



# Hidden Valley Lake Community Services District

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## MEMO

To: Sheri Miller, SWRCB Division of Drinking Water  
Cc: Erik Ekdahl, SWRCB Division of Water Rights  
Date: May 6, 2019  
RE: Compliance Order No. 02\_03\_14R\_004

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The State Water Resources Control Board, Division of Drinking Water Quality ("DDW") issued Compliance Order No. 02\_03\_14R\_004 ("Compliance Order") to Hidden Valley Lake Community Services District ("District") on October 14, 2014 pursuant to California Health and Safety Code section 116555(a)(3). Section 11655(a)(3) requires every public water system to "provide a reliable and adequate supply of pure, wholesome, healthful, and potable water." DDW asserted that the District was not providing a reliable and adequate supply of water because the State Water Resources Control Board, Division of Water Rights ("DWR") curtailed the District's and other right holders' appropriate surface water rights due to the extreme 2014-2015 drought. The District requests that DDW rescind the Compliance Order because the District possesses a reliable and adequate supply of groundwater that is available in all hydrologic conditions and is not subject to curtailment by DWR.

### **Background**

The District provides municipal water and wastewater service to the Hidden Valley Lake community in Lake County. Its municipal water supply is obtained from wells in the Coyote Valley Groundwater Basin that are located along Grange Road, southeast of Highway 29. These wells are on a terrace at least 1,600 feet south of the Putah Creek stream channel.

The District holds the following water rights reported to the State Water Board:

- a. Statements of Water Diversion & Use S014734, S014735, S014736 and S022191 for claimed riparian rights for water diverted from Putah Creek Underflow at Grange Road Well 1 (now known as Well 4), Well 2, Well 3 and the Agricultural Well for municipal use on a portion of the District's service area;



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- b. Appropriate water right License 9674 (Application A022033) for 2500 acre-feet of storage in Hidden Valley Lake for in-lake recreation and for fire protection of the Hidden Valley Lake community;
- c. Appropriate water right License 13527A (Application 30049A) for direct diversion of 651 acre-feet annually from Putah Creek Underflow from the Grange Road Wells for municipal use in the District's service area; and
- d. Appropriate water right Permit 20770B (Application 30049B) for direct diversion of 1,649 acre-feet annually from Putah Creek Underflow from the Grange Road Wells and Ag Well for municipal use in the District's service area, and fish and wildlife preservation in the Putah Creek channel.

At times during 2014 and 2015, DWR, acting under its authority to administer post-1914 appropriative water right permits and licenses, issued notices of unavailability of water (curtailment) to thousands of appropriative surface water rights in the Sacramento River watershed due to severe drought conditions and the demands of senior surface water right holders. This curtailment affected the District's appropriative water rights (License 9674, License 13527A and Permit 20770B).

The Compliance Order was issued on the presumption that surface water is the District's sole source of water and that the curtailment of the District's appropriative rights during the extreme 2014 and 2015 drought renders the District supply unreliable and inadequate in the future. As discussed below, the District has conducted an analysis of its wells and the Coyote Valley Basin and concludes that some or all of its wells extract percolating groundwater that is reliable, adequate, and not subject to curtailment.

### **Subterranean Stream Evaluation**

Water underground is presumptively percolating groundwater. (Los Angeles v. Pomeroy (1899) 124 Cal. 597, 628.) The State Water Board's appropriative water right permitting authority does not extend to the diversion or extraction of percolating groundwater. (State Water Resources Control Board Decision 1639, In re Garrapata Water Company.) The State Water Board's water right permitting authority extends to appropriation of "surface water" and water in "subterranean streams flowing through known and definite channels." (Water Code § 1200.) Accordingly, the Board's permitting authority over water





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underground extends only to water in subterranean streams flowing through known and definite channels. The State Water Board bears the burden of establishing that water underground is water flowing in a subterranean stream. (Los Angeles v. Pomeroy (1899) 124 Cal. 597, 628.)

Pomeroy establishes a four-part test for determining whether groundwater is flowing in a subterranean stream, which has been interpreted and refined by the Water Board in Decision 1639, In re Garrapata Water Company, and other decisions and orders.

The District filed water right applications for its Grange Road wells in 1991 to meet the deadline to establish surface water right claims under the Putah Creek stream adjudication. The District assumed the source of water available at the wells was groundwater and not water subject to the Board's permitting jurisdiction, but filed the applications out of abundance of caution. The source of water listed in the District's appropriative water right applications and License 9674 and Permit 20770 at the Grange Road Wells is "Putah Creek Underflow." "Underflow" is not a precise legal term; the Board has stated that "underflow is a subset of a subterranean stream flowing in known and definite channels." (Decision 1639 at 7.)

The enclosed Subterranean Stream Evaluation, Coyote Valley, Lake County, California, prepared by David Peterson, CEG, CHG, Wagner & Bonsignore Consulting Civil Engineers ("Subterranean Stream Evaluation"), evaluates the complex and heterogeneous geologic and hydrologic characteristics of the Coyote Valley and the District Grange Road wells against the four-part subterranean stream test. The Evaluation concludes that the District Grange Road wells are not located in and do not extract water from a subterranean stream. The Evaluation concludes in summary:

[A] well-defined channel is not uniformly present along the south side of Coyote Valley. Along the north side of the valley, the Clear Lake Volcanics are water-bearing and developed extensively with wells, and therefore, do not appear to meet the definition of a relatively impermeable bed and bank. This study concludes that locally, areas northwest of Highway 29 may meet the general criteria of the "Four-Part Test," while areas southeast of the highway do not.

### **(Subterranean Stream Evaluation at 8.)**

The four Grange Road wells, while proximately close, have remarkably non-uniform substrates. The evidence is dispositive that there is a lack of



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a well-defined channel at the Grange Road Well 4 and the Ag Well due to highly interfingering and interbedded silt/clay strata in those well logs. The Grange Road Wells 2 and 3 well logs show more extensive sand/gravel alluvium with less interbedding of silt/clay strata than Well 4 and Ag Well, but still appear to lack characteristics indicating a well-defined channel. Nevertheless, the District will continue to evaluate Grange Road Wells 2 and 3 in order to reach a definitive conclusion whether a subterranean stream channel is present.

### **Conclusions and Request**

The District concludes that its Grange Road Well 4 and the Ag Well are not located in a subterranean stream. Grange Road Well 4 and the Ag Well therefore produce percolating groundwater and are not subject to the Board's water right permitting jurisdiction. The District will cease reporting the diversion of water from Grange Road Well 4 and the Ag Well in its annual reports for its surface water rights. The District will continue to evaluate whether a subterranean stream channel is present at Grange Road Wells 2 and 3.

The District's response to Directive 6 of the Compliance Order submitted to DDW on May 1, 2015, as well as the District's annual Coyote Valley Basin groundwater condition reports, demonstrate that groundwater is available in Coyote Valley at the District's wells under all hydrologic conditions, and that the capacity of the District wells is more than sufficient to meet peak and annual water demands within the District.

Because the District Grange Road Well 4 and the Ag Well extract percolating groundwater that is reliable and adequate in all hydrologic conditions, the District is in compliance with the requirements of California Health and Safety Code section 116555(a)(3). The District respectfully requests that DDW rescind the Compliance Order.



# Wagner & Bonsignore

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## MEMORANDUM

### PRIVILEGED AND CONFIDENTIAL ATTORNEY-CLIENT COMMUNICATION

**To:** Mr. Peter Kiel  
Dickenson, Peatman & Fogarty Attorneys

**From:** David H. Peterson, Engineering Geologist-1186, Hydrogeologist-86

**Date:** April 24, 2019

**Re:** **Hidden Valley Lake Community Services District  
Subterranean Stream Evaluation  
Coyote Valley, Lake County, California**

#### Introduction

This study presents an evaluation of the geology of the alluvial deposits within Coyote Valley, as well as the water-bearing characteristics of older units underlying and bounding the basin. The purpose of the study is to assess if the physical setting of the valley meets the State Water Resources Control Boards' (SWRCB) criteria of a "subterranean stream" and if water supply wells operated by the Hidden Valley Lake Community Services District (HVLCS D) are located within such a feature. The general location of Coyote Valley with respect to other nearby groundwater basins is shown on the *Location Map*, Figure 1.

Groundwater is presumed in law to be percolating groundwater unless it can be shown that water is flowing through a subterranean stream, which is subject to the permitting authority of the SWRCB. The SWRCB's permitting jurisdiction over groundwater is generally limited to groundwater that meets criteria adopted by Water Board Decision 1639 regarding Garrapata Creek in Monterey County. The Garrapata Decision provides a test (referred to as the "Four-Part Test") for SWRCB jurisdiction for water right permitting of groundwater extractions. The following physical conditions must exist for groundwater to be classified as water in a subterranean stream flowing through a known and definite channel:

1. A subsurface channel must be present;
2. The channel must have relatively impermeable bed and banks;

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3. The course of the channel must be known or capable of being determined by reasonable inference; and
4. Groundwater must be flowing in the channel.

Notably, proximity of a well to the stream, or the physical attributes of a well, are not part of the four-part test.

### Scope and Methods of Investigation

The scope of the study included review of historical aerial photographs, published geologic maps, groundwater reports, and soil surveys for the vicinity, in addition to Well Completion Reports (WCRs; 113 total) on file with California Department of Water Resources. The references reviewed are listed in the References section. An area reconnaissance was performed on February 7, 2019 by a certified engineering geologist/hydrogeologist to map the surface geologic conditions and to field check interpretations made from the published maps, well logs, and aerial photographs.

Published geologic maps prepared for prior geologic and groundwater studies in the region generally depict the alluvium within Coyote Valley as a single undivided unit. However, for the purposes of this relatively regional-scale subterranean stream evaluation, more information about the type and distribution of alluvial units (active channel, flood plan, terrace and alluvial fan deposits) was needed. The *Geologic Map of Coyote Valley*, prepared for this evaluation, shown on Figure 2, was prepared using previously published geologic mapping, interpretation of geomorphic features in aerial photography and during field review, and correlation of mapped soil units and well logs data, to develop a detailed map of the alluvial geology of Coyote Valley. Geologic map units within the alluvium of the valley floor follow the general classifications used by California Geological Survey in its Preliminary Geologic Map series for Sonoma and Napa Counties (see for example, DeLattre, 2011; Delattre and McLaughlin, 2010).

### **Geologic and Hydrogeologic Setting**

#### Local Geologic Setting

The California Department of Water Resources indicates that the Coyote Valley Basin (Groundwater Basin No. 5-18) has a surface area of about 10 square miles (6,530 acres). The northwest trending valley is about 5 miles long, with a maximum width of about 2.5 miles. As shown on the *Geologic Map of Coyote Valley*, Figure 2, the valley is generally bounded to the south and west by consolidated and deformed sedimentary strata of the Jurassic to Cretaceous age Great Valley Sequence (map symbols *K<sub>Ju</sub>* and *K<sub>u</sub>*) and serpentized ultramafic rocks (serpentinite; map symbol *um*). In general, these older bedrock units are considered to be non-water bearing (Upson and Kunkel, 1955).

In upland areas at the northern margin of the basin, lava flows and tuff of the Quaternary-age Clear Lake Volcanics are exposed. When the prior groundwater studies were published



(Kunkel and Upson, 1955; Shaw and McClurg, 1962), few wells had been developed in the Clear Lake Volcanics and little information was available about the water-bearing characteristics. However, Shaw and McClurg (1962) noted that “the lava and fragmental volcanic rocks may absorb appreciable quantities of precipitation and store it in joints and fractures.” The basalt flows were noted to be highly fractured and have a “fairly high permeability.” As will be discussed, review of well log data indicates that in the vicinity, wells drilled in the volcanics (primarily fractured basalt) yield moderate to relatively high quantities of water, generally about 20 to over 100 gallons per minute (gpm).

Locally, sedimentary strata of the Cache formation (map symbol *QTc*) are also mapped at the northwest margin of the valley. The Cache formation is Plio-Pleistocene in age (deposited in the past few million years) and consists of fresh water deposits of gravel, silt, sand, and lesser amounts of water-laid tuff, limestone, and diatomite. In some places, the strata underlie lava caps. In general, most of the formation is classified as having low permeability, except for occasional gravel and sand beds. Some wells in the formation have reported moderate yields (Shaw and McClurg, 1962).

Overall, the extent of the older units (bedrock, Clear Lake Volcanics, and Cache formation) beneath the alluvium in Coyote Valley is not well known, although clayey strata encountered locally at depth in some of HVLCSD’s Grange Road wells (see Cross Section B-B’) might be part of the Clear Lake Volcanics or Cache formation strata.

As discussed, the alluvial deposits within Coyote Valley groundwater basin are shown as a single undivided unit on the published geologic mapping reviewed. Using well log information, soil survey data (Smith and Broderson, 1989), and field mapping, the alluvium was subdivided into four units shown on the *Geologic Map of Coyote Valley* (Figure 2). These consist of:

1. Active channel deposits of Putah Creek (map symbol *Qhc*) – these consist of crudely-bedded sand and gravel subject to scour, transport and deposition within the banks of the active stream channel. Generally latest Holocene to modern age.
2. Younger alluvial deposits (*Qhay*) – consists of units deposited in fan, basin and terrace environments adjacent to the active channel and on the modern flood plain (*Qya*) – wells drilled in these deposits generally encountered sand and gravel strata typical of deposition in a channel environment. Prior geologic studies by CGS in Napa and Sonoma Counties classified these deposits both as alluvium deposited on the modern floodplain and as young stream terrace deposits, based on the slight elevation above the active channel. These deposits are generally grass-covered and not highly dissected by erosion. In some areas, the ground surface in this unit was noted to be somewhat irregular, with remnant scour features preserved from older locations of the creek channel. Most likely mid- to late-Holocene in age.
3. Undivided alluvial deposits (*Qa*) – these deposits make up basin deposits on alluvial plains; the Soil Survey of Lake County classifies the surface soils as silty loams which are

somewhat finer grained than soils in areas more proximal to the active channel. Well logs indicate that in valley-bottom areas closer to Putah Creek, sand and gravel predominates. However, moving toward the valley margins, the coarser grained sediments are interbedded with finer grained, distal flood plain strata and by the more clayey, down-valley portions of alluvial fans. Cross Sections C-C' which generally follows Grange Road, and Cross Section B-B' which crosses the valley from north to south, both indicate the general interbedded nature of this unit. Overall, this unit (at least on the south side of the valley, where more well log data is available), appears to represent a transition zone between the mainly coarse-grained channel deposits nearer Putah Creek, to fine grain fan deposits at the valley margins. Likely Holocene to late Pleistocene in age.

4. Alluvial fan deposits, consisting of sand-clay mixtures derived from bedrock upland areas at the basin margins (*Qaf*). Surface soils developed on these deposits consist of clay loams derived predominantly from serpentinite bedrock. In the logs of the Treatment Plant monitoring wells (south of Grange Road), clays and clayey sands appear to predominate, with bedrock at relatively shallow depth. Likely range in age from Holocene to late Pleistocene.

#### Hydrogeologic Setting of HVLCSD Wells

Wells currently named in water right Permit 20770B (Application 30049B) issued by the SWRCB are located along Grange Road and are designated as the Agricultural Well, GR-2, GR-3, and GR-4. In addition, a proposed new well near Monitoring Wells 2A and 2B is included in Permit 20770B. The locations of the existing HVLCSD production wells are shown on the geologic map on Figure 2 and copies of the Well Completion Reports are included as an attachment. In addition, the geologic conditions encountered in these wells are depicted on *Cross Section B-B'* on Figure 3. The geologic setting of each of the wells is discussed briefly below:

Well GR-2 – drilled in 1985 by Weeks Drilling and Pump to a total depth of 292 feet and completed as a 120-foot deep well. The well is mapped in this study as lying within undivided alluvial deposits (*Qa*). Review of the drillers log indicates that conglomerate, boulders, gravel, and cobbles were encountered to a depth of 113 feet, underlain by clay containing “streaks” and layers of gravels, cemented gravels and boulders. From the drillers descriptions, the upper 113 feet appears to be very coarse-grained alluvium typical of a channel deposit. At greater depth, the deposits appear to consist of clays and cemented gravels, although it is not confirmed if they are older, somewhat more consolidated alluvium, or part of the Cache formation. However, the presence of cemented gravels interbedded in generally clayey deposits suggests they are probably part of the Cache formation.

Well GR-3 – drilled in 1991 by Weeks Drilling and Pump to a total depth of 205 feet and completed as a 180-foot deep well. The well is located in an area mapped as young undivided alluvial deposits (*Qhay*), deposited adjacent to the active channel and in the modern flood plain. The well log indicates that sandy gravel, conglomerate, boulders, and small amounts of silty clay were encountered to depth of 170 feet. The generally coarse-grained character of these materials



seems consistent with deposition within or adjacent to a stream channel. Underlying these deposits are conglomerate, brown clay, and sandy clay, which may be part of the Cache formation.

Well GR-4 – also drilled by Weeks Drilling and Pump in 2003. The well is located just north of Grange Road, in an area mapped as undivided alluvial deposits (Qa). The well bore was drilled to a total depth of 231 feet and was completed as a 206-foot deep, 14-inch diameter well. The geologic log indicates that interbedded clay and sand/gravel strata were encountered to a depth of 199 feet. Below this depth, clay with streaks of sand and gravel and embedded gravel were encountered to 199 feet deep. From 199 to 204 feet, “hard serpentine” was encountered, underlain by stiff clay to the bottom of the boring at 231 feet. We interpret the deposits in the upper 167 feet as interbedded stream alluvium (sand/gravel) and alluvial fan or distal floodplain deposits (clays). This seems consistent with the interpretation that the unit mapped as “Qa” on Figure 2 represents a “transition” zone between more granular channel deposits to the north and finer grained alluvial fan deposits to the south. From a depth of 167 to 199 feet, clays encountered might also be alluvial fan deposits, or possibly older deposits of the Cache formation. It appears that bedrock was likely encountered at 199 feet.

Agricultural Well – a WCR found in our well log search of DWR files indicates that the Agricultural Well was drilled in August 1951 by Hutton-Surhan Drilling of Upper Lake, California. The well appears to have been drilled by cable tool methods to a depth of 110 feet and completed with a 14-inch diameter casing. The well is located just south of Grange Road, in an area mapped in this study as undivided older alluvial deposits (unit Qa). The well log indicates that interbedded gravel/sand and clay strata were encountered to a depth of 106 feet. At the bottom of the boring, from a depth of 106 to 110 feet, “hard pan” was logged. Based on the mapped location, it appears that the interbedded strata may also lie in a transitional zone of interbedded deposits lying between more granular sand/gravel to the north, and finer grained deposits to the south.

### **Analysis of Subterranean Stream Criteria**

Below, the elements of the Garripata “Four-Part Test” are analyzed with regard to subsurface conditions in Coyote Valley.

#### *1. A subsurface channel must be present;*

Cross Section D-D’ at the northwest end of Coyote Valley, constructed from published geologic mapping (Wagner and Bortugno, 1983) and well completion reports, indicates that sand and gravel alluvium have been deposited in a relatively well-defined subsurface channel. As shown on *Cross Section D-D’*, Monitoring Well 3A/3B and a water well log (WCR 156188) indicate that in this relatively narrow reach of the valley, sand and gravel overlie serpentinite bedrock at a depth of about 120 feet. Further east in the valley bottom, logs of numerous domestic wells areas near Putah Creek, including Monitoring Wells 1A/1B and 2A/2B and MW-4, encountered sand and gravel deposits typical of a channel and/or granular flood plain deposits.

Along the northeasterly margin of Coyote Valley, the limit of a potential channel in the alluvium is defined by bedrock upland areas, consisting mainly of volcanic units of the Clear Lake Volcanics, overlain or interbedded with sedimentary strata of the Cache formation. Wells drilled in the alluvium in the more northerly portions of the valley appear to be predominated by clean sands and gravels, typical of older channel deposits.

Generally starting from the base of a bedrock ridge west of Highway 29 and extending along Grange Road, well logs indicate that the sand/gravel alluvium of the valley bottom interfinger and are interbedded with silt/clay strata, presumably derived from the Crazy Creek drainage to the south in a gradational and poorly-defined zone. The geologic interface between younger fluvial deposits (Qhay) and undivided alluvium (Qa) is generally defined by this gradational interface and general fining of deposits to the south. As shown on *Cross Sections B-B' and C-C'*, a subsurface channel does not appear well-defined between the interfingered valley bottom sand/gravel (Qhay) north of Grange Road and the interbedded clay, silt and sand strata (Qa) generally lying south of Grange Road.

