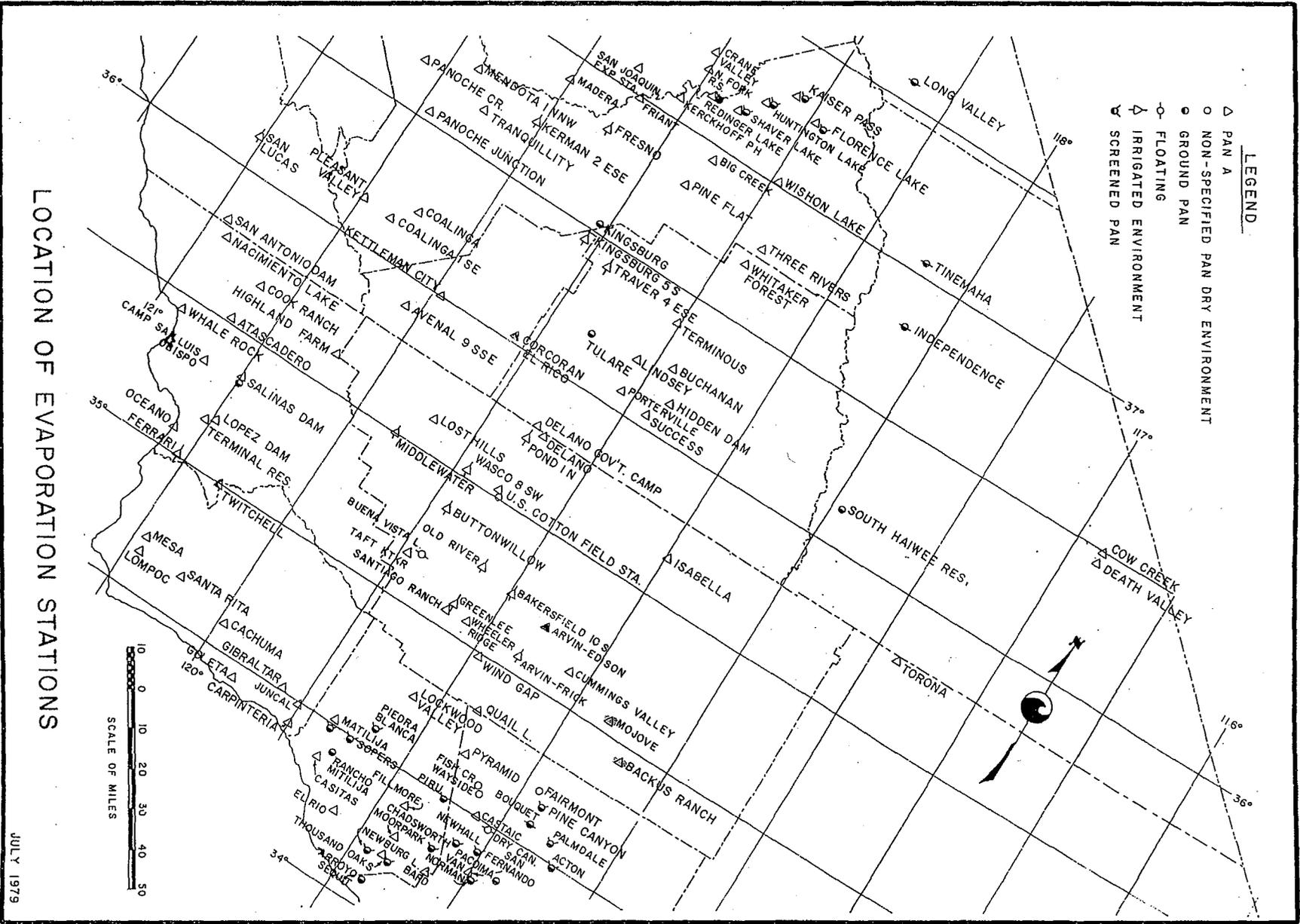
**Edmund G. Brown Jr.**  
Governor

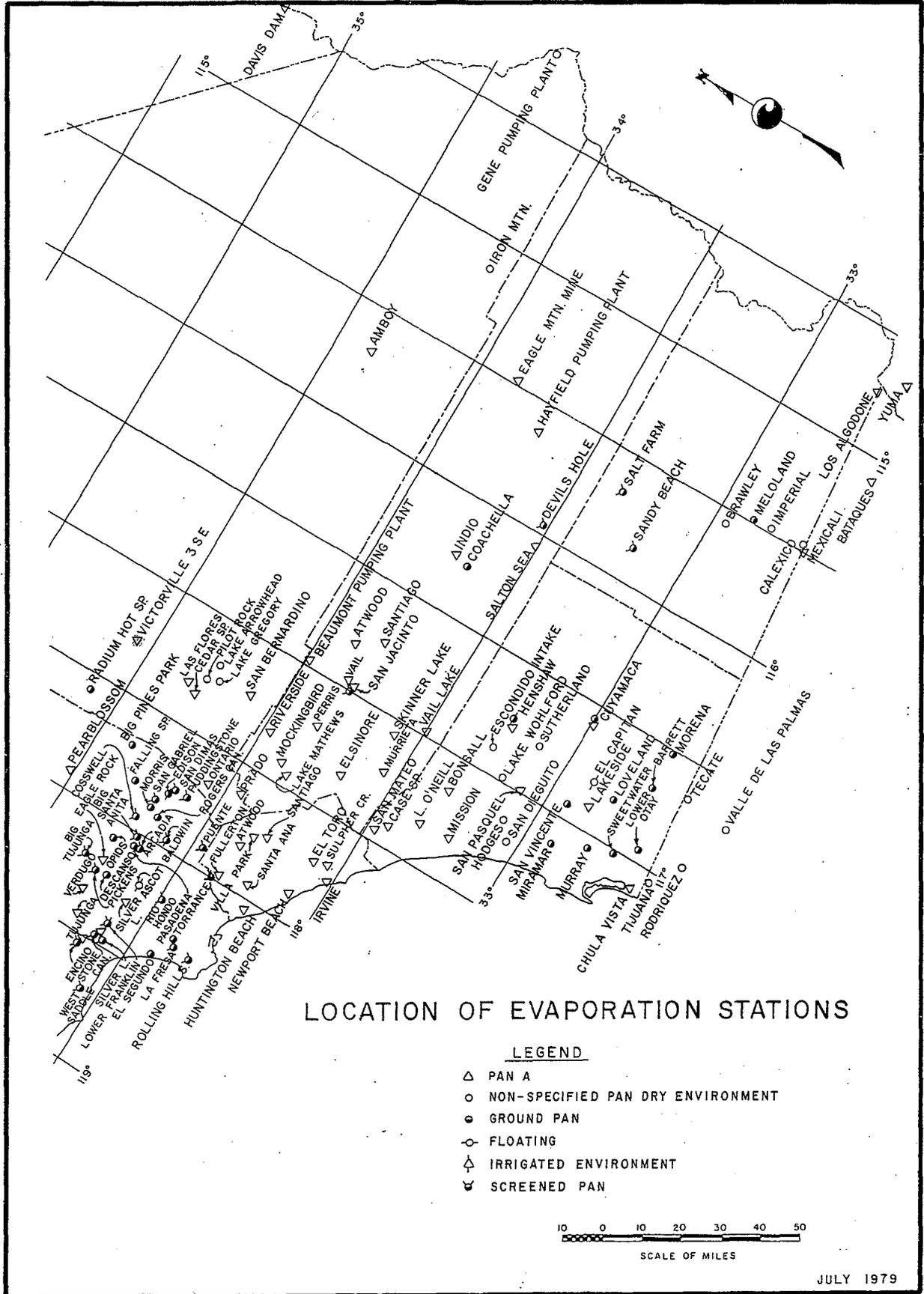
**Ronald B. Robie**  
Director

**The Resources  
Agency**

**State of  
California**

**Department of  
Water Resources**





EVAPORATION MEASUREMENT REPORT  
UNIT OF MEASURE \* MILLIMETRES

DATE 09/19/79

STATION NJM.		STATION NAME		*CONTINUED*		ELEV	T	R	S	L	B	LATITUDE	LONGITUDE	CD.	AGENCY	ENV. CD.
W24 837925		SOUTH HAIWEE RES				3825						36 08 00	117 58 00	INY	405	D
PAN	YEAR	TOTAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP		
L	1975	1679E	95	54	25E	33	54	101	128	200	264	282	273	170		
	1976	1661E	139	67	37	49	49E	108	140	188	267	256	244	117		
	1977	1633E	102	57	33E	16E	62	107	165	169	227	281	219	195		
	1978	1669E	117	78	30E	19E	31E	89E	131E	216	267	275	261	155		
	1979		124	56	18E											
L	MEAN	1624	116	59	33	33	56	103	139	189	233	257	231	175		

