Draft Interim Report

Study Element F: Allegretti Sub Basin as a Source Water Study
Study Element G: IID as a Source Water Study

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Study Element F: Allegretti Sub Basin as a Source Water Study
Study Element G: IID as a Source Water Study

1.0 Introduction

This report describes and analyzes the water source availability from the Allegretti Sub Basin for importation into the Borrego Valley. The water banking potential of the Sub Basin is also preliminarily evaluated.

This interim summary report covers the following study elements of Task F: Allegretti Sub-basin as a Source Water Study:

Task F1 – Coordinate with IID's storage and recovery investigation
Task F2 – Groundwater export issues
Task F3 – Obtain all published reports on the Allegretti Groundwater sub-basin
Task F4 – Obtain well completion reports, production and quality data for the sub-basin
Task F5 – Review of 'source' data from the existing groundwater model
Task F5a – Evaluate the potential use of the County groundwater model
Task F6 - Conduct additional sampling and testing
Task F7 – Identify water level trends and water quality trends
Task F8 – Prepare technical memorandum report
Task F9 – Identify alternative brine disposal options
Task F10 - Evaluate Water Banking issues in the Sub-basin
Task F11- Environmental and regulatory issues identification
Task F12 – Prepare a summary report

The interim report also covers Study Element G: IID as a Source Water Supply for the Borrego Valley and includes the following tasks as included in the scope of work:

Task G1 – Discuss with IID the possibility of 'wheeling' water through their system –
Task G2 – Analysis of IID delivery system for 'Task G3

All of these issues will be briefly explored to define any 'fatal' flaws in their potential use as a supply source for BV.

2.0 Allegretti Sub Basin as a Source Water Supply

2.1 Description of the Allegretti Sub Basin

The Allegretti Sub-basin is located directly east and adjacent to the Salton Sea (Fig. 1). The Sub-basin is situated within the Lower Borrego Valley and within Ocotillo Clark Valley (Ref. 1, basin 7-25) as defined by the California Department of Water Resources (DWR).

2.2 Boundaries of Sub Basin

DWR describes the Ocotillo Valley Ground Water Basin as a 410 square mile basin drained by San Felipe Creek. Based on the map in (Ref. 1) showing ground water basins

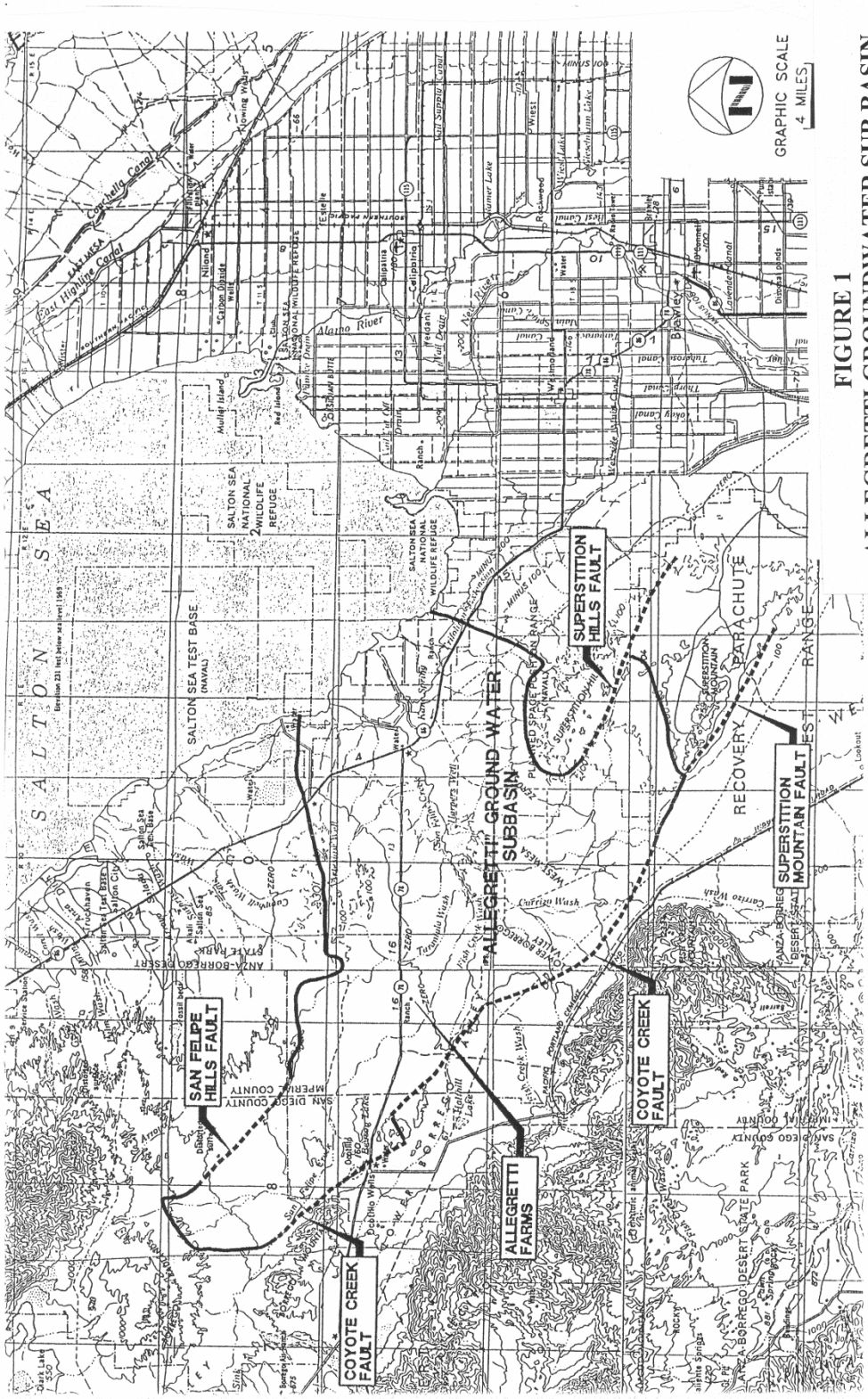


FIGURE 1
ALLEGRETTI GROUNDWATER SUB BASIN

within the Colorado Desert Hydrologic Study Area, the Ocotillo Valley Basin includes Lower Borrego Valley, both upstream and downstream of the Coyote Creek. The natural recharge is estimated at about 1,100 afy.

The Ocotillo Valley Ground Water Basin and its sub basins have not been clearly defined and data pertaining to the basin and sub basin boundaries are sparse.

The Allegretti sub basin has been defined (Ref. 6 - 8) generally as that area bounded on the southwest by the Ocotillo Badlands and the Coyote Creek fault, on the south by the Superstition Hills and the topographic divide between the Coyote Creek Fault and the Superstition Hills Fault, on the north by the San Felipe Hills Fault and the topographic divide between Tule Wash and San Felipe Creek, and on the east by the Salton Sea. For lack of a specific name designation, the ground water sub basin has been named the "Allegretti" sub basin.

2.3 Hydrogeologic Data from Wells within the Sub Basin

Driller's well construction logs for several of the wells identified in this report are included in Appendix A.

A large farming operation, the Allegretti Farms (Farm), has developed within the sub basin a well field for its operation. Much of the data on the hydrology of the sub basin is derived from the Farm's and nearby wells. The locations of the Farm and nearby wells are shown on Figure 2. DWR and the U S Geological Survey (USGS) supplied data concerning water levels and water quality.

The Farm is located situated easterly of the Ocotillo Badlands and the northwest/southeast trending Coyote Creek Fault. The fault is northeasterly of Fish Creek Mountains and northerly of Superstition Hills.

The Coyote Creek fault appears to constitute a ground water barrier as evidenced by data contained USGS Water Resources Investigations (Ref. 10). The reports indicate ground water levels much higher, up to 100 feet, and water quality much better, 1/4th the TDS, west of Coyote Creek fault. The sub basin easterly of Coyote Creek fault, from which the Farm derives its water supply, constitutes the easterly portion of the Ocotillo Valley Ground Water Basin.

There are 13 wells within the immediate vicinity of the Farm, Allegretti Wells 1 through 7, the Jacobs abandoned domestic well within the Allegretti property and the Payne, Gann, Scholl, Steinruck, and Blu-In Park Wells west of Allegretti Farm. There are 5 wells east of Allegretti Farm, the USGS test wells (12S/11E - 18J1 and J2), Harper's Well (12S/10E – 26M), and the two Three Flags Ranch wells (12S/11E – 5 Q).

Jacobs Ranch or Ranch Oasis, the Farm predecessor, constructed the first two wells in 1953 and began farming in 1954. Jacobs Ranch constructed additional wells in 1961 (Wells 2 and 3) and in 1976 (Wells 4, 5, and 6). The Farm assumed ownership of the ranch in the early 1980's and constructed a small domestic well (Well 7) in 1982. Construction and pump discharge data pertaining to Allegretti Farm wells are shown in Table 1.

TABLE 1 ALLEGRETTI FARMS WELL DATA

	WELL NUMBER							
	1	2	3	4	5	6	7	SAN FELIPE
	(12S/9E-23D2)	(12S/9E-22A2)	(12S/9E-15Q)	(12S/9E-27A)	(12S/9E-23G)	(12S/9E-25D)	(12S/9E-23B)	(12S/9E-23D1)
Constructed (year)	1965	1960	1969	1976	1976	1976	1982	1953
Well Depth (feet)	675	667	1,200±	1000	1130	1000	400	580
Perforated Intervals (feet)	260-674	380-667		380-980	350-780, 930-1120	380-1000	340-400	250-565
Pump Discharge (gpm)	1,500	1,800	3,000	2,800	1,800	3,100	N/A	N/A

Water quality data for the Farm wells and nearby by wells are shown in Table 2. The available water quality record was considered sufficient to negate any further testing of the identified wells.

