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TECHNICAL MEMORANDUM

DATE: November 22, 2022 Project No.: 941-80-21-62

TO: Ground-Level Monitoring Committee (GLMC)
Chino Basin Watermaster

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REVIEWED BY: Andy Malone, PG

SUBJECT: Construction and Calibration of One-Dimensional Compaction Models in the Northwest MZ-1 Area of the Chino Basin (FINAL)

BACKGROUND AND OBJECTIVES

The Chino Basin Watermaster's Subsidence Management Plan (SMP)[1] states that if data from existing monitoring efforts in the Areas of Subsidence Concern indicate the potential for adverse impacts due to subsidence, Watermaster will revise the SMP to avoid those adverse impacts. Watermaster has been monitoring vertical ground motion in Northwest MZ-1 via InSAR since the development of its original SMP (WEI, 2007). Land subsidence in Northwest MZ 1 was first identified as a concern in 2006 in the MZ 1 Summary Report (WEI, 2006). Of particular concern, the subsidence across the San Jose Fault in Northwest MZ 1 has occurred in a pattern of concentrated differential subsidence—the same pattern of differential subsidence that occurred in the Managed Area during the time of ground fissuring. Concerns associated with ground fissuring and differential subsidence include threats to infrastructure and changes to the hydraulic gradient in gravity flow systems.

The issue of differential subsidence, and the potential for ground fissuring in Northwest MZ 1, has been discussed at prior meetings of the Ground Level Monitoring Committee (GLMC), and the subsidence has been documented and described as a concern in Watermaster's State of the Basin Reports, the annual reports of the GLMC, and in the Initial Hydrologic Conceptual Model and Monitoring and Testing Program for the Northwest MZ 1 Area (WEI, 2017). Watermaster increased monitoring efforts in Northwest MZ 1 beginning in Fiscal Year (FY) 2012/13 to include ground elevation surveys and electronic distance measurements (EDM) to monitor ground motion and the potential for fissuring.

In 2015, the Watermaster's Engineer developed the *Work Plan to Develop a Subsidence Management Plan for the Northwest MZ-1 Area* (Work Plan).[2] The Work Plan is characterized as an ongoing

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[1] Wildermuth Environmental, Inc. 2015. Chino Basin Subsidence Management Plan. Prepared for the Chino Basin Watermaster. July 23, 2015.

[2] Wildermuth Environmental, Inc. 2015. Work Plan to Develop a Subsidence-Management Plan for Northwest MZ-1. Prepared for the Chino Basin Watermaster. July 23, 2015.

Watermaster effort and includes a description of a multi-year scope of work, a cost estimate, and an implementation schedule. The Work Plan was included in the SMP as Appendix B. Implementation of the Work Plan began in July 2015. On an annual basis, the GLMC analyzes the data and information generated by the implementation of the Work Plan. The results and interpretations generated from the analysis are documented in the annual report of the GLMC and used to prepare recommendations for future activities.

The Work Plan includes various tasks that involve the construction, calibration, and use of one-dimensional aquifer-system compaction models in Northwest MZ-1 (1D Models):

- Tasks 3 and 4 called for the construction and calibration of a single 1D Model at the location of Monte Vista Water District Well 28 (MVWD-28). This 1D Model was used to explore preliminary methods to manage pumping and recharge to avoid the future occurrence of land subsidence in Northwest MZ-1.
- Task 7 called for the construction and calibration of another 1D Model at the location of Pomona Extensometer (PX), which is based on the detailed lithologic information collected at the PX.

The main objective of this technical memorandum is to describe the methods and results for the construction and calibration of both 1D Models. Ancillary objectives are to describe the subsidence mechanisms and the vertical distribution of pre-consolidation head[3] within the aquifer system in Northwest MZ-1.

The knowledge of the subsidence mechanisms and pre-consolidation heads can provide guidance for the Chino Basin parties in the development of “subsidence-management alternatives” (i.e., managed pumping and/or recharge) to avoid the future occurrence of land subsidence in Northwest MZ-1. Subsequent tasks in the Work Plan will utilize the 1D Models described herein to evaluate the effectiveness of the subsidence-management alternatives.