STATION NUM.		STATION NAME				ELEV	T	R	S	L	B	LATITUDE	LONGITUDE	CD.	AGENCY	ENV. CD.
W26 041800		BACKUS RANCH				2645						34 57 00	118 11 00	KRN	900	D
PAN	YEAR	TOTAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP		
A	1936										470	494				
	1937		220	133	89				236	377	436	526	535	373		
	1938	3139	214	133	100	101	78	142	262	324	447	515	474	349		
	1939		193	135		67	117	134	259	354	465	546	560	271		
	1940	3241	187	103	87	60	93	198	247	389	517	536	322	302		
	1941	2752	217	114	75	69	60	130	178	326	408	463	403	315		
	1942	2968	176	99	55	73	103	177	210	338	497	479	440	321		
	1943	2971	227	133	97	83	95	158	229	377	362	444	444	322		
	1944	2728	185	105	66	59	80	179	234	304	311	417	441	347		
	1945		179	78		76	102	120	266	314	389	484	368	293		
	1946	2907	166	111	70	97	95	166	266	315	449	421	435	316		
	1947	2985	185	87	53	82	92	179	268	367	389	469	382	332		
	1948	2937	185	98	62	83	118	152	215	332	359	470	420	343		
	1949	2791	171	119	68	50	69	142	274	309	442	432	376	339		
	1950	2974	193	106	61	58	99	214	297	345	410	454	445	292		
	1951	3031	219	114	99	79	108	196	206	331	429	475	433	342		
	1952	2731	246	93	61	52	104	141	207	362	334	401	431	299		
	1953	2699	202	74	51	77	106	166	227	261	371	477	395	290		
	1954	3147	202	117	81	74	111	129	479	386	412	479	366	311		
	1955	2910	234	103	67	43	88	204	243	309	393	439	447	340		
	1956	2869	218	116	62	89	102	218	242	313	410	390	400	309		
	1957	2917	184	103	83	48	88	175	236	269	459	463	418	291		
	1958	2590	137	90	58	74	92	97	221	306	363	437	418	297		
	1959	3220	224	145	148	111	90	219	285	352	466	428	433	319		
	1960		254	144	87	62	92	192	270	354	471			321		
	1961		216	93	77	82	122	221	298	337	460					
	1962		217	106	57	78	74	130	280	327	469					
A	MEAN	2950	202	110	76	73	95	167	255	334	422	464	434	318		

STATION NUM.		STATION NAME				ELEV	T	R	S	L	B	LATITUDE	LONGITUDE	CD.	AGENCY	ENV. CD.
W26 294100		FAIRMONT RESERVOIR-LAW+P				3080	07N	15W	11	R	S	34 42 15	118 25 40	LAX	900	LAX
PAN	YEAR	TOTAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP		
L	1924					73	91	146	186	359	400	423	455	364		
	1925	2600	196	112	74	88	104	176	181	232	309	444	404	280		
	1926	2640	188	107	72	77	77	126	115	269	413	470	418	308		
	1927	2577	214	146	53	77	77	124	191	287	324	429	390	245		
	1928	2563	207	101	44	54	91	129	193	267	346	413	418	300		
	1929	2541	186	105	64	75	82	133	165	311	296	459	408	257		
	1930	2603	199	140	113	71	104	117	205	223	362	449	379	241		
	1931	2535	155	115	46	70	80	174	192	308	324	464	362	245		
	1932	2550	163	87	57	61	68	152	195	239	365	448	406	309		
	1933	2412	194	145	57	66	145	154	185	217	305	372	323	249		
	1934	2441	172	104	42	65	74	158	235	292	272	400	358	269		
	1935	2121	146	86	32	27	61	91	136	236	360	369	310	267		
	1936	2410	178	85	71	68	47	136	196	287	321	365	379	277		
	1937	2348	151	102	25	42	40	138	192	269	321	395	390	283		
	1938	2319	185	117	55	58	36	90	161	247	343	400	353	274		
	1939	2439	163	115	69	54	74	106	194	274	367	411	401	211		
	1940	2739	164	105	78	45	71	149	198	326	427	453	449	274		
	1941	2202	191	103	62	31	29	88	119	265	302	422	340	250		
	1942	2494	137	93	26	58	76	135	151	271	373	468	416	290		
	1943	2634	188	119	79	81	71	114	189	311	327	427	393	335		
	1944	2459	185	111	72	50	76	134	174	267	270	416	402	302		
	1945	2515	192	68	61	65	94	66	210	284	331	463	389	292		
	1946	2662	163	110	71	95	92	116	222	265	387	411	440	290		
	1947	2629	187	83	52	84	97	144	200	314	336	439	373	320		
	1948	2659	183	108	72	95	94	112	184	284	330	456	409	332		
	1949	2660	188	132	43	65	44	122	228	271	395	458	378	336		
	1950	2754	199	116	55	57	93	167	225	293	269	462	437	281		
	1951	2864	218	115	105	78	88	173	183	318	379	448	418	341		
	1952	2492	202	100	43	56	81	123	171	320	305	410	400	281		
	1953	2518	224	82	39	68	99	142	197	228	317	453	379	290		
	1954	2561	193	112	81	59	103	112	211	316	335	413	347	279		
	1955	2434	219	97	52	29	61	146	178	225	321	398	395	313		
	1956	2560	211	104	50	69	80	170	151	247	372	403	372	331		
	1957	2569	181	117	88	82	61	144	184	217	365	442	419	289		
	1958	2327	121	90	65	74	68	79	175	267	327	388	389	284		
	1959	2796	196	113	101	90	61	179	243	281	397	463	401	271		
	1960	2935	211	132	81	71	80	166	216	295	440	464	444	335		
	1961	2825	219	94	81	80	107	160	237	280	424	484	376	283		
	1962	2736	209	105	62	132	49	110	240	255	372	445	432	325		
	1963	2707	205	127	82	76	104	147	156	271	348	493	437	261		
	1964	2847	179	92	87	81	122	129	195	280	378	506	456	342		
	1965	2728	252	91	74	80	128	149	178	303	333	451	405	284		
	1966	3043	271	127	52	73	92	172	262	318	413	474	476	313		

