Attachment I

Hydrology Report

Pura Vineyards Project
Ground Water Hydrology Report

FEBRUARY 2022

HYDROGEOLOGICAL REPORT

PURA VINEYARDS

KELSEYVILLE, LAKE COUNTY, CALIFORNIA

Prepared for:

Pura Industries
100 Shoreline Hwy, Bldg B. Ste. 100
Mill Valley, CA 93941

Prepared By:

Kimley»Horn

Kimley-Horn Project No. 197456001

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1.0 INTRODUCTION

The following *Hydrogeologic Report* was prepared to document the subsurface hydrogeologic conditions and groundwater availability within the vicinity of the Pura Vineyards ("Vineyard" or "project area") (**Figure 1**). The project area is located southeast of Kelseyville, CA and is comprised of 5 contiguous parcels totaling 314.8 acres. The Lake County property appraiser identifies the project area parcels as APNs 007-018-02, 007-018-04, 007-018-11, 007-029-04, and 007-029-05. Pura Vineyards intends to replace approximately 14.85 acres of vineyards on the Site with 14.85 acres of cannabis cultivation. The remaining vineyards on the Site are intended to remain in production and independent of the proposed cannabis production.

Lake County Board of Supervisors Ordinance 3106 specifies that due to the on-going drought conditions throughout the County, land use approval is contingent upon demonstrating that sufficient groundwater quantities are available for the intended land use. The proposed commercial cannabis production facility (cannabis facility) will occupy parcels numbers 007-029-04 and 007-029-05. The remaining parcels (007-018-02, 007-018-04, and 007-018-11) will be used to meet Lake County's requirement that 20 acres of land be set aside for every acre (1-acres) of cannabis cultivation. Together, the commercial cannabis production facility and the additional parcels comprise the project area. The cannabis facility has a projected total outdoor canopy area or 646,820 square feet (sqft) or approximately 14.84 acres.

1.1 WATER USE DEMAND ESTIMATES

Water use demand for the cannabis facility varies and is governed by the life stage of the current crop. Early in the growing season, when the plants are young, a maximum daily water use demand for cultivation is approximately 25,000 gallons per day (GDP). During the summer months, when the local temperatures increase and plants mature, the maximum daily water use demand for cultivation at the cannabis facility is estimated to be up to 375,000 GDP. During a single growing season, the cannabis facility is expected to use 25,652,000 gallons of groundwater each year, which equates to approximately 78.72 acre feet/year (AF/year). Additional water use at the cannabis facility for non-cultivation operations is estimated to be approximately 720,720 gallons per year (gpy) or roughly 2.21 AF/yr. The total water use demand for all facility operations equates to 26,372,720 gpy or 80.93 AF/yr.

1.2 EXISTING ON-SITE WATER WELLS

Kimley-Horn was provided a well completion report for an existing water well located on the project site. The well is located on APN 007-029-05 and is identified as WE-1664. WE-1664 (on-site production well) was constructed in April 1999 and completed to a depth of 635 feet with an 8.32-inch casing. A review of Water Well Completion Reports (WWCR) by California Department of Water Resources (CDWR) identified an additional well (western well) on the western portion of the project area. It is Kimley-Horn's understanding the western well will not be utilized to meet the demands of the proposed cannabis facility. The western well is located on APN 007-018-02 and is identified by permit number WE-4585. This 6-inch diameter domestic supply well was completed on June 5, 2015 and has a total depth of 593 feet. The approximate well locations are depicted on **Figure 2**. PDFs of the well completion report is included in **Appendix A**. Lithology and construction information for the on-site wells are provided in **Exhibit 1**.

In 2020, Russ and Cramer Enterprises conducted a specificity capacity test to evaluate the yield of well WE-1664. The corresponding drawdown data is presented in **Appendix B**.

Additional water wells in the vicinity of the project area are discussed in **Section 2.9**.

2.0 HYDROGEOLOGIC SETTINGS

The following is a discussion of the localized hydrogeologic setting in the vicinity of the Vineyard.

2.1 AQUIFER IDENTIFICATION

According to the March 2006 *Lake County Groundwater Management Plan (LCGMP)*, completed for Lake County Watershed Protection District (LCWPD) the Pura Vineyards site is underlain by the Clear Lake Volcanics and to a lesser degree the Big Valley Groundwater Basin (**Figure 3**). The two existing wells on the Site were completed into the Clear Lake Volcanics. The Clear Lake Volcanics and Big Valley Groundwater Basin are further discussed below.

2.2 SURFACE AND SUBSURFACE GEOLOGY

The landscape of Lake County is dominated by Mt. Konocti, a dormant volcano, which is apart of the Clear Lake Volcanic Field. The Pura Vineyards Site is located within the Clear Lake Volcanic Field on the western flank of Mt. Konocti. The geology in the immediate area of the Site consists of a complex of faulted igneous rocks from late-Pliocene to early Holocene volcanic activity (**Figure 4**). The US Geological Survey (USGS) has mapped faults across the Site, which are depicted on **Figure 4**. The northwest to southeast trending fault located on the western boundary of the Site is known as the Big Valley Fault. Further discussion of the geologic units and tectonic features underlying the Pura Vineyards Site is provided in the following sections.

2.2.1 Dacite of Benson Ridge (Pleistocene) (Hearn) (dbr) 220.09 acres

Volcanic flows resulting in dacite containing biotite. Cooling of the dacite occurred gradually resulting in the formation of distinct crystals. Contains inclusions up to 4 feet in diameter. These flows originated from the South Peak and possibly additional vents on Benson Ridge and east of Shaul Valley. The maximum thickness of this unit is 980 feet.

2.2.2 Rhyolite of Cole Creek (Pleistocene) (Hearn)(rcc) 49.85 acres

Volcanic flows of rhyolite containing biotite. This rhyolite is concentrated in fine-grain volcanic rocks and ash and has a maximum exposed thickness of 260 feet.

2.2.3 Colluvium (Holocene) (Hearn) (co) 30.69 acres

Slope deposits of silt, sand, and coarser pieces of older rocks. This unit is only mapped in areas where extensive or overlies a critical contact of bedrock units.

2.2.4 Flows and Domes (Hearn) (dof) 6.34 acres

Characterized by low viscosity volcanic flows and high viscosity volcanic domes.

2.2.5 Alluvium (Holocene) (Hearn)(al) 5.08

Flood-plain, channel, and lake deposits of clay, silt, sand, and gravel. Locally may include youngest part of the basin deposits of Clear Lake.

2.2.6 Kelsey Tuff Member (named by Rymer1 1981, formerly aquifer ash of Hearn and others, 1976) (Hearn) (kk) 0.95 acres

The upper section of the Kelsey Tuff Member consists of approximately 4 feet of ash, small volcanic rocks, and vesicular andesite. The lower section consists of 1.5 feet of clay and silt. In the Shaul Valley, the lower part contains subangular to subrounded fragmented dacite up to 1 foot in diameter. It is speculated the source vent for the volcanic rock was a cinder cone in the vicinity of Mount Konocti. The Kelsey Tuff Member occurs roughly 100 to 130 feet beneath the eroded top of the Kelseyville Formation. It is classified as a major aquifer as deep as 230 feet below a majority of the southern Big Valley (Soil Mechanics and Foundation Engineers, Inc. 1967). The total outcrop thickness of the Kelsey Tuff Member is between 1 and 6 feet.

2.2.7 Kelseyville Formation, undivided (named by Ryner, 1981; includes pyroclastic and lake deposits of Shaul Valley area of Hearn and others, 1976) (Pleistocene) (Hearn)(k) 0.66 acres

Fluvial deposits originating from lakes and rivers and consist of all grain sized from ash to cobbles. Fractured rock is predominantly from Franciscan assemblage rocks and serpentinite with minor amounts of dacite. This formation was initially deposited in an ancestral Clear Lake basin and is likely from 0.35 and 0.45 Ma. The thickness of the Kelseyville Formation is approximately 1275 feet.

2.2.8 Andesite west of Shaul Valley (Pleistocene) (Hearn) (aws) 0.60 acres

Bomb and block tephra, small flows, and dikes of sparsely porphyritic andesite. Vented from the dikes that cut the rhyolite of Cole Creek (rcc) and rhyodacite of Mount Olive. Vesicular blocks of this andesite, up to 1 foot in diameter are 5-10 percent of the mudflow deposit of mixed biotite rhyolite and andesite that overlies the rhyolite of Cole Creek (rcc). Maximum thickness about 5 meters.

2.2.9 Terrace deposits, undivided (Pleistocene) (Unit 2) (Hearn)(t_2) 0.54 acres

Comprised predominantly of pebble to boulder sized material with minor amounts of sand. Four terraces from the Pleistocene, between 11,700 to 2.5 MA were mapped in riverine systems in the vicinity of the project area. In Cole Creek, the gravel is a mixture of volcanic rock and erosion tolerant gravels from the Kelseyville Formation. The Terrace deposits have a maximum thickness of 16 feet.

2.2.10 Big Valley Fault

According to the USGS, the Big Valley Fault crosses the southern and western portions of the project area (**Figure 4**). This fault originated in the late Quaternary period and is reportedly well constrained and has a reported slip rate of 0.2 to 1.0 millimeter per year (mm/year). Within the last 200 years displacement along the fault has reportedly occurred in the vicinity of the Pura Vineyards Site.

2.3 SURFACE SOILS

According to the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS), there are six (6) different types of soil across the Vineyard Site (**Appendix C**). A concise description of the soil types is provided below.

1 – Benridge-Konocti association (112): The Benridge-Konocti association consists of well drained, high runoff class soil derived primarily from volcanic ash. These soils have 15 to 30 percent slopes with an average depth to water greater than 80 inches and are not considered prime farmland.

2 – Benridge-Konocti association (113): The Benridge-Konocti association soils are well drained and commonly found within high runoff areas. Volcanic ash is the parent material for the soil, which is not classified as prime farmland.

3 – Bottlerock-Glenview-Arrowhead complex: The Bottlerock-Glenview-Arrowhead complex has 30 to 50 percent slopes and is not classified as prime farmland. The soils are reportedly well drained and in the very high runoff class. Soils in this series are derived from weathered obsidian.

4 – Kidd-Forward complex: The Kidd-Forward complex is not classified as prime farmland. Soils in this series contain 5 to 30 percent slopes and are derived from weathered rhyolite. These soils are reportedly are well drained and runoff is low.

5 – Konocti-Benridge complex: The Konocti-Benridge complex consists of soils derived from weathered andesite. These soils have slopes from 50 to 75 percent, are considered well drained, and have a runoff classification of high. The soils in the Konocti-Benridge complex are determined to not be prime farmland.

6 – San Joaquin variant fine sandy loam: The San Juaquin variant is a fine sandy loam complex that is well drained and determined to have a medium runoff class. These soils are not considered prime farmland and have slopes from 0 to 5 percent. Additionally, these soils originated from volcanic rock alluvium.

2.4 SUBSURFACE HYDROGEOLOGY

The Pura Vineyard is predominantly located within the Clear Lake Volcanics which is where the existing on-site production well is located (**Figure 2**). The Big Valley Groundwater Basin comprises the southwestern corner of the site and constitutes approximately 7% of the total project area. According to the *Lake County Groundwater Management Plan*, the amount of groundwater available within the Clear Lake Volcanics is highly variable and depends on the size, openness, frequency, and interconnection of fractures and joints encountered in the formation.

The Pura Vineyards Site lies between two mapped fault systems, the Big Valley Fault to the west and the Konocti Bay Fault System to the east. The Big Valley Fault crosses the western and southern portions of the Vineyards (approximately 524 feet west of well WE-1664) while the Konocti Bay Fault System is located approximately 0.7 miles east and consists of multiple faults. A third fault mapped by the USGS traverses the central portion of the Site approximately 0.4 miles north of well WE-1664. Little to no detailed information is available regarding this third fault.

The regional faulting affects the localized hydrogeology. The fractured bedrock results in secondary porosity within the water-bearing units. Additionally, the faults can create hydrogeologic boundary conditions that dictate localized groundwater flow regimes.

2.5 CLIMATE DATA

The nearest weather station with historical climatological data is located in Clearlake, according to the Western Regional Climate Center (WRCC). Annual average precipitation at the Clearlake station is approximately 27.48 inches per year based on data collected from October 1954 to June 2016. Approximately 720.9 AF/year of precipitation is anticipated to fall on the project area during a normal year. Drought conditions have dominated the project area and surrounding areas over recent years. Kimley-Horn assumes 60 percent of normal rainfall during drought conditions. This equates to 432.5 AF/year of rainfall on the project area during drought conditions.

Appendix A of Title 23 of the California Code of Regulations (23 CCR), Chapter 2.7 provides tables for the calculation of annual potential evapotranspiration for different areas of California. The Lower Lake area of Lake County where the Vineyards is proposed, is estimated to have a mean annual potential evapotranspiration of approximately 45.4 inches per year.

2.6 PRODUCTION ZONE

The fractured rock within the Clear Lake Volcanics, between the Big Valley Fault and the Konocti Bay Fault Zone, comprises the primary aquifer beneath the Pura Vineyards Site. Boring logs for well MW-031 associated with the Benson Ridge Facility (**Section 3.1**) document the localized lithology in the project area as fractured dacite to a depth of at least 455 feet (1,402 feet NAVD 88). Based on the fractured nature of the geologic units above and comprising the aquifer, the aquifer is presumed to be unconfined. The thickness of the Clear Lake Volcanics varies and is underlain by the Franciscan Formation. Near Mount Konocti, approximately 2.1 miles east of the project area, the Clear Lake Volcanics are over 4,000 feet thick, according to the 2006 *LCGWMP*. Additionally, a well drilled near the intersection of Red Hills Road and Highway 29, approximately 3.6 miles southeast of the project site, the formation is 1,600 feet thick . A water well construction log for Test Hole #1 located approximately 2.1 miles southeast of the on-site production well indicated the Clear Lake Volcanics appear to be greater than 700 feet thick. Test Hole #1 is roughly located at a similar elevation as the on-site production well.

According to the Lake County Groundwater Management Plan (2006), *"…groundwater in the Clear Lake Volcanics occurs primarily in fractures, joints, and within weathered zones that formed in between volcanic eruptions*. Additionally, *the amount of groundwater available to a well in the formation is highly dependent on the size, openness, frequency, and interconnection of fractures and joints encountered in the well*. Therefore, the hydrogeologic properties of the Clear Lake Volcanics vary from one location to the next.

2.7 WATER BEARING ZONE THICKNESS

According to information from well construction logs from deep wells constructed on and around the Site (**Appendix A**), the Clear Lake Volcanics formation at the Pura Vineyards site is greater than 635 feet thick. At the Site, the static water level is approximately 500 feet below land surface. According to 6 well construction logs summarized in **Table 2**, average thickness of the aquifer is 101 feet thick. Therefore, a conservative estimate of the aquifer thickness is approximately 100 feet at the Pura Vineyards Site.

2.8 CONFINING LAYERS

The Clear Lake Volcanics comprise the underlying geologic unit and aquifer. The aquifer is presumed to be unconfined due to the fractured nature of the volcanics and faulting in the local area. The Franciscan Formation forms the fractured bedrock in the majority of Lake County (LCGWMP 2006).

2.9 ON-SITE AND NEARBY WELLS

Kimley-Horn reviewed the Well Completion Report Map Application available through the California Department of Water Resources (DWR). Registered wells are not individually georeferenced in the map application. Instead, they are referenced by section, township, and range. Well density for the Sections at and surrounding the Site are outlined in the table below:

Table 1
NEARBY WELLS

Section, Township, and Range	Number of Registered Wells	Number of Production Wells	Number of Domestic Wells
S25 T13N R09W	33	1	11
S24 T13N R09W	14	1	11
S23 T13N R09W	20	3	16
S19 T13N R08W	6	NA	1
S26 T13N R09W	26	1	25
S30 T13N R08W	9	1	2

Wells listed in this database include domestic, production, agricultural, and dry wells. This includes wells located on the Pura Vineyard property, such as WE-4585 and WE 1664. WE-4585 is located on the western side of the project area and has a total depth of 593 feet. The reported static water level in the well is 405 feet. Testing performed in August 2015 estimated the yield of the well to be 25 gallons per minute. This well will not be used for cannabis cultivation. Well WE-1664 was installed in 2020 on the southern portion of the project area. The well was constructed to a depth of 598 feet and has a reported static water level of approximately 500 feet. The specific capacity estimated for the well is 721.9 feet^3/day/foot.

Well WE-3486, located approximately 1,230 feet north of the project area, has a total depth of 500 feet and a static water level of 380 feet based on the well completion report (**Appendix A**). Locations of the four (4) identified wells were determined based on location diagrams included in the completion reports (**Appendix A**). Wells with a completion depth of 300 feet or greater bls and whose approximate location could be determined are depicted on **Figure 5**. Also depicted on **Figure 5** are shallow monitoring wells located on the Benson Ridge Facility.

Kimley-Horn also reviewed available water well information from the DWR sustainable groundwater management act (SGMA) Data Viewer and the California Water Boards Ground Ambient Monitoring and Assessment Program (GAMA) online databases. Twelve (12) water wells associated with the Benson Ridge Facility (**Section 3.2**), which is less than 0.25 miles to the east of the project area. These wells range in depth from 11 feet to 435 feet. Well completion logs able to be obtained for these wells are included in **Appendix A**.

Two (2) water wells were identified on the SGMA Data Viewer online portal in the immediate vicinity of the project area. Well completion report WCR1979-004728 is georeferenced on the northern corner of the project area. However, the well completion report (**Appendix A**) states this was a dry well with a total depth of 263 feet bls. Additionally, the location of the well depicted in the diagram provided in the completion report cannot be definitively determined but the approximate location appears to be contradictory of the georeferenced location. The second water well is georeferenced on the southern adjacent property and is associated with well completion report WRC1979-004726. This well is an observation well and was completed to a depth of 159 feet bls. Depth to water information was not provided in the well completion report.

2.10 Local Streams or Springs

Data from the United States Fish and Wildlife Service (USFWS) and the National Wetland Inventory (NWI) confirmed the presence wetlands, ponds, and riverine systems are located in the vicinity of the project site (**Figure 6**). A freshwater emergent wetland is located approximately 1,900 feet east of the project site. A freshwater pond is located approximately 1,050 feet southwest of the Pura Vineyard Site. A freshwater forested / shrub wetland associated with McIntire Creek, is located approximately 1,060 feet south of the

Vineyard. A riverine system is located to the south, southwest, and west of the vineyards and is associated with the Cole Creek. Wetlands, lakes, ponds, riverine systems, and other mapped features in the NWI database are not located on the project site.

3.0 SURROUNDING DEVELOPMENT

The project area is situated within an area consisting of rural residential and agricultural development. A singular regulated facility, identified as the Benson Ridge Facility, is located on the eastern adjacent property.

3.1 SURROUNDING LAND USE

Properties north of the Pura Vineyards Site consist of orchards, vineyards, and rural land use. The Benson Ridge Facility is located on the eastern adjacent property and is followed by undeveloped vegetated land. Rural land use and a small greenhouse cultivation operation are located to the south of the proposed facility and are followed by State Highway 29 South. Rural land use is predominant to the west of the Pura Vineyards Site and is followed by State Highway 29 South.

3.2 BENSON RIDGE FACILITY

The Benson Ridge Facility, located at 7620 Highway 29, Kelseysville, CA, 95451, is listed in the California Department of Toxic Substance Control (DTSC) database. According to DTSC, this facility received liquid, sludge, and solid waste from the geothermal industry in the Geysers area. A Waste Consolidation Area, located at the facility, is used to contain roughly 103,000 cubic yards of waste, subsoils, and solidification agents. Since December 1992, the facility has been in post-closure Detection and Corrective Action Monitoring. Currently, semi-annual groundwater monitoring is conducted in March and September at the facility. Shallow and deep groundwater bearing zones are monitored and are associated with the corrective action and detection programs respectively.

On August 21, 2021, a *Semi-Annual Groundwater Monitoring Report* was completed for the Benson Ridge Facility. Groundwater samples collected during the March 2021 sampling event from the perched groundwater zone (corrective action program) exceeded the background concentration limits (CL) for sulfate, total dissolved solids, boron, and sodium. As the perched zone monitoring network is also used as recovery wells, static conditions did not exist and groundwater flow cannot be inferred. However, data collected prior to the sampling event suggests the perched groundwater flows to the south. This is consistent with topographic gradient.

Analytical data for groundwater samples collected from the deep monitoring wells was compared to the CL for their respective wells. The report stated "*Over thirty years of groundwater monitoring at the Benson Ridge facility have shown no impacts to the deep zone groundwater. It would be appropriate that the deep zone monitoring program could be reduced or discontinued and the wells designated for beneficial use*". Groundwater flow in deep water bearing zone is calculated to be to the south.

Groundwater contamination plume?

Well construction and boring logs for selected wells associated with the Benson Ridge Facility monitoring network are included in **Appendix A** and discussed in **Section 2.4** and **Section 6** and included in **Exhibit 2**.

4.0 CUMULATIVE IMPACT AREA

Water for the proposed cannabis cultivation will be sources from on-site water wells. The Cumulative Impact Area (CIA) for this investigation is defined as the area influenced by the projected groundwater use and existing groundwater demand within the vicinity of the Pura Vineyard project. Local topography, hydrology, hydrogeology, and existing groundwater usage are important components when determining the CIA.

The CIA for the Vineyard project was delineated based on the localized topography, and geology/hydrogeology. The northern boundary of the CIA was determined by topography and the location of a tributary to Cole Creek. The Konocti Bay Fault Zone mapped by USGS constitutes the eastern boundary of the CIA. The southern and western extents of the CIA are defined by the location of Cole Creek. The extent of the CIA is depicted on **Figure 7**. The delineated CIA encompasses and area of approximately 2,375 acres. Including the five Pura Vineyard parcels there are 92 parcels within the CIA. Portions of the Clear Lake Volcanics and the Big Valley Groundwater Basin are included within the CIA. As the Clear Lake Volcanics is the dominant component of the CIA, Clear Lake Volcanic aquifer characteristics were utilized for the analyses summarized in **Section 6.1**.

5.0 EXISTING AND PROJECTED GROUNDWATER USE

Kimley-Horn evaluated the current and projected water demand within the CIA. Water use demands for the proposed Vineyard were calculated by Kimley-Horn based on information provided by Pura Industries.

5.1 EXISTING PROJECT AREA WATER DEMAND

The project area was previously used as a vineyard for the cultivation of grapes. Approximately 15 acres of vineyard are being removed and replaced by the proposed cannabis facility.

5.2 CALCULATED WATER DEMAND

As stated in **Section 1.1**, the total water use demand for facility operations equates to approximately 26,372,720 gallons per year or 80.93-acre feet per year. This includes water demands for both cannabis cultivation and non-cultivation operations.

5.3 EXISTING OFF-SITE WATER DEMAND

The CIA encompasses all or portions of 87 off-site properties. These properties are utilized for a mixture of uses including single-family dwellings, vineyards, and orchards. It can be presumed that each of the 87 off-site properties is serviced by their own respective water well. The amount of groundwater extraction for off-site properties cannot be verifiably quantified. However, estimates can be extrapolated based on size of dwellings, property use, and application of usage rates for the identified development types (**Table 2**).

Land use for each parcel within the CIA was determined by aerial imagery. For estimation purposes, residential structures are surmised to be 3-bedroom houses. For parcels not completely within the CIA boundary, the total estimated water usage was included regardless of the land use distribution throughout the parcel. Agriculture on parcels within the CIA was observed to primarily consist of grape cultivation and orchard production. The agricultural production was not observed to cover the entirety of the parcels. However, the entire acreage of applicable parcels was used to calculate the existing water demand for the agricultural production.

5.4 PROJECTED OFF-SITE WATER DEMAND

Future water demand for undeveloped parcels was presumed to be equivalent to a 3-bedroom residence.

Table 2
Summary of Existing / Projected Groundwater Use

Description	Existing (acre-feet/year)	Future Development (acre-feet/year)	Total (acre-feet/year)
On-Site Groundwater Use			
Cannabis Production	0	78.72	78.72
Non-Production operations	0	2.21	2.21
Grape Cultivation[1]	30.7	-7.5[5]	23.2
Off-Site Groundwater Use			
Single Family Dwellings – Domestic Use [2]	36	21	57
Single Family Dwellings – Nonessential Use [3]	12	7	19
Grape Cultivation [1]	147.7	0	147.7
Orchard Dry Farming [4]	1.9	0	1.9
Total Groundwater Use			
Totals	**228.3**	**101.43**	**329.73**

Notes:
[1]: Usage rate of 0.5 AF/year per acre of grape cultivation (295.4 acres)
[2]: Usage rate of 0.25 AF/year per bedroom
[3]: Usage rate of 0.25 AF/year per dwelling
[4]: Usage rate of 0.01 AF/year per acre utilizing dry farming techniques (189.9 acres)
[5]: This accounts for the removal of 15-acres of current vineyard which will be replaced by proposed Pura Vineyards Site.

6.0 GROUNDWATER AVAILABILITY ANALYSIS

Kimley-Horn estimated the groundwater availability for the CIA based on the prevailing hydrogeologic conditions and the projected water use demands.

6.1 AQUIFER STORAGE CAPACITY

The *LCWPD* estimated the specific yield of the Clear Lake Volcanics to range from 0 to 15 percent. A conservative estimate of 7 percent was used in this analysis. The CIA encompasses a total area of 2,375 acres. Wells within the CIA which are presumed to target the lower water-bearing zone (>200 feet deep), based on well depth, were reviewed. The six (6) correspond wells are summarized on **Exhibit 2**. Approximate top of casing elevations were calculated with Google Earth Pro and topographic maps. Average static depth to water and aquifer depth is 385 feet and 486 feet respectively. Given the above parameters, the calculated storage capacity of the aquifer within the CIA is 16,792 AF. As stated in **Section 1.1**, the calculated water use demand of the Vineyard is 80.93 AF/year. The calculated water use of the Vineyard is less than on-half of a percent of the stored groundwater within the CIA. The total existing and projected water demand within the CIA, approximately 329.73 AF/year, is less than two (2) percent of the estimated groundwater in storage.

6.2 VINEYARD'S WATER BUDGET

To estimate the water balance of the project area, Kimley-Horn compared groundwater recharge to the calculated water use demand for the Vineyard. Precipitation is presumed to constitute the primary source of inflow into the underlying aquifer. The primary outflow of the aquifer is assumed to be evapotranspiration. Secondary sources of inflow and outflow to the groundwater are considered to be relatively equal. Based on the above assumptions, the below formula was used to calculate groundwater recharge beneath the project area.

According to the National Oceanic and Atmospheric Administration (NOAA) and the National Integrated Drought Information System (NIDIS), Lake County, CA is currently in severe drought and January 2022 was the 9th driest January on record over the past 128 years. During drought conditions, 60 percent of the average precipitation can be assumed.

$$\text{Recharge} = P - (ET_A + R + E_{CI} + S)$$

Precipitation (P)

As stated in **Section 2.5**, the Clearlake weather station recorded an average rainfall of 27.5 inches per year. Total annual precipitation over the project area is equivalent to 721.4 AF/year during a year with average precipitation and 432.9 AF/year during a year effected by drought.

Actual Evapotranspiration (ET_A)

Appendix A of Title 23 of the California Code of Regulations (23 CCR), Chapter 2.7, as stated in **Section 2.5**, determined Lower Lake area of Lake County is estimated to have a mean annual potential evapotranspiration of approximately 45.4 inches per year. This equates to an estimated 1,191 AF/year of potential evapotranspiration.