METHODS

This section describes:

- Background information on the modeling tools used to estimate head changes and aquifer system deformation.
- The technical methods that were applied to construct and calibrate the two 1D Models in Northwest MZ-1.

Model Codes Used

The United States Geological Survey (USGS) has developed a wide range of computer models to simulate saturated and unsaturated subsurface flow, solute transport, and chemical reactions in groundwater systems. The most widely used of these models is MODFLOW, which simulates three-dimensional (3D)

[3] The pre-consolidation head is the lowest piezometric level that an aquifer system has ever experienced. When piezometric levels are below the pre-consolidation head, permanent subsidence is caused.

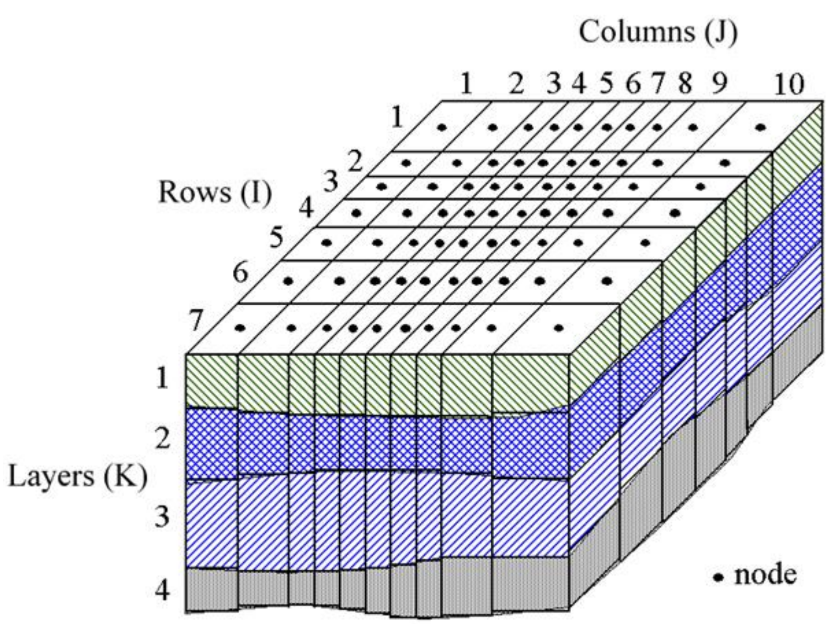
groundwater flow using the finite-difference method. Although it was conceived solely as a groundwater flow model in 1984 and released in 1988 (McDonald et al., 1988), the MODFLOW modular structure has provided a robust framework for the integration of additional simulation capabilities that build on and enhance its original scope. The family of MODFLOW-related models now includes capabilities for simulating coupled groundwater/surface water systems and solute transport.

MODFLOW-NWT (Niswonger et al., 2011) was chosen for this project because: 1) it has extensive publicly available documentation, 2) it has sustained rigorous USGS and academic peer review, 3) it has a long history of development and use, 4) it is widely used around the world in public and private sectors, 5) it can easily operate with additional simulation tools published by others, and 6) it has been used by the Watermaster in the Chino Valley Model (CVM) for the latest Safe Yield Recalculation (WEI, 2020).

The Interbed Storage Package (Leake and others, 1991) of MODFLOW-NWT was chosen to simulate the aquifer-system deformation that is caused by elastic and/or inelastic deformation of the fine-grained interbeds in an aquifer-system due to changes in the effective stress on the soil skeleton because of changing groundwater levels.

How MODFLOW Works

In a MODFLOW model, an aquifer system is represented by a discretized domain consisting of an array of finite difference blocks (model cells) and nodes at the cell centers. The figure below shows the spatial discretization scheme of an aquifer system with a mesh of model cells and nodes at which hydraulic heads are calculated. Hydrostratigraphic units can be represented by one or more model layers and the layer of thickness may vary from cell to cell. The nodal grid forms the framework of a finite-difference numerical model.