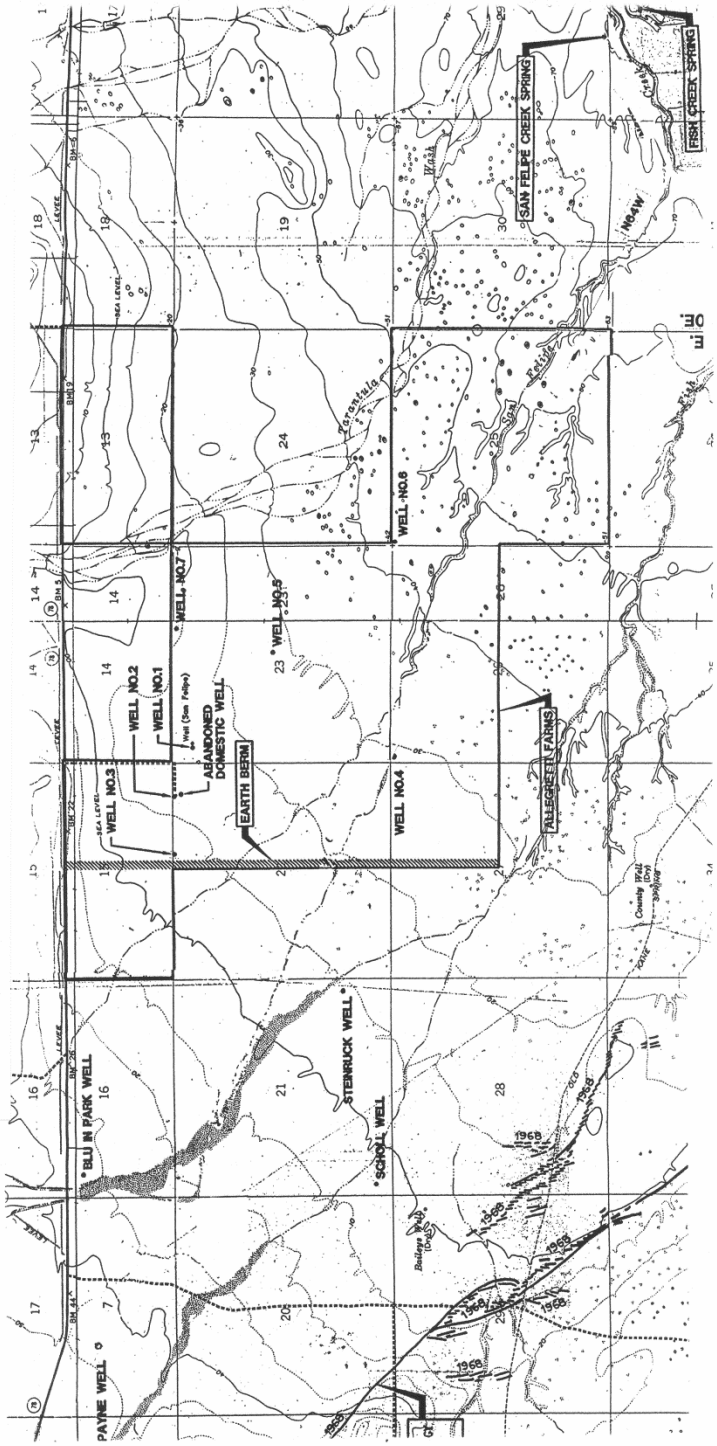


FIGURE 2
LOCATION OF WELLS NEAR ALLEGRETTI FARMS

2.4 Aquifers in the Sub Basin

A review of available well logs, construction information and well water quality suggest conclusively that there exists both a shallow and deep aquifer within the sub-basin. The USGS

(Ref. 9) also substantiates this finding.

The USGS drilled two test wells in 1964 in Section 18 (12S/11E - J1 and J2). Well J1 (artesian), which was drilled to a depth of 958 feet, cased to a depth of 650 feet, and perforated from 310 to 650 feet, had a TDS of 1,420 mg/L. Well J2 (on the same site), which was drilled to a depth of 55 feet and was perforated from 35 to 55 feet, had a TDS of 8,420 mg/L. The USGS concluded that "at this locality the shallow water and deep artesian water evidently are separated by very poorly permeable deposits**".**

2.41 Shallow Aquifer: The Farm's existing wells extend through the shallow aquifer and the underlying aquitard and penetrate the deep aquifer; however, the original Jacobs Ranch domestic well, now abandoned, may have penetrated either aquifers or only the shallow aquifer. For the Jacobs Ranch domestic well, water level data is unavailable; however, water quality data (TDS 5,910 mg/L) indicates significant influence from the shallow aquifer. At least two (Scholl and Steinruck) of five wells situated westerly of the Farm, only penetrate or are only perforated within the shallow aquifer based on water level and water quality. Another well (Payne) penetrates and is perforated within both aquifers, but based on water level and water quality data, it derives its water supply from the deep aquifer. Well and water level data are not available for the Blu-In Park Well and the Gann Well, Gann's property being adjacent to the Payne property; however, a water quality analysis is available for the Blu-In Park well.

The static water levels measured (1995) in the Scholl Well in the southwest corner of Section 21 (12S/19E) and the Steinruck Well in the southeast comer of Section 21 were 91 and 77 feet below ground surface, respectively. The water levels are consistent with an easterly ground water gradient. The static water levels in the Farm's wells and the Payne Well to the west are about 100 feet deeper than the static water levels in the Scholl and Steinruck wells. This significant differential within a short distance appears to also indicate at least two distinct and separate aquifers, one shallow and one deep.

The water quality analyses for the Scholl Well and the Jacobs Ranch domestic well with TDS of 7,900 mg/L and 5,910 mg/L, respectively, indicate markedly higher concentrations than the Farm Wells, the Payne Well, and the Blu-In Park Well with TDS concentrations of 930 to 1,800 mg/L, 4,790 mg/L, and 1,630 mg/L, respectively. TDS concentrations of three to four times greater than the previously mentioned wells appears also confirm the existence of distinct and separate aquifers as indicated by water level differences.

Although water levels and water samples are available from the Scholl Well, the well log is not.

Higher TDS in the shallow aquifer is probably a direct result of residual salts precipitated interstitially with sediments by receding waters of Lake Cahuilla with salts being periodically leached from the soil into the shallow aquifer during infiltration and percolation of surface runoff. The shallow aquifer can be conceptualized as ground water on laterally continuous clay layers, which effectively isolate the lower, less saline aquifer from the higher TDS water above. Few drillers' logs are available to facilitate lateral extrapolation of clay beds, but the logs which are available are credible indicators of persistent clay strata in the subsurface.

TABLE 2 WATER QUALTY DATA (mg/L)

Well	STATE WELL NUMBER	SAMPLE DATE	TOTAL DISSOLVED SOLIDS	Hardness	Sodium	Sulfate	Chloride
Allegretti Well No. 1	12S/9E-23D2	9/25/1962	1,650	530	381	388	628
		7/29/1963	1,740	534	409	425	645
		2/26/1965	1,687	488	380	393	574
		12/3/1969	1,724	492	387	--	568
		8/23/1991	1,673	--	370	405	630
		6/20/2002	1,400	390	360	350	500
		9/22/1995	1,790	510	390	630	61C
Allegretti Well No. 2	12S/9E-22A2	9/25/1962	1,580	486	372	388	578
		7/29/1963	1,560	442	383	400	55C
		8/15/1967	1,817	344	468	--	682
		12/3/1969	1,852	516	413	--	653
		4/18/1983	--	---	425	566	603
		8/23/1991	1,477	-	345	349	530
		9/22/1995	1,540	423	350	380	550
		6/20/2002	1,200	350	280	270	450
Allegretti Well No. 3	12S/9E-2281	8/29/1967	---	480	390	450	603
		12/2/1969	1,806	344	441	---	596
Allegretti Well No. 4	12S/9E-27A	8/29/1967	--	250	520	405	710
		4/18/1983		-	418	499	561
		11109184	---		320	310	485
		8/23/1991	1,553		355	391	528
		4/7/1993	1,548	--	370	380	54C
		9/22/1995	1,660	445	365	510	58C
Allegretti Well No. 6	12S/9E-25D	4/18/1983	---	---	258	345	348
		8/23/1991	1,243	---	258	256	490
		9/22/1995	1,200	350	256	280	500
Allegretti Well No. 7 (domestic)	128/9E-236	4/7/1982	880	217	232	240	312
		9/22/1995	930	198	245	230	410
Jacobs Abandoned Domestic Well	12S/9E-22AI	7/29/1963	5,910	1,880	1,360	1,850	2,000
Payne Well	12S/9E-17L	9/22/1995	1,790	451	455	520	800
Scholl Well	12S/19E-21N	9/22/1995	7,900	2,090	1,740	3,200	3,100
Blu-In Park Well	12S/19E-16M	9/22/1995	1,630	253	455	640	510
San Felipe Well	12S/9E-23D1	3/5/1955	1,840	602	439	412	724
San Felipe Spring		9/22/1995	14,800	3,460	3,900	5,800	5,000
Fish Creek Spring		8/21/1995	11,000	2,240	2,750	4,000	2,800
San Feiipe Creek @ Highway 86 (99)		8/21/1995	9,700	1,950	2,550	3,600	2,800

2.411 Surface Discharge of Shallow Aquifer Water to San Filipe and Fish Creek Springs

The shallow aquifer is an unconfined system. The ground water levels at the School and Steinruck wells when projected eastward, intersect the ground surface at approximately the same elevation as the springs in San Felipe and Fish Creeks in Section 32, (12S/9E). Thus, it is reasonably certain that the spring's water emanates from the shallow aquifer.

2.32 Deep Aquifer

The deep aquifer is, according to well logs, at least partially confined. The paucity of well logs for local wells makes lateral correlation of confining clay layers difficult; however, the well logs that are available indicate persistent clay layers from 2 to approximately 200 feet below ground surface.

The Farm is the principal pumper from the deep aquifer. Westerly of the Farm, the Payne, Gann, and Blu-In Park are the only pumpers that depend on the deep aquifer and they produce small quantities of ground water for limited use, essentially dust control and landscape irrigation.

Easterly of the Farm, the Three Flags Ranch extracted ground water for irrigation purposes for a very short period of time after the property was developed in the mid-1980's. Its first ground water extraction well was constructed in 1982 and 1,000 to 1,200 acres of citrus crops were planted. Reportedly, Three Flags Ranch immediately discontinued use of the ground water in favor of Colorado River water from Imperial Irrigation District. Three Flags Ranch longer pumps ground water from the deep aquifer, but it is allowing artesian surface water discharge.