EVAPORATION MEASUREMENT REPORT  
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STATION NUM.		STATION NAME		ELEV		T R S L B		LATITUDE		LONGITUDE		CD.	AGENCY	ENV. CD.
W26 294100		FAIRMONT RESERVDIR-LAW+P *CONTINUED*		3060		07N 15W 11 R 5		34 42 15		118 25 40		LAX	900	
PAN	YEAR	TOTAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
L	1967	2522	242	104	70	85	104	140	111	266	321	438	393	248
	1968	2737	240	109	53	70	79	144	212	290	389	450	378	323
	1969	2706	230	142	79	70	56	142	201	288	313	415	455	315
	1970	2824	201	91	83	76	93	147	203	315	350	502	448	315
	1971	2654	203	163	35	74	111	164	189	234	336	447	409	289
	1972	2704	186	117	42	77	120	211	235	293	338	481	358	246
	1973	2458	149	76	49	54	43	100	198	303	377	456	366	287
	1974	2691E	245	111	72	47E	110	122	196	297	381	401	389	320
	1975	2474	171	104	59	81	74	110	135	273	361	409	410	287
	1976	2511	179	117	80	99	93	141	185	300	364	416	326	211
	1977	2546E	170	115	84	40E	109	141	243	193	367	443	361	280
	1978	2567E	203	123	98	34E	71E	113	142	294	382	449	412	244
	1979		229	85	56	37E	43E	108	210	278				
L	MEAN	2594	193	109	65	68	82	135	190	277	352	437	397	289

STATION NUM.		STATION NAME		ELEV		T R S L B		LATITUDE		LONGITUDE		CD.	AGENCY	ENV. CD.
W26 575600		FAIRMONT RESERVDIR-LAW+P *CONTINUED*		2735		00		35 03 00		118 10 00		KRN	900	
PAN	YEAR	TOTAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
A	1964													317
	1965		223							391	360	429	396	287
	1966		223	93						359	440	478	479	283
	1967		197	112						378	470	413	277	245
	1968		127								466	417	374	350
	1969		192							342	340	423	438	312
	1970		202						257	380	394	444	425	353
	1971		245	141					250	296	386	497	431	319
	1972		214					250	304	359	379	521	428	303
	1973		182	93				132	267	347	412	469	415	318
	1974		227	163	84			167	237	407	431	406		
	1975		191	114				168		324	406	436	399	286
	1976		197	142			133	209	240	363	394	422	351	230
	1977		196		92	66	122	184	282	279	374	451	394	310
	1978		228	124	121	56	105	155	195					
A	MEAN	2946	203	123	99	61	120	181	254	352	404	447	401	301