To calculate the hydraulic heads at the nodes (i.e., centers of model cells), a water balance equation is

Spatial discretization scheme of MODFLOW

formulated for each model cell:

$$\Sigma\mathrm{Q} = \mathrm{S}_s \cdot \frac{\Delta \mathrm{h}}{\Delta \mathrm{t}} \cdot \mathrm{V} + \mathrm{S}' \cdot \frac{\Delta \mathrm{h}}{\Delta \mathrm{t}} \tag{1}$$

The left-hand side of the equation ($\Sigma\mathrm{Q}$) is the sum of all flows to/from neighboring cells, pumping, and recharge occurring within the model cell. The right-hand side represent the storage change within a time-interval of the length $\Delta\mathrm{t}$, where Ss is the specific storage (that accounts for compressibility of water), S' is the Skeletal storage coefficient (that accounts for compressibility of soil skeleton) of the model cell, V is the volume of the model cell, and $\Delta\mathrm{h}$ is the head change in the model cell over the time interval $\Delta\mathrm{t}$. The flows to/from neighboring cells can be expressed with the hydraulic heads of the model cell and its neighbors through the Darcy's law that describes the relationship between the flow, hydraulic conductivity, and hydraulic gradient. In summary, equation (1) can be rewritten to an equation containing unknown hydraulic head values at the cell and its neighboring cells with other aquifer property terms.

MODFLOW formulates such an equation for each of the active model cells (where the heads are unknown and need to be solved). Once all equations are formulated, the system of equations are solved together for the unknown head values. Once the head values are computed, they are used to back-calculate the cell-by-cell flow terms. The calculated head values and flow terms are the basis for water budget calculation, particle tracking simulations, transport models, and visualization, such as flow vectors and water level contours.

Estimating the vertical aquifer-system deformation in a model cell

The vertical deformation of a model cell ($\Delta\mathrm{b}$) over a time interval $\Delta\mathrm{t}$ is calculated as:

$$\Delta\mathrm{b} = \mathrm{S}' \cdot \Delta h \tag{2}$$

Soil skeleton deformation behavior is non-linear and is dependent on the current hydraulic head and the lowest hydraulic head (i.e., highest effective stress) that has ever been applied to the soil skeleton. To better approximate the non-linear behavior, equation (2) is further refined as follows:

$$\Delta\mathrm{b}_e = S_{fe} \cdot \Delta h \qquad if\ h > h_c \tag{3a}$$

$$\Delta\mathrm{b}_v = S_{fv} \cdot \Delta h \qquad if\ h \leq h_c \tag{3b}$$

The variable h_c is the pre-consolidation head (also referred to as critical head, or the previous lowest hydraulic head) of the model cell; $\Delta\mathrm{b}_e$ is the elastic deformation; S_{fe} is the elastic storage coefficient; $\Delta\mathrm{b}_v$ is the inelastic deformation; and S_{fv} is the inelastic storage coefficient. Equation (3a) applies when the hydraulic head is greater than the pre-consolidation head. Equation (3b) applies when the hydraulic head is equal or less than the pre-consolidation head.

If the hydraulic head remains greater than the pre-consolidation head, a further decrease in hydraulic head (i.e., increase in effective stress) causes a small elastic compression in both the coarse- and fine-grained sediments. This compression is recoverable if the head returns to its initial value. If the hydraulic head falls below the pre-consolidation head, the fine-grained sediments can compact inelastically. Inelastic compaction is explained by a physical rearrangement of the sediment grains and is largely permanent (Meade, 1964). Inelastic compaction of coarse-grained sediments is generally negligible compared to that of fine-grained sediments. For the same magnitude of changes in effective stress, inelastic compaction can be one to two orders of magnitude larger than elastic compression (Riley, 1969; Riley 1998).