The Farm (and its predecessors) began farming in 1954. From 1983 through 1996, excluding 1990, ground water production ranged from 3,250 afy to 6,050 af, averaging 4,400 afy during the last four years. During the 42 year period, ground water levels have declined but water quality has remained unchanged, particularly in Wells 1 through 4 where TDS has ranged between 1,500 mg/L and 1,850 mg/L. The TDS for Well 7 has ranged from 880 mg/L to 950 mg/L, about half the maximum TDS recorded in the deep aquifer and very similar to TDS in Harper's Well.

Harper's Well (12S/I0E-26M) constructed to a depth of 320 feet but perforation intervals are unknown. TDS was measured at 995 mg/L, 1,030 mg/L, and 1,030 mg/L in 1918, 1949, and 1962, respectively, indicating the well is perforated in the deep aquifer. TDS concentrations in Well 7 and Harper's Well indicate potentially better water quality in the upper levels of the deep aquifer, at least easterly of the Farm.

The Payne Well penetrates and is perforated within both the shallow and deep aquifers, indicating water extracted from the well would be a mixture of higher TDS water (shallow aquifer) and lower TDS water (deep aquifer); however, static water levels indicate water extracted from the well is water from the deep aquifer. An extraction blend of about 8% from the shallow aquifer (TDS 7,900 mg/L per Scholl Well) and about 92% from the upper levels of the deep aquifer (TDS 900 mg/L per Well 7) could account for TDS in the Payne Well being similar to TDS in the deeper Farm Wells.

The San Felipe Well, designated here as the USGS Monitoring Well, (12S/9E - 23D1) and located adjacent to Allegretti Well No. 1, was a producing well until the early 1960's, when the pumping unit was removed and it became a monitoring well. The USGS has monitored the well since 1953. Figure 3 shows the long term decline in water levels at the well.

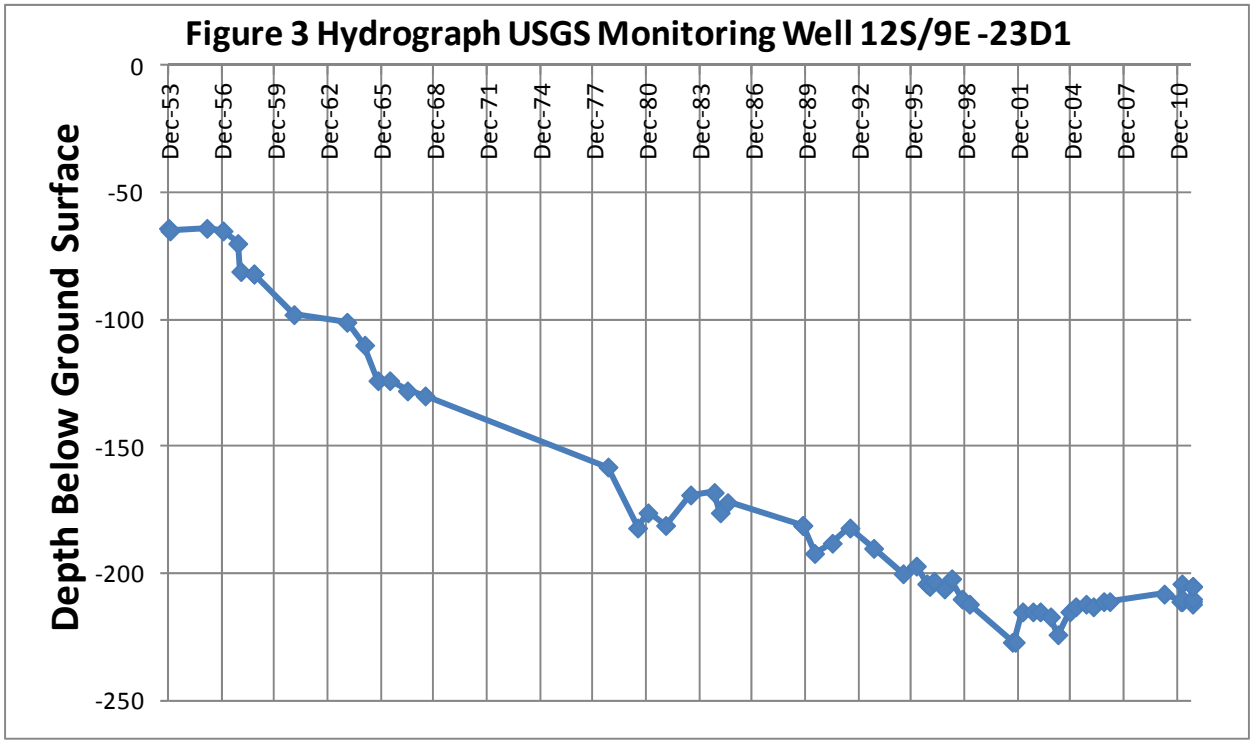
2.4 Groundwater Overdraft

2004 report (Ref. 11) using satellite information concluded that there was land subsidence at the Farm due to groundwater withdrawal. This, coupled with the long term decline in groundwater levels to about the year 2001, is evidence that the Allegretti Sub Basin was in a

state of overdraft for many years. However, Figure 3 shows that the long term decline has been reversed and that water levels are slowly rising. This would indicate that the basin is no longer in overdraft.

It is uncertain why the reversal occurred, but a court decision in 2004 suggests that the Farm needed to redevelop one of their production wells but were denied that action. The following is a brief summary of the findings of the Appeals Court.

In 1994, Allegretti & Company, which owns 2,400 acres of land, filed an application for a conditional use permit to redrill an inoperable well. The well, one of several on the property, would provide water for crop production on 200 acres. Nearly three years later, the county approved the permit but with a condition limiting Allegretti's draw of groundwater to 12,000 acre-feet per year from all wells on site." The court stated that although Allegretti has superior groundwater rights as an overlying user, those rights are restricted to reasonable beneficial use consistent with Article X, §2 of the state constitution. The court also said that Allegretti did not identify or challenge county's underlying reasons for the county's action, nor did it explain why county's limitation is in any way arbitrary and that as long as a governmental entity engages "in decision-making whose purpose is not delay for delay's sake but legitimate oversight," there is no compensable taking, the court concluded.



2.6 Storage Capacity

In 1970 a consulting firm (Ref. 5) defined the ground water basin from which Allegretti Farm derives its water supply as encompassing 150 square miles. The capacity was defined by assuming an average aquifer specific yield 20% and a thickness of 300 feet at 5,800,000 af.

2.7 Discharge to Salton Sea

Based on tests performed by the USGS, ground water discharge to the Salton Sea is

estimated at about 2,240 afy (Ref. 9).

2.8 Water Banking Issues in the Sub Basin

For this analysis, it is assumed that the storage water for a water bank would be Colorado River Water (CR) with a TDS of approximately 700 mg/L, as CR water is the only available water in the region.

The development of a water bank in the Sub Basin would be difficult for several reasons. First is that surface recharge to the basin would store water in the shallow aquifer. This aquifer contains ambient water with high concentrations of salts (6,000 – 8,000 mg/L TDS). Recharge waters would gradually mix with the native waters producing water requiring substantial demineralization for the recovery phase of a water bank. Further, since it appears that the shallow aquifer is discharging to the San Filipe and Fish Creek springs, the recharged water would increase the eastward gradient toward the spring discharge and in time would be lost through increased spring discharge. The amount of increased discharge would be considered a loss of banked water thus diminishing the amount storage water available for recovery.

Since the deep aquifer is considered to be confined, the recharge of banking water must be by injection wells. Several issues must be considered: the injection pressure 'mound' at the injection well field could limit the injection amounts as higher deep aquifer water levels might cause upward leakage into the shallow aquifer. The upward seepage would reduce the amount of stored water. An injection mound would also increase the eastward gradient and accelerate the subsurface discharge to the Salton Sea. The amount of increased discharge would be considered a loss of banked water thus diminishing the amount storage water available for recovery.

Additionally, the extraction of the injected water would at some point would begin to extract a blend of the native deep groundwater (1,600 – 1,800 mg/l TDS) and to a level above the 700 mg/L concentration. This would limit the storage of bank storage water.

Further, recharge by injection would require that the water be treated to reduce the suspended solids levels to near zero in order to reduce well clogging. The treatment would be by microfiltration but would add an additional layer of expense to a water banking operation.

While the recharge of CR water would not be considered a discharge of a waste, the California Water Quality Control Board maintains authority over the discharge of any waters into the waters of the state, including ground waters. The Board's interest is in the 'non-degradation' of the ambient ground water. The recharge of CR water into the shallow or deep aquifers of the Allegretti Sub Basin having higher TDS concentrations than CR water therefore would not be problematic to the Board. However, the Board would need to consider and approve the project. A waste discharge requirement (WDR) permit would be issued by the Board.

One positive factor in developing a water bank in the sub basin is the low pumping lift that would be required to transport the bank water from the IID system to the Farm area. The IID West Side Main Canal is at an approximate elevation of 30 feet below sea level and the Allegretti Farms elevation is about 15 feet below sea level.

A major issue in any banking project is the location of the area that would beneficially use the recovered bank water. There must be sufficient beneficial use downstream from the point of entry of the banked water into the distribution system of the receiving agency. If there were insufficient demand for the water at the distribution system entry point, a pumping station and delivery pipeline would need to be constructed to deliver the water to some other location, but this would add additional costs to the banking program. No study has been made regarding

this issue. However, as indicated in Section 2.9, the Allegretti Sub Basin is not an attractive location for a water bank.

2.81 Imperial County Groundwater Model

The County of Imperial contracted with a consulting firm in the 1990s to develop a numerical model of the groundwater resources in the county (Ref. 16). It is known as an Integrated Groundwater Surface Water Model (IGSM) and is finite element based. The 1995 model included a large portion of the sub-basin of interest. However, the IID staff conducting the storage and recover investigation described in Section 3.1 of this report, indicate that the model is not being used by IID to evaluate potential water banking projects. Further, their evaluation of the model is that it is basically a water balance model and not useful for storage and recovery analyses.

A verified model is a necessary tool to evaluate any water banking project. Unfortunately, none are available for the study area.