STATION NUM.		STATION NAME		ELEV		T R S L B		LATITUDE		LONGITUDE		CD.	AGENCY	ENV. CD.
W26 562401		PALMDALE HMS		2662		06N 12W 26 Q S		34 34 31		118 06 50		LAX	410	
PAN	YEAR	TOTAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
G	1932	2559	186	117	79	73	81	165	206	271	323	422	435	331
	1933	2472	207	119	73	50	90	145	187	228	293	432	353	295
	1934	2696	221	126	68	71	93	160	236	323	313	410	397	278
	1935	2406	172	90	46	40	67	98	172	272	395	416	340	298
	1936	2574	196	105	79	93	56	170	195	290	339	385	372	294
	1937	2348	177	113	65	53	62	103	158	252	307	405	375	278
	1938	2446	180	122	69	71	60	110	165	282	371	401	360	255
	1939													172
	1940	1645	134	60	52	46	74	113	139	191	226	235	211	164
	1941	1411	98	53	41	38	42	69	70	147	200	262	209	182
	1942	1853	102	68	60	46	55	116	126	195	249	334	286	216
	1943		135				84	114	139	233	306	347	335	
	1944		162		60	46	71	146	132	161	206	188	244	
	1945		180	93	44	44	54							225
	1946		148	89	74									
	1950					48	68	122	121	176	221	284	260	203
	1951	2516	157	114	86	63	100	164	205	268	285	310	396	358
	1952	2174	183	109	81	42	76	91	146	244	256	326	368	252
	1953	2471	178	93	59	73	126	164	178	232	290	420	358	300
	1954	2382	187	114	92	61	71	98	222	283	296	367	346	245
	1955		192	115	42									
G	MEAN	2217	168	100	65	56	74	126	165	238	287	350	332	256
Y	1946					79	73	124	150	227	322	360	382	258
	1947	1945	153	67	32	54	61	94	139	221	284	301	304	235
	1948	2052	157	74	43	70	79	96	161	207	267	332	312	254
	1949	2099	154	125	59	13	54	118	184	219	300	316	315	242
	1950	1781	140	81	57	48	68	122	121	176	221	284	260	203
	1951	2516	167	114	86	63	100	164	205	268	285	310	396	358
	1952	2174	183	109	81	42	76	91	146	244	256	326	368	252
	1953	2471	178	93	59	73	126	164	178	232	290	420	358	300
	1954	2357	187	114	92	61	71	98	222	283	296	367	346	245
	1955	2520	182	115	42	65	76	146	207	257	328	376	426	300
	1956	2175	202	108	70	87	94	133	180	272	307	373	20	309
	1957	2271	160	85	64	40	28	67	151	236	328	442	373	297
	1958	2289	160	77	42	78	67	84	129	298	332	386	362	274
	1959	2511	175	101	85	56	58	130	197	276	364	419	369	281
	1960	2658	205	123	61	33	93	138	240	304	226	444	450	341
	1961	2721	237	93	40	54	102	151	243	298	418	444	360	281
	1962	2582	201	102	55	51	68	94	223	278	353	442	411	304
	1963	2236	173	105	62	71	83	137	150	264	291	339	345	216
	1964	2421	154	77	46	57	87	124	166	255	326	447	401	281
	1965	2623	201	89	82	72	133	185	169	338	312	390	387	265
	1966	2847	198	80	41	47	62	133	213	344	434	489	500	306
	1967	2040	187	86	62	41	77	149	153	268	228	307	278	204
	1968	2759	180	161	63	57	65	128	240	322	425	462	351	305
	1969	2330	191	122	89	59	59	113	170	241	288	347	389	262

EVAPORATION MEASUREMENT REPORT  
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STATION NUM.		STATION NAME		ELEV	T	R	S	L	B	LATITUDE	LONGITUDE	CD.	AGENCY	ENV. CD.
W28 457140		LAKE ARROWHEAD FS 2		5200	02N	03W	15	D	S	34 15 45	117 10 50	S8D	429	F
PAN	YEAR	TOTAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
F	1895		71	30	9	2	21	28	47	135	168	160	157	128
	1896	366						24	86	73	165	129	140	117
	1897		103	33	31	14	6		76	121				
F	MEAN	950	67	32	20	8	14	26	70	110	167	144	149	123

STATION NUM.		STATION NAME		ELEV	T	R	S	L	B	LATITUDE	LONGITUDE	CD.	AGENCY	ENV. CD.
W28 468440		LAKE GREGORY		4335						34 13 48	117 16 12	S8D	813	
PAN	YEAR	TOTAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
W	1967									122	180	262	277	152
	1968		163	84				102	172	129	221	259	273	204
	1969		140	87						214	161	161	247	197
	1970		134		55				100	161	232	237	285	248
	1971		120	39										
W	MEAN	1588	139	87	55			102	136	157	211	230	271	200

