

**Results of Drilling, Construction and
Testing and Pump Design for
BBCCSD Well No. 3B**

Big Bear City Community Services District

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BIG BEAR CITY COMMUNITY SERVICES DISTRICT

WELL NO. 3B

RESULTS OF DRILLING, CONSTRUCTION, TESTING AND PUMP DESIGN

1.0 EXECUTIVE SUMMARY

A new municipal water well was recently completed for the Big Bear City Community Services District (the District) in Big Bear City, San Bernardino County, California. The new well, Well No. 3B, is a replacement for Well No. 3 and is located near the intersection of Maltby Boulevard and Shore Drive (see Figures 1 and 2).

Well No. 3B was drilled by South West Pump & Drilling of Coachella, California using a reverse circulation rotary drilling rig. A 26-inch inside diameter (ID) surface conductor casing was installed and cemented in place from the ground surface to a depth of 52 feet below ground surface (bgs). The 17 1/2-inch diameter pilot borehole was drilled to a total depth of 790 feet. At a depth of approximately 770 ft, cemented cobbles were encountered. The borehole was reamed to a 24-inch diameter to a depth of 807 ft. Due to hard drilling conditions, the borehole was reduced to a 17 1/2-inch diameter from 807 to 820 ft. The alluvial materials penetrated during drilling consisted primarily of layers of coarse to fine grained sand and gravel with interbedded layers of silt and clay.

Four zones were selected and tested before determining the final well design, including the placement of the screened intervals, slot size and filter pack selection. Selection of these zones was based upon examination of the formation samples and analysis of the geophysical logs. Water samples were obtained from Zone No. 1 (640 to 660 ft) and Zone No. 2 (480 to 500 ft) for general mineral and general physical properties, and fluoride concentrations. Water samples were collected from Zone No. 3 (300 to 320 ft) and Zone No. 4 (130 to 150 ft) for general mineral and general physical properties, fluoride concentrations, and volatile organic compounds. Analysis of the

water quality samples was performed by Applied P & Ch Laboratory, a state certified laboratory located in Chino, California.

Well No. 3B was completed to a total depth of 810 ft bgs using 14-inch ID high-strength low-alloy (HSLA) steel casing and screen¹. The completion process included reaming the 17 1/2-inch diameter pilot borehole to 24 inches in diameter to a depth of 807 feet and from 807 to 820 ft the hole remained at 17 1/2-inches due to hard drilling conditions. After the reaming 14-inch ID by 5/16 inch wall HSLA steel casing and Ful-Flo horizontal louvered well screen were installed. A total of 515 ft of screen was placed from 130 to 250 ft, 295 to 530 ft, and 630 to 790 ft. A 20-foot section of blank casing with an end plate was placed from 790 to 810 feet, to serve as a sediment trap below the screened sections.

Don Kelland Materials Custom “4 x 8” filter pack material (see Figure 5) was installed from 820 to 90 feet, between the 24-inch diameter borehole and the 14-inch ID casing and screen. Selected intervals of which sieve analyses were performed are shown in Figure 4 and Appendix E. A fine sand layer was placed from 85 to 90 ft to prevent the cement, when pumped, from invading the upper portion of the filter pack.

An annular seal of 10.3 sack cement mixture was placed from 85 feet to the ground surface to act as a deep sanitary seal for the well. Figure 3 shows the technical cross section of the well (as it was constructed), the laterolog (similar to guard resistivity log) superimposed with the zone test intervals, and a simplified lithologic log.

Pumping tests (see Appendix G and Figures 6, 7, and 9) have established that the designed discharge rate for the well is 1,000 gpm. Short-term pumping of this well (i.e., one day of continuous pumping) is expected to result in 28 feet of drawdown and a specific capacity of 35.7 gpm/ft. Long-term pumping (i.e., one year of continuous pumping) is expected to result in about 51 feet of drawdown (see Figure 14). Calculations using the information gathered from the step drawdown and constant rate pumping tests indicate a well efficiency of 61% (see Figure 8). The

1 Due to warm water conditions at depth, as determined by zone testing, HSLA steel was recommended for completion to protect against corrosion.

average calculated transmissivity using data collected from the pumping well (BBCCSD Well No. 3B) was 37,330 gpd/ft (see Figures 9, 10, and 11). The average calculated transmissivity using data collected from the observation well (BBCCSD Well No. 3A) was 220,880 gpd/ft (see Figures 12 and 13). The storativity value calculated using the observation well data was 0.00051.

Based on the information collected during the pumping tests, the recommended discharge rate and pump bowl setting are as follows:

**Recommended Pump Design - Big Bear City Community Services District
Well No. 3B**

Design Discharge Rate	1,000 gpm
Static Water Level	36 ft bgs
Design Drawdown	28 ft
Estimated Allowance For Unknown Effects And Seasonal Changes In Regional Water Level	50 ft
Total Dynamic Head (Total Lift To Surface - Does Not Include System Pressure)	114 ft
Recommended Pump Setting (Pump Intake Depth)	260 ft bgs

At the end of the 24-hour constant rate pumping test, samples were taken from the completed well by GEOSCIENCE personnel for Title 22 water quality analysis. The analyses were performed by Applied P & Ch Laboratory. The laboratory reported a total dissolved solids (TDS) concentration of 259 mg/L. This value is below the secondary drinking water standard of 500 mg/L recommended by the EPA. The analysis results indicated a fluoride concentration of 7.5 mg/L. This is above the maximum contaminant level (MCL) of 4.0 mg/L. Trichloroethene was detected at a concentration of 0.6 µg/L, well below the MCL of 5.0 µg/L. All other analysis results were below their respective MCLs. (See Figures 16 and 17 for Trilinear Diagram of water quality.)

Following the 24-hour constant rate pumping and recovery tests, a flowmeter (or “spinner”) survey was performed while the well was being pumped at an average rate of 1,050 gpm. Results showed that a majority of water (89%) was being produced from the lower two perforated intervals (295 to 530 ft and 630 to 790 ft).

After well completion, a downhole video survey was conducted as a permanent record of the post-construction condition of the well. The well casing and screen appeared to be clean and in good condition; however, several pieces of broken PVC airline were observed in the bottom of the well.

A plumbness and alignment survey was conducted to measure the verticality of the well. Results showed a deviation at 260 ft bgs (i.e., the recommended pump setting) of 1.2 inches in the North-South plane, and 1.2 inches in the East-West plane. The maximum deviation in the North-South plane was found between 420 and 560 ft, and was calculated to be 2.4 inches. The maximum deviation in the East-West plane was 3.6 inches, occurring between 780 and 800 ft depth. Both maximum deviation points occur well below the recommended depth for the pump intake. These maximum deviations are within the limits defined by the technical specifications. The results of the alignment survey are shown on Table 2, and are shown graphically in Figure 18.

2.0 INTRODUCTION

2.1 Background

A new municipal water well was recently completed for the Big Bear City Community Services District (the District) in Big Bear City, San Bernardino County, California (see Figures 1 and 2). The new well, Well No. 3B, is a replacement for Well No. 3 and is located near the intersection of Maltby Boulevard and Shore Drive.

2.2 Purpose and Scope

This report provides comprehensive details and results of the drilling, construction, and testing procedures for Well No. 3B. Included in this report is a final well design with completion details and recommendations for the optimum discharge rate and pump settings as well as water quality data.

2.3 General Hydrogeology of the Well Site

The well site is located in the West Baldwin subarea of the Baldwin Lake Watershed. It is structurally situated at the eastern end of Big Bear Valley within the San Bernardino Mountains of the eastern Transverse Ranges Geomorphic Province of Southern California. Three major formations occur in the Big Bear area: Lacustrine Deposits, Recent Alluvium, and Older Alluvium. The estimated thickness of these sediments at the site is estimated to be approximately 1,000 ft. Ground water in the Baldwin Lake watershed generally occurs in the unconsolidated alluvial deposits on the lower slopes of the surrounding mountains and in the valley. The aquifers have been separated into three units: an upper aquifer, middle aquifer, and lower aquifer.

Ground water levels at the existing Well No. 3 and adjacent monitoring Well No. 3A are measured monthly. In these two wells, water levels during the period between 1986 and 1999 ranged from artesian conditions to 50 ft bgs but have been primarily artesian since March 1998. During well drilling and construction (January to August 2000) the water level in Well No. 3 was typically 20 to 35 ft bgs.

3.0 WELL CONSTRUCTION

The drilling contractor for Big Bear City Community Services District Well No. 3B was South West Pump & Drilling of Coachella, California. Well construction began on May 3, 2000 with the drilling and installation of the conductor casing. Development and testing was completed on August 1, 2000 and the final video survey was completed on August 17, 2000. The contractor's Well Completion Report is included in Appendix I.

3.1 Conductor Casing Installation and Pilot Borehole Drilling

A 36-inch diameter conductor borehole was drilled to a depth of 52 ft. Formations consisted primarily of organic and inorganic clays with some sand, gravel, and cobbles. The 26-inch OD mild steel conductor casing was installed and cemented in place from ground surface to a depth of 52 ft. Below the bottom of the conductor casing, a 17 1/2-inch diameter pilot hole was drilled using a reverse circulation rotary drilling rig. Drilling of the pilot borehole began on May 30, 2000, and had advanced to a depth of 790 ft by June 2². Figure 3 shows a technical cross section of the well as it was constructed, and Table 1 summarizes the well construction procedures and materials.

Formation materials encountered during pilot hole drilling consisted of varying amounts of cobbles, gravel, sand, silt and clay.

3.2 Geophysical Logging and Aquifer Zone Testing

After reaching the final depth of the 17 1/2-inch pilot borehole at 790 feet, fluids in the borehole were circulated for an adequate amount of time so that borehole stability could be verified before removing the drilling string. A suite of geophysical borehole logs were then run by Pacific Surveys, Inc., of Claremont, California on June 3, 2000 and included the following:

2 During the reaming pass the borehole was advanced to a final depth of 820 ft bgs.

- (1) 16-inch and 64-inch normal resistivity;
- (2) Spontaneous potential (SP);
- (3) Acoustic (or sonic) with Variable Density Log (VDL);
- (4) Gamma ray; and
- (5) Focused guard resistivity (laterolog).

Appendix A contains a chronology of the well construction, development, and pumping tests. Appendix B contains copies of GEOSCIENCE personnel's Daily Field Notes for well construction, development, and pumping tests. Appendix C contains the detailed lithologic description of materials encountered while drilling the pilot borehole. Appendix D contains the geophysical logs including the caliper survey and the spinner survey. Appendix E contains individual mechanical grading analyses of the seven formation samples selected for sieve analysis. Figure 4 shows a composite plot of the mechanical grading analyses, and Figure 5 shows the plot of the Don Kelland Materials, Inc. 4 x 8 special blend filter pack material. Mean grain diameters (i.e., the 50% retained size) for aquifer materials ranged from 0.75 mm to 5.52 mm. Uniformity coefficients³ ranged from 1.8 to 30.3. The Masch-Denny hydraulic conductivities of the formation ranged from 83 to 261 gpd/ft².

3.3 Aquifer Zone Testing for Yield and Water Quality

From examination of the formation samples and analysis of the geophysical logs, four intervals (130-140 ft, 300-320 ft, 480-500 ft, and 640-660 ft bgs) were selected for isolated zone testing. The purpose for isolated zone testing is to determine both yield and water quality from the potential completion interval(s) before determining the final design of the well. Testing was accomplished by attaching a mill-slotted section of pipe (20 feet in length) to the end of the drill string. A pump chamber was installed in the drill string to allow for unrestricted pumping with a submersible pump.

³ The uniformity coefficient is defined as the 60% passing grain size (d₆₀) divided by the 10% passing grain size (d₁₀). The lower the value of the uniformity coefficient the more uniform the grading, and the larger the value the less uniform the grading of the material.

3.3.1 Aquifer Zone Testing Procedure

After filling the 17 1/2-inch pilot borehole with gravel and bentonite to the bottom of the zone to be tested, the 20 ft section of perforated pipe (attached to the drill string) was placed. Filter pack material was then added to the annular space between the 17 1/2-inch borehole and the zone test tool, until the tool was covered by at least 10 feet of material. A second bentonite seal was placed to isolate the zone from the rest of the borehole.

The test zone was initially developed by airlifting the temporary “well” until the fluid being discharged remained reasonably clean and clear, and the integrity of the seal had been verified⁴. If the seal was not holding, more bentonite and cuttings were added to the annulus and were allowed to hydrate before continuing to develop each zone. Once the seal had been verified, the static water level was measured and a submersible pump was installed to complete the development process.

Once the water pumped from the zone was determined to be clean and clear, and it was determined that the seal was holding, the temporary well was pumped for an additional six hours. This additional pumping was to ensure that only formation water from the isolated zone was being produced, and that the water was uncontaminated by the fluids used during drilling. During this time, periodic measurements were made of the pumping water level and rate of discharge.

At the end of the six hours of continuous pumping, samples were collected from the zone for water quality analysis. The water quality samples were then delivered to Applied P & Ch Laboratory for analysis of general mineral and general physical properties.

⁴ Verification of the seal for zone testing shall be determined when water levels occurring in the annulus remain stable and predictable (allowing for losses to the formation), and is different from the water level measured inside the zone testing tools, whether the zone is being actively pumped, or is at rest.

This process was repeated for each of the four zones to be tested.

The zone test procedure is summarized below:

Selective Aquifer Zone Testing for Water Quality

1. The 17 1/2-inch pilot borehole was backfilled to approximately 10 feet below the zone to be tested. A bentonite seal was placed on top of the backfill material.
2. A 20-foot long mill-slotted section of pipe was placed opposite the zone to be tested. A pump chamber was placed above the zone testing tools.
3. Filter pack material was placed in the annular space between the perforated tool and the borehole, to approximately 10 feet above the top of the tool.
4. Ten feet of bentonite material was placed on top of the filter pack material to complete the zone isolation process.
5. The temporary well was developed by airlifting and the integrity of the seal was verified. A submersible pump was installed to complete the development process.
6. Following development, each isolated zone was pumped for 6 hours at rates ranging from about 66 to 180 gpm.
7. Pumping water level measurements and discharge rates were recorded periodically. Water samples were collected for water quality analyses to determine the water chemistry for each zone tested.

3.3.2 Results of the Aquifer Zone Testing

Water quality analyses were performed for each zone and included general mineral and general physical properties, and fluoride concentrations. Zone Nos. 3 and 4 were also analyzed for volatile organic compounds. The analytical reports from Applied P & Ch Laboratory showed that the water from all zones exceeded the MCL of 4.0 mg/L for fluoride concentration. Water sampled from Zone No. 4 exceeded the MCL of 45 mg/L for nitrate as NO₃. All other parameters were reported below their respective MCLs.

The water quality results from the aquifer zone testing are summarized in the following table:

**Big Bear City Community Services District Well No. 3B Water Quality
(from Aquifer Zone Testing)**

Zone No.	Interval Tested [ft]	Average Discharge Rate [gpm]	Color [color unit]	Odor [odor unit]	TDS* [mg/L]	Fluoride (free F ⁻) [mg/L]	Iron [mg/L]	Manganese [mg/L]	Nitrate (as NO ₃) [mg/L]
1	640-660	180	5.0	1	259	8.0	ND	ND	4.1
2	480-500	180	5.0	1	309	9.0	ND	ND	3.2
3	300-320	175	5.0	1	293	6.3	0.36	0.0069	3.2
4	130-150	66	5.0	1	339	6.7	0.10	0.013	378

* Total Dissolved Solids

3.4 Casing and Screen Design

The well was completed with the bottom of the well casing placed at 810 ft. A caliper log was run by Pacific Surveys after the borehole was reamed to 820 ft and before installing the casing, screen, filter pack, and annular seals.

Roscoe Moss Company 14-inch ID HSLA (ASTM A606)⁵ steel Ful-Flo louvered screen sections with 3/32-inch openings were placed from 130 to 250 ft, 295 to 530 ft, and 630 to 790 ft. HSLA material was selected due to potential corrosion resulting from high water temperature at depth.

Sections of blank 14-inch ID HSLA steel casing were placed from ground surface to 130 ft, 250 to 295 ft, 530 to 630 ft, and 790 to 810 ft. The lowermost 20-foot section had an end plate attached, which was made of the same material as the casing and screen.

3.5 Filter Pack and Annular Seal

The 4 x 8 custom blend filter pack material (see Figure 5) was supplied by Don Kelland Materials, Inc. of Yuma, Arizona. The filter pack was placed from 820 to 90 ft bgs through a tremie pipe. The filter pack was designed using a pack-to-aquifer ratio of 4 to 6 times the finest aquifer materials, and was placed in the annular space between the 24-inch diameter borehole and the 14-inch ID casing and screen. The filter pack material was circulated into the annulus with clear water. A 3-inch diameter schedule 40 steel gravel feed pipe was installed in the annulus to a depth of 95 feet (extending 10 feet below the annular seal) allowing for future addition of filter pack material to the annulus, if necessary. A 2-inch diameter schedule 40 steel sounding tube was welded to the outside of the well casing to a depth of 128 feet.

Prior to pumping the annular seal, a 5-foot thick layer of fine sand was placed on top of the filter pack material from 85 to 90 ft. This fine sand layer prevented the cement slurry from invading the top of the filter pack. The annular seal, consisting of a 10.3 sack sand cement slurry was then pumped through a tremie pipe from the top of the fine sand layer at 85 feet to ground surface. The bottom of the tremie remained submerged in the cement slurry at all times.

5 One of the trade names for ASTM A606 material is "cor-ten" steel.

3.6 Well Development

Big Bear City Community Services District Well No. 3B was initially developed using a combination airlifting and swabbing tool to consolidate the filter pack after placement, and to remove the majority of the colloidal and fine-grained sediments from within the well, filter pack and near-well zone. Ten foot long intervals were swabbed and airlifted simultaneously until relatively clean water was discharged. A total of 72 hours were spent airlifting and swabbing the well with the drilling rig prior to demobilization. The contractor's notes taken during well development are contained in Appendix F.

Final development was conducted using a vertical turbine test pump from July 24 to 27, 2000. Final development consisted of pumping the well at a steady discharge rate until the sand concentration reached a minimum threshold of less than 5 parts per million (ppm). The 5 ppm threshold was maintained throughout the final development, both when the discharge rate was increased, and when the well was "surged".

During development pumping, the discharge rate, drawdown, and sand concentration were closely monitored. The discharge rate was measured using an in-line propeller meter. Water level measurements were collected using an electrical sounder. The sand concentration was measured while pumping using a centrifugal Rossum Sand Tester. When the specific capacity (discharge rate divided by drawdown) approached a maximum and the sand concentration approached a minimum, well development was considered complete.

During development by pumping, a maximum discharge rate of 1,600 gpm was achieved, with a short-term specific capacity of 47.5 gpm per foot of drawdown. The well cannot maintain this discharge rate for more than a very short time.

A total of 23.25 hours were spent on pump development instead of the bid amount of 60 hours. This was due to the sand content remaining low and the specific capacity not improving, even with extensive surging.

3.7 Plumbness and Alignment Survey

The plumbness and alignment survey was conducted by Pacific Surveys on August 17, 2000. Results showed a deviation at 260 ft bgs (i.e., the recommended pump setting) of 1.2 inches in the North-South plane, and 1.2 inches in the East-West plane. The maximum deviation in the North-South plane was found between 420 and 560 ft, and was calculated to be 2.4 inches. The maximum deviation in the East-West plane was 3.6 inches, occurring between 780 and 800 ft. Both maximum deviation points occur below the recommended depth for the pump intake. These maximum deviations are within the limits defined by the technical specifications. The results of the alignment survey are shown on Table 2, and are graphically shown on Figure 18.

3.8 Downhole Video Survey

Pacific Surveys completed a video log of the post-construction condition of the well on August 17, 2000, to serve as a permanent record of the construction details and condition of the well following development and testing. The video survey showed the well casing and screen to be clean and in good condition. Several pieces of detached airline (from well development) were found from 706 to 790 ft bgs. The video survey confirmed that the screened intervals had been placed as specified.

4.0 PUMPING TEST ANALYSIS PROCEDURES AND RESULTS

4.1 Data Collection

After development pumping, two separate pumping tests were conducted. First, a step drawdown test was run to determine specific capacity and well efficiency relationships. Then a 24-hour constant rate test was conducted to obtain data from which to calculate aquifer transmissivity and storativity.

During both tests the pumping water level, discharge rate, and sand content were closely monitored (see Appendix G). The field procedure for these tests followed the American Society for Testing and Materials (ASTM) (1994), standard test method D 4050.

4.2 Basic Assumptions Used in Analysis of Pumping Test Data

The purpose of a pumping test is to obtain field data, which when substituted into an equation or set of equations, will yield estimates of well and aquifer properties. As certain assumptions have been used to derive these equations, it is important to observe or control these factors during the test. These assumptions and conditions are:

- The aquifer material is assumed to consist of porous media, with flow velocities being laminar and obeying Darcy's law.
- The aquifer is considered to be homogeneous, isotropic, of infinite areal extent, and of constant thickness throughout.
- Water is released from (or added to) internal aquifer storage instantaneously upon change in water level.
- No storage occurs in the semi-confining layers of leaky aquifers.

- The storage in the well is negligible.
- The pumping well penetrates the entire aquifer and receives water from the entire thickness by horizontal flow.
- The slope of the water table or piezometric surface is assumed to be flat during the test with no natural (or other) recharge occurring which would affect test results.
- The pumping rate is assumed constant during the entire time period of pumping during a constant-rate test, and constant during each discharge step in a variable-rate test.

4.3 Pumping Test Data Analysis Methods

4.3.1 Step Drawdown Test Method

The purpose of the step drawdown test is to determine formation losses, well losses, and well efficiency; all necessary in determining the final pump design. In an actively pumping well, the total drawdown in the well is composed of both laminar and turbulent head loss components. Laminar losses generally occur away from the borehole (where approach velocities are low), while turbulent losses are confined to the area in and around the immediate vicinity of the well screen and within the well bore. The total drawdown in a pumping well may be expressed as:

$$s_w = BQ + CQ^2 \quad \text{"Drawdown In A Pumping Well"} \quad (1)$$

where:

- s_w = Total drawdown measured in the well, [ft]
- B = Formation or aquifer loss coefficient, [ft/gpm]
- Q = Discharge rate of the well, [gpm]
- C = Well loss coefficient, [ft/gpm²]

The first and second term in equation (1) are referred to as formation, or aquifer loss⁶ (BQ) and well loss⁷ (CQ²), respectively. Formation (i.e., aquifer) loss and well loss coefficients are determined from the step drawdown test. The test procedure involves pumping the well at multiple (at least three) discharge rates with each "step" being a fraction of the maximum discharge. Analysis of the step drawdown data requires plotting the "specific drawdown" (s_w/Q) for each step against discharge rate. The formation loss coefficient (B) is the y-intercept of the best-fit straight line through the specific drawdown data points. The slope of the line is equal to the well loss coefficient (C).

Well Efficiency (E) is defined as the ratio of the formation (i.e. aquifer) loss component (BQ) to the total drawdown measured in the well (s_w) and is expressed as a percent:

$$E = 100 \frac{BQ}{s_w} = \frac{100}{1 + CQ/B} \quad \text{"Well Efficiency"} \quad (2)$$

where:

- E = Well Efficiency, [%]
- B = Formation or aquifer loss coefficient, [ft/gpm]
- Q = Discharge rate of the well, [gpm]
- s_w = Total drawdown measured in the well, [ft]
- C = Well loss coefficient, [ft/gpm²]

⁶ Aquifer loss is the head loss measured at the interface between the aquifer and the filter pack. The magnitude of the aquifer loss can be found from consideration of radial flow into the well and can be calculated, for example, using Jacob's equation.

⁷ Well losses are turbulent flow losses which are head losses associated with the entrance of water into and through the well screen as well as those losses incurred as the flow moves axially towards the pump intake. These losses vary as the square of the velocity.

4.3.2 Constant Rate Test Methods

Calculation of aquifer parameters from pumping test data is based on analytical solutions of the basic differential equation of ground water flow which can be derived from fundamental laws of physics. One of the most widely used solutions of this equation for non-steady radial flow to wells is the “Theis Equation”:

$$s(r,t) = \frac{114.6Q}{T} W(u) \quad \text{“Theis Equation”} \quad (3)$$

where:

- $s(r,t)$ = Drawdown in the vicinity of an artesian well, [ft]
- r = Distance from pumping well, [ft]
- Q = Discharge rate of pumping well, [gpm]
- T = Transmissivity of aquifer, [gpd/ft]
- $W(u)$ = “Well function of Theis”
- u = $1.87 \times r^2 \times S / (T \times t)$

where:

- S = Storativity, [fraction]
- t = Time after pumping started, [days]

4.3.2.1 Jacob’s Straight-Line (Modified Theis Non-Equilibrium) Method

According to Jacob (1950), for small values of “u” ($u < 0.05$), the Theis equation may be approximated by Jacob’s equation:

$$s(r,t) = \frac{264Q}{T} \log\left(\frac{0.3 Tt}{r^2 S}\right) \quad \text{“Jacob’s Equation”} \quad (4)$$

Jacob's equation is valid for use for most hydrogeologic problems of practical interest, is easier to use than the Theis equation, and involves a simple graphical procedure to calculate transmissivity and storativity. This method (D 4105) is summarized by ASTM (1994).

Transmissivity (T, in gpd/ft) can be calculated as:

$$T = \frac{264Q}{\Delta s} \quad (5)$$

where:

Q = Pumping rate, [gpm]

Δs = Change in drawdown over one log cycle of time, [ft]

Storativity can be calculated as:

$$S = \frac{0.3Tt_0}{r^2} \quad (6)$$

where:

T = Transmissivity, [gpd/ft]

t_0 = Time at the zero-drawdown intercept, [days]

r = Radial distance from the pumping well, [ft]

4.3.2.2 Jacob's Straight-Line Method Applied to Recovery

The procedure used for recovery data analysis is identical to that used during the pumping cycle except that time is measured after the pump has stopped and "calculated recovery" is used instead of drawdown. Calculated recovery is the difference between the extrapolated time-drawdown curve and the residual drawdown. Residual drawdown is the difference between the static water level and depth to water after the pump is stopped.

4.3.2.3 Theis Recovery Method (ASTM D 5269)

According to Cooper and Jacob (1946), for large values of time, t , and small values of radius, r , the Theis equation for residual drawdown⁸ can be reduced to:

$$s' = \frac{264Q}{T} \log \left[\frac{t}{t'} \right] \quad (7)$$

where:

- s' = Residual Drawdown [ft]
- Q = Pumping rate, [gpm]
- T = Transmissivity, [gpd/ft]
- t = Time after pumping began, [min]
- t' = Time after pumping ceased, following pumping, [min]

The method uses a semi-log plot of the recovery ratio, t/t' vs. residual drawdown, s' . The transmissivity in gpd/ft is calculated as:

$$T = \frac{264Q}{\Delta s'} \quad (8)$$

where:

- Q = Discharge rate, [gpm]
- $\Delta s'$ = Change in residual drawdown over one log cycle of t/t' , [ft]

⁸ Residual drawdown is the difference between the projected pre-pumping water-level trend and the water level in a well after pumping has stopped.

4.4 Pumping Test Data Analysis and Results for Well No. 3B

4.4.1 Step Drawdown Pumping Test

A step drawdown test was performed on July 28, 2000. The step drawdown test was performed at discharge rates of 507 gpm, 903 gpm, and 1,340 gpm. The static water level at the beginning of the test was 36.7 ft bgs. Figure 6 is a plot of the step drawdown test data and shows the time-drawdown curve for each step. The specific drawdown for each step is shown in the following table:

Step m	Discharge Rate Q_m [gpm]	Incremental Drawdown δ_m [ft]	Drawdown s_m [ft]	Specific Drawdown $(s/Q)_m$ [ft/gpm]
1	507	10.8	10.8	0.0213
2	903	14.4	25.2	0.0279
3	1,340	14.4	39.6	0.0296

The specific drawdown plot (see Figure 6) shows the relationship between specific drawdown (s/Q) and the discharge rate (Q). The testing showed a formation loss coefficient (B) of 0.0172 ft/gpm and a well loss coefficient (C) of 0.0000109 ft/gpm².

The specific capacity and efficiency diagram (see Figure 7) shows estimated drawdown and well efficiency at various discharge rates ranging from 507 gpm to 1,340 gpm. Estimated drawdown and well efficiency may also be calculated from equations (1) and (2) above.

4.4.2 Constant Rate Pumping Test

Following recovery from the step drawdown test, a 24 hour constant rate pumping test was conducted on Well No. 3B on July 31 and August 1, 2000. The static water level at the start of the test was 35.7 feet, and the average discharge rate was 1,050 gpm. The well had 11.5 feet of drawdown per log cycle. The Jacob's straight-line method was used to analyze the time-drawdown data and results yield a transmissivity of 24,100 gpd/ft (see Figure 9). The Theis recovery method and the Jacob's straight-line method applied to recovery were used to analyze the time-drawdown data and results yield an average transmissivity of 43,940 gpd/ft (see Figures 10 and 11).

Water levels in nearby BBCCSD Well No. 3A were monitored throughout the constant rate pumping test. The Theis recovery method and the Jacob's straight-line method applied to recovery were used to analyze the time-drawdown data and results yield an average transmissivity of 220,880 gpd/ft (see Figures 12 and 13). A storativity value of 0.00051 was calculated using the Jacob's straight-line method applied to recovery.

The following table summarizes the transmissivity and storativity values obtained from the analysis of the constant rate pumping test:

Summary of Aquifer Testing
Big Bear City Community Services District Well No. 3B

Well No.	Methods	Transmissivity [gpd/ft]	Storativity
Big Bear City Community Services District Well No. 3B (Pumping)	Jacob's Straight-Line	24,100	-
	Theis Recovery	41,680	-
	Jacob's Straight-Line (Applied to Recovery)	46,200	-
Big Bear City Community Services District Well No. 3 (Observation)	Theis Recovery	221,760	-
	Jacob's Straight-Line (Applied to Recovery)	220,000	0.00051

4.5 Spinner (Flowmeter) Survey

Following the constant rate pump test, a flowmeter (spinner) survey was conducted at an average pumping rate of 1,050 gpm. Data from the spinner survey was analyzed and was converted to flow velocities at various depths (see Appendix D). The uppermost screened interval, from 130 to 250 ft was contributing 11% of the overall flow, while the middle interval from 295 to 530 ft was contributing 50% of the flow (see Figure 15). The lowermost screened interval, from 630 to 790 ft was contributing 39% of the flow.

Results of Spinner Survey
Big Bear City Community Services District Well No. 3B

Depth of Screened Interval [ft]	Amount of Flow Contributed By Screened Interval [gpm]	Percentage of Flow Contributed By Screened Interval [%]
130-250	112	11
295-530	529	50
630-790	409	39

5.0 DESIGN DISCHARGE RATE, TOTAL LIFT AND PUMP SETTING

A maximum pumping rate of 1,000 gpm is recommended for the well. At this rate, a short-term (i.e., one day) drawdown of 28 ft should be expected with a total lift of 114 ft (allowing 50 feet for unknown effects and/or seasonal fluctuations in water levels). The long-term drawdown (one year of continuous pumping) was estimated to be 51 ft (see Figure 14) with a total lift of 137 ft (also allowing 50 ft for unknown effects). Because the pumping water level may occur in the uppermost screen (130 to 250 ft bgs) after one year of continuous pumping, it is not recommended that the well be operated on a continuous, long-term basis. The intake of the permanent production pump should be set approximately 260 feet bgs, which is within a blank portion of the casing. The following table summarizes the recommended pump design:

Recommended Pump Design
Big Bear City Community Services District Well No. 3B

Parameter	Short Term	Long Term
Design Pumping Rate	1,000 gpm	1,000 gpm
Design Drawdown	28 ft	51 ft*
Design Well Efficiency	61%	NA
Pump Setting	260 ft bgs	260 ft bgs
Static Water Level Depth	36 ft bgs	36 ft bgs
Estimated Allowance for Unknown Effects and Regional Lowering of Water Levels	50 ft	50 ft
Total Lift to Surface	114 ft	137 ft

* Estimated drawdown after one year of continuous pumping at 1,000 gpm.

6.0 GROUND WATER QUALITY

Water samples were collected at the end of the 24-hour constant rate pumping test, and were submitted to Applied P & Ch Laboratory located in Chino, California for Title 22 analysis. The results of the Title 22 analysis, as well as water quality results from the aquifer zone testing are contained in Appendix H.

Chemical analyses of these ground water samples, as well as the ground water samples collected from the aquifer zone test, suggest the water to be sodium bicarbonate and potassium sulfate in character (see Figures 16 and 17). The total hardness value of the sample collected from the completed well was 26 mg/L, with a total dissolved solids value of 259 mg/L. Nitrate (as NO_3) on the completed well was reported to be 1.76 mg/L. Analytical results indicated a fluoride concentration of 7.5 mg/L, which is above the maximum contaminant level (MCL) of 4.0 mg/L. Trichloroethene was detected at a concentration of 0.6 $\mu\text{g/L}$, well below the MCL of 5.0 $\mu\text{g/L}$. All other analysis results were below their respective MCLs.

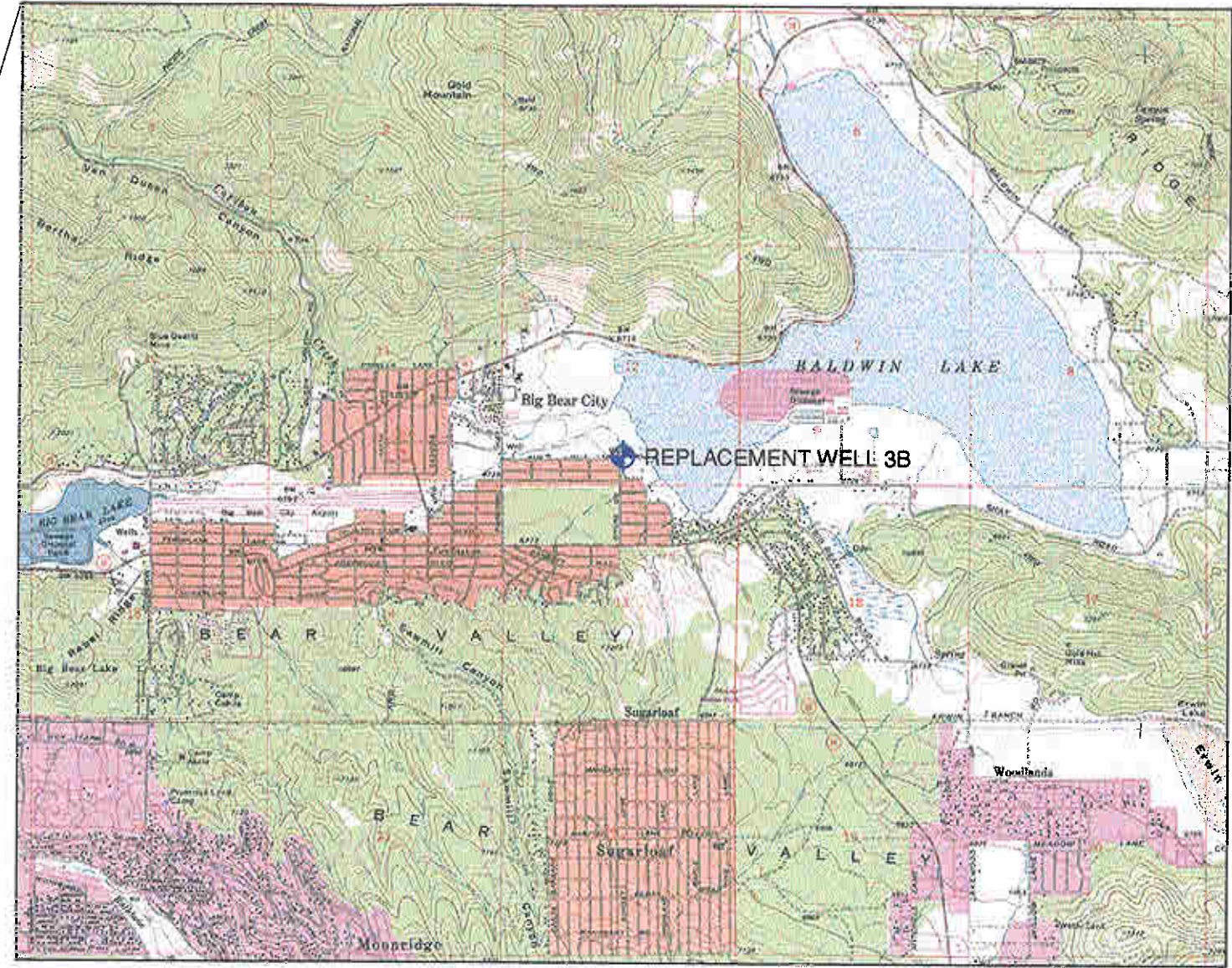
FIGURES

GEOSCIENCE Support Services, Inc.