Kimley-Horn calculated actual evapotranspiration (ET_A) for the project area using a site specific model as described in *A Guide to Estimating Irrigation Water Needs of Landscape Plantings in California* (UC Cooperative Extension, 2000). Acreage of varying vegetation types were calculated using GIS. A landscape

coefficient was calculated for each vegetation type including the proposed cannabis production area. Based on the variability of the species coefficient depending on cannabis subtype, highly conservative estimates were used for the species and density coefficient. Each landscape coefficient was multiplied by the potential evapotranspiration to get landscape evapotranspiration (ET_L). ET_L was multiplied by acreages for the identified vegetation types to calculate ET_A for the project area. Actual evapotranspiration for the project area was calculated to be 135.65 AF/year.

For ease of calculation, conservative assumptions and coefficients were utilized. Assumptions made within the calculation include constant year-round evapotranspiration rates were assumed for the cannabis and grape production

Runoff (R)

Type curves for various surfaces were calculated by the Sonoma County Water Agency in the Flood Management Design Manual, March 2020 (FMDM, 2020) (**Appendix XX**). Based on soil data reviewed and summarized in **Section 2.3** (**Appendix XX**), the majority of the slopes across the project area are greater than 20 percent. For conservative estimates, the entire project area was assumed to be greater than 20 percent slopes. Based on the project area estimates, the run-off coefficient of 0.47 was determined by the FMDM. The annual precipitation volume was multiplied by the run-off coefficient to estimate the annual outflow run-off volume. The run-off volume for a year with average rainfall equates to 339.1 AF/year while 203.4 AF/year is estimated during years of drought.

Canopy Interception Losses (E_{CI})

Canopy interception loss, as defined by Helvey and Patric 1965, is *rainfall retained on standing vegetation and evaporated without dripping off or running down the stems*. Studies conducted by Helve and Patric excluded grassland and other land surfaces without tree canopy cover. The interception loss coefficient is multiplied by the average rainfall and drought conditions for areas over the Vineyard with canopy cover. Canopy interception loss within the project area equates to 12.75 AF/year during years with average rainfall and 8.46 AF/year during years with drought conditions.

Spring Flow (S)

Springs are not located within the project area. As such, spring flow discharge is not incorporated in the groundwater recharge analysis.

Water Budget Results

Table 3
Pura Vineyard's Water Budget

Description	Inflow/Outflow	Volume (acre-feet/year) Average Precipitation	Volume (acre-feet/year) Drought Conditions
Precipitation	Inflow	+721.4	+432.9
Actual Evapotranspiration	Outflow	-146.05	-146.05
Run-off	Outflow	-339.1	-203.4
Canopy Interception	Outflow	-12.75	-8.46
Springs	Outflow	0	0
	Total	**+223.5**	**+74.99**

6.3 CIA'S WATER BUDGET

Groundwater recharge potential for the entirety of the CIA was calculated (minus the project area as this was calculated in Table 4). Conservative assumptions applied in the project area water budget calculations were similarly applied in the for figures within **Table 5**.

Table 4
CIA's Water Budget

Description	Inflow/Outflow	Volume (acre-feet/year) Average Precipitation	Volume (acre-feet/year) Drought Conditions
Precipitation	Inflow	+4,721.3	+2,832.8
Evapotranspiration	Outflow	-966.5	-966.5
Run-off	Outflow	-2,030.2	-1,217.1
Canopy Interception	Outflow	-129.49	-85.94
Springs	Outflow	0	0
	Total	**+1595.11**	**+563.26**

7.0 WATER QUALITY

Groundwater quality in the Clear Lake Volcanics is unavailable according to the Lake County Groundwater Management Plan. However, the California Department of Health Services (DHS) provided information during the preparation of the *LCGWMP* which indicated iron, aluminum, and manganese were detected above surface water quality levels (SWQLs) in the Clear Lake Volcanics. The location of the groundwater samples with elevated concentrations was not provided.

Semi-annual groundwater monitoring is conducted at the Benson Ridge Facility on the eastern adjacent property. Groundwater monitoring is conducted on the perched and deep water bearing zones beneath the facility. The deep monitoring wells and the on-site production well roughly target the same water bearing zone. In 30 years of monitoring, the deep water bearing zone has never show signs of groundwater contamination. The perched water bearing zone is continuously pumped and discharged into lined basins at the facility.

8.0 WELL EVALUATION AND DRAWDOWN ANALYSIS

The on-site production well, WE-1664 was installed in April of 1999 to a depth of 598 feet below land surface. In May 2020, a specific capacity test was performed during which the well was pumped continuously at a rate of 225 gallons per minute (gpm) for 4.5 hours. During the test, the well experienced a maximum of 60 feet of drawdown. The corresponding specific capacity of the well was estimated to be 3.75 gpm per foot of drawdown. This data was used to estimate a transmissivity value for the aquifer of approximately 795 $feet^2$/day.

The average water use demand for the project is approximately 72,250 gallons per day. This equates to approximately 50 gpm. Kimley-Horn used to the Theis drawdown equation to estimate the drawdown and radius of influence for the pumping well based on the average daily demand (**Appendix D**). Drawdown in the well is estimated to be approximately 11 feet, which correlates with the estimated specific capacity. At a radial distance of 200 feet from the well, drawdown in the aquifer is estimated to be less than 1-foot.

9.0 CONCLUSIONS AND RECOMMENDATIONS

Kimley-Horn has prepared the following conclusions and recommendations for the proposed cannabis production facility, identified as Pura Vineyards, located approximately 2.5 miles southeast of Kelseyville, CA:

- Based on published hydrogeologic data for Clear Lake Volcanics, the deep aquifer will be able to meet the water use demands for the proposed cannabis production facility. We anticipate that the existing on-site production well installed south of the production facility is sufficient to meet the proposed water use demands.
- The current water use within the CIA is 228.3 AF/year. The future water use demand within the CIA which includes cannabis cultivation is 101.43 AF/year.
- The estimated groundwater availability of the CIA is 16,792 AF. The future water use demand accounts for 2% of the total groundwater availability in the CIA.
- Under drought conditions, the proposed groundwater demand for Pura Vineyards is approximately 12% of the total recharge available to the CIA (638.25).
- The proposed cannabis cultivation will result in a net increase in the water use demand for the CIA. The availably groundwater within the CIA is capable of sustaining the proposed increase. Furthermore, it is not anticipated that the increased demands will adversely impact other legal users of the groundwater resource or sensitive environmental receptors.
- Pura Industries may want to install a second well in the future to provide redundancy for the irrigation system.

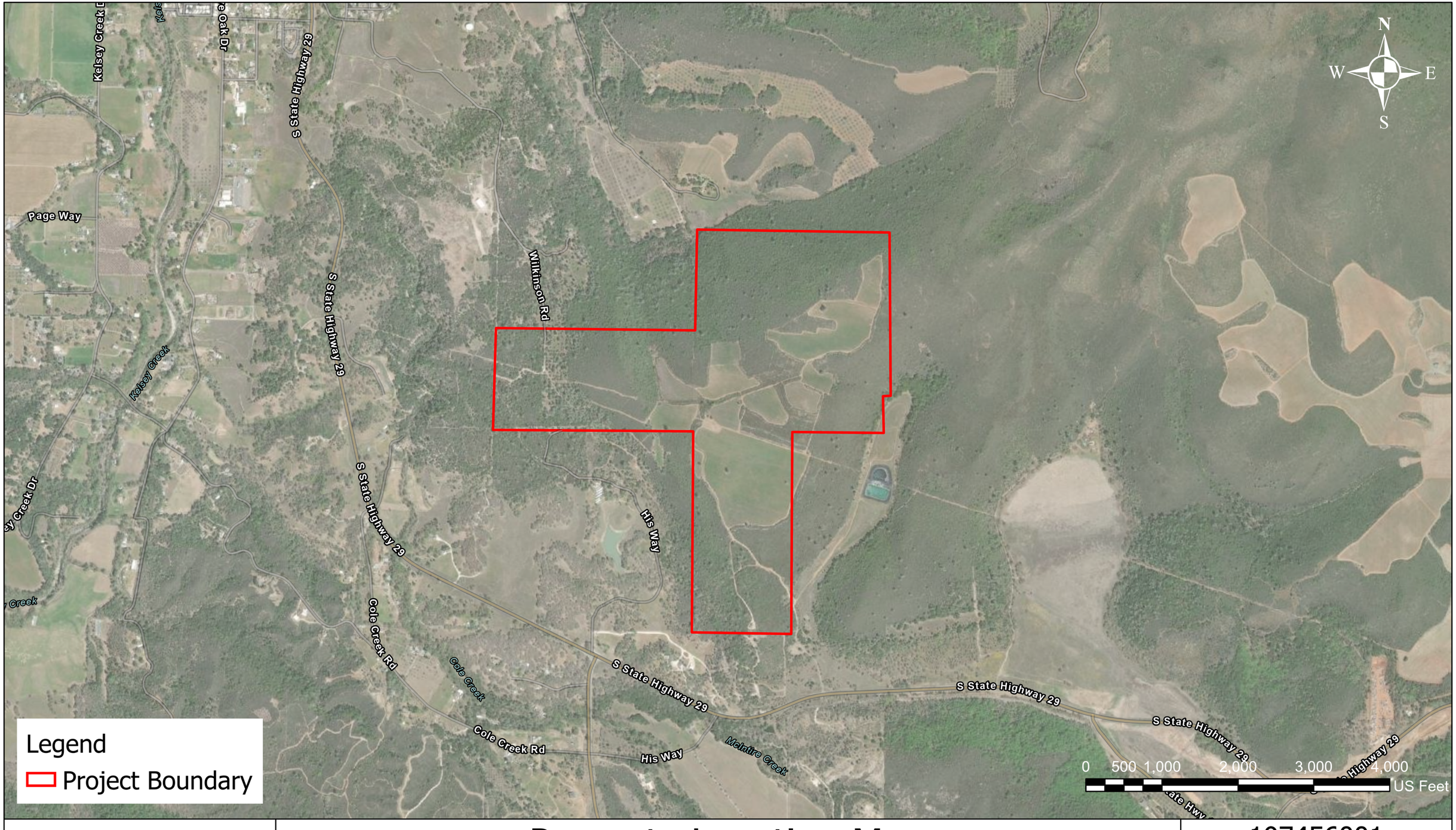
REFERENCES

Hearn B.C.Jr, J.M. Donnelly-Nolan, F.E. Goff, 1995 "*Geologic Map and Structure Sections of Clear Lake Volcanics, Northern California*" https://pubs.usgs.gov/imap/2362/

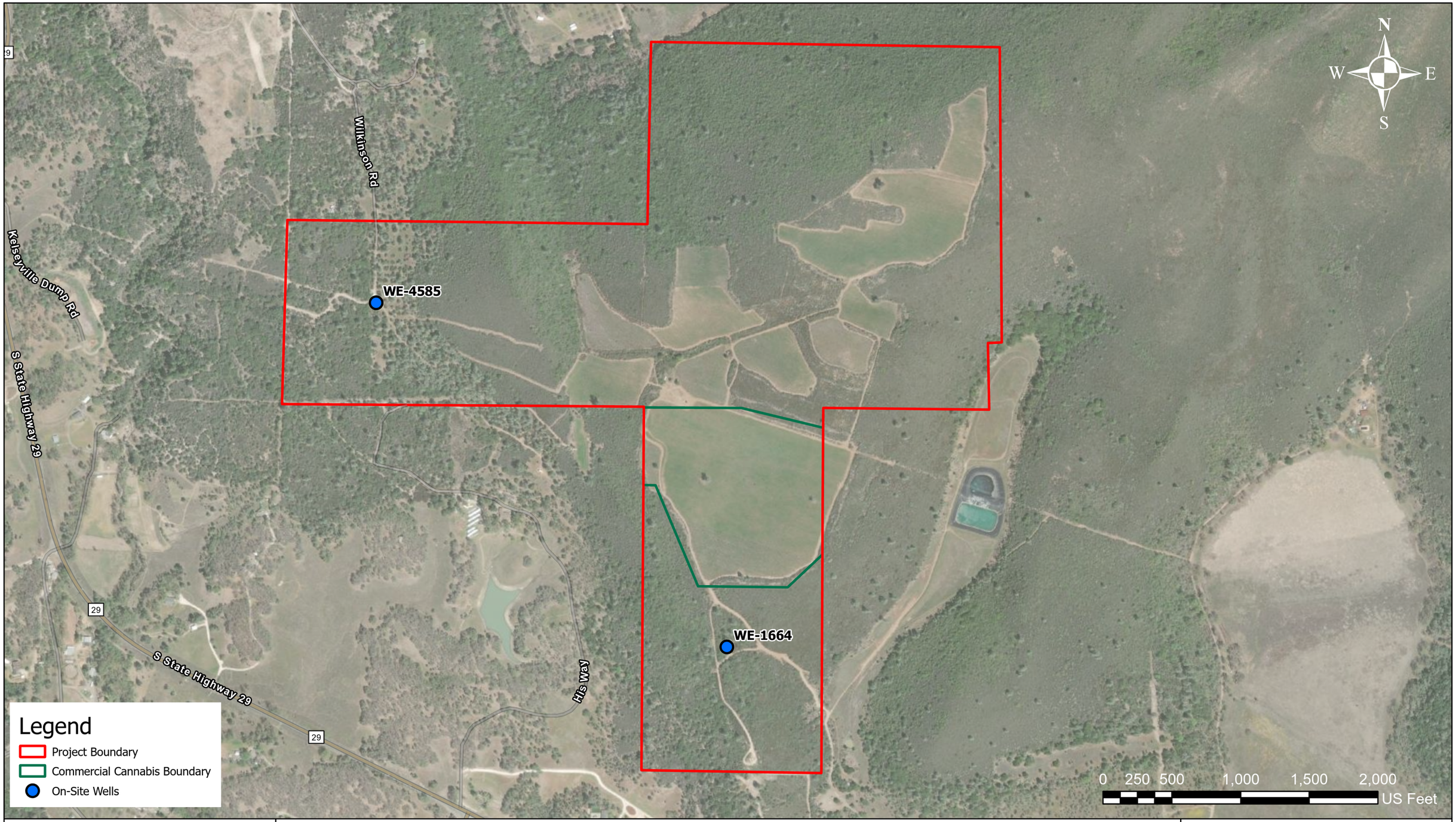
Domenico, P.A., F.W. Schwartz, 1990. *Physical and Chemical Hydrogeology*, John Wiley & Sons, New York, 824 p.

Helvey, J.D., J.H. Patric 1965. *Canopy and litter interception of rainfall by hardwoods of eastern United States*, Water Resources Research, Vol. 1, No. 2

FIGURES



Kimley»Horn	Property Location Map Pura Vineyards Kelseyville, Lake County, CA	197456001 Figure No. 1

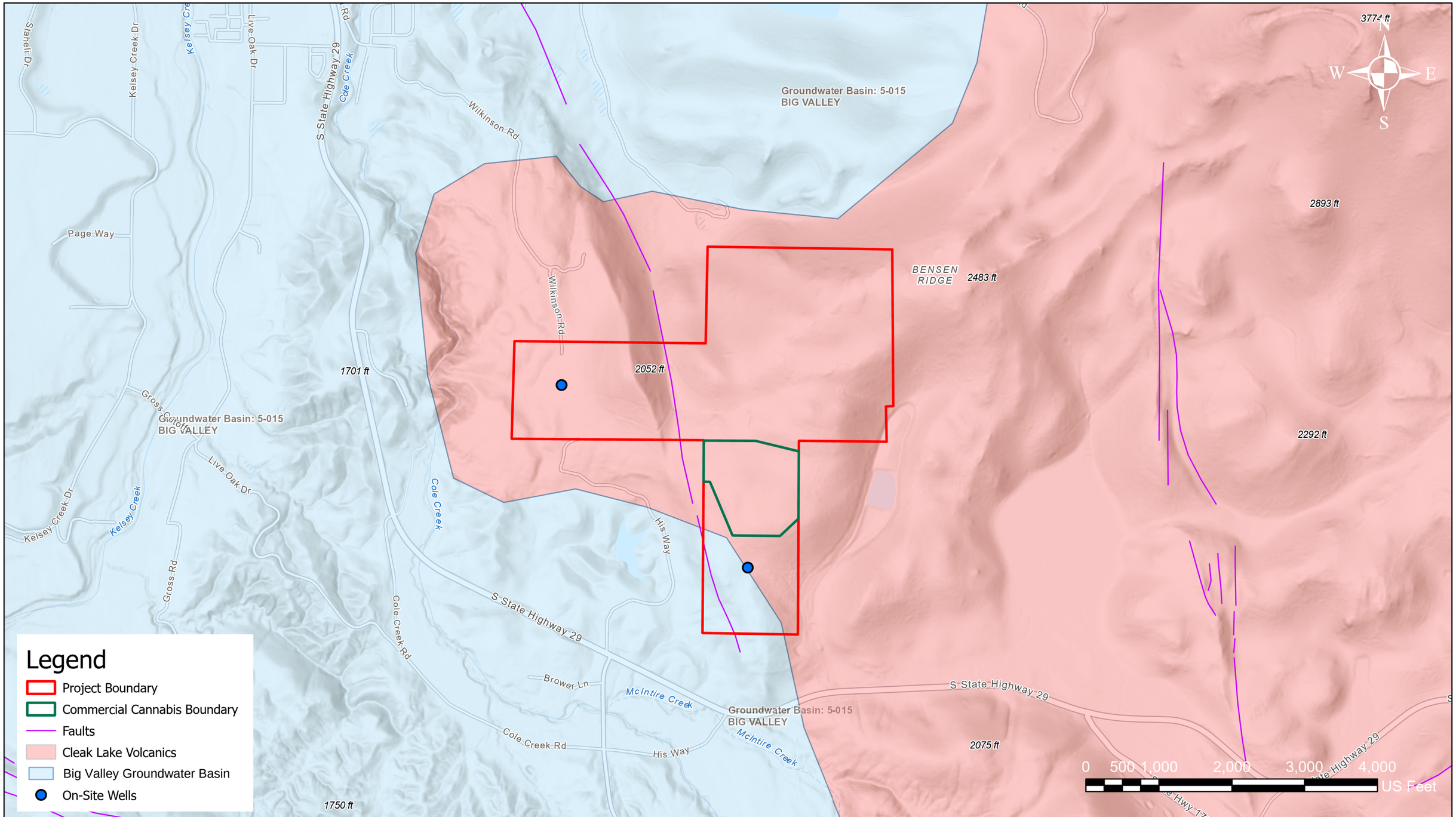


Kimley»Horn

Location of Existing On-Site Water Wells
Pura Vineyards Kelseyville, Lake County, CA

197456001

Figure No. 2

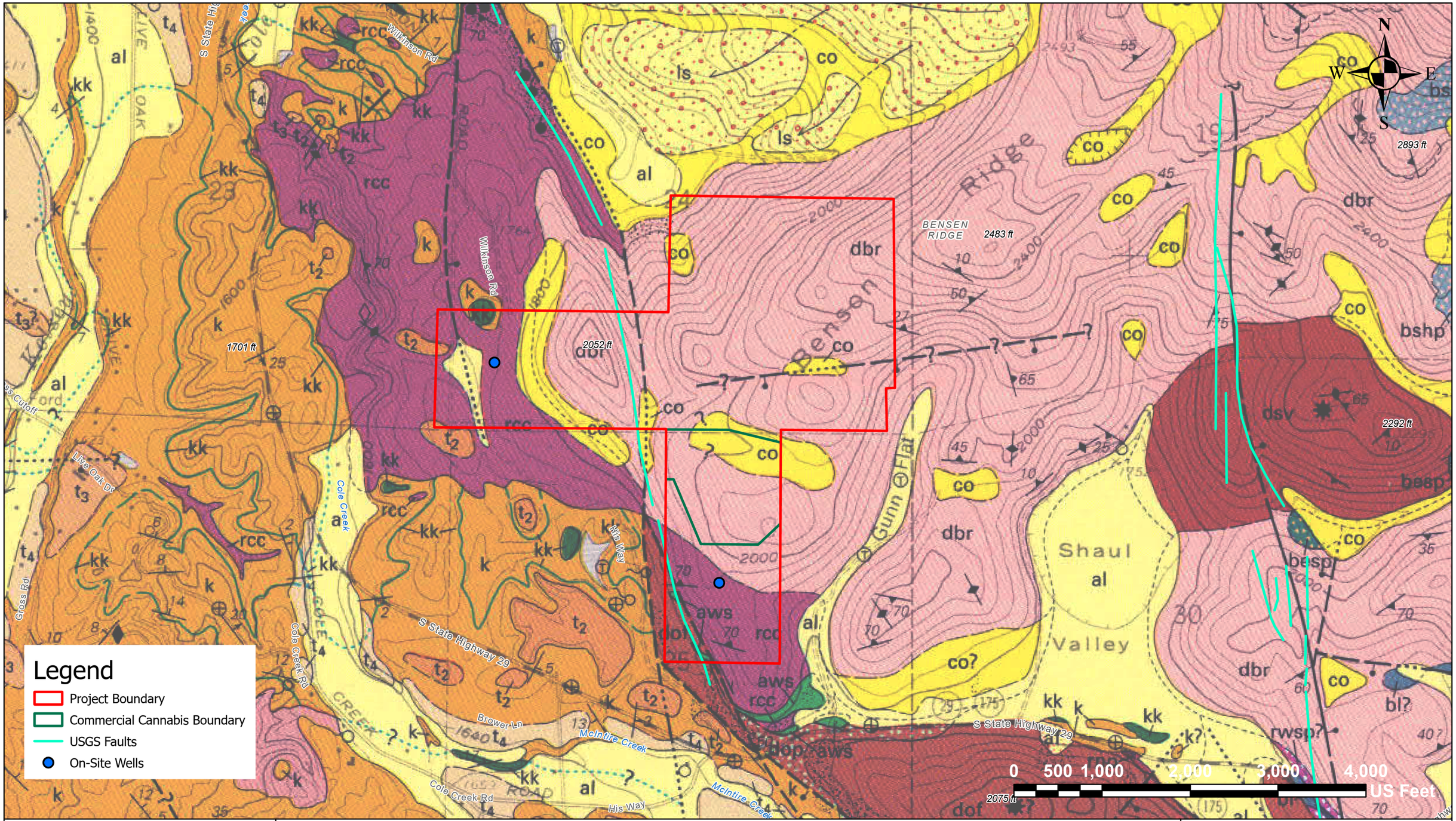


Kimley»Horn

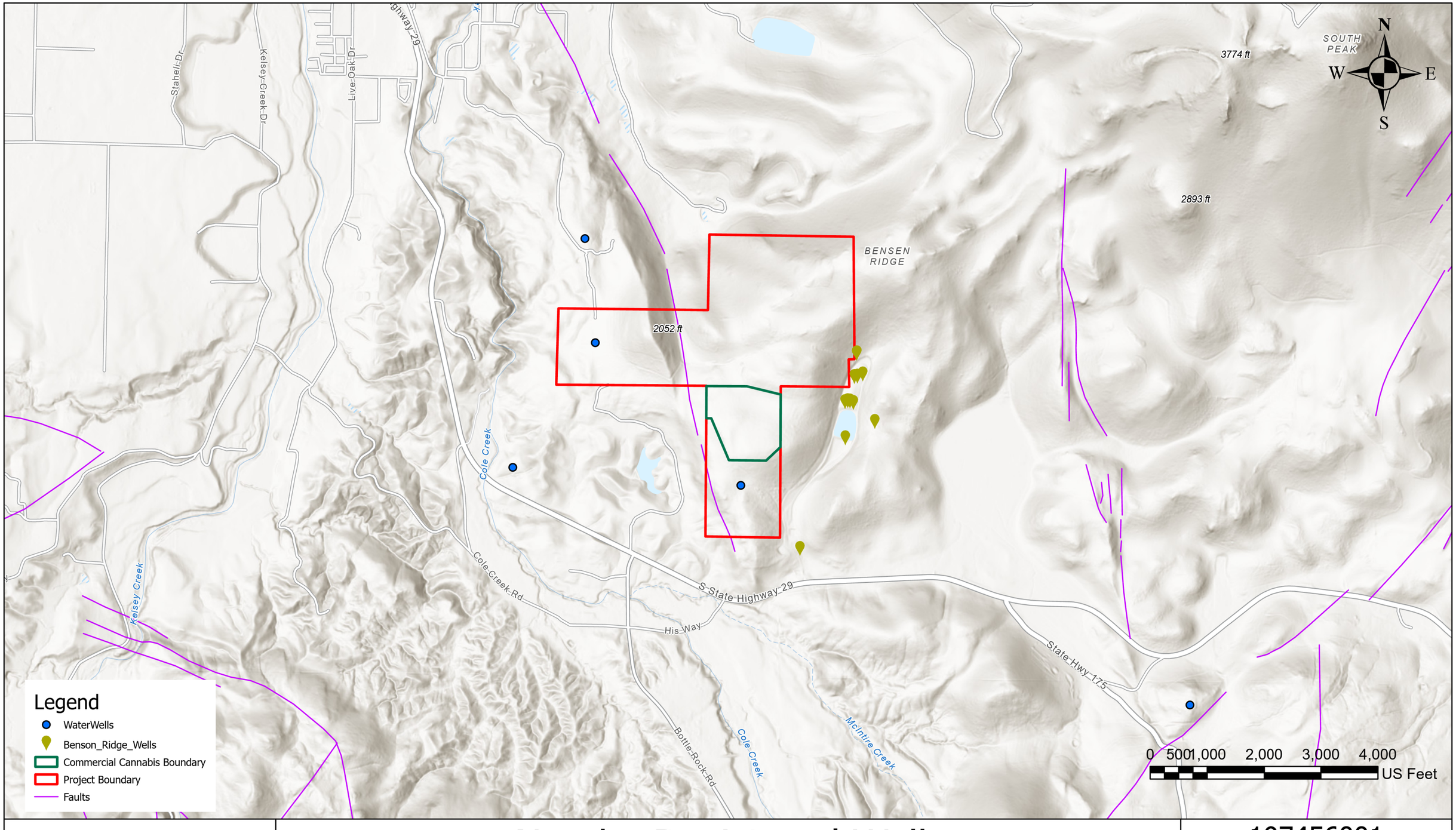
Groundwater Basins
Pura Vineyards Kelseyville, Lake County, CA

197456001

Figure No. 3



Kimley»Horn	Geologic Map Pura Vineyards Kelseyville, Lake County, CA	197456001 Figure No. 4