Time Delay of Compaction

Because of the characteristically low vertical hydraulic conductivity of fine-grained interbeds, the equilibration of hydraulic heads in the interbeds of an aquifer system typically lags the head changes in the bounding aquifers (Hoffmann and others, 2003). In the context of interbed compaction and land subsidence, the time delay caused by slow dissipation of transient overpressures in fine-grained interbed sediments is often given in terms of the time constant τ_0.

$$\tau_0 = \left(\frac{b_0}{2}\right)^2 / D' \qquad (4)$$

The time constant τ_0 is the time during which about 93 percent of the ultimate compaction for a given decrease in head occurs (Hoffmann and others, 2003) if the overpressures dissipate vertically in two directions into the bounding aquifers. The variable b_0 is the thickness of the interbed within a model cell and $D' = S_s'/VK_v'$ is the ratio of the specific storage (S_s') and the vertical hydraulic conductivity (VK_v') of the interbed. If the time constant τ_0 is significantly greater than the model time steps, the process of slow dissipation of the heads in the interbed must be explicitly simulated (Hoffmann and others, 2003). For most regional 3D groundwater models with large interbed thickness within model layers (such as CVM), the time constant τ_0 is often much greater than the model time steps. The Subsidence and Aquifer Compaction (SUB) Package introduces an approximation method to simulate the slow dissipation of heads in such models, where all interbeds within a model cell (of greater thickness) are lumped together and their root mean square of the thicknesses is used in the simulation. While this method is theoretically sound, it is impractical to accurately collect details of all interbed data for deep aquifers of a 3D model.

To address this challenge, this work used a combination of 3D and 1D models. In this approach, a 3D model is used to simulate regional groundwater head without the skeleton compression (i.e., compaction) terms. A vertical 1D model at a desired location with detailed lithological log is constructed with much higher vertical resolution, where thickness of each model cell is much smaller than the 3D model to obtain a proper time constant τ_0 for given time step lengths. The simulated heads from the 3D model are then assigned as the prescribed heads for the 1D model cells with coarse-grained sediments, and the 1D model run is executed to calculate the vertical aquifer-system deformation within the model cells of fine-grained sediments. The detailed steps of this approach are given below.

Steps to Construct and Calibrate 1D Compaction Models

In summary, the major steps to construct and calibrate the 1D Models were:

1. Construct the 1D Models using the Interbed Storage Package (Leake and others, 1991) of MODFLOW-NWT at areas of maximum historical subsidence. These models are a vertical stack of cells that represent the aquifer system at each location. The thicknesses of the 1D Model cells are chosen to ensure that the time constant τ_0 is smaller than model time steps. The model cells are categorized into either “Sand” for coarse-grained sediments or “Clay” for fine-grained sediments based on borehole lithologic and geophysical data. Initial aquifer (Sand) and aquitard (Clay) properties were assigned to the 1D Model cells.

2. Prepare a time-series of historical heads by aquifer-system layer to serve as input data for the 1D Models over the calibration period. For 1930-1977, these heads are estimated based on the measured groundwater elevations at wells in the vicinity of the 1D Models. For 1977-2018,

these heads are estimated from CVM output data for heads at the 1D Model locations by model layer. The heads are assigned as prescribed heads to the corresponding Sand cells in the 1D Model.

3. Run and calibrate the 1D Models over a historical period by adjusting the aquifer and aquitard properties. The 1D Model simulations were executed to compute a time series of vertical aquifer-system deformation in each 1D Model cell. During calibration, the aquitard properties were adjusted manually to best match historical observations of land subsidence with model-simulated compaction of the aquifer system. The sum of the calculated vertical deformation in all 1D Model cells was assumed to represent the vertical ground motion at the land surface.

RESULTS

This section describes the results and conclusions of the construction and calibration the 1D Models.

Location of the 1D Models

Two 1D Models were constructed and calibrated to simulate the vertical deformation of the aquifer-system sediments at sites in Northwest MZ-1. Figure 1 shows that one model is located at the PX facility and the second model is located at the MVWD-28 well site. Figure 1 also shows the contours of InSAR-estimated vertical ground motion across Northwest MZ-1 used to calibrate the 1D Models and the locations of nearby benchmarks (B-401, B-403, BM 2867, BM 4311, EV3052, EV3054) at which surveyed elevation data are available to validate the 1D Model calibrations.