**San Bernardino
County**



0 1/2 1
Approximate Scale Miles

**Figure
1**

Drawn: PLP
Checked:
Approved:
Date: 23-OCT-00

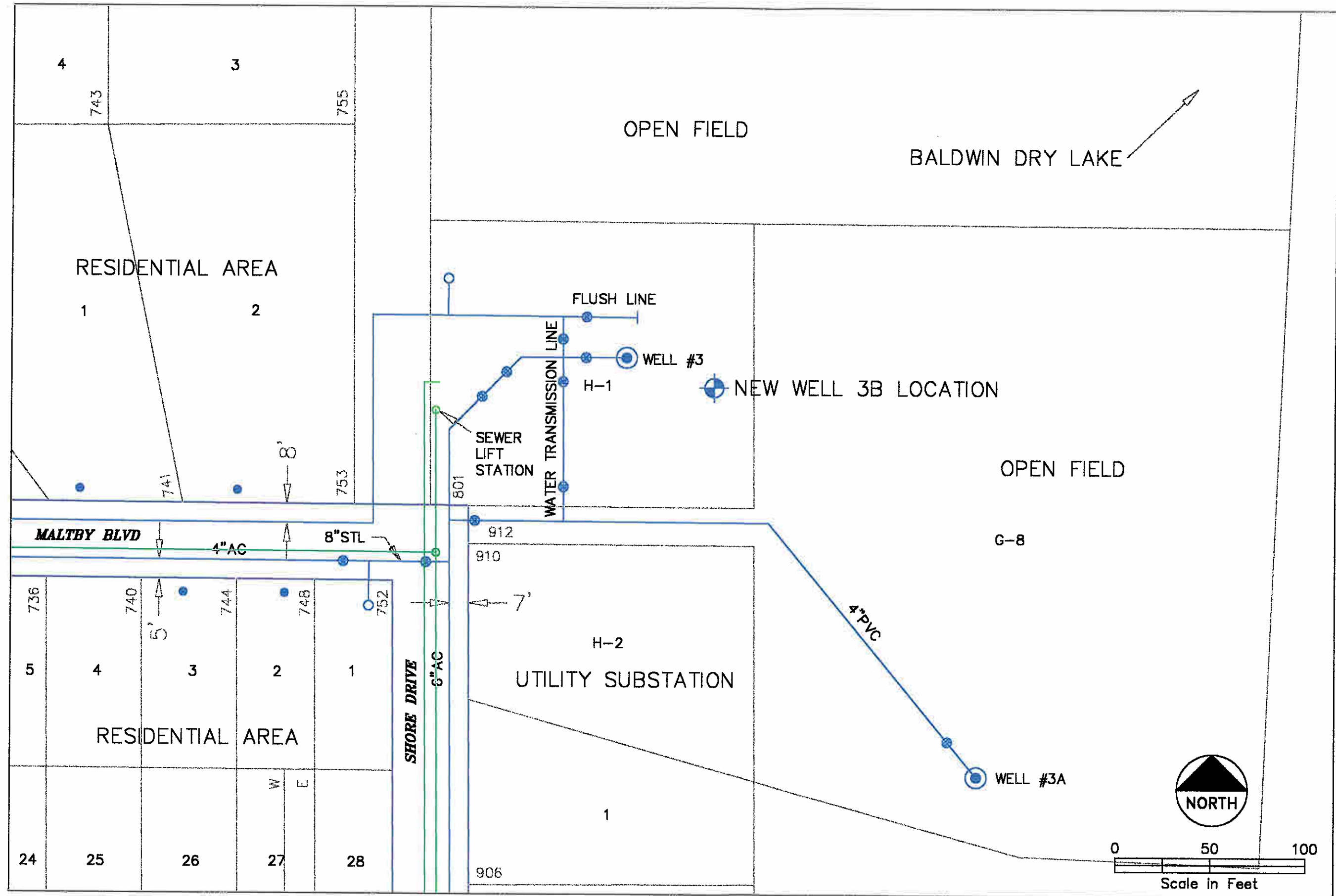
JN 99-560

BIG BEAR CITY COMMUNITY SERVICES DISTRICT

**GENERAL LOCATION MAP
REPLACEMENT WELL 3B**

GEOSCIENCE

Support Services Incorporated
P.O. Box 200 Claremont, CA 91711 (909) 525-0767



GEOSCIENCE

Support Services Incorporated
P.O. Box 220 Claremont, CA 91711 (909) 920-0707

BIG BEAR CITY COMMUNITY SERVICES DISTRICT

WELL LOCATION MAP

Drawn: PLP

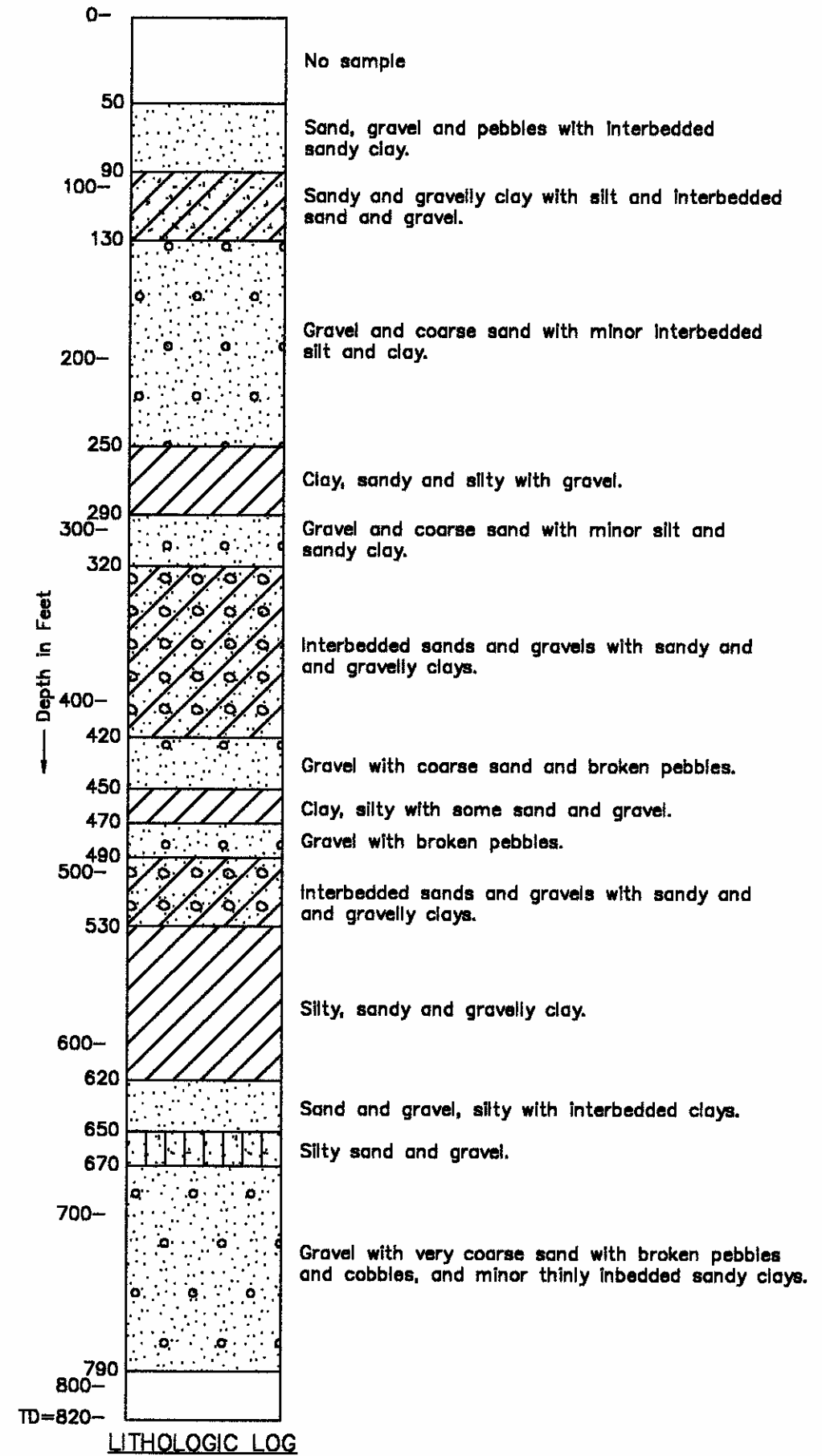
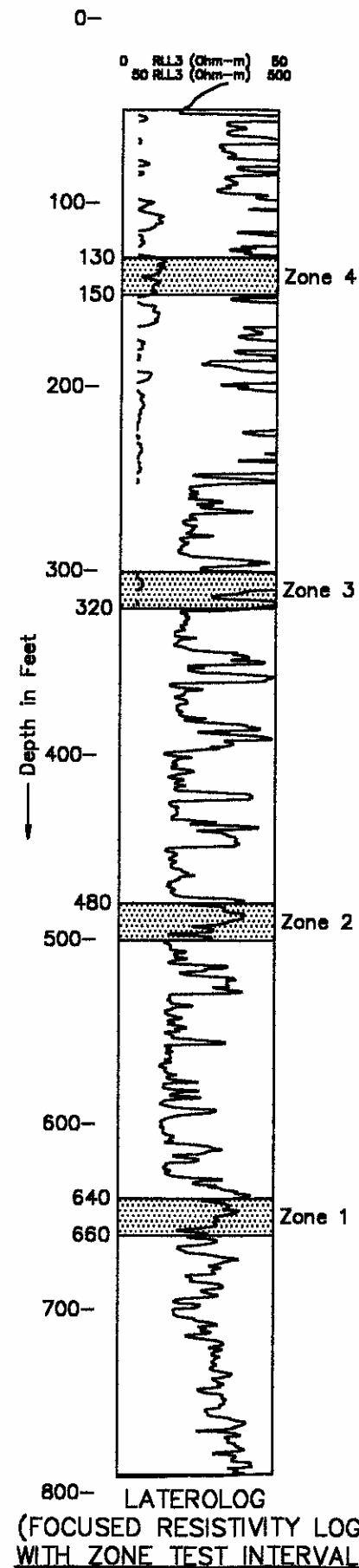
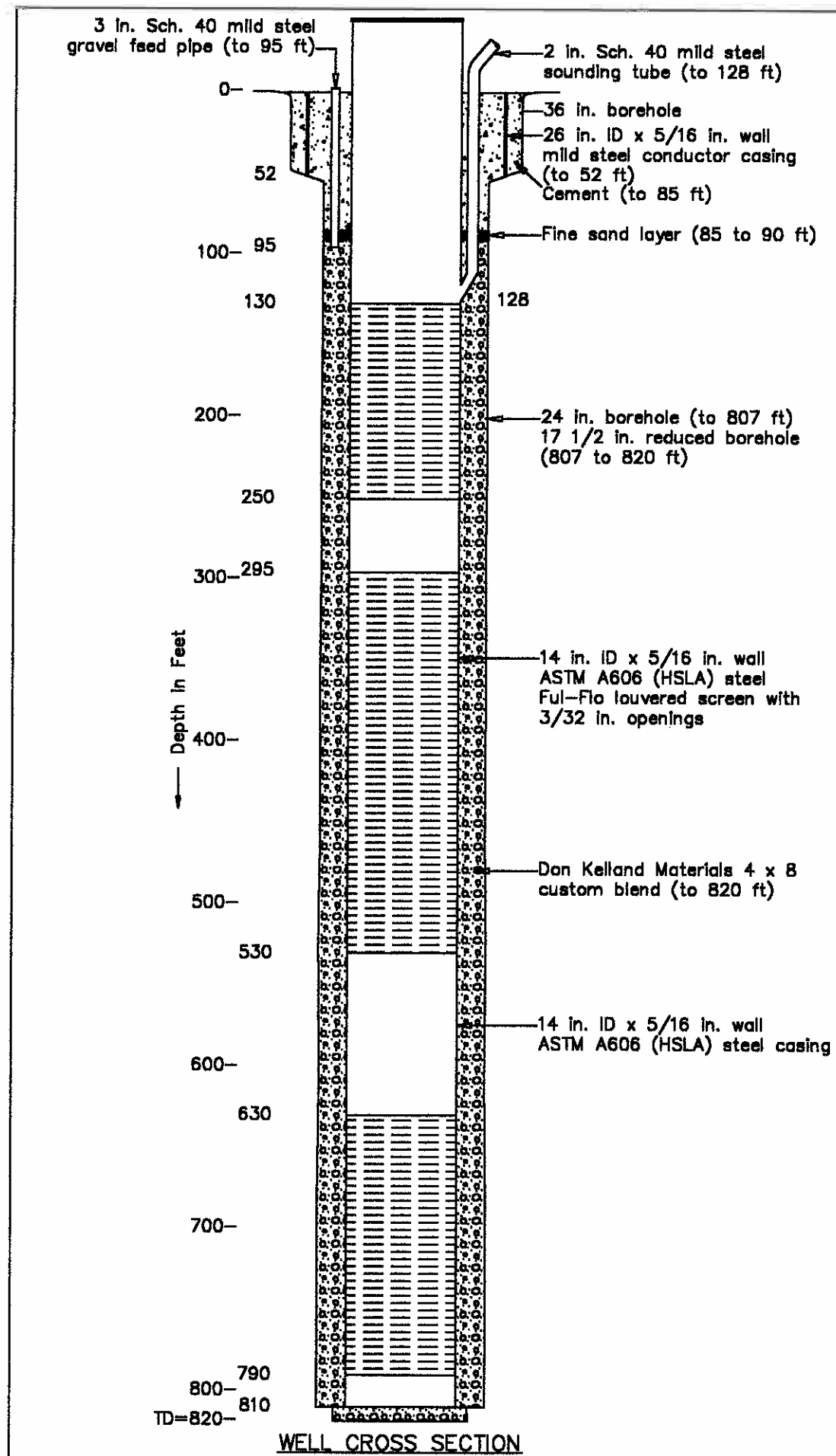
Checked:

Approved:

Date: 23-OCT-00

Figure 2

JN 99-561



GEOSCIENCE

BIG BEAR CITY COMMUNITY SERVICES DISTRICT

TECHNICAL CROSS SECTION REPLACEMENT WELL 3B

Drawn: PLP

Checked:

Approved:

Date: 23-OCT-00

Figure 3

JN 99-561

Support Services Incorporated
P.O. Box 220 Claremont, CA 91711 (909) 928-0727

MECHANICAL GRADING ANALYSIS - COMPOSITE PLOT
BIG BEAR CITY COMMUNITY SERVICES DISTRICT WELL NO. 3B

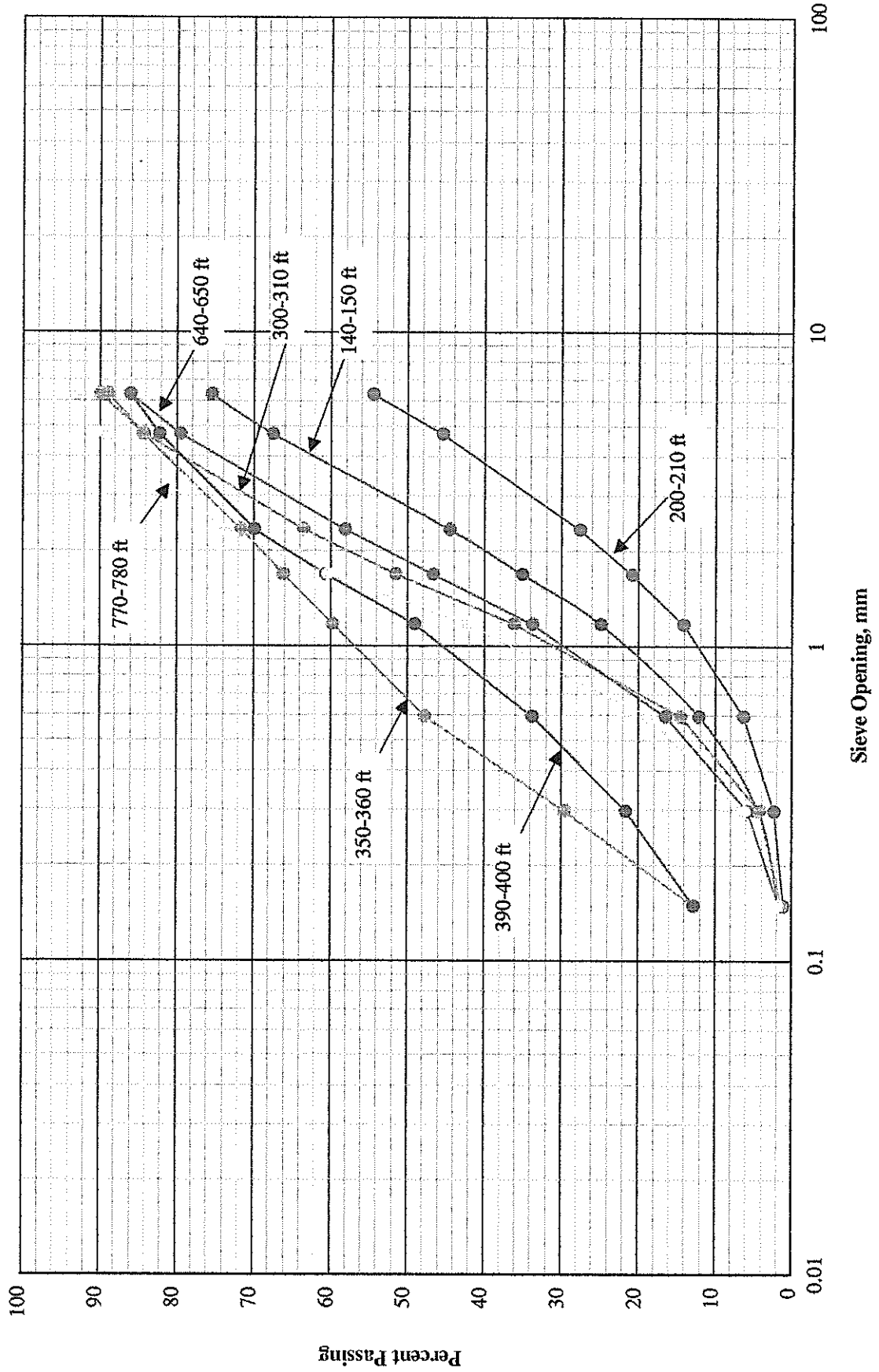


Figure 4

**MECHANICAL GRADING ANALYSIS
DON KELLAND MATERIALS "Custom 4 x 8" FILTER PACK
BIG BEAR CITY COMMUNITY SERVICES DISTRICT WELL NO. 3B**