Little water well data is available at the southeasterly end of Coyote Valley. However, two well logs were used to construct *Cross Section E-E'*, at the southeast end of the valley and indicate that the alluvial deposits in that area are made up of interbedded clays, gravels and sands/clayey sands. A coarse-grained (sand/gravel) subsurface channel deposit similar to that noted in *Cross Section D-D'* at northwest end of the valley, is not evident in *Cross Section E-E'*.

2. *The channel must have relatively impermeable bed and banks;*

As shown on the *Geologic Map*, Figure 2, the western portion of Coyote Valley, generally west of Highway 29 is bounded and underlain by bedrock units consisting of serpentinite and sedimentary strata (sandstone, mudstone, and conglomerate) of the Great Valley Sequence. In general, the serpentinite and Great Valley Sequence are considered to be non-water bearing (Upson and Kunkel, 1955). As shown on Cross Section D-D' (Figure 5), a water well (WCR 756188) appears to have encountered serpentinite bedrock underlying young sand/gravel alluvial deposits. It therefore appears that alluvial deposits in areas of northwest Coyote Valley are bounded or underlain by bedrock formations that may meet the criteria of a relatively impermeable bed and bank.

East of Highway 29, the north side of the valley is bounded by volcanic units of the Clear Lake Volcanics, locally underlying or interbedded with pebbly sandstone, conglomerate, siltstone and tuff of the Cache formation (Wagner and Bortugno, 1982). Review of well logs (19 total, primarily in Sections 17, 20 and 21 of T11N, R6W), indicate that units in the Clear Lake Volcanics locally consist of basalt (lava) flows, fractured or "broken" basalt, volcanic ash, red lava, and green "soft rock." The yield recorded on the well logs ranged from 20 to over 200 gallons per minute (gpm), with an average yield of 69 gpm. While some massive or little fractured lava flows within the Clear Lake Volcanics may yield little water, overall, the volcanics appear to have moderate permeability and would not appear to meet the criteria of a relatively impermeable bed or bank.



As shown on Figure 2, the Cache formation is mapped as bounding a portion of Coyote Valley on the northeast side. As described by Upson and Kunkel (1955), the Cache formation in Coyote Valley consists of outcrops of light-colored cobble gravels, water-laid tuffs and tuffaceous sands that “appear beneath basalt.” Yields of most wells in the Cache formation are low, often insufficient for domestic uses, although a few wells yield as much as 200 gpm. Based on the gravels exposed in outcrop, it was assumed that the formation will locally yield moderate quantities of water (Upson and Kunkel, 1962). The extent or depth of the Cache formation beneath the alluvium of Coyote Valley is not known. It appears that permeability of the Cache formation is generally low but is not uniform. A relatively thick section of clays with gravel were encountered at depth in Grange Road Well #2, although it is not verified if these units are part of the Cache formation.

As discussed, along the southwest portion of the valley, generally following Grange Road (see *Cross Section C-C'*), the more permeable, granular deposits to the north generally appear to interfinger and grade to less permeable, more clayey strata to the south. In this general area, a well-defined or relatively impermeable bed and bank were not evident in the well logs reviewed.

3. *The course of the channel must be known or capable of being determined by reasonable inference;*

The prior regional-scale mapping of the alluvium within Coyote Valley did not identify a channel deposit, or a group of alluvial units that might be interpreted as a channel. The mapping in the current study generally provides additional information about the location of the active channel of Putah Creek, as well as the general distribution of young basin and flood plain deposits that, along with data from water wells, generally identify the course of a channel. However, as discussed, the specific course of a channel and the location of the bank along the southwest side of the valley (i.e., along Grange Road) is not conclusive from the well log data reviewed. Based on the data reviewed in the current evaluation, the channel becomes gradational to older, fine grained alluvial fan deposits derived from bedrock units in the Crazy Creek drainage. Looking in the upstream (northwest) direction, there does not appear to be an inferable “left bank” on the south side of Grange Road and thus, areas south of Grange Road are beyond the limits of a potential subterranean stream, if such a channel existed.

4. *Groundwater must be flowing in the channel.*

Ongoing groundwater monitoring of the basin verifies that groundwater is present at relatively shallow depth and is generally flowing in a down-valley direction. However, well data indicate that groundwater flows through both the more granular channel deposits and in the interbedded and finer grained fan deposits at the margins of the basin. Therefore, groundwater flow does not appear to be confined to a well-defined channel deposit.

## Discussion and Conclusions

In the northwest portion of Coyote Valley, generally northwest of Highway 29, valley bottom sediments appear to be predominated by sand and gravel alluvium. The geologic formations making up the valley margins consist of older, generally non-water bearing units. In general, it appears that the portions of northwest Coyote Valley might locally meet the general physical criteria of the “four-part test”

East of Highway 29 and along the northern margin of Coyote Valley, upland areas that constitute the “bank” for channel deposits with the valley are made up of volcanic units (Clear Lake Volcanics) that have been developed extensively for groundwater, and more locally, by sedimentary strata (Cache formation) of generally low, but unverified permeability. While it is possible that portions of the valley bounded or underlain by strata of the Cache formation might be characterized as relatively impermeable, there is currently insufficient data to conclude the distribution of these types of strata at depth beneath the valley. The upland areas underlain by the volcanics appear to be moderately to highly permeable, based on the yields of water wells. Therefore, a uniform, relatively impermeable bed and bank bounding the northern valley is not evident in the data reviewed.

Generally following Grange Road, it appears that sand-gravel deposits more typical of an alluvial channel fill, grade southward (toward the valley margin) to more clayey alluvial fan and distal flood plain deposits. Available data suggest this interface is generally gradational and interfingering, and that a well-defined or impermeable channel bank and bed is not present. From our analysis of the four HVLCS D wells, it appears that wells GR-2 and GR-3 contain deposits more typical of coarse stream channel alluvium. Well GR-4 and the Agricultural Well encountered interbedded coarse (sand/gravel) and fine-grained strata (clays) that did not appear to represent a well-defined channel deposit. Based on the available subsurface data, the edge of a well-defined channel (i.e., a “left bank” looking upstream) is not evident, nor does it appear to be bounded by an impermeable bed and bank. Based on available data, the general position of a channel, if it existed, would lie generally north of Grange Road Well GR-4.

Geologic conditions described in the SWRCB’s Decision 1645 for the Pauma Basin of the San Luis Rey River, indicates that the geologic setting is similar to that evaluated in Coyote Valley; namely, bedrock highlands bounding one side of the basin and a gradational relationship between water bearing channel deposits and older alluvial deposits on the other. In that Decision, the presence of a subterranean stream could not be conclusively demonstrated, which led the SWRCB to rule that the groundwater in the basin was percolating groundwater.

This evaluation concludes, based on available data, that a well-defined channel is not uniformly present along the south side of Coyote Valley. Along the north side of the valley, the Clear Lake Volcanics are water-bearing and developed extensively with wells, and therefore, do not appear to meet the definition of a relatively impermeable bed and bank. This study concludes that locally, areas northwest of Highway 29 may meet the general criteria of the “Four-Part Test,” while areas southeast of the highway do not.



We trust this Memorandum provides the information you require. Please contact us if you have questions about the evaluation or need additional information.

## References

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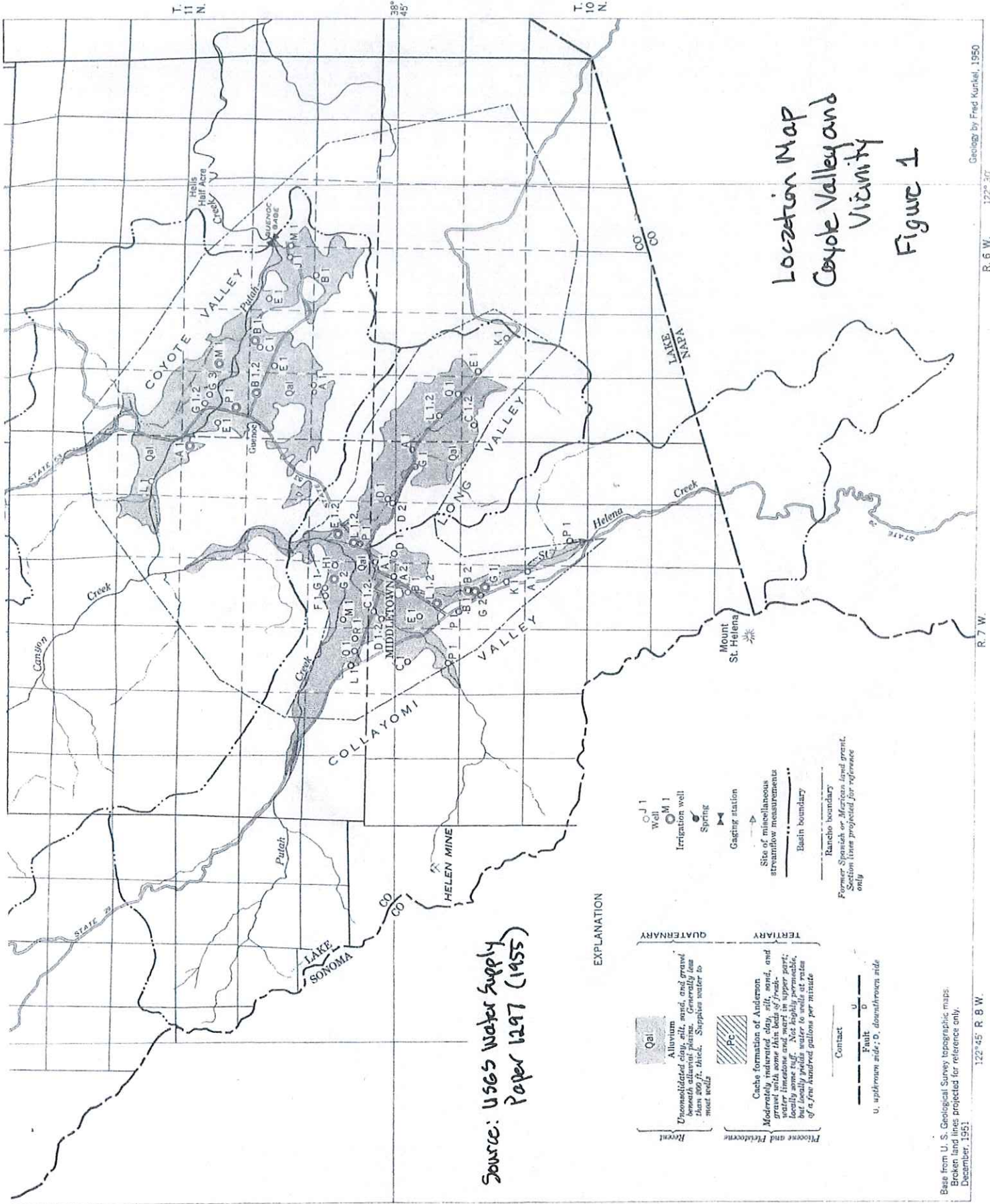
Upson, J.E. and Kunkel, F., 1955, Ground Water of Lower Lake – Middletown Area, Lake County, California: U.S. Geological Survey Water Supply Paper 1297, 87p.

Wagner, D.L. and Bortugno, E.J., 1982, Geologic Map of the Santa Rosa Quadrangle, California, 1:250,000: California Division of Mines and Geology Regional Geologic Map Series, Map No. 2A (Geology), Sheet 1 of 6.

**Attachments**

Vicinity Geologic Map (from USGS WSP 1297), Figure 1  
Geologic Map of Coyote Valley, Figure 2  
Cross Section B-B'-B'', Figure 3  
Cross Section C-C', Figure 4  
Cross Section D-D', Figure 5  
Cross Section E-E', Figure 6  
HVLCS D Well Completion Reports





Source: USGS Water Supply Paper 1297 (1955)

Location Map  
Coyote Valley and  
Long Valley  
Vicinity  
Figure 1

**QUATERNARY**  
 Qal Alluvium  
 Unconsolidated clay, silt, sand, and gravel beneath alluvial plains. Generally less than 80 ft. thick. Supplies water to most wells.

**TERTIARY**  
 PC Cache formation of Anderson  
 Moderately indurated clay, silt, sand, and gravel with some thin beds of fresh-water limestone and, near the upper part, locally thin beds of sandstone, but locally yields water to wells at rates of a few hundred gallons per minute.

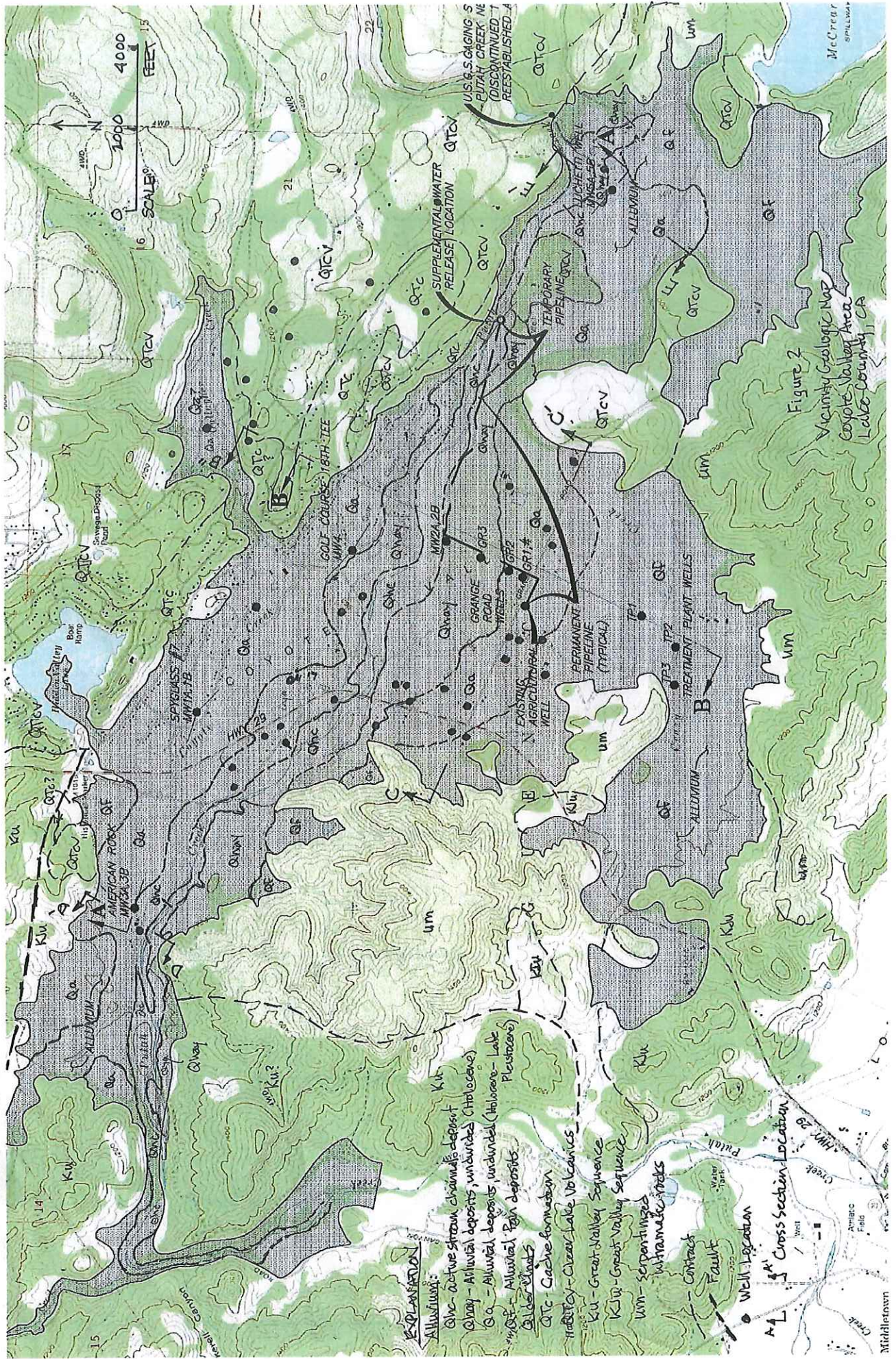
EXPLANATION

- Well
- Irrigation well
- Spring
- Gauging station
- Site of miscellaneous streamflow measurements
- Basin boundary
- Rancho boundary
- Former Spanish or Mexican land grant. Section lines projected for reference only

- Contact
- Fault
- u, upthrown side; d, downthrown side

Base from U. S. Geological Survey topographic maps. Broken land lines projected for reference only. December, 1951





**EXPLANATION**

- Alluvium:
  - Qvc - active stream channels deposit
  - Qchay - Alluvial deposits, unsorted (Holocene)
  - Qa - Alluvial deposits, undisturbed (Holocene - Late Pleistocene)
  - Qsf - Alluvial fan deposits
  - Qld - older alluvium
  - Qtc - Cache formation
- Qm - Cretaceous - Quaternary
- Ku - Great Valley Sequence
- Kst - Great Valley Sequence
- um - Serpentinized ultramafic rocks