2.9 Conclusions

While the Sub Basin is located near the IID water transmission system and the pumping lift from the IID system to the recharge area is small, the hydrogeologic nature of the sub basin has several major drawbacks: (1) the water quality of the shallow aquifer and its apparent hydraulic connection with the San Filipe and Fish Creek Springs would require the recharge water to be injected into the deep aquifer, (2) the quality of the deep aquifer is nearly 2 1/2 times saltier than the CR water, thus reducing the amount of recovery of the banked water due to mixing with the native waters, (3) recharge by injection would require filtration of the injected water prior to injection and (4) the injection mound would likely cause upward leakage into the shallow aquifer as well as an increase in subsurface discharge into the Salton Sea.

For these reasons, the Allegretti Sub Basin is considered a poor prospect for developing a water bank.

3.0 Imperial Irrigation District as a Source Water Source for Borrego Valley

3.1 Imperial Irrigation District's (IID) Storage and Recovery Investigation

In December of 2009, the IID announced the initiation of a water storage and recovery investigation to store surplus water in such times that their needs are less than their available supplies. These recharged supplies would be available for subsequent extracting and deliver into the system in years when their need exceeds their available supplies. With storage criteria established, the IID investigation proceeded to conduct a preliminary assessment of four groundwater recharge sites located in basins in or near their delivery system. Unfortunately, these sites did not include the Borrego Valley area or the Allegretti Sub-basin as neither site met the established criteria. The primary criteria included storage within IID's service area and at minimal cost.

The preliminary assessment of these four recharge sites was presented to the IID Board at a workshop on March 29, 2011. The assessment identified the opportunities and challenges of each site. The sites included East Mesa, Painted Canyon, Thomas Levey and Martinez Canyon.

The potential of recharge and groundwater storage (and water banking opportunities) of surplus Colorado River water in the Borrego Valley groundwater basin and the Allegretti Sub-basin have been presented to the management team at IID on numerous occasions (7/07, 8/08

and 1/10). Additionally, Mr. Jerry Rolwing informed the IID Board at the March meeting that the Bureau of Reclamation (BOR) was under an agreement to conduct a regional study of the water banking opportunities. Also, a citizen resident of Borrego Valley spoke in favor of including the Borrego Valley groundwater basin for further analysis.

Nonetheless, the IID did not agree to include Borrego or Allegretti for further study. They selected, for future study; the East Mesa site in Imperial County and the Painted Canyon site in Coachella Valley (Riverside County). Discussions with the IID staff indicated the following problems are associated with recharging the Borrego and Allegretti basins:

While their primary reason for not proceeding with the Borrego Basin was the lack of a pipeline to convey and recover the water they indicated that the cost to transport water to the Borrego basin is the major inhibitor. They cited an elevation difference of more than 700 feet between IID and Borrego and a distance of more than 30 miles. The cost of transportation was far more that IID considered acceptable, which is the range of $25 to $50 per af. (Preliminary estimated costs to import water into the Borrego area are about $425 per af, of which about $165/af is for energy – Ref. 12).

3.2 Groundwater Export Issues

The Allegretti sub-basin area is located within the Imperial County. The County has adopted a General Plan component which requires obtaining a license to export groundwater out of the County. Excerpts from the General Plan appear to generally prevent export of groundwater from the Imperial County, as indicated by the following sections:

> 92203.01 Exportation permit: Unless otherwise exempt, no groundwater shall be exported from the county or from the groundwater basin from which the groundwater is derived unless the operator of the exportation facility has applied for and obtained a permit which establishes the quantity of groundwater which may be exported and the conditions on such exportation.
>
> 92203.02 Excess supply required for exportation : The commission shall not issue any permit to export water from the county or from the groundwater basin from which the groundwater is derived unless the applicant has established that there is an available supply in excess of the amount currently required for reasonable and beneficial uses within the county, and the commission determines that such export, if permitted, would not adversely affect the rights of groundwater users within the county or the groundwater basin from which the groundwater is derived. The commission shall issue permits for export for such time periods and under such other terms and conditions, including the right to reduce or suspend exports, as the commission determines appropriate.

Discussions with Imperial County will be necessary to determine if they would accept a water trade to allow for export of the water from the Allegretti Farm or some other form of compensation.

3.3 Wheeling Water through the Imperial Irrigation District System

Since the only imported water available in the region is CR water, it has been proposed that a connection to the IID system for a pipeline that would deliver CR water to the Borrego Valley be constructed. This proposed project is the subject of this study and has been conceptualized on several occasions. Routing of the pipeline to BV is discussed earlier in this report.

Conceptually, CR water is fully appropriated by several entities that have established long term rights to the CR water. Thus, in order to obtain an imported supply to BV, a contract for State Water Project (SWP) water must be obtained. That water would be exchanged through the MWD system into the CR for delivery through the IID system to some point of discharge to the proposed pipeline to BV. Thus, the conveyance of water from the CR through the All American Canal and the IID system must be evaluated for delivery capacity in those two conveyance systems.

Conceptually, the transmission of water through the All American Canal could be through the use of the capacity rights in that canal held by the City of San Diego.

The IID West Side Main Canal is the probable delivery system to an export pipeline to BV. The capacity of the canal, which has recently been increased, is 1,200 cfs.

Prior to this discussion, it should be realized that the quantity and rates of flow of water to BV are almost di minimis as compared to the flows of the IID and Coachella Valley Water District. For example, the IID water right on the CR is 3,100,000 afy.

Prior studies have estimated the need for imported water in BV at about 14,000 afy. (If this amount were delivered on continuous basis, the flow rate would be about 20 cfs.) This is the estimated current overdraft. The overdraft is considered stable in accordance with existing development restrictions.

Water Banking needs for water would be in addition to the overdraft correction amount. For example, a 100,000 af water bank would be developed over a series of years. Current thinking is that surplus waters in the SWP may occur in only 3 years in a 10 year period. Thus, the 100,000 af water bank would require roughly 33,000 af of delivery capacity in each of the three years. To this amount, the annual overdraft would need to be added bringing the total to about 50,000 af in a few years. If this were delivered on a continuous basis, the capacity flow rate would be about 70 cfs. Assuming that IID's delivery capacity during the height of the growing season might require their entire capacity, it is assumed that the BV deliveries would require about twice the 70 cfs during the irrigation off peak season. Thus, about 11% of the capacity of that canal would be need in those years. In other years, 7 of 10, the BV need would be only about 20 cfs.

While the required BV flows appear small relative to canal capacities, the IID has indicated that their system occasionally delivers at maximum rate in order to satisfy their customers and that a BV export would be treated as an additional customer, subject to the IID water delivery policies and regulations.

Negations with IID coupled with a thorough distribution system study, which should be conducted by IID, would needed in order to appropriately assess any capacity limitations and possible mitigation for the BV deliveries to occur.

3.4 IID Irrigation Return Flows

A potential source of water for the Borrego Valley might be the irrigation return flows emanating from the vast agricultural area of the Imperial Valley. These flows are subject to water quality regulations of the Colorado River Basin Water Quality Control Board, Region 7 (Board). The regulations are designed to protect several Board designated beneficial uses, including Recreation 1 and 2 and Wildlife. Nonetheless, the chemical composition of these flows is typical of agricultural return flows and as such would require substantial treatment, including microfiltration, reverse osmosis and ultra-violet disinfection to meet direct drinking water standards or ground water recharge in the Borrego Valley. The water quality standards to meet the designated beneficial uses are contained in Ref. 14.

In order to obtain a right to reclaim this water, an appropriation permit would need to be obtained from the State Water Resources Control Board (State Board). These flows appear be subject to appropriation under the California Water Code, Section 1202:

> *The following are hereby declared to constitute unappropriated water:*
>
> *(a) All water which has never been appropriated and,*
>
> *(d) Water which having been appropriated or used flows back into a stream, lake or other body of water.*

Further, Section 1243 of that code states:

> *The use of water for recreation and preservation and enhancement of fish and wildlife resources is a beneficial use of water. In determining the amount of water available for appropriation for other beneficial uses, the board shall take into account, whenever it is in the public interest, the amounts of water required for recreation and the preservation and enhancement of fish and wildlife resources.*

And Section 1243.5 states:

> *In determining the amount of water available for appropriation, the board shall take into account, whenever it is in the public interest, the amounts of water needed to remain in the source for protection of beneficial uses, including any uses specified to be protected in any relevant water quality control plan established pursuant to Division 7 commencing with Section 13000) of this code.*

The return flows are an essential water supply component of the Salton Sea and are currently serving downstream beneficial uses. With Salton Sea water levels falling, it is very likely that any attempt to appropriate a portion of these return flows would be met with opposition from several sources. The probable outcome would most likely be denial of the permit.

In the unlikely event that a permit were granted, as indicated earlier, a costly water treatment system would need to be constructed to convert the irrigation flow quality to meet drinking water standards. And, since the irrigation flow result from the application of irrigation water in the Imperial Valley, any modification to the irrigation practices, such as the development of on farm return flow recycle systems, would diminish the return flow quantities. In other words, a permit to appropriate the return flows, would not guarantee the continuation of those flows in the future.

Consequently, the prospect of obtaining Imperial Valley irrigation return flow as a potential source of water for Borrego Valley is dismissed from future consideration.

3.5 Brine Disposal

In spite of the conclusion in Section 2.9 of this report, which concluded that the Allegretti Sub Basin is a poor prospect for developing a water bank, it should be evaluated as a possible water supply source for BV.

As indicated in Section 3.2 of this report, the County requires a permit for ground water export and the demonstration that the proposed ground water export is in excess of the amount currently required for reasonable and beneficial uses within the county, and would not adversely affect the rights of ground water users within the county or the ground water basin from which the ground water is derived.

Figure 3, in Section 2.4 of this report, clearly indicate that the Sub Basin was in a state of overdraft until about 2001. The rise in water levels after that point appears to indicate that the basin is no longer in overdraft and that there is an excess above present needs in the basin. Such a statement is speculative and would need to be confirmed by other water level data.