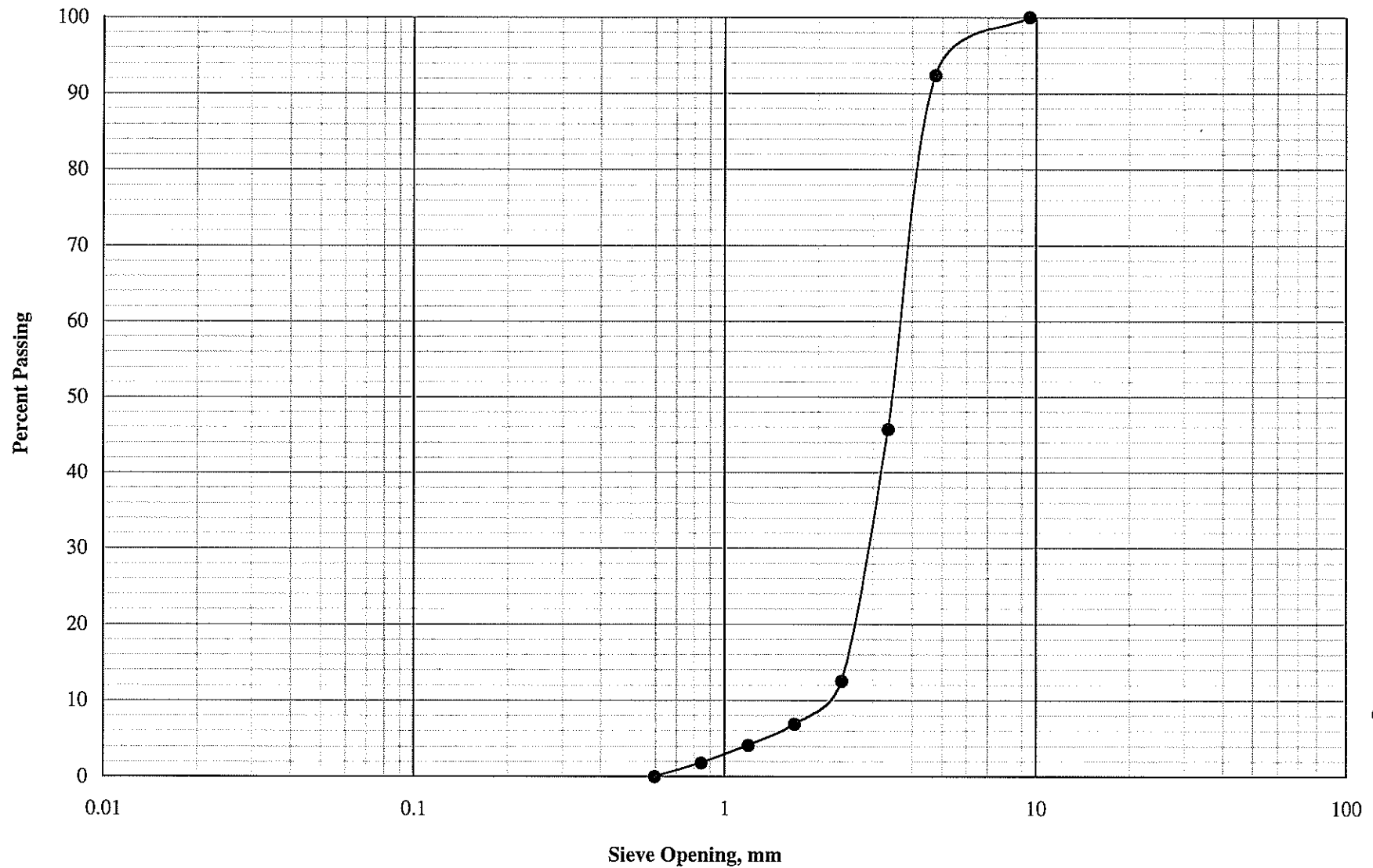


Figure 5

STEP DRAWDOWN TEST **BIG BEAR CITY COMMUNITY SERVICES DISTRICT WELL NO. 3B**

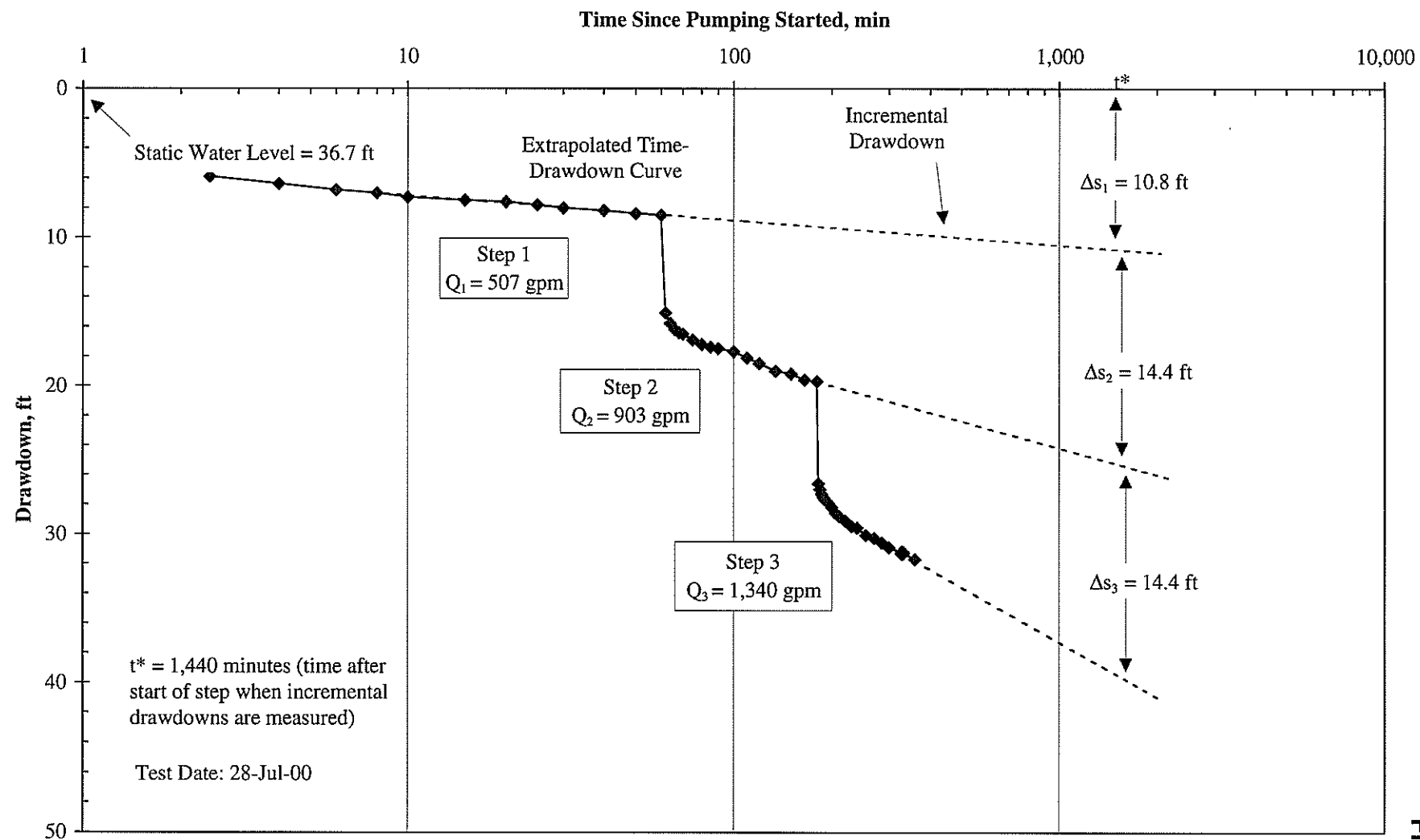


Figure 6

**SPECIFIC DRAWDOWN PLOT
BIG BEAR CITY COMMUNITY SERVICES DISTRICT WELL NO. 3B**

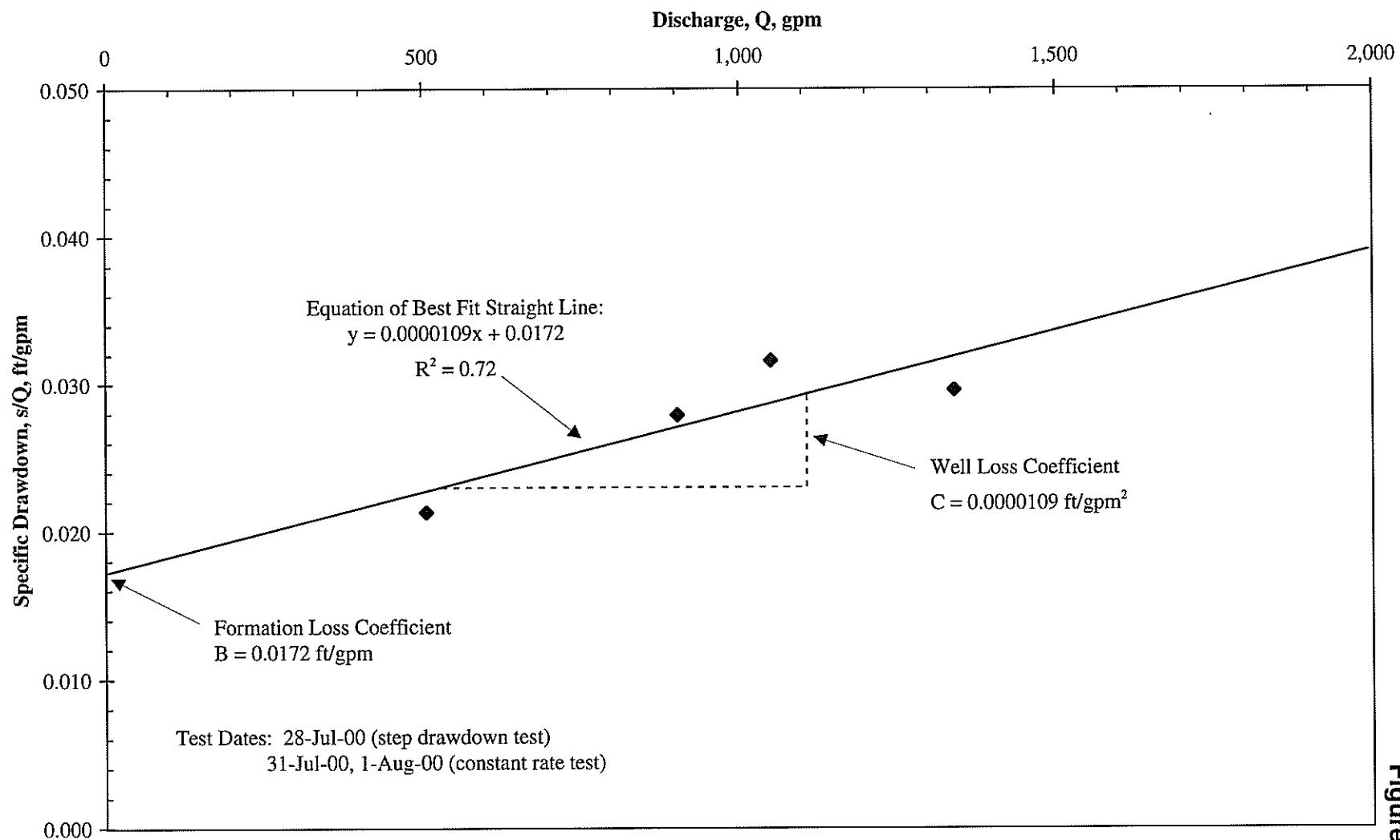


Figure 7

SPECIFIC CAPACITY & EFFICIENCY PLOT **BIG BEAR CITY COMMUNITY SERVICES DISTRICT WELL NO. 3B**

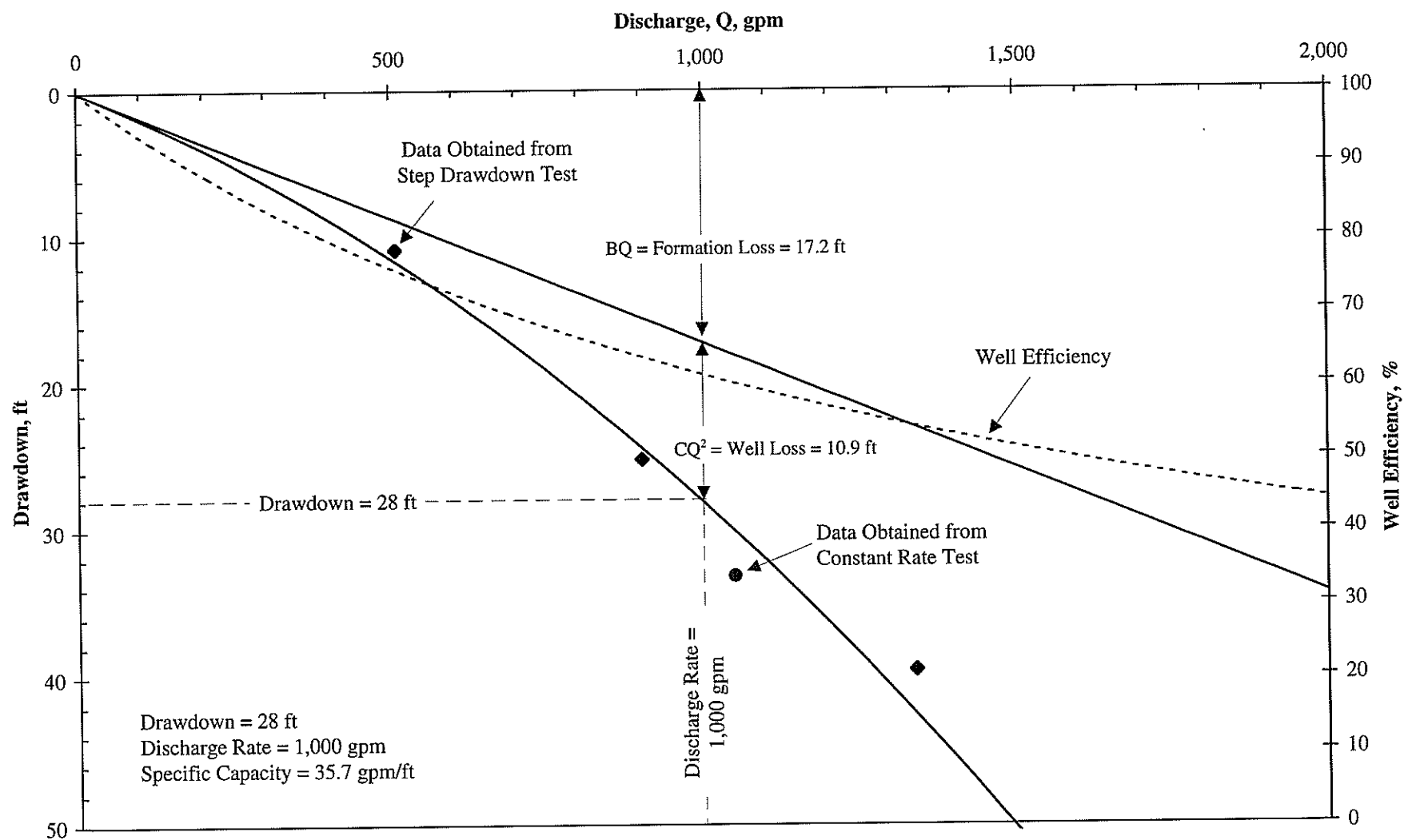


Figure 8

**24-HOUR CONSTANT RATE TEST
BIG BEAR CITY COMMUNITY SERVICES DISTRICT WELL NO. 3B**

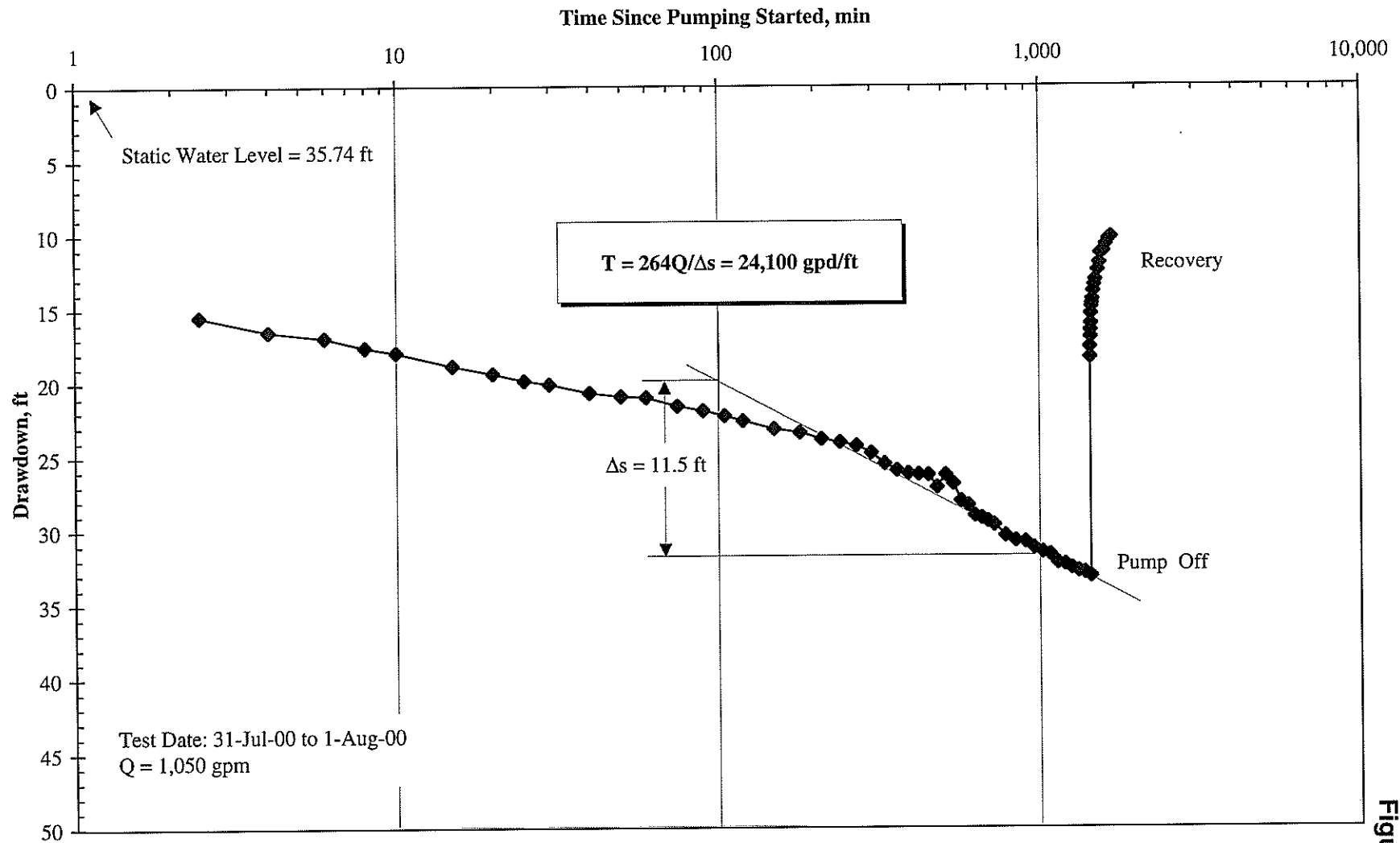


Figure 9

THEIS RECOVERY METHOD **BIG BEAR CITY COMMUNITY SERVICES DISTRICT WELL NO. 3B**

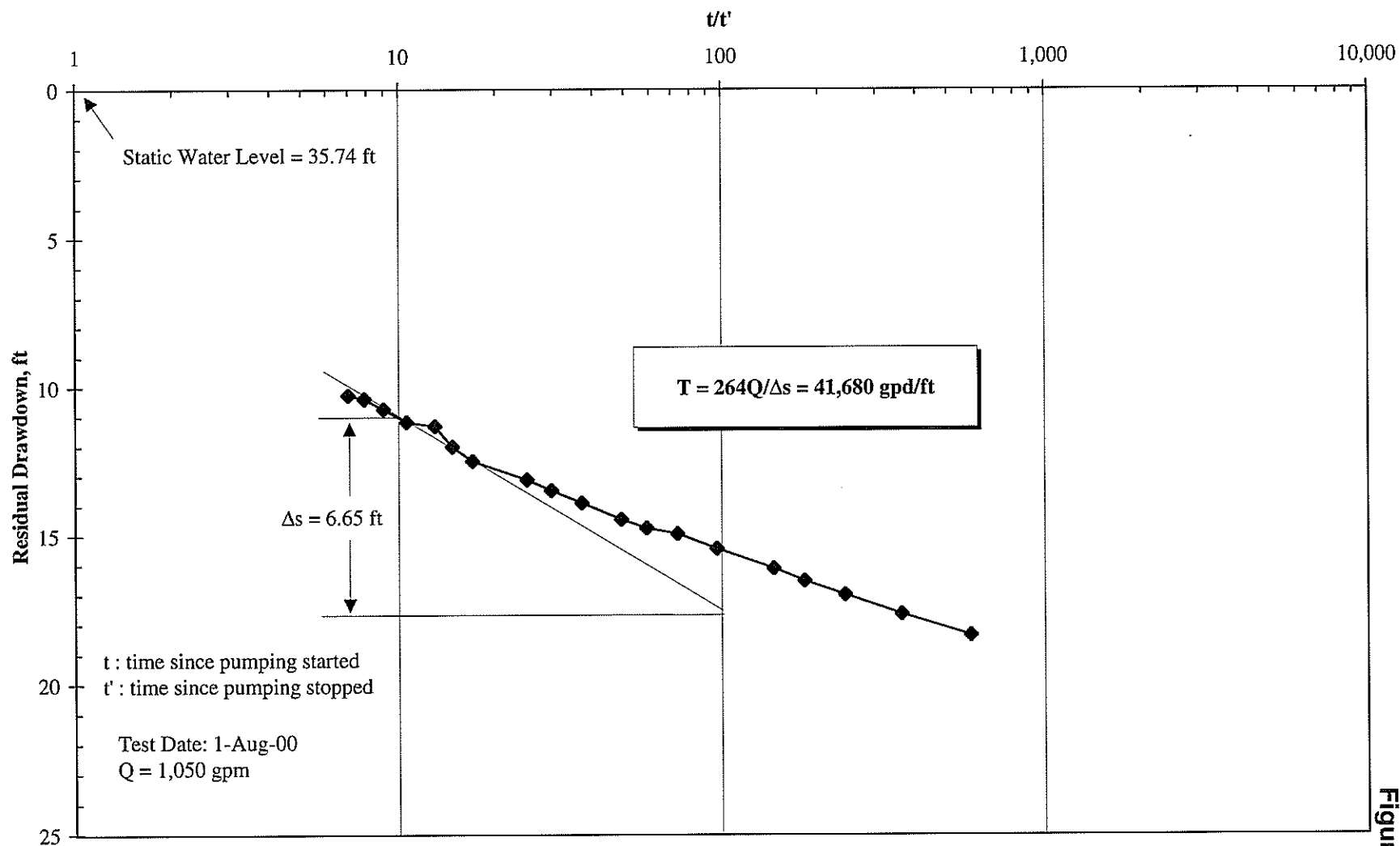


Figure 10

**CALCULATED RECOVERY ANALYSIS
BIG BEAR CITY COMMUNITY SERVICES DISTRICT WELL NO. 3B**

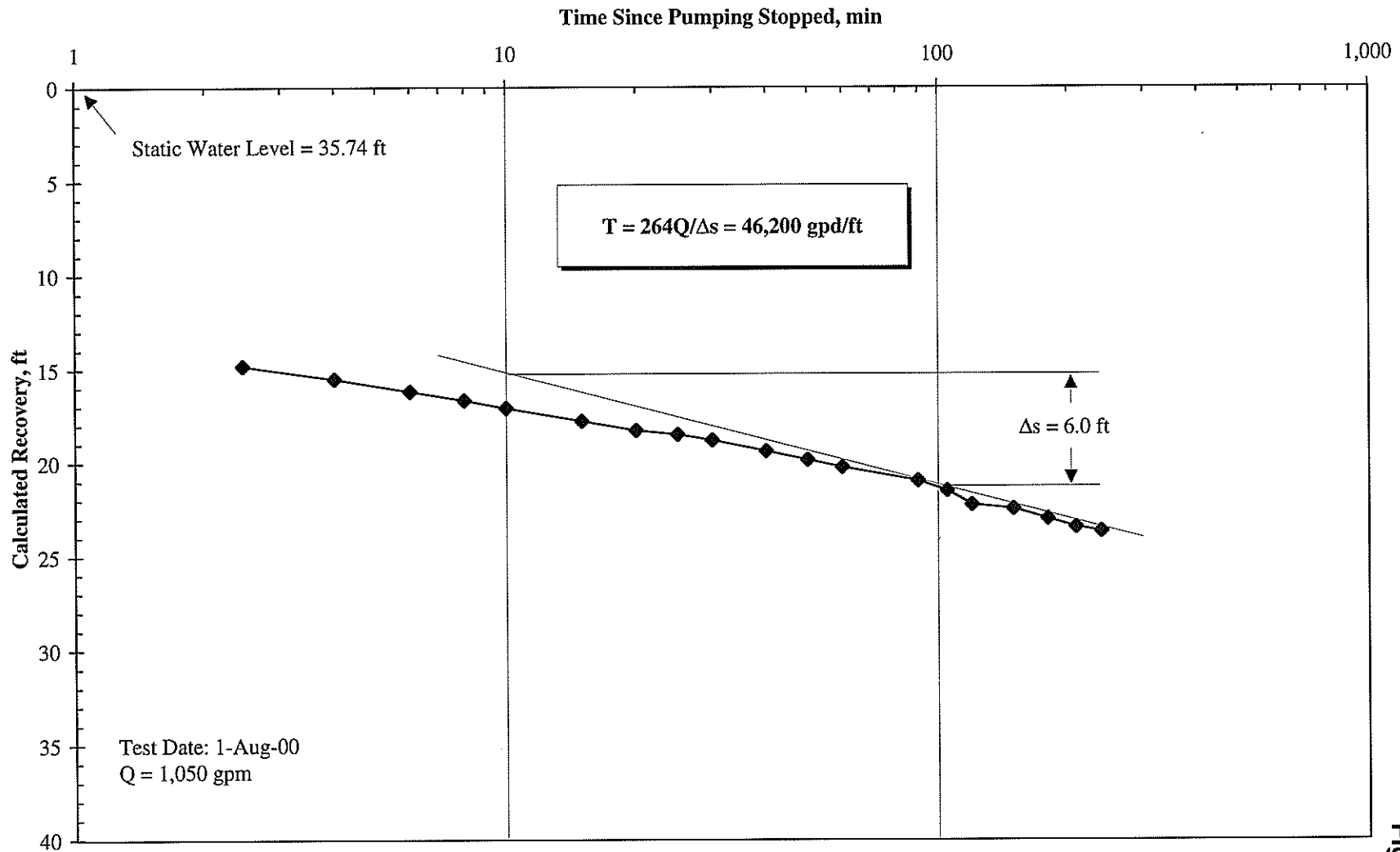


Figure 11

THEIS RECOVERY METHOD
BIG BEAR CITY COMMUNITY SERVICES DISTRICT WELL NO. 3A
(OBSERVATION WELL)

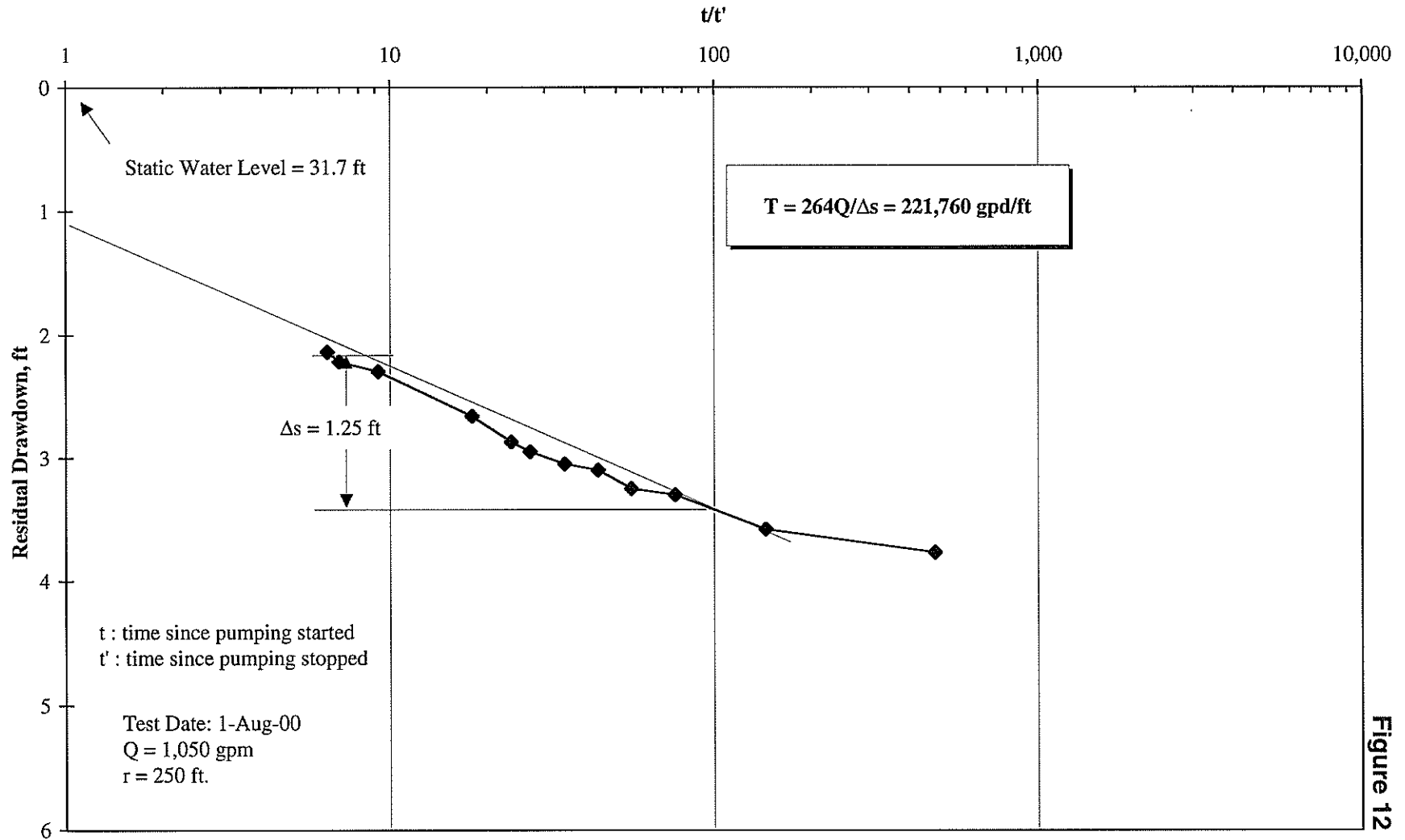


Figure 12

**CALCULATED RECOVERY ANALYSIS
BIG BEAR CITY COMMUNITY SERVICES DISTRICT WELL NO. 3A
(OBSERVATION WELL)**

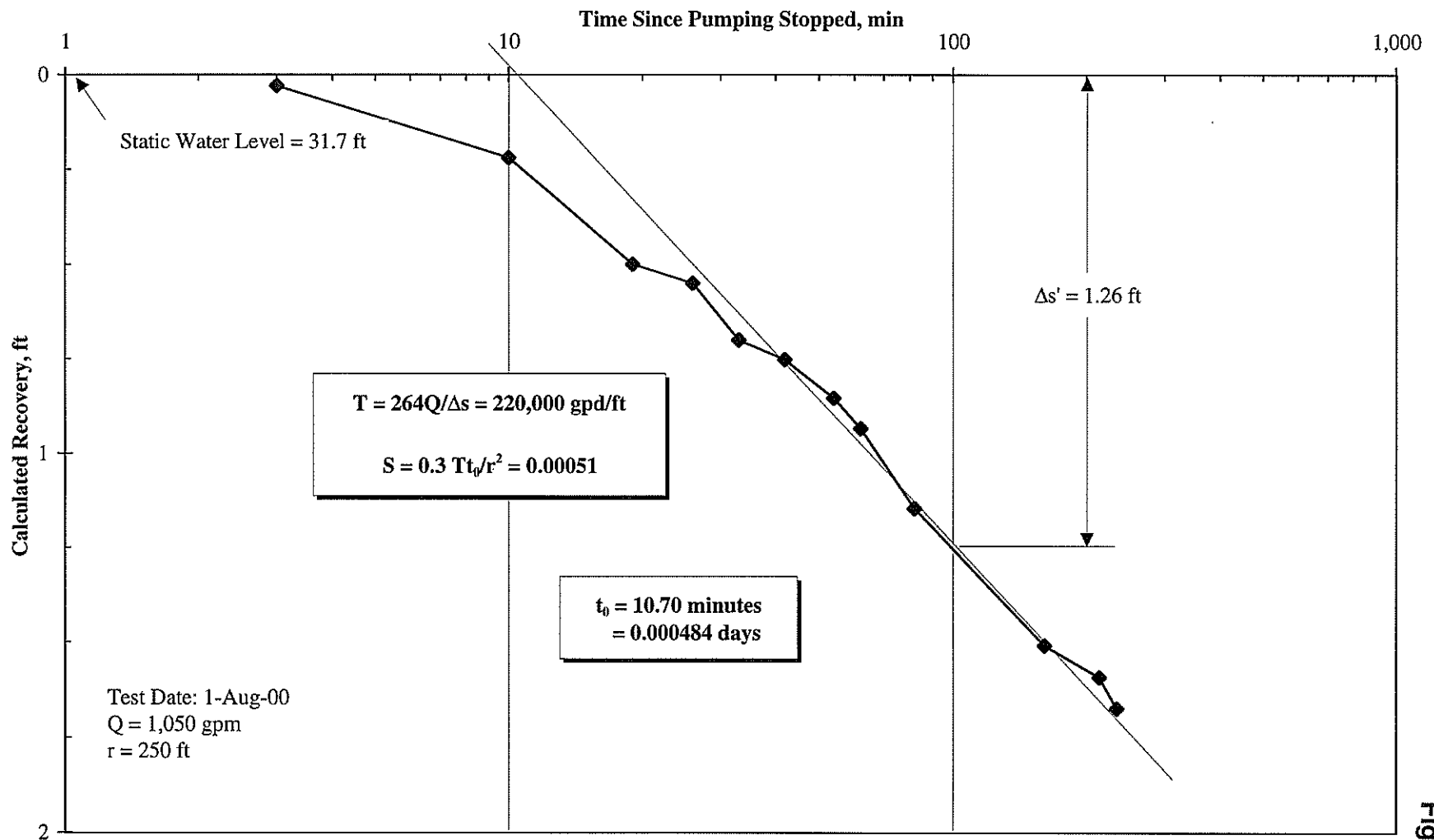


Figure 13

ESTIMATE OF DRAWDOWN AFTER ONE YEAR OF PUMPING BIG BEAR CITY COMMUNITY SERVICES DISTRICT WELL NO. 3B

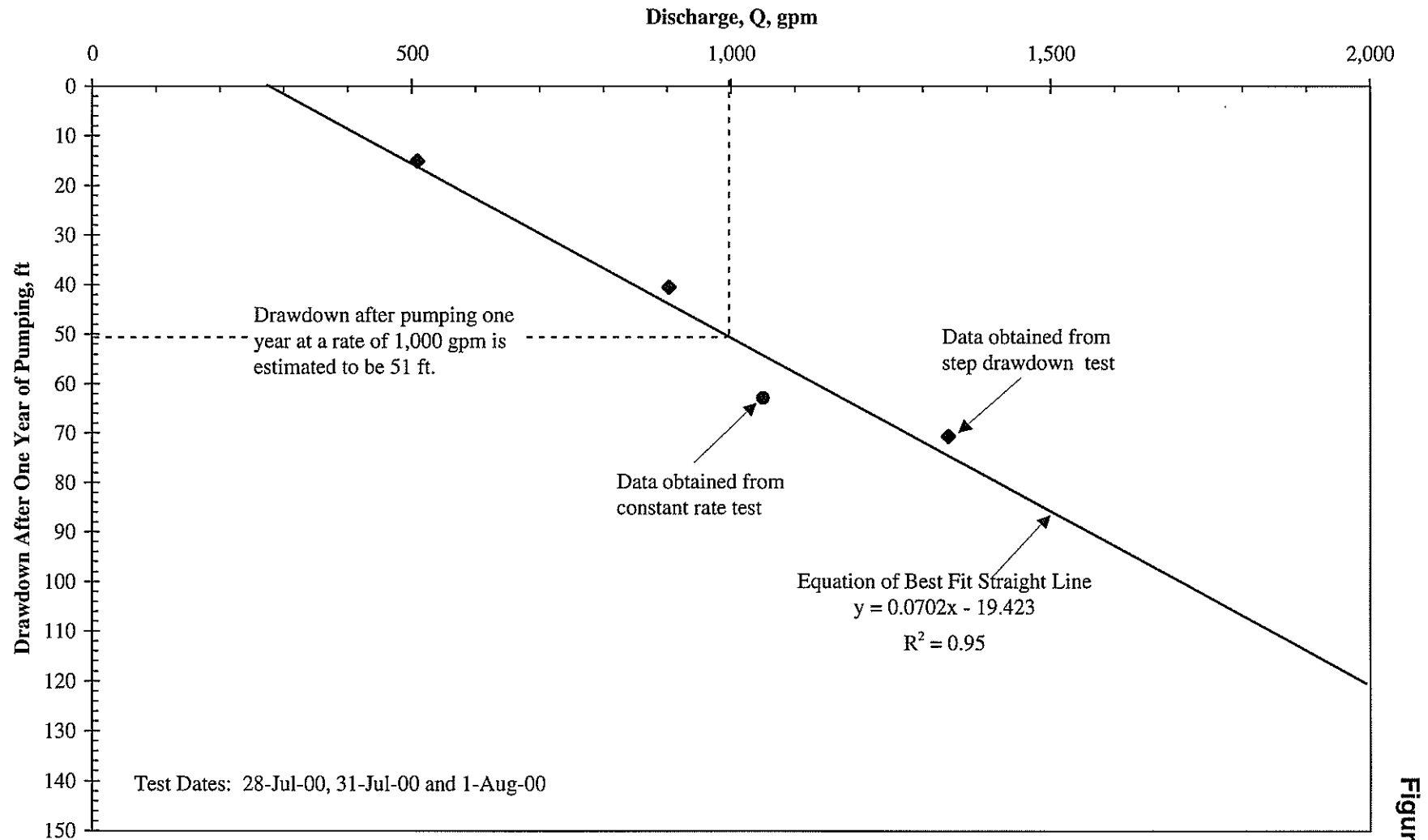


Figure 14

**GALLONS PER MINUTE PER SCREENED INTERVAL
BIG BEAR CITY COMMUNITY SERVICES DISTRICT WELL NO. 3B**

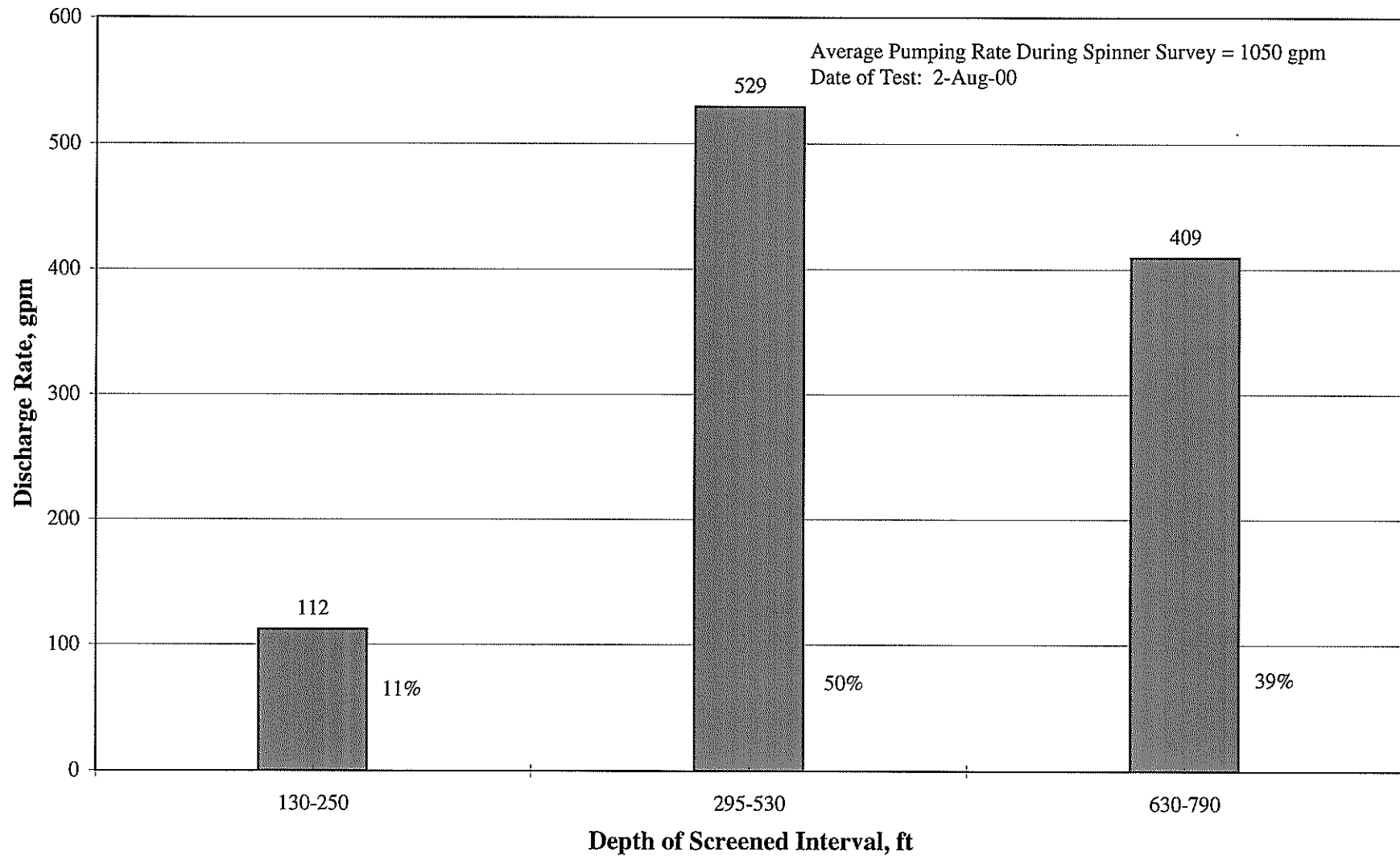


Figure 15

Figure 16

TRILINEAR DIAGRAM
USING AQUIFER ZONE TEST WATER QUALITY DATA
BIG BEAR CITY COMMUNITY SERVICES DISTRICT WELL NO. 3B

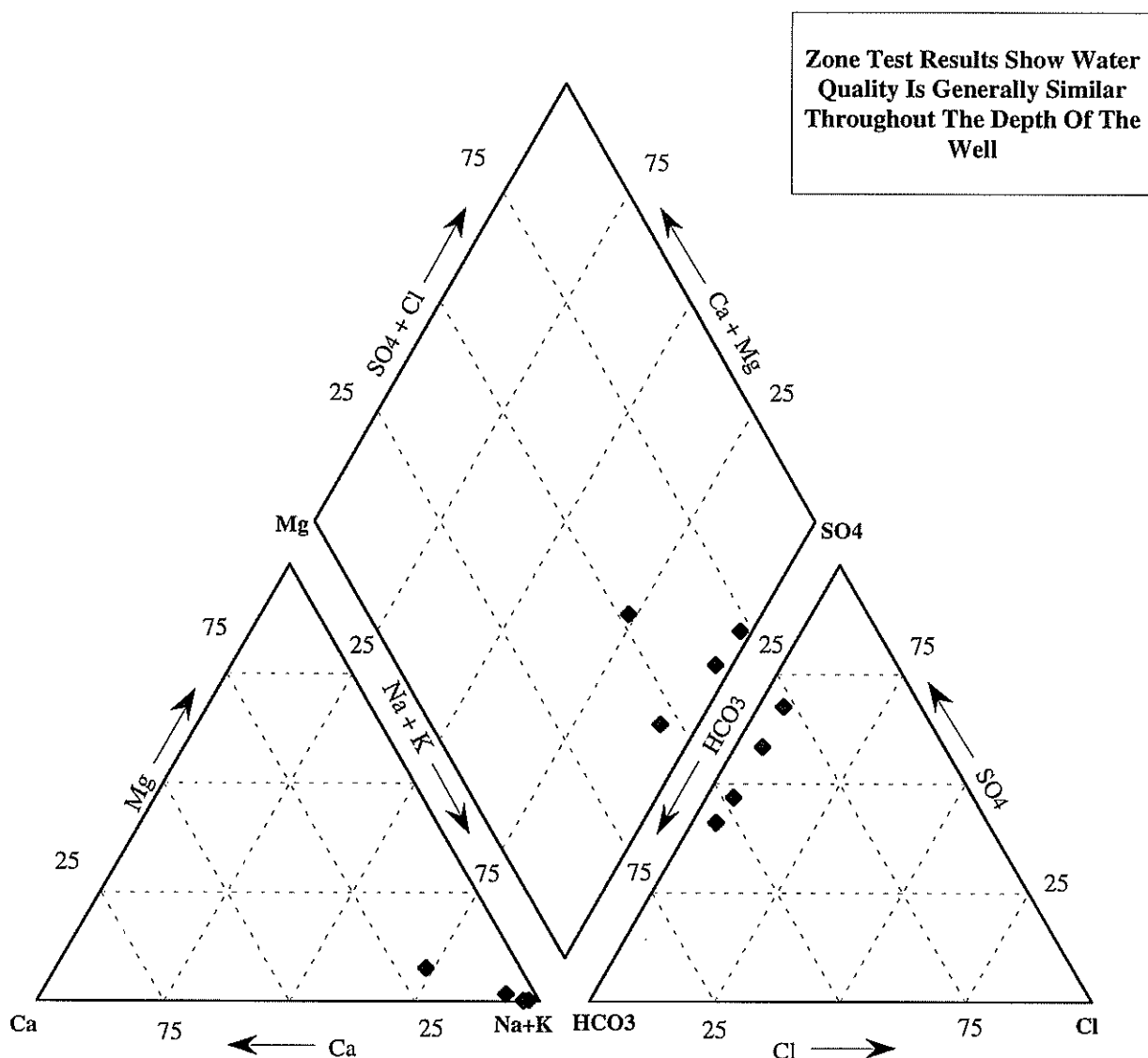
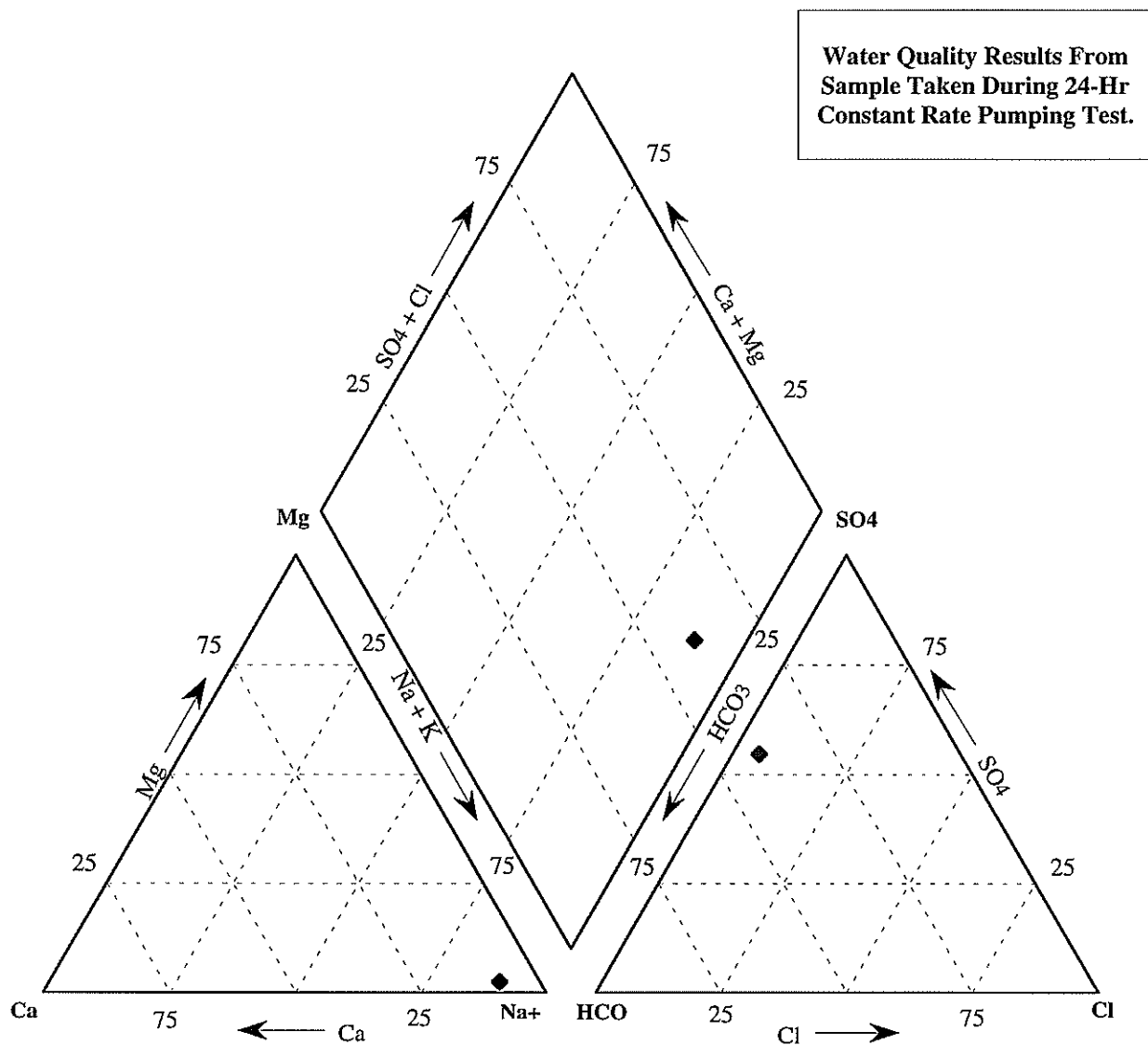


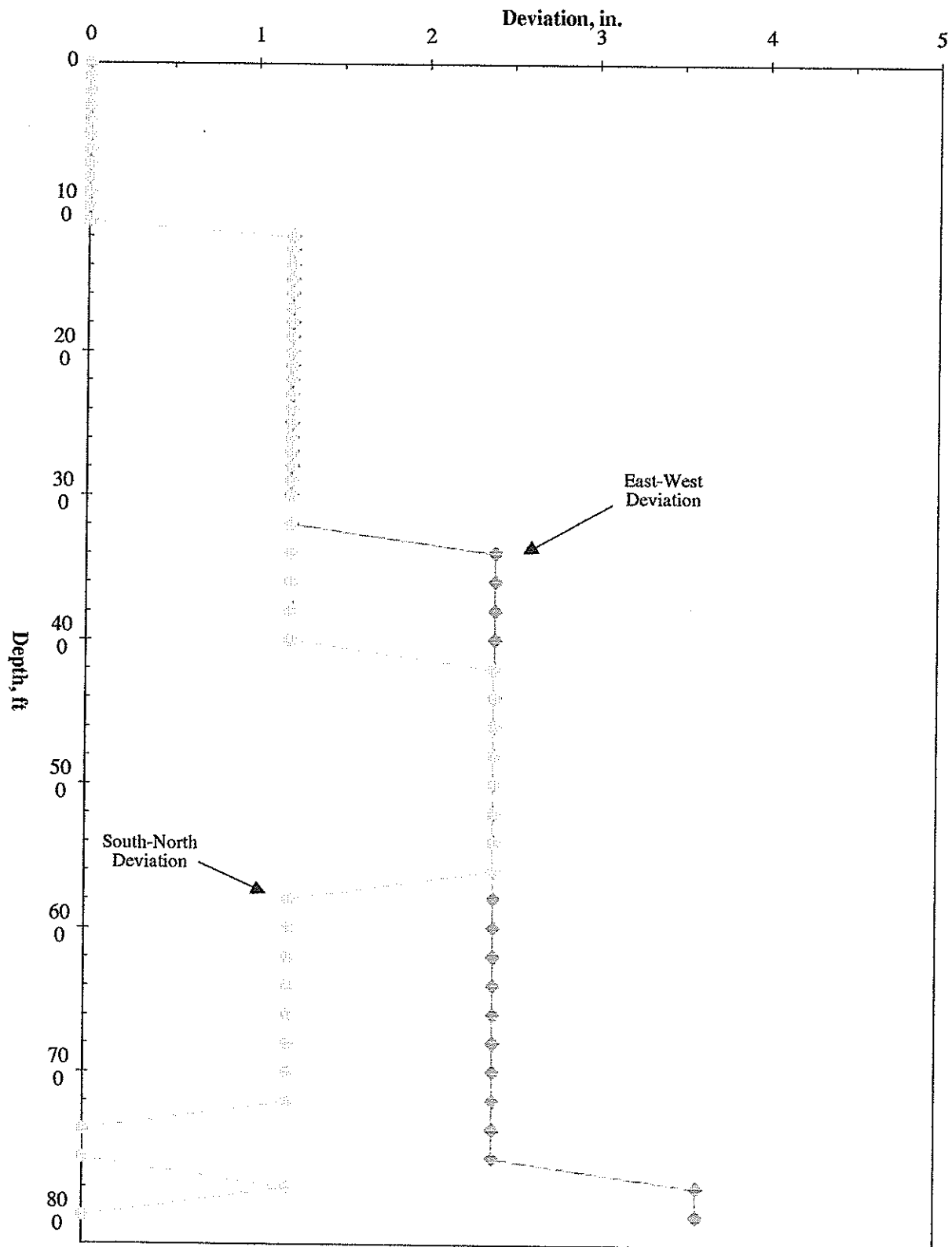
Figure 17

**TRILINEAR DIAGRAM USING
COMPLETED WELL WATER QUALITY DATA
BIG BEAR CITY COMMUNITY SERVICES DISTRICT WELL NO. 3B**



DEVIATION SURVEY PLOT BIG BEAR CITY COMMUNITY SERVICES DISTRICT WELL NO. 3B

Figure 18



Data Source: Pacific Surveys, Inc.