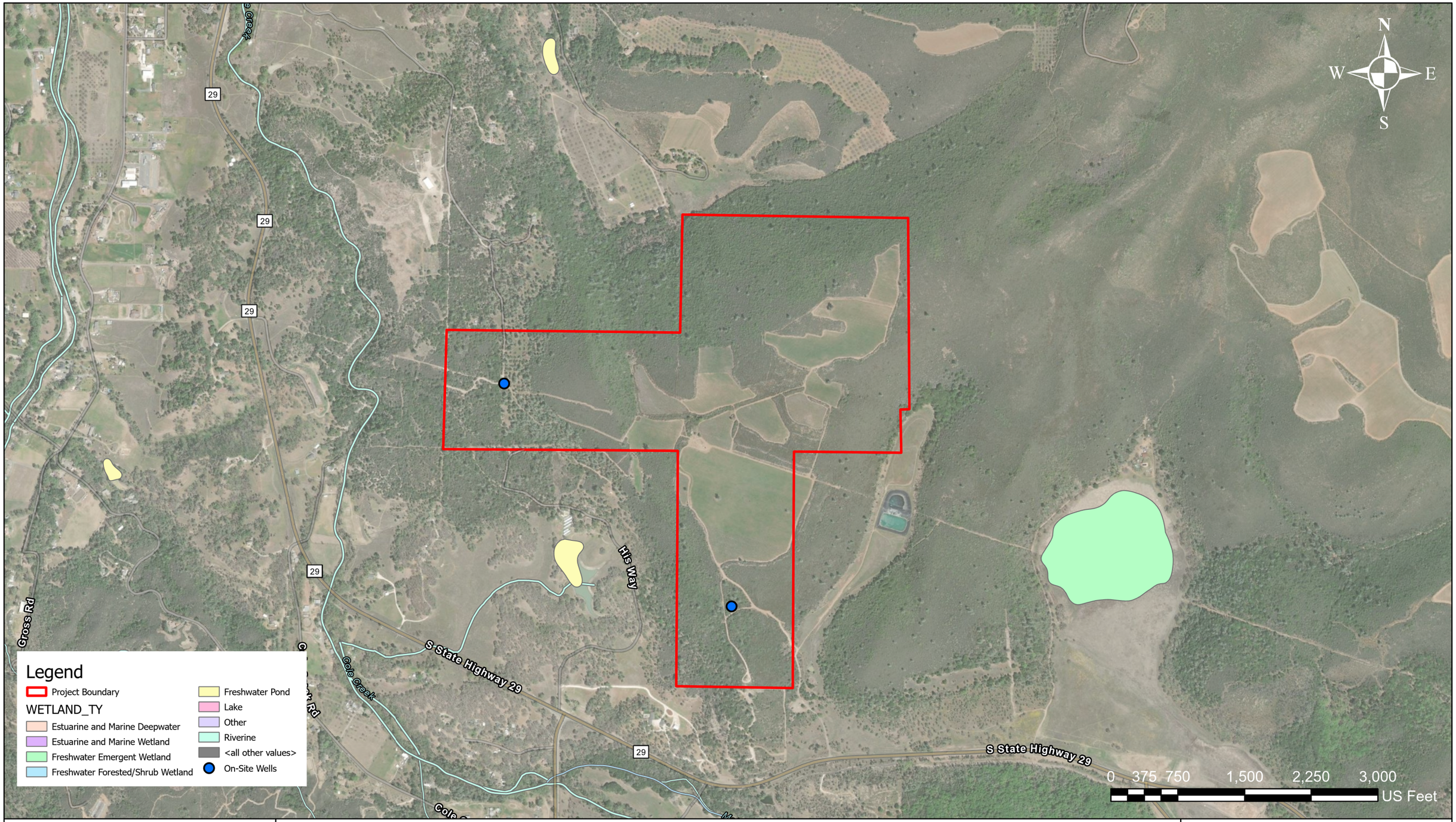


Kimley»Horn

Nearby Registered Wells
Pura Vineyards Kelseyville, Lake County, CA

197456001

Figure No. 5

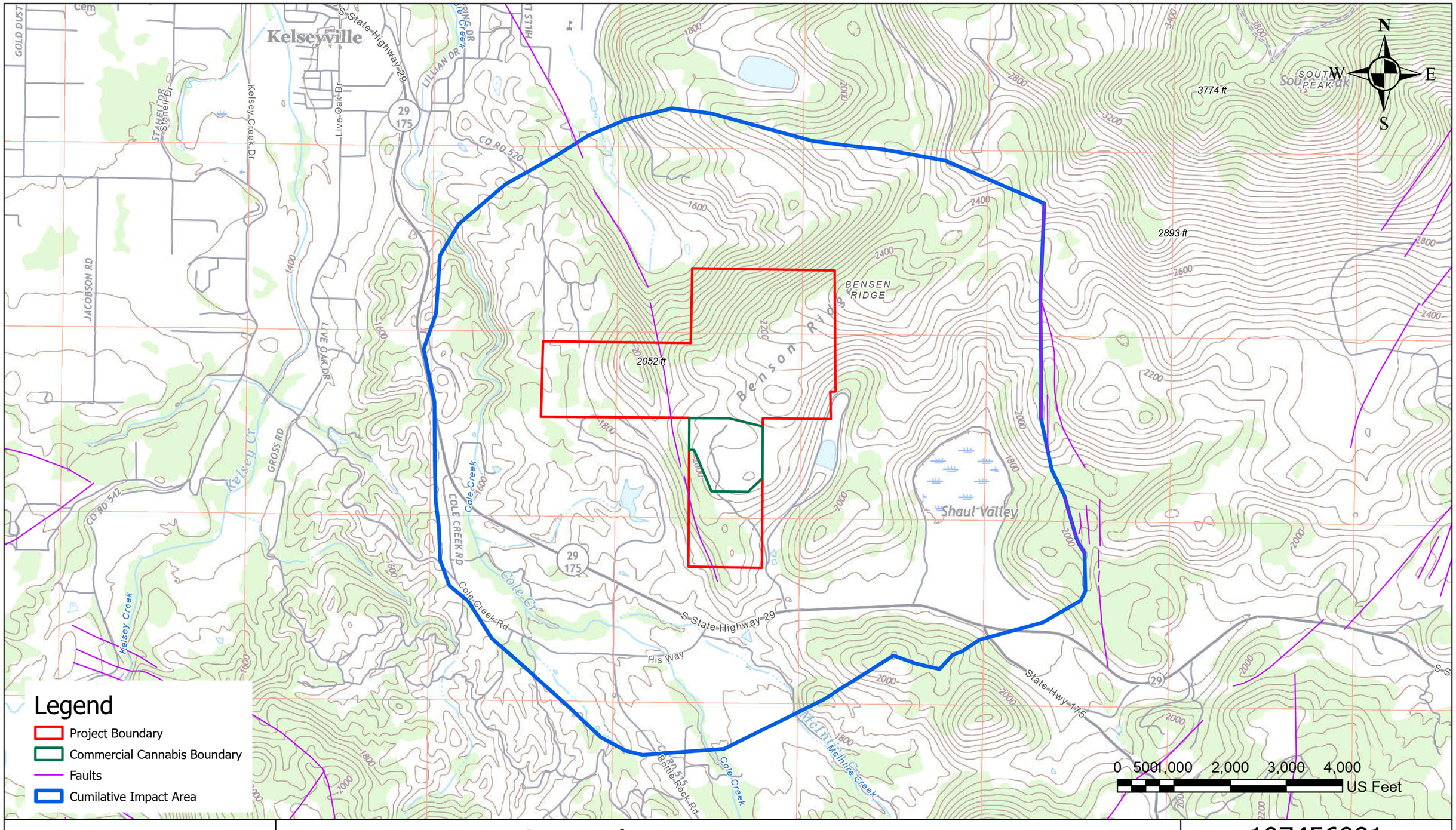


Kimley»Horn

Surface Water Bodies
Pura Vineyards Kelseyville, Lake County, CA

197456001

Figure No. 6



Kimley»Horn

Cumulative Impact Area
Pura Vineyards Kelseyville, Lake County, CA

197456001

Figure No. 7

EXHIBIT 1

Exhibit 1

On-Site Wells

Well ID	Construction Date	Construction Type	Casing Diameter (in)	Approximate Elevation (ft)	Top of Screen (ft bls)	Bottom of Screen (ft bls)	Depth (ft bls)
WE-1664	April 1999	Irrigation	8.32	1957	555	635	635
WE-4585	August 2015	Domestic	6	1784	433	593	593

WE-1664

Lithology	Top (ft bls)	Base (ft bls)
White volcanic rock	0	460
Red volcanic rock	460	500
Pink volcanic rock	500	635

WE-4585

Lithology	Top (ft bls)	Base (ft bls)
Sandy silt	0	3
Tan volcanic rock	3	37
Pink/tan volcanic rock	37	53
Tan volcanic rock with fractures from 480 ft to bottom	53	600

Notes:
Elevation: estimated using Google Earth Pro
bls: below land surface

EXHIBIT 2

Exhibit 2
Water Wells in the Vicinity of Pura Vineyards

Well Permit No. / Well ID	Approximate Elevation (ft)	Top of Screen (ft bls)	Bottom of Screen (ft bls)	Depth (ft bls)	Static Depth to Water (ft bls)	Estimated Groundwater Elevation (ft)	Aquifer Thickness (ft)
WE-4585	1783	433	593	593	405	1378	188
WE-3486	1650	400	500	500	380	1270	120
WE-1664	1958	555	635	635	500	1458	135
MW-32	1874.25	365	385	385	326	1548.25	59
MW-31	1857.61	415	435	435	385	1472.61	50
MW-13	1780.47	352	362	370	312.5	1467.97	57.5
Averages				486.33	384.75	1432.47	101.58

Notes:
Elevations for wells MW-13, MW-31, and MW-32 have been surveyed
Aquifer thickness is equal to well depth minus static depth to water and is therefore limited by the depth of the wells.

APPENDIX A

QUADRUPLICATE
For Local Requirements

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

No. 713396

DWR USE ONLY — DO NOT FILL IN
001-029-05
STATE WELL NO./STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

Page ___ of ___
Owner's Well No. WP9578
Date Work Began 3-22-99, Ended 4-23-99
Local Permit Agency Health Dept.
Permit No. WE-11643 Permit Date 3-21-99

GEOLOGIC LOG

ORIENTATION (✓) X VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DRILLING METHOD Air rotary FLUID ___

DEPTH FROM SURFACE Ft. to Ft.	DESCRIPTION *Describe material, grain size, color, etc.*
0 460	White Volcanic Rock
460 500	Red Vol Rock
500 625	Pink Vol Rock

RECEIVED
NOV 12 2004
LAKE COUNTY
ENVIRONMENTAL HEALTH

TOTAL DEPTH OF BORING 625 (Feet)
TOTAL DEPTH OF COMPLETED WELL 625 (Feet)

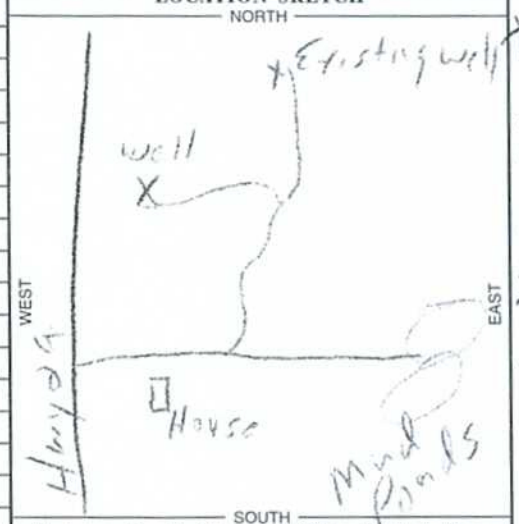
WELL OWNER

Name Gar Snider
Mailing Address 130 Pepper Ave
City Lower Lake State Ca ZIP 95457

WELL LOCATION

Address 7620 Hwy 29
City Kelseyville
County Lake
APN Book 07 Page 09 Parcel 05
Township 13 Range 9 Section 25
Latitude ___ DEG. ___ MIN. ___ SEC. NORTH
Longitude ___ DEG. ___ MIN. ___ SEC. WEST

LOCATION SKETCH



Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. ***PLEASE BE ACCURATE & COMPLETE.***

ACTIVITY (✓)

X NEW WELL
MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)
___ DESTROY *(Describe Procedures and Materials Under "GEOLOGIC LOG")*

PLANNED USES (✓)

WATER SUPPLY
___ Domestic ___ Public
X Irrigation ___ Industrial
___ 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 530 (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL 500 (Ft.) & DATE MEASURED 4-25-99
ESTIMATED YIELD 200+ (GPM) & TEST TYPE air lift
TEST LENGTH 4 (Hrs.) TOTAL DRAWDOWN ___ (Ft.)
* *May not be representative of a well's long-term yield.*

CASING (S)

DEPTH FROM SURFACE Ft. to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0 500	12 1/4	X				511.156	8.32	156	
500 555	8 3/4	X				"	"	"	
555 625	"		X			"	"	"	Factory Perf

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft. to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0 20		X		
20 500				Pea Gravel

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 Jerry Herring Drilling (PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)
ADDRESS 13011 Hwy 29 CITY Lower Lake STATE Ca ZIP 95457
Signed ___ (WELL DRILLER/AUTHORIZED REPRESENTATIVE) DATE SIGNED 4-26-99 C-57 LICENSE NUMBER 446211

DWR 188 REV. 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

ORIGINAL
File with DWR

SEP 28 2015

Page 1 of 1

STATE OF CALIFORNIA

WELL COMPLETION REPORT

Refer to Instruction Pamphlet

No. e0283709

DWR USE ONLY --- DO NOT FILL IN

13N/09W-24

STATE WELL NO./ STATION NO.

LATITUDE LONGITUDE

APN/TRS/OTHER

Owner's Well No. WELL #1

Date Work Began 8/3/2015, Ended 8/11/2015

Local Permit Agency Lake County Environmental

Permit No. WE-4585 Permit Date 6/5/2015

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)

DRILLING METHOD AIR FLUID N/A

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain, size, color, etc.*
0	3	Sandy tan silt and diamond dust
3	37	Tan volcanic rock with black speckles and tiny diamonds
37	53	Pink/tan volcanic rock with black speckles, tiny diamonds and pyrite
53	600	Tan volcanic rock with black speckles and tiny diamonds with fractures from 480 ft to bottom

TOTAL DEPTH OF BORING 600 (Feet)

TOTAL DEPTH OF COMPLETED WELL 593 (Feet)

[redacted]

WELL LOCATION

Address 6700 Wilkinson Road

City Kelseyville CA

County Lake

APN Book 007 Page 018 Parcel 020

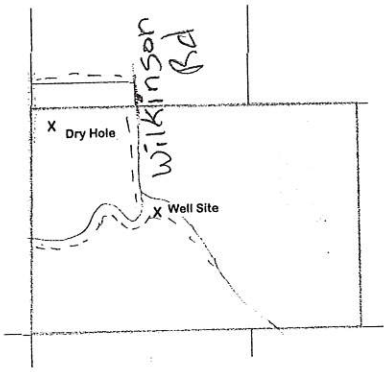
Township 13 N Range 9 W Section 24 ✓

Latitude 38 DEG. 57 MIN. 287 N SEC.

122 DEG. 49 MIN. 059 W SEC.

LOCATION SKETCH

NORTH



WEST EAST

SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

✓ NEW WELL

MODIFICATION/REPAIR ___ Deepen ___ Other (Specify)

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

PLANNED USES (✓)

WATER SUPPLY ✓ Domestic ___ Public ___ Irrigation ___ Industrial

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 N/A (Ft.) BELOW SURFACE 1

DEPTH OF STATIC WATER LEVEL 405 (Ft.) & DATE MEASURED 8/11/2015

ESTIMATED YIELD * 25 (GPM) & TEST TYPE Air Developed

TEST LENGTH 4 (Hrs.) TOTAL DRAWDOWN BTM (Ft.)

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

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	20	13 1/2								
20	600	10								
+2	433		✓				PVC	6	SDR21	
433	593			✓			PVC	6	SDR21	.032

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	21		✓		
21	593			✓	3/8 Pea Gravel

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

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

Signed June Imsiglini WELL DRILLER/AUTHORIZED REPRESENTATIVE

09/17/15 DATE SIGNED

177681 C-57 LICENSE NUMBER

DWR 188 REV. 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

ORIGINAL
File with DWR

AUG 10 2011

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

Page 1 of 1

No. e0134505

DWR USE ONLY -- DO NOT FILL IN
13N/08W-32
STATE WELL NO./ STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

Owner's Well No. TEST HOLE #1
Date Work Began 6/27/2011, Ended 7/26/2011
Local Permit Agency Lake County Environmental
Permit No. WE4246 Permit Date 6/7/2011

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL — HORIZONTAL — ANGLE — (SPECIFY)
DRILLING METHOD AIR FLUID N/A

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain, size, color, etc.*
		TEST HOLE
0	43	Yellow volcanic sand, cobbles, ash, obsidian
43	88	Tan volcanic sands, gravels, ash, obsidian
88	105	White pumice and red volcanic rock
105	141	Tan volcanics with red volcanic rock
141	167	White pumice with red volcanic rock
167	242	White yellow volcanic rock with pink, red volcanic rock
242	338	Burgundy and multi colored volcanic rock with some pink ash
338	408	Hard purple rock
408	441	Pink and white rock
441	511	Burgundy, black and multi colored rock
511	538	Gray rock with dark green speckles
538	639	Dark green multi colored rock (like glass)
639	700	Dark green black volcanic rock fractured
		Test hole backfilled and abandoned per Lake county requirements

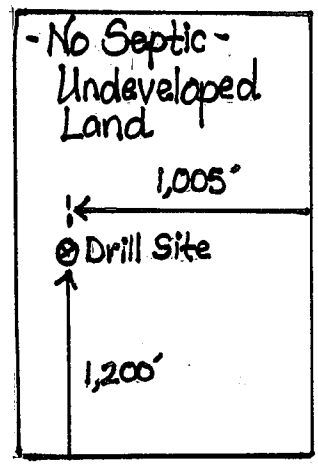
TOTAL DEPTH OF BORING 700 (Feet)
TOTAL DEPTH OF COMPLETED WELL N/A (Feet)

[redacted] ZIP

WELL LOCATION

Address 7713 Highway 175
City Kelseyville CA
County Lake County
APN Book 009 Page 022 Parcel 47-10
Township 13N Range 8W Section 32
Latitude DEG. MIN. SEC. DEG. MIN. SEC.

LOCATION SKETCH



Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)
✓ NEW WELL
MODIFICATION/REPAIR
— Deepen
— Other (Specify)
— DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USES (✓)
WATER SUPPLY
✓ Domestic — Public — Industrial
— Irrigation
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 N/A (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL N/A (Ft.) & DATE MEASURED
ESTIMATED YIELD * N/A (GPM) & TEST TYPE N/A
TEST LENGTH N/A (Hrs.) TOTAL DRAWDOWN N/A (Ft.)
May not be representative of a well's long-term yield.

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	CASING (S) TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	40	11"								
40	700	8"								
-----		----------					----------	----------	----------	----------

DEPTH FROM SURFACE Ft.	to Ft.	ANNULAR MATERIAL TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	20		✓		
-----	-----				----------

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 (PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)
P.O. Box 176 (ADDRESS) Sebastopol (CITY) CA (STATE) 95473 (ZIP)
Signed Melissa G Lopez (WELL DRILLER/AUTHORIZED REPRESENTATIVE) 08/04/11 (DATE SIGNED) 177681 (C-57 LICENSE NUMBER)

DWR 188 REV. 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

ORIGINAL
File with DWR

Page ___ of ___

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

No. 1075325

DWR USE ONLY — DO NOT FILL IN

STATE WELL NO./STATION NO. 13N/09W-24

LATITUDE ___ LONGITUDE ___

APN/TRS/OTHER ___

Owner's Well No. ___
Date Work Began 9-9-04, Ended 9-21-04
Local Permit Agency Health Dept.
Permit No. WE-3486 Permit Date 8-3-04

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DRILLING METHOD Air Rotary FLUID ___

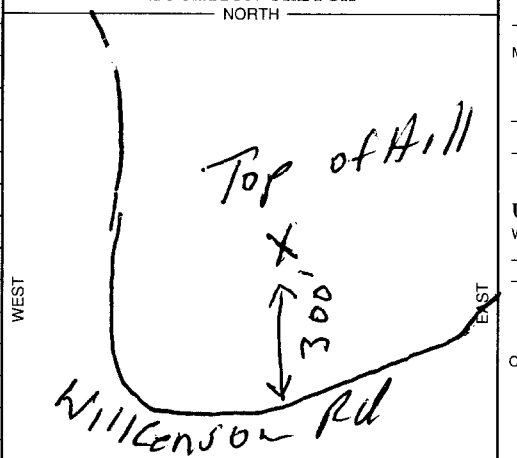
DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain size, color, etc.*
0	80	Blue Sand (med Hard)
80	295	Brown Sand (Harder)
295	440	Lost Circulation
440	525	Hard Green + White Volcanic + Clear [redacted] Quartz

TOTAL DEPTH OF BORING 525 (Feet)
TOTAL DEPTH OF COMPLETED WELL 500 (Feet)

WELL LOCATION

Address 6680 WILKINSON Road
City Kelseyville Ca 95451
County Lake
APN Book 007 Page 018 Parcel 10
Township 13N Range 9W Section 24
Lat ___ DEG. ___ MIN. ___ SEC. N
Long ___ DEG. ___ MIN. ___ SEC. W

LOCATION SKETCH



Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. ***PLEASE BE ACCURATE & COMPLETE.***

ACTIVITY (✓)

✓ NEW WELL
MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)
___ DESTROY *(Describe Procedures and Materials Under "GEOLOGIC LOG")*

USES (✓)

WATER SUPPLY
✓ Domestic ___ Public
___ Irrigation ___ Industrial
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 440 (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL 380 (Ft.) & DATE MEASURED 9-20-04
ESTIMATED YIELD * 40 (GPM) & TEST TYPE Air Lift
TEST LENGTH 2 (Hrs.) TOTAL DRAWDOWN ___ (Ft.)
** May not be representative of a well's long-term yield.*

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	20	9	X				PVC	4½	160	
20	400	7	X				PVC	4½	160	
400	500	7		X			PVC	4½	200	.030

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	20	✓			
20	500				5/16 pea
					5/16 pea

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 Larry Herman Drilling (PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)
ADDRESS 13011 Hwy 29 CITY Lower Lake STATE Ca ZIP 95457
Signed Jarl Herman C-57 LICENSED WATER WELL CONTRACTOR
DATE SIGNED 9-22-04
C-57 LICENSE NUMBER 465071

DWR 188 REV. 05-03

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

OSP 03 78836

ORIGINAL
File with DWR

RECEIVED
MAR 29 1999

Page ___ of ___

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

No. 705638

DWR USE ONLY — DO NOT FILL IN
13N/09W-26M
STATE WELL NO./STATION NO.
LATITUDE ___ LONGITUDE ___
APN/TRS/OTHER

Owner's Well No. ___
Date Work Began 12-22-98 Ended 12-29-98
Local Permit Agency Lake County Environmental Health
Permit No. WE 1642 Permit Date 12-22-98

GEOLOGIC LOG

ORIENTATION (✓) X VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DRILLING METHOD Rotary FLUID Air

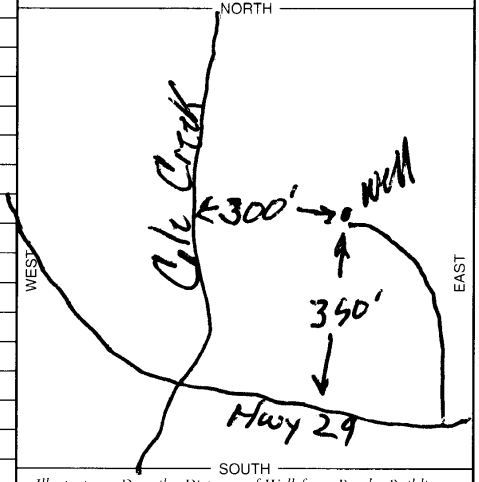
DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain size, color, etc.*
0	3	Brn. Soil
3	10	Vol. Sand + Gravel
10	25	Brn. Clay
25	60	Gray Clay
60	150	Gray Vol. Rock
150	190	Blak, Rink + Gray Vol. Rock
190	270	Gray Vol. Rock
270	310	Green Vol. Rock

TOTAL DEPTH OF BORING 310 (Feet)
TOTAL DEPTH OF COMPLETED WELL 308 (Feet)

WELL LOCATION

Address 7230 S. Hwy 29
City Kelseyville CA
County Lake
APN Book 007 Page 027 Parcel 21
Township 13N Range 09W Section 26
Latitude ___ DEG. ___ MIN. ___ SEC. NORTH
Longitude ___ DEG. ___ MIN. ___ SEC. WEST

LOCATION SKETCH



Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. ***PLEASE BE ACCURATE & COMPLETE.***

ACTIVITY (✓)

X NEW WELL
MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)
___ DESTROY *(Describe Procedures and Materials Under "GEOLOGIC LOG")*

PLANNED USES (✓)

WATER SUPPLY
X Domestic ___ Public
___ Irrigation ___ Industrial
___ 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 302 (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL 273 (Ft.) & DATE MEASURED 12-29-98
ESTIMATED YIELD * 26 (GPM) & TEST TYPE Air Lift
TEST LENGTH 1 (Hrs.) TOTAL DRAWDOWN ___ (Ft.)
** May not be representative of a well's long-term yield.*

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	60	9	X				PVC F480	4½	SDR26	
60	288	7	X				PVC F480	4½	SDR26	
288	308	7		X			PVC F480	4½	SDR26	2X ⅛

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	20	X			
20	308				Pea Gravel
			APR	20	1994

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 Dan Mc Mullen Well Drilling
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

1487 Old Long Valley Rd. Clearlake Oaks CA 95423
ADDRESS CITY STATE ZIP

Signed Dan Mc Mullen
WELL DRILLER/AUTHORIZED REPRESENTATIVE

12-29-98
DATE SIGNED

533152
C-57 LICENSE NUMBER

DWR 188 REV. 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

ORIGINAL
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STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

No. 414705

DWR USE ONLY — DO NOT FILL IN
13N/08W-31M1
STATE WELL NO./STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

Page ___ of ___
Owner's Well No. ___
Date Work Began 7-8-93 D.W.R. 8-24-93
Local Permit Agency Lake County Environmental Health
Permit No. WE917 Permit Date 7-12-93

GEOLOGIC LOG

ORIENTATION (✓) X VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DEPTH TO FIRST WATER 580 (Ft.) BELOW SURFACE

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain size, color, etc.*
0	460	Vol Rock
460	540	Pink+Green Vol. Rock
540	670	Red+Blk Vol. Rock

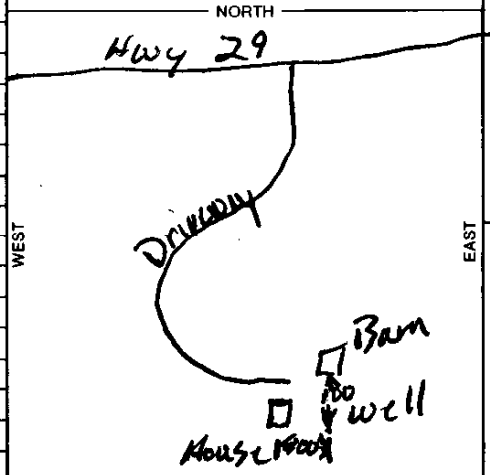
TOTAL DEPTH OF BORING 670 (Feet)
TOTAL DEPTH OF COMPLETED WELL 660 (Feet)

WELL OWNER

WELL LOCATION

Address 7659 Hwy 29
City Kelseyville
County Lake
APN Book 9 Page 24 Parcel 09-01
or
Township 13N Range 08W Section 31
or
Latitude ___ DEG. ___ MIN. ___ SEC. NORTH Longitude ___ DEG. ___ MIN. ___ SEC. WEST

LOCATION SKETCH



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

ACTIVITY (✓)

X NEW WELL
MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)
___ DESTROY *(Describe Procedures and Materials Under "GEOLOGIC LOG")*

PLANNED USE(S) (✓)

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

DRILLING METHOD Air Rotary FLUID ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH OF STATIC WATER LEVEL 580± (Ft.) & DATE MEASURED 8-18-93
ESTIMATED YIELD* 50 (GPM) & TEST TYPE Air Lift
TEST LENGTH 1 (Hrs.) TOTAL DRAWDOWN None (Ft.)
** May not be representative of a well's long-term yield.*

CASING(S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL/GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	60	9	X				F480 PVC	4½	SDR26	
60	640	6¾	X				F480 PVC	4½	SDR26	
640	660	6¾					F480 PVC	4½	SDR26	2 x ⅛

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	44	X			
44	660				Pea Gravel

SEP

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 Dan Mc Muller Well Drilling 1603
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)
ADDRESS 1487 Old Long Valley Rd. CITY Clearlake Oaks STATE CA ZIP 95423
Signed Dan Mc Muller
WELL DRILLER/AUTHORIZED REPRESENTATIVE
DATE SIGNED 8-30-93 C-57 LICENSE NUMBER 533152

DWR 188 REV. 7-90

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

13N/09W-25M

ORIGINAL

File with DWR

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

Do not fill in
No. 171570

Notice of Intent No.
Local Permit No. or Date

State Well No.
Other Well No.