However, if the Allegretti sub-basin is determined to be a feasible water supply source for BV, then a desalting facility would be needed to reduce the salinity of the deep aquifer water to meet direct potable use or for ground water recharge. It is assumed that the facility would be located on the Farm property. Thus, brine disposal alternatives would need to be developed and analyzed. The alternatives include discharge into an existing spring located east of the Farm, a pipeline from the desalting facility to the Salton Sea or the use of evaporation ponds.

Evaporation ponds would need to be double lined in order to protect ground waters. Even with the high evaporations rates in the area, evaporation ponds require large areas to be effective. BWD's experience is that the requirement for double liners make this brine disposal alternative expensive as compared to surface discharge to nearby areas via a pipeline.

Discharge directly to the Salton Sea would require a 22 mile pipeline. A much closer discharge point would be to the San Filipe or Fish Creek Springs, a distance of about 4 miles from a desalting facility at the Farm. Table 2 includes water quality analyses at these two springs. TDS values, respectively, were 14,800 mg/L and 11,000 mg/L at these springs (sampled in 1995).

A desalting facility with an 85% recovery would produce a brine flow with a concentration (assuming an input concentration of 1,800 mg/L from the deep aquifer) of about 12,000 mg/L. Thus, the permeate quality would be compatible with the concentration of either spring water.

There are a number of environmental issues associated with a discharge to either spring. For example, the San Felipe Spring is the residence of an endangered fish, which is sensitive to chemicals that are or have been used in agricultural operations at the Farm. Since the deep aquifer appears to be confined, any agricultural chemicals that may have percolated through the soil would have been prevented from penetrating the deep aquifer by its' overlying aquitard. Further testing of the deep aquifer's water would be necessary.

Also, the permeate from the desalting facility is a waste discharge and as such is subject to permit requirements from the Colorado River Water Quality Board.

The above analysis assumes a water treatment facility located at the Farm. An alternative is the placement of the treatment facility in the BV. This would allow the deep aquifer well water to be transported and distributed with minimal treatment for landscape and recreation uses. Only the water intended for direct or indirect potable use would need the advanced treatment. The major drawback to this alternative would be the disposal of the brine flow. Costly

evaporation ponds would appear to be the only reasonable disposal means. Further study of this issue would be need and is beyond the scope of this feasibility study.

4.0 References

Published reports are listed as follows:

1. California Department of Water Resources, California's Groundwater Bulletin 118 - Update 2003
2. ----------, Water Wells and Springs in Borrego, Carrizo, and San Felipe Valley Areas, San Diego and Imperial Counties, California, Bulletin 91-15, January 1968
3. County of Imperial, Imperial County Groundwater Study, Final Report. Montgomery Watson, December 1995.
4. Court of Appeal, Fourth Appellate District Division One, State of California, Allegretti & Company v. County of Imperial. D045156
5. Koebig & Koebig, Inc. Adequacy of Water Supply, Ranch Oasis State Highway 78, Imperial County. January, 1970
6. ----------, Hydrogeologic Investigation for Allegretti Farm W Western Imperial County, November 1995.
7. ----------, Incorporated. Supplement to Hydrogeologic Investigation for Allegretti Farm Western Imperial County, revised February 1997
8. ----------, Incorporated. Supplement to Hydrogeologic Investigation for Allegretti Farm Western Imperial County, October 25, 2002
9. U. S. Geological Survey, Geohydrologic Reconnaissance of the Imperial Valley, California, Geological Survey Professional Paper 486-K. 1975
10. ----------, Water-Resources Investigation Reports 83-4116 – A, B and C, 1984.
11. Van Zandt, Afton, surface deformation in the Western Salton Trough as observed by InSAR, San Diego State University, San Diego California, 2004.
12. Borrego Water District. Integrated Water Resources Mangement Plan, Mach , 2010
13. Court of Appeal, Fourth Appellate District, Allegretti & Co. v. County of Imperial, No. D045156, Super. Ct. No 94756. Filed March 28, 2006. Ordered published April 26, 2006.
14. Colorado River Water Quality Control Board, Region 7, Basin Plan, June, 2006.
15. Borrego Water District, Integrated Water Resources Management Plan, March 2009
16. County of Imperial, Imperial County Groundwater Study, final report, prepared by Montgomery Watson, December, 1995.

5.0 APPENDIX A

Well Log Information

JACOBS ABANDONED DOMESTIC WELL

ORIGINAL
File Original, Duplicate and Triplicate with the
DIVISION OF WATER RESOURCES
P. O. BOX 1079
SACRAMENTO 5, CALIFORNIA

WATER WELL DRILLERS REPORT
(Sections 7076, 7077, 7078, Water Code)
STATE OF CALIFORNIA—DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

ABANDONED DOMESTIC WELL NEAR WELL 2

State Well No. 12S/9E - 22
Other Well No.
Region 7

(1) DRILLER: (person, firm, or corporation)
Name MANN BROTHERS
Address P.O.BOX#755
THERMAL, CALIFORNIA.

5100' & 800' W. of SE Cor. of ¼ Sec. 22
Plotted on Borrego Mountain SE. (72-66)
well log card made ERJ 11/6/63

OWNER:
Name PAUL B. ZILK*
Address 3501 STERNE STREET
SAN DIEGO, CALIFORNIA.

* USGS has one T.M. Jacobs listed as owner

(2) Proposed Use (Check)

				Equipment	
Domestic	X	Industrial		Rotary	X
Irrigation	X	Test Well		Cable	
Municipal		Other		Dug Well	
				Other	

(3) CASING:

151	ft. of	6"	in I.D.	lb./ga. casing		left in well
161	"	6"	" I.D.	"	" 10 ga	" " "
100	"	6"	" O.D.	"	" 10 ga	" " "
	"		"	"	"	" " "
	"		"	"	"	" " "

Type and size of shoe or well ring

(4) PERFORATIONS:
Type of perforator used Acetylene Torch
Perforated 312 ft. to 412 ft. 6 rows holes per 6" in.
Diameter of perforations in., length in.

(5) WATER LEVELS:
Was electric log made of well? ☐ Yes ☒ No If yes, attach copy.
Depth at which water was first found Rotary Drilling ft.
Standing level before perforating " " ft.
Standing level after perforating " " ft.
Note your observation of any change in water level while drilling --
Was a surface sanitary seal provided? No

(6) WELL PUMPING TEST:
Capacity gal./min. ft. draw down
Was well gravel packed? No
Were any strata sealed against pollution? Upper stratas w/mud
Temperature -- Was a chemical analysis made? Attach copy
If abandoned was well capped? Not abandoned

(7) TYPE OF WORK (check):
New well ☒ Reconditioning of well ☐

(8) LOCATION OF WELL:
County ~~San Diego~~ Imperial
R. F. D. or Street No.
NE¼ of NE¼ of Sec. 22 Twp 12
Range 9E S.B.B.M.

(9) WELL LOG:
Total depth of well 412

Formation: Mention size of water gravel—

0	ft. to	25	ft.	Clay w/Fine Sand Streak
25	"	47	"	Coarse Sand
47	"	69	"	Coarse & Medium Sand
69	"	90	"	Gravel w/Clay
90	"	111	"	Coarse Sand w/Clay Strea
111	"	133	"	Coarse Sand w/gravel
133	"	143	"	Clay
143	"	153	"	Coarse Sand
153	"	166	"	Clay w/Coarse Sand Strea
166	"	174	"	Gravel
174	"	194	"	Clay
194	"	217	"	Clay w/Fine Sand Streaks
217	"	244	"	Fine Sand w/Clay Streaks
244	"	270	"	Clay w/Coarse Sand Strea
270	"	283	"	Gravel and Rocks
283	"	304	"	Gravel, Coarse Sand w/Sh
304	"	316	"	Clay w/Large Gravel
316	"	326	"	Medium & Coarse Sand
326	"	343	"	Med & Coarse Sand w/Clay
343	"	347	"	Cemented Sand
347	"	362	"	Clay w/Coarse Sand Strea
362	"	379	"	Coarse Sand w/Clay
379	"	390	"	Clay w/Coarse Sand Strea
390	"	402	"	Clay
402	"	412	"	Clay w/Coarse Sand
412	"	445	"	Clay w/Coarse Sand

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MICROFILMED

Work started 19 , Completed
Date of Report April 28, 1953.

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

[SIGNED] MANN BROTHERS
Well Driller
By Lowell R. Mann Partner
License No. 113457 Classification C-57
Dated April 28, 1953. 19

PAYNE WELL

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
WATER WELL DRILLERS REPORT
PAYNE WELL

Do not ...
No. D93882

State Well No.
Other Well No.

154185

OWNER: Name Gary S. Payne
8415 La Rouche Dr.
San Diego Zip 92119

LOCATION OF WELL (See instructions):
County San Diego Owner's Well Number
Address if different from above Off Hwy 78-Ocotiilo Wells
Township Range Section
Distances from cities, roads, railroads, fences, etc.

(3) TYPE OF WORK:
New Well ☒ Deepening ☐
Reconstruction ☐
Reconditioning ☐
Horizontal Well ☐
Destruction ☐ (Describe destruction materials and procedures in Item 12)

(4) PROPOSED USE:
Domestic ☒
Irrigation ☐
Industrial ☐
Test Well ☐
Stock ☐
Municipal ☐
Other ☐

WELL LOCATION SKETCH

EQUIPMENT:
Rotary ☒ Reverse ☐
☐ Air ☐
☐ Bucket ☐
mud

(6) GRAVEL PACK:
Yes ☒ No ☐ Size #4 x #7
Diameter of bore
Packed from 4 yds. to

CASING INSTALLED:
Steel ☒ Plastic ☐ Concrete ☐

(8) PERFORATIONS:
Type of perforation or size of screen

Diam	To ft.	Dia. in.	Gage or Wall	From ft.	To ft.	Slot size
	51	8 5/8" x .188"		140	170	1/16" x 1½" x 7 row
				228	235	
	316	5"	class 160 PVC			

WELL SEAL:
Surface sanitary seal provided? Yes ☒ No ☐ If yes, to depth 50 ft.
Strata sealed against pollution? Yes ☐ No ☐ Interval ft.
Method of sealing cement grout

(10) WATER LEVELS:
Depth of first water, if known ft.
Standing level after well completion 202.5 ft.