23-Oct-00

GEOSCIENCE Support Services, Inc.

TABLES

GEOSCIENCE Support Services, Inc.



**TABLE 1: SUMMARY OF WELL CONSTRUCTION DETAILS FOR
BIG BEAR CITY COMMUNITY SERVICES DISTRICT WELL NO. 3B**

General Information		
Owner Well No.: BBCCSD Well No. 3B	Latitude:	Hydrologic Unit: West Baldwin Subunit
State Well Number:	Longitude:	Geological Setting: Alluvial materials overlying consolidated quartzite and granitic rocks
Well Owner: Big Bear City Comm. Svcs. District	Land Surface Elevation: 6720 ft AMSL	Use of Water: Municipal
Owner Address: Shore Drive and Maltby Blvd. Big Bear City, CA 92314	Well Location: 150' N-NE of intersection of Maltby Blvd. and Shore Dr.	
Drilling Equipment		
Drilling Rig Type: Reverse Rotary	Mud Reservoir Type: Above-ground tank	
Pilot Borehole Bit Size/Type: 17 1/2 inch mill-tooth roller cone	Mud Additives: None	
Reamed Borehole Bit Size/Type: 26 inch dia. mill-tooth roller cone to 807' then 17 1/2 inch to 820'	Method of Cutting Recovery: Sample collection box	
Conductor Casing and Sanitary Seal		
Conductor Casing OD: 26 in.	Conductor Borehole Diameter: 36 in.	Annular Seal Depth: 52 ft
Wall Thickness: 5/16 in.	Start Date of Conductor Borehole: 3-May-00	Composition of Sanitary Seal: 10.3 sack sand-cement slurry
Casing Length: 52 ft.	Completion Date of Conductor Borehole: 5-May-00	Date of Seal Placement: 5-May-00
Casing Material: Mild Steel	Date Conductor Casing Set: 5-May-00	Witness of Seal Placement: GEOSCIENCE personnel
Borehole Drilling and Logging		
Pilot Borehole Diameter: 17 1/2 in.	Reamed Borehole Diameter: 24 inches	Geophysical Logs Run: 3-Jun-00
Start Date of Pilot Borehole: 30-May-00	Start Date of Borehole Reaming: 20-Jun-00	16"/64" Normal Resistivity Laterolog 3 (focused resist.)
Completion Date of Pilot Borehole: 2-Jun-00	Completion Date of Borehole Reaming: 24-Jun-00	Sonic/NDDL Gamma-Ray
Total Depth of Pilot Borehole: 790 ft	Total Depth of Reamed Borehole: 26 inches to 807 ft 17 1/2 inches to 820 ft	Spontaneous Potential (SP) Caliper (26-Jun-00)
Casing, Screen, Filter Pack And Annular Seals		
Start Date of Casing and Screen Install.: 27-Jun-00	Date of Completion of Casing & Screen Install.: 27-Jun-00	Completed Depth: 810 ft
Casing ID: 14 in.	Screen ID: 14 in.	Filter Pack: Don Kelland Materials Custom 4 x 8 Blend
Casing Wall Thickness: 5/16 in.	Screen Wall Thickness: 5/16 in.	Method of Placement: Fluid circulation through tremie pipe
Casing Type: Roscoe Moss spirally welded	Screen Type: RMC Ful- Flo Louvers with 3/32" openings	Start Date of Filter Pack Placement: 27-Jun-00
Casing Material: ASTM A606 (HSLA)	Screen Material: ASTM A606 (HSLA) Steel	Completion Date of Filter Pack Placement: 27-Jun-00
Cased Intervals: 0-130, 250-295, 530-630, 790-810 ft	Screened Intervals: 130-250, 295-530, 630-790 ft	Annular Seals: 85 ft to ground surface, with fine sand from 85 to 90 ft
Sounding Tube Size & Length: 2 in., 0-128 ft	Gravel Feed Pipe Size & Length: 3 in. sch 40, 0-95 ft	

DEVIATION SURVEY DATA
BIG BEAR CITY COMMUNITY SERVICES DISTRICT WELL NO. 3B

Table 2

Depth [in.]	Deviation Angle (deg)	Deviation Reading [in.]	
		North-South	East-West
0	0.00	0.00	0.00
10	0.00	0.00	0.00
20	0.00	0.00	0.00
30	0.00	0.00	0.00
40	0.00	0.00	0.00
50	-36.50	0.00	0.00
60	-54.62	0.00	0.00
70	1.71	0.00	0.00
80	-1.33	0.00	0.00
90	-14.19	0.00	0.00
100	-21.56	0.00	0.00
110	-31.82	0.00	0.00
120	-43.54	1.20	1.20
130	-46.36	1.20	1.20
140	-45.11	1.20	1.20
150	-43.46	1.20	1.20
160	-43.54	1.20	1.20
170	-37.06	1.20	1.20
180	-33.50	1.20	1.20
190	-30.28	1.20	1.20
200	-27.77	1.20	1.20
210	-27.77	1.20	1.20
220	-27.77	1.20	1.20
230	-27.77	1.20	1.20
240	-27.77	1.20	1.20
250	-29.67	1.20	1.20
260	-34.77	1.20	1.20
270	-40.72	1.20	1.20
280	-43.54	1.20	1.20
290	-43.54	1.20	1.20
300	-43.54	1.20	1.20
320	-49.33	1.20	1.20
340	-60.46	1.20	2.40
360	-62.19	1.20	2.40
380	-58.94	1.20	2.40
400	-59.28	1.20	2.40
420	-55.86	2.40	2.40
440	-52.40	2.40	2.40
460	-52.40	2.40	2.40

DEVIATION SURVEY DATA
BIG BEAR CITY COMMUNITY SERVICES DISTRICT WELL NO. 3B

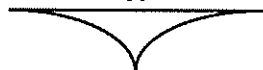
Table 2

Depth [in.]	Deviation Angle (deg)	Deviation Reading [in.]	
		North-South	East-West
480	-48.98	2.40	2.40
500	-46.46	2.40	2.40
520	-46.46	2.40	2.40
540	-46.46	2.40	2.40
560	-47.05	2.40	2.40
580	-54.52	1.20	2.40
600	-58.05	1.20	2.40
620	-58.05	1.20	2.40
640	-61.85	1.20	2.40
660	-65.62	1.20	2.40
680	-68.45	1.20	2.40
700	-70.98	1.20	2.40
720	-75.05	1.20	2.40
740	-78.10	0.00	2.40
760	-78.10	0.00	2.40
780	-77.96	1.20	3.60
800	-80.57	0.00	3.60

Source: Pacific Surveys, Inc.

APPENDIX A
Chronology of Construction

GEOSCIENCE Support Services, Inc.



CHRONOLOGY OF CONSTRUCTION
BIG BEAR CITY COMMUNITY SERVICES DISTRICT WELL NO. 3B

- 3-May-00** South West Pump & Drilling mobilized to the site and began drilling the 36 inch diameter conductor borehole using a bucket auger rig. Drilled to a depth of only 5 feet by 5:15 PM.
- 4-May-00** South West continued drilling the 36 inch diameter conductor borehole. Drilled to a depth of 29 feet by 6:00 PM.
- 5-May-00** Continued drilling the 36 inch diameter conductor borehole. Reached the final depth of 50 feet at 12:45 PM. The 26 inch OD x 5/16" wall conductor casing was set to 52 feet. Cement slurry pumped into the annular space through a tremie pipe.
- 30-May-00** Began drilling 17 1/2 inch diameter pilot borehole. Reached a depth of 90 feet by 8:45 PM.
- 31-May-00** Continued drilling the pilot borehole. Reached depth of 210 feet at 11 AM.
- 1-Jun-00** Continued drilling the pilot borehole. Reached a depth of 630 feet without encountering bedrock. Drilling temporarily halted for repairs to the rig. Reached a depth of 650 feet by 10:30 PM.
- 2-Jun-00** Drilling temporarily delayed at 710 ft while South West Pump checked the condition of the drill bit. Drilling of the 17 1/2 inch pilot borehole was resumed at 2:30 PM. Reached the total depth of 790 feet by 11:30 PM.
- 3-Jun-00** All drilling tools were removed from the hole by 4:00 AM. Pacific Surveys arrived at 4:20 AM to perform the geophysical logs. All logs were completed by 7:00 AM.
- 5-Jun-00** South West Pump begin setting up to run Zone Test No. 1 from 640 to 660 feet.
- 6-Jun-00** South West Pump completed setting up to run Zone Test No. 1. Airlifting was begun and completed by 3:00 pM. South West Pump installed the submersible pump for testing. By 10:00 PM, word was received that the wrong pump was installed in the borehole and would have to be changed.

Appendix A

Chronology Of Construction: Big Bear City Community Services District Well No. 3B

23-Oct-00

- 7-Jun-00** South West Pump began pumping from Zone No. 1 at 2:00 AM with larger pump. By 6:00 AM, Zone No. 1 was pumping at ~200 gpm and the discharge was clear. Water quality samples were collected at 6:10 AM. The tools were removed from the hole and reset in Zone No. 2. South West Pump completed airlifting from Zone No. 2 (480-500 feet bgs) by 8:00 PM. The pump was installed and began pumping at 9:30 PM. Zone No. 2 was pumping 180 gpm and the discharge was clear at 11:20 PM.
- 8-Jun-98** Collected water quality samples from Zone No. 2 at 7:30 AM. Tools were pulled, cleaned and reset in Zone No. 3. By 4:30 PM, airlifting began on Zone No. 3 (300-320 feet bgs). Zone No. 3 was clear by 7:20 PM. South West Pump began installation of the pump for Zone No. 3 at 8:00 PM.
- 9-Jun-00** Collected water quality samples from Zone No. 3 at 10:15 AM. Zone No. 3 was pumped at 175 gpm.
- 13-Jun-00** Pumping from Zone No. 4 (130-150 feet bgs) at ~66 gpm at 7:55 AM. Discharge water is clear. Collected water quality samples at 8:00 AM.
- 20-Jun-00** South West Pump ran the reaming bit into the pilot borehole. Began reaming the pilot borehole to 24 inch diameter at 10:00 AM. Reached 100 feet at 7:00 PM.
- 21-Jun-00** Continued reaming the 24 inch diameter borehole. Reached 292 feet by 10:00 PM.
- 22-Jun-00** Continued reaming the 24 inch diameter borehole. Reached 452 feet by 7:00 PM.
- 23-Jun-00** Continued reaming the 24 inch diameter borehole. Reached 750 feet by 11:00 PM. Three loads of gravel pack material were delivered to the site.
- 24-Jun-00** Reamed 24 inch diameter borehole to 807 feet by 11:00 AM. South West Pump removed the bit due to extremely slow drilling. A 17 1/2 inch pilot bit was used to finish the borehole. The total depth of 820 feet was reached at 5:05 PM using the 17 1/2 inch bit.
- 26-Jun-00** Caliper log run by Pacific Surveys at 11:15 AM. Well casing was delivered to the site and inspected by GEOSCIENCE. South West Pump decided to begin setting the casing tomorrow.

- 27-Jun-00** By 1:20 PM both the 14 inch ID x 5/16" wall high-strength low-alloy (ASTM A606) well casing and the Ful-Flo louvered screen (3/32" slot size) was set to a total depth of 810 feet bgs (screen to 790 ft bgs). The 4 x 8 custom blend filter pack was installed from 818 to 92 feet bgs by 11:15 PM using a tremie pipe.
- 28-Jun-00** South West Pump added more filter pack to the annular space, bringing it up to a depth of 90 feet bgs before adding fine transition sand to the annular space. The top of the sand was tagged at 85 feet bgs. Type II 10.3 sack cement slurry was pumped into the annular space at 11:30 AM until it was visible at the ground surface.
- 29-Jun-00** South West Pump began airlifting the interval from 130 to 200 ft bgs. Each 10 ft interval was developed for ~1 hour, and was initially very dirty but cleared up quickly. Work halted at 8:30 PM due to the air compressor breaking down.
- 30-Jun-00** Air compressor was repaired at 10:20 AM. Airlifting was resumed. However, South West Pump shut down at 3:00 PM for the holiday weekend.
- 5-Jul-00** South West Pump resumed airlifting, working 24 hrs/day until completed. Airlifted and swabbed from 130 to 450 feet bgs. Discharge cleared quickly.
- 6-Jul-00** By 1:30 PM, the first airlifting pass down was completed and the 2nd upward pass was begun. Airlifting from 480-520 feet bgs at 11:10 PM.
- 7-Jul-00** South West Pump continued airlifting from 360-400 ft bgs.
- 8-Jul-00** Completed airlift development by 2:00 AM.
- 10-Jul-00** South West Pump demobilized the drilling rig.
- 24-Jul-00** At 1:30 PM South West Pump began pump development. Static water level measured at 33' 5" by wireline sounder.

- 25-Jul-00** Pump development continued. Started at 200 gpm. Trace fine sand on startup, cleared quickly, with a specific capacity of 50 gpm/ft. At 400 gpm, no sand, with specific capacity of 33 gpm/ft. At 600 gpm, no sand, with specific capacity of 43 gpm/ft. At 800 gpm, no sand, with specific capacity of 57 gpm/ft. At 1000 gpm, no sand, with specific capacity of 56 gpm/ft. Surged 3 times at 200, 400, 600, and 800 gpm. Broken discharge pipe caused development operations to shut down.
- 26-Jul-00** Pump development continued at 11:00 AM. Discharge rate was increased to 1,200 gpm.
- 27-Jul-00** Pump development continued. At the maximum discharge rate of 1,600 gpm there was less than 2 ppm sand and pipe scale. Pumped again at 400, 1,200, and 1,600 gpm. Pump development was completed at 4:45 PM.
- 28-Jul-00** At 8:00 AM, the step drawdown test was begun. There were three steps at rates of 507, 903, and 1,340 gpm. At the end of the test, at a rate of 1,340 gpm, there was no sand and the specific capacity was 42 gpm/ft. The test was completed at 2:00 PM.
- 31-Jul-00** At 12:00 PM, the constant rate pump test was started at 1,050 gpm. Nearby Wells No. 3 and 3A were monitored to help determine transmissivity and storativity for the aquifer(s).
- 1-Aug-00** Water quality samples were collected from Well No. 3B. The constant rate pumping test was completed at 12:00 PM with no sand, and a specific capacity of 43.6 gpm/ft. Once the pump was shut down, recovery levels were monitored in Wells No. 3, 3A, and 3B.
- 2-Aug-00** Pacific Surveys ran a spinner log at 12:50 PM. The test was completed at 3:45 PM.
- 17-Aug-00** Pacific Surveys performed a videolog of the well at 10:30 AM. Perforated intervals appeared clean and in good condition. At 11:00 AM, Pacific Surveys ran a deviation survey in the well, and showed that the well was very straight. A broken PVC airline was observed in the bottom of the well. At 12:15 PM, the well cover was locked.

APPENDIX B
GEOSCIENCE's Daily Field Notes

GEOSCIENCE Support Services, Inc.



DAILY FIELD NOTES

Logged by : Diane Smith

GSS Project Number : 561

Sheet 1 of 1

Date : 1-Feb-00

Time Arrived :

Time Left :

GSS Project Name : Big Bear City Community Services District Well No. 3B

Project Location : Shore Drive & Maltby Blvd, Big Bear City, California

☐ Well Construction. Drilling Contractor :

Rig Type :

☐ Pump Test. Pumping Contractor :

Pump Type :

☐ Site Reconnaissance.☒ Other.

NOTES

PRE - BID MEETING

Contacts:

Roger Langley - Water Development Corporation
 Gary Keller - Big Bear City Community Services District
 Curt and Traci McCalla - South West Pump and Drilling
 Diane Smith - GEOSCIENCE

Packer Tests:

3A and 3 to determine fluoride concentrations.
 Start date - March.
 Will be raising well pad by ~4-5 ft due to high water level of Baldwin Lake.

Well No. 3A:

Will abandon this summer after 3B is on line (separate bid sheet).

Well No. 3B:

Work hours will be 24 hours/day or 12 hours will be acceptable.
 Whisper quiet mufflers will be needed.
 Sound barriers may be required. Big Bear City CSD will evaluate bid prices and consider the possibility of removing the sound barrier requirement.
 Regarding NPDES, well flows at surface from time to time. So far there has been no special requirements.
 No silt can be allowed to enter the lake. Hay bales can be used to halt the suspended solids and the water allowed to percolate into the ground.

Prevailing wage rates do apply. Big Bear CSD will supply the rates.

Site is fenced, chain link.

Cuttings can be spread onsite.

The pilot borehole will be drilled to bedrock. Water Development would recommend using direct mud in order to keep the weighted mud system in good shape.

Test pumping water - contain until clear and then flow to lake (natural drainage).

Liquidated Damages: \$250/day, 90 working days contract time.

Bid Date: February 15, 2:30PM public bid opening.

Cell Phones: Pacbell (Sprint does not work, Nextel works, LA Cellular is unknown).

DAILY FIELD NOTES

Logged by : Diane Smith

GSS Project Number : 561

Sheet 1 of 1

Date : 8-Feb-00

Time Arrived :

Time Left :

GSS Project Name : Big Bear City Community Services District Well No. 3B

Project Location : Shore Drive & Maltby Blvd, Big Bear City, California

☐ Well Construction. Drilling Contractor :

Rig Type :

☐ Pump Test. Pumping Contractor :

Pump Type :

☐ Site Reconnaissance.☒ Other.

NOTES

PRE - CONSTRUCTION MEETING

Site Visit: Okay to remove fence.
Water can be discharged to field NE of site.

Water Source: Reverse requires 300 to 400 gpm standby.
1 1/2 million gallon reservoir west of site (1/2 mile).
Hydrant at site.

Sound barriers to South and West (needs pump).

Big Bear CSD will remove vault covers, loading pen pallets, etc. (containers will stay).

DAILY FIELD NOTES

Sheet 1 of 1
Date : 18-Apr-00
Time Arrived :
Time Left :

Logged by : Diane Smith

GSS Project Number : 561

GSS Project Name : Big Bear City Community Services District Well No. 3B

Project Location : Shore Drive & Maltby Blvd, Big Bear City, California

- ☐ Well Construction. Drilling Contractor :
☐ Pump Test. Pumping Contractor :
☐ Site Reconnaissance.
☒ Other.

Rig Type :

Pump Type :

NOTES

Tim Moran
Gary Keller
Curt McCalla
Diane Smith

Contract documents delivered, everything is in place.
Curt would like two more copies of specs, B&W is okay.
Backhoe to be delivered tomorrow, followed by the drill rig, etc.
Notice to Proceed by the end of the week (to be dated May 1, 2000).
Construction meter to be installed by the end of the week, fees waived.

Telephone lists: Nextel service.

Rig 314: Gary Nelson, Driller - 12 hour shifts.
Edison Thomas, Driller.

TCE detected in Well No. 3 - need to run 8260 analysis in zone test analysis, plus fluoride.

Pipe dope - environmentally acceptable? Need MSDS sheet from Brian.

Inorganic analysis - Well No. 3 from last year, from Tim. Well No. 3 is a blend of the upper two zones.

Sound curtains on two sides only (west and south sides).

Development fluid - into field. Gary has NPDES waiver.

Conductor - drill in with rig, 2-3 days (daylight only).

Permit has been applied for.
South West Pump to contact Dig Alert.
Big Bear CSD will remove the fence.
2 1/2" pipeline, 10 psi source water.
Well No. 3 to be off line once Curt starts work.

DAILY FIELD NOTES

Sheet 1 of 1
Date : 3-May-00
Time Arrived : 5:15 PM
Time Left :

Logged by : Diane Smith

GSS Project Number : 561

GSS Project Name : Big Bear City Community Services District Well No. 3B

Project Location : Shore Drive & Maltby Blvd, Big Bear City, California

☒ Well Construction. Drilling Contractor : South West Pump & Drilling

Rig Type : Bucket Auger

☐ Pump Test. Pumping Contractor :

Pump Type :

☐ Site Reconnaissance.

☐ Other.

NOTES

1:00 PM Met with Curt McCalla and Brian at South West Pump offices. Bucket rig was mobilized today. Crews will set up and start drilling this afternoon.

5:15 PM Arrived at site. Crews have already shut down. Have dug ~4-5 feet with the auger. Approximately 55 feet of 30 inch diameter, 1/4 inch wall casing on ground.

DAILY FIELD NOTES

Sheet 1 of 1
Date : 4-May-00
Time Arrived : 3:00 AM
Time Left : 6:00 PM

Logged by : Diane Smith

GSS Project Number : 561

GSS Project Name : Big Bear City Community Services District Well No. 3B

Project Location : Shore Drive & Maltby Blvd, Big Bear City, California

- ☒ Well Construction. Drilling Contractor : South West Pump & Drilling
☐ Pump Test. Pumping Contractor :
☐ Site Reconnaissance.
☐ Other.

Rig Type : Bucket Auger

Pump Type :

NOTES

- 9:30 AM Spoke with Tim Lynch at Roscoe Moss. Assuming 1% ellipticity, the collapse strength of 30" OD x 1/4" wall casing is 31 psi. Assuming 2% ellipticity, it is 26 psi.
- 10:15 AM Spoke with Curt McCalla. He is not worried about collapse as they use it all the time. He was reminded of the calculations and suggested filling the casing with fluid and pouring the cement in lifts. He was reminded that he was deviating from the specs and that any problem will be on him. He will look into getting other casing up there - they will be ready for it this afternoon.
Specs call for 26" OD x 5/16" wall (67 psi).
Assuming 1 psi per foot of cement, need 50psi.
- 11:30 AM Curt can get 26" OD x 3/8" wall conductor to the site this afternoon.
- 3:00 PM Arrived at site. 36" borehole has been drilled to 20 feet. Tim Moran on site.
0 to 5 feet, moist organic soil
5 to 20 feet, sticky plastic clay, interbedded gray green plastic inorganic clays with soft organic / peaty clays, some inorganic clays, fairly stiff.
- 4:30 PM Drilling at 25 feet, clays sticky.
- 5:30 PM Drilling at 29 feet, drill stem sticking causing no weight on bucket which is accounting for some of the slow progress. Shut down rig to call Curt.
- 6:00 PM South West Pump crews will begin early tomorrow (Edison will drill) to get the conductor in tomorrow.

DAILY FIELD NOTES

Sheet 1 of 1
 Date : 5-May-00
 Time Arrived : 9:00 AM
 Time Left : 5:20 PM

Logged by : Diane Smith

GSS Project Number : 561

GSS Project Name : Big Bear City Community Services District Well No. 3B

Project Location : Shore Drive & Maltby Blvd, Big Bear City, California

☒ Well Construction. Drilling Contractor : South West Pump & Drilling

Rig Type : Bucket Auger

☐ Pump Test. Pumping Contractor :

Pump Type :

☐ Site Reconnaissance.

☐ Other.

NOTES

9:30 AM Drilling 36" borehole at 35 feet - clay still fairly dry and sandy, grey green color. Making progress difficult. Edison is drilling.
 New 26" OD x 5/16" wall conductor casing is on site.

10:15 AM Exchanging auger for bucket.

11:45 AM Drilling 36" hole at 43 feet.

12:45 AM Total depth of hole at 50 feet, starting to run casing.
 Welder is overheating, South West Pump personnel replaced the belts.
 Conductor casing is 26" OD x 5/16" wall x 19'. Three pieces for a total of 57 feet (Roscoe Moss).

3:30 PM Landed casing at 52' (5' of stickup), running tremie.

3:50 PM Concrete pumper on site. One load of 10.3 sack cement ordered.

4:23 PM Cement truck on site with 8 cubic yards 10 sack mix.

4:32 PM Pumping cement.

5:00 PM Cement to ~6 feet below ground surface. Dammed ditch. Started pulling tremie.
 8 cubic yards pumped.

5:20 PM Cut off 4' of casing, moved bucket rig forward and set backhoe bucket over casing.

0-5 feet -Organic soil, moist, crumbly, dark brown.

5-10 feet -Organic silty clay, dark brown, spongy resilient.

10-30 feet -Interbedded organic and inorganic clays. Alternating from sticky and plastic (silty and sandy clay) to very stiff and dry (sandy clay). Organic clays are soft and plastic, dark brown, peaty. Inorganic clays are variable, gray green and olive colored, some black clays.

30-43 feet -Stiff gray green and olive clay, sandy, fairly dry, hard.

43-48 feet -Dry, stiff sand, yellow brown clay. Drills much easier than the gray green clay.

48-50 feet -Yellow brown, sandy clay with well rounded cobbles and large gravels.

DAILY FIELD NOTES

Logged by : Diane Smith

GSS Project Number : 561

Sheet 1 of 1

Date : 8-May-00

Time Arrived : 1:30 PM

Time Left : 4:00 PM

GSS Project Name : Big Bear City Community Services District Well No. 3B

Project Location : Shore Drive & Maltby Blvd, Big Bear City, California

☒ Well Construction. Drilling Contractor : South West Pump & Drilling

Rig Type :

☐ Pump Test. Pumping Contractor :

Pump Type :

☐ Site Reconnaissance.☐ Other.

NOTES

1:30 PM

Spoke with Brian Jeffers at South West Pump regarding the drillers' shifts/crews, mobilization time and start date including Big Bear CSD's concerns about drillers.

4:00 PM

Spoke with Gary Keller regarding mobilization date of Wednesday May 10, 2000.
Tentative start date of Monday May 15, 2000.
Comment from Gary - contract time clock is ticking.

DAILY FIELD NOTES

Logged by : Diane Smith

GSS Project Number : 561

Sheet 1 of 1

Date : 23-May-00

Time Arrived : 2:00 PM

Time Left : 6:00 PM

GSS Project Name : Big Bear City Community Services District Well No. 3B

Project Location : Shore Drive & Maltby Blvd, Big Bear City, California

☒ Well Construction. Drilling Contractor : South West Pump & Drilling

Rig Type :

☐ Pump Test. Pumping Contractor :

Pump Type :

☐ Site Reconnaissance.☐ Other.

NOTES

2:00 PM Arrived at site. Not drilling yet. Have not completed sound barriers. Have not filled pit. Missing several victaulic couplings. Welding the circulation pit lines together. Edison to be on site at 6:00 PM for the night shift. Gary does not have a telephone. Sound curtains are 18 feet tall at most. Geolograph? Deviating survey tool? Mud checking equipment?

3:30 PM Check site. Still not ready. Crew thinks they will be ready by 6:00 PM when Edison comes on shift.

4:30 PM Spoke with Tim Moran, weather has been very hot, dry and windy. He is worried about coming Memorial Day weekend and increased water demand. Discussed waiting until Tuesday, May 30th, to start drilling to avoid having an open borehole next to Well No. 3 in case they need to use the well over the weekend (in addition to Well No. 3A).

5:10 PM Spoke with Curt McCalla regarding waiting until Tuesday, geolograph, phone, deviation tool etc.

6:00 PM Recieved call from Curt. He has discussed the situation with Gary Keller and Tim Moran and they will start drilling the pilot borehole on Tuesday May 30, 2000.

DAILY FIELD NOTES

Logged by : Diane Smith

GSS Project Number : 561

Sheet 1 of 1

Date : 30,31-May-00

Time Arrived :

Time Left :

GSS Project Name : Big Bear City Community Services District Well No. 3B

Project Location : Shore Drive & Maltby Blvd, Big Bear City, California

☒ Well Construction. Drilling Contractor : South West Pump & Drilling

Rig Type :

☐ Pump Test. Pumping Contractor :

Pump Type :

☐ Site Reconnaissance.☐ Other.

NOTES

30-May-00

3:30 PM Arrived at site, not drilling yet. Finishing set up.
MD Totco representative on site to set up geolograph and deviation tool.

4:30 PM Started rig engine, drill bit at 50 feet but not ready to circulate yet.

5:15 PM Running in airline. MD Totco representative off site.

6:30 PM Began drilling at 50 feet (17 1/2 inch hole).

7:15 PM Drilling at 70 feet.

8:20 PM Making connection at 90 feet.

8:45 PM Drilling at 90 feet. Left site.

31-May-00

7:00 AM Connection at 170 feet, crews are servicing the equipment.

10:30 AM Logged samples 50 to 210 feet.
Drilling at 210 feet.

11:30 AM Deviation survey at 210 feet.

DAILY FIELD NOTES

Logged by : Diane Smith

GSS Project Number : 561

Sheet 1 of 1

Date : 1-Jun-00

Time Arrived : 8:45 PM

Time Left : 10:30 PM

GSS Project Name : Big Bear City Community Services District Well No. 3B

Project Location : Shore Drive & Maltby Blvd, Big Bear City, California

☒ Well Construction. Drilling Contractor : South West Pump & Drilling

Rig Type :

☐ Pump Test. Pumping Contractor :

Pump Type :

☐ Site Reconnaissance.☐ Other.

NOTES

10:30 AM Spoke with Brian at South West Pump.
Drilling at 490 feet.

8:45 PM Arrived at site. 17 1/2 inch borehole has been drilled to 630 feet, no bedrock.

9:00 PM Spoke with Gary Keller. He does not want to go past 700 feet for now without additional authorization.
Drillers are currently welding up the swivel, washed out.

10:00 PM Very rocky at 664 feet, rounded quartzite pebbles. Drilling rate is 10 feet every 1 1/4 hours.
Estimate 700 feet at 7 or 8 AM, then 4 hours to trip out.

10:30 PM Running deviation survey at 650 feet. Still drilling in coarse sand and pebbles.
Left site.

DAILY FIELD NOTES

Sheet 1 of 2
 Date : 2-Jun-00
 Time Arrived : 7:55 AM
 Time Left :

Logged by : Diane Smith

GSS Project Number : 561

GSS Project Name : Big Bear City Community Services District Well No. 3B

Project Location : Shore Drive & Maltby Blvd, Big Bear City, California

- ☒ Well Construction. Drilling Contractor : South West Pump & Drilling
☐ Pump Test. Pumping Contractor :
☐ Site Reconnaissance.
☐ Other.

Rig Type :

Pump Type :

NOTES

2-Jun-00

- 7:55 AM Arrive at site. Drillers are tripping out of the hole to check the bit. Depth is 710 feet and was hard at the bottom. Formation interval is alluvium.
- 8:30 AM Spoke with Tim Moran and South West Pump regarding status of drilling. Almost out of hole except for collar and bit.
- 8:45 AM Gary Keller wants to keep going to bedrock. Spoke to South West Pump. Pacific Surveys on hook for late tonight.
- 10:30 AM Out of hole with collars and bit. Putting on new retip bit (long-tooth mill). Tim Moran and Gary Keller on site. Bit coming out of hole has most of the teeth well rounded and cones are loose. Logged cuttings from 210 to 710 feet.
- 11:50 AM Running collars back in hole.
- 1:50 PM On bottom and ready to drill after cleaning pits and circulating the borehole.
- 2:30 PM Resumed drilling at 710 feet.
- 5:10 PM Making correction at 743 feet, running deviation survey. Still in very coarse material.
- 6:00 PM Back to drilling at 743 feet. Logged remainder of cuttings.
- 7:30 PM Drilling at 750 feet, drilling rate is slowing down.
- 8:00 PM Drilling rate extremely slow at 755 feet, cemented material still drills rough and rocky but very slow.
- 9:00 PM Cuttings very angular (quartzite, granitics, and limestone) but otherwise appears the same as above 765 feet. Sandy clay layers from 769 to 770 feet. Spoke with Gary Keller and Tim Moran with status report. Instructed driller to make connection and keep drilling several more feet to make sure the material is cemented.
- 10:15 PM Drilling at 780 feet. Cuttings are angular, uniform size, less weathered. Drill string locking up easily, relatively slow penetration rate. Pacific Surveys set up for 5:00 AM.

DAILY FIELD NOTES

Logged by : Diane Smith

GSS Project Number : 561

Sheet 2 of 2

Date : 2,3-Jun-00

Time Arrived :

Time Left : 8:00 AM

GSS Project Name : Big Bear City Community Services District Well No. 3B

Project Location : Shore Drive & Maltby Blvd, Big Bear City, California

☒ Well Construction. Drilling Contractor : South West Pump & Drilling

Rig Type :

☐ Pump Test. Pumping Contractor :

Pump Type :

☐ Site Reconnaissance.☐ Other.

NOTES

2-Jun-00 Contd.

11:30 PM Total depth of pilot borehole is 790 feet. Same material, circulated hole.

3-Jun-00

12:00 AM Began to trip out.

4:00 AM Out of hole. The bit is well worn for only drilling 80 feet.

4:20 AM Mike Ridder of Pacific Surveys running e-log.

4:55 AM Running gamma/laterolog.

5:42 AM Running acoustic log.

7:00 AM Completed logs, rigging down and making copies.

8:00 AM Left site.

DAILY FIELD NOTES

Logged by : Diane Smith

GSS Project Number : 561

Sheet 1 of 1

Date : 5,6-Jun-00

Time Arrived :

Time Left :

GSS Project Name : Big Bear City Community Services District Well No. 3B

Project Location : Shore Drive & Maltby Blvd, Big Bear City, California

☐ Well Construction. Drilling Contractor :

Rig Type :

☒ Pump Test. Pumping Contractor : South West Pump & Drilling

Pump Type :

☐ Site Reconnaissance.☐ Other.

NOTES

5-Jun-00

~10:30 AM Provided South West Pump with verbal interval for Zone#1 (630-650 feet).

8:30 PM Received call from Brian at South West Pump. Due to length of tool, could not set at 630-650 feet.
Decision made that 640-660 feet was acceptable.

6-Jun-00

~9:30 AM Zone tool set and sealed, airlifting. Cleared within one hour. Lots of water, seal is good.
Instructed them to run the pump.

3:00 PM Airlifting established at ~300 gpm and clear.

10:00 PM Received call from South West Pump. Wrong pump was installed and is only pumping 30 gpm.
Instructed them to change the pump out and immediately resume pumping.

DAILY FIELD NOTES

Sheet 1 of 1
Date : 7-Jun-00
Time Arrived :
Time Left :

Logged by : Diane Smith

GSS Project Number : 561

GSS Project Name : Big Bear City Community Services District Well No. 3B

Project Location : Shore Drive & Maltby Blvd, Big Bear City, California

☐ Well Construction. Drilling Contractor :

Rig Type :

☒ Pump Test. Pumping Contractor : South West Pump & Drilling

Pump Type :

☐ Site Reconnaissance.

☐ Other.

NOTES

2:00 AM Pumping from Zone#1 (640 to 660 feet).
Pumping at 180 gpm with larger pump.