(2) LOCATION OF WELL (See instructions):
County LAKE Owner's Well Number MW-12B
Well address if different from above DEMION RIDGE FACILITY
Township 13N Range 8W Section 36
Distance from cities, roads, railroads, fences, etc.

WELL LOCATION SKETCH

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

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

(5) EQUIPMENT:
Rotary ☐ Reverse ☐
Cable ☐ Air ☐
Other ☒ Bucket ☐

(6) GRAVEL PACK:
Yes ☒ No ☐ Size #3 SAND
Diameter of bore 12 INCH
Packed from 51 to 69 ft.

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

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

From ft.	To ft.	Dia. in.	Gage or Wall	From ft.	To ft.	Slot size
+2.5	64	4	SCH 40	54	64	.020 INCH

(9) WELL SEAL:
Was surface sanitary seal provided? Yes ☒ No ☐ If yes, to depth ft.
Were strata sealed against pollution? Yes ☒ No ☐ Interval 0-51 ft.
Method of sealing Bentonite pellets & cement

(10) WATER LEVELS:
Depth of first water, if known ft.
Standing level after well completion 33 ft.

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

(12) WELL LOG: Total depth 70 ft. Depth of completed well 70 ft.

from ft.	to ft.	Formation (Describe by color, character, size or material)
		See accompamying borehole logs

ALL TERRAIN EXPLORATION DRILLING
2879 LIBERTY LANE
ROSEVILLE, CA 95678

LISCENSE # 437836

JAN 05 1987

Work started JANUARY 7 19 85 Completed JANUARY 10 19 85

WELL DRILLER'S STATEMENT: 01369

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief

SIGNED (Well Driller)

NAME IT Corporation (Person, firm, or corporation) (Typed or printed)

Address 17500 Red Hill Avenue

City Irvine Zip 92714

License No. EG 940 Date of this report November 14, 1985

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

BORING NO. MW-12B

COORDINATES N Not yet surveyed
E Not yet surveyed

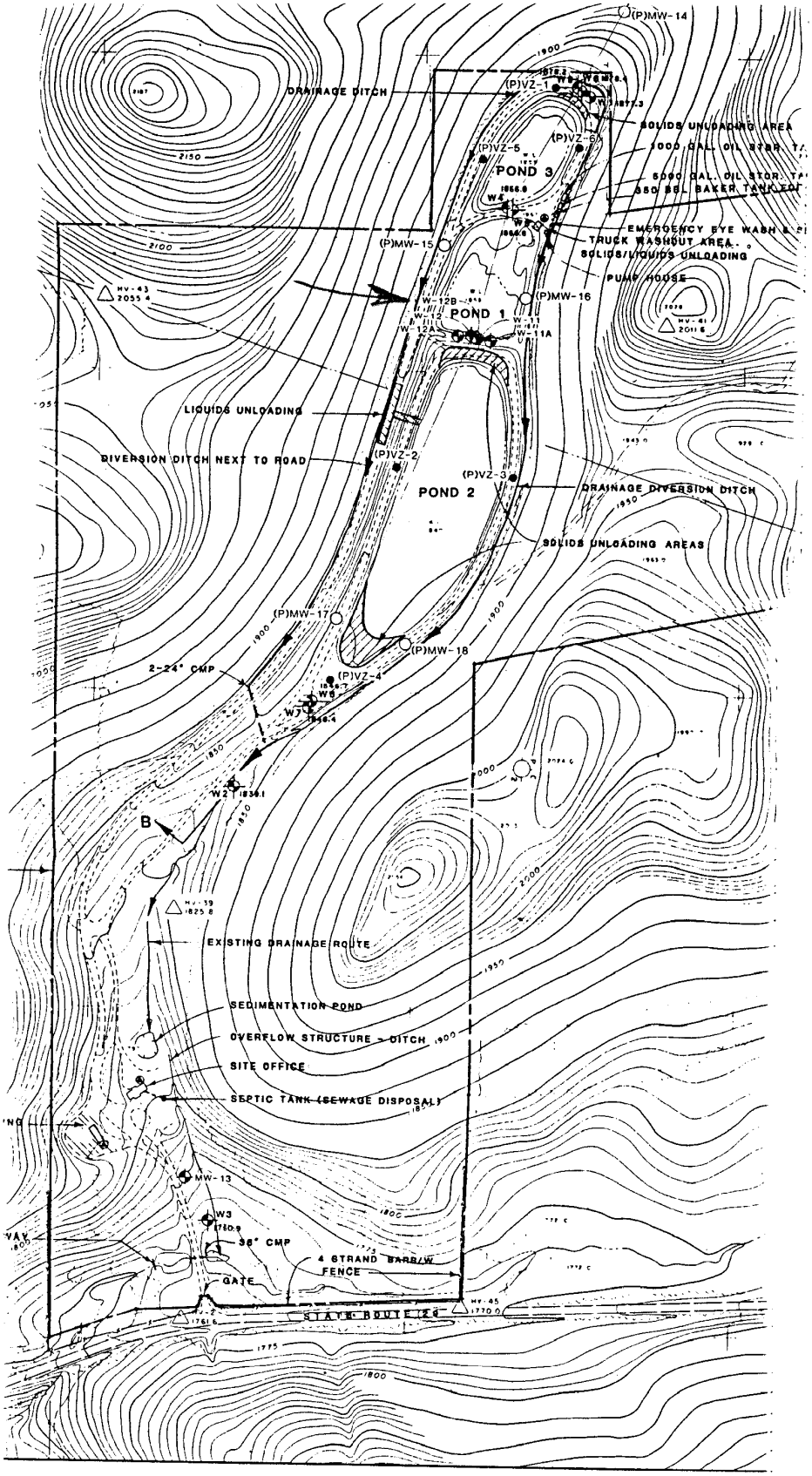
FIELD ENGINEER V. Shupe
EDITED BY M. Egli
CHECKED BY M. Balderman

DATE BEGAN 01/07/85
DATE FINISHED 01/10/85
GROUND SURFACE EL. Not yet surveyed

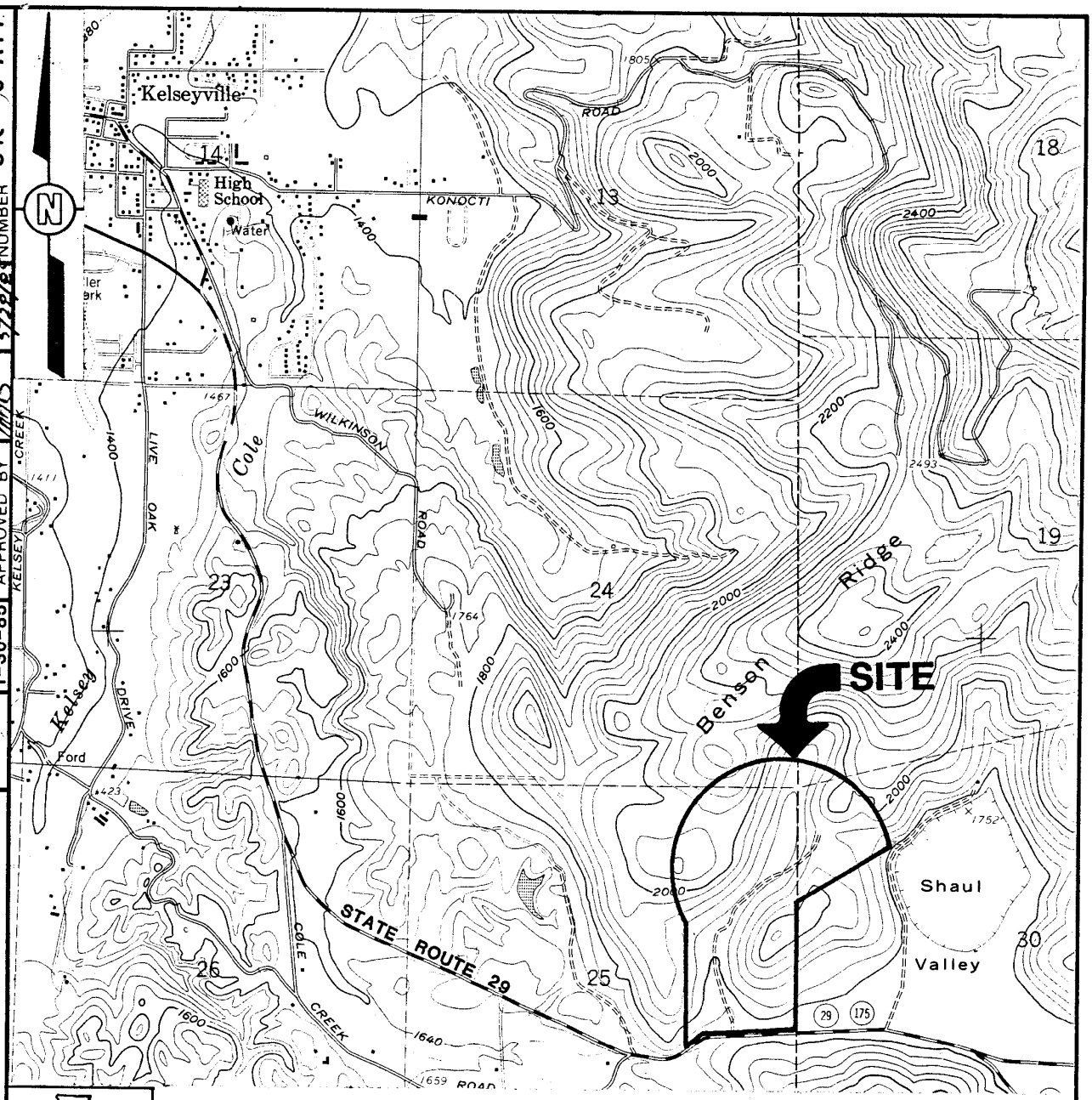
DEPTH IN FEET	LABORATORY TEST DATA: TESTS REPORTED ELSEWHERE	ATTERBERG LIMITS: LIQUID LIMIT (%)	ATTERBERG LIMITS: PLASTICITY INDEX (%)	STRENGTH TEST DATA: TYPE OF TEST	STRENGTH TEST DATA: NORMAL OR CONFINING PRESSURE (PSF)	STRENGTH TEST DATA: DEVIATOR STRESS (PSF)	STRENGTH TEST DATA: SHEAR STRENGTH (PSF)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FT.) SAMPLE	USCS	PROFILE	DESCRIPTION
0													
5										S-1 63	cl/ch		FILL. Hard, REDDISH-BROWN sandy clay with gravels, moist, contains approximately 75 percent clay and silt, 20 percent fine to medium grained sand, and 5 percent gravels; gravels consist of gray-blue tuffaceous ash clasts up to a maximum size of 1 1/4 inches, contains wood and other vegetation.
10										S-2 82			Approximately 70 percent clay and silt, 20 percent sand, and 10 percent gravel; gravels consist of friable gray-green tuffaceous ash clasts up to a maximum size of 1 1/4 inches.
15										S-3 100			Approximately 60 percent clay and silt, 20 percent sand, and 20 percent gravel, ash clasts up to 1 3/4 inches, roots.
													19.0 Feet
20										S-4 46	sm/ml cl		Loose to hard, orange-brown SANDY to CLAYEY SILT, moist, contains appoximately 80 percent clay and silt, 15 percent very fine sand, and 2 percent fine gravels, roots.
													21.0 Feet
													Hard, reddish-brown SANDY CLAY with gravel, moist.
25										S-5 82			Hard, orange-brown SILTY CLAY, decrease in moisture, contains approximately 80 percent clay and silt, 20 percent sand, and trace amounts of gravel.
30										S-6 7			Hard, orange-brown SILTY CLAY, decrease in moisture, contains approximately 80 percent clay and silt, 20 percent sand, and trace amounts of gravel.
35										S-7 61	cl/ch		Approximately 70 percent clay and silt, 20 percent sand, and 10 percent gravel.
													38.0 Feet
40										S-8 54	sc/cl		Very hard to very dense, reddish-brown SANDY CLAYEY SILT, and CLAYEY SILTY SAND, moist, contains approximately 45 percent clay and silt, 45 percent sand, and 10 percent gravel; sand increasing in content and grain size, gravels consist of gray to light gray, white, and orange ash clasts.
45										S-9 38			Wet.
													49.5 Feet
50										S-10 23			Indurated, gray TUFFACEOUS ASH, slightly moist, friable, iron stained (weathered surface?).
													52.0 Feet
55										S-11 66	sc/cl		Very hard to very dense, reddish orange-brown SANDY CLAYEY SILT to CLAYEY SILTY SAND, very hard to very dense, moist to wet, contains approximately 45 percent clay and silt, 45 percent fine sand, and 10 percent fine gravels.
60										S-12 80			Well consolidated, fractured.
65										S-13 93			Moist to wet.
													TOTAL DEPTH 70.0 FEET

PROJECT NO. 840030
CLIENT IT - BENSON RIDGE

IT CORPORATION



BENSON RIDGE
WELL LOCATIONS



SCALE

0 2000 4000 FEET

FIGURE 1

SITE LOCATION MAP

BENSON RIDGE FACILITY

PREPARED FOR

IT CORPORATION BENSON RIDGE FACILITY

REFERENCE:

7.5 MINUTE U.S.G.S. TOPOGRAPHIC MAP OF KELSEYVILLE CALIFORNIA QUADRANGLE DATED: 1959, PHOTOREVISED 1975 SCALE 1:24,000

"Do Not Scale This Drawing"

IT ... Creating a Safer Tomorrow

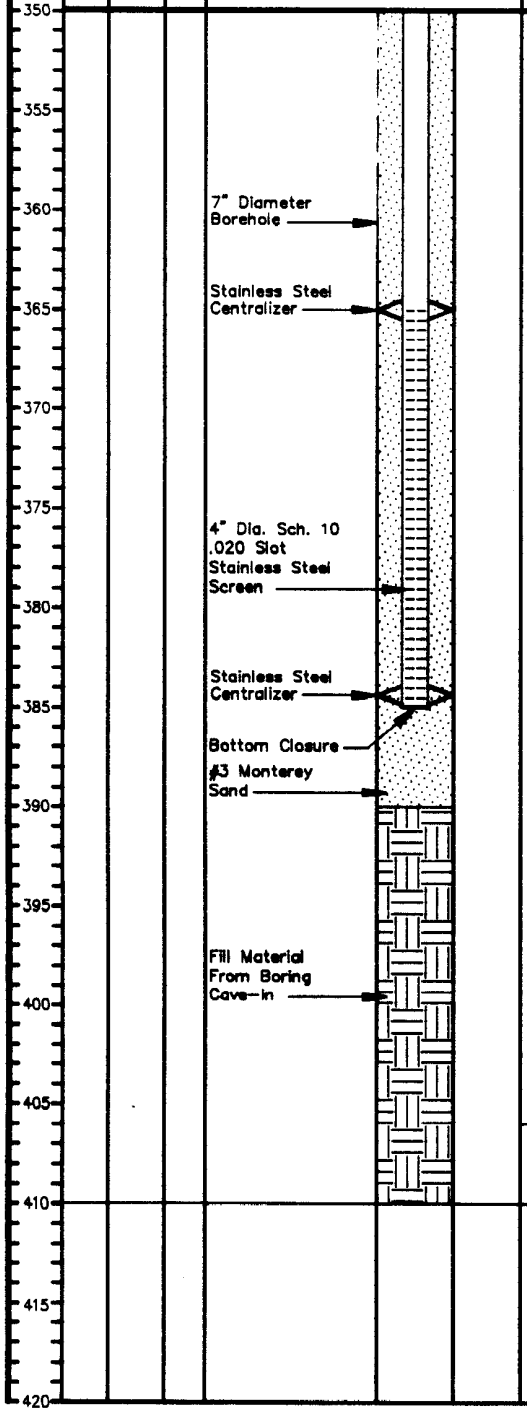
85360

DRAWING NUMBER 84C 0-A14
CHECKED BY DPB 5/29/85
APPROVED BY MWS 5/29/85
RVH 1-30-85
N
Dr

BORING NO. MW-32

PROJ. GEOL. J.R. Mount
FIELD GEOLOGIST J. Murphy
EDITED BY J.R. Mount
CHECKED BY P. McLaughlin
TOTAL DEPTH 410 ft.

COORDINATES N 23555.9, E 41419.9
DATE BEGAN 2-20-90
DATE FINISHED 2-23-90
GROUND SURFACE EL. 1867.9



DESCRIPTION

DACITE PORPHYRY; light red, dark olive, dark gray, white; soft; highly fractured; slightly weathered.

-dense zone 355'-359'.

-dense zone 361'-365'.

Water encountered at 375'.

-vesicles in gray and brownish gray groundmass at 400'-406'.

406'

DACITE; hydrothermal altered, white to light gray and black.
-slightly fractured.
-weathered or unconsolidated, decomposed chips.

TOTAL DEPTH 410 FEET

Lost Circulation Zones
32-36 ft.
61-63 ft.
94-100 ft.
125-135 ft.
215 ft.

DRILLING CO.: Water Development Corporation
DRILL METHOD: Air Rotary with Foam & Water

SEE LEGEND FOR LOGS AND TEST PITS FOR EXPLANATION OF SYMBOLS AND TERMS

PROJECT NO.: ADBE02
CLIENT: Benson Ridge
LOCATION: Martinez, California

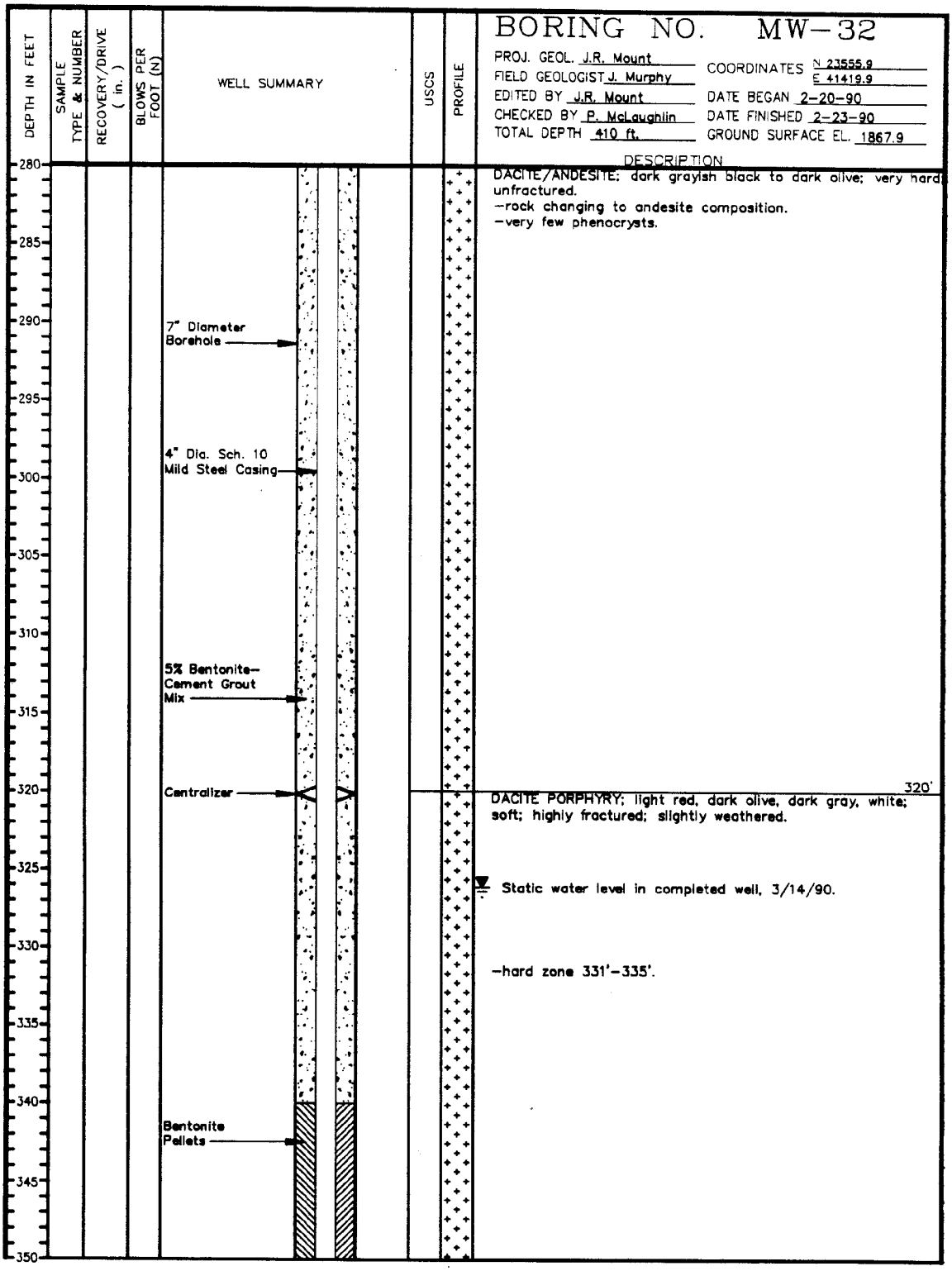
BR-MW32(BR3)

INTERNATIONAL TECHNOLOGY CORPORATION

BORING NO. MW-32

PROJ. GEOL. J.R. Mount
FIELD GEOLOGIST J. Murphy
EDITED BY J.R. Mount
CHECKED BY P. McLaughlin
TOTAL DEPTH 410 ft.

COORDINATES N 23555.9 E 41419.9
DATE BEGAN 2-20-90
DATE FINISHED 2-23-90
GROUND SURFACE EL. 1867.9



DRILLING CO.: Water Development Corporation
DRILL METHOD: Air Rotary with Foam & Water

SEE LEGEND FOR LOGS AND TEST PITS FOR EXPLANATION OF SYMBOLS AND TERMS

PROJECT NO.: ADBE02
CLIENT: Benson Ridge
LOCATION: Martinez, California

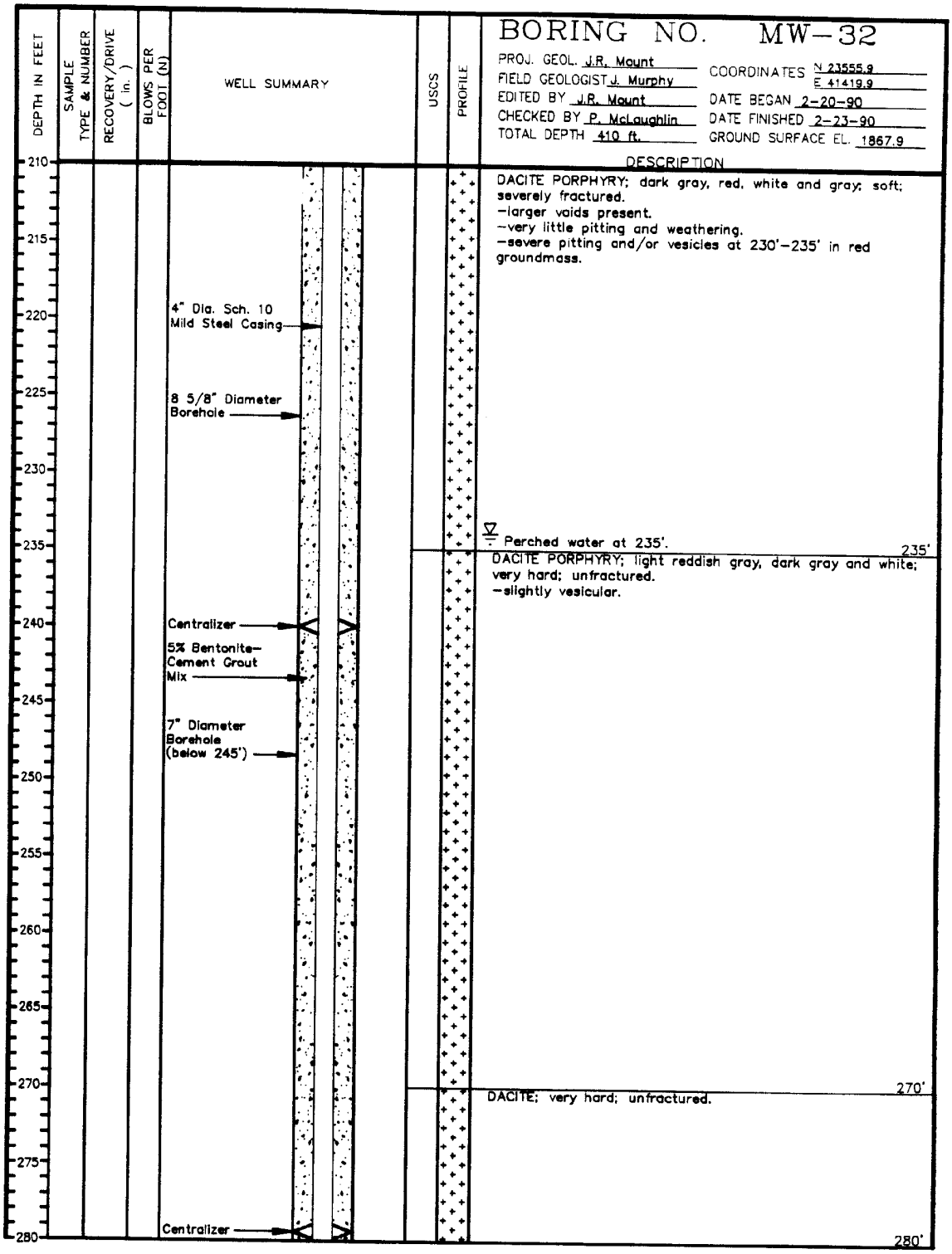
BR-MW32(BR3)

INTERNATIONAL TECHNOLOGY CORPORATION

BORING NO. MW-32

PROJ. GEOL. J.R. Mount
FIELD GEOLOGIST J. Murphy
EDITED BY J.R. Mount
CHECKED BY P. McLaughlin
TOTAL DEPTH 410 ft.