(11) WELL TESTS:
Was a well test made? Yes ☒ No ☐ If yes, by whom? R. Anderson
Type of test Pump ☐ Bailer ☐ Air lift ☒
Depth to water at start of test ft. At end of test ft.
Discharge 90 gal/min after hours Water temperature
Was a chemical analysis made? Yes ☐ No ☒ If yes, by whom?
Was electrical log made? Yes ☐ No ☒ If yes, attach copy to this report

(12) WELL LOG: Total depth ft. Depth of completed well ft.

from ft.	to ft.	Formation (Describe by color, character, size of material)
0	23	Loose coarse sand & gra
23	25	Silty
25	38	Loose sand & gravel
38	48	Red (rose) clays
48	50	Silt
50	107	Sand and gravel general
		loose w/streaks of clay
107	114	Sand & gravel, loose an
		fast drilling.
114	115	Silty
115	124	Sand & gravel
124	130	Silty sand and gravel
130	138	Sand and gravel
138	141	Cemented sand & gravel
141	156	Silty sand & gravel
156	162	Silty sand & gravel ver
162	175	Silt
175	193	Rose clay
193	202	Cream colored clay
202	213	Consolidated sand and s
		gravel
213	220	Clay
220	238	Consolidated sand
238	248	Semi consolidated sand
		gravel
248	253	Looser semi-consolidate
		and gravel.
253	282	Consolidated sand & gra
282	297	Rocks or cemented sand
		gravel 295-216 Consoi
PERFORATIONS CON'T		sand-drills sl
245	247	1/16" x 1½" x 7 row
253	260	" " " "
280	307	" " " "

Work started 2/20/ 19 81 Completed 2/28/81 19

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
SIGNED R. Anderson (Well Driller)
NAME Rex E. Anderson (Person, firm, or corporation) (Typed or printed)
Address P.O. BOX 384
City Julian Zip 920
License No. A 305739 Date of this report 3/6/81

Form 188 (REV. 7-78) IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

SOLIDARITY BUSINESS
NOT FOR RESALE

ALLEGRETTI WELL NO.

DUPLICATE
File Original, Duplicate and Triplicate with the
REGIONAL WATER POLLUTION
ROL BOARD No._____
ppropriate number)

WATER WELL DRILLERS REPORT
(Sections 7076, 7077, 7078, Water Code)

STATE OF CALIFORNIA
WELL 2

Do Not Fill In
No 59043
State Well No. 12S/9E-22
Other Well No.

OWNER:
Theodore M. Jacobs
ess 530 Broadway
San Diego, California

(2) LOCATION OF WELL:
County Imperial Owner's number, if any—
R. F. D. or Street No.
The NE 1/4 of the NE 1/4 of Section 22, T 12, S., R 9E, SBB&M

(3) TYPE OF WORK (*check*):
New well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 11.

(4) PROPOSED USE (*check*):
Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☒ Test Well ☐ Other ☐

(5) EQUIPMENT:
Rotary ☒
Cable ☐
Dug Well ☐

(6) CASING INSTALLED:
SINGLE ☒ DOUBLE ☐

From ft.	to ft.	Diam.	Gage or Wall
0	287	14" O. D. x 5/16"	
287	667	12-3/4" O.D. x 1/4"	

ad size of shoe or well ring

If gravel packed

Diameter of Bore	from ft.	to ft.
24"	245'	667

Size of gravel: Pea

Welded

(7) PERFORATIONS:
Type of perforator used Torch
Size of perforations 6 in., length, by 1/8 in.

From ft.	to ft.	Perf. per row	Rows per ft.
380	667		

(8) CONSTRUCTION: Concrete Foundation
Was a surface sanitary seal provided? ☒ Yes ☐ No To what depth ft.
Were any strata sealed against pollution? ☒ Yes ☐ No If yes, note depth of strata
From 0 ft. to 245 ft.
Rotary Mud and Cutting from hole
Method of Sealing

(9) WATER LEVELS:
water was first found ft.
before perforating ft.
after perforating 85 ft.

ELL TESTS: Drilling Contractor
made? ☒ Yes ☐ No If yes, by whom
00 gal./min. with 21 ft. draw down after hrs.
water Was a chemical analysis made? ☐ Yes ☒ No

(11) WELL LOG:
Total depth 667 ft. Depth of completed well 667 ft.
Formation: *Describe by color, character, size of material, and structure.*

ft. to ft.	Formation
0 – 193	Fine Sand
193 – 303	Clay
303 – 333	Medium and Coarse San
333 – 421	Clay and Medium Sand
421 – 450	Clay
450 – 480	Clay and Sand Streaks
480 – 620	Clay and Medium Sand
620 – 655	Coarse Sand with Clay and Rock
655 – 667	Cemented Sand

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U.S.G.S: 5240' N. & 850' W. of SE. Cor. of SE 1/4 Sect. 22
plotted on Borrego Mountain
well log card made
ERW 11/6/03

MICROFILMED

Work started May 8 19 61. Completed May 26 19 61

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the be my knowledge and belief.
NAME MANN BROS. (Person, firm, or corporation) (Typed or printed)
Address Box 755, Thermal, Calif.
[SIGNED] Well Driller
License No. C57-148880 Dated July 1 19 6

ORIGINAL
File with DWR

Well #4

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

WATER WELL DRILLERS REPORT

WELL 4

ALLEGRETTI WELL NO.

Do Not Fill In

№ 103831

State Well No.

Other Well No.

(1) OWNER:
Name Ranch Oasis Ltd.
Address 10960 Wilshire Blvd. Suite 1928
Los Angeles, Calif.

(2) LOCATION OF WELL:
County Imperial Owner's number, if any
Township, Range, and Section T12S; R9E SBB&M Sec. 26
Distance from cities, roads, railroads, etc.

(3) TYPE OF WORK *(check)*:
New Well [X] Deepening [ ] Reconditioning [ ] Destroying [ ]
If destruction, describe material and procedure in Item 11.

(4) PROPOSED USE *(check)*:
Domestic [ ] Industrial [ ] Municipal [ ]
Irrigation [X] Test Well [ ] Other [ ]

(5) EQUIPMENT:
Rotary [X]
Cable [ ]
Other [ ]

(6) CASING INSTALLED:
STEEL: OTHER:
SINGLE [X] DOUBLE [ ]

From ft.	To ft.	Diam.	Gage or Wall	Diameter of Bore	From ft.	To ft.
0	400	16OD	5/16			
400	1000	14OD	5/16	24"	0	1000
1-16" to 14" reducer				1- bull nose		

If gravel packed

Size of shoe or well ring:
Size of gravel birdseye
Describe joint Collared & welded

(7) PERFORATIONS OR SCREEN:
Type of perforation or name of screen Roscoe Moss Louver

From ft.	To ft.	Perf. per row	Rows per ft.	Size in x in.
0	380	Blank		
380	980	.090		
	Standard louver shutter screen			

(8) CONSTRUCTION:
Was a surface sanitary seal provided? Yes [X] No [ ] To what depth 200 ft.
Were any strata sealed against pollution? Yes [ ] No [X] If yes, note depth of strata
From ft. to ft.
From ft. to ft.
Method of sealing Rotary mud slurry

(9) WATER LEVELS:
Depth at which water was first found, if known ft.
Standing level before perforating, if known ft.
Standing level after perforating and developing 103 ft.

(10) WELL TESTS:
Was pump test made? Yes [X] No [ ] If yes, by whom? C.V. Pump
Yield: 3500 gal./min. with 30 ft. drawdown after 2 hrs.
Temperature of water Was a chemical analysis made? Yes [ ] No [X]
Was electric log made of well? Yes [X] No [ ] If yes, attach copy

(11) WELL LOG:
Total depth 1130 ft. Depth of completed well 1000 ft.
Formation: *Describe by color, character, size of material, and structure*

ft. to ft.	
0 - 30	Fine and medium sand with streaks of coarse sand.
30 - 60	Fine, medium with streaks of coarse sand.
60 - 87	Fine, medium sand with streaks of coarse sand and some clay.
87 - 119	Fine, medium and coarse sand with streaks of clay.
119 - 182	Fine, medium and coarse sand, very free.
182 - 232	Clay.
232 - 374	Clay with small streaks of sand.
374 - 394	Clay with streaks of medi to coarse sand.
394 - 428	In and out of medium to coarse sand and clay.
428 - 459	Good medium to coarse san with some clay streaks.
459 - 510	Fine, medium and coarse sand.
510 - 615	Good medium to coarse san with some gravel mixed, s small streaks of clay.
615 - 645	Clay with streaks of medi to coarse sand.
645 - 690	Clay with small streaks o medium to coarse sand.
690 - 706	[illegible]
[illegible]	Clay with streaks of fine to medium sand.

(well log continued on back)

Work started 9/24/ 19 76 Completed 10/19 19 76

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Coachella Valley Pump & Supply, In
(Person, firm, or corporation) (Typed or printed)

Address P.O. Box 1274
Indio, Calif. 92201

[SIGNED] [signature]
(Well Driller)

License No. 161541 Dated [illegible], 19 76

SKETCH LOCATION OF WELL ON REVERSE SIDE

Well #5

ORIGINAL
File with DWR

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
WATER WELL DRILLERS REPORT
WELL 5

ALLEGRETTI WELL NO.

Do Not Fill In

№ 103832

State Well No.

Other Well No.

(1) OWNER:
Name Ranch Oasis Ltd.
Address 10960 Wilshire Blvd.
Los Angeles, Calif.

(2) LOCATION OF WELL:
County Imperial (Owner's number, if any)
Township, Range, and Section T12S R9E SBB&M Sec. 23
Distance from cities, roads, railroads, etc.

(3) TYPE OF WORK (check):
New Well ☒ Deepening ☐ Reconditioning ☐ Destroying ☐
If destruction, describe material and procedure in Item 11.