- Contract Fault
- Well Location
- 1/4" Cross Section Location

Figure 2  
Vicinity Geologic Map  
Coyote Valley Area  
Lodi County, CA



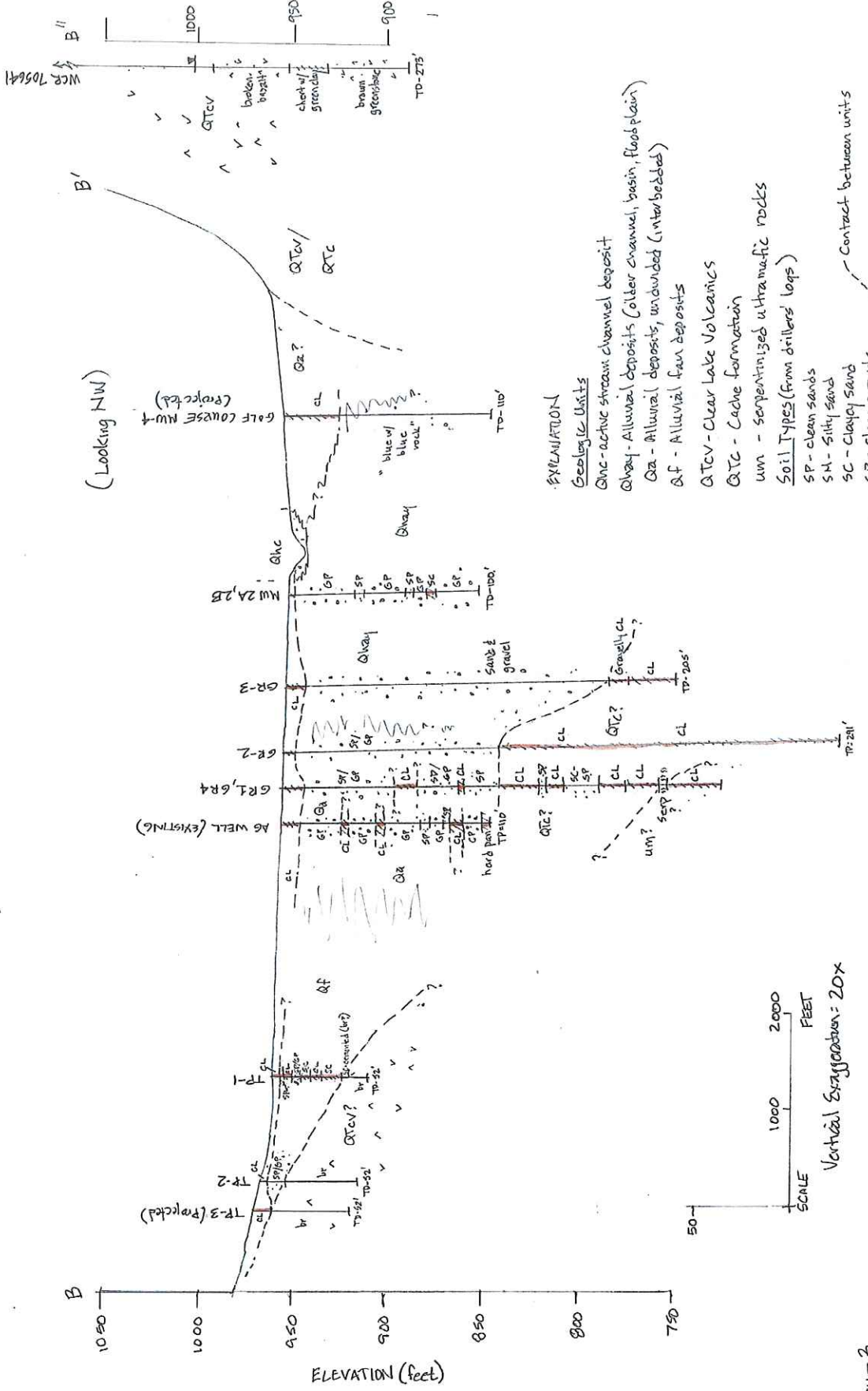
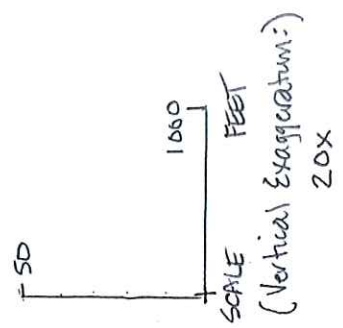
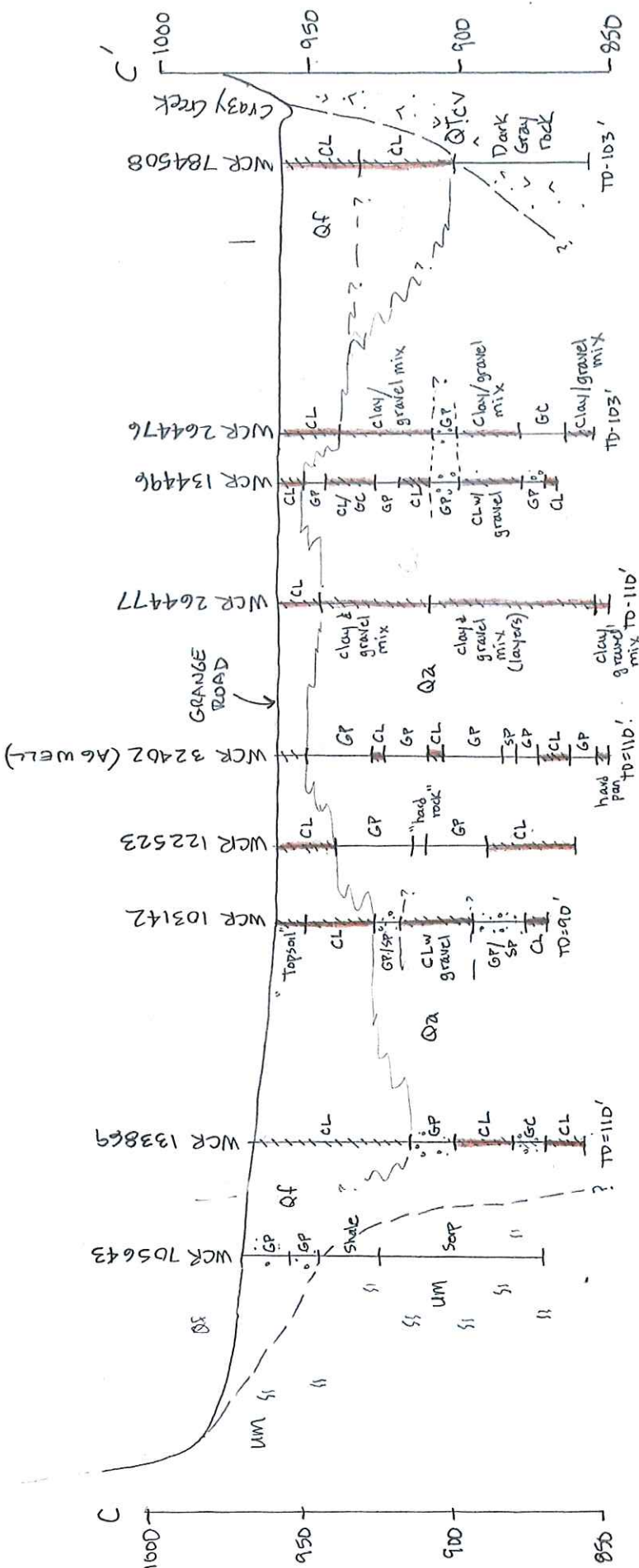


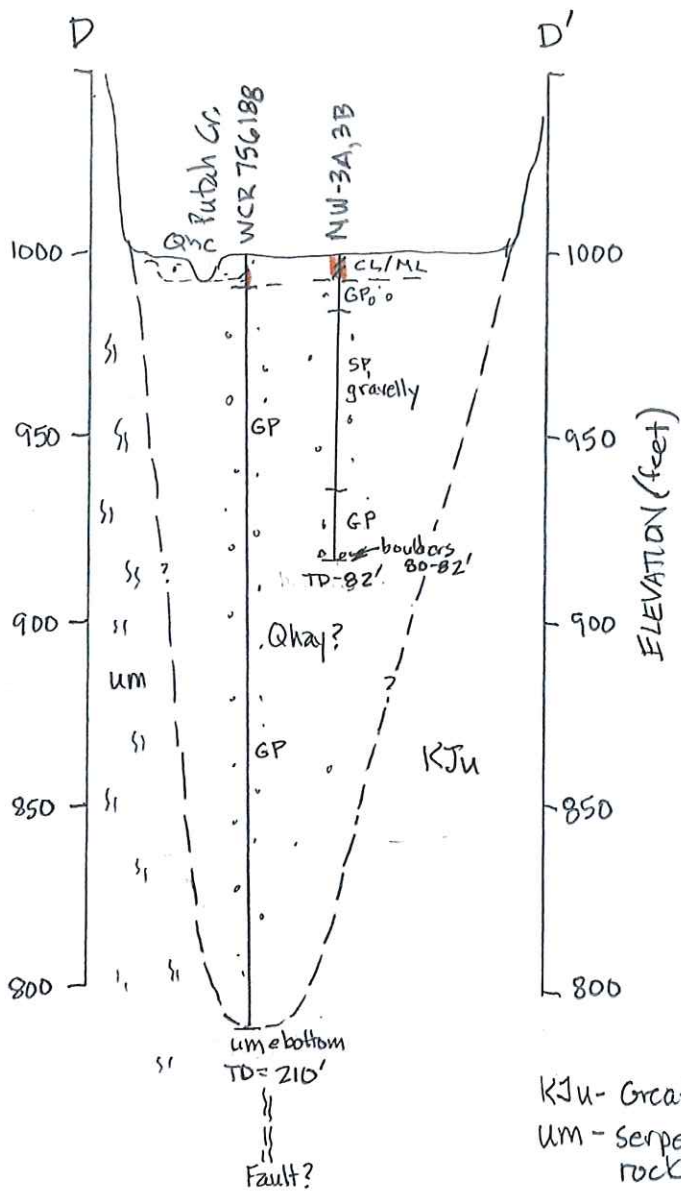
Figure 3  
 GEOLOGIC SECTION B-B'  
 Coyote Valley Area  
 Lake County, CA



(Note: See Figure 3 for Explanation of units)

GEOLOGIC SECTION C-C'  
COYOTE VALLEY AREA  
LAKE COUNTY, CA  
Figure 4





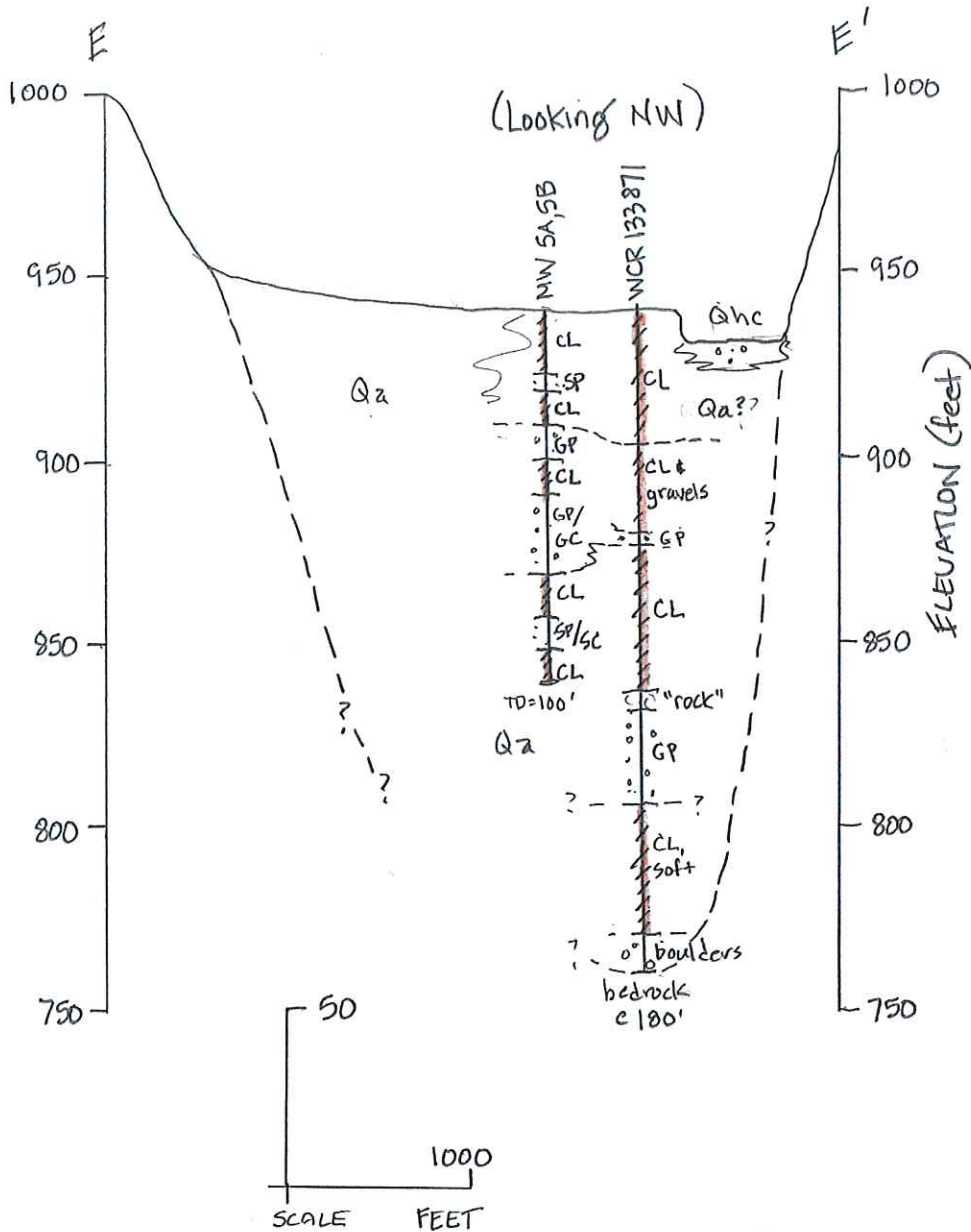
50  
SCALE FEET  
(Vertical Exaggeration: 20x)

KJu - Great Valley Sequence  
UM - serpentinized ultramafic rocks

GEOLOGIC SECTION D-D'  
Coyote Valley Area  
Lake County, CA

(See Figure 3 for unit descriptions)

Figure 5



(See Figure 3 for explanation of units)

GEOLOGIC SECTION E-E'  
 Coyote Valley Area  
 Lake County, CA

Figure 6



11 10 / 106 W - 2714

Do Not Fill In **CR-1**

ORIGINAL File with DWR

CONFIDENTIAL LOG  
Water Code Sec. 1375

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

No. 93463

State Well No. \_\_\_\_\_  
Other Well No. \_\_\_\_\_

(1) OWNER:

Name Stone House Mutual Water Co  
Address PO Box 628  
Middleton Calif.

(2) LOCATION OF WELL:

County LAKE Owner's number, if any \_\_\_\_\_  
Township, Range, and Section \_\_\_\_\_  
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

(11) WELL LOG:

Total depth 110 ft. Depth of completed well 110 ft.

Formation: Describe by color, character, size of material, and structure  
ft. to \_\_\_\_\_ ft.  
0 TO 14' Black Top Soil  
14 TO 35 Clay & Gravel  
35 TO 65 COARSE GRAVEL  
65 TO 76 FINE SAND  
76 TO 85 BROWN CLAY  
85 TO 110 CLAY WITH GRAVEL

(6) CASING INSTALLED:

STEEL: <input checked="" type="checkbox"/>				OTHER: _____			
SINGLE <input type="checkbox"/>				DOUBLE <input checked="" type="checkbox"/>			
From ft.	To ft.	Diam.	Gage or Wall	If gravel packed			
				Diameter of Bore	From ft.	To ft.	
0	50	16"	219				
	110	12 3/4"	219				

Size of shoe or well rings 0 Size of gravel: \_\_\_\_\_

Describe joint BUT WELD

(7) PERFORATIONS OR SCREEN:

Type of perforation or name of screen GV Mill Cut

From ft.	To ft.	Perf. per row	Rows per ft.	Size in. x in.
55	100			3/16 x 4"

(8) CONSTRUCTION:

Was a surface sanitary seal provided? Yes  No  To what depth 50 ft.  
Were any strata sealed against pollution? Yes  No  If yes, note depth of strata \_\_\_\_\_  
From \_\_\_\_\_ ft. to \_\_\_\_\_ ft.  
From \_\_\_\_\_ ft. to \_\_\_\_\_ ft.

(9) WATER LEVELS:

Depth at which water was first found, if known \_\_\_\_\_ ft. 35  
Standing level before perforating, if known \_\_\_\_\_ ft. 35  
Standing level after perforating and developing \_\_\_\_\_ ft. 35

(10) WELL TESTS:

Was pump test made? Yes  No  If yes, by whom? Neal Durcan  
700 gal./min. with 65 ft. drawdown after 6 hrs.  
Temperature of water 60 Was a chemical analysis made? Yes  No   
Was electric log made of well? Yes  No  If yes, attach copy \_\_\_\_\_

Work started JUNE 10 1976 Completed JUNE 29 1976

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 EUGENE LOUISOUE  
(Person, firm, or corporation) (Typed or printed)

Address PO Box 65 Lower Lake -

[SIGNED] Eugene Louisoué  
(Well Driller)

License No. 196290 Dated AUG 10, 1976

SKETCH LOCATION OF WELL ON REVERSE SIDE

STATE OF CALIFORNIA  
DEPARTMENT OF PUBLIC HEALTHWELL DATA (1) Place and Owner Stonehouse Mutual Water Company(2) Source of Information Larry Menzio, SuperintendentCollected by A. Dinos Date September 1, 1981

(3) Number or Name	Grange Road Well
Date drilled	June 14, 1976
(4) Location: Neighborhood	Northwest corner of a vineyard
Size of lot	Multi-acred
Distance to: Sewer	$\frac{1}{4}$ mile
Sewage disposal	Ranch house septic system $\frac{1}{2}$ mile away
Abandoned well	None
Nearest property line	50 feet
(5) Housing: Type	Wooden housing (3 sided)
Condition	New
Pit depth (if any)	None
Floor (material)	Pedestal only, no floor
Drainage	Natural, away, and minimal
(6) Well Depth	112 feet
(7) Casing: Depth	112 feet
Diameter	12 $\frac{3}{4}$ inches
Kind	Steel
Height above floor	1 foot
Distance to highest perforations	50 feet
Surface sealed (yes or no)	Yes
Gravel pack (yes or no)	No
Second casing depth	None
Second casing diameter	None
Annular seal (depth)	Yes, to 50 feet
(8) Impervious Strata: { Thickness	5 feet (water atop the clay layer)
Penetrated { Depth to	35 feet
(9) Water Levels: { Surface	35 feet (See above)
Depth to { Static	29 feet
{ When pumping	6-inch drawdown at 300 GPM; or, 29 $\frac{1}{2}$ feet.
(10) Pump: Make	National
Type	Deep well turbine
Capacity, g.p.m.	500 GPM
Lubrication	Oil
Power	PGE 230/460 volts
Auxiliary power	None
Control	Automatic (clearwell tank level)
Discharge location	Above ground
Discharge to	Water treatment plant $\frac{1}{2}$ miles away (mostly 8-inch pipe)
(11) Frequency of Use	Daily
(12) Flood Hazard	Minimal
(13) Remarks and Defects	Driller: Lovisone of Lower Lake (Tele: 707 904-2612).
(Use other side if necessary)	Note: Dinos and Menzio interviewed Lovisone who was drilling another well on another property near

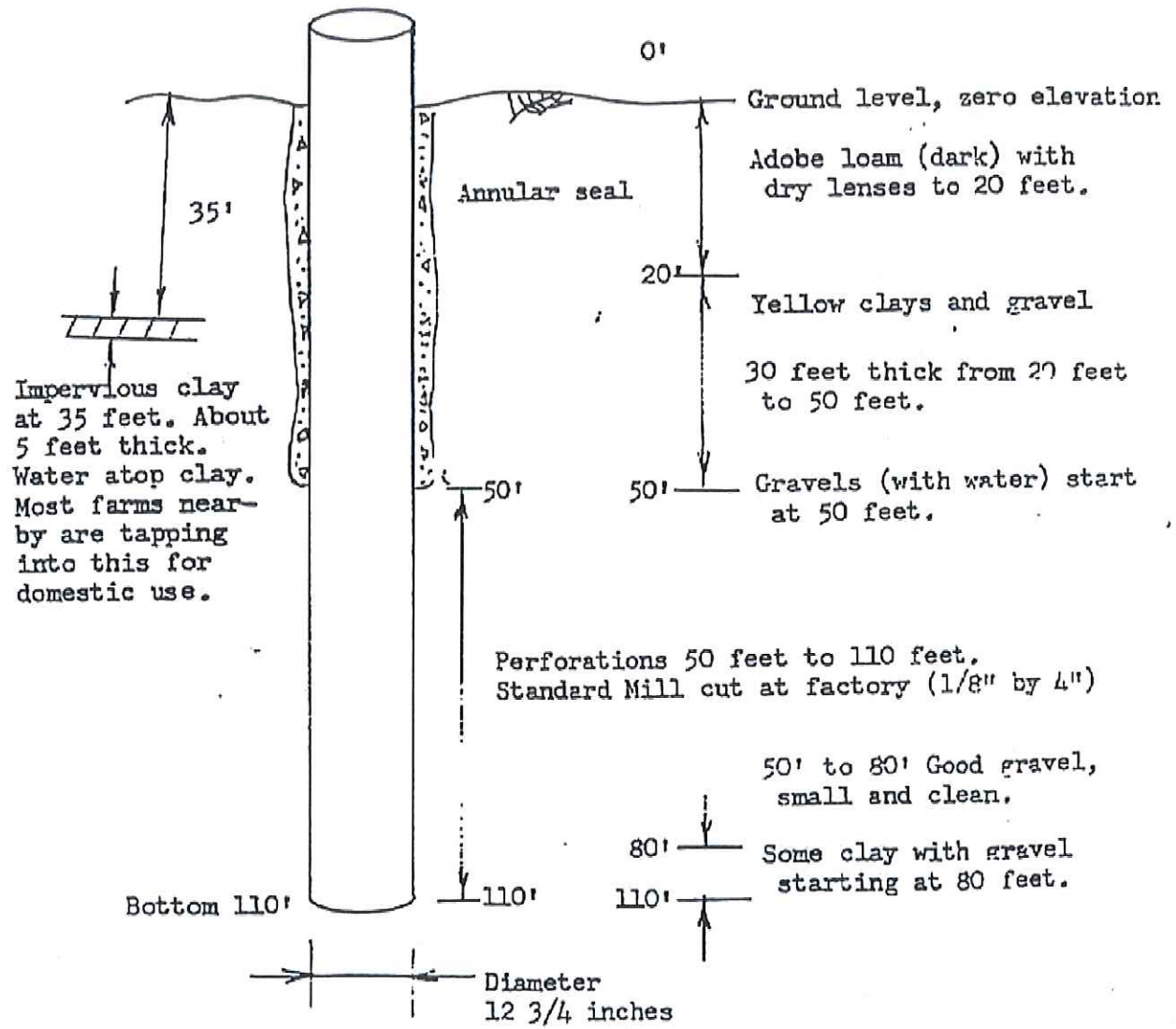


Well # 1 filed

Grange Road Well Details  
and Geology.

Described verbally by the driller Lovisone  
in the field September 1, 1981 to Dinos and Menzio.

Lovisone was drilling another well on another property  
near the vineyard where the Grange Road Well is located.