6:00 AM pH = 9.3 units
TDS = 216 gpm
Temp. = 26.3 degrees C
SWL = 2.7 after 1 minute, 2.5 after 30 minutes
PWL = 29 feet bgs
Top of gravel = 620 feet bgs
Top of seal = 605 feet bgs
Q = 18 to 18 1/2", orifice = 6" x 3" = ~180 gpm
No odor, air, or sand. Clear.

6:10 AM Collected water quality samples - General Mineral and General Physical.

6:20 AM Pump off, PWL = 28.5 feet, immediately rose to 5 feet bgs.

6:30 AM SWL = 2.7 feet bgs

7:00 AM SWL = 2.5 feet bgs

10:15 PM Received call from Curt. Ready to pump Zone#2. Airlifted from 6:30 PM to 8:00 PM, clear in 1 1/2 hours. Installed pump and started pumping at 9:30 PM.

11:20 PM Spoke with Curt. Zone is pumping clear at ~180 gpm. Made arrangements to collect water quality samples at around 7:00 AM, 8-Jun-00.

DAILY FIELD NOTES

Sheet 1 of 1
Date : 8-Jun-00
Time Arrived : 7:30 AM
Time Left : 7:20 PM

Logged by : Diane Smith

GSS Project Number : 561

GSS Project Name : Big Bear City Community Services District Well No. 3B

Project Location : Shore Drive & Maltby Blvd, Big Bear City, California

☐ Well Construction. Drilling Contractor :

Rig Type :

☒ Pump Test. Pumping Contractor : South West Pump & Drilling

Pump Type :

☐ Site Reconnaissance.☐ Other.

NOTES

7:30 AM Arrived at site, pumping from Zone#2 (480 to 500 feet bgs).
Collected water quality samples.
PWL = 48.8 feet bgs
SWL = 20.4 feet bgs after 2 minutes, 16.1 feet bgs after 10 minutes.
Q = 18 1/2", orifice = 3 1/2" x 6" = ~180 gpm
pH = 9.2 units
TDS = 256 ppm
Temp. = 23.2 degrees C
Top of gravel = 517 feet bgs
Top of Seal = 467 feet bgs
No odor, color, air or sand

7:45 AM Pump off, water level recovery slower than in Zone#1.
30 minute recovery = 14.1 feet bgs.
Pulling pump and tool.

4:30 PM Airlifting Zone#3 (300 to 320 feet bgs).
Top of gravel = 285 feet bgs
Top of seal = 274 feet bgs

7:20 PM Still airlifting. Zone is clear. Edison plans to pull the airline at 8:00 PM and install the pump.

DAILY FIELD NOTES

Logged by : Ben Stewart

GSS Project Number : 561

Sheet 1 of 1

Date : 9-Jun-00

Time Arrived : 10:15 AM

Time Left : 1:30 PM

GSS Project Name : Big Bear City Community Services District Well No. 3B

Project Location : Shore Drive & Maltby Blvd, Big Bear City, California

- ☐ Well Construction. Drilling Contractor :
- ☒ Pump Test. Pumping Contractor : South West Pump & Drilling
- ☐ Site Reconnaissance.
- ☐ Other.

Rig Type :

Pump Type :

NOTES

7:30 AM Calibrated instruments. Prepared equipment.

8:45 AM Left Claremont.

10:15 AM Arrived at Big Bear Well No. 3B.
Took samples for general mineral, general physical, fluoride, odor, VOC's

10:30 AM Took parameters.
pH = 8.2
TDS = 258 ppm
Temp. = 18.4 degrees C
PWL = 60.5 feet bgs
SWL = 2.5 feet bgs
Q = 17.5" = ~175 gpm

10:45 AM Left site.

1:30 PM Dropped off samples at APCL.

DAILY FIELD NOTES

Logged by : Diane Smith

GSS Project Number : 561

Sheet 1 of 1

Date : 13-Jun-00

Time Arrived : 7:55 AM

Time Left : 9:10 AM

GSS Project Name : Big Bear City Community Services District Well No. 3B

Project Location : Shore Drive & Maltby Blvd, Big Bear City, California

- ☐ Well Construction. Drilling Contractor :
- ☒ Pump Test. Pumping Contractor : South West Pump & Drilling
- ☐ Site Reconnaissance.
- ☐ Other.

Rig Type :

Pump Type :

NOTES

7:55 AM Pumping from Zone#4 (130 to 150 feet bgs).
pH = 8.3 units
TDS = 222 ppm
Temp. = 17.1 degrees C
Q = 2 1/2", orifice = 3 1/2" x 6" = ~66 gpm
PWL = 124 feet bgs

8:00 AM Collected water quality samples for general mineral, general physical, odor, and 8260.

8:16 AM Pump off. Recovery to 24 feet bgs in 1 minute.

8:26 AM Recovery of 22 feet bgs in 10 minutes.

8:45 AM Recovery of 21 feet bgs in 30 minutes.

9:10 AM Left site.

10:07 AM Handed samples to Emilie Mitescu in Redlands for delivery to APCL.

DAILY FIELD NOTES

Sheet 1 of 1
 Date : 19,20,21-Jun-00
 Time Arrived :
 Time Left :

Logged by : Diane Smith

GSS Project Number : 561

GSS Project Name : Big Bear City Community Services District Well No. 3B

Project Location : Shore Drive & Maltby Blvd, Big Bear City, California

☒ Well Construction. Drilling Contractor : South West Pump & Drilling

Rig Type :

☐ Pump Test. Pumping Contractor :

Pump Type :

☐ Site Reconnaissance.

☐ Other.

NOTES

19-Jun-00 Rig was not operating.

20-Jun-00

7:00 AM Ran reaming bit into borehole.

10:00 AM Reaming at 50 feet.

7:00 PM Reaming 24 inch hole at 100 feet. Gooseneck on kelly is plugging frequently with large rocks.

21-Jun-00

7:00 AM Reaming at 145 feet.

7:00 PM Reaming at 244 feet, drilling rate has increased.

7:30 PM Leave Claremont, get gas.

10:00 PM Arrive at well site. Edison (driller) is circulating at 292 feet.

10:20 PM Making connection, pumping off pits. Fluid appears thick.
 Geolograph to be started at midnight.
 Discussed the need to expedite the project. Should have hole down by Saturday.

11:00 PM Left site.

DAILY FIELD NOTES

Logged by : Diane Smith

GSS Project Number : 561

Sheet 1 of 2

Date : 22,23-Jun-00

Time Arrived :

Time Left :

GSS Project Name : Big Bear City Community Services District Well No. 3B

Project Location : Shore Drive & Maltby Blvd, Big Bear City, California

☒ Well Construction. Drilling Contractor : South West Pump & Drilling

Rig Type :

☐ Pump Test. Pumping Contractor :

Pump Type :

☐ Site Reconnaissance.☐ Other.

NOTES

22-Jun-00

7:30 AM Spoke with Brian. 24 inch hole reamed to 350 feet.

10:00 AM 24 inch hole reamed to 392 feet.

4:30 PM As per Roscoe Moss, the earliest casing will be ready by Monday morning.

7:00 PM 24 inch hole reamed to 452 feet.

23-Jun-00

7:20 AM 24 inch hole reamed to 552 feet. Pits have been thinned down, fluid looks good. Everything is going well. Spoke with Brian Jeffers to authorize filter pack (Don Kelland 1/4 x 12). Crews repairing airline connection inside the swivel.

9:50 AM As per Brian, first gravel truck is headed for Big Bear now. Casing will be ready Monday morning. Finish reaming 8:00 AM Monday, run casing Tuesday, airlift Friday. Curt would expect to be paid extra if his crews work over the weekend.

12:20 PM Spoke with Dr. Williams. We must insist on working Saturday without extra compensation to South West Pump as the crews did not work last Monday. Push to keep the schedule.

12:23 PM Brian out for next 1/2 hour. Curt out until next Thursday. Brian to when back in office.

2:05 PM Spoke with Brian Jeffers. South West Pump has no problem working the weekend. However, they expect to be compensated for the overtime. According to Brian, not working Monday should not matter as they had to wait for the Board's decision. The truth is that South West Pump was instructed to start reaming a 24 inch hole on Monday June 19th. The rig shut down from the 14th to 19th as per South West Pump's decision.

3:00 PM Spoke with Bill Hiatt. He has contacted South West Pump and asked that they drop off a trailer on Saturday so that it can be loaded and ready for pickup on Sunday evening. South West Pump said they would pick the casing up at 10:00 AM on Monday.

3:05 PM Spoke with Brian regarding the above schedule. He doesn't want to work the guys on Sunday and pay them overtime, resistant also to dropping off the trailer on Saturday. Brian will speak with Curt (Ralph at BBCCSD wants to turn on Well No. 3 by Tuesday).

DAILY FIELD NOTES

Sheet 2 of 2
Date : 23-Jun-00
Time Arrived :
Time Left :

Logged by : Diane Smith

GSS Project Number : 561

GSS Project Name : Big Bear City Community Services District Well No. 3B

Project Location : Shore Drive & Maltby Blvd, Big Bear City, California

- ☒ Well Construction. Drilling Contractor : South West Pump & Drilling
☐ Pump Test. Pumping Contractor :
☐ Site Reconnaissance.
☐ Other.

Rig Type :

Pump Type :

NOTES

23-Jun-00 Contd.

- 3:10 PM Spoke with Tom and Dr. Williams regarding the above conversations.
- 3:50 PM Spoke with Gary Keller to keep South West Pump moving, worry about the money later. The big push is to get water ASAP.
- 6:00 PM Reaming pass completed to 675 feet.
- 11:00 PM Reaming pass completed to 750 feet.
3 loads of gravel pack delivered (bulk). Collected samples of gravel pack.
Reaming progressing slowly, airlift may be plugged. Instructed driller (Edison) to get the weight indicators working by the time the casing will be run.
- 11:40 PM Pulling airline to check for rocks caught in it.
Left site.

DAILY FIELD NOTES

Sheet 1 of 1
Date : 24-Jun-00
Time Arrived :
Time Left :

Logged by : Diane Smith

GSS Project Number : 561

GSS Project Name : Big Bear City Community Services District Well No. 3B

Project Location : Shore Drive & Maltby Blvd, Big Bear City, California

- ☒ Well Construction. Drilling Contractor : South West Pump & Drilling
☐ Pump Test. Pumping Contractor :
☐ Site Reconnaissance.
☐ Other.

Rig Type :

Pump Type :

NOTES

- 6:00 AM Spoke to Edison. Drilling became very hard at 806 feet. Rig was rattling loudly at 3:00 AM and a neighbor complained about the noise. He was instructed to keep drilling and make as much footage as possible, if no headway made then trip out and finish the hole with a 17 1/2" bit.
- 11:00 AM Spoke with Gary Nelson. Edison reamed to 807 feet before pulling out the bit. The bit and ream are out of the hole and are both badly worn. Currently, a 17 1/2" pilot bit is being tripped in to finish the hole to 820 feet.
- 5:05 PM Hole total depth was 820 feet with 17 1/2" bit. Tripped out except for collars. Gary will return at 1:00 AM Monday night to run a cleanout pass before running a caliper log. They are to notify me of time schedule for caliper on Monday.

DAILY FIELD NOTES

Sheet 1 of 2
 Date : 26-Jun-00
 Time Arrived : 1:15 PM
 Time Left :

Logged by : Karl Seibert

GSS Project Number : 561

GSS Project Name : Big Bear City Community Services District Well No. 3B

Project Location : Shore Drive & Maltby Blvd, Big Bear City, California

- ☒ Well Construction. Drilling Contractor : South West Pump & Drilling
☐ Pump Test. Pumping Contractor :
☐ Site Reconnaissance.
☐ Other.

Rig Type :

Pump Type :

NOTES

11:00 AM Left Claremont.

1:15 PM Arrive at site. Spoke with Edison, received 6 copies of caliper logs.
 Casing is already offloaded lying next to site in little field, ~50 feet east. Began inspecting casing.

CASING	LENGTH	ID	OD	SLOT SIZE
Bottom	end cap OK 20' 30.5" 20' 8" to bottom	14"	14 1/2"	none
17	39' 11 7/8"	14"	14 5/8"	OK
4	40'	14"	14 5/8"	OK
16	40' 1/4"	14"	14 5/8"	OK
2	40' 1/2"	14"	14 5/8"	OK
3	40' 5/8"	14"	14 5/8"	OK
5	39' 11 3/4"	14"	14 5/8"	OK
6	40' 1/2"	14"	14 5/8"	blank
7	40' 1/4"	14"	14 5/8"	blank
8	40' 3/4"	14"	14 5/8"	20' blank at bottom
9	40' 3 1/8"	14"	14 5/8"	OK
10	40' 3/8"	14"	14 5/8"	OK
11	40' 3/8"	14"	14 1/2"	OK
12	40' 1/8"	14"	14 5/8"	OK
13	40' 1/3"	14"	14 5/8"	OK
15	40' 1/8"	14"	14 1/2"	20' blank at bottom
14	41' 1/8"	14"	14 1/2"	25' blank at top
18	40' 3/8"	14"	14 5/8"	screen, bottom to 20'
19	40' 2 1/2"	14"	14 5/8"	blank
20	40' 3/8"	14"	14 1/2"	blank
21	40' 3/8"	14"	14 5/8"	blank

1:30 PM Gary Keller on site.

1:45 PM Keller leaves.

2:00 PM Brian on site.

2:15 PM Brian leaves.

DAILY FIELD NOTES

Appendix B

Logged by : Karl Seibert

GSS Project Number : 561

Sheet 2 of 2

Date : 26-Jun-00

Time Arrived :

Time Left : 7:30 PM

GSS Project Name : Big Bear City Community Services District Well No. 3B

Project Location : Shore Drive & Maltby Blvd, Big Bear City, California

☒ Well Construction. Drilling Contractor : South West Pump & Drilling

Rig Type :

☐ Pump Test. Pumping Contractor :

Pump Type :

☐ Site Reconnaissance.

☐ Other.

NOTES

26-Jun-00 Contd.

2:30 PM Keller on site briefly.

3:15 PM Completed logging casing.

3:20 PM 8 pieces of tremie in. Going to run 25 joints for 760 feet total.

3:30 PM Diane Smith called. She will be here in 2 to 2 1/2 hours.

4:10 PM Gary Keller on site.

4:20 PM Keller leaves.

Gravel feed pipe: 5 pcs at 21' 3" each = 106' 3" x 3" diameter

Sounding tube: 6 pcs at 21' 3" each = 127' 6" x 2" diameter

5:00 PM Drillers continue laying tremie.

5:20 PM Drillers finished laying tremie. To begin laying 3" pipe.

5:45 PM Diane Smith arrives.

Conference with Edison about what Curt wants to do. Curt wants to close up and run casing in the morning. Diane and Dr. Williams disagree. Diane calls Dr. Williams. Curt does not have another crew for tonight so we will start with casing in the morning.

7:30 PM Left site.

9:10 PM Arrive Claremont.

DAILY FIELD NOTES

Logged by : Diane Smith

GSS Project Number : 561

Sheet 1 of 1

Date : 26-Jun-00

Time Arrived : 5:38 PM

Time Left : 7:45 PM

GSS Project Name : Big Bear City Community Services District Well No. 3B

Project Location : Shore Drive & Maltby Blvd, Big Bear City, California

☒ Well Construction. Drilling Contractor : South West Pump & Drilling

Rig Type :

☐ Pump Test. Pumping Contractor :

Pump Type :

☐ Site Reconnaissance.☐ Other.

NOTES

7:00 AM As per Gary Nelson, he is running the 17.5" bit into the borehole. He has 2 more stands of pipe to run before reaching the bottom.

9:45 AM Circulated hole and tripped out (no fill). Everything out of the hole except for drill collars. Pacific Surveys is on their way. The casing has not yet been delivered to site but is on the way.

5:38 PM Arrived on site. Tremie has been run to the bottom of the borehole. Karl has inspected and checked casing. Casing has been unloaded on the ground near the site and was not left at trailer. Minimal room for maneuvering the backhoe with a 40' section of casing. Edison building a lifting bail for the 3" SCH40 gravel feed pipe. Caliper log was run at 11:15 AM.

6:00 PM Curt wants the rig shut down tonight to start running casing early in the morning. Spoke with Dr. Williams. We must insist that the casing be run tonight. Curt eventually called DEW directly.

6:15 PM Dr. Williams approved the casing being run early in the morning. Start at 6:00 AM with Edison.

6:30 PM Inspected casing.

6:40 PM Received message from Dr. Williams that he has agreed to wait until morning to run casing.

7:45 PM Left site. 3" has been loaded, drillers securing site and laying down gravel on mud and soft gravel in front of rig.

DAILY FIELD NOTES

Appendix B

Logged by : Karl Seibert

GSS Project Number : 561

Sheet 1 of 2

Date : 27-Jun-00

Time Arrived : 9:15 AM

Time Left : 11:15 PM

GSS Project Name : Big Bear City Community Services District Well No. 3B

Project Location : Shore Drive & Maltby Blvd, Big Bear City, California

- ☒ Well Construction. Drilling Contractor : South West Pump & Drilling
☐ Pump Test. Pumping Contractor :
☐ Site Reconnaissance.
☐ Other.

Rig Type :

Pump Type :

NOTES

7:10 AM Left Claremont for Big Bear.

9:15 AM Arrive onsite. Drillers have 9 sections (340 feet), in ground welding section #10 (380 feet).
Talked to Edison, they started at 7:00 AM (battery on rig was dead). They tagged bottom at 818 feet.

9:30 AM Diane called for update.

10:00 AM Centralizers being welded on at joint 12 & 13.

10:25 AM Centralizers at joint 14 & 15.

11:00 AM Gary Keller arrives. Drillers welding sounding tube to casing 2 feet above top of perforation (128 feet bgs).

11:10 AM #18 goes up with sounding tube.

12:30 PM Centralizers at joint 19 & 20.

1:20 PM Casing set. Conductor sticks up 3' 4", casing sticks up 6' 9" above = 10' 1".

1:30 PM Top 5 feet of casing cut off, end cap welded on, setting up to run gravel pack. Diane called for update.

2:20 PM Begin running gravel down tremie (818-760 feet).

2:40 PM Removing top two tremie sections (62 feet).

3:20 PM Removing next two tremie sections (123 feet total).

3:40 PM Removing next two tremie sections (185 feet total).

4:20 PM Removing next two tremie sections (247 feet total).

4:55 PM Removing next two tremie sections (308 feet total).

5:30 PM New crew arrives from South West Pump. Removing next two tremie sections (371 feet total).

6:00 PM Removing next two tremie sections (433 feet total).

6:40 PM Removing next two tremie sections.

DAILY FIELD NOTES

Appendix B

Logged by : Karl Seibert

GSS Project Number : 561

Sheet 2 of 2

Date : 27-Jun-00

Time Arrived : 9:15 AM

Time Left : 11:15 PM

GSS Project Name : Big Bear City Community Services District Well No. 3B

Project Location : Shore Drive & Maltby Blvd, Big Bear City, California

☒ Well Construction. Drilling Contractor : South West Pump & Drilling

Rig Type :

☐ Pump Test. Pumping Contractor :

Pump Type :

☐ Site Reconnaissance.

☐ Other.

NOTES

27-Jun-00 Contd.

7:20 PM Removing next two tremie sections (62 more feet).

7:50 PM Waiting as the gravel mixer is refueled.

8:40 PM Running of gravel pack resumed.

9:00 PM Removing next two tremie sections (#19 and 20)

9:40 PM Removing next two tremie sections (21 and 22). Tagged at 150 feet, need 60 more feet.

10:15 PM Tagged 132 feet.

10:45 PM Tagged 112 feet. Need 1.5 yards (2 buckets).

11:15 PM Tagged 92 feet. Closing down for the night.
They will pump sand in the morning. Cement to arrive at 1:00 PM but may be earlier. They will call Diane if cement arrives earlier.
Leaving site.

DAILY FIELD NOTES

Sheet 1 of 1
Date : 27-Jun-00
Time Arrived :
Time Left :

Logged by : Diane Smith

GSS Project Number : 561

GSS Project Name : Big Bear City Community Services District Well No. 3B

Project Location : Shore Drive & Maltby Blvd, Big Bear City, California

- ☒ Well Construction. Drilling Contractor : South West Pump & Drilling
☐ Pump Test. Pumping Contractor :
☐ Site Reconnaissance.
☐ Other.

Rig Type :

Pump Type :

NOTES

9:20 AM Spoke with Karl. 400 feet of casing in the hole so far. Everything is going well.

2:00 PM Landing casing. Rigging up to pump filter pack.

5:05 PM As per Karl, have gravel pack, ~300 feet of hole, should finish by 7:30 PM.

5:15 PM Spoke with DEW regarding Big Bear. Karl to witness completion of gravel packing and be there for cementing tomorrow.

5:25 PM Spoke with Edison. Gravel at ~450 feet. Pulling 2 more joints of tremie. Nelson Thomas-Tennyson on tonight to finish gravel packing by 9:00 PM tonight. Cement is set up for 1:00 PM tomorrow (earliest they could get it).

5:30 PM Spoke with Karl with instructions regarding tagging the top of the gravel, cementing tomorrow and running in open ended (no sooner than 8 hours after cementing), taking samples, etc.

DAILY FIELD NOTES

Sheet 1 of 1
 Date : 28-Jun-00
 Time Arrived : 8:45 AM
 Time Left : 12:25 PM

Logged by : Karl Seibert

GSS Project Number : 561

GSS Project Name : Big Bear City Community Services District Well No. 3B

Project Location : Shore Drive & Maltby Blvd, Big Bear City, California

☒ Well Construction. Drilling Contractor : South West Pump & Drilling

Rig Type :

☐ Pump Test. Pumping Contractor :

Pump Type :

☐ Site Reconnaissance.

☐ Other.

NOTES

8:30 AM Update Tom and Diane by phone.

8:45 AM Arrive on site.
 Gary Nelson already on site. They tagged gravel at 92 feet today then put in two more feet of gravel and tagged at 90 feet. As I arrived, they were putting in fine sand layer.

9:15 AM Tagged sand at 86 feet. Will wait for it to settle and tag again when grout arrives.

10:45 AM Tagged sand at 86 feet. Added a foot of gravel, tagged at 85 feet.

11:15 AM Grout pumpers on site.
 Mixture: tri grade sand 23,380 to 23,385 lbs
 Type II 7,525 to 7,520 lbs
 well water 2,130 to 2,143 lbs
 0% calcium chloride
 water/cement = 0.414
 8 yards

11:30 AM Begin pumping cement to 85 feet. Get two samples, place in water.

11:50 AM Update Diane by phone.

11:55 AM Cement tagged at ground surface, drillers and pumpers begin to clean up.

12:10 PM Talked to Diane. She said she talked to Brian at South West Pump and they won't begin airlifting until morning. She also talked to Gary Keller at BBCCSD and informed him he could turn his adjacent well on after airlifting.

12:20 PM G. Keller stops by.

12:25 PM Collect sample in bucket and take to GEOSCIENCE.

3:30 PM Check grout sample, it spilled out en route but is hard and crumbles.

DAILY FIELD NOTES

Logged by : Diane Smith

GSS Project Number : 561

Sheet 1 of 1

Date : 28-Jun-00

Time Arrived :

Time Left :

GSS Project Name : Big Bear City Community Services District Well No. 3B

Project Location : Shore Drive & Maltby Blvd, Big Bear City, California

☒ Well Construction. Drilling Contractor : South West Pump & Drilling

Rig Type :

☐ Pump Test. Pumping Contractor :

Pump Type :

☐ Site Reconnaissance.☐ Other.

NOTES

7:45 AM Spoke with Gary Nelson. Cement is scheduled for 1:00 PM today. Top of gravel is at 92 feet, have not added any fine sand yet but will be adding it shortly. The importance of a good seal at the bottom was stressed. Tremie to be 8 feet of bottom.

8:20 AM Received call from Brian at South West Pump. Cement delivery was moved up to 11:00 AM

8:30 AM Spoke with Karl. He is almost at the well site.

9:02 AM Tagged top of sand at 8 feet. Need to wait at least 1/2 hour for the fine sand to settle. Could not tag inside the casing as cover is welded on and cannot get the sounding weight through the 2" transition.

11:45 AM As per Karl, the last of the load is being pumped.
Spoke with Brian at South West Pump. They will not trip in until tomorrow morning to clean out heavy mud, then will begin airlifting the screen from 130 to 325 feet in the afternoon. Spoke with Gary Keller to give status report. We will let him know when they can turn on Well No. 3 tomorrow.

DAILY FIELD NOTES

Logged by : Diane Smith

GSS Project Number : 561

Sheet 1 of 1

Date : 29-Jun-00

Time Arrived : 7:20 PM

Time Left : 10:40 PM

GSS Project Name : Big Bear City Community Services District Well No. 3B

Project Location : Shore Drive & Maltby Blvd, Big Bear City, California

☐ Well Construction. Drilling Contractor :

Rig Type :

☐ Pump Test. Pumping Contractor :

Pump Type :

☐ Site Reconnaissance.☒ Other.

NOTES

7:20 PM Arrived at well site, airlifting 130 to 158 feet

8:00 PM Made connection, airlifted 160 to 200 feet
Each 10 ft interval was very dirty (dark brown color) but cleared quickly, producing a lot of water.
BBCCSD personnel on site. He will check back at 10:00 AM in morning for progress. Karl will be on site, he will check with him.
Very little sand, just colored water.

8:30 PM Air compressor down.
Top of gravel pack at 7 feet below top of gravel feed pipe. Taking water at ~1/2 gpm.

9:30 PM Changing fuel filters. Compressor still down.
South West Pump will send a mechanic in the morning. They don't know what time.
Looking for reset switch or loose wire, seems to not be getting fuel.

10:40 PM Called Brian Cavanagh (BBCCSD). No news of compressor down for repair.

DAILY FIELD NOTES

Sheet 1 of 1
Date : 29-Jun-00
Time Arrived : 1:25 PM
Time Left : 6:00 PM

Logged by : Karl Seibert

GSS Project Number : 561

GSS Project Name : Big Bear City Community Services District Well No. 3B

Project Location : Shore Drive & Maltby Blvd, Big Bear City, California

- ☐ Well Construction. Drilling Contractor :
☐ Pump Test. Pumping Contractor :
☐ Site Reconnaissance.
☒ Other.

Rig Type :

Pump Type :

NOTES

11:30 AM Left Claremont.

1:25 PM Arrive onsite. Gary Nelson updates the situation. They are finished with airlifting and are getting ready to trip out and begin swabbing.

1:45 PM Talked to Diane. Updated her.

3:00 PM Finished tripping out. Preparing to airlift/swab between packers. Gary says that there is a +3 feet of gravel in the feed pipe.
Brian Cavenagh 585-9399 call with time to start pump, depth.

4:30 PM Begin airlifting 120 to 130 feet. Dirty, top of casing (130).

4:45 PM 130 to 140 clean after 10 minutes swabbing.
145 to 155 clean out heavy mud, then back up through interval.

4:50 PM 140 to 150.

5:05 PM 4 swabs.

5:40 PM 140 to 150 still cloudy just after swabbing.

5:50 PM Gravel pack 5 feet from top of gravel feed pipe.

5:55 PM Still slightly cloudy, no sand.

6:00 PM Left Big Bear for Claremont, arriving at 7:30 PM.

DAILY FIELD NOTES

Sheet 1 of 1
Date : 30-Jun-00
Time Arrived : 3:30 PM
Time Left : 6:40 PM

Logged by : Diane Smith

GSS Project Number : 561

GSS Project Name : Big Bear City Community Services District Well No. 3B

Project Location : Shore Drive & Maltby Blvd, Big Bear City, California

- ☐ Well Construction. Drilling Contractor :
☐ Pump Test. Pumping Contractor :
☐ Site Reconnaissance.
☒ Other.

Rig Type :

Pump Type :

NOTES

10:20 AM Air compressor repaired, airlifting. As per Brian at South West Pump they should be down to 320 feet by the end of the shift. Requested that they concentrate on interval from 320 feet up to 130 feet once they finish the initial pass down. Brian agreed to this.

3:30 PM Arrived at site. As per BBCCSD personnel, the South West Pump crew left at 3:00 PM (end of shift is 6:00 PM). No crew on tonight as had been previously planned.
Well No. 3 was pumping to waste, very dirty.

4:30 PM Discharge of Well No. 3 clears with time. However, with raising and lowering the rpms, the discharge becomes dirty.

5:00 PM Spoke with Dr. Williams.
Well No. 3 is improving.

5:30 PM Well No. 3 clearing in 4 minutes, not getting very dirty with increasing rpms.

6:30 PM Diverted pump-to-waste discharge system (reservoir).
Gary Keller on site.

6:40 PM Left site.

DAILY FIELD NOTES

Logged by : Diane Smith

GSS Project Number : 561

Sheet 1 of 1

Date : 5,6,7,8-Jul-00

Time Arrived :

Time Left :

GSS Project Name : Big Bear City Community Services District Well No. 3B

Project Location : Shore Drive & Maltby Blvd, Big Bear City, California

☐ Well Construction. Drilling Contractor :

Rig Type :

☐ Pump Test. Pumping Contractor :

Pump Type :

☐ Site Reconnaissance.☒ Other.

NOTES

5-Jul-00

8:30 AM

South West Pump resuming airlifting and swabbing at 320 feet. Will be working 24 hrs/day until completed.

8:30 PM

Spoke with Edison. Has completed the upper screen (130 to 450 feet) and going down to 2nd screen interval.
Each zone is cleaing up quickly, dirty initially after swabbing, then clears again quickly.

6-Jul-00

1:30 PM

Spoke with Gary Nelson. He has completed the first pass downward and is now starting back up. He has been spending ~1 hour for every 10 feet of screen. Top of gravel in gravel feed pipe was 5 feet bgs at 7:00 AM.

4:45 PM

Called Brian at South West Pump for tally of hours. He does not have it.

11:10 PM

Checked on status of airlifting. Currently working on 480 to 520 ft interval. Top of gravel in gravel feed pipe was at 34 ft bgs. Crews are spending ~3 hours on every 40 feet of screen.
Discharge clears quickly after swabbing.

Tally of airlift hours:

6/29	4:00 PM - 8:30 PM	air compressor down	4.5 hours
6/30	10:00 AM - 3:00 PM	air compressor repaired	5.0 hours
7/5	10:00 AM - midnight		14.0 hours
7/6	midnight - midnight		24.0 hours
TOTAL HOURS			47.5 hours

11:40 PM

Left site.

7-Jul-00

12:30 PM

At 360 to 400 ft. ~1/2 hour per 10 feet. At this rate, they won't finish until 2 to 3 AM.
The top of the gravel was at 40 ft. Gary topped it off this morning and it has dropped ~2" since then.
Vigorous swabbing causes the discharge to become slightly cloudy.

8-Jul-00

Completed airlift development (72 hours) by 2:00 AM. Secured rig.

DAILY FIELD NOTES

Sheet 1 of 1
Date : 9,10-Jul-00
Time Arrived :
Time Left :

Logged by : Diane Smith

GSS Project Number : 561

GSS Project Name : Big Bear City Community Services District Well No. 3B

Project Location : Shore Drive & Maltby Blvd, Big Bear City, California

- ☐ Well Construction. Drilling Contractor :
☐ Pump Test. Pumping Contractor :
☐ Site Reconnaissance.
☒ Other.

Rig Type :

Pump Type :

NOTES

9-Jul-00 No work.

10-Jul-00 Demobilizing. Test pump installation scheduled for early next week.

DAILY FIELD NOTES

Sheet 1 of 1
 Date : 24-Jul-00
 Time Arrived : 10:30 AM
 Time Left : 5:00 PM

Logged by : Karl Seibert

GSS Project Number : 561

GSS Project Name : Big Bear City Community Services District Well No. 3B

Project Location : Shore Drive & Maltby Blvd, Big Bear City, California

- ☐ Well Construction. Drilling Contractor :
☐ Pump Test. Pumping Contractor :
☐ Site Reconnaissance.
☒ Other.

Rig Type :

Pump Type :

NOTES

8:30 AM Left Claremont.

10:30 AM Arrive on site. No one from South West Pump on site.
 Diane calls. She will call South West.

10:40 AM Diane calls. She says that South West personnel are on the way. They will be here in an hour or so.

10:45 AM Gary Keller stops by.

12:30 PM Call Diane. Inform her no one from South West is here yet. She will call back when she finds out where they are.

12:45 PM Brian from BBCCSD stops by.
 Diane calls. South West crew is out of radio range so should be here soon.

1:30 PM South West (Manny and Gary) on site. Begin setting up.

3:10 PM Diane called to check on progress.

3:20 PM South West ready to go. Water level measured at 33' 5" by wireline sounder.

3:30 PM Talked to Diane to confirm procedure. Start at 200 gpm and go to 800 or 1000 gpm. Surge once, clear, surge twice, and so on until clear.

4:15 PM Driller is plugging holes and setting up Rossum sand tester.

4:30 PM Minimum pump rate = 600 gpm. Call Tom and Diane for instructions. Tom says go ahead if it is clearing up.

5:00 PM Sand = 0 ppm.

DAILY FIELD NOTES

Sheet 1 of 1
 Date : 25-Jul-00
 Time Arrived : 8:00 AM
 Time Left : 6:00 PM

Logged by : Diane Smith

GSS Project Number : 561

GSS Project Name : Big Bear City Community Services District Well No. 3B

Project Location : Shore Drive & Maltby Blvd, Big Bear City, California

- ☐ Well Construction. Drilling Contractor :
☐ Pump Test. Pumping Contractor :
☐ Site Reconnaissance.
☒ Other.

Rig Type :

Pump Type :

NOTES

8:00 AM Arrived at site. Operator Manny has warmed up the test engine but has not started pumping.
 SWL = 34' 4"

8:30 AM Contacted T. Moran for entrance to Well No. 3 to measure SWL (essentially the same as Well No. 3B). Hooked up hose to run water into gravel feed pipe.

9:00 AM Started pump at 200 gpm, small amount of very fine sand on startup, cleared quickly.
 T = 82 degrees F, drawdown = 4'.

9:30 AM Increased Q to 400 gpm, no sand, drawdown 8', T = 82 degrees F.

10:00 AM Increased Q to 600 gpm, no sand, drawdown 12'.

10:30 AM Increased Q to 800 gpm, no sand, drawdown 14'.

11:00 AM Increased Q to 1000 gpm, no sand, drawdown 18'.

12:00 PM Surged once at 200 gpm, no sand.

12:30 PM Surged 3 times at 200 gpm, slightly cloudy, some very fine sand, T = 81 degrees F.

1:05 PM Increased Q to 400 gpm, remained clear, surged 3 times, resumed pumping at 400 gpm.

1:30 PM Increased Q to 600 gpm, surged 6 times, very little color.

2:40 PM Increased Q to 800 gpm. Discharge line blew apart, PVC cracked badly. Development operations shut down. Manny trying to get together a new piece of 8" pipe.

2:50 PM Tim Moran on site, discussed situation.

3:00 PM Moran off site.

6:00 PM Spoke with Manny. New piece of pipe on its way. Should take ~1 hour to put it together in the morning.

DAILY FIELD NOTES

Logged by : Diane Smith

GSS Project Number : 561

Sheet 1 of 1

Date : 26-Jul-00

Time Arrived :

Time Left :

GSS Project Name : Big Bear City Community Services District Well No. 3B

Project Location : Shore Drive & Maltby Blvd, Big Bear City, California

- ☐ Well Construction. Drilling Contractor :
☐ Pump Test. Pumping Contractor :
☐ Site Reconnaissance.
☒ Other.

Rig Type :

Pump Type :

NOTES

11:00 AM Spoke with Manny. All is going well. Having a hard time getting the discharge dirty. However, on startup at 200 gpm there was a trace of sand, so the well was worked at that rate for over an hour.

5:00 PM Maximum discharge rate was 1200 gpm.
Before startup of development pumping:

WELL	SWL	
Well No. 3	35' 3"	
Well No. 3A	58' 5 1/2"	Pumping Well
Well No. 3B	35' 3"	

DAILY FIELD NOTES

Logged by : Diane Smith

GSS Project Number : 561

Sheet 1 of 1

Date : 27-Jul-00

Time Arrived : 12:10 AM

Time Left : 5:00 PM

GSS Project Name : Big Bear City Community Services District Well No. 3B

Project Location : Shore Drive & Maltby Blvd, Big Bear City, California

☐ Well Construction. Drilling Contractor :

Rig Type :

☐ Pump Test. Pumping Contractor :

Pump Type :

☐ Site Reconnaissance.☒ Other.