STATION NUM.		STATION NAME		ELEV	T	R	S	L	B	LATITUDE	LONGITUDE	CD.	AGENCY	ENV. CD.
W28 480370		LAS. FLORES RCH-CAL WAT PJ		3160	03N	04W	29	J	S	34 18 52	117 18 50	S8D	813	
PAN	YEAR	TOTAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
	1956										289	521	387	335
	1967	2288	178	90	154	99	77	109	124	225	303	373	344	212
	1968		134	139				124	300	243	347	352	346	290
	1969		201	185						316	236	398	227	245
	1970		188	90	44			243	185	351	461	400	400	307
	1971		208	112										
	MEAN	2550	172	123	99	99	77	159	203	284	294	421	341	278

STATION NUM.		STATION NAME		ELEV	T	R	S	L	B	LATITUDE	LONGITUDE	CD.	AGENCY	ENV. CD.
W28 636801		PILOT ROCK EVAP		0	02N	04W	10	K	S	34 16 16	117 16 53	S8D	813	
PAN	YEAR	TOTAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
A	1960										303	323	301	239
	1961		143	86			93	115	179	204	308	320		
	1962	2130	150	104	90	23	71	124	207	204	256	308	318	275
	1963	2056	161	101	79	59	101	153	132	224	247	321	294	184
	1964		205	108					154	199	228	204	255	241
	1965	1489	176	73	56	30	69	84	59	183	179	241	175	164
	1966	2000	135	49	93	119	157	122	184	186	233	271	260	191
	1967	1595	130	65	38	58	77	104	70	186	195	270	246	156
	1968	1778	162	84	21	52	62	120	153	195	233	255	231	210
	1969		136	88				174	179	238	230	279	311	225
	1970	2177	149	169	56	67	80	157	174	237	237	316	285	250
	1971		149	103			91	142	149	156	240	287	274	220
	1972	1962	135	106	46	49	93	166	176	240	231	331	223	166
	1973		94	53						206	227	280	210	215
	1974	1636E	148	56	33	29	72E	87	142	190	227	221	226	205
	1975		224	74	55	59	59			207	246	283	277	212
	1976	1562E	138	85	52	72	61E	145E	122	205	231	201E	185E	65E
	1977		125	59			76E	100E	129	135E	265	326E	262	193
	1978	1562	146	93	54	30	45	77	89	81	234	272	249	192
	1979		190	122			76	92	134					
A	MEAN	1864	152	88	56	54	80	123	143	193	241	279	255	200

STATION NUM.		STATION NAME		ELEV	T	R	S	L	B	LATITUDE	LONGITUDE	CD.	AGENCY	ENV. CD.
W28 932503		VICTORVILLE 33 SE		2700						34 34 00	117 17 00	S8D	906	
PAN	YEAR	TOTAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
A	1931													
	1932	2064	131	80	49	64	83	173	199	270	268	311	246	206
	1933		145	99	53	58	71	165	197	234	260	305	296	212
A	MEAN	2095	138	90	51	61	84	169	198	252	264	308	271	209

STATION NUM.		STATION NAME		ELEV	T	R	S	L	B	LATITUDE	LONGITUDE	CD.	AGENCY	ENV. CD.
X10 017615		AMBLY BESE SALTUS		625	05N	12E	11	P	S	34 32	115 42	S8D	429	
PAN	YEAR	TOTAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
	1973		205	135	103	127	147	251	455	504	554			
	MEAN	2481	205	135	103	127	147	251	455	504	554			
A	1967													
	1968	4185	298	139	84	134	219	248	289	519	566	624	543	416
	1969	3970	253	197	98	150	177	294	448	543	560	636	462	394
	1970		269	124	149	110	118	274	419	419	478	626	575	403
	1971	4069	271	148	75	141	239	359	408	365	575	611	462	415
	1972	4182	284	204	132	118	276	401	359	495	509	605	449	350
	1973		205	135	103									
	1974													
	1975	3798	267	174	107	137	194	313	357	480	679	559	454	369
	1976	4053	318	163	211	151	164	295	322	458	569	541	527	334
	1977					95	203	274	407		593	502		
A	MEAN	4024	271	168	120	126	198	299	365	463	560	578	491	385

**APPENDIX F**

USGS TOPO