(4) PROPOSED USE (check):
Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☒ Test Well ☐ Other ☐

(5) EQUIPMENT:
Rotary ☒
Cable ☐
Other ☐

(6) CASING INSTALLED:
STEEL SINGLE ☒ DOUBLE ☐ OTHER:

From ft.	To ft.	Diam.	Gage or Wall
0	400	16"OD	5/16
400	1130	14"OD	5/16
1 - 14"x 16" reducer			

If gravel packed

Diameter of Bore	From ft.	To ft.
24"	0	1130

Size of shoe or well ring:
Size of gravel: mixed pea
Describe joint collared & welded

(7) PERFORATIONS OR SCREEN:
Type of perforation or name of screen Roscoe Moss Louver

From ft.	To ft.	Perf. per row	Rows per ft.	Size in. x in.
350	400	.090 standard louver-16"		
400	280	.090 standard louver-14"		
930	1000	.090 standard louver-14"		
1000	1120	.090 full flo - 14"		
1 - 14" x 16" reducer 1- Bull nose				

(8) CONSTRUCTION:
Was a surface sanitary seal provided? Yes ☒ No ☐ To what depth 360 ft.
Were any strata sealed against pollution? Yes ☐ No ☒ If yes, note depth of strata
From ft. to ft.
From ft. to ft.
Method of sealing Rotary mud slurry

(9) WATER LEVELS:
Depth at which water was first found, if known ft.
Standing level before perforating, if known ft.
Standing level after perforating and developing ft. 114

(10) WELL TESTS:

(11) WELL LOG:
Total depth 1130 ft. Depth of completed well 1130 ft.
Formation: Describe by color, character, size of material, and structure

ft. to ft.	
0 - 25	Fine to medium sand.
25 - 33	Clay.
33 - 83	Fine, medium, some coarse sand with clay streaks.
83 - 137	Clay.
137 - 205	Clay with small streaks of sand.
205 - 265	Fine, medium and coarse sand.
265 - 292	Fine, medium and coarse sand with streaks of clay.
292 - 324	Good medium to coarse sand with ~~xxxy~~ small clay strea
324 - 386	Good medium to coarse sand with clay streaks.
386 - 540	In and out of fine, medi coarse sand and clay.
540 - 604	Good medium to coarse sand with clay streaks.
604 - 635	In and out of medium to coarse sand and clay.
✓ 635 - 740	Clay.
740 - 769	Good medium to coarse sand with some gravel mixed.
769 - 946	Clay.
946 - 977	Clay with small streak of good medium to coarse sand
977 - 1008	Clay with good streaks of medium to coarse sand.
1008 - 1130	Good medium to coarse sand with some gravel mixed.

Work started 10-22 19 76 . Completed 11/17 19 76

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Coachella Valley Pump & Supply, I
(Person, firm, or corporation) (Typed or printed)

Address P.O. Box 1274

Well #5

ORIGINAL
File with DWR

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
WATER WELL DRILLERS REPORT
WELL 5

ALLEGRETTI WELL NO.

Do Not Fill In

№ 103832

State Well No.

Other Well No.

(1) OWNER:
Name Ranch Oasis Ltd.
Address 10960 Wilshire Blvd.
Los Angeles, Calif.

(2) LOCATION OF WELL:
County Imperial Owner's number, if any
Township, Range, and Section T12S R9E SBB&M Sec. 23
Distance from cities, roads, railroads, etc.

(3) TYPE OF WORK (check):
New Well ☒ Deepening ☐ Reconditioning ☐ Destroying ☐
If destruction, describe material and procedure in Item 11.

(4) PROPOSED USE (check):
Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☒ Test Well ☐ Other ☐

(5) EQUIPMENT:
Rotary ☒
Cable ☐
Other ☐

(6) CASING INSTALLED:
STEEL OTHER:
SINGLE ☒ DOUBLE ☐

From ft.	To ft.	Diam.	Gage or Wall	Diameter of Bore	From ft.	To ft.
0	400	16"OD	5/16	24"	0	1130
400	1130	14"OD	5/16			
1 14"x 16" reducer				1 - Bull nose		

If gravel packed
Size of gravel: mixed pea
Size of shoe or well ring:
Describe joint collared & welded

(7) PERFORATIONS OR SCREEN:
Type of perforation or name of screen Roscoe Moss Louver

From ft.	To ft.	Perf. per row	Rows per ft.	Size in. x in.
350	400	.090 standard louver-16"		
400	780	.090 standard louver-14"		
930	1000	.090 standard louver-14"		
1000	1120	.090 ful flo - 14"		
1 - 14" x 16" reducer 1- Bull nose				

(8) CONSTRUCTION:
Was a surface sanitary seal provided? Yes ☒ No ☐ To what depth 360 ft.
Were any strata sealed against pollution? Yes ☐ No ☒ If yes, note depth of strata
From ft. to ft.
From ft. to ft.
Method of sealing Rotary mud slurry

(9) WATER LEVELS:
Depth at which water was first found, if known ft.
Standing level before perforating, if known ft.
Standing level after perforating and developing ft. 114

(10) WELL TESTS:

(11) WELL LOG:
Total depth 1130 ft. Depth of completed well 1130 ft.
Formation: Describe by color, character, size of material, and structure

ft. to ft.	
0 - 25	Fine to medium sand.
25 - 33	Clay.
33 - 83	Fine, medium, some coarse sand with clay streaks.
83 - 137	Clay.
137 - 205	Clay with small streaks of sand.
205 - 265	Fine, medium and coarse sand.
265 - 292	Fine, medium and coarse sand with streaks of clay.
292 - 324	Good medium to coarse sand with ~~xxxy~~ small clay streak
324 - 386	Good medium to coarse sand with clay streaks.
386 - 540	In and out of fine, medi coarse sand and clay.
540 - 604	Good medium to coarse sand with clay streaks.
604 - 635	In and out of medium to coarse sand and clay.
✓ 635 - 740	Clay.
740 - 769	Good medium to coarse sand with some gravel mixed.
769 - 946	Clay.
946 - 977	Clay with small streak of good medium to coarse sand
977 - 1008	Clay with good streaks of medium to coarse sand.
1008 - 1130	Good medium to coarse sand with some gravel mixed.

Work started 1-8-22 19 76 Completed 11/17 19 76

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Coachella Valley Pump & Supply, I
(Person, firm, or corporation) (Typed or printed)

Address P.O. Box 1274

01/08/97

ARI-CAL PUMP 2

10

ALLEGRETTI WELL NO.

DUPLICATE
Retain this copy

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
WATER WELL DRILLERS REPORT
WELL 6

Do Not Fill In
№ 103833
State Well No.
Other Well No.

1) OWNER:
Name Ranch Oasis Ltd.
Address 10-960 Wilshire Blvd.Suite 1928
Los Angeles, Calif. 9

2) LOCATION OF WELL:
County Imperial Owner's number, if any
Township, Range, and Section T12S; R9E SBB&M Sec. 25
Distance from cities, roads, railroads, etc.

(3) TYPE OF WORK (check):
New Well ☒ Deepening ☐ Reconditioning ☐ Destroying ☐
If destruction, describe material and procedure in Item 11.

(4) PROPOSED USE (check):
Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☒ Test Well ☐ Other ☐

(5) EQUIPMENT:
Rotary ☒
Cable ☐
Other ☐

(6) CASING INSTALLED:
STEEL: SINGLE ☒ DOUBLE ☐ OTHER:

From ft.	To ft.	Diam.	Gage or Wall	Diameter of Bore	From ft.	To ft.
0	400	16"OD	5/16"	24"	0	1000
400	1000	14"OD	5/16"			

If gravel packed

Size of shoe or well ring: 1 - 16" to 14" reducer 1 - bull nose
Size of gravel: Mixed pea
Describe joints: collared & welded

(7) PERFORATIONS OR SCREEN:
Type of perforation or name of screen Roscoe Moss Louver

From ft.	To ft.	Perf. per row	Rows per ft.	Size in. x in.
580	1000	.090	standard	louver

(8) CONSTRUCTION:
Was a surface sanitary seal provided? Yes ☒ No ☐ To what depth 340 ft.
Were any strata sealed against pollution? Yes ☐ No ☒ If yes, note depth of strata
From ft. to ft.
From ft. to ft.
Method of sealing Rotary mud slurry & cuttings

(9) WATER LEVELS:
Depth at which water was first found, if known ft.
Standing level before perforating, if known ft.
Standing level after perforating and developing 104 ft.

(10) WELL TESTS:
Was pump test made? Yes ☒ No ☐ If yes, by whom? C.V. Pump
Yield 3000 gal./min. with 61 ft. drawdown after 2 hrs.
Temperature of water Was a chemical analysis made? Yes ☒ No ☐
Was electric log made of well? Yes ☒ No ☐ If yes, attach copy

(11) WELL LOG:
Total depth 1038 ft. Depth of completed well 1000 ft.
Formation: Describe by color, character, size of material, and structure

ft. to ft.	
0 - 115	Fine, medium with streaks of course sand.
115 - 386	Clay with some small streaks of sand.
386 - 388	Good medium to coarse sand with streaks of clay.
388 - 511	Good medium to coarse sand.
511 - 573	Clay with streaks of good medium to coarse sand.
573 - 604	Clay with streaks of fine to medium sand.
604 - 628	Clay.
628 - 720	In and out of clay and ~~some~~ fine to medi sand, some coarse mix
720 - 759	Good medium to coarse sand with streaks of clay.
759 - 790	Good medium to coarse sand.
790 - 880	Clay.
880 - 914	Clay with streaks of medium to coarse sand
914 - 956	Clay.
956 - 995	In and out of clay an medium to coarse sand
995 - 1008	Good medium to coarse sand.
1008 - 1038	Clay.

Work started 12/13/76 Completed 12/23 19 76

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Coachella Valley Pump & Supply, Inc
(Person, firm, or corporation) (Typed or printed)

Address P.O. Box 1274
Indio, Calif. 92201

[SIGNED]
(Well Driller)

License No. 161541 Dated 19

01/08/97 11:34 FAX 6193961222 ARI-CAL PUMP 2 08

ALLEGRETTI WELL NO.