NOTES

12:10 PM Before Startup:

WELL	SWL	
Well No. 3	36' 4"	
Well No. 3A	59' 6 1/2"	Pumping Well
Well No. 3B	37' 3"	

1:10 PM Arrive at site.
Increased Q to maximum output of 1600 gpm, <2 ppm sand and pipe scale.
Surged well 10 times, no increase in sand.

2:30 PM Decreased discharge to 200 gpm, then shut pump off to allow well to recover at 1:30 PM.

3:15 PM WL = 42 feet, resumed pumping at 400 gpm.

3:45 PM Increased Q to 1200 gpm.

4:15 PM Increased Q to 1500 gpm. Plotted dS vs Q.
Made arrangements for step test tomorrow at 500, 1000, 1500 gpm.

4:45 PM Pump off.

5:00 PM Left site.

DAILY FIELD NOTES

Sheet 1 of 1
 Date : 28-Jul-00
 Time Arrived :
 Time Left :

Logged by : Diane Smith

GSS Project Number : 561

GSS Project Name : Big Bear City Community Services District Well No. 3B

Project Location : Shore Drive & Maltby Blvd, Big Bear City, California

☐ Well Construction. Drilling Contractor :

Rig Type :

☒ Pump Test. Pumping Contractor : South West Pump & Drilling

Pump Type :

☐ Site Reconnaissance.

☐ Other.

NOTES

6:00 AM	WELL	SWL	
	Well No. 3	36' 8"	
	Well No. 3A	59' 4"	Pumping Well
	Well No. 3B	38' 3"	
	Turned Well No. 3 off.		
7:00 AM	Well No. 3	35' 0"	
	Well No. 3A	35' 6 0"	
	Well No. 3B	38' 4"	
7:30 AM	Well No. 3		
	Well No. 3A		
	Well No. 3B	36.75'	
7:45 AM	Well No. 3		
	Well No. 3A	34.33'	
	Well No. 3B	36.70'	
7:55 AM	Well No. 3	35.00'	
	Well No. 3A		
	Well No. 3B	36.70'	
8:00 AM	Began Step#1 at 500 gpm.		
9:00 AM	Step#2 at 1000 gpm.		

DAILY FIELD NOTES

Sheet 1 of 1
 Date : 31-Jul-00
 Time Arrived : 9:00 AM
 Time Left :

Logged by : Diane Smith

GSS Project Number : 561

GSS Project Name : Big Bear City Community Services District Well No. 3B

Project Location : Shore Drive & Maltby Blvd, Big Bear City, California

☐ Well Construction. Drilling Contractor :

Rig Type :

☒ Pump Test. Pumping Contractor : South West Pump & Drilling

Pump Type :

☐ Site Reconnaissance.

☐ Other.

NOTES

6:45 AM Spoke with Manny. He has not left shop yet.

9:00 AM Arrived at site. Manny not here yet.
Well Nos. 3 and 3A were off at 7:30 AM.

10:45 AM Manny on site. Fueling engine and checking fluid levels. Contacted APCL, bottles will be delivered this afternoon to GEOSCIENCE office.

11:15 AM Well No. 3A RP = 0.80 feet above floor of pump house.
WL = 32.58 feet.

11:20 AM Well No. 3 RP = 1.60 feet above floor of pump house.
WL = 34.45 feet.

11:30 AM Well No. 3B WL = 35.75 feet

11:35 AM Well No. 3A WL = 32.54 feet

11:40 AM Well No. 3 WL = 34.37 feet

11:45 AM Well No. 3B WL = 35.74 feet

11:50 AM Well No. 3 WL = 34.35 feet
Well No. 3A WL = 32.50 feet
Well No. 3B WL = 35.74 feet

12:18 PM Well No. 3A WL = 33.00 feet

12:23 PM Well No. 3 WL = 38.35 feet

DAILY FIELD NOTES

Logged by : Karl Seibert

GSS Project Number : 561

Sheet 1 of 1

Date : 2-Aug-00

Time Arrived : 10:35 AM

Time Left : 4:30 PM

GSS Project Name : Big Bear City Community Services District Well No. 3B

Project Location : Shore Drive & Maltby Blvd, Big Bear City, California

- ☐ Well Construction. Drilling Contractor :
☐ Pump Test. Pumping Contractor :
☐ Site Reconnaissance.
☒ Other.

Rig Type :

Pump Type :

NOTES

9:00 AM Left GEOSCIENCE for Big Bear.

10:35 AM Arrive in Big Bear. Mike Ridder (Pacific Surveys) and Keith and Albert (South West) on site.

11:00 AM Talked to Diane. She said to turn off Well No. 3. Tim Moran of BBCCSD on site to turn off Well No. 3.

11:20 AM Called Kristen to get screen intervals.

11:45 AM Pump on. Flow meter reads zero.

12:30 PM Pumping WL = 63.1 feet.

12:50 PM Start spinner test. Flow rate 1050 gpm. Mike Ridder will test the bottom two zones and subtract to get flow from top zone (above the bowls). Called Kris for spinner specs. Called Diane, left message.

1:10 PM Mike can't get down to the bottom. Apparently the air line was dropped into the well.

1:20 PM Pacific Surveys gets all the way down the well.

3:45 PM Completed tests. Pump off. Well No. 3 back on line.

4:30 PM Received 6 copies of the test results.
Left site.

DAILY FIELD NOTES

Sheet 1 of 1
Date : 17-Aug-00
Time Arrived : 10:30 AM
Time Left : 3:00 PM

Logged by : Diane Smith

GSS Project Number : 561

GSS Project Name : Big Bear City Community Services District Well No. 3B

Project Location : Shore Drive & Maltby Blvd, Big Bear City, California

- ☐ Well Construction. Drilling Contractor :
☐ Pump Test. Pumping Contractor :
☐ Site Reconnaissance.
☒ Other.

Rig Type :

Pump Type :

NOTES

9:15 AM Leave for Big Bear.

10:30 AM Arrive at site.
Video camera is currently at 600 feet. Screens are in good condition, clean and open.
Four pieces of air line left in the well. South West Pump did not remove them after pulling the test pump.

11:00 AM Alignment survey shows well is very straight. The maximum deviation is 0.3 feet.

12:15 PM Well cover was locked.

2:40 PM Left message for Brian (he had already left for the day) to remove the four pieces of air line and to complete cleaning up the site.

3:00 PM Left site.

APPENDIX C
Lithologic Log

GEOSCIENCE Support Services, Inc.



LITHOLOGIC LOG

GSS Job Number: 00-561

Well Number/Name: Big Bear Well No. 3B

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.			Sorting			Grain Shape			Plasticity			Cementation			Mineral Composition						Alteration Visible	Grading Analysis	Rock Type (USCS Group)	Comments
			Dry	Moist	Saturated	Cobbles	Sand & Gravel	Silt & Clay	Well	Medium	Poor	Angular	Sub-Angular	Sub-Rounded	Rounded	High	Medium	Low	None	None	Weak	Moderate	Strong	Quartz	Feldspar	Mica	Amphibole	Evaporites	Other	
0 to 10																													No Sample	No Sample - Conductor borehole
10 to 20																													No Sample	No Sample - Conductor borehole
20 to 30																													No Sample	No Sample - Conductor borehole
30 to 40																													No Sample	No Sample - Conductor borehole
40 to 50																													No Sample	No Sample - Conductor borehole
50 to 60		10YR 5/6 Yellow Brown	•				•				•		•	•				•		•				•	•				SW/GW	SAND, GRAVEL AND PEBBLES: w/ major brown sandy clay, sand
60 to 70		10YR 5/4 Yellow Brown	•				•				•		•	•				•		•				•	•				SM	INTERBEDDED SAND, silt and clay
70 to 80		10YR 5/3 Brown	•				•			•			•	•				•		•				•	•				SP	SAND (med to coarse) w/ some interbedded sand, clay-fairly dry and hard, w/ pebbles and cobbles
80 to 90		10YR 4/3 Brown	•				•				•		•	•				•		•				•	•				GP	GRAVEL: coarse sand w/ broken cobbles, minor sandy clay - med plasticity
90 to 100		10YR 4/6 dk. yellowish Brown	•				•				•		•	•				•		•				•	•				SC/GC	SANDY & GRAVELLY CLAY: w/ interbedded coarse sand and gravel

LITHOLOGIC LOG

GSS Job Number: 00-561

Well Number/Name: Big Bear Well No. 3B

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.			Sorting			Grain Shape			Plasticity			Cementation			Mineral Composition						Alteration Visible	Grading Analysis	Rock Type (USCS Group)	Comments
			Dry	Moist	Saturated	Cobbles	Sand & Gravel	Silt & Clay	Well	Medium	Poor	Angular	Sub-Angular	Sub-Rounded	Rounded	High	Medium	Low	None	None	Weak	Moderate	Strong	Quartz	Feldspar	Mica	Amphibole	Evaporites	Other	

100 to 110		10YR 4/6 dk. yellowish Brown	•			•	•	•			•	•	•	•			•		•					•						SC/GC	SANDY & GRAVELLY CLAY: w/ interbedded coarse sand and gravel
110 to 120		10YR 5/3 Brown		•		•	•	•			•	•	•	•			•		•					•						SM	SILTY SAND: w/ gravel and interbedded sandy clay
120 to 130		10YR 5/3 Brown		•		•	•	•			•	•	•	•			•		•					•						SM	SILTY SAND: w/ gravel and interbedded sandy clay
130 to 140		10YR 6/4 lt yellow Brown		•		•	•	•				•	•	•										•						GP	GRAVEL: w/ cm sand- clear and well sorted, broken cobbles and pebbles
140 to 150		10YR 6/4 lt yellow Brown		•		•	•	•				•	•	•										•						GP	GRAVEL: w/ cm sand- clear and well sorted, broken cobbles and pebbles
150 to 160		10YR 6/4 lt yellow Brown		•		•	•	•				•	•	•										•						GP	PEBBLES: broken cobbles, coarse sand and gravel
160 to 170		10YR 6/4 lt yellow Brown		•		•	•	•				•	•	•										•						GP	GRAVEL: w/ minor interbedded gravelly clay
170 to 180		10YR 6/4 lt yellow Brown		•		•	•	•				•	•	•										•						GP	GRAVEL: w/ minor interbedded gravelly clay
180 to 190		10YR 5/4 yellow Brown		•		•	•	•				•	•	•										•						SP/SC	INTERBEDDED SAND & GRAVEL: sandy clay w/ gravel -clays silty to sandy, stiff and fairly dry
190 to 200		10YR 5/3 Brown		•		•	•	•				•	•	•										•						GP	SANDY GRAVEL: broken pebbles and cobbles, fairly clean

Appendix C

LITHOLOGIC LOG

GSS Job Number: 00-561

Well Number/Name: Big Bear Well No. 3B

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.			Sorting			Grain Shape			Plasticity			Cementation			Mineral Composition						Alteration Visible		Grading Analysis	Rock Type (USCS Group)	Comments
			Dry	Moist	Saturated	Cobbles	Sand & Gravel	Silt & Clay	Well	Medium	Poor	Angular	Sub-Angular	Sub-Rounded	Rounded	High	Medium	Low	None	None	Weak	Moderate	Strong	Quartz	Feldspar	Mica	Amphibole	Evaporites	Other		

200 to 210		10YR 5/3 Brown																													GP	BROKEN PEBBLES, COBBLES: gravel and very coarse sand, clean and well sorted
210 to 220		10YR 5/4-5/6 yellow Brown																													GP/SP	COARSE SAND: gravel, broken pebbles and cobbles within lenses of clay, brown clay, minor silt
220 to 230		10YR 5/4-5/6 yellow Brown																													GP/SP	COARSE SAND: gravel, broken pebbles and cobbles within lenses of clay, brown clay, minor silt
230 to 240		10YR 5/4-5/6 yellow Brown																													GP	GRAVEL: broken cobbles and coarse sand -clean
240 to 250		10YR 5/4-5/6 yellow Brown																													GP	GRAVEL: broken cobbles and coarse sand -clean
250 to 260		10YR 4/3 Brown																													CL	CLAY: sandy to silty w/ gravel, micaceous - medium stiff
260 to 270		10YR 4/2 dk. grayish Brown																													CL	INTERBEDDED SANDY AND SILTY CLAY: with gravel, clays soft
270 to 280		10YR 4/2 dk. grayish Brown																													CL	INTERBEDDED SANDY AND SILTY CLAY: with gravel, clays soft
280 to 290		10YR 4/2 dk. grayish Brown																													CL	INTERBEDDED SANDY AND SILTY CLAY: with gravel, clays soft
290 to 300		10YR 5/4-5/6 yellowish Brown																													GP	GRAVEL AND COARSE SAND: minor silt and interbedded thin brown sandy clay - soft

Appendix C

LITHOLOGIC LOG

GSS Job Number: 00-561

Well Number/Name: Big Bear Well No. 3B

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.		Sorting		Grain Shape			Plasticity			Cementation			Mineral Composition						Alteration Visible		Grading Analysis		Rock Type (USCS Group)	Comments
			Dry	Moist	Saturated	Cobbles	Sand & Gravel	Silt & Clay	Well	Medium	Poor	Angular	Sub-Angular	Sub-Rounded	Rounded	High	Medium	Low	None	None	Weak	Moderate	Strong	Quartz	Feldspar	Mica	Amphibole	Evaporites	Other	

300 to 310		10YR 5/4 yellowish Brown																												GP	GRAVEL AND COARSE SAND: minor silt and interbedded thin brown sandy clay - soft
310 to 320		10YR 5/3 Brown																												CL	CLAY: sandy, med. stiff micaceous, brown
320 to 330		10YR 5/3 Brown																												GP/SC	INTERBEDDED GRAVEL AND SAND: gravelly clay-clays soft, somewhat micaceous
330 to 340		10YR 5/3 Brown																												GC	CLAYEY GRAVEL: minor broken cobbles, brown, soft
340 to 350		2.5Y 4/3 olive brown																												SM/CL	SANDY SILT: w/ interbedded sandy clay and gravel, fine gravel for most part
350 to 360		2.5Y 4/3 olive brown																												SM	SILT/SAND MIXTURE: w/ minor gravel and thin sandy clays
360 to 370		2.5Y 4/3 olive brown																												SM	SILT/SAND MIXTURE: w/ minor gravel and thin sandy clays
370 to 380		2.5Y 4/2 dk. grayish brown																												CL	SANDY CLAY/GRAVELLY CLAY: soft to med. stiff, brown, sl.. micaceous
380 to 390		2.5Y 4/2 dk. grayish brown																												CL	GRAVELLY CLAY/SANDY CLAY: sl. micaceous - stiff
390 to 400		2.5Y 4/2 dk. grayish brown																												CL	SAND AND GRAVELLY CLAY: med stiff, sl. micaceous

Appendix C

GSS Job Number: 00-561

Well Number/Name: Big Bear Well No. 3B

Well Number/Name: Big Bear Well No. 3B

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class
Dry	Moist	Saturated
Cobbles	Sand & Gravel	Silt & Clay
Well	Medium	Poor
Angular	Sub-Angular	Sub-Rounded
Rounded	High	Medium
Low	None	Weak
Moderate	Strong	Quartz
Feldspar	Mica	Amphibole
Evaporites	Other	Mineral Composition
Alteration Visible	Grading Analysis	Rock Type (USCS Group)
Comments		

[illegible]

LITHOLOGIC LOG

GSS Job Number: 00-561

Well Number/Name: Big Bear Well No. 3B

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.			Sorting			Grain Shape				Plasticity				Cementation				Mineral Composition							Alteration Visible	Grading Analysis	Rock Type (USCS Group)	Comments
			Dry	Moist	Saturated	Cobbles	Sand & Gravel	Silt & Clay	Well	Medium	Poor	Angular	Sub-Angular	Sub-Rounded	Rounded	High	Medium	Low	None	None	None	Weak	Moderate	Strong	Quartz	Feldspar	Mica	Amphibole	Evaporites	Other				
500 to 510		2.5Y 4/2 dk. grayish brown																															CL	SILTY, GRAVELLY CLAY: stiff, sl. micaceous
510 to 520		2.5Y 4/2 dk. grayish brown																															CL	SILTY, GRAVELLY CLAY: stiff, sl. micaceous
520 to 530		2.5Y 4/2 dk. grayish brown																															CL	SILTY, GRAVELLY CLAY: sl. micaceous, varying amount of sand and gravel, varying from soft to stiff
530 to 540		2.5Y 4/2 dk. grayish brown																															CL	SILTY, GRAVELLY CLAY: sl. micaceous, varying amount of sand and gravel, varying from soft to stiff
540 to 550		2.5Y 4/2 dk. grayish brown																															CL	SILTY, GRAVELLY CLAY: sl. micaceous, varying amount of sand and gravel, varying from soft to stiff
550 to 560		2.5Y 4/2 dk. grayish brown																															CL	SILTY, GRAVELLY CLAY: sl. micaceous, varying amount of sand and gravel, varying from soft to stiff
560 to 570		2.5Y 4/2 dk. grayish brown																															CL	SILTY, GRAVELLY CLAY: sl. micaceous, varying amount of sand and gravel, varying from soft to stiff
570 to 580		2.5Y 4/2 dk. grayish brown																															CL	SILTY, GRAVELLY CLAY: sl. micaceous, varying amount of sand and gravel, varying from soft to stiff
580 to 590		2.5Y 4/2 dk. grayish brown																															CL	SILTY, GRAVELLY CLAY: sl. micaceous, varying amount of sand and gravel, varying from soft to stiff
590 to 600		2.5Y 4/2 dk. grayish brown																															CL	SILTY, GRAVELLY CLAY: sl. micaceous, varying amount of sand and gravel, varying from soft to stiff

Appendix C

LITHOLOGIC LOG

GSS Job Number: 00-561

Well Number/Name: Big Bear Well No. 3B

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.			Sorting			Grain Shape			Plasticity			Cementation			Mineral Composition							Alteration Visible	Grading Analysis	Rock Type (USCS Group)	Comments
			Dry	Moist	Saturated	Cobbles	Sand & Gravel	Silt & Clay	Well	Medium	Poor	Angular	Sub-Angular	Sub-Rounded	High	Medium	Low	None	Weak	Moderate	Strong	Quartz	Feldspar	Mica	Amphibole	Evaporites	Other				

600 to 610		2.5Y 4/2 dk. grayish brown																												CL	SILTY, GRAVELLY CLAY: sl. micaceous, varying amount of sand and gravel, varying from soft to stiff
610 to 620		2.5Y 5/3 lt. olive brown																												GM	SILTY SAND AND GRAVEL: w/ interbedded soft sandy clays
620 to 630		2.5Y 5/3 lt. olive brown																												SP	very coarse SAND AND GRAVEL w/ minor silt and clay balls
630 to 640		2.5Y 5/3 lt. olive brown																												SP	very coarse SAND AND GRAVEL w/ minor silt and clay balls
640 to 650		2.5Y 5/3 lt. olive brown																												SM	SILTY SAND w/ gravel and broken pebbles
650 to 660		2.5Y 5/3 lt. olive brown																												SM	SILTY SAND w/ gravel and broken pebbles
660 to 670		2.5Y 5/3 lt. olive brown																												GM	SILTY GRAVEL: w/ sand
670 to 680		2.5Y 5/3 lt. olive brown																												GP/SP	GRAVEL and coarse SAND, fairly clean, some thin sandy clays
680 to 690		2.5Y 5/3 lt. olive brown																												GP/SP	GRAVEL and coarse SAND, fairly clean, some thin sandy clays
690 to 700		2.5Y 5/3 lt. olive brown																												SM	silty SAND, silty GRAVEL, silt

Appendix C

LITHOLOGIC LOG

GSS Job Number: 00-561

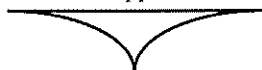
Well Number/Name: Big Bear Well No. 3B

Sample Depth (ft)	Drilling Rate (ft/hr)	Color: Munsell Name and Class	Moisture Content			Particle % Dist.			Sorting			Grain Shape			Plasticity			Cemen- tation			Mineral Composition						Alteration Visible	Grading Analysis	Rock Type (USCS Group)	Comments		
			Dry	Moist	Saturated	Cobbles	Sand & Gravel	Silt & Clay	Well	Medium	Poor	Angular	Sub-Angular	Sub-Rounded	Rounded	High	Medium	Low	None	None	Weak	Moderate	Strong	Quartz	Feldspar	Mica					Amphibole	Evaporites
700 to 710		2.5Y 4/2 dk. grayish brown																													SP	very coarse SAND w/ GRAVEL and minor silt, thin sandy clays
710 to 720		2.5Y 4/2 dk. grayish brown																													GP	GRAVEL, very coarse SAND, few fine, clean, some broken cobbles and pebbles
720 to 730		2.5Y 4/2 dk. grayish brown																													GP	GRAVEL, very coarse SAND, few fine, clean, some broken cobbles and pebbles
730 to 740		2.5Y 4/2 dk. grayish brown																													GP	GRAVEL, very coarse SAND few fine, clean, some broken cobbles and pebbles
740 to 750		2.5Y 4/2 dk. grayish brown																													GP	GRAVEL, very coarse SAND, few fine, clean, some broken cobbles and pebbles
750 to 760		2.5Y 4/2 dk. grayish brown																													GP	GRAVEL, very coarse SAND, few fine, clean, some broken cobbles and pebbles
760 to 770		2.5Y 4/2 dk. grayish brown																													GP	765'-469' BROKEN COBBLES much more angular-cemented; 769'-770' gravelly and sandy CLAY, soft
770 to 780		2.5Y 4/2 dk. grayish brown																													GP	Cemented? quartzite and limestone pebbles and cobbles - angular, more uniformly sized, no rounding
780 to 790		2.5Y 4/2 dk. grayish brown																													GP	TD 17 1/2" pilot borehole = 790 ft.

Appendix C

APPENDIX D
Geophysical Logs

GEOSCIENCE Support Services, Inc.

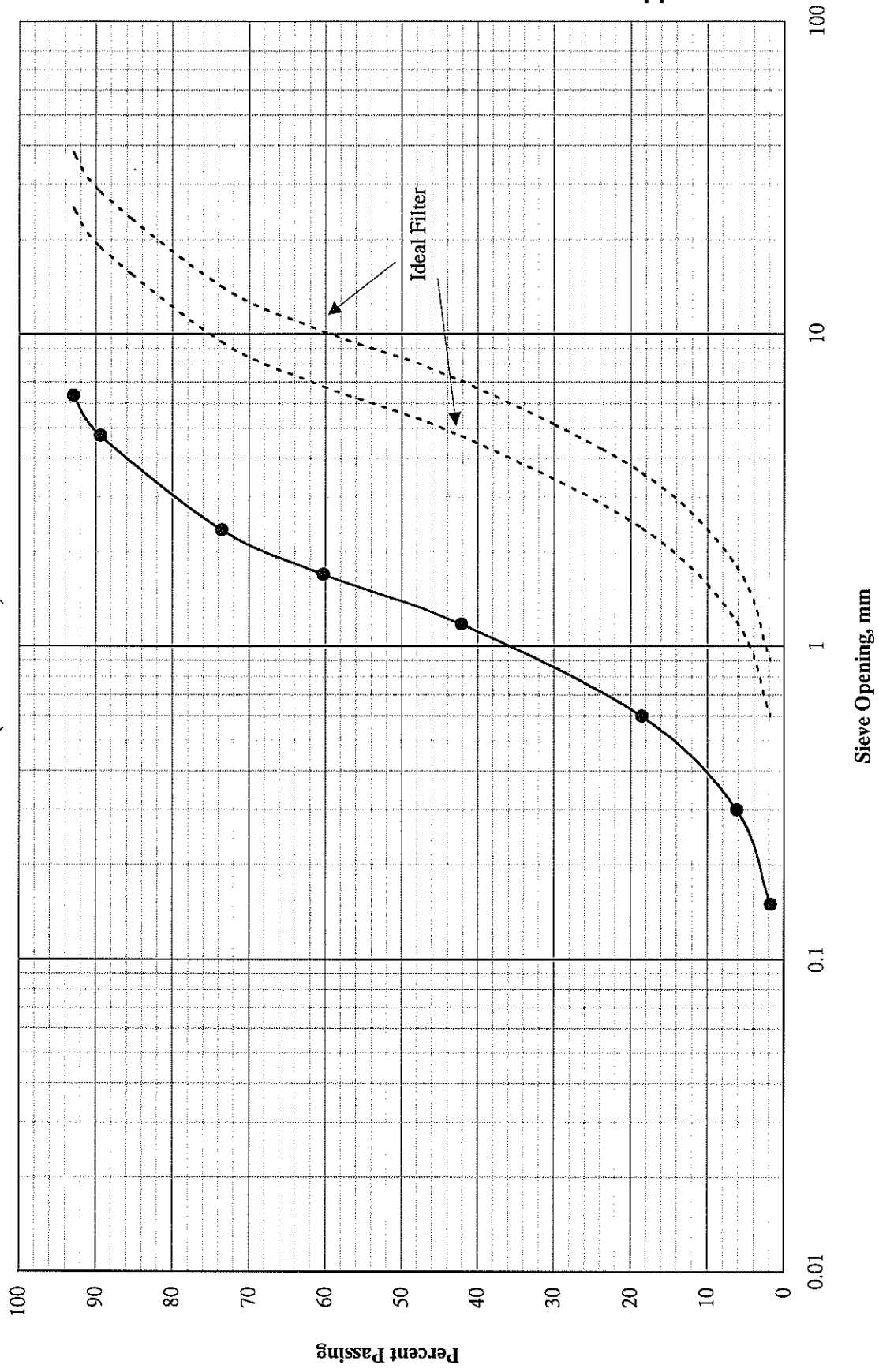


APPENDIX E
Mechanical Grading Analyses

GEOSCIENCE Support Services, Inc.