Note: No scale.  
No proportion.  
SES Santa Rosa.  
September 2, 1981

**PG&E Pump Test Services**  
**\*\*\*\* PUMP TEST REPORT \*\*\*\***

Tested By: DAN WILLIAMSON  
 Test Date: 05/09/96  
 Customer Plant ID:

Drive: Electric Motor  
 H.P.: 30  
 Drive Make: General Electric  
 Pump Make: Other  
 PG&E Plant Id:

Location: GRANGE RD #1

CUSTOMER MAILING ADDRESS

Steve Shaw  
 HIDDEN VALLEY LAKE COMMUNITY SVCS DIST  
 BOX 5148  
 MIDDLETOWN, CA 95461

ACCOUNT INFORMATION

Account No: RNJ-54-27661  
 Control No: 4271090 Pump Suffix: A  
 Meter No: 1654R6  
 Pump Usage: 135,431 KWH / YR  
 Account Usage: 135,431 KWH / YR  
 Energy Cost: 10.60 Cents / KWH

----- TEST RESULTS -----

Run Number:	1
Standing Water Level (ft)	25.0
Drawdown (ft)	6.9
Pumping Water Level (ft)	31.9
Discharge Level (ft)	32.3
Discharge Pressure at Gauge (psi)	14.0
Total Lift (ft)	64.2
PG&E Water Flow (gpm)	945
Customer Water Flow (gpm)	800
Well Yield (gpm/ft)	137.0
KW Input	20.3
Horsepower Input	27.2
Percent of Rated Motor Load	80.0
Millions of Gallons per 24 Hrs	1.4
KWH per Millions of Gallons	358.0
Overall Plant Efficiency (%)	56.3

----- TEST REMARKS -----

VALVE OPEN AT GOLF COURSE POND. CONDITIONS MAY NOT BE TYPICAL.

----- POTENTIAL SAVINGS -----

The Potential Savings shown below are possible if the overall efficiency of pumping plant is improved to the level indicated under the Estimated After Repairs column.

	PRESENT CONDITIONS	ESTIMATED AFTER REPAIRS	POTENTIAL SAVINGS
Overall Plant Efficiency	56.3	60.9	
Pump Energy Used ( KWll )	135,431	129,217	6,214
Annual Cost (\$)	\$14,356	\$13,697	\$659
Annual Operating llours	6,671	5,139	1,533
Water Flow Rate (gpm)	945	1,227	282
Total Lift (ft)	64.2	66.3	
Percent of Rated Motor Load	80.0	100.0	
KWH per Millions of Gallons	358.0	341.6	
Annual Millions of Gallons Pumped	378.3	378.3	16.4



**PG&E Pump Test Services**  
**\*\*\*\* PUMP TEST REPORT \*\*\*\***

Tested By: DAN WILLIAMSON  
 Test Date: 05/09/96  
 Customer Plant ID:

Drive: Electric Motor  
 H.P.: 30  
 Drive Make: General Electric  
 Pump Make: Other  
 PG&E Plant Id:

Location: GRANGE RD #2

CUSTOMER MAILING ADDRESS

Steve Shaw  
 HIDDEN VALLEY LAKE COMMUNITY SVCS DIST  
 BOX 5148  
 MIDDLETOWN, CA 95461

ACCOUNT INFORMATION

Account No: RNJ-54-27661  
 Control No: 4271090 Pump Suffix: B  
 Meter No: 1654R6  
 Pump Usage: 135,431 KWH / YR  
 Account Usage: 135,431 KWH / YR  
 Energy Cost: 10.60 Cents / KWH

TEST RESULTS

Run Number:	1
Standing Water Level (ft)	22.8
Drawdown (ft)	38.0
Pumping Water Level (ft)	60.8
Discharge Level (ft)	25.4
Discharge Pressure at Gauge (psi)	11.0
Total Lift (ft)	86.2
PG&E Water Flow (gpm)	714
Customer Water Flow (gpm)	750
Well Yield (gpm/ft)	18.8
KW Input	24.0
Horsepower Input	32.2
Percent of Rated Motor Load	95.0
Millions of Gallons per 24 Hrs	1.0
KWH per Millions of Gallons	560.2
Overall Plant Efficiency (%)	48.3

TEST REMARKS

VALVE WAS OPEN AT GOLF COURSE POND. CONDITIONS MAY NOT BE TYPICAL.

POTENTIAL SAVINGS

The Potential Savings shown below are possible if the overall efficiency of pumping plant is improved to the level indicated under the Estimated After Repairs column.

	PRESENT CONDITIONS	ESTIMATED AFTER REPAIRS	POTENTIAL SAVINGS
Overall Plant Efficiency	48.3	60.9	
Pump Energy Used ( KWH )	135,431	117,344	18,087
Annual Cost (\$)	\$14,356	\$12,438	\$1,917
Annual Operating Hours	5,643	4,666	976
Water Flow Rate (gpm)	714	863	149
Total Lift (ft)	86.2	94.2	
Percent of Rated Motor Load	95.0	100.0	
KWH per Millions of Gallons	560.2	485.4	74.8
Annual Millions of Gallons Pumped	241.7	241.7	

PG&E Pump Test Services  
\*\*\*\* PUMP TEST REPORT \*\*\*\*

OCT 09 1996

JAMES D. WILLIAMSON

Tested By: DAN WILLIAMSON  
Test Date: 05/09/96  
Customer Plant ID:

Drive: Electric Motor  
H.P.: 30  
Drive Make: General Electric  
Pump Make: Other  
PG&E Plant ID:

Location: 18953 GRANGE RD #3

CUSTOMER MAILING ADDRESS

Steve Shaw  
STONE HOUSE MUTUAL WTR CO  
BOX 5148  
MIDDLETOWN, CA 95461

ACCOUNT INFORMATION

Account No: RNJ-54-28691  
Control No: 5974900 Pump Suffix: A  
Meter No: 5075R0  
Pump Usage: 29,024 KWH / YR  
Account Usage: 29,024 KWH / YR  
Energy Cost: 16.40 Cents / KWH

----- TEST RESULTS -----

Run Number:	1
Standing Water Level (ft)	23.0
Drawdown (ft)	62.8
Pumping Water Level (ft)	85.8
Discharge Level (ft)	25.4
Discharge Pressure at Gauge (psi)	11.0
Total Lift (ft)	111.2
PG&E Water Flow (gpm)	664
Customer Water Flow (gpm)	680
Well Yield (gpm/ft)	10.6
KW Input	22.9
Horsepower Input	30.7
Percent of Rated Motor Load	91.0
Millions of Gallons per 24 Hrs	1.0
KWH per Millions of Gallons	574.8
Overall Plant Efficiency (%)	60.7

----- TEST REMARKS -----

VALVE OPEN AT GOLF COURSE POND. CONDITIONS MAY NOT BE TYPICAL.

----- POTENTIAL SAVINGS -----

Not Applicable



ICATE  
's Copy

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

GR-2  
Do not fill in

No. 177233

Well No. or Date

State Well No.  
Other Well No.

OWNER: Name Stonehouse Mutual Water Co.  
William Hamann, P. O. Box 471  
Uddletown, CA Zip 95461

(12) WELL LOG: Total depth 292 ft. Depth of completed well 120 ft.  
from ft. to ft. Formation (Describe by color, character, size or material)

LOCATION OF WELL (See instructions):  
Lake Owner's Well Number #2  
Use if different from above Grange Road  
Uddletown Range \_\_\_\_\_ Section \_\_\_\_\_  
from cities, roads, railroads, fences, etc.

0 - 7 Topsoil  
7 - 22 Conglomerate boulders and gravel  
22 - 51 Conglomerate boulders, cobbles, and gravel  
51 - 58 Conglomerate gravels, cobbles & traces of brown clay  
58 - 74 Gravels and cobbles  
74 - 113 Conglomerate boulders, cobbles, and gravels

RECEIVED  
MAR - 7 1991  
JAMES C. HANSON

(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

113 - 117 Brown clay  
117 - 150 Brown sandy clay with cemented gravel  
150 - 160 Brown clay  
160 - 178 Brown sandy clay with streaks of gravel  
178 - 184 Brown clay & cemented boulders  
184 - 192 Brown clay  
192 - 205 Brown clay with streaks of gravel  
205 - 208 Brown clay  
208 - 219 Brown clay with seams of cemented gravel  
219 - 248 Blue clay with layers of cemented gravel  
248 - 260 Brown clay

WELL LOCATION SKETCH

(A) GRAVEL PACKING:  
Yes  No  Size 8 x 16  
Diameter of bore 12 1/2 - 18"  
Packed from 53 to 120 ft.

260 - 263 Blue clay  
263 - 265 Streaks of small blue gravel  
265 - 282 Blue clay with streaks of cemented gravel  
282 - 292 Cemented conglomerate

EQUIPMENT:  
 Reverse   
 Air   
 Bucket   
MATERIALS INSTALLED:  
Plastic  Concrete

(B) PERFORATIONS:  
Type of perforation Rosanna Moss SuperFlo

WELL SEAL:  
Is auxiliary seal provided? Yes  No  If yes, to depth 53 ft.  
Is well sealed against pollution? Yes  No  Interval \_\_\_\_\_ ft.  
If sealing Sand grout on pack

Work started 5/17 1985 Completed 5/15 1985

WATER LEVELS:  
Static water, if known \_\_\_\_\_ ft.  
Level after well completion 227 ft.

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

WELL TESTS:  
Test made? Yes  No  If yes, by whom? To be tested  
Test: Pump  Bailor  Air lift   
Start of test 23 ft. At end of test 30 ft.  
Flow rate 2 gal/min after 4 hours. Water temperature Cool  
Analysis made? Yes  No  If yes, by whom?  
Circulation log made? Yes  No  If yes, attach copy to this report

SIGNED: Gerald C. Thompson, By: Ward Thompson  
(Well Driller)  
NAME: WEEKS DRILLING AND PUMP COMPANY  
(Person, firm, or corporation) (Typed or printed)  
Address: P. O. Box 176  
City: Sebastopol, CA Zip: 95472  
License No. C57-177681 Date of this report May 20, 1985



STATE OF CALIFORNIA  
THE RESOURCES AGENCY  
DEPARTMENT OF WATER RESOURCES

Do not fill in

WATER WELL DRILLERS REPORT

No. 375939

AK-3  
File  
Stonehouse

WELL #3

Form No. WE 561

State Well No. \_\_\_\_\_  
Other Well No. \_\_\_\_\_

OWNER: Name Stonehouse Mutual Water Company  
& Winzler & Kelly, 495 Tesconi Circle  
Santa Rosa, CA ZIP 95401

(12) WELL LOG: Total depth 205 ft. Completed depth 180 ft.

from ft.	to ft.	Formation (Describe by color, character, size or material)
0	- 10	Brown sandy clay & sandy gravel with cobbles
10	- 115	Sandy gravel with conglomerate and boulders
115	- 120	Sand & gravel with conglomerate and boulders, small amounts of silty clays & sandy clay
120	- 165	Sandy gravel with conglomerate and boulders
165	- 170	Conglomerate sand & gravel with boulders
170	- 180	Conglomerate brown clay with embedded rock
180	- 198	Brown clay
198	- 205	Tan sandy clay

LOCATION OF WELL (See instructions): 14-270-66  
Lake \_\_\_\_\_ Owner's Well Number \_\_\_\_\_  
Address if different from above 18963 Grange Road  
City Middletown Range \_\_\_\_\_ Section \_\_\_\_\_  
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   
Municipal   
Other  (Describe) Public

WELL LOCATION SKETCH

EQUIPMENT:  
Rotary  Reverse   
Table  Air   
Other  Bucket

(6) GRAVEL PACK:  
Yes  No  Size 20  
Diameter of bore 12 1/2  
Packed from 50 to 180

CASING INSTALLED:  
 Plastic  Concrete

(8) PERFORATIONS:  
Type of perforation S.S. Screen  
Size of perforation \_\_\_\_\_

From ft.	To ft.	Di. in.	Gage or Wall	From ft.	To ft.	Slot size
180	12 3/4	0.25	80	180	12 3/4	0.070

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 Sand Grout On Pack

(7) WATER LEVELS:  
Depth of first water, if known \_\_\_\_\_ ft.  
Standing level after well completion 29 ft.

(9) WELL TESTS:  
Well test made? Yes  No  If yes, by whom? Weeks  
Type of test Pump  Bailor  Air lift   
Duration at start of test 29 ft. At end of test 123 ft.  
Discharge 700 gal/min after 6 hours. Water temperature 67°  
Chemical analysis made? Yes  No  If yes, by whom? \_\_\_\_\_  
Electric log made? Yes  No  If yes, attach copy to this report

Work started 10-9 1991 Completed 10-22 1991

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 Ward Thompson (Well Driller)  
NAME WEEKS DRILLING & PUMP CO.  
(Person, firm, or corporation) (Typed or printed)  
Address POB 176  
City Sebastopol, CA ZIP 95473  
License No. C57-177681 Date of this report 11-14-91

RECEIVED  
APR 28 1992  
JAMES C. HANSON

\*\* 500 G.P.M. At 80' \*\*



Grange Road Well #4

RECEIVED MAR 10 2003

TOP OF CASING ELEV 956.89

TRIPPLICATE Owner's Copy

STATE OF CALIFORNIA WELL COMPLETION REPORT

Refer to Instruction Pamphlet

No. 769936

DWR USE ONLY - DO NOT FILL IN. STATE WELL NO / STATION NO. LATITUDE LONGITUDE APN/RS/OTHER

Page 1 of 1

Owner's Well No. Well #4 4

Date Work Began 1/23/2003, Ended 2/26/2003

Local Permit Agency Lake Co Environ Health

Permit No. WE-2201

Permit Date 1/29/2003

GEOLOGIC LOG

Table with columns: ORIENTATION, DRILLING METHOD, DEPTH FROM SURFACE, DESCRIPTION. Includes handwritten entries for mud rotary drilling and geological descriptions like 'Tan clay', 'Sand and gravel, cobble and boulders', etc.

WELL OWNER

Name Hidden Valley Com. Service District, Mailing Address 19400 Hartman Road, Middletown CA

WELL LOCATION

Address 18963 Grange Road, City Middletown CA, County Lake, APN Book 014 Page 270 Parcel 67

Latitude, Longitude, LOCATION SKETCH NORTH, ACTIVITY (NEW WELL)

MONITORING, TEST WELL, CATHODIC PROTECTION, HEAT EXCHANGE, DIRECT PUSH, INJECTION, VAPOR EXTRACTION, SPARGING, REMEDIATION, OTHER (SPECIFY)

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER (Feet) BELOW SURFACE, DEPTH OF STATIC WATER LEVEL 22 (Feet) & DATE MEASURED 2/26/2003, ESTIMATED YIELD 100 (GPM) & TEST TYPE BAILED

Table with columns: DEPTH FROM SURFACE, BORE-HOLE DIA., CASING (S) TYPE, MATERIAL GRADE, INTERNAL DIAMETER, GAUGE OR WALL THICKNESS, SLOT SIZE IF ANY

Table with columns: DEPTH FROM SURFACE, ANNULAR MATERIAL TYPE, CE-MENT, BEN-TONITE, FILTER PACK (TYPE/SIZE)

- ATTACHMENTS (2): Geologic Log, Well Construction Diagram, Geophysical Log(s), Soil/Water Chemical Analysis, Other

CERTIFICATION STATEMENT: I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief. NAME Weeks Drilling & Pump, Signed Melissa G. Lopez, DATE SIGNED 03/05/03







ON REPORT

AG Well?

WELL LOCATION

11N/8W-30H1

Report No. Lake # 84

Owner \_\_\_\_\_

Pump No. Peerless # J86820

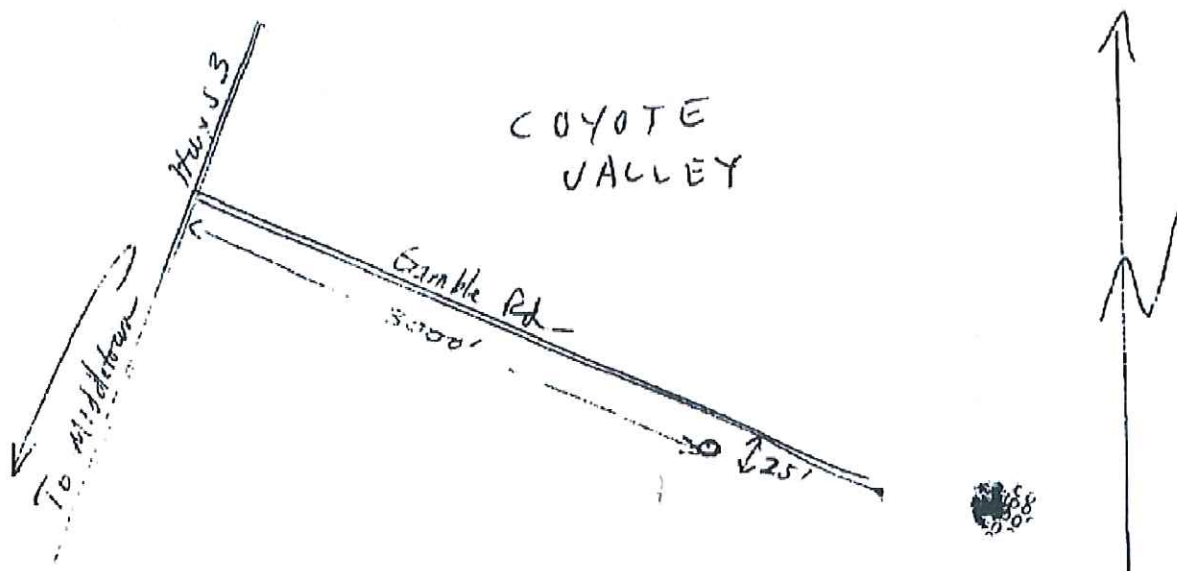
Meter No. 106317

Region 5; County Lake

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

Township 11N Range ~~16W~~ Projected 16W Section 30H1, MD B&M.  
~~4200~~ ft. north, 500 ft. west from southeast corner of Projected Section.

SKETCH

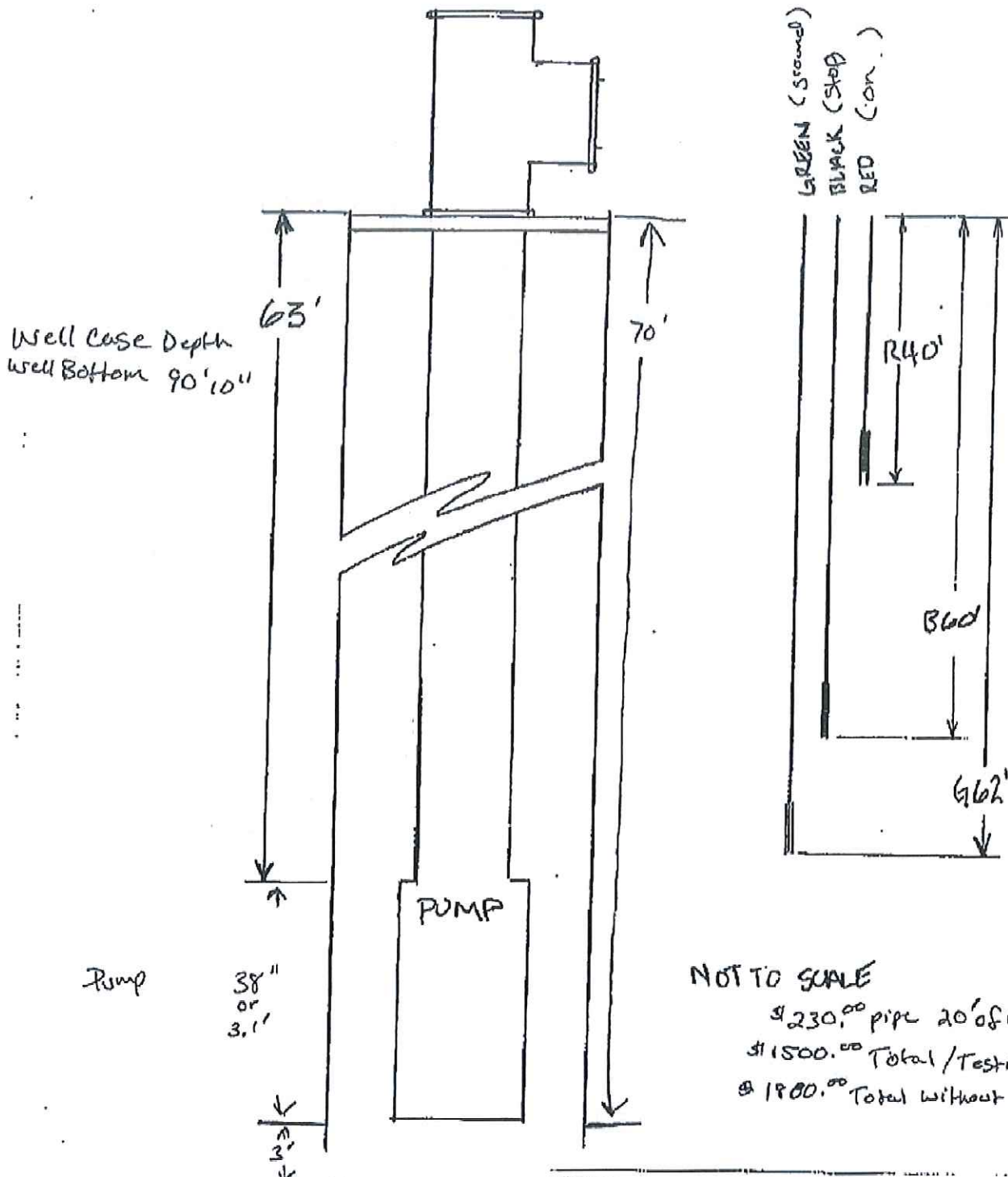


FOR OFFICIAL USE ONLY

DESCRIPTION OR REMARKS

Present owner is Road

Checked by R. S. Ford Date 1-13-61



NOT TO SCALE

\$230.00 pipe 20' of 6"

\$11500.00 Total / Testing

\$ 1800.00 Total without testing

HIDDEN VALLEY  
GRANG RD  
SUB PUMP

Project:	Date:
<b>WEEKS</b>	



Copy

# WELL COMPLETION REPORT

Refer to Instruction Pamphlet

1 of 1  
Owner's Well No. 1

No. 415770

Date Work Began 10/24/94, Ended 10/28/94

Local Permit Agency Lake County Public Health Dept.