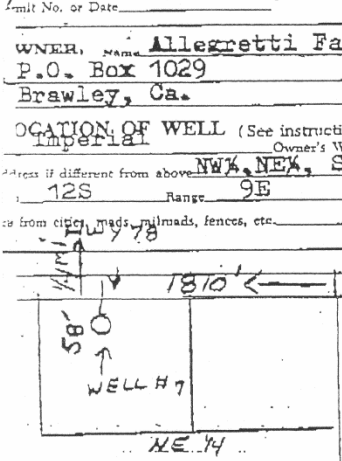
STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
WATER WELL DRILLERS REPORT

Do not fill in
No. 058135

Intent No. 195449
Permit No. or Date
State Well No.
Other Well No.
WELL 7

OWNER: Name Allegretti Farms
P.O. Box 1029
Brawley, Ca. Zip 92227

LOCATION OF WELL (See instructions): Imperial County
Owner's Well Number 7
Address if different from above NW¼, NE¼, Sec23, T12S,
12S Range 9E Section 23
Distance from cities, roads, railroads, fences, etc.



WELL LOCATION SKETCH

(3) TYPE OF WORK:
New Well ☒ Deepening ☐
Reconstruction ☐
Reconditioning ☐
Horizontal Well ☐
Destruction ☐ (Describe destruction materials and procedures in Item 12)

(4) PROPOSED USE:
Domestic ☒
Irrigation ☐
Industrial ☐
Test Well ☐
Stock ☐
Municipal ☐
Other ☐

EQUIPMENT:
☒ Reverse ☐
☐ Air ☐
☐ Bucket ☐

(6) GRAVEL PACK: Yes ☒ No ☐ Size Mix Pea
Diameter of bore 15"
Packed from 390 to 400 ft.

CASING INSTALLED: Plastic ☐ Concrete ☐

(8) PERFORATIONS: Mill Cut
Type of perforation or size of screen 2½" x 1/8"

Diam	To ft.	Dia. in.	Gage or Wall	From ft.	To ft.	Slot size
	400	8	.188	340	400	2½" x 1/8"

WELL SEAL:
Surface sanitary seal provided? Yes ☒ No ☐ If yes, to depth 300 ft.
Aquifer stratum sealed against pollution? Yes ☐ No ☐ Interval ft.
Method of sealing Rotary Mud Slurry

WATER LEVELS:
Depth to first water, if known ft.
Standing level after well completion 168 ft.

WELL TESTS:
Was well test made? Yes ☐ No ☒ If yes, by whom?
Type of test Pump ☐ Bailer ☐ Air lift ☐
Depth to water at start of test ft. At end of test ft.

(12) WELL LOG: Total depth 400 ft. Depth of completed well 400 ft.

From ft.	to ft.	Formation (Describe by color, character, size or material)
0	-40	Med sand
40	-80	Brown clay
80	-120	Fine Sand
120	-180	Fine, Med. & corse sand with short streak of brown Clay.
180	-280	Fine sand & some Med. mix
280	-335	Brown clay
335	-400	Med. & corse sand.

Work started 3-29 19 82 Completed 4-5 19 82

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Signed (Well Driller)
NAME Coachella Valley Pump & Supply, Inc.
(Person, firm, or corporation) (Typed or printed)
P.O. Drawer 000

COPY ONLY FOR PUBLIC USE
WATER CODE SEC. 13752

ORIGINAL
e with DWR

Attachment

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
WATER WELL DRILLERS REPORT

THREE FLAGS RANCH

Do not fill
No. 058134

State Well No. 12S/11E/5Q
Other Well No.

Intent No. [illegible]
al Permit No. or Date

(1) OWNER: Name Ila na Investments, Inc.
Address P.O. Box 1023
Coachella, California 92236 Zip

(2) LOCATION OF WELL (See instructions): Owner's Well Number X #4
County
ll address if different from above
Township 12S Range 11E Section 5
Distance from cities, roads, railroads, fences, etc.

(3) TYPE OF WORK:
New Well ☒ Deepening ☐
Reconstruction ☐
Reconditioning ☐
Horizontal Well ☐
Destruction ☐ (Describe destruction materials and procedures in Item 12)

(4) PROPOSED USE:
Domestic ☐
Irrigation ☒
Industrial ☐
Test Well ☐
Stock ☐
Municipal ☐
Other ☐

Well
2000'
100'
WELL LOCATION SKETCH

(5) EQUIPMENT:
Rotary ☒ Reverse ☐
able ☐ Air ☐
ther ☐ Bucket ☐

(6) GRAVEL PACK:
Yes ☒ No ☐ Size 5/[illegible]
Diameter of bore 15"
Packed from 350 to 1174 ft.

(7) CASING INSTALLED:
el ☒ Plastic ☐ Concrete ☐

From ft.	To ft.	Dia. in.	Gauge or Wall	From ft.	To ft.	Slot size
0	400	15 1/2"	1/4	400	1174	1/8"
400	1174	7 7/8"				

(8) PERFORATIONS:
Perforated Interval
Type of perforation or size of screen

(9) WELL SEAL:
Was surface sanitary seal provided? Yes ☒ No ☐ If yes, to depth 350 ft.
Were strata sealed against pollution? Yes ☐ No ☐ Interval ft.
Method of sealing Cement mill slurry

(10) WATER LEVELS:
Depth of first water, if known ft.
Standing level after well completion 20 feet low ft.

(11) WELL TESTS:
Was well test made? Yes ☐ No ☐ If yes, by whom?
Type of test Pump ☐ Bailer ☐ Air lift ☐
Depth to water at start of test ft. At end of test ft
Discharge gal/min after hours Water temperature °
Chemical analysis made? Yes ☒ No ☐ If yes, by whom? ?
Was electric log made? Yes ☒ No ☐ If yes, attach copy to this report

(12) WELL LOG: Total depth 1174 ft. Depth of completed well 1174
from ft. to ft. Formation (Describe by color, character, size or material)

from ft.	to ft.	Formation
0	178'	fine sand w/clay streaks
178	187	fine sand
187	240	blue & brown clay w/streaks of fine sand
[illegible]	[illegible]	fine sand w/ streaks of clay
[illegible]	364	brown & blue.
364	[illegible]	brown clay w/streaks of fine sand
[illegible]	[illegible]	brown clay
425	456	brown clay
456	[illegible]	fine sand w/clay streaks
[illegible]	515	Red coarse sand w/clay
[illegible]	549	Clay w/ streaks of red.
[illegible]	[illegible]	red
549	578	clay w/small red sand streaks
578	610	clay
610	640	clay w/ medium sand streaks
640	700	Brown & blue clay
700	730	brown clay w/ fine to med.
730	827	clay
827	888	Clay w/ streaks of sand
888	918	sandy clay w/ sand streaks
918	1002	clay
1002	1118	Caly w/ streaks of fine sand
1118	1174	brown clay
1174		fine sand

Work started [illegible] 19 Completed [illegible] 19

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Signed (Well Driller)
NAME Coachella Valley Pump & Supply, I
(Person, firm, or corporation) (Typed or printed)
Address P.O. Drawer
City Indio, California 92202 Zip
License No. 161541 Date of this report 7/15/82

DWR 188 (REV. 7-76) IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

UNOFFICIAL COPY FOR PUBLIC USE
COACHELLA VALLEY WATER DISTRICT

9-043
(December 1949)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

No. 12S/11E-18J

Other Nos. LCRP #19

WELL LOG

State California County Imperial Subarea San Felipe Cr.

Owner U. S. GEOLOGICAL SURVEY, Yuma, Arizona

Location Near junction State Highway 78 and U. S. 99

Drilled by Coachella Valley Pump & Supply, Inc. Address Indio, California

Date April 1964 Casing diam. 10" & 8" Land-surf. alt. -175 feet

Source of data Interpretation of driller's log, cuttings, & electrical log by J. H. Robison

(Enter type of well, perforations, yield, and drawdown at end of log)

Correlation	Material	Thickness (feet)	Depth (feet)
	Clay, silty brown, and fine sand	19	19
	Sand, coarse to v. coarse	14	33
	Clay, silty brown	33	40
	Sand, med. to v. coarse, and v. fine gravel	25	65
	Clay, silty brown and silt. Few streaks of gray clay	76	116
	Silt, brown, and v. fine sand	8	124
	Clay, silty brown, and silt. Few streaks of gray clay	29	153
	Sand, fine to coarse. Some brown silt	39	193
	Clay, silty brown	20	212
	Sand, fine, and brown silt	12	224
	Clay, silty brown, with some fine to coarse sand	53	227
	Sand, med. to coarse	12	239
	Clay, silty brown, with fine sand	25	302
	Sand, partly cemented, fine to med., and silty brown clay.	30	332
	Sand, fine to v. coarse, with small amount v. fine gravel. Subangular to subrounded feldspar & quartz	73	405
	Clay, silty brown, with some gray clay	33	438
	Sand, fine to v. coarse, with layers of silty brown clay.	32	470
	Sand, fine to v. coarse, and small amount v. fine gravel.	18	488
	Clay, silty brown	40	528
	Sand, fine to coarse	29	557
	Clay, silty brown and gray with layers of fine to med. sand	43	600
	Sand, fine to v. coarse, partly cemented, with layers of brown and gray silty clay.	68	668
	Clay, silty brown and clay, with layers of med. to coarse sand.	32	700
	Sand, fine to v. coarse	25	725
	Clay, brown and gray silty	18	743
	Sand, fine to v. coarse, with some clay.	25	768

Record by ..... Date .....

Sheet 1 of 2

51753

9-063
(December 1949)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

No. 12S/11E-18J

Other Nos. LCRP #19

WELL LOG

State _____ County _____ Subarea _____

Owner _____

Location _____

Drilled by _____ Address _____

Date _____ Casing diam. _____ Land-surf. alt. _____

Source of data _____

(Enter type of well, perforations, yield, and drawdown at end of log)

Correlation	Material	Thickness (feet)	Depth (feet)
	Clay, grayish brown, silty, small amt. olive green. clay	45	813
	Sand, fine, and grayish brown clay	22	835
	Sand, fine to coarse, with some clay	33	868
	Clay, grayish brown silty	11	879
	Sand, fine to coarse	9	888
	Clay, gray and brown silty	15	903
	Sand, fine to coarse, and silt	21	924
	Clay, gray and brown silty	7	931
	Sand, fine to coarse and grayish brown silty clay	28	959
	Note: Small gastropods found to a depth of Approx. 300 feet.		
	Perforations: .100", 10 per round, 310-650 feet.		

Record by _____ Date _____ Sheet 2 of 2

51753