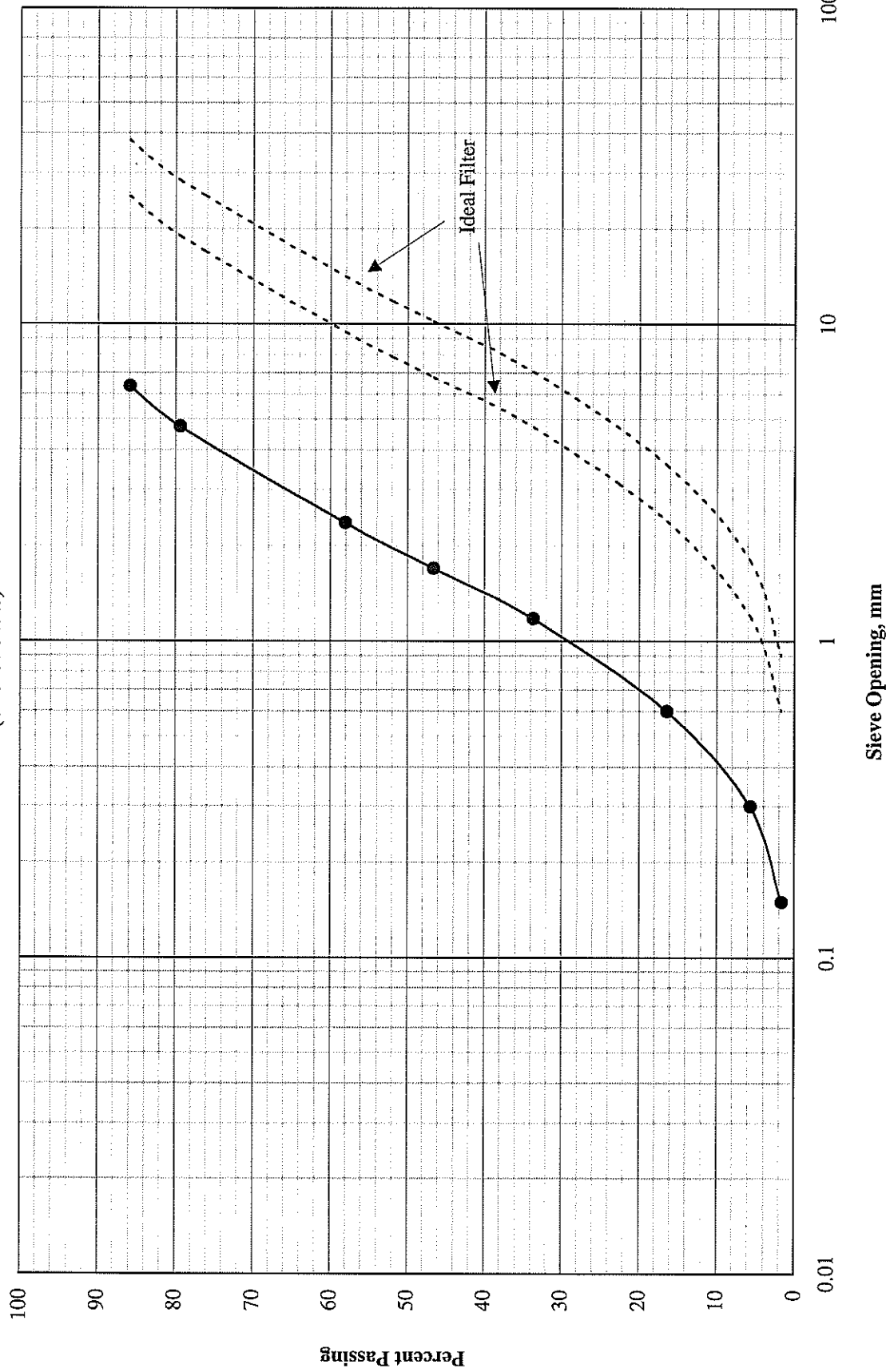


**BIG BEAR CITY COMMUNITY SERVICES DISTRICT WELL 3B
MECHANICAL GRADING ANALYSIS
(770-780 FT)**



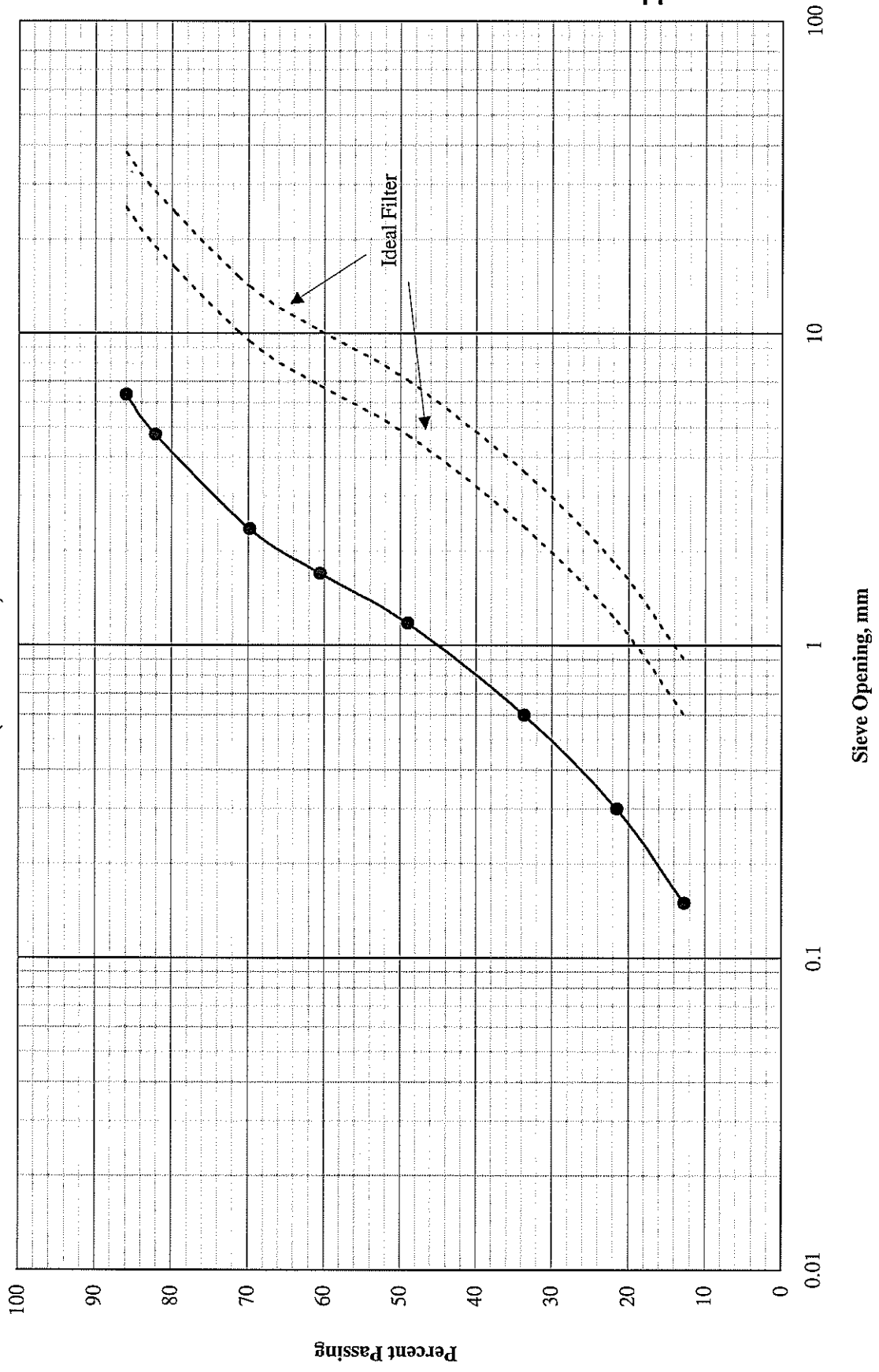
Appendix E

BIG BEAR CITY COMMUNITY SERVICES DISTRICT WELL 3B **MECHANICAL GRADING ANALYSIS** **(640-650 FT)**



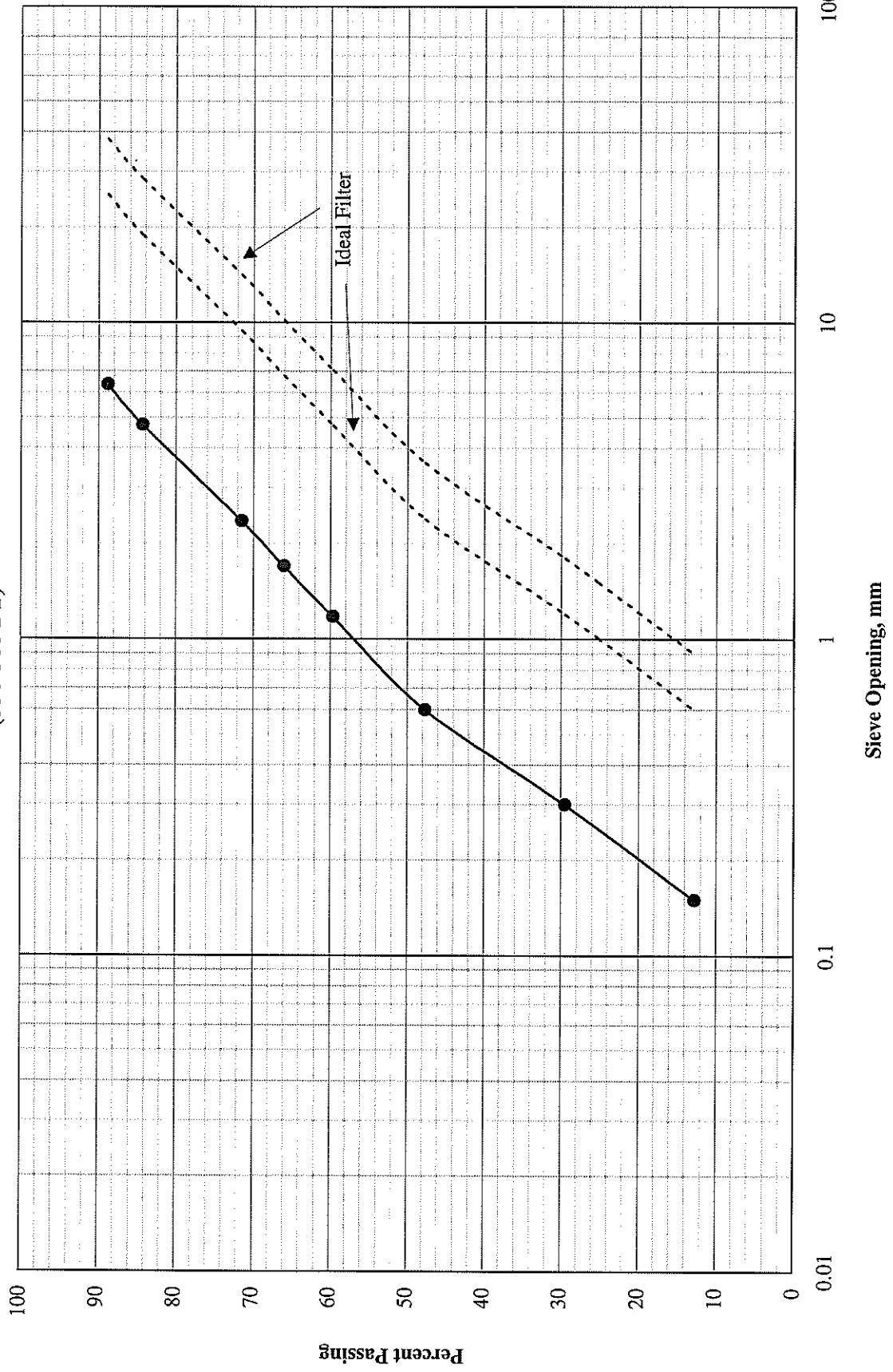
Appendix E

**BIG BEAR CITY COMMUNITY SERVICES DISTRICT WELL 3B
MECHANICAL GRADING ANALYSIS
(390-400 FT)**



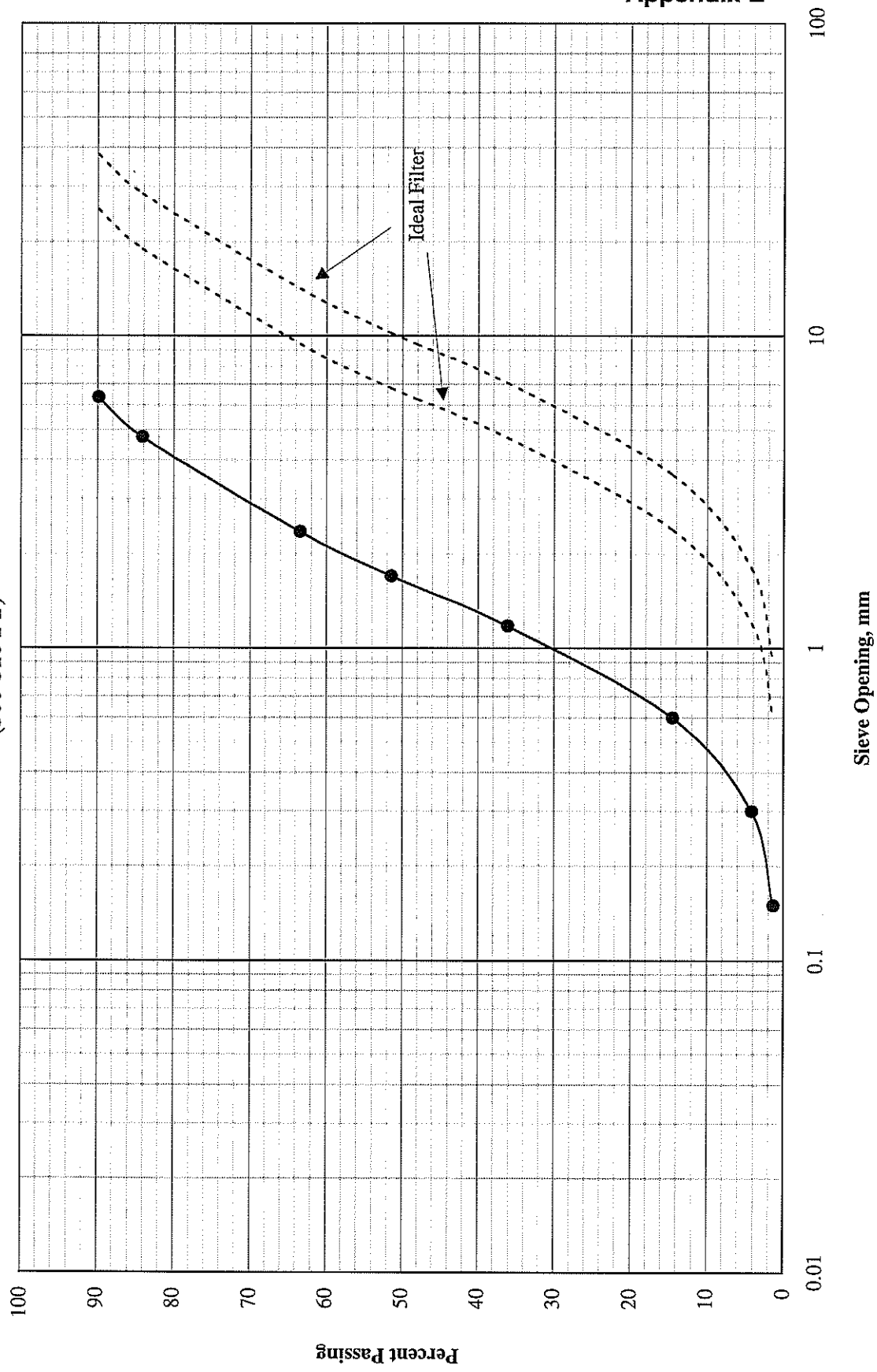
Appendix E

**BIG BEAR CITY COMMUNITY SERVICES DISTRICT WELL 3B
MECHANICAL GRADING ANALYSIS
(350-360 FT)**



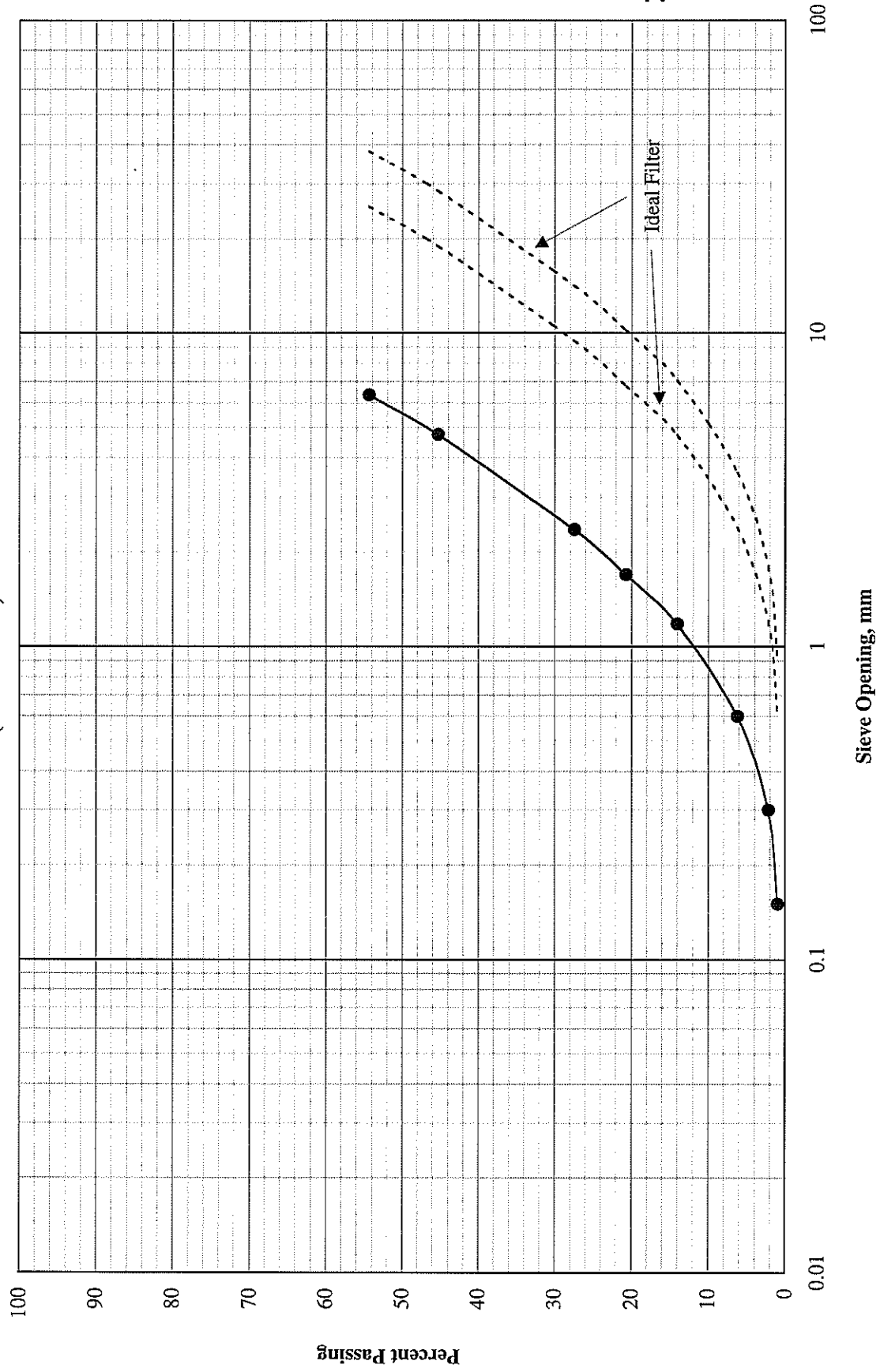
Appendix E

BIG BEAR CITY COMMUNITY SERVICES DISTRICT WELL 3B **MECHANICAL GRADING ANALYSIS** **(300-310 FT)**



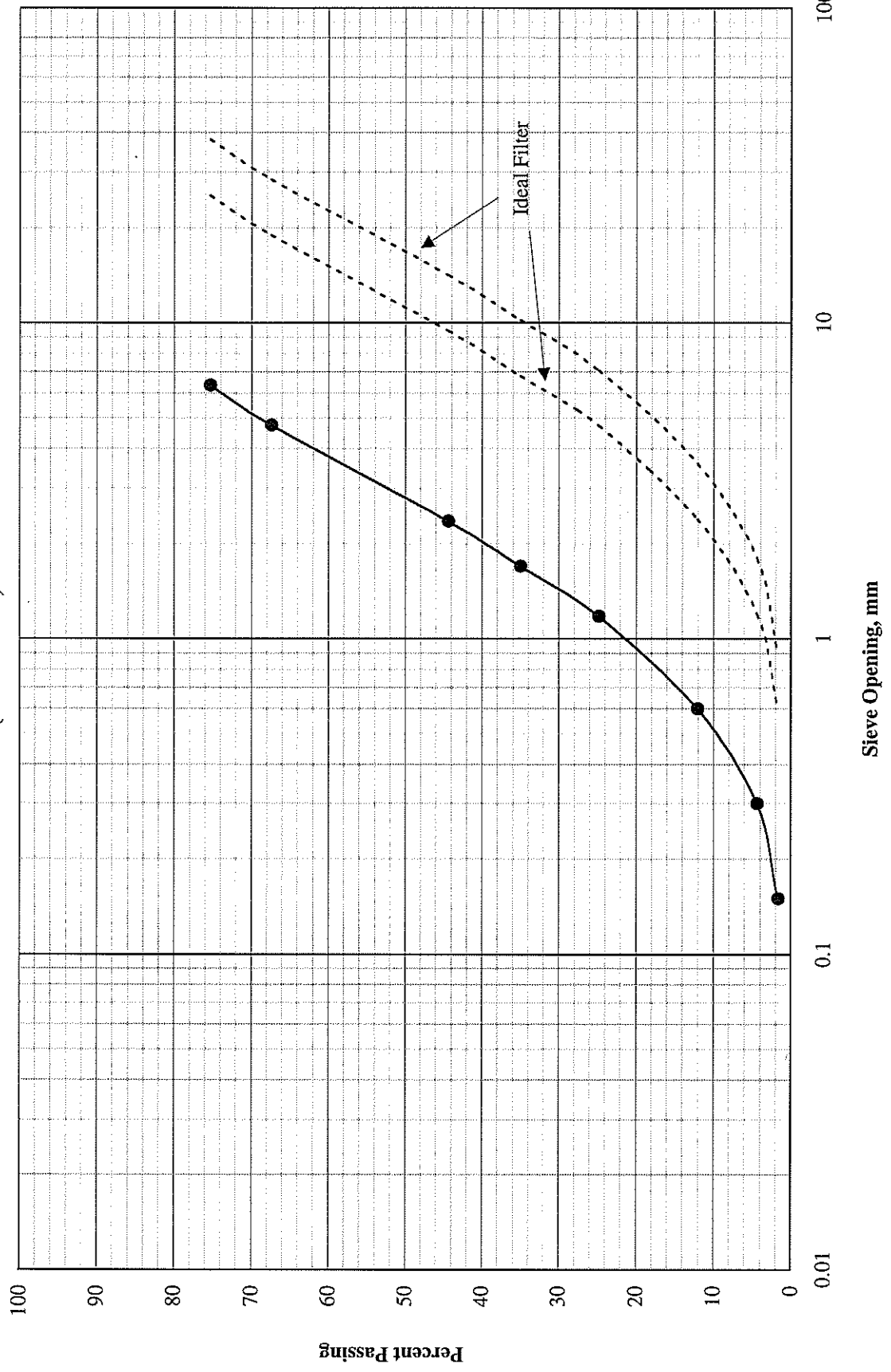
Appendix E

BIG BEAR CITY COMMUNITY SERVICES DISTRICT WELL 3B **MECHANICAL GRADING ANALYSIS** **(200-210 FT)**



Appendix E

BIG BEAR CITY COMMUNITY SERVICES DISTRICT WELL 3B **MECHANICAL GRADING ANALYSIS** **(140-150 FT)**



Appendix E

APPENDIX F
Contractor's Development Notes

GEOSCIENCE Support Services, Inc.



Pump Test Report

Date: 7-27-00
 Customer: A's Best Water
 Discharge Pipe: 8"
 Orifice Dia: 8x6"
 Bowl Used:
 Hours Pumped This Day: 8 45 min

Tested By: Manny
 Well Depth: 14"
 Static Level: 37' 3"
 Type Perfs:
 Hours Pumped To Date:

Location:
 Remarks:
 Page:

South West Pump & Drilling
 53-381 Highway 111
 Coachella, CA 92236
 Office: 800.770.7360
 Fax: 760.398.2287

Time	Orifice "	G.P.M.	S.W.L.	Pumping Level	Drawdown	Eng R.P.M.	Yield	Clean Up Time	Remarks
8:00 AM	8x6"	1200	37' 3"	55' 10 1/2"	0 19' 1 1/2"	1500	??		Surge to time.
8:30	8x6"	1200	37' 3"	58' 4 1/2"	0 2' 6"	1500	??	Trace	Q AT-1200 G.P.M. Water clear,
9:00	8x6"	1200	37' 3"	61' 5"	0 3' 4 1/2"	1500	??	Trace	Surge 10 mins, water clear
9:30	8x6"	1200	37' 3"	61' 5"	0 3' 4 1/2"	1500	??	Trace	Water clear Surge 6 min
10:00	8x6"	1400	37' 3"	65'	0 3' 9"	1700	??		Surge 10 min, water clear. index 9 1400
11:00	8x6"	1400	37' 3"	65'	0 3' 9"	1700	??	Trace	Surge 10 min water clear
11:30	8x6"	1400	37' 3"	66' 9"	0 1' 9"	1700	??	Trace	Water clear,
12:00	8x6"				0		??		Surge 10 min (index 9 1400)
1:00	8x6"	1600	37' 3"	70' 11"	0 4' 2"	1900	??	if head	
1:30	8x6"	300	37' 3"		0	900	??		Surge 10 min Water clear lower 300
2:45	8x6"	400	37' 3"	47' 9"	0 10' 6"	900	??		Water clear No sand
3:15	8x6"	800	37' 3"	53' 10"	0 16' 7"	1200	??	Trace	Water clear
3:45	8x6"	1200	37' 3"	61' 9"	0 24' 6"	1500	??		
4:15	8x6"	1550	37'	67' 4"	0 30'	1800	??	Trace	
4:45	8x6"	1550	37' 3"	67' 4"	0 30'	1800	??	Trace	
					0		??		
					0		??		

Pump Test Report

Date: 7-26-00
 Customer: B's Bar Water dist
 Discharge Pipe: 8"
 Orifice Dia: 8" x 6"
 Bowl Used:
 Hours Pumped This Day: 8 LT

Tested By: many
 Well Depth: 14"
 Well I.D.: 14"
 Static Level: 34' 4"
 Type Perfs:
 Hours Pumped To Date:

Location:
 Remarks:
 Page:

South West Pump & Drilling
 53-381 Highway 111
 Coachella, CA 92236
 Office: 800.770.7360
 Fax: 760.398.2287

Time	Orifice"	G.P.M.	S.W.L.	Pumping Level	Drawdown	Eng R.P.M.	Yield	Clean Up Time	Remarks
10:00	8x6"	200	35' 3"	38' 8 1/2"	0 3' 5 1/2"	900	??	Place	Water clear
11:00	8x6"	200	35' 5"	38' 8 1/2"	0 3' 5 1/2"	900	??		Q at 200
11:30	8x6"	600	35' 5"	44' 8"	0 5' 11 1/2"	1000	??	Sand at	Water clear some sand in sand pushed in of sand
12:00	8x6"	600	35' 3"	44' 9"	0 5' 11 1/2"	1000	??		Inc Q to 600
12:15	8x6"	600	35' 3"	46' 2"	0 10"	1000	??		Surge 6 time, Water clear
12:30	8x6"	600	35' 3"	46' 2"	0 10"	1000	??		Water clear No sand
12:45	8x6"	1000	35' 3"	51' 9 1/2"	0 19" 5' 7 1/2"	1300	??		Water clear No sand
1:00	8x6"	1000	35' 3"	58' 9 1/2"	0 18" 7 1/2"	1300	??		Surge 6 time, Water clear No sand
1:30	8x6"	1000	35' 3"	58' 9 1/2"	0 27 1/2"	1300	??	Place	Water clear No sand
1:45	8x6"	1100	35' 3"	61' 2"	0 2' 4 1/2"	1400	??		Surge 6 time, Water clear No sand
2:00	8x6"	1100	35' 3"	61' 2"	0 22' 4 1/2"	1400	??		Water clear No sand
2:30	8x6"	1800	35' 5"	65' 4"	0 4' 2"	1600	??	Place	Sand
3:00	8x6"	1200	35' 3"	65' 4"	0 4' 2"	1600	??	Place	Inc Q 1200
4:00	8x6"	1400	35' 3"	69' 8 1/2"	0 4' 4 1/2"	1700	??	Place	Water clear
5:00	8x6"	1500	35' 3"	71' 10 1/2"	0 2' 2"	1800	??	Place	Surge 6 time
6:00	8x6"	1500	35' 3"	71' 10 1/2"	0 2' 2"	1800	??	Place	Water clear, surge 10
6:30					0		??	Place	Time inc Q 1400
							??	Place	Surge 6 time
							??	Place	Water clear
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							??	Place	Surge 6 time
							??	Place	Water clear
							??	Place	Time inc Q 1400
							??	Place	Surge 1

Pump Test Report

Date: 7-25-00
 Customer: Big Bear water dist.
 Discharge Pipe: 8"
 Orifice Dia: 8" x 6"
 Bowl Used:
 Hours Pumped This Day: 5 hrs
 Tested By: MANN
 Well Depth: 14"
 Well I.D.: 14"
 Static Level: 34' 4" (well #3 on 5/22/00)
 Type Perfs: 7/24/00
 Location:
 Remarks:
 Page:

Smith Hot Pump & Drilling
 53-381 Highway 11
 Coachella, CA 92231
 Office: 800.770.7360
 Fax: 760.398.2287

Time	Orifice "	G.P.M.	S.W.L.	Pumping Level "	Drawdown	Eng R.P.M.	Yield	Clean Up Time	Remarks
9:00	8" x 6"	200	34' 4"		0	WORKING	??		water clear, check water level
9:15		200	34' 4"	38' 9"	0 4' 5"	WORKING	??		
9:30		200	34' 4"	38' 9"	0 4' 5"	WORKING	??	50	check water level
9:45		400	34' 4"	40' 5 1/2"	0 6' 5 1/2"	WORKING	??		water clear - 14' 0" Q +
10:00		400		40' 5 1/2"	0 6' 5 1/2"	WORKING	??		check water level (same)
10:15		600		44' 1/2"	0 9' 8 1/2"		??		check Q to 600
10:30		800		48' 8"	0 14' 4"		??		
10:45		800		48' 8"	0 14' 4"		??		
11:00		800		48' 4"	0 14' 4"		??		
11:15		1000		52' 4 1/2"	0 18' 1/2"		??		
11:30		1000		53'	0 18' 8"		??		
12:00		1000		53' 8"	0 19' 4"		??		
12:15		200		40' 9"	0 6' 5"		??		
12:30		200		42' 3 1/2"	0 7' 11 1/2"		??		
12:45		200		42' 3 1/2"	0 7' 11 1/2"		??		
1:00		400		44' 5 1/2"	0 9' 10 1/2"		??		
1:15		400		44' 5 1/2"	0 9' 10 1/2"		??		
1:30		400		44' 5 1/2"	0 9' 10 1/2"		??		
2:00		400		44' 5 1/2"	0 9' 10 1/2"		??		

Date: 7-24-08
Customer: Bear Water dist
Discharge Pipe: 3
Office Dia: 8
Bowl Used:
Hours Pumped This Day: 1 hr 1/2

Tested By: *Manny*
Well Depth:
Well I.D.:
Static Level:
Type Perfs:
Hours Pumped To Date:

South West Pump & Drilling
53-381 Highway 111
Coachella, CA 92236
Office: 800.770.7360
Fax: 760.398.2287

Location: _____
Remarks: _____
Page: _____

[illegible]

APPENDIX G
Pumping Test Data

GEOSCIENCE Support Services, Inc.



GEOSCIENCE Support Services Incorporated

Ground Water Resources Development

PUMPING TEST DATA SHEETTEL: (909) 920-0707
FAX: (909) 920-0403

Well Name / Number: Big Bear City Community Services District Well No. 3B

Test Date: 28-Jul-00

Circle Well Type: Pumping Observation (r = ft)Circle Test Type: Step Drawdown Constant Rate Recovery Development

Static Water Level Depth 36.7 ft Reference Point Elevation: +0.4 ft. above ground surface

Time of Day	Time min Step	Time min Total	Depth to Water (ft)	Draw-down (ft)	Pumping Rate (gpm)	Sand Content (ppm)	Specific Capacity (gpm/ft)	Totalizer (x1000 gal)	Remarks & other data
8:00 AM	0	0	36.7	--	--	--	--	--	
8:02 AM	2	2	42.6	5.9	--	--	--	--	adjusting Q
8:04 AM	4	4	43.1	6.4	--	trace	--	--	
8:06 AM	6	6	43.5	6.8	--	0.0	--	--	
8:08 AM	8	8	43.7	7.0	--	0.0	--	--	
8:10 AM	10	10	44.0	7.3	--	0.0	--	--	
8:15 AM	15	15	44.2	7.5	--	0.0	--	--	
8:20 AM	20	20	44.3	7.6	--	0.0	--	--	
8:25 AM	25	25	44.5	7.8	--	0.0	--	--	
8:30 AM	30	30	44.7	8.0	--	0.0	--	--	
8:40 AM	40	40	44.9	8.2	--	0.0	--	--	orifice = 500 gpm
8:50 AM	50	50	45.1	8.4	--	0.0	--	--	
9:00 AM	60	60	45.2	8.5	--	0.0	--	--	Q ₁ = 507 gpm
9:02 AM	2	62	51.8	15.1	--	0.0	--	--	sp. cap. = 59.7 gpm/ft
9:04 AM	4	64	52.5	15.8	--	0.0	--	--	
9:06 AM	6	66	52.9	16.2	--	0.0	--	--	
9:08 AM	8	68	53.1	16.4	--	0.0	--	--	
9:10 AM	10	70	53.2	16.5	--	0.0	--	--	
9:15 AM	15	75	53.6	16.9	--	0.0	--	--	
9:20 AM	20	80	53.9	17.2	--	0.0	--	--	
9:25 AM	25	85	54.1	17.4	--	0.0	--	--	
9:30 AM	30	90	54.2	17.5	--	0.0	--	--	
9:40 AM	40	100	54.4	17.7	--	0.0	--	--	
9:50 AM	50	110	54.8	18.1	--	0.0	--	--	
10:00 AM	60	120	55.2	18.5	--	0.0	--	--	
10:15 AM	75	135	55.7	19.0	--	0.0	--	--	
10:30 AM	90	150	55.9	19.2	--	0.0	--	--	
10:45 AM	105	165	56.3	19.6	--	0.0	--	--	
11:00 AM	120	180	56.4	19.7	--	0.0	--	--	Q ₂ = 903 gpm
11:02 AM	2	182	63.3	26.6	--	0.0	--	--	sp. cap. = 45.8 gpm/ft
11:04 AM	4	184	63.7	27.0	--	0.0	--	--	
11:06 AM	6	186	64.0	27.3	--	trace	--	--	
11:08 AM	8	188	64.2	27.5	--	--	--	--	
11:10 AM	10	190	64.4	27.7	--	--	--	--	
11:15 AM	15	195	64.6	27.9	--	--	--	--	
11:20 AM	20	200	64.9	28.2	--	--	--	--	
11:25 AM	25	205	65.3	28.6	--	--	--	--	

GEOSCIENCE Support Services Incorporated <i>Ground Water Resources Development</i>					PUMPING TEST DATA SHEET				
					TEL: (909) 920-0707 FAX: (909) 920-0403				
Well Name / Number: Big Bear City Community Services District Well No. 3B									
Test Date: 31-Jul-00, 01-Aug-00									
Circle Well Type:		Pumping		Observation (r =		ft)			
Circle Test Type:		Step Drawdown		Constant Rate		Recovery		Development	
Static Water Level Depth:		34.35 ft		Reference Point Elevation: +1.6 ft. above ground surface					
Time of Day	Time min Step	Time min Total	Depth to Water (ft)	Draw-down (ft)	Pumping Rate (gpm)	Sand Content (ppm)	Specific Capacity (gpm/ft)	Totalizer (x1000 gal)	Remarks & other data
12:00 PM	0	0	35.7	--	--	--	--	--	greenish color @ startup
12:02 PM	2	2	51.2	15.5	1050.0	--	--	--	reddish for 5 seconds
12:04 PM	4	4	52.3	16.5	--	trace	--	--	clear
12:06 PM	6	6	52.7	16.9	--	trace	--	--	
12:08 PM	8	8	53.3	17.6	--	--	--	--	
12:10 PM	10	10	53.7	17.9	--	--	--	--	
12:15 PM	15	15	54.6	18.9	--	--	--	--	
12:20 PM	20	20	55.1	19.4	--	clear	--	--	
12:25 PM	25	25	55.6	19.9	--	--	--	--	
12:30 PM	30	30	55.8	20.1	--	--	--	--	
12:40 PM	40	40	56.5	20.7	--	--	--	--	
12:50 PM	50	50	56.7	20.9	--	--	--	--	readjusted valve
1:00 PM	60	60	56.8	21.0	--	--	--	--	
1:15 PM	75	75	57.4	21.6	--	--	--	--	
1:30 PM	90	90	57.7	21.9	--	--	--	--	
1:45 PM	105	105	58.0	22.3	--	--	--	--	
2:00 PM	120	120	58.3	22.6	--	--	--	--	
2:30 PM	150	150	58.9	23.2	--	--	--	--	
3:00 PM	180	180	59.1	23.4	--	--	--	--	
3:30 PM	210	210	59.6	23.9	--	--	--	--	
4:00 PM	240	240	59.8	24.1	--	--	--	--	
4:30 PM	270	270	60.1	24.3	--	--	--	--	
5:00 PM	300	300	60.6	24.8	--	--	--	--	
5:30 PM	330	330	61.3	25.5	--	--	--	--	
6:00 PM	360	360	61.7	26.0	--	--	--	--	Q decreased to 40"
6:30 PM	390	390	62.0	26.2	--	--	--	--	
7:00 PM	420	420	92.0	56.3	--	--	--	--	
7:30 PM	450	450	62.1	26.3	--	--	--	--	
8:00 PM	480	480	62.9	27.2	--	--	--	--	
8:30 PM	510	510	62.0	26.3	--	--	--	--	
9:00 PM	540	540	62.7	27.0	--	--	--	--	
9:30 PM	570	570	63.8	28.1	--	--	--	--	
10:00 PM	600	600	64.1	28.4	--	--	--	--	
10:30 PM	630	630	64.8	29.1	--	--	--	--	
11:00 PM	660	660	65.0	29.2	--	--	--	--	
11:30 PM	690	690	65.2	29.4	--	--	--	--	
12:00 AM	720	720	65.4	29.7	--	--	--	--	

GEOSCIENCE Support Services Incorporated

Ground Water Resources Development

PUMPING TEST DATA SHEET

TEL: (909) 920-0707

FAX: (909) 920-0403

Well Name / Number: Big Bear City Community Services District Well No. 3B

Test Date: 31-Jul-00, 01-Aug-00

Circle Well Type: Pumping Observation (r = ft)

Circle Test Type: Step Drawdown Constant Rate Recovery Development

Static Water Level Depth	34.35 ft	Reference Point Elevation: +1.6 ft. above ground surface
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[illegible]

GEOSCIENCE Support Services Incorporated

Ground Water Resources Development

PUMPING TEST DATA SHEET

TEL: (909) 920-0707

FAX: (909) 920-0403

Well Name / Number: Big Bear City Community Services District Well No. 3

Test Date: 31-Jul-00, 01-Aug-00

Circle Well Type: Pumping Observation (r = 47 ft)

Circle Test Type: Step Drawdown Constant Rate Recovery Development

Static Water Level Deptl	34.35 ft	Reference Point Elevation: +1.6 ft. above ground surface
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[illegible]

GEOSCIENCE Support Services Incorporated

Ground Water Resources Development

PUMPING TEST DATA SHEET

TEL: (909) 920-0707

FAX: (909) 920-0403

Well Name / Number: Big Bear City Community Services District Well No. 3

Test Date: 1-Aug-00

Circle Well Type: Pumping Observation (r = 47 ft)

Circle Test Type: Step Drawdown Constant Rate Recovery Development

Static Water Level Depth	34.45 ft	Reference Point Elevation	+1.6 ft above ground surface
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[illegible]

APPENDIX H
Water Quality Data

GEOSCIENCE Support Services, Inc.



Applied P & Ch Laboratory

13760 Magnolia Ave. Chino CA 91710

Tel: (909) 590-1828 Fax: (909) 590-1498

Submitted to:

GEOSCIENCE Support Services, Inc.

Attention: Johnson Yeh

1326 Monte Vista, Ste# 3

Upland CA 91786

Tel: (909) 920-0707 Fax: (909) 920-0403

APCL Analytical Report

Service ID #: 801-003276

Collected by: Diane Smith

Collected on: 06/07/00

Received: 06/07/00

Extracted: N/A

Tested: 06/07-12/00

Reported: 06/12/00

Sample Description: Water

Project Description: Big Bear City CSD

Analysis of Water Samples

Component Analyzed	Method	Unit	PQL	Analysis Result
				Zone #1 640-660' 00-03276-1
General Physical Properties				
Color, for drinking water	110.2	Color Unit	1	5.0
Odor, for drinking water	140.1	Odor Unit	1	1
Turbidity	180.1	NTU	0.1	0.79
General Minerals				
Alkalinity	310.1	mg-CaCO ₃ /L	2	93
Bicarbonate	SM2320B	mg-CaCO ₃ /L	2	68
Carbonate	SM2320B	mg-CaCO ₃ /L	2	25
Hydroxide	SM2320B	mg-CaCO ₃ /L	2	ND
Chloride Cl ⁻	325.3	mg/L	1	5.9
Hardness	130.2	mg-CaCO ₃ /L	2	2
Surfactants (MBAS)	425.1	mg/L	0.1	ND
pH	9040	pH unit	0.01	9.10
Electric conductivity	120.1	μS/cm	1	367
Nitrate as N	SM4500NO3D	mg/L	1	0.9J
Sulfate SO ₄ ⁻	375.4	mg/L	2	86
Solids, Total Dissolved (TDS)	160.1	mg/L	10	259
Dilution Factor				10
Fluoride, Free F ⁻ ,	300.0	mg/L	0.1	8.0
Dilution Factor				1
Calcium	6010	mg/L	0.2	2.6
Copper	6010	mg/L	0.01	ND
Iron	6010	mg/L	0.05	ND
Magnesium	6010	mg/L	0.1	0.10
Manganese	7460	mg/L	0.002	ND
Potassium	6010	mg/L	0.4	0.58
Sodium	6010	mg/L	2	91.8
Zinc	6010	mg/L	0.01	0.010

PQL: Practical Quantitation Limit.

MDL: Method Detection Limit.

CRDL: Contract Required Detection Limit

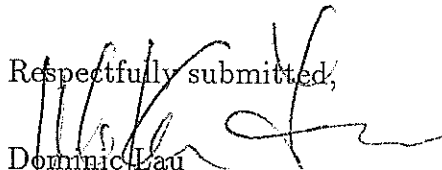
N.D.: Not Detected or less than the practical quantitation limit.

"-": Analysis is not required.

J: Reported between PQL and MDL.

Listed Dilution Factors (DF) are relative to the method default DF. All unlisted DFs are 1.0

Respectfully submitted,


 Dominic Lau
 Laboratory Director
 Applied P & Ch Laboratory

Applied P & Ch Laboratory

13760 Magnolia Ave. Chino CA 91710

Tel: (909) 590-1828 Fax: (909) 590-1498

Submitted to:

GEOSCIENCE Support Services, Inc.

Attention: Tom Harder

1326 Monte Vista, Ste# 3

Upland CA 91786

Tel: (909) 920-0707 Fax: (909) 920-0403

APCL Analytical Report

Service ID #: 801-003307

Collected by: Diane Smith

Collected on: 06/08/00

Received: 06/08/00

Extracted: N/A

Tested: 06/08-13/00

Reported: 06/13/00

Sample Description: Ground Water from Zone 2 Well 3B

Project Description: Big Bear City CSD

Analysis of Water Samples

Component Analyzed	Method	Unit	PQL	Analysis Result BBCCSD#3B 00-03307-1
General Physical Properties				
Color, for drinking water	110.2	Color Unit	1	5.0
Odor, for drinking water	140.1	Odor Unit	1	1
Turbidity	180.1	NTU	0.1	1.2
General Minerals				
Alkalinity	310.1	mg-CaCO ₃ /L	2	78
Bicarbonate	SM2320B	mg-CaCO ₃ /L	2	65
Carbonate	SM2320B	mg-CaCO ₃ /L	2	13
Hydroxide	SM2320B	mg-CaCO ₃ /L	2	ND
Chloride Cl ⁻	325.3	mg/L	1	6.9
Hardness	130.2	mg-CaCO ₃ /L	2	17
Surfactants (MBAS)	425.1	mg/L	0.1	0.1J
pH	9040	pH unit	0.01	8.97
Electric conductivity	120.1	μS/cm	1	416
Sulfate SO ₄ ²⁻	375.4	mg/L	2	126
Solids, Total Dissolved (TDS)	160.1	mg/L	10	309
Nitrate as N	SM4500NO3D	mg/L	1	0.7J
Fluoride	300.0	mg/L	1	9.0
Calcium	6010	mg/L	0.2	1.9
Copper	6010	mg/L	0.02	ND
Iron	6010	mg/L	0.05	ND
Magnesium	6010	mg/L	0.1	0.14
Manganese	6010	mg/L	0.01	ND
Potassium	6010	mg/L	0.4	0.87
Sodium	6010	mg/L	2	103
Zinc	6010	mg/L	0.02	ND

PQL: Practical Quantitation Limit.