Well No. WE 1101 M Permit Date 08/04/94

## GEOLOGIC LOG

ORIENTATION (Z)  VERTICAL  HORIZONTAL  ANGLE  (SPECIFY)

DEPTH TO FIRST WATER (FL) BELOW SURFACE

DEPTH FROM SURFACE		DESCRIPTION <i>Describe material, grain size, color, etc.</i>
Fl.	to Fl.	
0	1	Topsoil
1	3	Silty dark brown clay
3	4	Brown clays with sands and gravels
4	6	Sand and gravels
6	10	Silty light brown clays
10	15	Sand and gravel
15	20	Sand and gravel with brown clays
20	26	Sandy brown clays with embedded gravels
26	36	Sand and gravel with brown clays
36	40	Cemented sand and gravels with some clays
40	52	Fractured volcanic rock with some brown clays

TP-1

STATE WELL NO./STATION NO.	
LATITUDE	LONGITUDE
APN/TRS/OTHER	

## WELL OWNER

Name Hidden Valley Lake C.S.D.  
 Mailing Address c/o F & H const., P.O. Box 55245  
 City Stockton STATE 95215

WELL LOCATION  
 Address 18896 Grange Road  
 City Middletown, CA  
 County Lake  
 APN Book 014 Page 270 Parcel 10  
 Township \_\_\_\_\_ Range \_\_\_\_\_ Section \_\_\_\_\_  
 Latitude \_\_\_\_\_ NORTH Longitude \_\_\_\_\_ WEST

LOCATION SKETCH

ACTIVITY (Z)

NEW WELL  
 MONITORING  
 WATER SUPPLY  
 Domestic  
 Public  
 Irrigation  
 Industrial  
 "TEST WELL"  
 CATHODIC PROTECTION  
 OTHER (Specify)

DESTROY (Describe Penetration and Materials Under "TR IN (MIN) EXT")

PLANNED USE(S) (Z)

Illustrate or Describe Distance of Well from Landmarks such as Roads, Buildings, Fences, Rivers, etc. PLEASE BE ACCURATE & COMPLETE.

DRILLING METHOD Mud Rotary FLUID Bentonite  
 WATER LEVEL & YIELD OF COMPLETED WELL  
 DEPTH OF STATIC WATER LEVEL 23.9 (Fl.) & DATE MEASURED 10/28/94  
 ESTIMATED YIELD 2 (GPM) & TEST TYPE Pump  
 TEST LENGTH 2 (Hrs.) TOTAL DRAWDOWN 24 (Fl.)  
 \* May not be representative of a well's long-term yield.

TOTAL DEPTH OF BORING 52 (Feet)  
 TOTAL DEPTH OF COMPLETED WELL 50 (Feet)

DEPTH FROM SURFACE Fl. to Fl.	BORE-HOLE DIA. (Inches)	CASING(S)					DEPTH FROM SURFACE Fl. to Fl.	ANNULAR MATERIAL				
		TYPE (Z)				MATERIAL / GRADE		INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)	TYPE	
		BLANK	SCREEN	COB-DOCTOR	FIL PIPE							CE-MENT (Z)
0	30	8 3/4	X			F 480 PVC 4"	CL200					
30	50	8 3/4	X			F 480 PVC 4"	CL200	.020			X #3 sand	

- ATTACHMENTS (Z)
- Geologic Log
  - Well Construction Diagram
  - Geophysical Log(s)
  - Soil/Water Chemical Analyses
  - Other
- ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME WEEKS DRILLING AND PUMP COMPANY by Ward Thompson  
 (PUBLIC FIRM, OR CORPORATION, PARTNERSHIP OR LIMITED)  
 ADDRESS P.O. Box 176 CITY Sebastopol STATE CA ZIP 95473  
 Signed Ward Thompson DATE SIGNED 10/31/94 C-57 LICENSE NUMBER 177681  
 WELL DRILLER/AUTHORIZED REPRESENTATIVE



Owner's Copy

WELL COMPLETION REPORT

Refer to Instruction Pamphlet

Page 1 of 1

Owner's Well No. 3

No. 415772

Date Work Began

Oct. 24, 1994 Ended Oct 28, 1994

Local Permit Agency Lake County Public Health Department

Permit No. WE 1103-M

Permit Date 08/04/94

STATE WELL NO./STATION NO.  
 LATITUDE  
 LONGITUDE  
 APN/TRS/OTHER

ORIENTATION (Z)  VERTICAL  HORIZONTAL  ANGLE (SPECIFY)

DEPTH TO FIRST WATER (IN.) BELOW SURFACE

DEPTH FROM SURFACE		DESCRIPTION
Fl.	to Fl.	
0	1	Top soil
1	3	Silty brown clay
3	12	Sand and gravel
12	13	Multi-colored volcanics with brown clays
13	19	Fractured gray rock with some clays
19	37	Extremely hard gray rock with some gray clays
37	44	Extremely hard multi-colored volcanic rock with some clays
44	46	Gray clay and gray rock
46	52	Gray clay with embedded gray rock

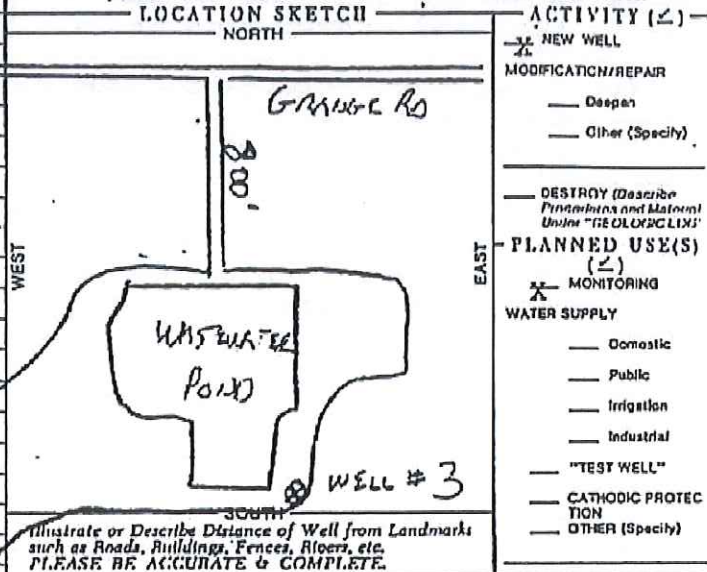
Describe material, grain size, color, etc.

WELL OWNER

Name HIDDEN VALLEY LAKE C.S.D.  
 Mailing Address c/o F & H Const., P.O. 55245  
Stockton CA 95205

WELL LOCATION

Address 18896 Grange Road  
 City Middletown, CA  
 County Lake  
 APN Book 014 Page 280 Parcel 19  
 Township \_\_\_\_\_ Range \_\_\_\_\_ Section \_\_\_\_\_  
 Latitude \_\_\_\_\_ North Longitude \_\_\_\_\_ West



DRILLING METHOD MUD ROTARY FLUID Bentonite

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH OF STATIC WATER LEVEL 10.2 (Feet) & DATE MEASURED 10/23/94

ESTIMATED YIELD 6 (GPM) & TEST TYPE Pump

TEST LENGTH 2 (Fts.) TOTAL DRAWDOWN 37 (Feet)

\* May not be representative of a well's long-term yield.

DEPTH FROM SURFACE	BORE-HOLE DIA. (Inches)	CASING(S)						DEPTH FROM SURFACE	ANNULAR MATERIAL					
		TYPE (Z)				MATERIAL/GRADE	INTERNAL DIAMETER (Inches)		GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)	TYPE			
Fl.	to Fl.	BLANK	SCREEN	CONDUCTOR	FILL PIPE							Fl.	to Fl.	CE-MENT (Z)
0	14	8 3/4	X					0	10	X				
14	50	8 3/4	X			F-480 PVC	4"	CL200				X	#3 sand	

ATTACHMENTS (Z)

Geologic Log  
 Well Construction Diagram  
 Geophysical Log(s)  
 Soil/Water Chemical Analyses  
 Other

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME WEEKS DRILLING AND PUMP COMPANY by Ward Thompson  
 (PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

ADDRESS P.O. Box 176 Sebastopol CA 95473  
 CITY STATE ZIP

Signed [Signature] DATE SIGNED 10/31/94 177611  
 WELL DRILLER/AUTHORIZED REPRESENTATIVE CST LICENSE NUMBER



1's Copy  
 of 1  
 Owner's Well No. 2

WELL COMPLETION REPORT  
 Refer to Instruction Pamphlet

Date Work Began 10/24/94 Ended 10/28/94 No. 415771  
 Local Permit Agency Lake County Public Health Department  
 Permit No. WE 1102-M Permit Date 8/4/94

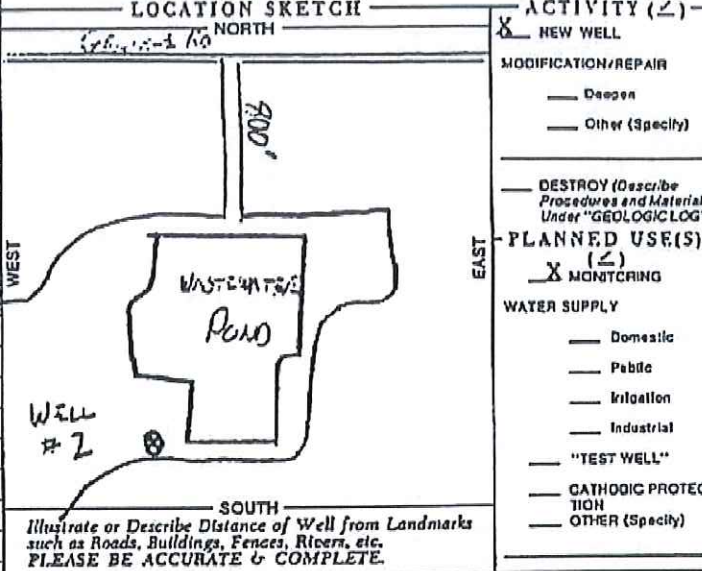
STATE WELL NO./STATION NO.  
 LATITUDE LONGITUDE  
 APN/TRS/OTHER

GEOLOGIC LOG

DEPTH FROM SURFACE		DEPTH TO FIRST WATER (FL) BELOW SURFACE	DESCRIPTION
Fl.	to Fl.	#2	Describe material, grain size, color, etc.
0	1		Top soil
1	9		Stiff brown clays with embedded rock
9	12		Volcanic conglomerate with brown clays
12	19		Fractured gray rock
19	25		Fractured gray rock with some gray clays
25	52		Gray clay with fractured gray rock

WELL OWNER

Name HIDDEN VALLEY LAKE C.S.D.  
 Mailing Address c/o F & H Const., P.O. B. 55245  
 Stockton CA 95205  
 CITY STATE ZIP  
 WELL LOCATION  
 Address 18896 Grange Road  
 City Middletown, CA  
 County LAKE  
 APN Book 014 Page 280 Parcel 19  
 Township Range Section  
 Latitude NORTH Longitude WEST  
 DEG. MIN. SEC. DEG. MIN. SEC.



ACTIVITY (✓)  
 NEW WELL  
 MODIFICATION/REPAIR  
 Deepen  
 Other (Specify)  
 DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")  
 PLANNED USE(S) (✓)  
 MONITORING  
 WATER SUPPLY  
 Domestic  
 Public  
 Irrigation  
 Industrial  
 "TEST WELL"  
 CATHODIC PROTECTION  
 OTHER (Specify)  
 DRILLING METHOD MUD ROTARY FLUID Bentonite  
 WATER LEVEL & YIELD OF COMPLETED WELL  
 DEPTH OF STATIC WATER LEVEL 11.5 (Fl.) & DATE MEASURED 10/28/94  
 ESTIMATED YIELD 3.5 (GPM) & TEST TYPE Pump  
 TEST LENGTH 2 (Hrs.) TOTAL DRAWDOWN 36 (Fl.)  
 \* May not be representative of a well's long-term yield.

DEPTH FROM SURFACE	BORE-HOLE DIA. (Inches)	CASING(S)							
		TYPE (✓)				MATERIAL/ GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
Fl.	to Fl.	BLANK	SCREEN	CON- DUCTOR	FILL PIPE				
0	14	8 3/4	X			F-480 PVC	4"	CL200	
14	50	8 3/4	X			F-480 PVC	4"	CL200	.020

DEPTH FROM SURFACE	ANNULAR MATERIAL				
	TYPE				
Fl.	to Fl.	CE- MENT (✓)	BEN- TONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	11	X			
11	52			X	#3 Sand

- ATTACHMENTS (✓)
- Geologic Log
  - Well Construction Diagram
  - Geophysical Log(s)
  - X Soil/Water Chemical Analyses
  - Other
- ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT  
 I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.  
 NAME WEEKS DRILLING AND PUMP COMPANY by Ward Thompson  
 (PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)  
 P.O. Box 176 Sebastopol CA 95473  
 ADDRESS CITY STATE ZIP  
 Signed Ward Thompson DATE SIGNED 10/31/94 177681  
 WELL DRILLER/AUTHORIZED REPRESENTATIVE C-57 LICENSE NUMBER



ORIGINAL  
File with DWR

WATER WELL DRILLERS REPORT  
(Sections 7079, 7080, 7081, 7382, Water Code)

Do Not Fill In

No 20869

THE RESOURCES AGENCY OF CALIFORNIA  
DEPARTMENT OF WATER RESOURCES

State Well No. \_\_\_\_\_  
Other Well No. 11N/6W-20

30x607  
20 Bluff Cml 96080

(1) OWNER:  
Name Hidden Valley Lake  
Address Middletown Calif 95461

(11) WELL LOG:  
Total depth \_\_\_\_\_ ft. Depth of completed well \_\_\_\_\_ ft.  
Formation: Describe by color, character, size of material and structure  
0 to 30' Brown top soil

(2) LOCATION OF WELL:  
County NAKIE Owner's number, if any \_\_\_\_\_  
Township, Range, and Section \_\_\_\_\_  
Distance from cities, roads, railroads, etc. \_\_\_\_\_

10 to 30' Brown clay with heavy rock  
30 to 100' Blue with blue rock

(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:		If gravel packed			
From	To	Diam.	Gage or Wall	Diameter of Bore	From	To	
7	110	12 3/4	.250				

Size of shoe or well ring 12 3/4 x 1/2 x 4" Size of gravel \_\_\_\_\_  
Describe joint BUT WELD

(7) PERFORATIONS OR SCREEN:

From ft.	To ft.	Perf. per row	Rows per ft.	Size in. x in.
30'	95'			1/8

CONFIDENTIAL LOG  
Water Code Sec. 13752

(8) CONSTRUCTION:  
Was a surface sanitary seal provided? Yes  No  To what depth \_\_\_\_\_ ft.  
Were any struts sealed against pollution? Yes  No  If yes, note depth of struts \_\_\_\_\_  
From \_\_\_\_\_ ft. to \_\_\_\_\_ ft.  
From \_\_\_\_\_ ft. to \_\_\_\_\_ ft.  
Method of sealing \_\_\_\_\_

Work started 6-4-73 Completed 6-12-73

(9) WATER LEVELS:  
Depth at which water was first found, if known \_\_\_\_\_ ft. 30  
Standing level before perforating, if known \_\_\_\_\_ ft. 30  
Standing level after perforating and developing \_\_\_\_\_ ft. 30

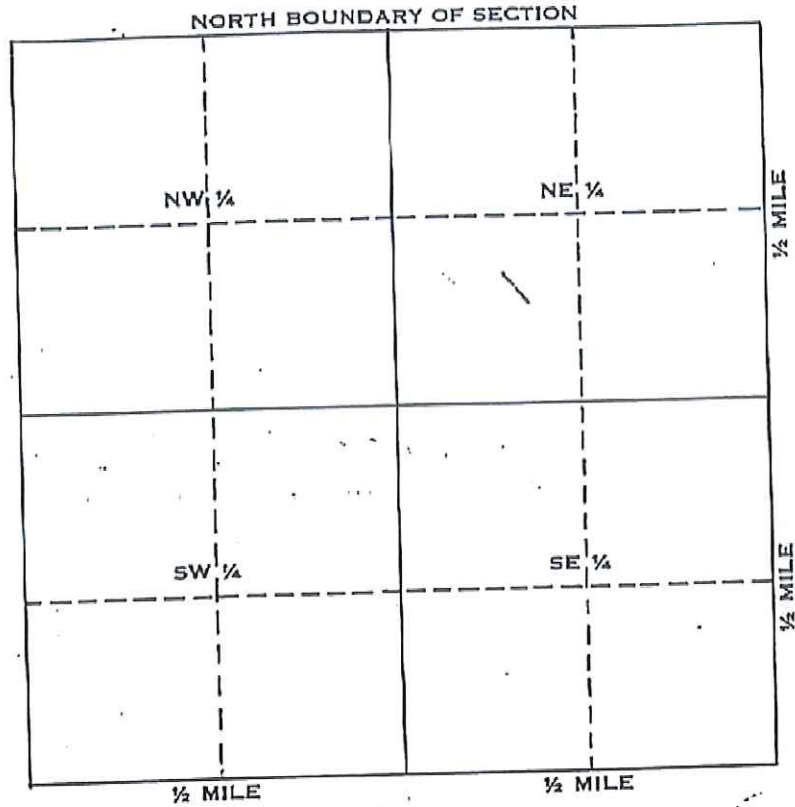
WELL DRILLER'S STATEMENT:  
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

(10) WELL TESTS:  
pump test made? Yes  No  If yes, by whom \_\_\_\_\_  
is \_\_\_\_\_ gal./min. with \_\_\_\_\_ ft. drawdown after \_\_\_\_\_ hrs.  
Temperature of water \_\_\_\_\_ Was a chemical analysis made? Yes  No   
Was electric log made of well? Yes  No  If yes, attach copy \_\_\_\_\_

NAME EUGENE LOUISONE  
(Person, firm, or corporation) (Typed or printed)  
Address PO BOX 265  
Hidden Valley Lake  
[SIGNED] Eugene Louison  
(Well Driller)  
License No. 196290 Dated 6-18-73



WE LOCATION SKETCH

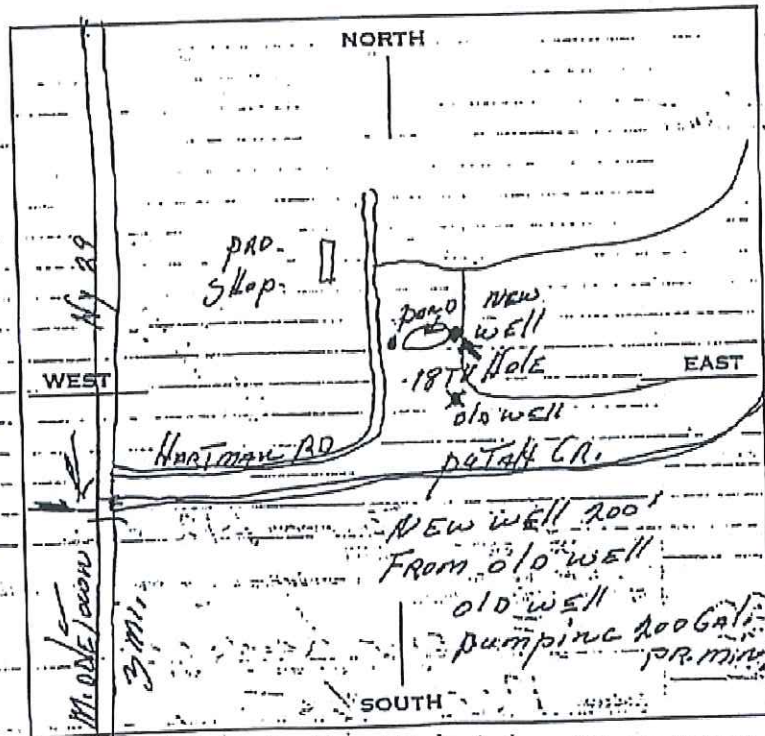


Township \_\_\_\_\_

Range \_\_\_\_\_

Section No. \_\_\_\_\_

A. Location of well in sectionized areas.  
Sketch roads, railroads, streams, or other features as necessary.



B. Location of well in areas not sectionized.  
Sketch roads, railroads, streams, or other features as necessary.  
Indicate distances.