COORDINATES N 23555.9, E 41419.9
DATE BEGAN 2-20-90
DATE FINISHED 2-23-90
GROUND SURFACE EL. 1867.9



DRILLING CO.: Water Development Corporation
DRILL METHOD: Air Rotary with Foam & Water

PROJECT NO.: ADBE02
CLIENT: Benson Ridge
LOCATION: Martinez, California

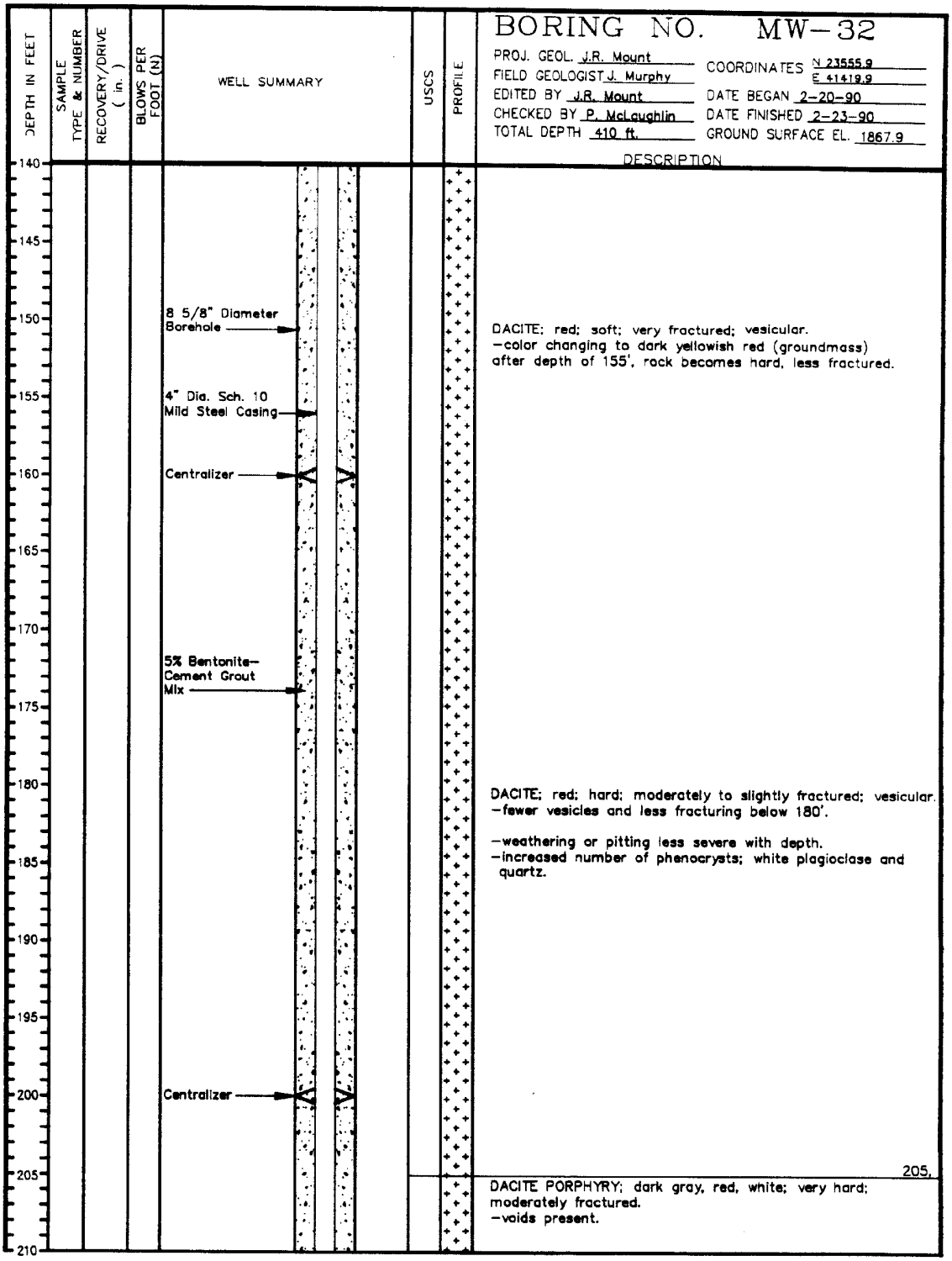
SEE LEGEND FOR LOGS AND TEST PITS FOR EXPLANATION OF SYMBOLS AND TERMS

BR-MW32(BR3)

INTERNATIONAL TECHNOLOGY CORPORATION

BORING NO. MW-32

PROJ. GEOL. J.R. Mount
FIELD GEOLOGIST J. Murphy
EDITED BY J.R. Mount
CHECKED BY P. McLaughlin
TOTAL DEPTH 410 ft.
COORDINATES N 23555.9 E 41419.9
DATE BEGAN 2-20-90
DATE FINISHED 2-23-90
GROUND SURFACE EL. 1867.9



DRILLING CO.: Water Development Corporation
DRILL METHOD: Air Rotary with Foam & Water

SEE LEGEND FOR LOGS AND TEST PITS FOR EXPLANATION OF SYMBOLS AND TERMS

PROJECT NO.: ADBE02
CLIENT: Benson Ridge
LOCATION: Martinez, California

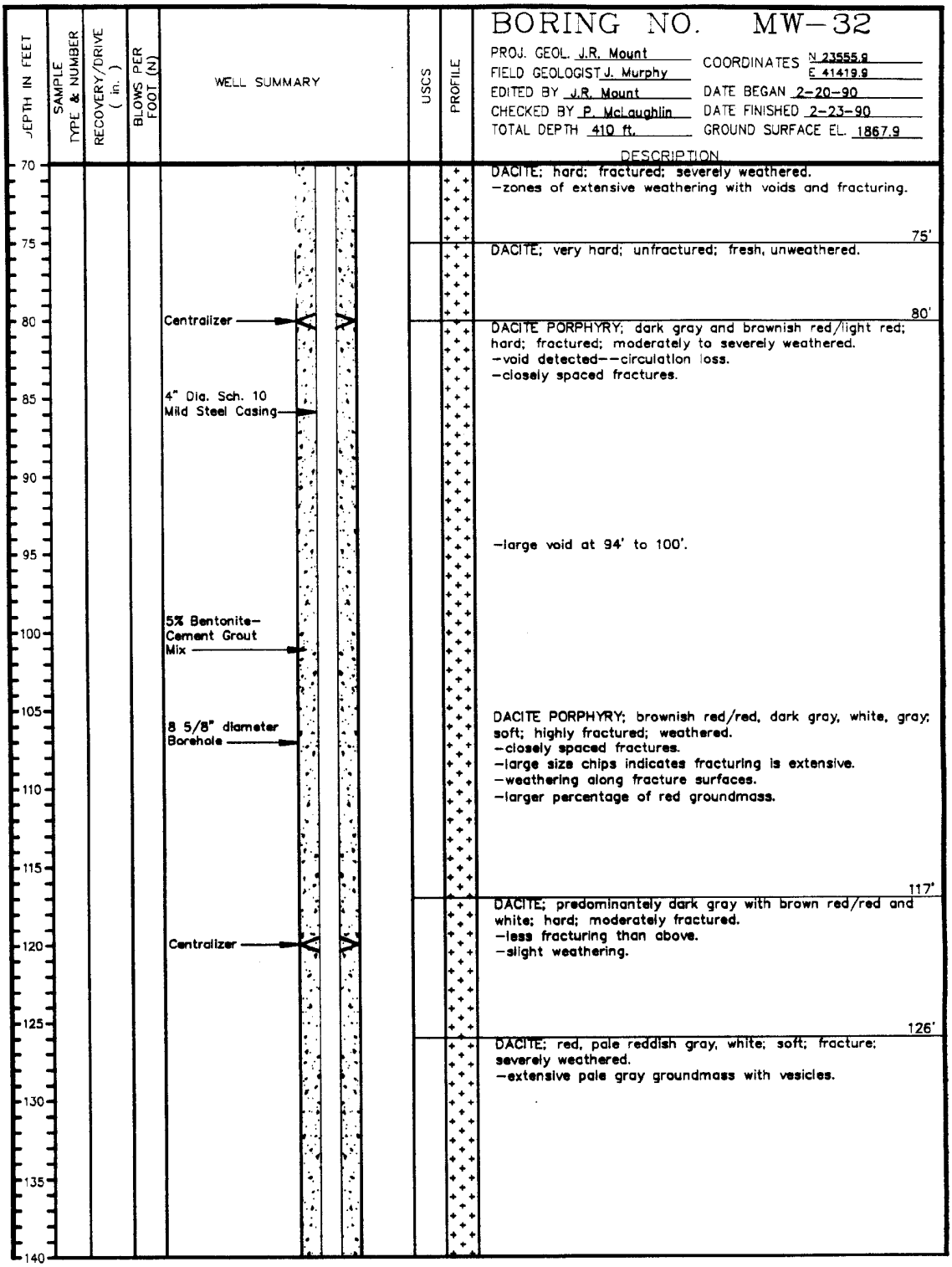
BR-MW32(BR3)

INTERNATIONAL TECHNOLOGY CORPORATION

BORING NO. MW-32

PROJ. GEOL. J.R. Mount
FIELD GEOLOGIST J. Murphy
EDITED BY J.R. Mount
CHECKED BY P. McLaughlin
TOTAL DEPTH 410 ft.

COORDINATES N 23555.9 E 41419.9
DATE BEGAN 2-20-90
DATE FINISHED 2-23-90
GROUND SURFACE EL. 1867.9



DRILLING CO.: Water Development Corporation
DRILL METHOD: Air Rotary with Foam & Water

SEE LEGEND FOR LOGS AND TEST PITS FOR EXPLANATION OF SYMBOLS AND TERMS

PROJECT NO.: ADBE02
CLIENT: Benson Ridge
LOCATION: Martinez, California

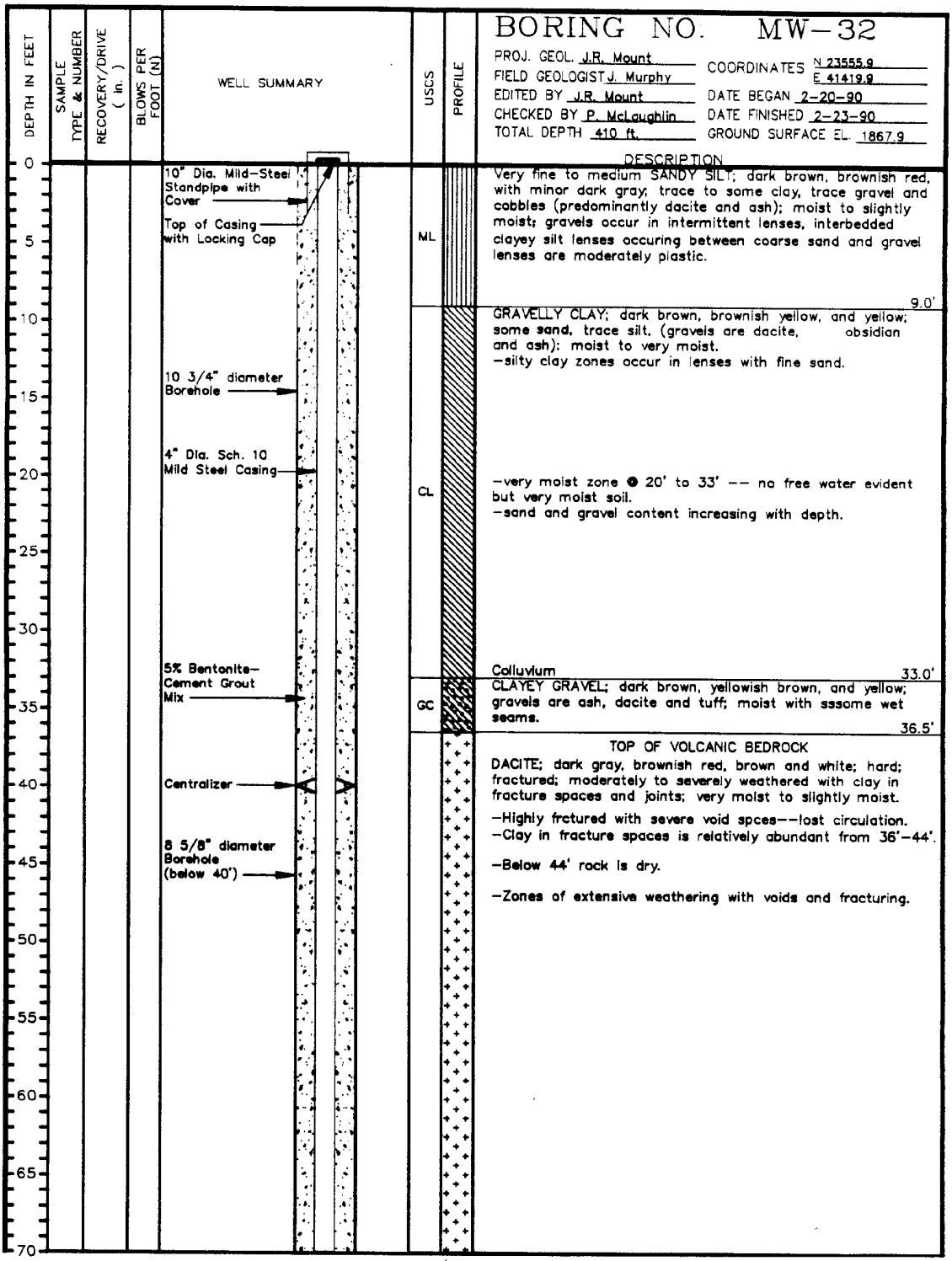
BR-MW32(BR3)

INTERNATIONAL TECHNOLOGY CORPORATION

BORING NO. MW-32

PROJ. GEOL. J.R. Mount
FIELD GEOLOGIST J. Murphy
EDITED BY J.R. Mount
CHECKED BY P. McLaughlin
TOTAL DEPTH 410 ft.

COORDINATES N 23555.9, E 41419.9
DATE BEGAN 2-20-90
DATE FINISHED 2-23-90
GROUND SURFACE EL. 1867.9



DESCRIPTION

Very fine to medium SANDY SILT; dark brown, brownish red, with minor dark gray; trace to some clay, trace gravel and cobbles (predominantly dacite and ash); moist to slightly moist; gravels occur in intermittent lenses, interbedded clayey silt lenses occuring between coarse sand and gravel lenses are moderately plastic.

9.0'

GRAVELLY CLAY; dark brown, brownish yellow, and yellow; some sand, trace silt, (gravels are dacite, obsidian and ash); moist to very moist.
-silty clay zones occur in lenses with fine sand.

-very moist zone @ 20' to 33' -- no free water evident but very moist soil.
-sand and gravel content increasing with depth.

Colluvium 33.0'

CLAYEY GRAVEL; dark brown, yellowish brown, and yellow; gravels are ash, dacite and tuff; moist with sssome wet seams.

36.5'

TOP OF VOLCANIC BEDROCK

DACITE; dark gray, brownish red, brown and white; hard; fractured; moderately to severely weathered with clay in fracture spaces and joints; very moist to slightly moist.

-Highly fractured with severe void spces--lost circulation.
-Clay in fracture spaces is relatively abundant from 36'-44'.

-Below 44' rock is dry.

-Zones of extensive weathering with voids and fracturing.

DRILLING CO.: Water Development Corporation
DRILL METHOD: Air Rotary with Foam & Water

PROJECT NO.: ADBE02
CLIENT: Benson Ridge
LOCATION: Martinez, California

SEE LEGEND FOR LOGS AND TEST PITS
FOR EXPLANATION OF SYMBOLS AND TERMS

BR-MW32(BR3)

INTERNATIONAL TECHNOLOGY CORPORATION

13N/09W-25M

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

ORIGINAL
File with DWR

WATER WELL DRILLERS REPORT

Do not fill in

No. 324448

ice of Intent No. 91025
Local Permit No. or Date WE088

State Well No.
Other Well No. MW-32

(12) WELL LOG: Total depth 410 ft. Completed depth 385 ft.

from ft. to ft. Formation (Describe by color, character, size or material)

– See attached boring log

(2) LOCATION OF WELL (See instructions):
County Lake Owner's Well Number MW-32
Well address if different from above 7620 Hwy 29, Kelseyville
Township 13N Range 9W Section 24 25
Distance from cities, roads, railroads, fences, etc. 2.5 mi southeast of Kelseyville, approx 1900 ft north of state Hwy 29, approx 25 ft east of WMU3
Marked MW-32

WELL LOCATION SKETCH

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

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

(5) EQUIPMENT:
Rotary [X] Reverse [ ]
Cable [ ] Air [X]
Other [ ] Bucket [ ]

(6) GRAVEL PACK:
Yes [X] No [ ] Size #3 Sand
Diameter of bore Telescope 9"- 7⅞"
Packed from 390 ft. to 350 ft.

(7) CASING INSTALLED:
Steel [X] Plastic [ ] Concrete [ ]

From ft.	To ft.	Dia. in.	Gage or Wall
0	365	4	Sch 10

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

From ft.	To ft.	Slot size
365	385	.020

(9) WELL SEAL:
Was surface sanitary seal provided? Yes [X] No [ ] If yes, to depth 340 ft.
Were strata sealed against pollution? Yes [ ] No [X] Interval ft.
Method of sealing Tremmy, Neat Cement & Sand/cement mix

JUN 29 1990

Work started 2/20 19 90 Completed 3/1 19 90

(10) WATER LEVELS:
Depth of first water, if known 375 (Encountered) ft.
Standing level after well completion 326 ft.

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

WELL DRILLER'S STATEMENT: 106

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Signed [signature] RME
(Well Driller)
NAME Water Development Corp.
(Person, firm, or corporation) (Typed or printed)
Address 1202 Kentucky Ave.
City Woodland, CA ZIP 95695
License No. 288326 Date of this report

VOID INITIAL
NOT PUBLIC USE
WATER CODE SEC. 13752

DWR 188 (REV. 12-86) IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM 86 96355

13N/09W-25M

ORIGINAL
File with DWR

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

WATER WELL DRILLERS REPORT

Do not fill in

No. 324449

Well Tag No. 91025
Local Permit No. or Date WE087

State Well No. ____
Other Well No. MW-31

(12) WELL LOG: Total Depth 455 ft. Completed Depth 435 ft.
From ft. To ft. | Formation: Describe by color, character, size of material

See attached boring log

(2) LOCATION OF WELL (See instructions):
County: Lake Owner's Well Number: MW-31
Well address if different from above: 7620 Hwy 29, Kelseyville
Township: 13N Range: 9W Section: 24 & 25
Distance from cities, roads, railroads, fences, etc.: 2.5 mi southeast of Kelseyville, approx 1400 ft north of State Hwy 29, between WMU 1 and WMU 2, Marked MW-31

(3) TYPE OF WORK
New Well: X Deepening
Reconstruction
Reestablishing
Horizontal Well
Destruction (Describe procedure and materials used)
Other (Describe)

(4) PROPOSED USE
Domestic
Irrigation
Industrial
Test Well
Municipal
Other: X
If abandoned, describe method and type of seal

WELL LOCATION SKETCH

(5) EQUIPMENT
Rotary: X Reverse
Cable: Air: X
Other: Mud:

(6) GRAVEL PACK
Yes: X No:
Size of gravel: #3 Sand
Gravel placed from: 10 5/8" ft. to 407 ft. to 438 ft.

(7) CASING INSTALLED
Steel: Plastic: X Concrete:

From ft.	To ft.	Diameter (in.)	Gauge or Wall	Slot size
0	415	5	Sch 80	

(8) PERFORATIONS
Type of perforator used: ____

From ft.	To ft.	Slot size
415	435	.020

(9) WELL SEAL
Was surface seal provided? Yes: X No: If yes, to depth: 340 ft.
Were strata containing undesirable water or other pollutants sealed off? Yes: No: X Interval: ft.
Method of sealing: Tremmy, Neat Cement & Bent. (5%)

(10) WATER LEVELS
Depth to first water: 420.0 (Encountered) ft.
Standing level after well completed: 385.0 ft.

(11) WELL TESTS
Was well test made? Yes: No: X If yes, by whom?
Type: Pump: Bailer: Air lift:
Depth to water at start of test: ft. After 1 hr. ft.
Discharge: gal./min. Drawdown: Water temperature:
Was a chemical analysis made? Yes: No: X If yes, by whom?
Was electric log made? Yes: No: X If yes, by whom?

Work started: 12/20 89 Completed: 1/3 90

WELL DRILLER'S STATEMENT: 106

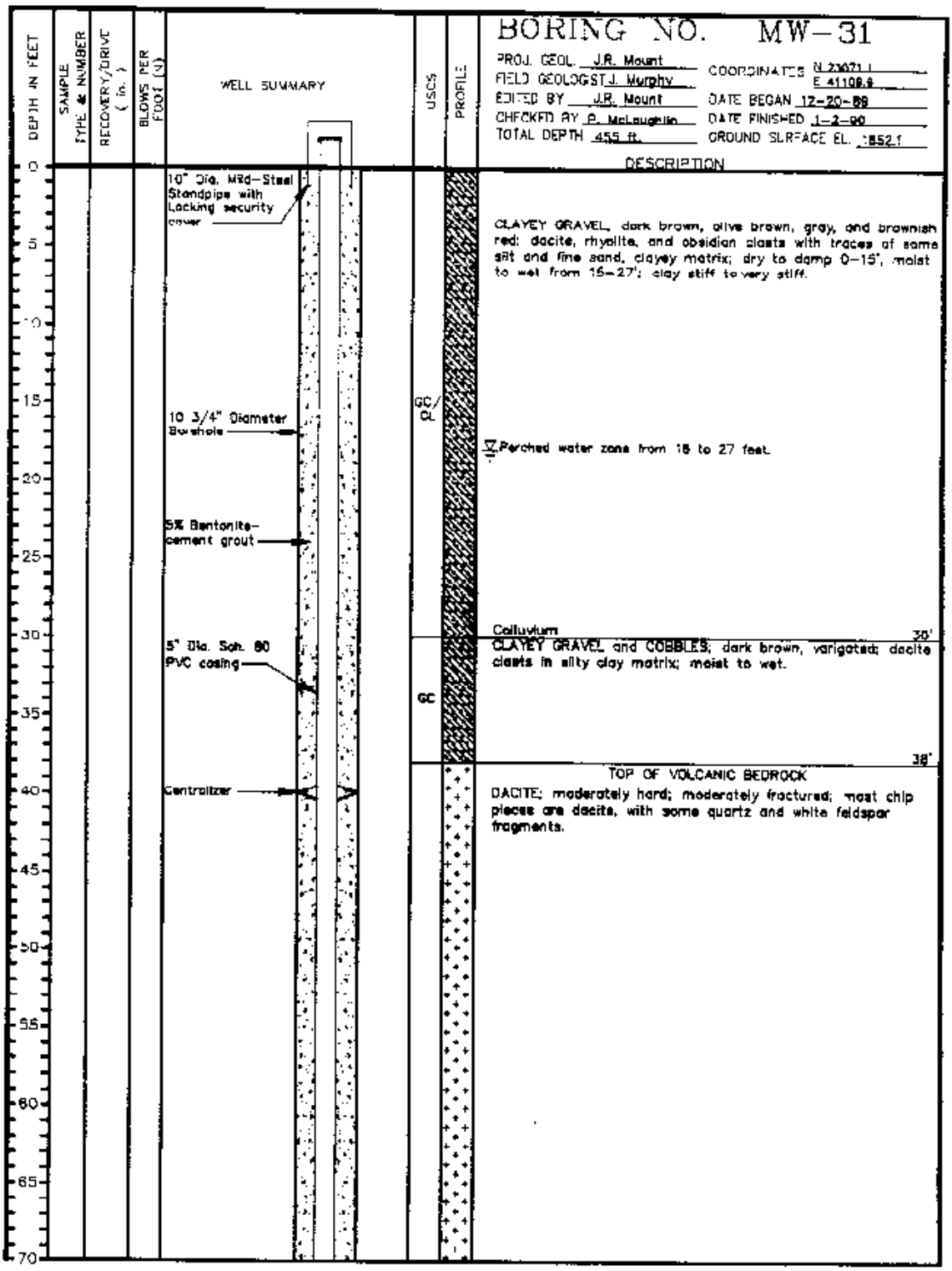
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Signed: ____ (Well Driller)
NAME: ____ (Person, firm or corporation)
Address: ____
City: ____ State: ____ Zip: ____
Driller's License No. ____ Date: ____

CONFIDENTIAL

DWR 188 REV. 12-86

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM



BORING NO. MW-31

PROJ. GEOL. J.R. Mount
FIELD GEOLOGIST J. Murphy
EDITED BY J.R. Mount
CHECKED BY P. McLaughlin
TOTAL DEPTH 455 ft.

COORDINATES N 23671.1 E 41108.8
DATE BEGAN 12-20-89
DATE FINISHED 1-2-90
GROUND SURFACE EL. 3852.1

DESCRIPTION

CLAYEY GRAVEL, dark brown, olive brown, gray, and brownish red; dacite, rhyolite, and obsidian clasts with traces of sand grit and fine sand, clayey matrix; dry to damp 0-15', moist to wet from 15-27'; clay stiff to very stiff.

▽ Perched water zone from 15 to 27 feet.

Colluvium 30'

CLAYEY GRAVEL and COBBLES; dark brown, variegated; dacite clasts in silty clay matrix; moist to wet.

38'

TOP OF VOLCANIC BEDROCK

DACITE; moderately hard; moderately fractured; most chip pieces are dacite, with some quartz and white feldspar fragments.

DRILLING CO.: Water Development Corporation
DRILL METHOD: Air Rotary with Foam and Water

PROJECT NO.: ADBE02
CLIENT: Benson Ridge
LOCATION: Martinez, California

SEE LEGEND FOR LOGS AND TEST PITS FOR EXPLANATION OF SYMBOLS AND TERMS

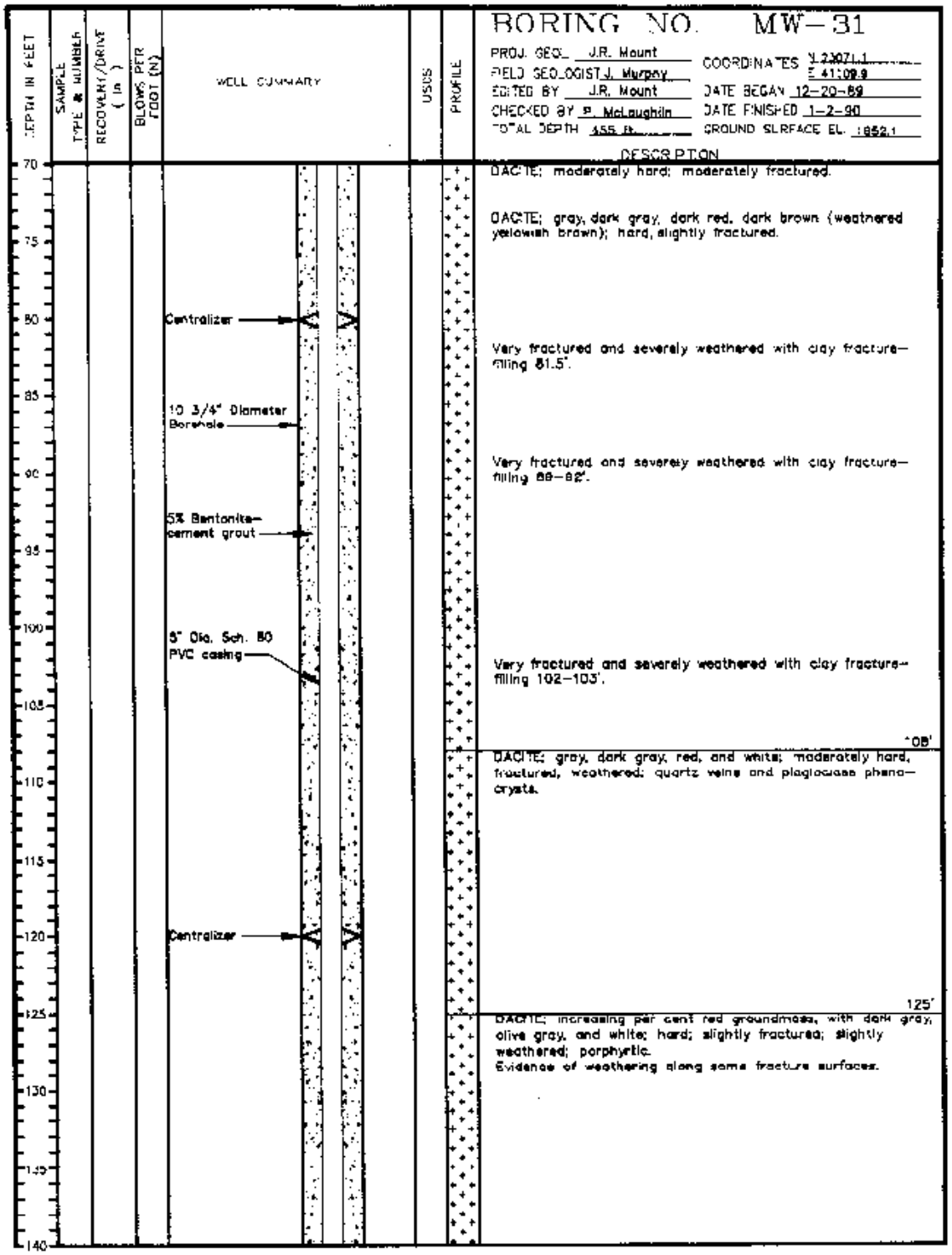
INTERNATIONAL TECHNOLOGY CORPORATION

99-MW31(*BR3)

BORING NO. MW-31

PROJ. GEOL. J.R. Mount
FIELD GEOLOGIST J. Murphy
EDITED BY J.R. Mount
CHECKED BY P. McLaughlin
TOTAL DEPTH 455 ft.