MDL: Method Detection Limit.

CRDL: Contract Required Detection Limit

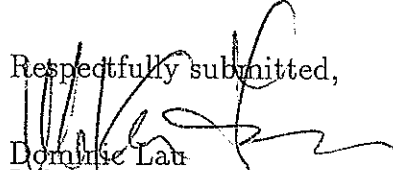
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"-": Analysis is not required.

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Respectfully submitted,


 Dominic Lau
 Laboratory Director
 Applied P & Ch Laboratory

Applied P & Ch Laboratory

13760 Magnolia Ave. Chino CA 91710

Tel: (909) 590-1828 Fax: (909) 590-1498

Submitted to:

GEOSCIENCE Support Services, Inc.

Attention: Johnson Yeh

1326 Monte Vista, Ste# 3

Upland CA 91786

Tel: (909) 920-0707 Fax: (909) 920-0403

APCL Analytical Report

Service ID #: 801-003333

Received: 06/09/00

Collected by: BS

Extracted: N/A

Collected on: 06/09/00

Tested: 06/09-14/00

Reported: 06/16/00

Sample Description: Well Water from Big Bear

Project Description: Well 3B

Analysis of Water Samples

Component Analyzed	Method	Unit	PQL	Analysis Result	
				Zone 3	
				00-03333-1	
General Physical Properties					
Color, for drinking water	110.2	Color Unit	1	5.0	
Odor, for drinking water	140.1	Odor Unit	1	1	
Turbidity	180.1	NTU	0.1	8.60	
General Minerals					
Alkalinity	310.1	mg-CaCO ₃ /L	2	134	
Bicarbonate	SM2320B	mg-CaCO ₃ /L	2	134	
Carbonate	SM2320B	mg-CaCO ₃ /L	2	ND	
Hydroxide	SM2320B	mg-CaCO ₃ /L	2	ND	
Chloride Cl ⁻	325.3	mg/L	1	6.9	
Hardness	130.2	mg-CaCO ₃ /L	2	16	
Surfactants (MBAS)	425.1	mg/L	0.1	ND	
pH	9040	pH unit	0.01	8.61	
Electric conductivity	120.1	μS/cm	1	404	
Sulfate SO ₄ ^{- -}	375.4	mg/L	2	80	
Solids, Total Dissolved (TDS)	160.1	mg/L	10	293	
Nitrate as N	SM4500NO3D	mg/L	1	0.7J	
Dilution Factor				10	
Fluoride, F ⁻	300.0	mg/L	0.1	6.3	
Dilution Factor				1	
Calcium	6010	mg/L	0.2	5.5	
Copper	6010	mg/L	0.01	ND	
Iron	6010	mg/L	0.05	0.36	
Magnesium	6010	mg/L	0.1	0.95	
Manganese	6010	mg/L	0.005	0.0069	
Potassium	6010	mg/L	0.4	0.98	
Sodium	6010	mg/L	2	98.2	
Zinc	6010	mg/L	0.01	ND	

Applied P & Ch Laboratory
 13760 Magnolia Ave. Chino CA 91710
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APCL Analytical Report

Component Analyzed	Method	Unit	PQL	Analysis Result
				Zone 3
				00-03333-1
Volatile organics				
Dilution Factor				1
Acetone	8260	µg/L	100	ND
Benzene	8260	µg/L	5	ND
Bromobenzene	8260	µg/L	5	ND
Bromochloromethane	8260	µg/L	5	ND
Bromodichloromethane	8260	µg/L	5	ND
Bromoform	8260	µg/L	5	ND
Bromomethane	8260	µg/L	5	ND
2-Butanone (MEK)	8260	µg/L	100	ND
n-Butylbenzene	8260	µg/L	5	ND
sec-Butylbenzene	8260	µg/L	5	ND
tert-Butylbenzene	8260	µg/L	5	ND
Carbon disulfide	8260	µg/L	5	ND
Carbon tetrachloride	8260	µg/L	5	ND
Chlorobenzene	8260	µg/L	5	ND
Chlorodibromomethane	8260	µg/L	5	ND
Chloroethane	8260	µg/L	5	ND
Chloroform	8260	µg/L	5	ND
Chloromethane	8260	µg/L	5	ND
2-Chlorotoluene	8260	µg/L	5	ND
4-Chlorotoluene	8260	µg/L	5	ND
1,2-Dibromo-3-chloropropane (DB)	8260	µg/L	5	ND
1,2-Dibromoethane (EDB)	8260	µg/L	5	ND
Dibromomethane	8260	µg/L	5	ND
1,2-Dichlorobenzene	8260	µg/L	5	ND
1,3-Dichlorobenzene	8260	µg/L	5	ND
1,4-Dichlorobenzene	8260	µg/L	5	ND
Dichlorodifluoromethane	8260	µg/L	5	ND
1,1-Dichloroethane	8260	µg/L	5	ND
1,2-Dichloroethane	8260	µg/L	5	ND
1,1-Dichloroethene	8260	µg/L	5	ND
cis-1,2-Dichloroethene	8260	µg/L	5	ND
trans-1,2-Dichloroethene	8260	µg/L	5	ND
1,2-Dichloropropane	8260	µg/L	5	ND
1,3-Dichloropropane	8260	µg/L	5	ND
2,2-Dichloropropane	8260	µg/L	5	ND
1,1-Dichloropropene	8260	µg/L	5	ND
cis-1,3-Dichloropropene	8260	µg/L	5	ND
trans-1,3-Dichloropropene	8260	µg/L	5	ND
Ethylbenzene	8260	µg/L	5	ND

Applied P & Ch Laboratory
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 Tel: (909) 590-1828 Fax: (909) 590-1498

APCL Analytical Report

Component Analyzed	Method	Unit	PQL	Analysis Result
				Zone 3
				00-03333-1
Hexachlorobutadiene	8260	µg/L	5	ND
Isopropylbenzene (Cumene)	8260	µg/L	5	ND
p-Isopropyltoluene	8260	µg/L	5	ND
Methylene chloride	8260	µg/L	5	ND
4-Methyl-2-pentanone (MIBK)	8260	µg/L	50	ND
Methyl-t-Butyl ether (MTBE)	8260	µg/L	10	ND
Naphthalene	8260	µg/L	5	ND
n-Propylbenzene	8260	µg/L	5	ND
Styrene	8260	µg/L	5	ND
1,1,1,2-Tetrachloroethane	8260	µg/L	5	ND
1,1,2,2-Tetrachloroethane	8260	µg/L	5	ND
Tetrachloroethene	8260	µg/L	5	ND
Toluene	8260	µg/L	5	ND
1,2,3-Trichlorobenzene	8260	µg/L	5	ND
1,2,4-Trichlorobenzene	8260	µg/L	5	ND
1,1,1-Trichloroethane	8260	µg/L	5	ND
1,1,2-Trichloroethane	8260	µg/L	5	ND
Trichloroethene	8260	µg/L	5	ND
Trichlorofluoromethane	8260	µg/L	5	ND
1,2,3-Trichloropropane	8260	µg/L	5	ND
1,2,4-Trimethylbenzene	8260	µg/L	5	ND
1,3,5-Trimethylbenzene	8260	µg/L	5	ND
Vinyl chloride	8260	µg/L	5	ND
o-Xylene	8260	µg/L	5	ND
m/p-Xylene	8260	µg/L	5	ND

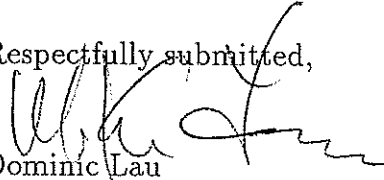
PQL: Practical Quantitation Limit. MDL: Method Detection Limit. CRDL: Contract Required Detection Limit

N.D.: Not Detected or less than the practical quantitation limit. "-": Analysis is not required.

J: Reported between PQL and MDL.

Listed Dilution Factors (DF) are relative to the method default DF. All unlisted DFs are 1.0

Respectfully submitted,


 Dominic Lau
 Laboratory Director
 Applied P & Ch Laboratory

Applied P & Ch Laboratory

13760 Magnolia Ave. Chino CA 91710

Tel: (909) 590-1828 Fax: (909) 590-1498

Submitted to:

GEOSCIENCE Support Services, Inc.

Attention: Johnson Yeh

1326 Monte Vista, Ste# 3

Upland CA 91786

Tel: (909) 920-0707 Fax: (909) 920-0403

APCL Analytical Report

Service ID #: 801-003370

Received: 06/13/00

Collected by: Diane Smith

Extracted: N/A

Collected on: 06/13/00

Tested: 06/13-15/00

Reported: 06/15/00

Sample Description: Water

Project Description: Big Bear City CSD

Analysis of Water Samples

Component Analyzed	Method	Unit	PQL	Analysis Result
				BBCCSD #3B Zone 4
				00-03370-1
General Physical Properties				
Color, for drinking water	110.2	Color Unit	1	5.0
Odor, for drinking water	140.1	Odor Unit	1	1
Turbidity	180.1	NTU	0.1	5.70
General Minerals				
Alkalinity	310.1	mg-CaCO ₃ /L	2	109
Bicarbonate	SM2320B	mg-CaCO ₃ /L	2	109
Carbonate	SM2320B	mg-CaCO ₃ /L	2	ND
Hydroxide	SM2320B	mg-CaCO ₃ /L	2	ND
Chloride Cl ⁻	325.3	mg/L	1	7.1
Hardness	130.2	mg-CaCO ₃ /L	2	61
Electric conductivity	120.1	μS/cm	1	410
Surfactants (MBAS)	425.1	mg/L	0.1	ND
pH	9040	pH unit	0.01	7.76
Solids, Total Dissolved (TDS)	160.1	mg/L	10	339
Nitrate as N	SM4500NO3D	mg/L	1	84
Dilution Factor				10
Fluoride, F	300.0	mg/L	0.1	6.7
Sulfate SO ₄ ^{- -}	300.0	mg/L	2	84
Dilution Factor				1
Calcium	6010	mg/L	0.2	18.0
Copper	6010	mg/L	0.01	ND
Iron	6010	mg/L	0.05	0.10
Magnesium	6010	mg/L	0.1	4.4
Manganese	6010	mg/L	0.005	0.013
Potassium	6010	mg/L	0.4	1.6
Sodium	6010	mg/L	2	79.3
Zinc	6010	mg/L	0.01	0.030

Applied P & Ch Laboratory
 13760 Magnolia Ave. Chino CA 91710
 Tel: (909) 590-1828 Fax: (909) 590-1498

APCL Analytical Report

Component Analyzed	Method	Unit	PQL	Analysis Result	
				BBCCSD #3B Zone 4	
				00-03370-1	
Volatile organics					
Dilution Factor				1	
Acetone	8260	µg/L	100	ND	
Benzene	8260	µg/L	5	ND	
Bromobenzene	8260	µg/L	5	ND	
Bromochloromethane	8260	µg/L	5	ND	
Bromodichloromethane	8260	µg/L	5	ND	
Bromoform	8260	µg/L	5	ND	
Bromomethane	8260	µg/L	5	ND	
2-Butanone (MEK)	8260	µg/L	100	ND	
n-Butylbenzene	8260	µg/L	5	ND	
sec-Butylbenzene	8260	µg/L	5	ND	
tert-Butylbenzene	8260	µg/L	5	ND	
Carbon disulfide	8260	µg/L	5	ND	
Carbon tetrachloride	8260	µg/L	5	ND	
Chlorobenzene	8260	µg/L	5	ND	
Chlorodibromomethane	8260	µg/L	5	ND	
Chloroethane	8260	µg/L	5	ND	
Chloroform	8260	µg/L	5	ND	
Chloromethane	8260	µg/L	5	ND	
2-Chlorotoluene	8260	µg/L	5	ND	
4-Chlorotoluene	8260	µg/L	5	ND	
1,2-Dibromo-3-chloropropane (DB)	8260	µg/L	5	ND	
1,2-Dibromoethane (EDB)	8260	µg/L	5	ND	
Dibromomethane	8260	µg/L	5	ND	
1,2-Dichlorobenzene	8260	µg/L	5	ND	
1,3-Dichlorobenzene	8260	µg/L	5	ND	
1,4-Dichlorobenzene	8260	µg/L	5	ND	
Dichlorodifluoromethane	8260	µg/L	5	ND	
1,1-Dichloroethane	8260	µg/L	5	ND	
1,2-Dichloroethane	8260	µg/L	5	ND	
1,1-Dichloroethene	8260	µg/L	5	ND	
cis-1,2-Dichloroethene	8260	µg/L	5	ND	
trans-1,2-Dichloroethene	8260	µg/L	5	ND	
1,2-Dichloropropane	8260	µg/L	5	ND	
1,3-Dichloropropane	8260	µg/L	5	ND	
2,2-Dichloropropane	8260	µg/L	5	ND	
1,1-Dichloropropene	8260	µg/L	5	ND	
cis-1,3-Dichloropropene	8260	µg/L	5	ND	
trans-1,3-Dichloropropene	8260	µg/L	5	ND	
Ethylbenzene	8260	µg/L	5	ND	

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APCL Analytical Report

Component Analyzed	Method	Unit	PQL	Analysis Result
				BBCCSD #3B Zone 4
				00-03370-1
Hexachlorobutadiene	8260	µg/L	5	ND
Isopropylbenzene (Cumene)	8260	µg/L	5	ND
p-Isopropyltoluene	8260	µg/L	5	ND
Methylene chloride	8260	µg/L	5	ND
4-Methyl-2-pentanone (MIBK)	8260	µg/L	50	ND
Methyl-t-Butyl ether (MTBE)	8260	µg/L	10	ND
Naphthalene	8260	µg/L	5	ND
n-Propylbenzene	8260	µg/L	5	ND
Styrene	8260	µg/L	5	ND
1,1,1,2-Tetrachloroethane	8260	µg/L	5	ND
1,1,2,2-Tetrachloroethane	8260	µg/L	5	ND
Tetrachloroethene	8260	µg/L	5	ND
Toluene	8260	µg/L	5	ND
1,2,3-Trichlorobenzene	8260	µg/L	5	ND
1,2,4-Trichlorobenzene	8260	µg/L	5	ND
1,1,1-Trichloroethane	8260	µg/L	5	ND
1,1,2-Trichloroethane	8260	µg/L	5	ND
Trichloroethene	8260	µg/L	5	ND
Trichlorofluoromethane	8260	µg/L	5	ND
1,2,3-Trichloropropane	8260	µg/L	5	ND
1,2,4-Trimethylbenzene	8260	µg/L	5	ND
1,3,5-Trimethylbenzene	8260	µg/L	5	ND
Vinyl chloride	8260	µg/L	5	ND
o-Xylene	8260	µg/L	5	ND
m/p-Xylene	8260	µg/L	5	ND

PQL: Practical Quantitation Limit. MDL: Method Detection Limit. CRDL: Contract Required Detection Limit

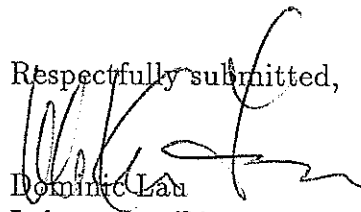
N.D.: Not Detected or less than the practical quantitation limit.

"-": Analysis is not required.

J: Reported between PQL and MDL.

Listed Dilution Factors (DF) are relative to the method default DF. All unlisted DFs are 1.0

Respectfully submitted,


 Dominic Lau

Laboratory Director
 Applied P & Ch Laboratory

Applied P & Ch Laboratory

13760 Magnolia Ave. Chino CA 91710

Tel: (909) 590-1828 Fax: (909) 590-1498

Submitted to:

GEOSCIENCE Support Services, Inc.

Attention: Tom Harder

1326 Monte Vista, Ste# 3

Upland CA 91786

Tel: (909) 920-0707 Fax: (909) 920-0403

APCL Analytical Report

Service ID #: 801-004098

Collected by: Diane Smith

Collected on: 08/01/00

Received: 08/01/00

Extracted: 08/02-07/00

Tested: 08/01-18/00

Reported: 08/21/00

Sample Description: Water from Big Bear City

Project Description: CSD

Analysis of Water Samples

Component Analyzed	Method	Unit	PQL	Analysis Result Well #3B 00-04098-1
General Physical Properties				
Color, for drinking water	110.2	Color Unit	1	5.0
Odor, for drinking water	140.1	Odor Unit	1	1
Turbidity	180.1	NTU	0.1	0.2
General Minerals				
Alkalinity	310.1	mg-CaCO ₃ /L	2	95
Bicarbonate	SM2320B	mg-CaCO ₃ /L	2	95
Carbonate	SM2320B	mg-CaCO ₃ /L	2	<2
Hydroxide	SM2320B	mg-CaCO ₃ /L	2	<2
Chloride Cl ⁻	325.3	mg/L	1	7.5
Hardness	130.2	mg-CaCO ₃ /L	2	26
Surfactants (MBAS)	425.1	mg/L	0.1	0.2
pH	9040	pH unit	0.01	8.61
Electric conductivity	120.1	μS/cm	1	504
Sulfate SO ₄ ²⁻	375.4	mg/L	2	102
Solids, Total Dissolved (TDS)	160.1	mg/L	10	259
Nitrate as N	SM4500NO3D	mg/L	1	0.4J
Bromide Br ⁻	320.1	mg/L	1	<1
Cyanide, Total	335.2	mg/L	0.05	<0.05
Fluoride (Total)	340.2	mg/L	0.1	7.50
Nitrite (NO ₂ ⁻) as N	354.1	mg/L	0.02	<0.02
Nitrogen, Total Kjeldahl (TKN)	351.3	mg/L	0.2	0.3
Carbon, Total Organic (TOC)	415.1	mg/L	1	2.2
Dilution Factor				1
Aluminum	6010	mg/L	0.05	<0.05
Antimony, Sb,	6010	mg/L	0.01	<0.01
Arsenic	6010	mg/L	0.005	<0.005
Barium, Ba,	6010	mg/L	0.01	<0.01
Beryllium, Be,	6010	mg/L	0.002	<0.002
Cadmium, Cd,	6010	mg/L	0.002	<0.002
Calcium	6010	mg/L	0.2	7.5
Copper	6010	mg/L	0.01	<0.01
Chromium, Cr,	6010	mg/L	0.005	<0.005
Iron	6010	mg/L	0.05	0.12
Lead, Pb,	6010	mg/L	0.005	<0.005
Magnesium	6010	mg/L	0.1	1.4
Manganese	6010	mg/L	0.005	<0.005
Mercury, Hg	7470	mg/L	0.0005	<0.0005
Nickel, Ni,	6010	mg/L	0.005	<0.005
Potassium	6010	mg/L	0.4	0.83
Selenium, Se,	6010	mg/L	0.01	<0.01
Silver, Ag,	6010	mg/L	0.01	<0.01
Sodium	6010	mg/L	2	95.1
Thallium, Tl,	6010	mg/L	0.01	<0.01
Zinc	6010	mg/L	0.01	<0.01

Applied P & Ch Laboratory
 13760 Magnolia Ave. Chino CA 91710
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APCL Analytical Report

Component Analyzed	Method	Unit	PQL	Analysis Result Well #3B 00-04098-1
Fumigants, EDB/DBCP				
Dilution Factor				1
1,2-Dibromo-3-chloropropane	504	µg/L	0.01	<0.01
1,2-Dibromoethane (EDB)	504	µg/L	0.02	<0.02
N/P-containing pesticides, Title 22				
Dilution Factor				1
Alachlor (AAtrex)	507	µg/L	0.5	<0.5
Atrazine (AAtrex)	507	µg/L	0.5	<0.5
Butachlor	507	µg/L	0.38	<0.38
Diazinon	507	µg/L	0.02	<0.02
Dimethoate	507	µg/L	0.5	<0.5
Malathion	507	µg/L	0.5	<0.5
Metolachlor	507	µg/L	0.5	<0.5
Metribuzin	507	µg/L	0.5	<0.5
Molinate (Ordram)	507	µg/L	0.5	<0.5
Prometryn	507	µg/L	0.5	<0.5
Simazine (Princep)	507	µg/L	0.5	<0.5
Thiobencarb (Bolero)	507	µg/L	0.5	<0.5
Organochlorine Pesticides				
Dilution Factor				1
Aldrin	508	µg/L	0.02	<0.02
Chlordane	508	µg/L	0.02	<0.02
Chlorothalonil	508	µg/L	0.02	<0.02
Dieldrin	508	µg/L	0.02	<0.02
Endrin	508	µg/L	0.02	<0.02
gamma-BHC	508	µg/L	0.02	<0.02
Heptachlor	508	µg/L	0.02	<0.02
Heptachlor epoxide	508	µg/L	0.02	<0.02
Methoxychlor	508	µg/L	0.02	<0.02
Polychlorinated Biphenyls	508	µg/L	0.02	<0.02
Propachlor	508	µg/L	0.02	<0.02
Toxaphene	508	µg/L	0.02	<0.02
Herbicides, Title 22				
Dilution Factor				1
Bentazon (Basagran)	515.1	µg/L	0.2	<0.2
Dalapon	515.1	µg/L	0.5	<0.5
Dicamba	515.1	µg/L	0.2	<0.2
Dinoseb (DNBP)	515.1	µg/L	0.2	<0.2
Picloram	515.1	µg/L	0.2	<0.2
Pentachlorophenol	515.1	µg/L	0.2	<0.2
2,4-D	515.1	µg/L	0.2	<0.2
2,4,5-T	515.1	µg/L	0.2	<0.2
2,4,5-TP (Silvex)	515.1	µg/L	0.2	<0.2

Applied P & Ch Laboratory

13760 Magnolia Ave. Chino CA 91710

Tel: (909) 590-1828 Fax: (909) 590-1498

APCL Analytical Report

Component Analyzed	Method	Unit	PQL	Analysis Result
				Well #3B
				00-04098-1
Volatile Organic Compounds				
Dilution Factor				1
Benzene	524.2	µg/L	0.5	<0.5
Bromobenzene	524.2	µg/L	0.5	<0.5
Bromochloromethane	524.2	µg/L	0.5	<0.5
Bromodichloromethane	524.2	µg/L	0.5	<0.5
Bromoform	524.2	µg/L	0.5	<0.5
Bromomethane	524.2	µg/L	0.5	<0.5
n-Butylbenzene	524.2	µg/L	0.5	<0.5
sec-Butylbenzene	524.2	µg/L	0.5	<0.5
tert-Butylbenzene	524.2	µg/L	0.5	<0.5
Carbon tetrachloride	524.2	µg/L	0.5	<0.5
Chlorobenzene	524.2	µg/L	0.5	<0.5
Chlorodibromomethane	524.2	µg/L	0.5	<0.5
Chloroethane	524.2	µg/L	0.5	<0.5
Chloroform	524.2	µg/L	0.5	<0.5
Chloromethane	524.2	µg/L	0.5	<0.5
2-Chlorotoluene	524.2	µg/L	0.5	<0.5
4-Chlorotoluene	524.2	µg/L	0.5	<0.5
Dibromomethane	524.2	µg/L	0.5	<0.5
1,2-Dichlorobenzene	524.2	µg/L	0.5	<0.5
1,3-Dichlorobenzene	524.2	µg/L	0.5	<0.5
1,4-Dichlorobenzene	524.2	µg/L	0.5	<0.5
Dichlorodifluoromethane	524.2	µg/L	0.5	<0.5
1,1-Dichloroethane	524.2	µg/L	0.5	<0.5
1,2-Dichloroethane	524.2	µg/L	0.5	<0.5
1,1-Dichloroethene	524.2	µg/L	0.5	<0.5
cis-1,2-Dichloroethene	524.2	µg/L	0.5	<0.5
trans-1,2-Dichloroethene	524.2	µg/L	0.5	<0.5
1,2-Dichloropropane	524.2	µg/L	0.5	<0.5
1,3-Dichloropropane	524.2	µg/L	0.5	<0.5
2,2-Dichloropropane	524.2	µg/L	0.5	<0.5
1,1-Dichloropropene	524.2	µg/L	0.5	<0.5
cis-1,3-Dichloropropene	524.2	µg/L	0.5	<0.5
trans-1,3-Dichloropropene	524.2	µg/L	0.5	<0.5
Ethylbenzene	524.2	µg/L	0.5	<0.5
Hexachlorobutadiene	524.2	µg/L	0.5	<0.5
Isopropylbenzene (Cumene)	524.2	µg/L	0.5	<0.5
p-Isopropyltoluene	524.2	µg/L	0.5	<0.5
Methylene chloride	524.2	µg/L	0.5	<0.5
Methyl-t-Butyl ether (MTBE)	524.2	µg/L	1	<1

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APCL Analytical Report

Component Analyzed	Method	Unit	PQL	Analysis Result
				Well #3B 00-04098-1
Naphthalene	524.2	µg/L	0.5	<0.5
n-Propylbenzene	524.2	µg/L	0.5	<0.5
Styrene	524.2	µg/L	0.5	<0.5
1,1,1,2-Tetrachloroethane	524.2	µg/L	0.5	<0.5
1,1,2,2-Tetrachloroethane	524.2	µg/L	0.5	<0.5
Tetrachloroethene	524.2	µg/L	0.5	<0.5
Toluene	524.2	µg/L	0.5	<0.5
1,2,3-Trichlorobenzene	524.2	µg/L	0.5	<0.5
1,2,4-Trichlorobenzene	524.2	µg/L	0.5	<0.5
1,1,1-Trichloroethane	524.2	µg/L	0.5	<0.5
1,1,2-Trichloroethane	524.2	µg/L	0.5	<0.5
Trichloroethene	524.2	µg/L	0.5	0.6
Trichlorofluoromethane	524.2	µg/L	0.5	<0.5
1,2,3-Trichloropropane	524.2	µg/L	0.5	<0.5
1,1,2-Trichlorotrifluoroethane	524.2	µg/L	0.5	<0.5
1,2,4-Trimethylbenzene	524.2	µg/L	0.5	<0.5
1,3,5-Trimethylbenzene	524.2	µg/L	0.5	<0.5
Vinyl chloride	524.2	µg/L	0.5	<0.5
o-Xylene	524.2	µg/L	0.5	<0.5
m/p-Xylene	524.2	µg/L	0.5	<0.5
Synthetic Organic Compounds				
Dilution Factor				1
Bis(2-Ethylhexyl)adipate	525	µg/L	5	<5
Bis(2-ethylhexyl) phthalate	525	µg/L	1	<1
Hexachlorobenzene	525	µg/L	0.5	<0.5
Hexachlorocyclopentadiene	525	µg/L	1	<1
Polynuclear Aromatic HC (PAH)				
Dilution Factor				1
Acenaphthene	550	µg/L	5	<5
Acenaphthylene	550	µg/L	2	<2
Anthracene	550	µg/L	0.2	<0.2
Benz(a)anthracene	550	µg/L	0.2	<0.2
Benzo(a)pyrene	550	µg/L	0.2	<0.2
Benzo(b)fluoranthene	550	µg/L	0.2	<0.2
Benzo(g,h,i)perylene	550	µg/L	0.2	<0.2
Benzo(k)fluoranthene	550	µg/L	0.2	<0.2
Chrysene	550	µg/L	0.2	<0.2
Dibenz(a,h)anthracene	550	µg/L	0.5	<0.5
Fluoranthene	550	µg/L	0.2	<0.2
Fluorene	550	µg/L	1	<1
Indeno(1,2,3-cd)pyrene	550	µg/L	0.2	<0.2

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APCL Analytical Report

Component Analyzed	Method	Unit	PQL	Analysis Result
				Well #3B
				00-04098-1
Naphthalene	550	$\mu\text{g/L}$	5	< 5
Phenanthrene	550	$\mu\text{g/L}$	1	< 1
Pyrene	550	$\mu\text{g/L}$	0.2	< 0.2

PQL: Practical Quantitation Limit. MDL: Method Detection Limit. CRDL: Contract Required Detection Limit

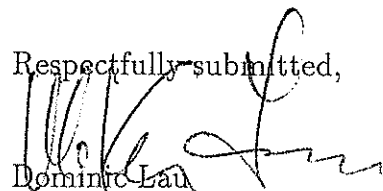
N.D.: Not Detected or less than the practical quantitation limit.

"-": Analysis is not required.

J: Reported between PQL and MDL.

Listed Dilution Factors (DF) are relative to the method default DF. All unlisted DFs are 1.0

Respectfully submitted,


Dominic Lau

Laboratory Director

Applied P & Ch Laboratory

APPENDIX I
Well Completion Report

GEOSCIENCE Support Services, Inc.



ORIGINAL
File with DWR

00-03-35

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

Appendix I

Page 1 of 2

Owner's Well No. 3B

No. 518611

Date Work Began 5/03/00 Ended 8/03/00

Local Permit Agency San Bernardino County Environmental Health

Permit No. 2000050316 Permit Date 4/18/00

DWR USE ONLY - DO NOT FILL IN

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

GEOLOGIC LOG

WELL OWNER

ORIENTATION (✓) ☒ VERTICAL ☐ HORIZONTAL ☐ ANGLE (SPECIFY)

Name Big Bear City Community Service Dist.

Mailing Address P.O. Box 558

City Big Bear City, CA 92314-0558 STATE CA ZIP 92314

WELL LOCATION

Address Shore Drive & Maltby Blvd.

City Big Bear City

County San Bernardino

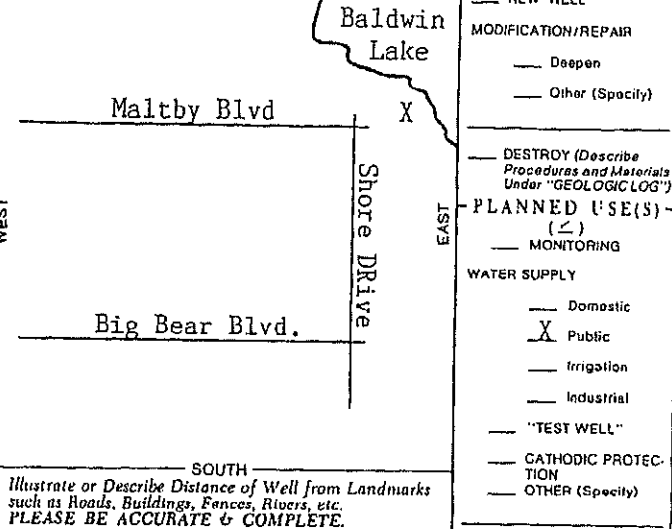
APN Book 313 Page 202 Parcel 14

Township 2N Range 1E Section 12

Latitude 34° 15' 00" N Longitude 116° 55' 00" W

DEG. MIN. SEC. NORTH Longitude DEG. MIN. SEC. WEST

LOCATION SKETCH NORTH SOUTH



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

DRILLING METHOD Reverse Rotary FLUID Water

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH OF STATIC 36' 7 1/2" (FL.) & DATE MEASURED 7/28/00

WATER LEVEL 36' 7 1/2" (FL.) & DATE MEASURED 7/28/00

ESTIMATED YIELD 1050 (GPM) & TEST TYPE 24 hr constant

TEST LENGTH 24 (Hrs.) TOTAL DRAWDOWN 33.16 (FL.)

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

DEPTH FROM SURFACE		DESCRIPTION <i>Describe material, grain size, color, etc.</i>
Fl.	to Fl.	
0	130	Sandy clay, fine sand
130	150	Gravel
150	160	Coarse gravel
160	180	Sandy gravel
180	200	Sandy clay
200	220	Gravel
220	240	Sandy gravel
240	250	Sand
250	300	Clay & Sandy clay
300	320	Sandy gravel
320	330	Clay
330	340	Gravel & clay
340	350	Clay
350	360	Gravel & clay
360	370	Clay
370	390	Clay & gravel
390	400	Clay
400	420	Clay & gravel
420	440	Gravel
440	470	Clay
470	490	Sandy gravel
490	510	Clay
510	550	Sandy clay
550	580	Clay
580	620	Sandy clay
620	820	Sand & gravel

TOTAL DEPTH OF BORING 820 (Feet)

TOTAL DEPTH OF COMPLETED WELL 810 (Feet)

DEPTH FROM SURFACE			BORE-HOLE DIA. (Inches)	CASING(S)							DEPTH FROM SURFACE	ANNULAR MATERIAL					
				TYPE (✓)				MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS		SLOT SIZE IF ANY (Inches)	TYPE				
				BLANK	SCREEN	CON- DUCTOR	FILL PIPE						CE- MENT (✓)	BEN- TONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)	
Fl.	to	Fl.									Fl.	to	Fl.				
0	50	36			X		Mild stl	26od	5/16		820	90			X	1/4x12 Kel	
0	130	24	X				Cor-Ten	14	5/16		90	85			X	Fine sand	
130	250	24		X			Cor-Ten FF	14	5/16	.094	85	0	X			10 sack	
250	295	24	X				Cor-Ten	14	5/16								
295	530	24		X			Cor-Ten FF	14	5/16	.094							
530	630	24	X				Cor-Ten	14	5/16								

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 South West Pump & Drilling, Inc.
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

ADDRESS 53381 Hwy 111, Coachella, CA 92236

CITY Coachella STATE CA ZIP 92236

Signed [Signature]
WELL DRILLER/AUTHORIZED REPRESENTATIVE

DATE SIGNED 10/09/00 723919

C-57 LICENSE NUMBER

ORIGINAL
File with DWR

Page 2 of 2Owner's Well No. 3B

Date Work Began _____, Ended _____

Local Permit Agency _____

Permit No. _____ Permit Date _____

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

No. 505369

DWR USE ONLY - DO NOT FILL IN

STATE WELL NO./STATION NO.

LATITUDE

LONGITUDE

APN/TRS/OTHER

GEOLOGIC LOG				WELL OWNER			
ORIENTATION (☐) ☐ VERTICAL ☐ HORIZONTAL ☐ ANGLE (SPECIFY)				Name <u>Big Bear City Community Service Dist.</u>			
DEPTH TO FIRST WATER _____ (Ft.) BELOW SURFACE				Mailing Address <u>P.O. Box 558</u>			
DEPTH FROM SURFACE Ft. to Ft. DESCRIPTION <i>Describe material, grain size, color, etc.</i>				<u>Big Bear City, CA 92314-0558</u>			
				CITY _____ STATE _____ ZIP _____			
				WELL LOCATION _____			
				Address _____			
				City _____			
				County _____			
				APN Book _____ Page _____ Parcel _____			
				Township _____ Range _____ Section _____			
				Latitude _____ DEG. MIN. SEC. NORTH Longitude _____ DEG. MIN. SEC. WEST			
				LOCATION SKETCH NORTH ACTIVITY (☐) ☐ NEW WELL MODIFICATION/REPAIR ☐ Deepen ☐ Other (Specify) _____ ☐ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG") PLANNED USE(S) (☐) ☐ MONITORING WATER SUPPLY ☐ Domestic ☐ Public ☐ Irrigation ☐ Industrial ☐ "TEST WELL" ☐ CATHODIC PROTECTION ☐ OTHER (Specify) _____			
				SOUTH Illustrate or Describe Distance of Well from Landmarks such as Roads, Buildings, Fences, Rivers, etc. PLEASE BE ACCURATE & COMPLETE.			
				DRILLING METHOD _____ FLUID _____			
				WATER LEVEL & YIELD OF COMPLETED WELL _____			
				DEPTH OF STATIC WATER LEVEL _____ (Ft.) & DATE MEASURED _____			
				ESTIMATED YIELD * _____ (GPM) & TEST TYPE _____			
				TEST LENGTH _____ (Hrs.) TOTAL DRAWDOWN _____ (Ft.)			
				* May not be representative of a well's long-term yield.			
TOTAL DEPTH OF BORING _____ (Feet)							
TOTAL DEPTH OF COMPLETED WELL _____ (Feet)							

[illegible]

ATTACHMENTS ()	CERTIFICATION STATEMENT
☐ Geologic Log ☐ Well Construction Diagram ☐ Geophysical Log(s) ☐ Soil/Water Chemical Analyses ☐ Other _____	I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief. NAME _____ (PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED) ADDRESS _____ CITY _____ STATE _____ ZIP _____ Signed _____ WELL DRILLER/AUTHORIZED REPRESENTATIVE DATE SIGNED _____ P-57 LICENSE NUMBER _____