HVLC

JAMES C. HANSON  
CONSULTING CIVIL ENGINEER  
A CORPORATION  
444 NORTH THIRD STREET, SUITE 400  
SACRAMENTO, CA 95814  
(916) 448-2821  
(916) 448-4736 FAX

April 22, 1997

CONFIDENTIAL WELL LOG FILE  
DEPARTMENT OF WATER RESOURCES  
NORTHERN DISTRICT  
ATTN: SANDY IRVING  
2440 Main Street  
Red Bluff, CA 96080-2398

RE: Well Logs

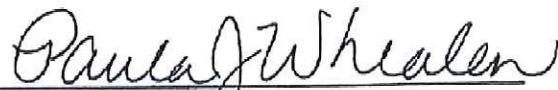
Transmitted:

- ▶ Well Completion Reports for Three Monitoring Wells Drilled in Lake County
- ▶ Boring Log for Each Well

Remarks:

Enclosed are the Completion Reports and Boring Logs for three wells drilled in Lake County in the fall of 1996. Please contact me if you have any questions regarding the enclosed matter.

By:



Paula J. Whealen

Encls. ✓

cc: Mel Aust, HVLCSD w/encl  
Weeks Drilling & Pump Co. w/encl.  
Dave Peterson, Trans Tech Consultants w/encl.  
Lake County - Environmental Health Dept. w/encl.

Via: Mail

LETTER OF TRANSMITTAL



ORIGINAL  
File with DWR

Page 1 of 1

Owner's Well No. MW-1A and B

Date Work Began 9/3/96, Ended 9/5/96

Local Permit Agency Lake County Dept. of Environmental Health

Permit No. WE 1350M Permit Date 8/19/96

STATE OF CALIFORNIA  
**WELL COMPLETION REPORT**

Refer to Instruction Pamphlet

No. 391302

DWR USE ONLY - DO NOT FILL IN

STATE WELL NO./STATION NO.

LATITUDE LONGITUDE

APN/TRS/OTHER

DEPTH FROM SURFACE		DESCRIPTION <i>Describe material, grain size, color, etc.</i>
Ft.	to Ft.	
0	6.5	Brown sandy silt; fine grained sand
6.5	8.5	Brown sandy clay
8.5	12.0	Brown clayey sandy gravel
12.0	18.0	Gray brown sandy gravel
18.0	35.0	Gray gravelly sand
35.0	41.0	Gray gravel
41.0	48.0	Gray sand, coarse grained
48.0	50.0	Gray gravel
50.0	69.5	Gray sand with gravel interbeds
69.5	71.0	Dark gray gravel
71.0	80.0	Gray sand, coarse grained
80.0	86.5	Brown clayey sand
86.5	100.0	Gray gravel

**WELL OWNER**

Name Hidden Valley Community Services District

Mailing Address P. O. Box 5148

Middletown CA 95461

CITY STATE ZIP

**WELL LOCATION**

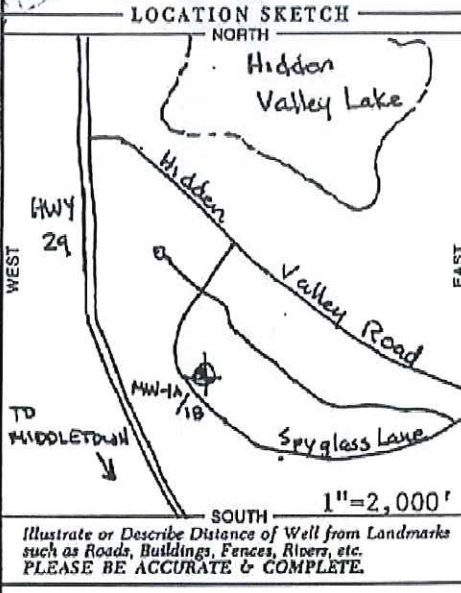
Address Hidden Valley Lake Golf Course (7th Tee)

County Lake

APN Book 141 Page 311 Parcel 25

Township 11N Range 6W Section 18P

Latitude \_\_\_\_\_ NCRTH Longitude \_\_\_\_\_ WEST



**ACTIVITY (✓)**

NEW WELL

MODIFICATION/REPAIR

\_\_\_ Deepen

\_\_\_ Other (Specify)

DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

**PLANNED USE(S) (✓)**

MONITORING

WATER SUPPLY

\_\_\_ Domestic

\_\_\_ Public

\_\_\_ Irrigation

\_\_\_ Industrial

\_\_\_ "TEST WELL"

\_\_\_ CATHODIC PROTECTION

\_\_\_ OTHER (Specify)

DRILLING METHOD Mud Rotary FLUID Bentonite

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH OF STATIC WATER LEVEL 14.9 (Ft.) & DATE MEASURED 10/24/96

ESTIMATED YIELD\* --- (GPM) & TEST TYPE Not tested

TEST LENGTH --- (Hrs.) TOTAL DRAWDOWN --- (Ft.)

\* May not be representative of a well's long-term yield.

DEPTH FROM SURFACE	BORE-HOLE DIA. (Inches)	CASING(S)				MATERIAL/ GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
		TYPE (✓)							
Ft.	to Ft.	BLANK	SCREEN	CON- DUCTOR	FILL PIPE				
0	40	6 5/8	X			PVC	2.0	Sch. 40	---
40	45	"	X			"	"	"	0.020
45	74	"	X			"	"	"	---
74	79	"	X			"	"	"	0.020

DEPTH FROM SURFACE	ANNULAR MATERIAL				
	TYPE				
Ft.	to Ft.	CE- MENT (✓)	BEN- TONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	20.6	X			
20.6	38.0			X	Sand/Gravel
38.0	46.5			X	Lonestar#3
46.5	70.5			X	Sand/Gravel
70.5	71.0		X		
71.0	80.0			X	Lonestar#3

**ATTACHMENTS (✓)**

Geologic Log

Well Construction Diagram

\_\_\_ Geophysical Log(s)

\_\_\_ Soil/Water Chemical Analyses

\_\_\_ Other

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

**CERTIFICATION STATEMENT**

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME WEEKS DRILLING & PUMP CO.

(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

ADDRESS PO Box 176 CITY SEBASTOPOL STATE CA ZIP 95473

Signed [Signature] DATE SIGNED 4/8/97 C-57 LICENSE NUMBER 177681

WELL DRILLER/AUTHORIZED REPRESENTATIVE



Log of Boring MW-1A and

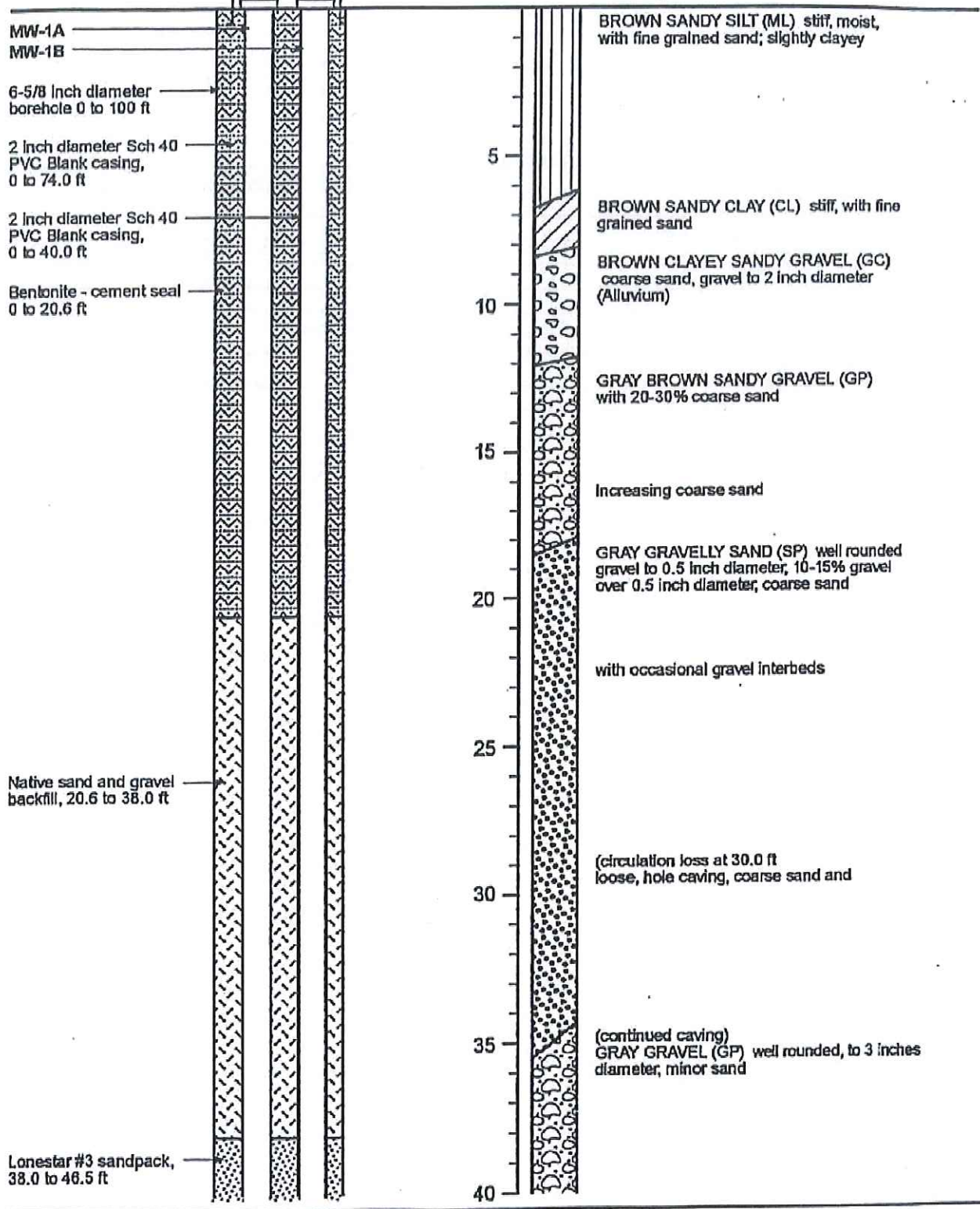
Equipment: /pc: 6-5/8 Inch Rotary Wash

Elevation: \_\_\_\_\_ Date: 9-5-98

Well Completion Detail

Blows / ft.  
Depth (ft)  
Sample

Description



**TRANS TECH CONSULTANTS**  
ENVIRONMENTAL AND GEOTECHNICAL SERVICES

Log of Boring MW-1A and B  
Hidden Valley Lake CSD  
Lake County, California

PLATE  
**2**

JOB NUMBER  
4071.01.01

DRAWN  
PM

APPROVED  
DMP

DATE  
10/98



Log of Boring MW-1A and B :ont.

Equipment: 6-5/8 Inch Rotary Wash

Elevation: \_\_\_\_\_ Date: 9-5-86

Well Completion Detail

Blows / ft.

Depth (ft)

Sample

Description

MW-1A  
MW-1B

2 inch diameter slotted  
0.02 screen, 40.0 to 45.0 ft

Lonestar #3 sand,  
38.0 to 46.5 ft

Native sand and gravel  
backfill 46.5 to 70.5 ft

Bentonite pellet seal  
70.5 to 71.0 ft

Lonestar #3 Sandpack  
71.0 to 80.0 ft

2 inch diameter slotted  
0.02 screen,  
74.0 to 79.0 ft

Hole cleaned out to  
80.0 ft

45

50

55

60

65

70

75

80

GRAY SAND (SP) loose, coarse grained,  
with occasional gravel to 1 inch diameter

GRAY GRAVEL (GP) loose, well  
rounded, to 2 inches diameter

GRAY SAND (SP) coarse grained

with 10-15% gravel to 1 inch diameter

medium to coarse grained sand

with gravel interbeds 1 to 3 ft thick

DARK GRAY GRAVEL (GP) with minor  
coarse sand

GRAY SAND (SP) loose, coarse grained with  
occasional interbedded gravel



Log of Boring MW-1A and B, continued  
Hidden Valley Lake CSD  
Lake County, California

PLATE  
**2**

JOB NUMBER  
4071.01.01

DRAWN  
PM

APPROVED  
DHP

DATE  
10/86

Log of Boring MW-1A and B :cont.

Equipment: 6-5/8 inch Rotary Wash

Elevation: \_\_\_\_\_ Date: 9-5-96

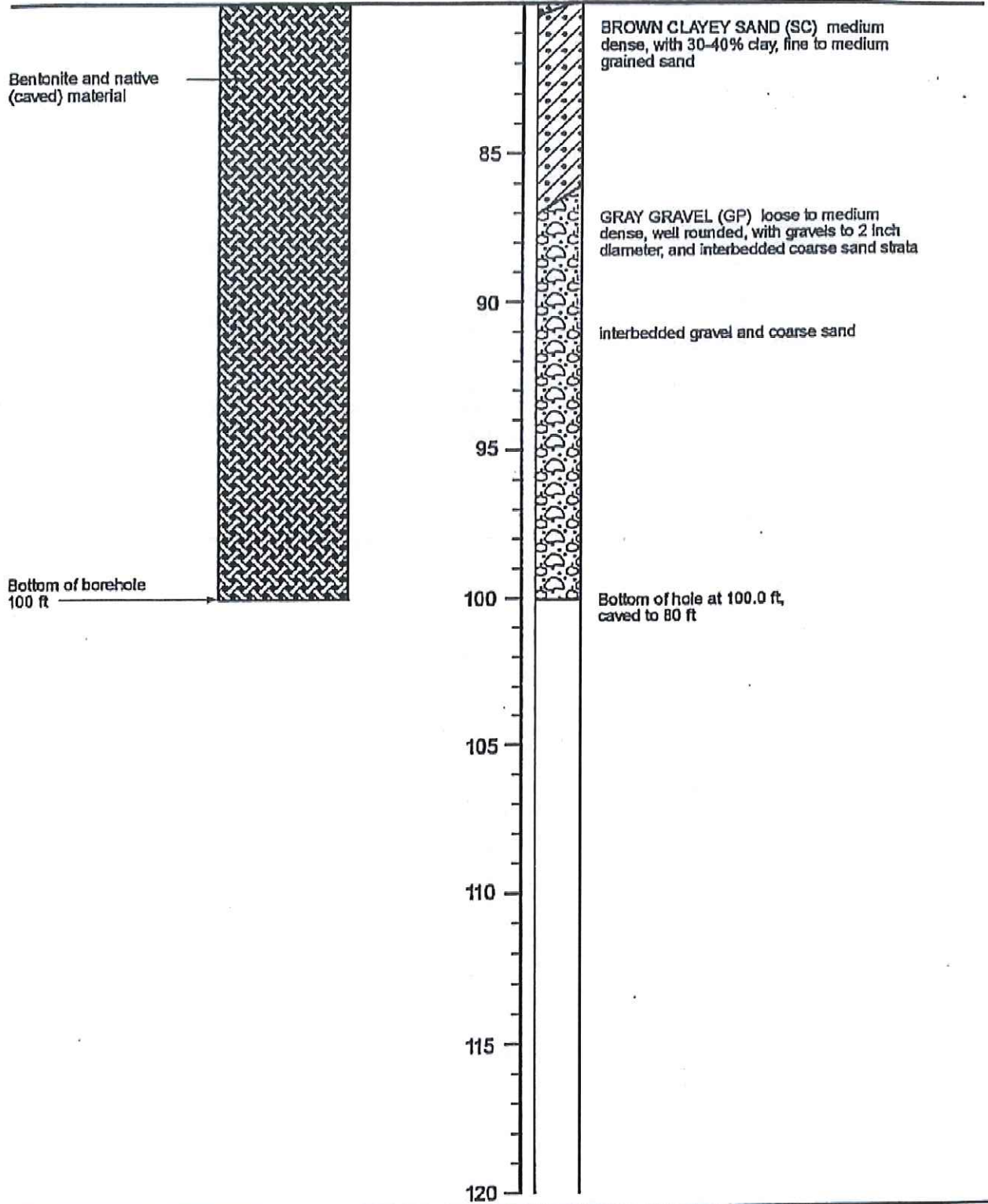
Well Completion Detail

Blows / ft.

Depth (ft)

Sample

Description



**TRANS TECH CONSULTANTS**  
ENVIRONMENTAL AND GEOTECHNICAL SERVICES

Log of Boring MW-1A and B, continued  
Hidden Valley Lake CSD  
Lake County, California

PLATE  
**2**

JOB NUMBER  
4071.01.01

DRAWN  
PM

APPROVED  
*DHP*

DATE  
10/96



ORIGINAL  
File with DWR

Page 1 of 1

Owner's Well No. MW2A and B

Date Work Began 9/9/96, Ended 9/9/96

Local Permit Agency Lake County Dept. of Environmental Health

Permit No. WE 1353M Permit Date 8/19/96

STATE OF CALIFORNIA  
**WELL COMPLETION REPORT**  
Refer to Instruction Pamphlet

No. **391303**

DWR USE ONLY - DO NOT FILL IN

STATE WELL NO./STATION NO.

LATITUDE LONGITUDE

APN/TRS/OTHER

**GEOLOGIC LOG**

ORIENTATION (∠)  VERTICAL  HORIZONTAL  ANGLE (SPECIFY)

DEPTH TO FIRST WATER (Ft.) BELOW SURFACE

DEPTH FROM SURFACE		DESCRIPTION
Ft.	to Ft.	
0	4.0	Brown sandy silt
4.0	36.0	Gray brown sandy gravel
36.0	39.5	Gray sand, coarse grained
39.5	61.5	Gray gravel
61.5	65.0	Gray sand, coarse grained
65.0	75.0	Gray gravel
75.0	78.5	Brown clayey sand
78.5	100.0	Gray sandy gravel

**WELL OWNER**

Name Hidden Valley Community Services District

Mailing Address P. O. Box 5148

Middletown CA 95461

**WELL LOCATION**

Address 18963 Grange Road

City Middletown

County Lake

APN Book 14 Page 270 Parcel 66

Township 11N Range 6W Section 20N

Latitude \_\_\_\_\_ Longitude \_\_\_\_\_

**LOCATION SKETCH**



**ACTIVITY (∠)**

- NEW WELL
- MODIFICATION/REPAIR
  - Deepen
  - Other (Specify)
- DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")
- PLANNED USE(S) (∠)
  - MONITORING
- WATER SUPPLY
  - Domestic
  - Public
  - Irrigation
  - Industrial
  - "TEST WELL"
  - CATHODIC PROTECTION
  - OTHER (Specify)

DRILLING METHOD Mud Rotary FLUID Bentonite

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH OF STATIC WATER LEVEL 19.1 (Ft.) & DATE MEASURED 10/24/96

ESTIMATED YIELD\* --- (GPM) & TEST TYPE Not tested

TEST LENGTH --- (Hrs.) TOTAL DRAWDOWN --- (Ft.)

\* May not be representative of a well's long-term yield.

TOTAL DEPTH OF BORING 100 (Feet)

TOTAL DEPTH OF COMPLETED WELL 96 (Feet)

DEPTH FROM SURFACE Fl. to Fl.	BORE-HOLE DIA. (Inches)	CASING(S)						DEPTH FROM SURFACE Fl. to Fl.	ANNULAR MATERIAL TYPE				
		TYPE (∠)	MATERIAL/ GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)	CE- MENT (∠)		BEN- TONITE (∠)	FILL (∠)	FILTER PACK (TYPE/SIZE)		
0	35.0	6 5/8	X	PVC	2.0	Sch. 40	---	0	27.5	X			
35.0	40.0		X	"	"	"	0.020	27.5	30.0	X			
40.0	86.0		X	"	"	"	---	30.0	45.0		X	Lonestar#3	
86.0	96.0		X	"	"	"	0.020	45.0	75.0		X	Sand/Gravel	
								75.0	81.0	X			
								81.0	96.0		X	Lonestar#3	

**ATTACHMENTS (∠)**

- Geologic Log
- Well Construction Diagram
- Geophysical Log(s)
- Soil/Water Chemical Analysis
- Other

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

**CERTIFICATION STATEMENT**

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME WEEKS DRILLING & PUMP Co.  
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

PO Box 176 SEBASTOPOLE CA 95473  
ADDRESS CITY STATE ZIP

Signed [Signature] DATE SIGNED 4/8/97 C-57 LICENSE NUMBER 177681



Log of Boring **MW-2A and B**

Equipment type: 6-5/8 Inch Rotary Wash

Elevation: \_\_\_\_\_ Date: 9-9-96

Well Completion Detail

Blows / ft.