COORDINATES N 2307.1, E 41.09.9
DATE BEGAN 12-20-89
DATE FINISHED 1-2-90
GROUND SURFACE EL. 1852.1



DRILLING CO.: Water Development Corporation
DRILL METHOD: Air Rotary with Foam and Water

SEE LEGEND FOR LOGS AND TEST PITS
FOR EXPLANATION OF SYMBOLS AND TERMS

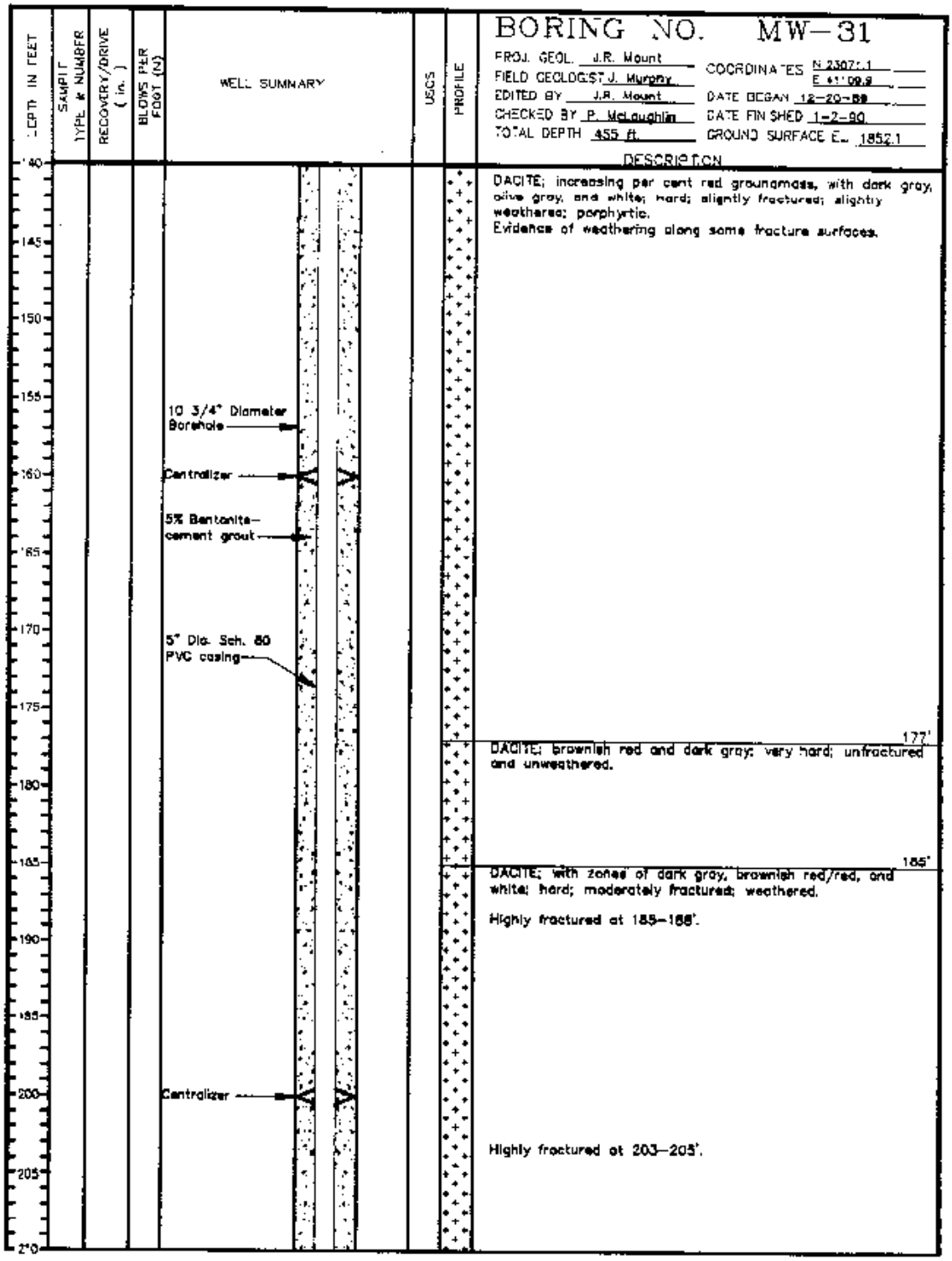
PROJECT NO.: ADBE02
CLIENT: Benson Ridge
LOCATION: Martinez, California

INTERNATIONAL TECHNOLOGY CORPORATION

BR-MW31(+BR3)

BORING NO. MW-31

PROJ. GEOL. J.R. Mount
FIELD GEOLOGIST J. Murphy
EDITED BY J.R. Mount
CHECKED BY P. McLaughlin
TOTAL DEPTH 455 ft.
COORDINATES N 2307.1, E 41'09.9
DATE BEGAN 12-20-89
DATE FINISHED 1-2-90
GROUND SURFACE E. 1852.1



DESCRIPTION

DACITE; increasing per cent red groundmass, with dark gray, olive gray, and white; hard; slightly fractured; slightly weathered; porphyritic.
Evidence of weathering along some fracture surfaces.

177'

DACITE; brownish red and dark gray; very hard; unfractured and unweathered.

185'

DACITE; with zones of dark gray, brownish red/red, and white; hard; moderately fractured; weathered.

Highly fractured at 185–188'.

Highly fractured at 203–205'.

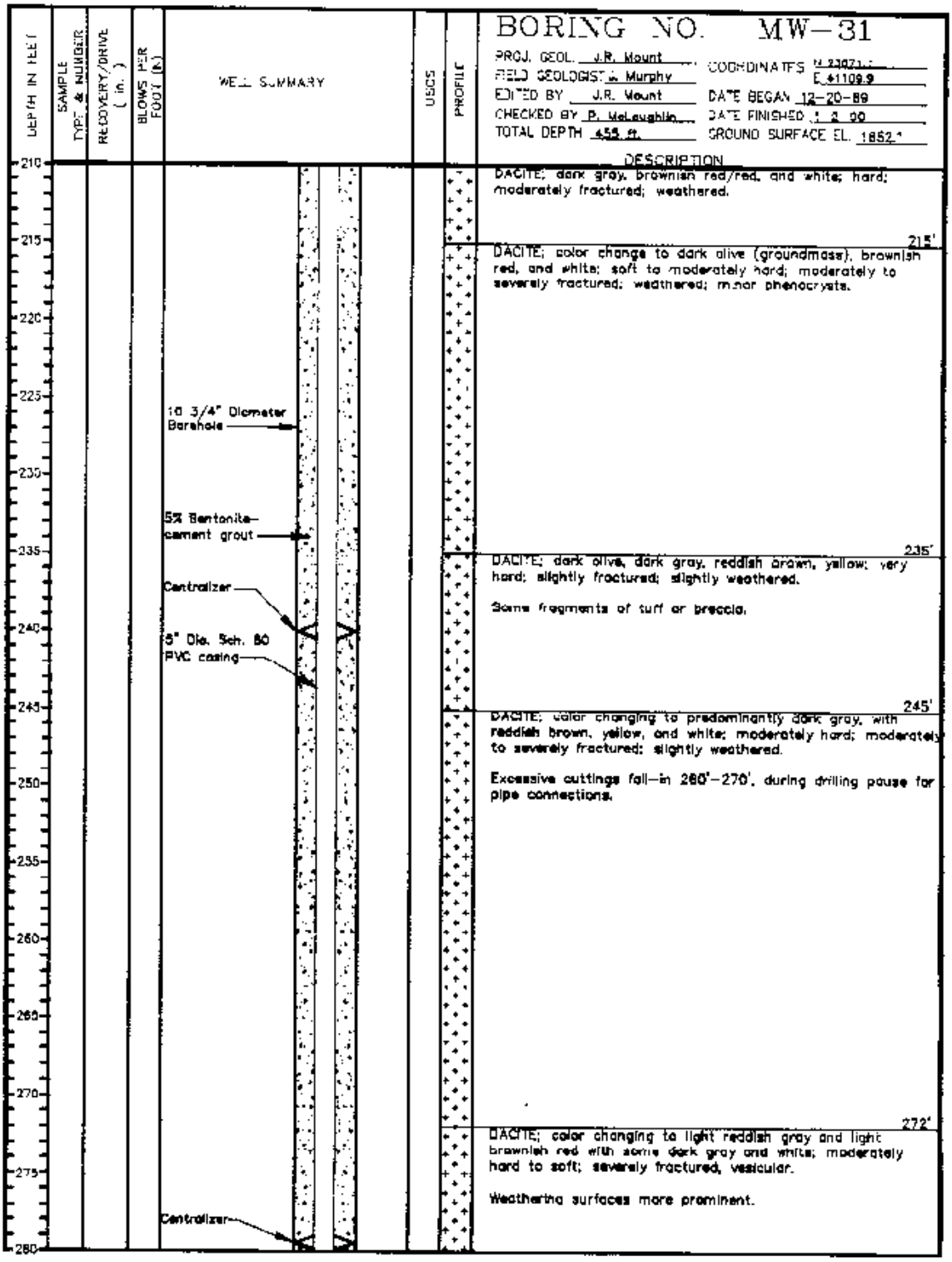
DRILLING CO.: Water Development Corporation
DRILL METHOD: Air Rotary with Foam and Water

PROJECT NO.: ADBE02
CLIENT: Benson Ridge
LOCATION: Martinez, California

SEE LEGEND FOR LOGS AND TEST PITS FOR EXPLANATION OF SYMBOLS AND TERMS

BR-MW31(=BR3)

INTERNATIONAL TECHNOLOGY CORPORATION



BORING NO. MW-31

PROJ. GEOL. J.R. Mount
FIELD GEOLOGIST J. Murphy
EDITED BY J.R. Mount
CHECKED BY P. McLaughlin
TOTAL DEPTH 455 ft.
COORDINATES N 23071.; E 41109.9
DATE BEGAN 12-20-89
DATE FINISHED 1-2-90
GROUND SURFACE EL. 1852.1

DESCRIPTION

DACITE; dark gray, brownish red/red, and white; hard; moderately fractured; weathered.

215'

DACITE; color change to dark olive (groundmass), brownish red, and white; soft to moderately hard; moderately to severely fractured; weathered; minor phenocrysts.

235'

DACITE; dark olive, dark gray, reddish brown, yellow; very hard; slightly fractured; slightly weathered.

Some fragments of tuff or breccia.

245'

DACITE; color changing to predominantly dark gray, with reddish brown, yellow, and white; moderately hard; moderately to severely fractured; slightly weathered.

Excessive cuttings fall-in 260'-270', during drilling pause for pipe connections.

272'

DACITE; color changing to light reddish gray and light brownish red with some dark gray and white; moderately hard to soft; severely fractured, vesicular.

Weathering surfaces more prominent.

DRILLING CO.: Water Development Corporation
DRILL METHOD: Air Rotary with Foam and Water

PROJECT NO.: ADBE02
CLIENT: Benson Ridge
LOCATION: Martinez, California

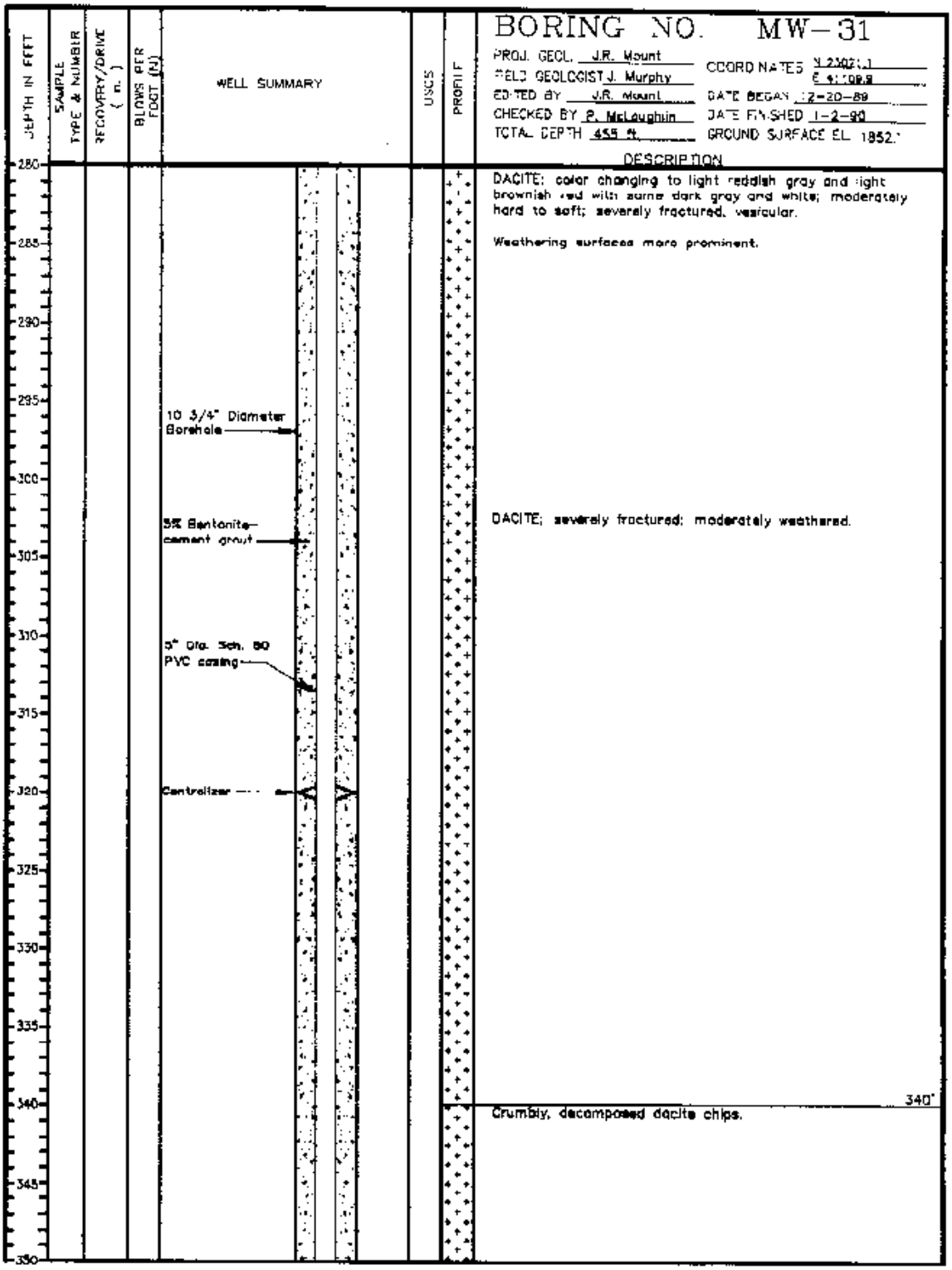
SEE LEGEND FOR LOGS AND TEST PITS
FOR EXPLANATION OF SYMBOLS AND TERMS

BR-MW31(=BR3)

INTERNATIONAL TECHNOLOGY CORPORATION

BORING NO. MW-31

PROJ. GEOL. J.R. Mount
FIELD GEOLOGIST J. Murphy
EDITED BY J.R. Mount
CHECKED BY P. McLaughlin
TOTAL DEPTH 455 ft.
COORDINATES N 2302[illegible]
E 4[illegible]
DATE BEGAN 12-20-89
DATE FINISHED 1-2-90
GROUND SURFACE EL. 1852.'



DESCRIPTION

DACITE: color changing to light reddish gray and light brownish red with some dark gray and white; moderately hard to soft; severely fractured, vesicular.

Weathering surfaces more prominent.

DACITE; severely fractured; moderately weathered.

340'

Crumbly, decomposed dacite chips.

DRILLING CO.: Water Development Corporation
DRILL METHOD: Air Rotary with Foam and Water

PROJECT NO.: ADBE02
CLIENT: Benson Ridge
LOCATION: Martinez, California

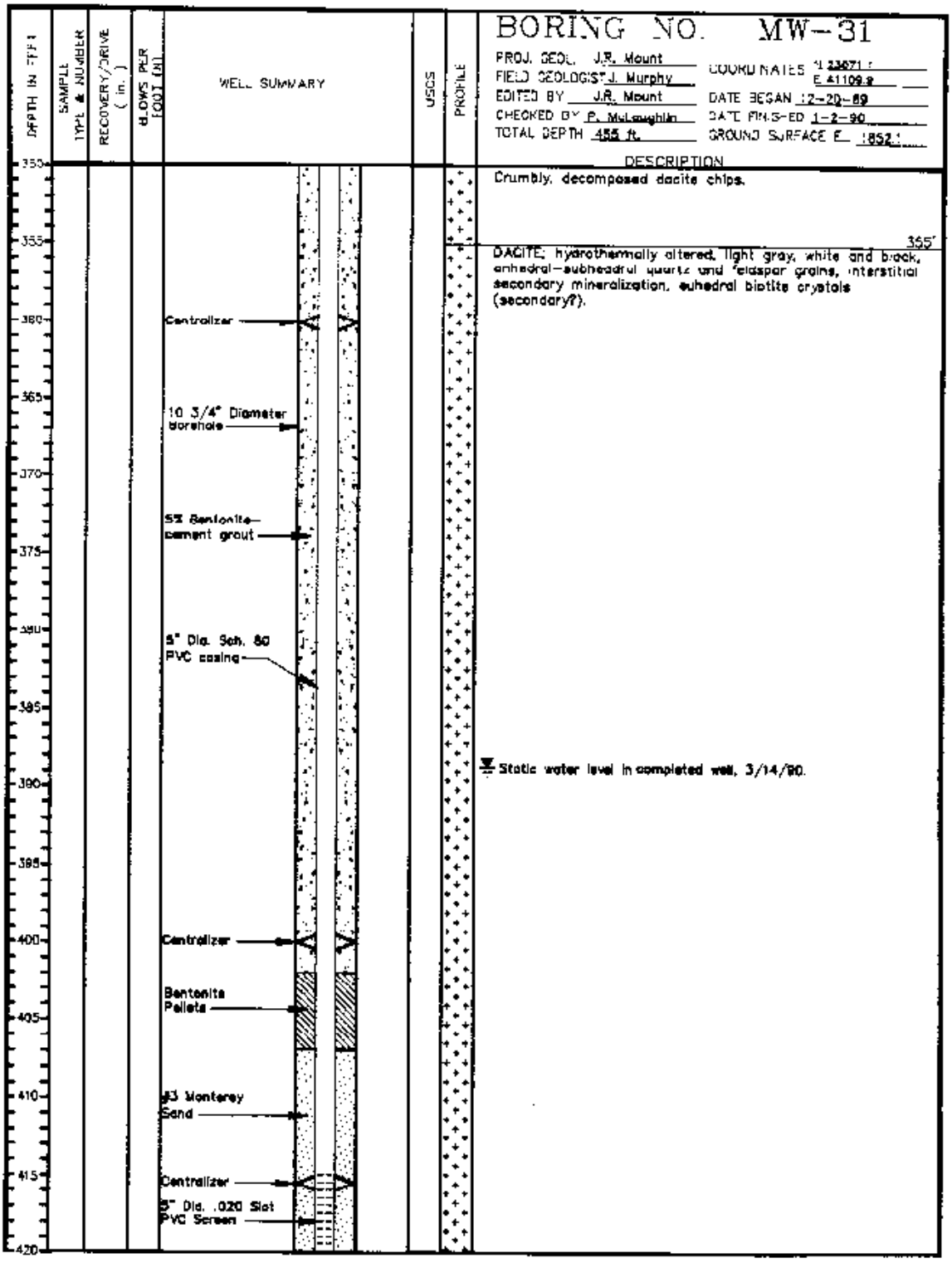
SEE LEGEND FOR LOGS AND TEST PITS
FOR EXPLANATION OF SYMBOLS AND TERMS

BR-MW31(=BR31)

INTERNATIONAL TECHNOLOGY CORPORATION

BORING NO. MW-31

PROJ. GEOL. J.R. Mount
FIELD GEOLOGIST J. Murphy
EDITED BY J.R. Mount
CHECKED BY P. McLaughlin
TOTAL DEPTH 455 ft.
COORDINATES N 23671 ; E 41109.9
DATE BEGAN 12-20-89
DATE FINISHED 1-2-90
GROUND SURFACE E 1852.1



DRILLING CO.: Water Development Corporation
DRILL METHOD: Air Rotary with Foam and Water

PROJECT NO.: AUBE02
CLIENT: Benson Ridge
LOCATION: Martinez, California

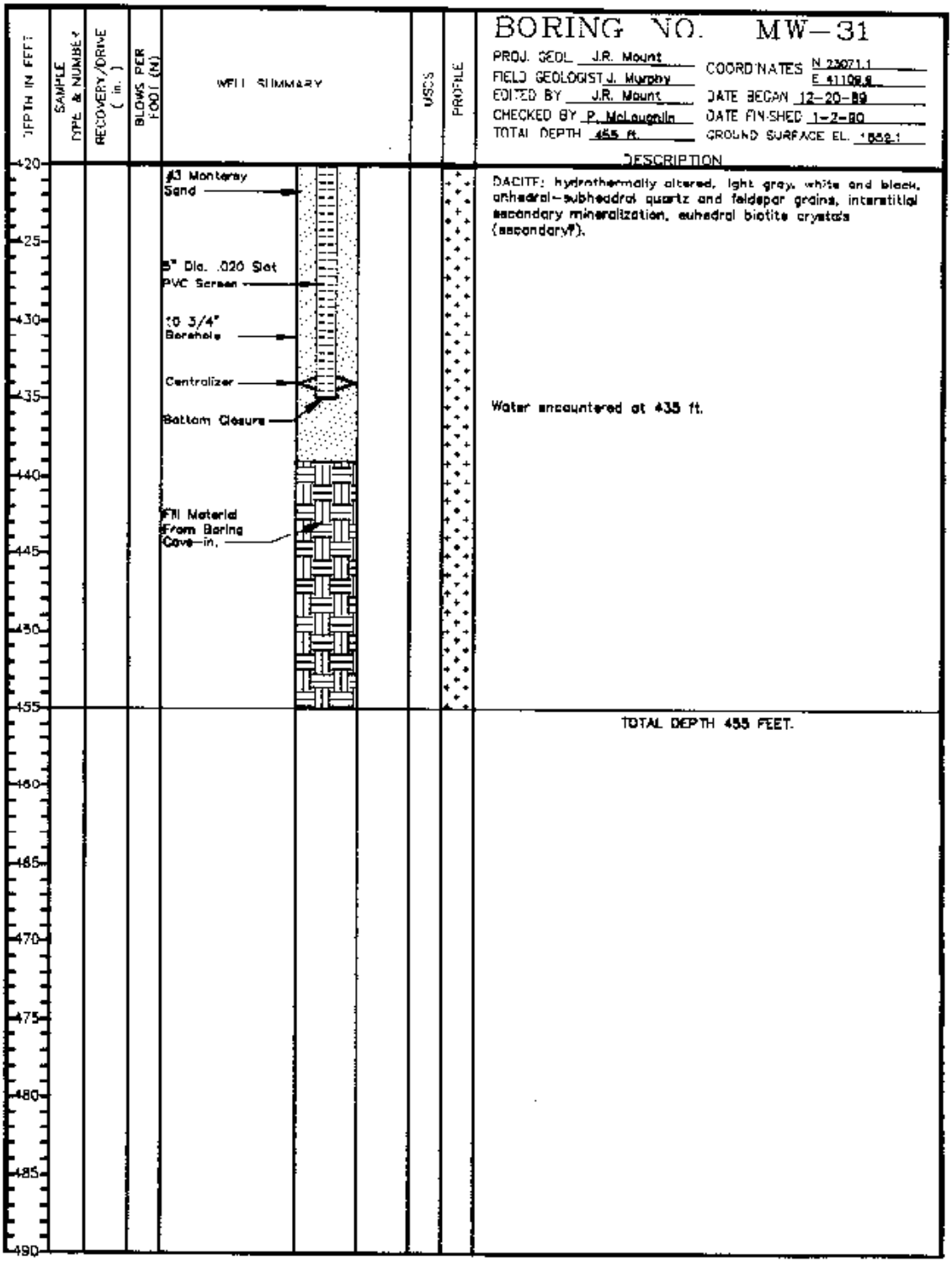
SEE LEGEND FOR LOGS AND TEST PITS FOR EXPLANATION OF SYMBOLS AND TERMS

BR-MW31(=BR3)

INTERNATIONAL TECHNOLOGY CORPORATION

BORING NO. MW-31

PROJ. GEOL. J.R. Mount
FIELD GEOLOGIST J. Murphy
EDITED BY J.R. Mount
CHECKED BY P. McLaughlin
TOTAL DEPTH 455 ft.
COORDINATES N 23071.1, E 41108.8
DATE BEGAN 12-20-89
DATE FINISHED 1-2-90
GROUND SURFACE EL. 1852.1



DRILLING CO.: Water Development Corporation
DRILL METHOD: Air Rotary with Foam and Water

PROJECT NO.: ADBE02
CLIENT: Benson Ridge
LOCATION: Martinez, California

SEE LEGEND FOR LOGS AND TEST PITS
FOR EXPLANATION OF SYMBOLS AND TERMS

DR - MW31(+BR3)

INTERNATIONAL TECHNOLOGY CORPORATION

13N/09W-25M

ORIGINAL

File with DWR

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

WATER WELL DRILLERS REPORT

Do not fill in

No. 172378

Notice of Intent No.

Local Permit No. or Date

State Well No.

Other Well No.

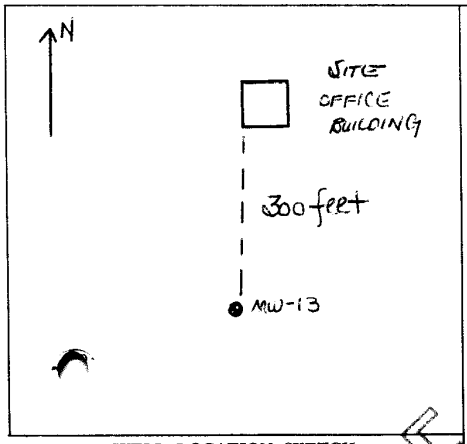
(2) LOCATION OF WELL (See instructions):

County Lake Owner's Well Number MW-13

Well address if different from above Benson Ridge Facility

Township 13N Range 8W Section 30

Distance from cities, roads, railroads, fences, etc.



WELL LOCATION SKETCH

(3) TYPE OF WORK:

New Well ☒ Deepening ☐
Reconstruction ☐
Reconditioning ☐
Horizontal Well ☐
Destruction ☐ (Describe destruction materials and procedures in Item 12)

(4) PROPOSED USE:

Domestic ☐
Irrigation ☐
Industrial ☐
Test Well ☒
Stock ☐
Municipal ☐
Other ☐

(5) EQUIPMENT:

Rotary ☒ Reverse ☐
Cable ☐ Air ☐
Other ☐ Bucket ☐

(6) GRAVEL PACK:

Yes ☒ No ☐ Size #2 sand
Diameter of bore 8.5 inch
Packed from 347 to 362 ft.