Depth (ft)

Sample

Description

MW-2A  
MW-2B

6-5/8 inch diameter  
borehole 0 to 100 ft

2 inch diameter Sch 40  
PVC Blank casing,  
0 to 86.0 ft

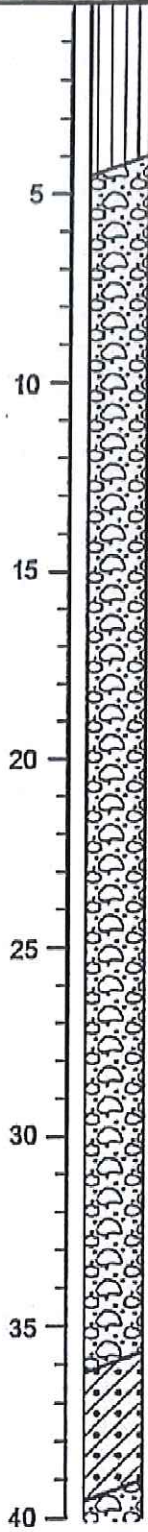
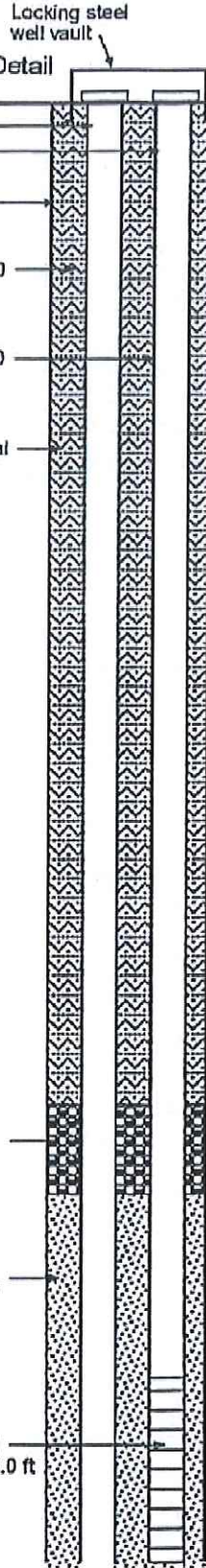
2 inch diameter Sch 40  
PVC Blank casing,  
0 to 35.0 ft

Bentonite - cement seal  
0 to 27.5 ft

Bentonite pellet seal  
27.5 to 30.0 ft

Lonestar #3 sandpack,  
30.0 to 45.0 ft

2 inch diameter slotted  
0.02 screen, 35.0 to 40.0 ft



BROWN SANDY SILT (ML) stiff, dry, voids  
in upper 1 ft, fine grained sand

GRAY BROWN SANDY GRAVEL (GP)  
loose to medium dense, well rounded, with  
coarse sand (Alluvium)

increasing sand

interbedded coarse sand and gravel strata

with gravel to 2 inches diameter, well rounded

predominantly well rounded gravel, 0.5 to 2  
inches diameter, with occasional interbedded  
coarse sand

GRAY SAND (SP) coarse *grained* gravel, no fines

GRAY GRAVEL (GP) rounded to subangular,  
to 2-1/2 inches diameter



Log of Boring MW-2A and B cont.

Equipment / type: 6-5/8 Inch Rotary Wash

Elevation: \_\_\_\_\_ Date: 9-9-96

Well Completion Detail

Blows / ft.

Depth (ft)

Sample

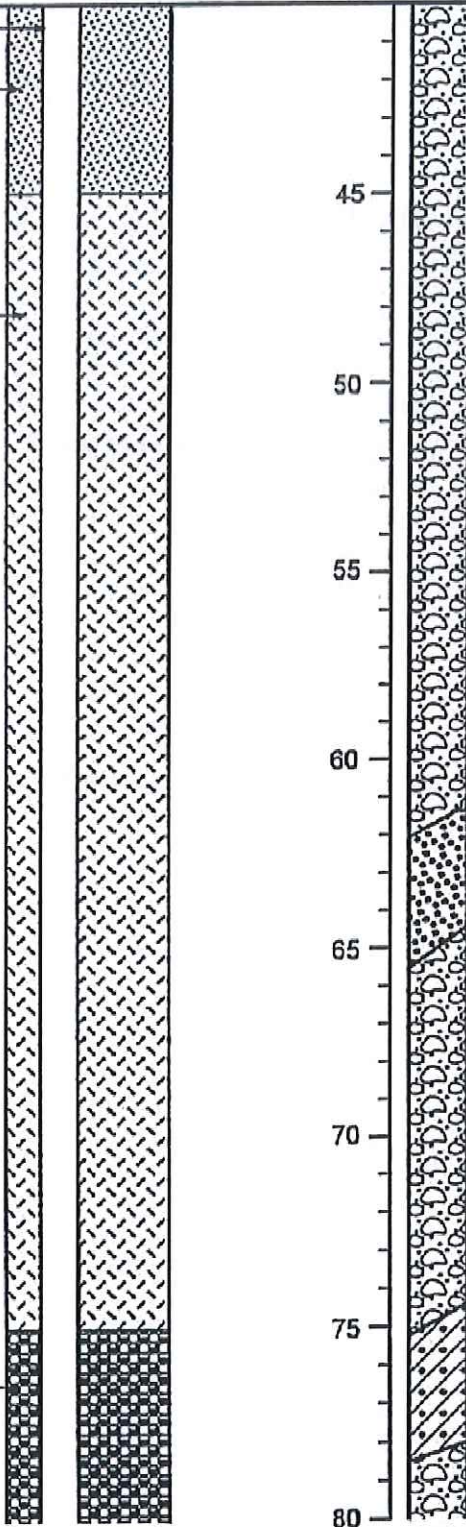
Description

MW-2A

Lonestar #3 sandpack,  
30.0 to 45.0 ft

Native sand and gravel  
backfill 45.0 to 75.0 ft

Bentonite pellet seal  
75.0 to 81.0 ft



GRAY GRAVEL (GP) rounded to subangular, to 2-1/2 inches diameter

with sand interbeds

GRAY SAND (SP) coarse grained, with rounded gravel

GRAY GRAVEL (GP) well rounded, no fines

BROWN CLAYEY SAND (SC) medium dense, fine grained sand with 30-35% clay



**TRANS TECH CONSULTANTS**  
ENVIRONMENTAL AND GEOTECHNICAL SERVICES

Log of Boring MW-2A and B, continued  
Hidden Valley Lake CSD  
Lake County, California

PLATE  
**3**

JOB NUMBER  
4071.01.01

DRAWN  
PM

APPROVED  
DWP

DATE  
10/96

Log of Boring MW-2A and B, cont.

Equipment type: 6-5/8 Inch Rotary Wash

Elevation: \_\_\_\_\_ Date: 9-9-86

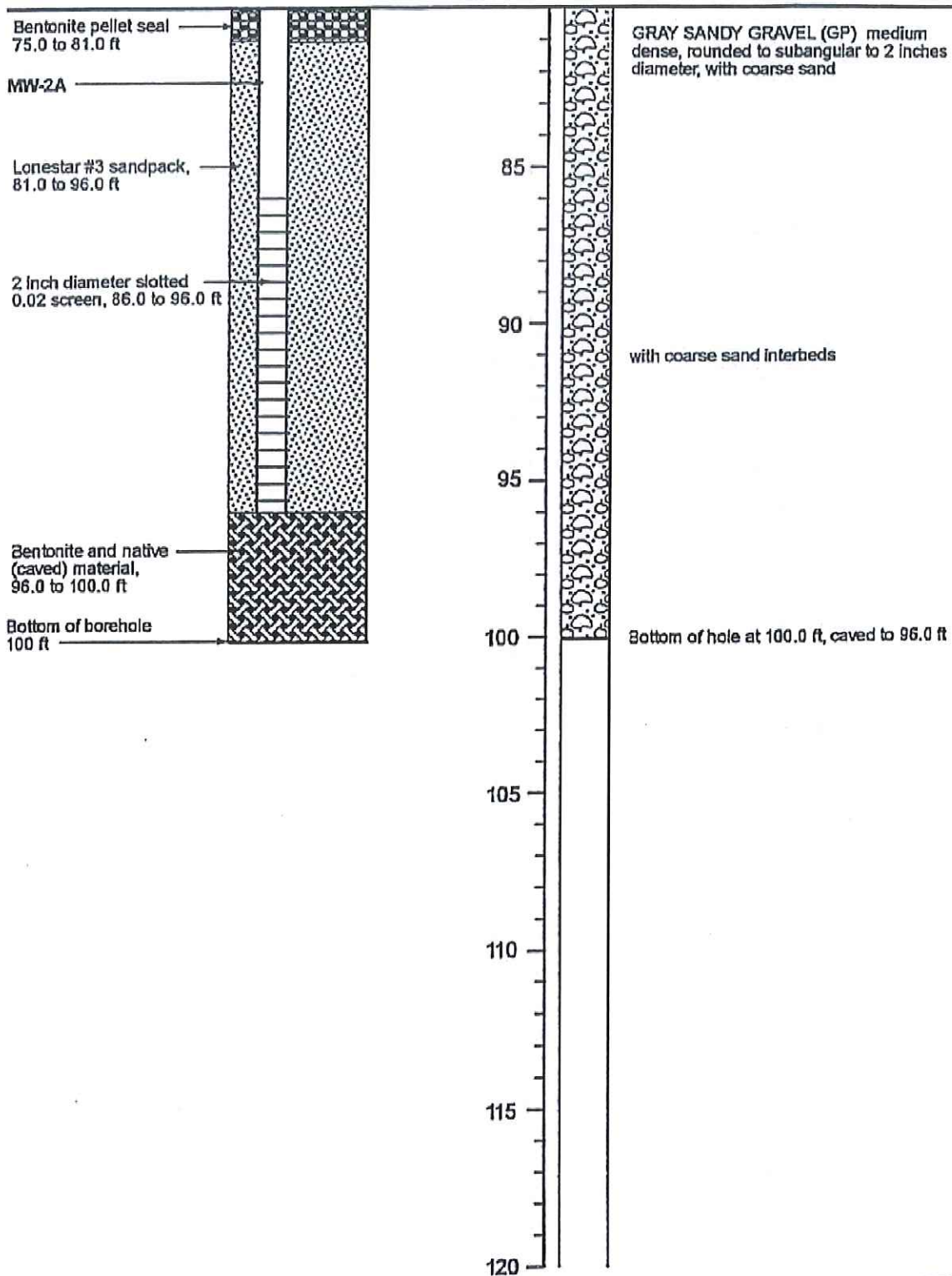
Well Completion Detail

Blows / ft.

Depth (ft)

Sample

Description



**TRANS TECH CONSULTANTS**  
ENVIRONMENTAL AND GEOTECHNICAL SERVICES

Log of Boring MW-2A and B, continued  
Hidden Valley Lake CSD  
Lake County, California

PLATE  
**3**

JOB NUMBER  
4071.01.01

DRAWN  
PM

APPROVED  
DAP

DATE  
10/96



ORIGINAL  
File with DWR

Page 1 of 1

Owner's Well No. MW-3A and B

Date Work Began 9/10/96, Ended 9/11/96

Local Permit Agency Lake County Dept. of Environmental Health

Permit No. WE 1352M Permit Date 8/19/96

STATE OF CALIFORNIA  
**WELL COMPLETION REPORT**  
Refer to Instruction Pamphlet

No. **391304**

DWR USE ONLY - DO NOT FILL IN

STATE WELL NO./STATION NO.

LATITUDE LONGITUDE

APN/TRS/OTHER

DEPTH FROM SURFACE			DESCRIPTION <i>Describe material, grain size, color, etc.</i>
Fl.	to	Fl.	
0	2.5	2.5	Brown sandy silt
2.5	7.0	7.0	Brown sandy clay
7.0	15.0	15.0	Gray brown sandy gravel
15.0	63.0	63.0	Gray gravelly sand
63.0	82.0	82.0	Gray sandy gravel
TOTAL DEPTH OF BORING <u>82</u> (Feet)			
TOTAL DEPTH OF COMPLETED WELL <u>80</u> (Feet)			

**WELL OWNER**

Name Hidden Valley Community Services District

Mailing Address P. O. Box 5148

Middletown CA 95461

CITY STATE ZIP

**WELL LOCATION**

Address 1/2 mile west of Spruce Grove Road

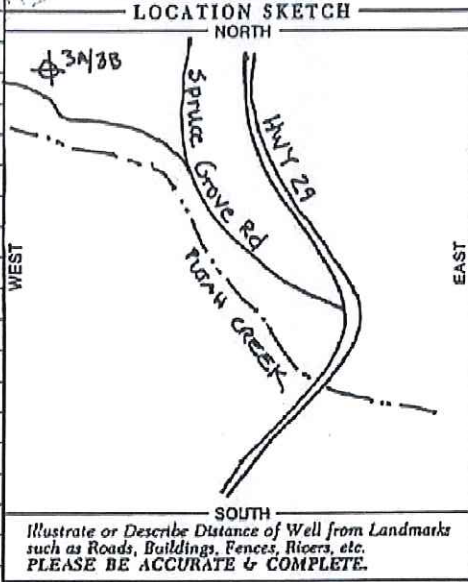
City Middletown

County Lake

APN Book 14 Page 230 Parcel 10

Township 11N Range 7W Section 13L

Latitude \_\_\_\_\_ Longitude \_\_\_\_\_



**ACTIVITY (✓)**

NEW WELL

**MODIFICATION/REPAIR**

Deepen

Other (Specify)

**DESTROY (Describe Procedure and Materials Under "GEOLOGIC LOG")**

DESTROY

**PLANNED USE(S) (✓)**

MCNITORING

**WATER SUPPLY**

Domestic

Public

Irrigation

Industrial

"TEST WELL"

CATHODIC PROTECTION

OTHER (Specify)

**DRILLING METHOD** Mud Rotary FLUID Bentonite

**WATER LEVEL & YIELD OF COMPLETED WELL**

DEPTH OF STATIC WATER LEVEL 22.0 (Ft.) & DATE MEASURED 10/24/96

ESTIMATED YIELD --- (GPM) & TEST TYPE Not tested

TEST LENGTH --- (Hrs.) TOTAL DRAWDOWN --- (Ft.)

\* May not be representative of a well's long-term yield.

DEPTH FROM SURFACE	BORE-HOLE DIA. (Inches)	CASING(S)						DEPTH FROM SURFACE	ANNULAR MATERIAL							
		TYPE (✓)				MATERIAL/ GRADE	INTERNAL DIAMETER (Inches)		GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)	TYPE					
		BLANK	SCREEN	CON-DUCTOR	FILL PIPE						CE-MENT (✓)	BEN-TONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)		
0	30.0	6	5/8	X			PVC	2.0	Sch. 40	---	0	23.0	X			
30.0	35.0			X			"	"	"	0.020	23.0	24.0	X			
35.0	70.0			X			"	"	"	---	24.0	35.0		X	Lonestar#2/12	
70.0	80.0			X			"	"	"	0.020	35.0	67.0		X	1-inch gravel	
											67.0	80.0		X	Lonestar#2/12	

**ATTACHMENTS (✓)**

Geologic Log

Well Construction Diagram

Geophysical Log(s)

Soil/Water Chemical Analyses

Other \_\_\_\_\_

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

**CERTIFICATION STATEMENT**

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME WEEKS DRILLING & PUMP CO.

(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

ADDRESS PO Box 176 SEBASTOPOL CA 95473

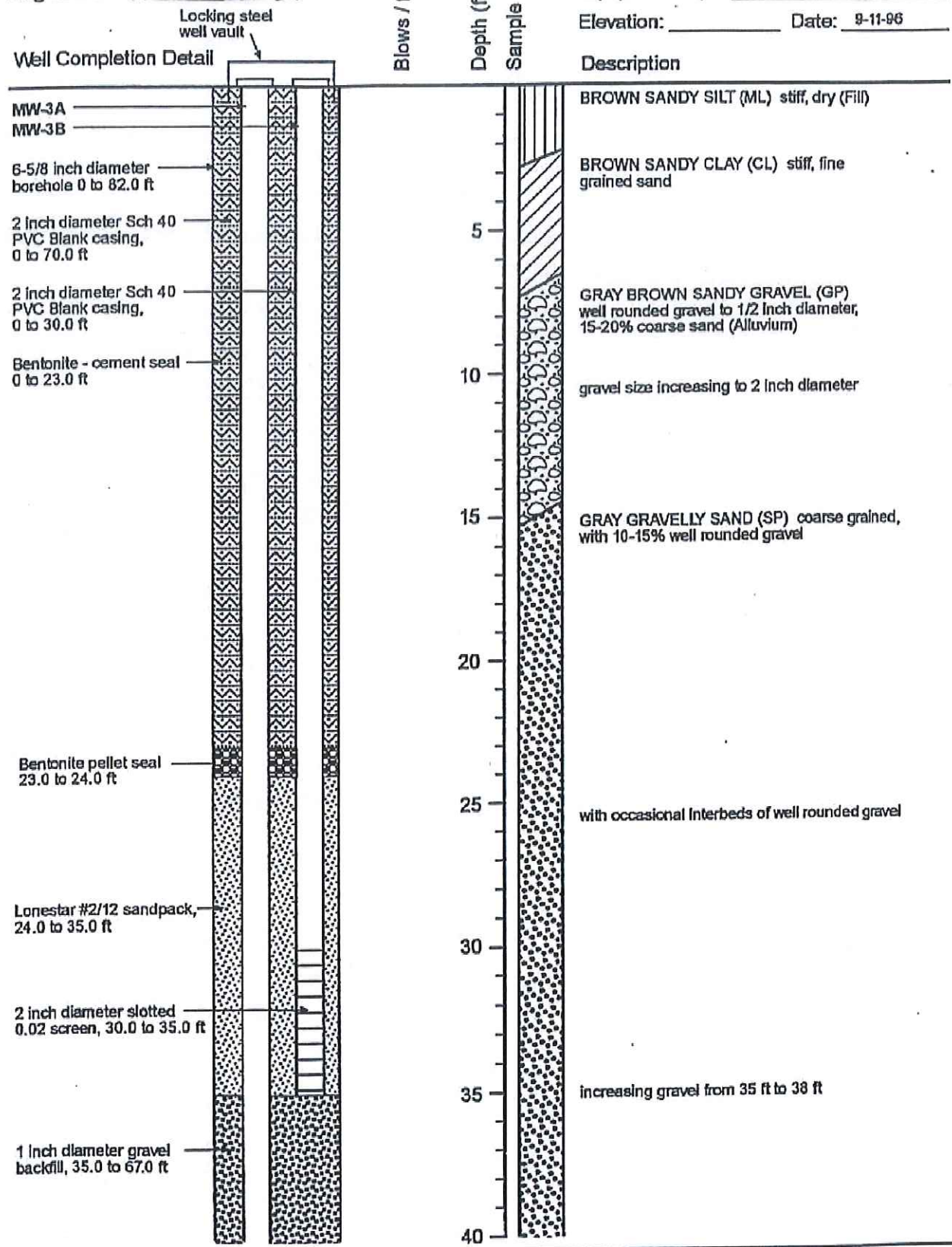
CITY STATE ZIP

Signed [Signature] 4/8/97 177681

WELL DRILLER/AUTHORIZED REPRESENTATIVE DATE SIGNED C-57 LICENSE NUMBER

**Log of Boring MW-3A and B**

Equipment: 6-5/8 Inch Rotary Wash  
 Elevation: \_\_\_\_\_ Date: 9-11-96



**Log of Boring MW-3A and B**  
 Hidden Valley Lake CSD  
 Lake County, California

PLATE  
**4**



Log of Boring MW-3A and cont.

Equipment /pe: 6-5/8 Inch Rotary Wash

Elevation: \_\_\_\_\_ Date: 9-11-96

Well Completion Detail

Blows / ft.