(7) CASING INSTALLED:

Steel ☐ Plastic ☒ Concrete ☐

(8) PERFORATIONS:

Type of perforation or size of screen

From ft.	To ft.	Dia. in.	Gage or Wall	From ft.	To ft.	Slot size
0	362	4	SCH 40	352	3102	.020 INCH

(9) WELL SEAL:

Was surface sanitary seal provided? Yes ☒ No ☐ If yes, to depth ft.
Were strata sealed against pollution? Yes ☒ No ☐ Interval 0-347 ft.
Method of sealing Bentonite pellets & grout

(10) WATER LEVELS:

Depth of first water, if known 348 ft.
Standing level after well completion 302.5 ft.

(11) WELL TESTS:

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

(12) WELL LOG:

Total depth 370 ft. Depth of completed well 362 ft.

from ft. to ft. Formation (Describe by color, character, size or material)

See accompanying boring logs

HAM Drilling Inc. 1407
1538 WILLOW PASS RD.
PITTSBURG, CA. 94565
P.O. Box 1271

LICENSE # 426664 JAN 05 1987

Work started September 26 19 84 Completed October 6 19 84

WELL DRILLER'S STATEMENT:

01407

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

SIGNED (Well Driller)

NAME IT Corporation (Person, firm, or corporation) (Typed or printed)

Address 17500 Red Hill Avenue

City Irvine Zip 92714

License No. EG 940 Date of this report November 15, 198

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

BORING NO. MW-13

COORDINATES N 300 Feet south of office building.
E

FIELD ENGINEER D. Collins
EDITED BY D. Collins
CHECKED BY M. Balderman
TOTAL DEPTH 370 Feet

DATE BEGAN 9/26/84
DATE FINISHED 10/06/84
GROUND SURFACE EL. Approx. 1,760 feet

DEPTH IN FEET	TESTS REPORTED ELSEWHERE	LABORATORY TEST DATA: ATTERBERG LIMITS: LIQUID LIMIT (%)	ATTERBERG LIMITS: PLASTICITY INDEX (%)	STRENGTH TEST DATA: TYPE OF TEST	STRENGTH TEST DATA: NORMAL OR CONFINING PRESSURE (PSF)	STRENGTH TEST DATA: DEVIATOR STRESS (PSF)	STRENGTH TEST DATA: SHEAR STRENGTH (PSF)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	DRILL PENETRATION RATE	SAMPLE NUMBER	PROFILE	DESCRIPTION
0											ROTARY AIR DRILLING		Silty gravels with cobbles of dacite as described below.
													TOP OF ROCK
5											G-1		Oxidized DACITE - aphanitic groundmass with 1 mm plagioclase and quartz phenocrysts. Reddish colored, frothy cinder (50%) and dark gray dacite fragments (50%) in cuttings. Small vesicles present.
10										NO DATA	ROTARY MUD DRILLING		
15											G-2		Dark grey DACITE - No brick red fragments of cinder. No or few vesicles.
											G-3		Balls of greenish clay with greenish chalcedony fragments coming up with cuttings
25											G-4		Oxidized DACITE - with abundant red cinder.
											MUD DRILLING		Dark grey DACITE - no red cinders.
													29 1/2" - heavy drill chatter rapid drilling. Oxidized DACITE with approximately 50 percent brick red cinders.
35											G-5		Dark grey DACITE - no red cinders, harder drilling.
40													40 1/4' - loss of drilling fluid. Medium greenish gravish microcrystalline dacite with 1/2 mm black microphenocrysts altered to chlorite.
45										NO DATA	ROTARY AIR DRILLING		
50													Medium gray aphanitic-no chlorite.
55											G-6		Rock with reddish stained, 1 mm to 5 mm long fractures. Also some greenish alteration coloring has returned. Iron oxide staining on fracture surfaces, very slight weathering.
60													Medium dark gray DACITE, aphanitic to microcrystalline texture.
65											G-7		
											R-1		

PROJECT NO. [illegible]

BORING NO. MW-13

COORDINATES N 300 feet south of office building
E

FIELD ENGINEER D. Collins — DATE BEGAN 9/26/84
EDITED BY D. Collins — DATE FINISHED 10/06/84
CHECKED BY M. Balderman — GROUND SURFACE EL. Approx. 1,768 Feet
TOTAL DEPTH 370 Feet

LABORATORY TEST DATA

DEPTH IN FEET	TESTS REPORTED ELSEWHERE	ATTERBERG LIMITS: LIQUID LIMIT (%)	ATTERBERG LIMITS: PLASTICITY INDEX (%)	STRENGTH TEST DATA: TYPE OF TEST	STRENGTH TEST DATA: NORMAL OR CONFINING PRESSURE (PSF)	STRENGTH TEST DATA: DEVIATOR STRESS (PSF)	STRENGTH TEST DATA: SHEAR STRENGTH (PSF)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	DRILL PENETRATION RATE	SAMPLE NUMBER	PROFILE
70												
75											G-8	
80												
85											G-9	
90												
95											ROTARY AIR DRILLING	
100											G-10	
105												
110												
115											G-11	
120											G-12	
125											G-13	
130												
135											G-14	

DESCRIPTION

Contains some reddish discontinuous streaks, occasional greenish alteration on fractures.

Oxidized DACITE - with red cinders in cutting; faster drilling.

Dark grey DACITE.

101' loss of air circulation. No cuttings returning.

Oxidized DACITE with approximately 25 percent brick red cinder fragments. Increases to 45 percent. Damp.

111' - 80 percent red cinders. Overall color is purple-red.

Dark grey DACITE.

PROJECT NO 848040

IT CORPORATION

BORING NO. MW-13

COORDINATES N 300 f.+ south of office building.
E

FIELD ENGINEER D. Collins
EDITED BY D. Collins
CHECKED BY M. Balderman
TOTAL DEPTH 170 Feet

DATE BEGAN 9/26/84
DATE FINISHED 10/06/84
GROUND SURFACE EL. Approximately 1,765

LABORATORY TEST DATA

DEPTH IN FEET	TESTS REPORTED ELSEWHERE	ATTERBERG LIMITS: LIQUID LIMIT (%)	ATTERBERG LIMITS: PLASTICITY INDEX (%)	STRENGTH TEST DATA: TYPE OF TEST	STRENGTH TEST DATA: NORMAL OR CONFINING PRESSURE (PSF)	STRENGTH TEST DATA: DEVIATOR STRESS (PSF)	STRENGTH TEST DATA: SHEAR STRENGTH (PSF)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	DRILL PENETRATION RATE	SAMPLE NUMBER	PROFILE	DESCRIPTION
140										2 4 8 10 12			Dark grey DACITE - as before, microcrystalline to aphanitic texture. Greenish colored quartz is distinguishable. Also has 1 mm plagioclase crystals.
145											G-15		
150											ROTARY AIR DRILLING		
155													
160											G-16		
165													Oxidized DACITE - Purplish gray colored rock with 5 percent brick red colored cinder. 167.0'
											G-17		Dark grey DACITE. 172.0'
175											FOAM DRILLING		Oxidized DACITE - Contains abundant red cinders. Much faster drilling.
180										0.8	G-18		
185													
190										0.4	G-19		
195													
200													
205										0.5	G-20		

PROJECT NO. 4480-0

BORING NO. MW-13

COORDINATES N 300 feet south of office building.
E

FIELD ENGINEER D. Collins
EDITED BY D. Collins
CHECKED BY M. Balderman
TOTAL DEPTH 370 Feet

DATE BEGAN 9/26/84
DATE FINISHED 10/06/84
GROUND SURFACE EL. Approx. 1,768 Feet

LABORATORY TEST DATA

DEPTH IN FEL	TESTS REPORTED ELSEWHERE	ATTERBERG LIMITS: LIQUID LIMIT (%)	ATTERBERG LIMITS: PLASTICITY INDEX (%)	STRENGTH TEST DATA: TYPE OF TEST	STRENGTH TEST DATA: NORMAL OR CONFINING PRESSURE (PSF)	STRENGTH TEST DATA: DEVIATOR STRESS (PSF)	STRENGTH TEST DATA: SHEAR STRENGTH (PSF)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	DRILL PENETRATION RATE	SAMPLE NUMBER	PROFILE
210												
215										0.6		
220										0.4		
225												
230												
235											G-21	
240											FOAM DRILLING	
245											G-22	
250										0.8		
255												
260										0.8		
265												
270											G-23	
275												

DESCRIPTION

Oxidized DACITE - as before.

Greenish grey DACITE - dark to light grey greenish gray aphanitic. Partially altered to give grayish-white rock fragments with greenish chlorite patches and hydrothermally attacked plagioclase crystals. Slower drilling than above rock; medium coarse cuttings up to 1/4" or 1/2".

G-22 sample: Medium to light greenish colored, aphanitic to microcrystalline with some microporphyritic textures present. Basic color is greenish with pinkish white patches.

PROJECT NO. 84W140

IT CORPORATION

BORING NO. MW-13

COORDINATES N 300 feet south of office building.
E

FIELD ENGINEER D. Collins
EDITED BY D. Collins
CHECKED BY M. Balderman
TOTAL DEPTH 370 Feet

DATE BEGAN 9/26/84
DATE FINISHED 10/06/84
GROUND SURFACE EL. Approx. 1,768 Feet

DEPTH IN FEET	TESTS REPORTED ELSEWHERE	LABORATORY TEST DATA: ATTERBERG LIMITS: LIQUID LIMIT (%)	ATTERBERG LIMITS: PLASTICITY INDEX (%)	STRENGTH TEST DATA: TYPE OF TEST	STRENGTH TEST DATA: NORMAL OR CONFINING PRESSURE (PSF)	STRENGTH TEST DATA: DEVIATOR STRESS (PSF)	STRENGTH TEST DATA: SHEAR STRENGTH (PSF)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	DRILL PENETRATION RATE	SAMPLE NUMBER	PROFILE	DESCRIPTION
280													
285											G-24		Sample G-24: Dark Green colored-few if any light patches.
290													
295													
300											FOAM DRILLING		
305											G-25		
													October 6/19/85
315													Static water level at 312.5' on September 6 and 7.
320										1.4	G-26		
325													
330										1.6			
										1.2			HYDROTHERMALLY ALTERED DACITE - very coarse cuttings up to 1" across. Gray-green and gray-white aphanitic rock particles. Some dissolution cavities present, silica (?) veining, chlorite alteration, cloudy plagioclase phenocrysts. Lighter colored and more highly altered than above unit.
335										0.8	G-27		
340										1.2			
										0.8			
345										0.8			
										1.2	G-28		348' - Water encountered during drilling.

PROJECT NO. 84R040

IT CORPORATION

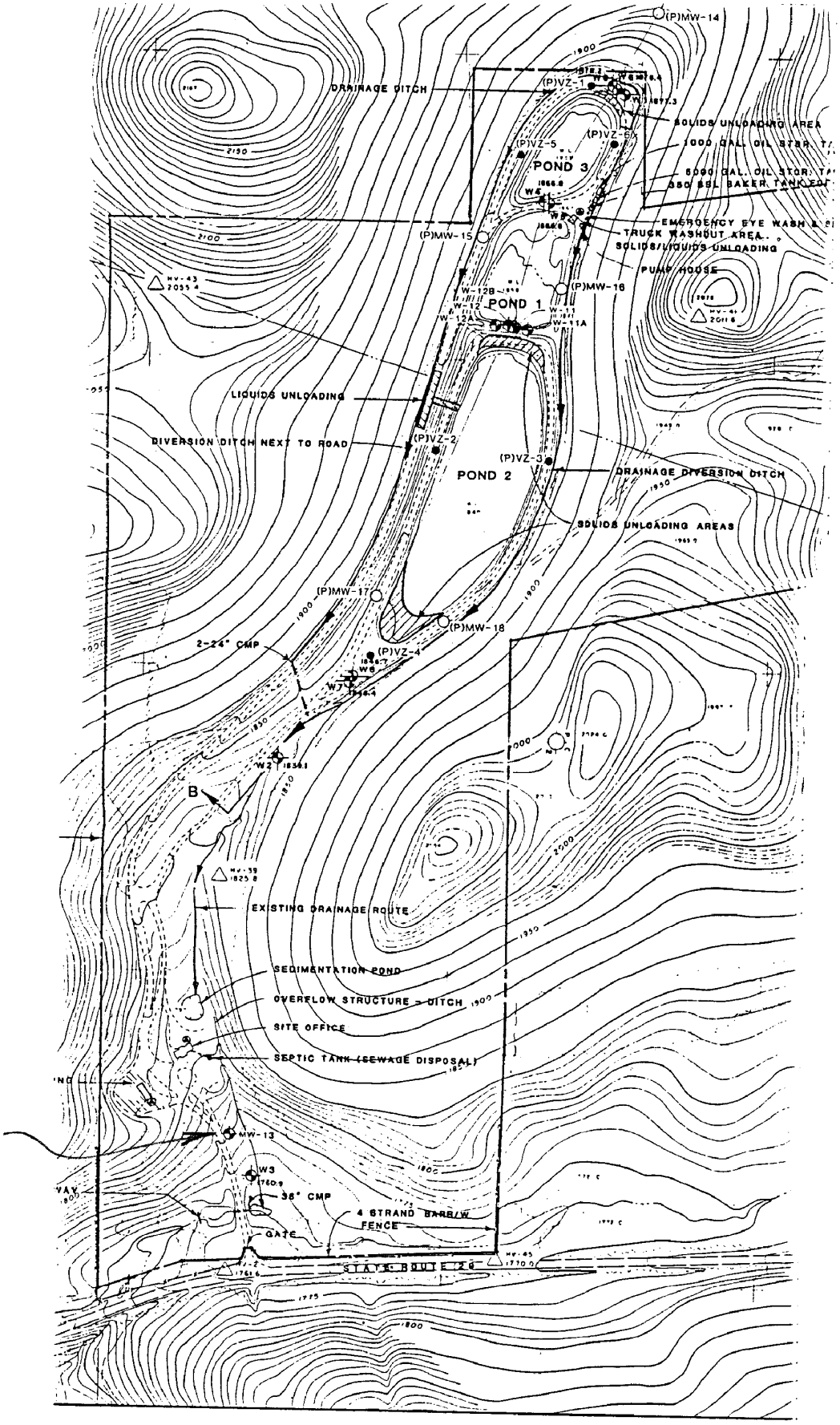
BORING NO. MW-13

COORDINATES N 300 feet south of office building.
E

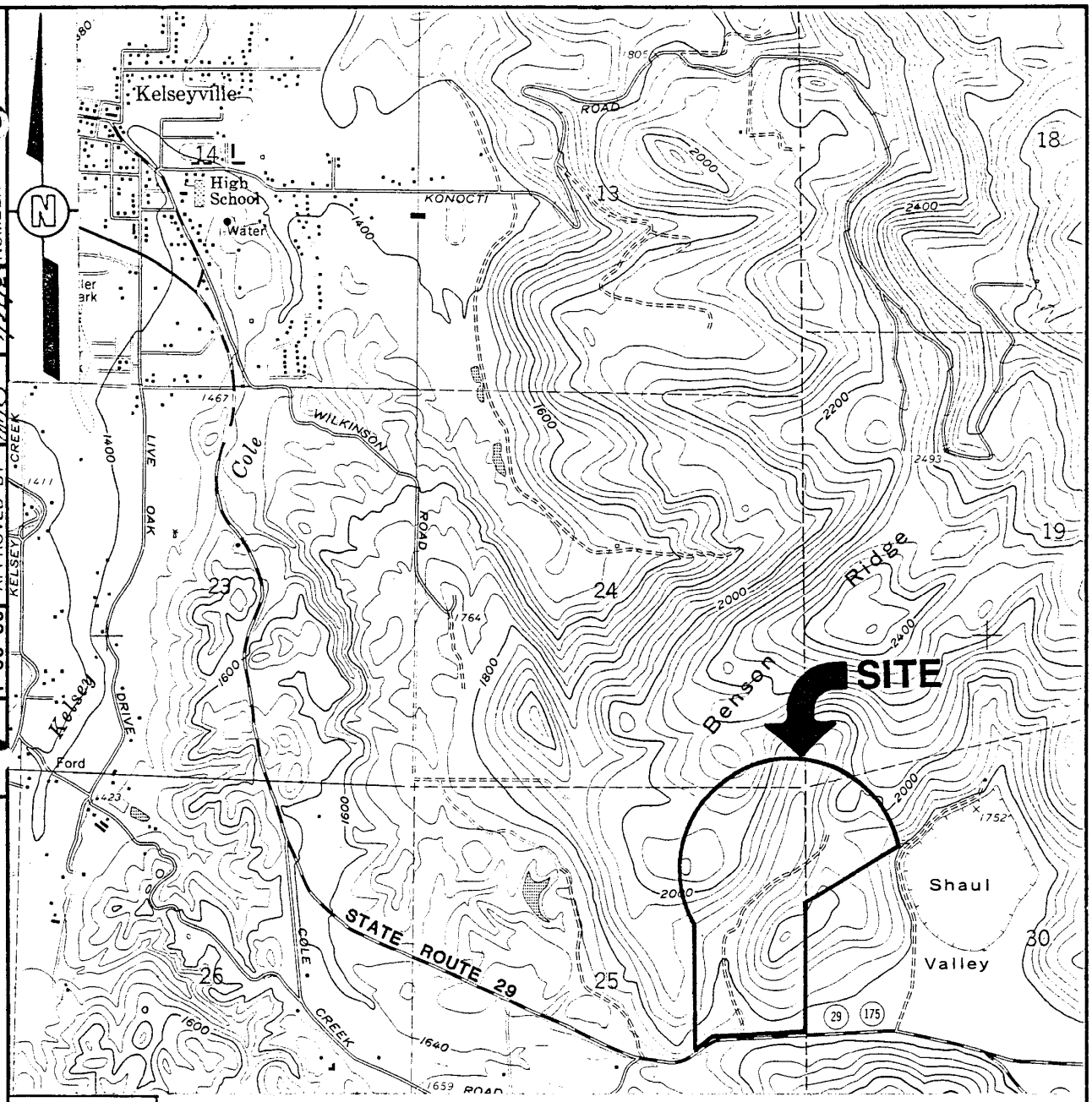
FIELD ENGINEER D. Collins
EDITED BY D. Collins
CHECKED BY M. Balderman
TOTAL DEPTH 370 Feet

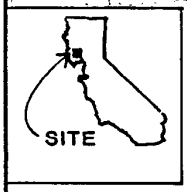
DATE BEGAN 9/26/84
DATE FINISHED 10/06/84
GROUND SURFACE EL. Approx. 1,768 Feet

DEPTH IN FEET	LABORATORY TEST DATA: TESTS REPORTED ELSEWHERE	ATTERBERG LIMITS: LIQUID LIMIT (%)	ATTERBERG LIMITS: PLASTICITY INDEX (%)	STRENGTH TEST DATA: TYPE OF TEST	STRENGTH TEST DATA: NORMAL OR CONFINING PRESSURE (PSF)	STRENGTH TEST DATA: DEVIATOR STRESS (PSF)	STRENGTH TEST DATA: SHEAR STRENGTH (PSF)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	DRILL PENETRATION RATE	SAMPLE NUMBER	PROFILE	DESCRIPTION
350										0.8			HYDROTHERMALLY ALTERED DACITE - as before.
355										1.6	G-29		
360										1.2	FOAM DRILLING		
365										3.2			
										5.0	G-30		
										1.0			
										1.5			
370										1.0			TOTAL DEPTH 370 FEET



BENSON RIDGE
WELL LOCATIONS





SCALE

0 2000 4000 FEET

FIGURE 1

SITE LOCATION MAP

BENSON RIDGE FACILITY

PREPARED FOR

IT CORPORATION BENSON RIDGE FACILITY

REFERENCE:

7.5 MINUTE U.S.G.S. TOPOGRAPHIC MAP
OF KELSEYVILLE CALIFORNIA QUADRANGLE
DATED: 1959, PHOTOREVISED 1975
SCALE 1:24,000

"Do Not Scale This Drawing"

DRAWING NUMBER 84-10-A14
5/29/84
5/22/84
CHECKED BY PPB
APPROVED BY
RVH 1-30-85
DRAWN

Chem

65360

IT ... Creating a Safer Tomorrow

13N/9W-25

ORIGINAL

File with DWR

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

WATER WELL DRILLERS REPORT

Do not fill in

No. 087440

CONFIDENTIAL LOG

Notice of Intent No.

Permit No. or Date

State Well No. ~~Water Code Sec. 13752~~

Other Well No.

(1) OV

Address

City

(2) LOCATION OF WELL (See instructions):

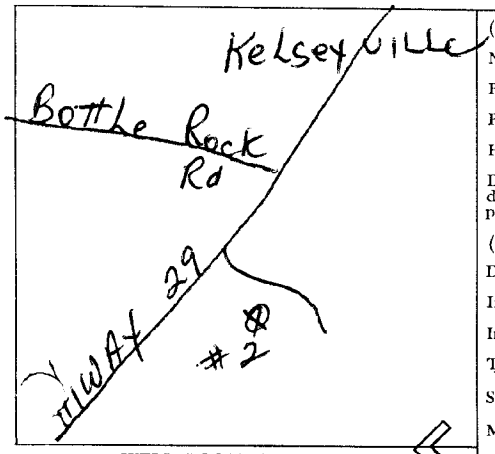
County Lake Owner's Well Number

Well address if different from above

Township Range Section

Distance from cities, roads, railroads, fences, etc.

7620 Hiway 29
Kelseyville



WELL LOCATION SKETCH

(3) TYPE OF WORK:

New Well ☒ Deepening ☐
Reconstruction ☐
Reconditioning ☐
Horizontal Well ☐
Destruction ☐ (Describe destruction materials and procedures in Item 12)

(4) PROPOSED USE:

Domestic ☐
Irrigation ☐
Industrial ☐
Test Well ☐
Stock ☐
Municipal ☐
Other observation ☒

(5) EQUIPMENT:

Rotary ☐ Reverse ☐
Cable ☐ Air ☒
Other ☐ Bucket ☐

(6) GRAVEL PACK:

Yes ☒ No ☐ Size Pea
Diameter of bore 9 7/8 & 6"
Packed from 10' to 159' ft.

(7) CASING INSTALLED:

Steel ☐ Plastic ☒ Concrete ☐

(8) PERFORATIONS: sawn

Type of perforation or size of screen

From ft.	To ft.	Dia. in.	Gage or Wall	From ft.	To ft.	Slot size
0	162'	4½"	200 PSI	119	159	1/8x4"
				22	119	

(9) WELL SEAL:

Was surface sanitary seal provided? Yes ☒ No ☐ If yes, to depth 10' ft.

Were strata sealed against pollution? Yes ☐ No ☒ Interval ft.

Method of sealing cement on gravel pack

(10) WATER LEVELS:

Depth of first water, if known ft.

Standing level after well completion ft.

(11) WELL TESTS:

Was well test made? Yes ☐ No ☒ If yes, by whom?

Type of test Pump ☐ Bailer ☐ Air lift ☐

Depth to water at start of test ft. At end of test ft

Discharge gal/min after hours Water temperature

Chemical analysis made? Yes ☐ No ☒ If yes, by whom?

Electric log made? Yes ☐ No ☒ If yes, attach copy to this report

(12) WELL LOG: Total depth 159 ft. Depth of completed well 159 ft.

from ft.	to ft.	Formation (Describe by color, character, size or material)
		OBSERVATION HOLE # 2
0	18	Sand & rocks
18	23	Clayee sand & rocks
23	38	Brown sandy clay & clayee brown sand w/rocks
38	46	Highly fractured rock
46	63	Volcanic conglomerate rock
63	80	Very hard multicolored conglomerate rock
80	159	Hard multicolored conglomerate rock

Work started July 13, 19 79 Completed July 16, 19 79

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 Gerald Thompson By: Mary E. Thompson
(Well Driller)

NAME WEEKS DRILLING AND PUMP COMPANY
(Person, firm, or corporation) (Typed or printed)

Address Sebastopol Road

City Sebastopol, California 95472

License No. C57-177681 Date of this report July 23, 1979

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

ORIGINAL
File with DWR SEP 28 2015

Page 1 of 1

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

No. e0283710

DWR USE ONLY — DO NOT FILL IN
13N/09W-24
STATE WELL NO./ STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

Owner's Well No. DRY HOLE #1
Date Work Began 8/4/2015, Ended 8/4/2015
Local Permit Agency Lake County Environmental
Permit No. WE-4585 Permit Date 6/5/2015

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DRILLING METHOD AIR FLUID N/A

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain, size, color, etc.*
		DRY HOLE
0	1	Sandy tan silt and diamond dust
1	250	Tan volcanic rock with black speckles and tiny diamonds
		DRY HOLE
		Dry hole backfilled and abandoned per Lake County requirements.

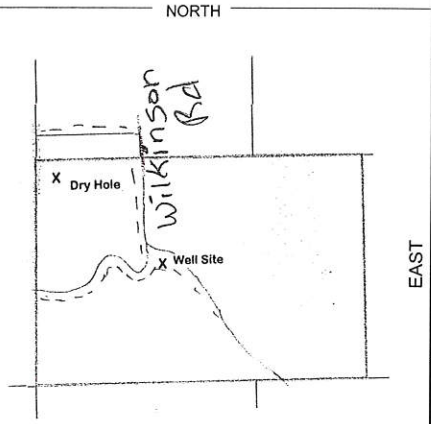
TOTAL DEPTH OF BORING 250 (Feet)
TOTAL DEPTH OF COMPLETED WELL N/A (Feet)

[redacted]

WELL LOCATION

Address 6700 Wilkinson Road
City Kelseyville CA
County Lake
APN Book 007 Page 018 Parcel 020
Township 13 N Range 9 W Section 24 ✓
Latitude 38 DEG. 57 MIN. 381 N SEC.
122 DEG. 49 MIN. 188 W SEC.

LOCATION SKETCH



Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)
✓ NEW WELL
MODIFICATION/REPAIR ___ Deepen ___ Other (Specify)
___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG"

PLANNED USES (✓)
WATER SUPPLY ✓ Domestic ___ Public ___ Irrigation ___ Industrial
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 N/A (Ft.) BELOW SURFACE 1
DEPTH OF STATIC WATER LEVEL N/A (Ft.) & DATE MEASURED
ESTIMATED YIELD * N/A (GPM) & TEST TYPE N/A
TEST LENGTH N/A (Hrs.) TOTAL DRAWDOWN N/A (Ft.)
May not be representative of a well's long-term yield.

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	CASING (S) TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	20	13 1/2								
20	250	10								
-----	-----	----------					----------	----------	----------	----------

DEPTH FROM SURFACE Ft.	to Ft.	ANNULAR MATERIAL TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
10	30		✓		
-----	-----				----------

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 (PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)
P.O. Box 176 ADDRESS Sebastopol CITY CA STATE 95473 ZIP
Signed June Ancidoni WELL DRILLER/AUTHORIZED REPRESENTATIVE
09/17/15 DATE SIGNED
177681 C-57 LICENSE NUMBER

DWR 188 REV. 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

13N/9W-24 Q?

ORIGINAL

File with DWR

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

WATER WELL DRILLERS REPORT

Do not fill in

No. 087444

Permit No. or Date

State Well No.

Other Well No.

(1) OV

Address

City

(2) LOCATION OF WELL (See instructions):

County Lake Owner's Well Number

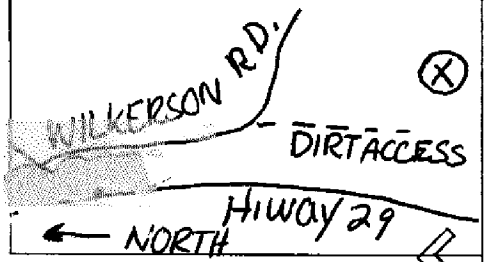
Well address if different from above

Township Range Section

Distance from cities, roads, railroads, fences, etc.

Wilkinson Road

Kelseyville



WELL LOCATION SKETCH

(3) TYPE OF WORK:

New Well ☒ Deepening ☐
Reconstruction ☐
Reconditioning ☐
Horizontal Well ☐
Destruction ☐ (Describe destruction materials and procedures in Item 12)

(4) PROPOSED USE:

Domestic ☒
Irrigation ☐
Industrial ☐
Test Well ☐
Stock ☐
Municipal ☐
Other ☐

(5) EQUIPMENT:

Rotary ☐ Reverse ☐
Cable ☐ Air ☒
Other ☐ Bucket ☐

(6) GRAVEL PACK:

Yes ☐ No ☒ Size

Diameter of bore 9 7/8-6 3/4"

Packed from ft. to ft.

(7) CASING INSTALLED:

Steel ☐ Plastic ☐ Concrete ☐

From ft.	To ft.	Dia. in.	Gage or Wall

(8) PERFORATIONS:

Type of perforation or size of screen

From ft.	To ft.	Slot size

(9) WELL SEAL:

Was surface sanitary seal provided? Yes ☐ No ☐ If yes, to depth ft.

Were strata sealed against pollution? Yes ☐ No ☐ Interval ft.

Method of sealing

(10) WATER LEVELS:

Depth of first water, if known ft.

Standing level after well completion ft.

(11) WELL TESTS:

Was well test made? Yes ☐ No ☐ If yes, by whom?

Type of test Pump ☐ Bailer ☐ Air lift ☐

Depth to water at start of test ft. At end of test ft.

[illegible] min after hours Water temperature

[illegible] Yes ☐ No ☐ If yes, by whom?

[illegible] Yes ☐ No ☐ If yes, attach copy to this report

(12) WELL LOG: Total depth 263 ft. Depth of completed well 263 ft.

from ft.	to ft.	Formation (Describe by color, character, size or material)
		UNCASED DRY HOLE # 1
0	1	Red volcanic's
1	6	Red volcanic clay
6	10	Volcanic conglomerate
10	12	Hard red volcanic rock
12	29	Multicolored conglomerate rock
29	33	Moist brown sand & rocks
33	38	Multicolored volcanic conglomerate
38	194	Tan tuffa
194	263	Hard multicolored volcanic rock w/occasional fracture

Work started July 9, 1979 Completed July 11, 1979

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 Gerald Thompson By: Mary E. Thompson
(Well Driller)

NAME WEEKS DRILLING AND PUMP COMPANY
(Person, firm, or corporation) (Typed or printed)

Address Sebastopol Road

City Sebastopol, California Zip 95472

License No. C57-177681 Date of this report July 25, 1979

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

APPENDIX B

DRINKING WATER SECTION

WELL YIELD TEST LOG

Name of PWS: Russ/Cramer Enterprises

Well Name: 7602 Hwy 29 Kelseyville, CA, 95451

Depth to Pump[1] (ft): 588' + pump

Static Water Level[1] (ft): Static - 500', Depth of well - 598'

Date	Time	Elapsed Time (Hrs.;Min.)	Pumping Rate (gpm)	Water Level[1] (feet)	Drawdown[2] (feet)	Comments
5/6/20	14:30	00:00	225	500'	0'	Clear & Gassy
5/6/20	15:00	00:30	225	550'	50'	start of perforations
5/6/20	16:00	01:30	225	560'	60'	Clear & Gassy
5/6/20	17:00	02:30	225	560'	60'	Clear & Gassy
5/6/20	18:00	03:30	225	560'	60'	Clear & Gassy
5/6/20	18:30	04:00	225	560'	60'	Clear & Gassy
5/6/20	19:00	04:30	225	560'	60'	Clear & Gassy
5/6/20	19:10	04:40	0	555'	55'	Recovery
5/6/20	19:20	04:50	0	525'	25'	Recovery
5/6/20	19:30	05:00	0	500'	0'	Recovery

[1] Measured from the established ground surface. [2] Water level minus static level.

APPENDIX C

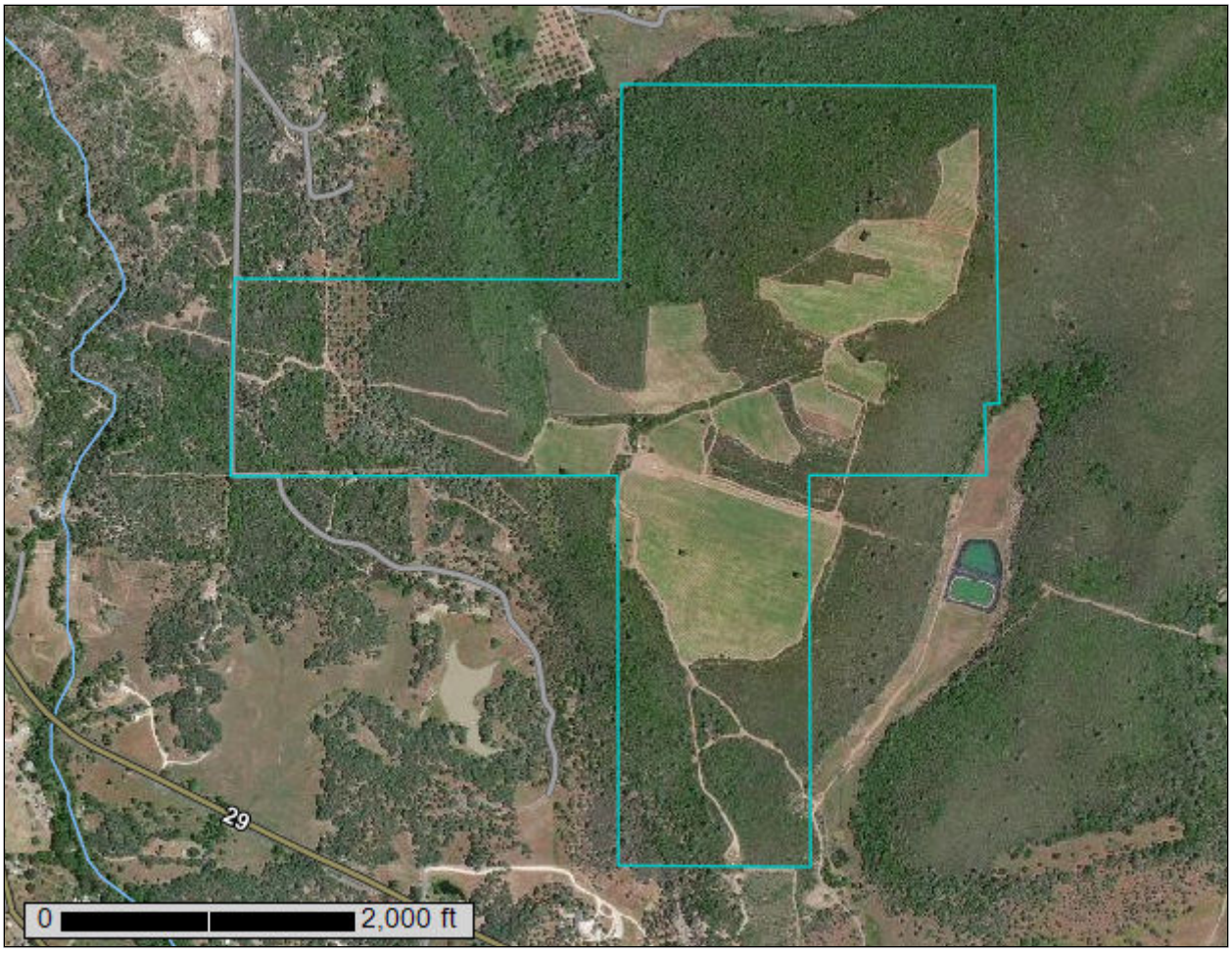
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Lake County, California



January 6, 2022

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

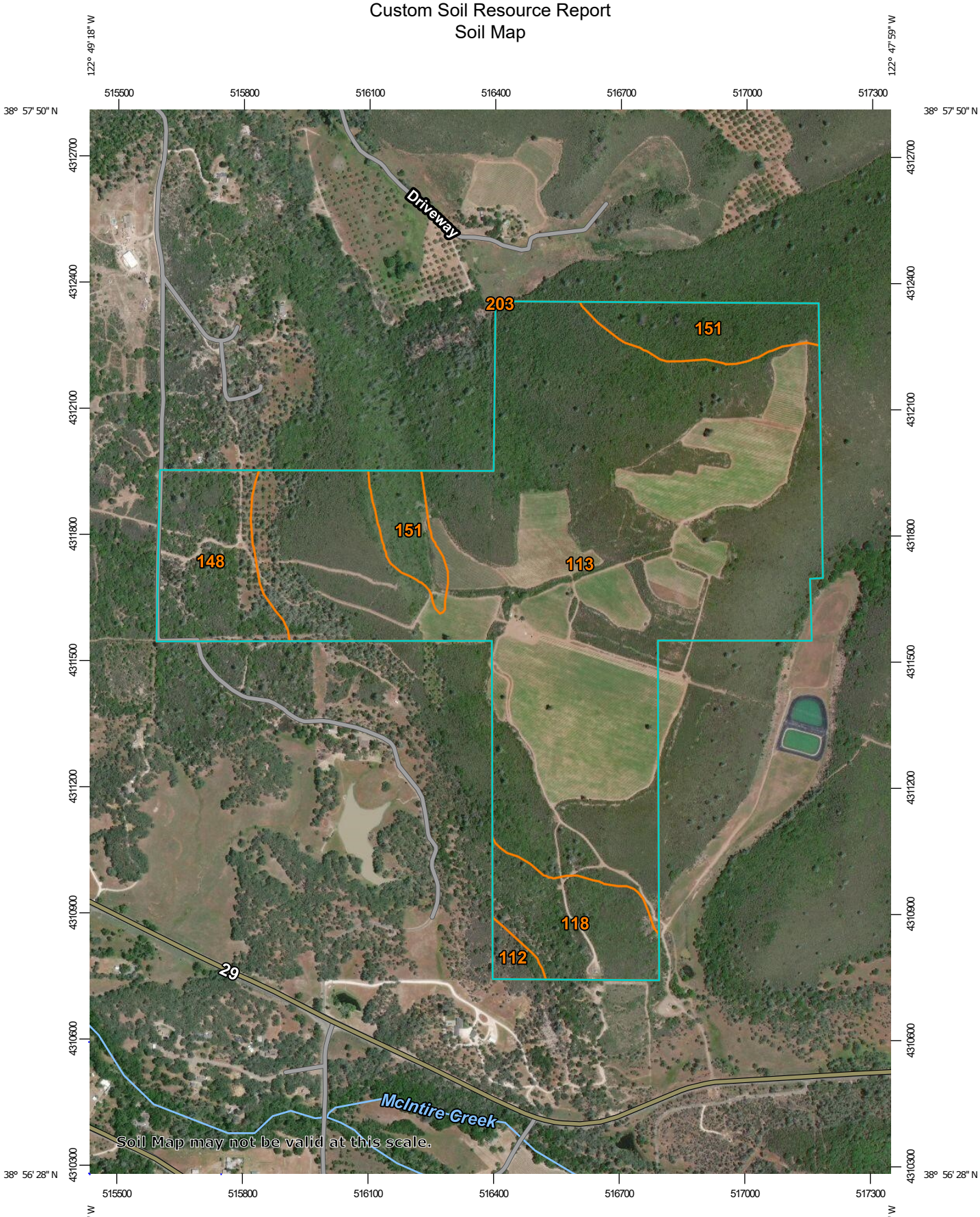
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:12,300 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 150 300 600 900

Feet: 0 500 1000 2000 3000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
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MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Lake County, California
Survey Area Data: Version 18, Sep 6, 2021

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 18, 2016—Nov 4, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
112	Benridge-Konocti association, 15 to 30 percent slopes	2.8	0.9%
113	Benridge-Konocti association, 30 to 50 percent slopes	241.6	76.7%
118	Bottlerock-Glenview-Arrowhead complex, 30 to 50 percent slopes	21.1	6.7%
148	Kidd-Forward complex, 5 to 30 percent slopes	24.9	7.9%
151	Konocti-Benridge complex, 50 to 75 percent slopes	24.4	7.7%
203	San Joaquin variant fine sandy loam, 0 to 5 percent slopes	0.1	0.0%
Totals for Area of Interest		**314.8**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not

mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Lake County, California

112—Benridge-Konocti association, 15 to 30 percent slopes

Map Unit Setting

National map unit symbol: hf52
Elevation: 1,000 to 4,500 feet
Mean annual precipitation: 30 to 35 inches
Mean annual air temperature: 57 degrees F
Frost-free period: 140 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Benridge and similar soils: 40 percent
Konocti and similar soils: 20 percent
Konocti and similar soils: 20 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Benridge

Setting

Landform: Hills, mountains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Upper third of mountainflank, side slope
Down-slope shape: Concave, linear
Across-slope shape: Convex, linear
Parent material: Volcanic ash

Typical profile

H1 - 0 to 6 inches: loam
H2 - 6 to 21 inches: gravelly clay loam
H3 - 21 to 63 inches: gravelly clay
H4 - 63 to 68 inches: gravelly clay

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 8.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: R015XY014CA - Loamy Mountains 20-40"ppt
Hydric soil rating: No

Description of Konocti

Setting

Landform: Hills, mountains, ravines, ridges
Landform position (two-dimensional): Shoulder, backslope, summit
Landform position (three-dimensional): Upper third of mountainflank, side slope, nose slope
Down-slope shape: Concave, linear
Across-slope shape: Convex, linear
Parent material: Residuum weathered from andesite

Typical profile

H1 - 0 to 8 inches: cobbly loam
H2 - 8 to 16 inches: stony loam
H3 - 16 to 32 inches: very stony sandy clay loam
H4 - 32 to 39 inches: very stony sandy loam
H5 - 39 to 49 inches: bedrock

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: 39 to 43 inches to lithic bedrock
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: R015XY009CA - Hills 20-40"ppt
Hydric soil rating: No

Description of Konocti

Setting

Landform: Hills, mountains, ridges, ravines
Landform position (two-dimensional): Shoulder, backslope, summit
Landform position (three-dimensional): Upper third of mountainflank, side slope, nose slope
Down-slope shape: Concave, linear
Across-slope shape: Convex, linear
Parent material: Residuum weathered from andesite

Typical profile

H1 - 0 to 4 inches: stony loam
H2 - 4 to 11 inches: stony loam
H3 - 11 to 28 inches: very stony sandy clay loam
H4 - 28 to 38 inches: bedrock

Properties and qualities

Slope: 15 to 30 percent
Surface area covered with cobbles, stones or boulders: 0.1 percent

Depth to restrictive feature: 28 to 32 inches to lithic bedrock
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: R015XY009CA - Hills 20-40"ppt
Hydric soil rating: No

Minor Components

Konocti, variant

Percent of map unit: 4 percent
Hydric soil rating: No

Steeper slopes

Percent of map unit: 4 percent
Hydric soil rating: No

Rock outcrop

Percent of map unit: 4 percent
Hydric soil rating: No

Gentler slopes

Percent of map unit: 4 percent
Hydric soil rating: No

Unnamed

Percent of map unit: 4 percent
Hydric soil rating: No

113—Benridge-Konocti association, 30 to 50 percent slopes

Map Unit Setting

National map unit symbol: hf53
Elevation: 1,000 to 4,500 feet
Mean annual precipitation: 30 to 35 inches
Mean annual air temperature: 57 degrees F
Frost-free period: 140 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Benridge and similar soils: 40 percent
Konocti and similar soils: 30 percent
Konocti and similar soils: 15 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Benridge

Setting

Landform: Hills, mountains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Upper third of mountainflank, side slope
Down-slope shape: Concave, linear
Across-slope shape: Convex, linear
Parent material: Volcanic ash

Typical profile

H1 - 0 to 6 inches: loam
H2 - 6 to 21 inches: gravelly clay loam
H3 - 21 to 63 inches: gravelly clay
H4 - 63 to 68 inches: gravelly clay

Properties and qualities

Slope: 30 to 50 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 8.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: R015XY014CA - Loamy Mountains 20-40"ppt
Hydric soil rating: No

Description of Konocti

Setting

Landform: Hills, hills, mountains, ridges
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Upper third of mountainflank, side slope, nose slope
Down-slope shape: Concave, linear
Across-slope shape: Convex, linear
Parent material: Residuum weathered from andesite

Typical profile

H1 - 0 to 8 inches: cobbly loam
H2 - 8 to 16 inches: stony loam

H3 - 16 to 32 inches: very stony sandy clay loam
H4 - 32 to 39 inches: very stony sandy loam
H5 - 39 to 49 inches: bedrock

Properties and qualities

Slope: 30 to 50 percent
Depth to restrictive feature: 39 to 43 inches to lithic bedrock
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: R015XY014CA - Loamy Mountains 20-40"ppt
Hydric soil rating: No

Description of Konocti

Setting

Landform: Hills, hills, mountains, ridges
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Upper third of mountainflank, side slope, nose slope
Down-slope shape: Concave, linear
Across-slope shape: Convex, linear
Parent material: Residuum weathered from andesite

Typical profile

H1 - 0 to 4 inches: stony loam
H2 - 4 to 9 inches: stony loam
H3 - 9 to 28 inches: very stony sandy clay loam
H4 - 28 to 38 inches: bedrock

Properties and qualities

Slope: 30 to 50 percent
Surface area covered with cobbles, stones or boulders: 0.1 percent
Depth to restrictive feature: 28 to 32 inches to lithic bedrock
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C

Ecological site: R015XY014CA - Loamy Mountains 20-40"ppt
Hydric soil rating: No

Minor Components

Steeper slopes
Percent of map unit: 3 percent
Hydric soil rating: No

Rock outcrop
Percent of map unit: 3 percent
Hydric soil rating: No

Konocti, variant
Percent of map unit: 3 percent
Hydric soil rating: No

Unnamed
Percent of map unit: 2 percent
Hydric soil rating: No

Unnamed
Percent of map unit: 2 percent
Hydric soil rating: No

Unnamed
Percent of map unit: 2 percent
Hydric soil rating: No

118—Bottlerock-Glenview-Arrowhead complex, 30 to 50 percent slopes

Map Unit Setting
National map unit symbol: hf58
Elevation: 1,500 to 3,000 feet
Mean annual precipitation: 40 inches
Mean annual air temperature: 55 degrees F
Frost-free period: 150 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition
Bottlerock and similar soils: 40 percent
Glenview and similar soils: 20 percent
Arrowhead and similar soils: 15 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bottlerock

Setting
Landform: Hills

Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Residuum weathered from obsidian

Typical profile

H1 - 0 to 5 inches: very gravelly loam
H2 - 5 to 19 inches: very gravelly loam
H3 - 19 to 39 inches: very gravelly sandy clay loam
H4 - 39 to 63 inches: very gravelly clay

Properties and qualities

Slope: 30 to 50 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: F005XZ010CA - Very Deep Gravelly Mesic Hills 40-60"ppt
Hydric soil rating: No

Description of Glenview

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Residuum weathered from obsidian

Typical profile

H1 - 0 to 1 inches: very gravelly loam
H2 - 1 to 6 inches: gravelly loam
H3 - 6 to 15 inches: clay loam
H4 - 15 to 65 inches: gravelly clay
H5 - 65 to 75 inches: bedrock

Properties and qualities

Slope: 30 to 50 percent
Depth to restrictive feature: 65 to 69 inches to lithic bedrock
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None

Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 8.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: F005XZ010CA - Very Deep Gravelly Mesic Hills 40-60"ppt
Hydric soil rating: No

Description of Arrowhead

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from obsidian

Typical profile

H1 - 0 to 1 inches: very gravelly sandy loam
H2 - 1 to 8 inches: gravelly sandy loam
H3 - 8 to 14 inches: gravelly sandy clay loam
H4 - 14 to 31 inches: very stony clay
H5 - 31 to 41 inches: bedrock

Properties and qualities

Slope: 30 to 50 percent
Depth to restrictive feature: 31 to 35 inches to lithic bedrock
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: F005XZ006CA - Mesic Hills <40"ppt
Hydric soil rating: No

Minor Components

Steeper slopes

Percent of map unit: 10 percent
Hydric soil rating: No

Unnamed, cobbly

Percent of map unit: 10 percent
Hydric soil rating: No

Unname, severely eroded

Percent of map unit: 5 percent

Hydric soil rating: No

148—Kidd-Forward complex, 5 to 30 percent slopes

Map Unit Setting

National map unit symbol: hf67
Elevation: 400 to 4,500 feet
Mean annual precipitation: 30 to 60 inches
Mean annual air temperature: 48 to 55 degrees F
Frost-free period: 145 to 260 days
Farmland classification: Not prime farmland

Map Unit Composition

Kidd and similar soils: 60 percent
Forward and similar soils: 20 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kidd

Setting

Landform: Hillslopes, mountains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Center third of mountainflank, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from rhyolite

Typical profile

H1 - 0 to 9 inches: gravelly loam
H2 - 9 to 16 inches: gravelly sandy loam
H3 - 16 to 26 inches: bedrock

Properties and qualities

Slope: 5 to 30 percent
Depth to restrictive feature: 16 to 20 inches to lithic bedrock
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Low to high (0.01 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 1.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: D
Ecological site: F015XY015CA - Loamy Mountains >40"ppt
Hydric soil rating: No

Description of Forward

Setting

Landform: Mountains, hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Center third of mountainflank, side slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Residuum weathered from rhyolite

Typical profile

H1 - 0 to 9 inches: loam
H2 - 9 to 25 inches: gravelly sandy loam
H3 - 25 to 60 inches: bedrock

Properties and qualities

Slope: 5 to 30 percent
Depth to restrictive feature: 25 to 29 inches to paralithic bedrock
Drainage class: Somewhat excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: F015XY010CA - Hills >40"ppt
Hydric soil rating: No

Minor Components

Aiken

Percent of map unit: 10 percent
Hydric soil rating: No

Rock outcrop

Percent of map unit: 5 percent
Hydric soil rating: No

Unnamed, steeper slopes

Percent of map unit: 5 percent
Hydric soil rating: No

151—Konocti-Benridge complex, 50 to 75 percent slopes

Map Unit Setting

National map unit symbol: hf6b
Elevation: 1,000 to 4,500 feet
Mean annual precipitation: 30 to 35 inches
Mean annual air temperature: 57 degrees F
Frost-free period: 140 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Konocti and similar soils: 40 percent
Konocti and similar soils: 30 percent
Benridge and similar soils: 15 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Konocti

Setting

Landform: Hillslopes, mountains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank, side slope
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Residuum weathered from andesite

Typical profile

H1 - 0 to 4 inches: stony loam
H2 - 4 to 9 inches: stony loam
H3 - 9 to 28 inches: very stony sandy clay loam
H4 - 28 to 38 inches: bedrock

Properties and qualities

Slope: 50 to 75 percent
Depth to restrictive feature: 28 to 32 inches to lithic bedrock
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C

Ecological site: R015XY014CA - Loamy Mountains 20-40"ppt
Hydric soil rating: No

Description of Konocti

Setting

Landform: Hillslopes, mountains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank, side slope
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Residuum weathered from andesite

Typical profile

H1 - 0 to 8 inches: cobbly loam
H2 - 8 to 16 inches: stony loam
H3 - 16 to 32 inches: very stony sandy clay loam
H4 - 32 to 39 inches: very stony sandy loam
H5 - 39 to 49 inches: bedrock

Properties and qualities

Slope: 50 to 75 percent
Surface area covered with cobbles, stones or boulders: 0.1 percent
Depth to restrictive feature: 39 to 43 inches to lithic bedrock
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Ecological site: R015XY014CA - Loamy Mountains 20-40"ppt
Hydric soil rating: No

Description of Benridge

Setting

Landform: Hillslopes, mountains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank, side slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Residuum weathered from andesite

Typical profile

H1 - 0 to 6 inches: loam
H2 - 6 to 21 inches: gravelly clay loam
H3 - 21 to 63 inches: gravelly clay
H4 - 63 to 68 inches: gravelly clay

Properties and qualities

Slope: 50 to 75 percent

Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 8.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Ecological site: R015XY014CA - Loamy Mountains 20-40"ppt
Hydric soil rating: No

Minor Components

Unnamed

Percent of map unit: 5 percent
Hydric soil rating: No

Konocti, variant

Percent of map unit: 5 percent
Hydric soil rating: No

Sodabay

Percent of map unit: 5 percent
Hydric soil rating: No

203—San Joaquin variant fine sandy loam, 0 to 5 percent slopes

Map Unit Setting

National map unit symbol: hf80
Elevation: 1,300 to 1,500 feet
Mean annual precipitation: 25 to 35 inches
Mean annual air temperature: 57 degrees F
Frost-free period: 155 to 205 days
Farmland classification: Not prime farmland

Map Unit Composition

San joaquin, variant, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of San Joaquin, Variant

Setting

Landform: Terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from volcanic rock

Typical profile

H1 - 0 to 21 inches: fine sandy loam
H2 - 21 to 25 inches: clay
H3 - 25 to 30 inches: indurated
H4 - 30 to 65 inches: stratified loamy sand to fine sandy loam

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches; 25 to 30 inches to duripan
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.9 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Wolfcreek

Percent of map unit: 5 percent
Hydric soil rating: No

Unnamed

Percent of map unit: 5 percent
Hydric soil rating: No

Unnamed

Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

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APPENDIX D

THEIS DRAWDOWN ANALYSIS

$K := 7.95 \cdot \frac{ft}{day}$

$B := 100 \cdot ft$

$Q := 9625 \cdot \frac{ft^3}{day}$

$d := 1 .. 500$

$r_d := d \cdot ft$

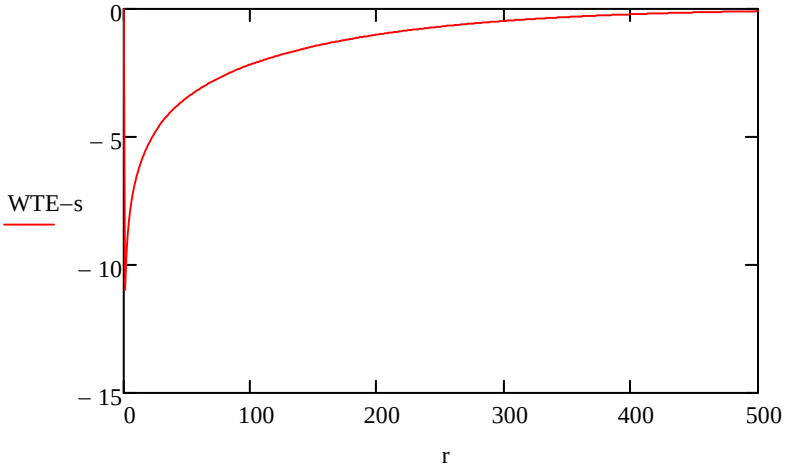
$t := 1 \cdot day$

$S := .02$

$WTE := 0 \cdot ft$

$$u_d := \frac{S \cdot \left(r_d \right)^2}{4 \cdot K \cdot B \cdot t}$$

$$s_d := \frac{Q}{4 \cdot \pi \cdot K \cdot B} \left(\int_{u_d}^{\infty} \frac{e^{-u}}{u} \, du \right)$$



s =

	0
197	1.024
198	1.016
199	1.009
200	1.001
201	0.994
202	0.987
203	0.979
204	0.972
205	0.965
206	0.957
207	0.95
208	0.943
209	0.936
210	0.929
211	0.922
212	0.915
213	0.909
214	0.902
215	...

ft