Depth (ft)

Sample

Description

MW-3A

1 inch diameter gravel backfill (American Rock Quarry), 35.0 to 67.0 ft

Lonestar #2/12 Sandpack 67.0 to 80.0 ft

2 inch diameter slotted 0.02 screen, 70.0 to 80.0 ft



45

coarse sand and rounded gravel, no fines

50

coarse sand with 20-30% gravel

55

decreasing gravel, mainly sand

60

65

SANDY GRAVEL (GP) subangular to well rounded to 2 inch diameter, coarse sand, no fines

70

(driller reports boulders at 70.0 ft)

(caving; driller reports larger gravels)

75

mainly well rounded gravel to 2 inch diameter, 10-15% coarse sand, no fines

80

(driller reports nest of boulders at 80.0 ft; hole not advancing)



**TRANS TECH CONSULTANTS**  
ENVIRONMENTAL AND GEOTECHNICAL SERVICES

Log of Boring MW-3A and B, continued <sup>PLATE</sup>

Hidden Valley Lake CSD  
Lake County, California

**4**

JOB NUMBER  
4071.01.01

DRAWN  
PM

APPROVED  
DWP

DATE  
10/96

Log of Boring MW-3A and B cont.

Equipment: 6-5/8 Inch Rotary Wash

Elevation: \_\_\_\_\_ Date: 9-11-98

Well Completion Detail

Blows / ft.

Depth (ft)

Sample

Description

Bentonite and native  
(caved) material,  
80.0 to 82.0 ft



boulders at 82.0 ft; Bottom of boring at 82.0 ft

85  
90  
95  
100  
105  
110  
115  
120



**TRANS TECH CONSULTANTS**  
ENVIRONMENTAL AND GEOTECHNICAL SERVICES

Log of Boring MW-3A and B, continued  
Hidden Valley Lake CSD  
Lake County, California

PLATE  
**4**

JOB NUMBER  
4071.01.01

DRAWN  
PM

APPROVED  
DHP

DATE  
10/98



Wells 5A & 5B



October 27, 1998  
Job No. 108.07.01

James C. Hanson Consulting Civil Engineer  
444 North Third Street, Suite 400  
Sacramento, California 95814

5A 5B  
Monitoring Well Installation  
MW-~~4A~~ and ~~4B~~, Luchetti Ranch  
Hidden Valley Lake CSD  
Lake County, California

Gentlemen:

This letter summarizes the drilling activities and transmits our geologic log associated with the installation of monitoring well MW-4A and -4B for the Hidden Valley Lake Community Services District in Lake County, California. The wells were drilled on the Luchetti property, north of Grange Road and about 2.53 miles southeast of Highway 29, at the location shown on the attached Location Map, Plate 1. Our scope of services consisted of logging the conditions encountered during drilling of the well boring, providing geologic input to the construction of the wells, and presenting the findings in this letter.

#### Field Activities

On June 1 and 2, 1998, our engineering geologist observed the drilling of the boring for wells MW-4A and 4B by Weeks Drilling and Pump Company of Sebastopol, California. The well boring was drilled to a total depth of 100 feet, using a truck-mounted Failing 1500 rotary wash drill rig, equipped with a 7-7/8 inch diameter bit. The subsurface conditions encountered were logged by observing the drill cuttings circulated out of the borehole. The lithologic log for the boring is attached as Plate 2. The alluvial soils encountered were classified according to the Unified Soil Classification System described on Plate 3.

At the completion of drilling, the boring was flushed with clean water and two monitoring well casings were installed. The well completion detail is presented on Plate 2. The wells were constructed of 2-inch diameter Schedule 40 PVC casing, with 0.020-inch machine-slotted well screens. The deeper well casing (MW-4A) was screened from a depth of 90 to 100 feet and the second, shallower well (MW-4B) was screened from a depth of 30 to 40 feet. The dual well completion was performed to allow measurement of slight differences in

water levels, as an indicator of vertical ground-water gradients. The static water level was obscured by the bentonite mud used to drill the boring and we were not able to measure a water level at the time of drilling.

The annular space around the screened interval of each well consists of Lonestar #3 sand. A bentonite seal was placed above the sandpack from a depth of 20 to 16 feet. A surface grout seal, consisting of cement with approximately 5% bentonite was placed under the observation of Mr. Manual Ramirez of the Lake County Department of Environmental Health. The well casings extend above grade and are housed within a locking steel well vault.

#### Interpretation of Subsurface Conditions

Wells MW-1 through MW-3, previously installed further west, encountered predominantly clean sands and gravels, indicative of stream channel deposits. The boring for MW-4A and 4B encountered interbedded sandy gravel, gravelly sand, clayey sand, and sandy clay alluvial strata to the depth explored. The clean sand and gravel units (soil symbols SP and GP) appear to represent stream channel deposits, possibly deposited as the main stream channel occasionally shifted across the valley bottom, or from tributaries. These strata are interbedded with finer grained materials that are more likely overbank and flood plain deposits, somewhat more removed from the main channel. We assume that ground water in the more permeable sand and gravel strata is at least partially confined.

We trust this letter provides the information you require. If you have questions about our findings, please call the undersigned at (707) 823-9290.

Very truly yours,  
The Geoservices Group



David H. Peterson  
Engineering Geologist - 1186

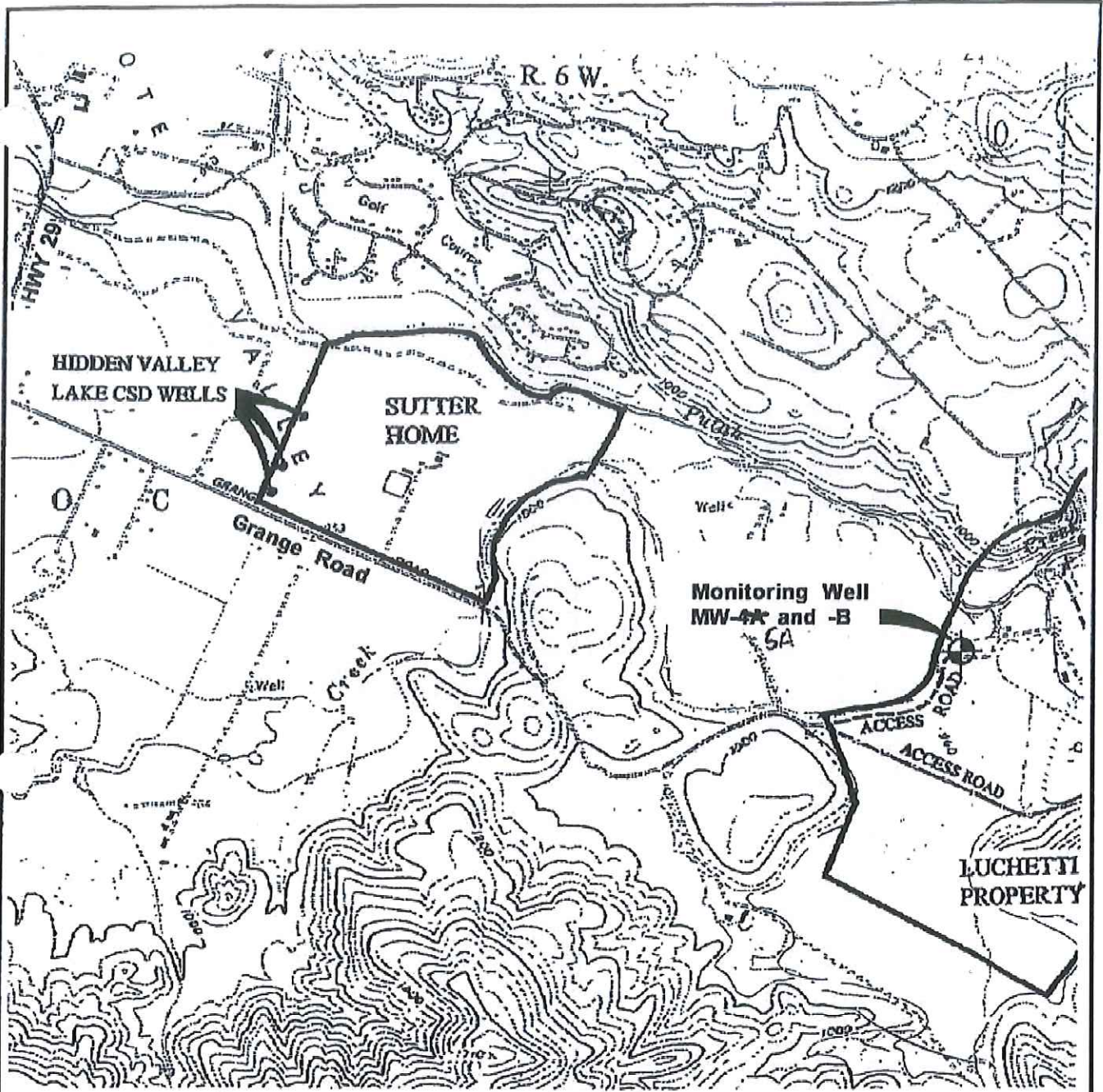


Attachments:      Location Map, Plate 1  
                         Log of Boring MW-4A and B, Plate 2  
                         Unified Soil Classification System, Plate 3

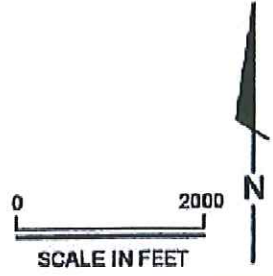
DHP:dhp\1080701.MWI

Original and two copies submitted





Reference: U.S. Geological Survey, Middletown  
7.5 Minute Quadrangle.



The  
**GG**eoservices  
group

**Location Map**  
Hidden Valley Lake CSD  
Lake County, California

PLATE  
**1**

# Log of Boring MW-4A and B

Job Number 108.07.01 Date Completed 6-1-98  
 Drilling Method 7-7/8" Rotary Wash Depth 100 ft  
 Logged by DHP Elevation \_\_\_\_\_

## Laboratory Data

MW-4A  
 MW-4B

7-7/8 inch diameter  
 borehole 0 to 100 ft

2 inch diameter Sch 40  
 PVC Blank casing,  
 0 to 90.0 ft

2 inch diameter Sch 40  
 PVC Blank casing,  
 0 to 30.0 ft

Bentonite - cement seal  
 0 to 16.0 ft

Bentonite pellet seal  
 16.0 to 20.0 ft

Lonestar #3 sandpack,  
 20.0 to 100.0 ft

2 inch diameter slotted  
 0.02 screen, 30.0 to 40.0 ft

Locking steel  
 well vault

(N) Blows /ft.\*

Depth Feet

Graphic Log

Description

BROWN SANDY CLAY (CL) stiff, wet

GRAY-BROWN SANDY GRAVELLY CLAY  
 (CL) stiff, rounded gravel to 1 inch diameter  
 (Alluvium)

same with occasional sandier strata

GRAY GRAVELLY SAND (SP) medium dense,  
 coarse grained sand

BROWN SANDY CLAY (CL) stiff, with 30 to  
 40% sand, 10 to 15% fine sand

increasing fine to medium sand (25-35%)

DARK GRAY SANDY GRAVEL (GP) coarse  
 sand and rounded gravel to 1/2 inch diameter

(rig chatter at 33.0 ft)  
 coarse sand and gravel to 1 inch diameter



**Log of Boring MW-4A and B, cont.**

Job Number 108.07.01 Date Completed 6-1-98  
 Drilling Method 7-7/8" Rotary Wash Depth 100 ft.  
 Logged by DHP Elevation \_\_\_\_\_

Laboratory Data

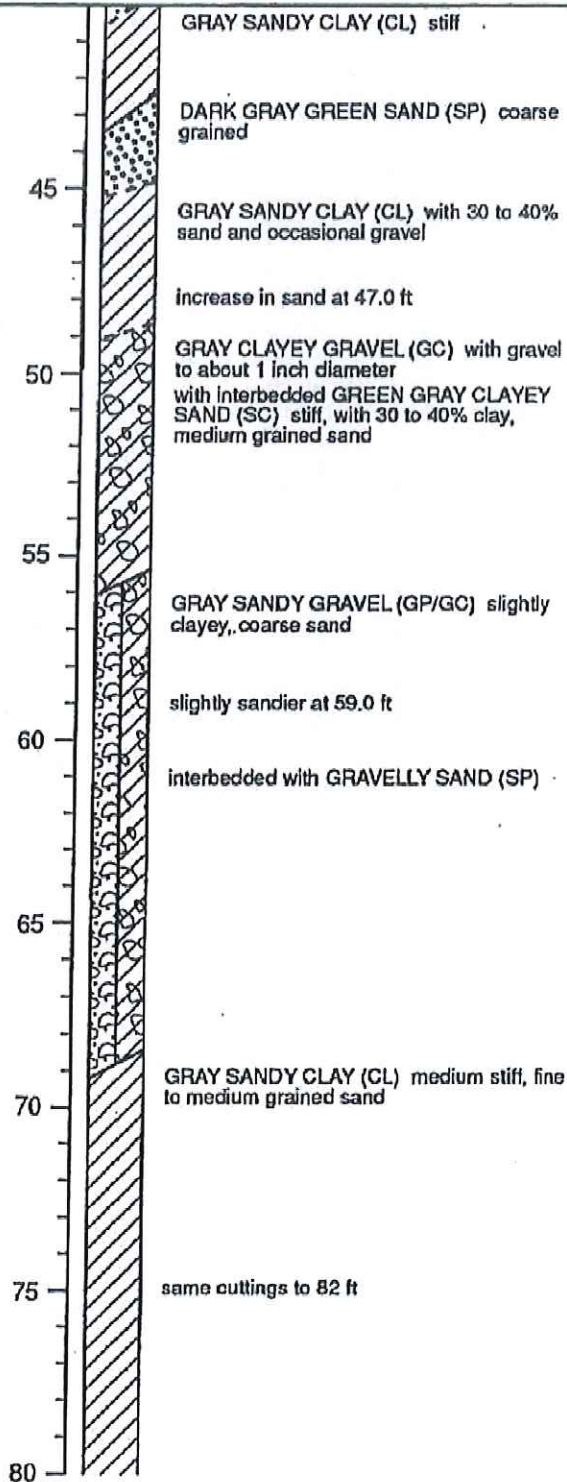
MW-4A \_\_\_\_\_  
 Lonestar #3 sandpack,  
 20.0 to 100.0 ft

(N) Blows /ft.\*

Depth Feet

Graphic Log

Description

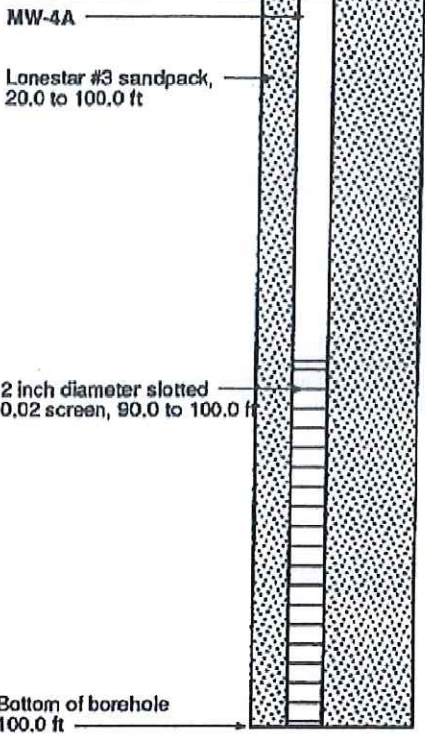


GRAY SANDY CLAY (CL) stiff  
 DARK GRAY GREEN SAND (SP) coarse grained  
 GRAY SANDY CLAY (CL) with 30 to 40% sand and occasional gravel  
 increase in sand at 47.0 ft  
 GRAY CLAYEY GRAVEL (GC) with gravel to about 1 inch diameter with interbedded GREEN GRAY CLAYEY SAND (SC) stiff, with 30 to 40% clay, medium grained sand  
 GRAY SANDY GRAVEL (GP/GC) slightly clayey, coarse sand  
 slightly sandier at 59.0 ft  
 interbedded with GRAVELLY SAND (SP)  
 GRAY SANDY CLAY (CL) medium stiff, fine to medium grained sand  
 same cuttings to 82 ft

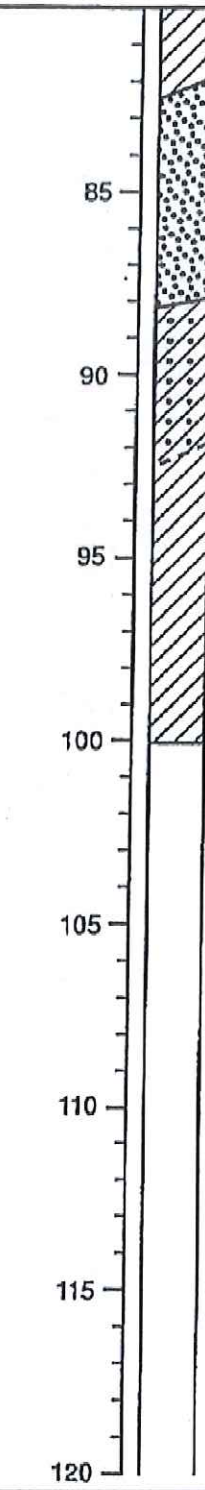
**Log of Boring MW-4A and B, cont.**

Job Number 108.07.01 Date Completed 6-1-98  
 Drilling Method 7-7/8" Rotary Wash Depth 100 ft  
 Logged by DHP Elevation \_\_\_\_\_

**Laboratory Data**



(N) Blows /ft.  
 Depth Feet  
 Graphic Log



**Description**

same, 20 to 25% fine sand

DARK GRAY SAND (SP) medium dense, coarse grained

85

increasing clay at 87.0 ft

GRAY CLAYEY SAND (SC) medium dense, 15 to 20% clay, fine to medium grained sand

90

GRAY GREEN SANDY CLAY (CL) very stiff (firm drilling), 15 to 20% fine sand

95

20 to 30% fine to medium sand

100

105

110

115

120



MAJOR DIVISIONS			TYPICAL NAMES	
COARSE-GRAINED SOILS MORE THAN HALF IS COARSER THAN NO. 200 SIEVE	GRAVELS	CLEAN GRAVELS WITH LITTLE TO NO FINES	GW	WELL GRADED GRAVELS WITH OR WITHOUT SAND, LITTLE OR NO FINES
		GRAVELS WITH OVER 12% FINES	GP	POORLY GRADED GRAVELS WITH OR WITHOUT SAND, LITTLE OR NO FINES
			GM	SILTY GRAVELS, SILTY GRAVELS WITH SAND
			GC	CLAYEY GRAVELS, CLAYEY GRAVELS WITH SAND
	SANDS		CLEAN SANDS WITH LITTLE OR NO FINES	SW
		SANDS WITH OVER 12% FINES	SP	POORLY GRADED SANDS WITH OR WITHOUT GRAVEL, LITTLE OR NO FINES
			SM	SILTY SANDS WITH OR WITHOUT GRAVEL
			SC	CLAYEY SANDS WITH OR WITHOUT GRAVEL
FINE-GRAINED SOILS MORE THAN HALF IS FINER THAN NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT 50% OR LESS		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTS WITH SANDS AND GRAVELS
		CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, CLAYS WITH SANDS AND GRAVELS, LEAN CLAYS	
		OL	ORGANIC SILTS OR CLAYS WITH LOW PLASTICITY	
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50%	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS, FINE SANDY OR SILTY SOILS, ELASTIC SILTS	
		CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS	
		OH	ORGANIC SILTS OR CLAYS OF MEDIUM TO HIGH PLASTICITY	
HIGHLY ORGANIC SOILS		PI	PEAT AND OTHER HIGHLY ORGANIC SOILS	

### UNIFIED SOIL CLASSIFICATION - ASTM D2487-85

Perm	-	Pemeability	Shear Strength (psf)	Confining Pressure
Consol	-	Consolidation	TxUU 3200 (FM) or (S)	(2600) - Unconsolidated Undrained Triaxial Shear (field moisture or saturated)
LL	-	Liquid Limit (%)	TxCU 3200 (P)	(2600) - Consolidated Undrained Triaxial Shear (with or without pore pressure measurement)
PI	-	Plastic Index (%)	TxCD 3200 (P)	(2600) - Consolidated Drained Triaxial Shear
G <sub>s</sub>	-	Specific Gravity	SSCU 3200 (P)	(2600) - Simple Shear Consolidated Undrained (with or without pore pressure measurement)
MA	-	Particle Size Analysis	SSCD 3200	(2600) - Simple Shear Consolidated Drained
■	-	"Undisturbed" Sample	DSCD 2700	(2000) - Consolidated Drained Direct Shear
☒	-	Bulk or Classification Sample	UC 470	- Unconfined Compression
			LVS 700	- Laboratory Vane Shear

### KEY TO TEST DATA