The PX and MVWD-28 sites were chosen as the 1D Model locations because:

1. Both sites are located within the area of greatest subsidence in Northwest MZ-1 as estimated by InSAR from 1992-2021.
2. The boreholes were drilled to total depths of 1,290 and 1,317 feet below ground surface (ft-bgs) for PX and MVWD-28, respectively. These depths are deeper than most production wells in the area and penetrate all five model layers as currently conceptualized in the CVM.
3. The borehole lithologic descriptions are consistent with the borehole resistivity logs. This is important because the borehole lithology was the primary information used to construct and discretize the 1D Models into "Sand" and "Clay" layers.

Data for Calibration and Validation

Both models were calibrated to match the InSAR estimates of vertical ground motion at the locations of the 1D Models. In addition, ground-level survey data at nearby benchmarks were used to validate the calibration. The table below describes the time range of the available InSAR and ground-level survey data, including data provided by the Los Angeles Department of Public Works (LADPW)[4] and the data acquired by the Chino Basin Watermaster as part of its Ground-Level Monitoring Program.

[4] https://dpw.lacounty.gov/sur/BenchMark/

Time Range of Ground-Motion Data Used in 1D Model Calibration and Validation	
Location/Method	Time Range
InSAR at the PX and MVWD-28 locations	1992 to 1999, and 2005 to 2020
Benchmark 2867 via LADPW leveling surveys	1990 to 2013
Benchmark 4311 via LADPW leveling surveys	1990 to 2013
Benchmarks B-401 and B-403 via CBWM leveling surveys	2013 to 2021

Borehole Lithology

The lithology at PX and MVWD-28 consists of coarse-grained "Sand" layers comprised of silty sands, sands, and gravels, interbedded with fine-grained "Clay" layers comprised of silts, silty clays, and clays.[5] The table below shows the mapping of Unified Soils Classification System (USCS) codes to "Sand" or "Clay" layers.

Mapping of USCS Codes to Sand or Clay Layers		
USCS Code	Cell Type	Description
SP-SM	Sand	Poorly graded sand with silt
SP-SC	Sand	Poorly graded sand with clay
SP	Sand	Poorly graded sand with gravel
SC	Sand	Clayey sand or Sand with clay
SM	Sand	Silty sand
CH	Clay	Fat clay
ML	Clay	Sandy silt
CL	Clay	Sandy lean clay or Clay with sand

Spatial Discretization

Figures 2 and 3 show the generalized borehole lithology at the PX and MVWD-28 sites, short-normal borehole resistivity logs, 1D Model cells (Sand cells are shaded in blue; Clay cells are shaded white), and the corresponding CVM layers. CVM Layer 1 represents the shallow aquifer-system and is generally characterized by unconfined to semi-confined groundwater conditions. CVM Layers 2 to 5 represent the deep aquifer-system and are characterized by confined groundwater conditions, lower permeability sand and gravel layers (compared to Layer 1), and a greater abundance of interbedded fine-grained sediments.

For the PX 1D Model, the borehole lithology was discretized into a stacked column of 529 two-foot-thick cells starting from 234 ft-bgs to 1,292 ft-bgs. The uppermost 234 feet of sediments were not included in

[5] The PX2 and MVWD-28 borehole lithologic and geophysical logs are included in Appendix A to this memorandum.

the 1D Model because the sediment was unsaturated throughout the simulation and therefore not subject to deformation caused by changes in head. Each 1D Model cell was mapped to the borehole lithology and identified as either a “Sand” or “Clay” cell based on the mapping shown in the table above.

For the MVWD-28 1D Model, the borehole lithology was discretized into a stacked column of 510 two-foot-thick cells starting from 280 ft-bgs to 1,300 ft-bgs. The uppermost 280 feet of sediments were not included in the 1D Model because the sediment was unsaturated throughout the simulation and therefore not subject to deformation caused by changes in head. Each model cell was mapped to the borehole lithology and identified as either a “Sand” or “Clay” cell based on the mapping shown in the table above.

Time Discretization

The 1D Models were ran from July 1, 1930 to June 30, 2018 on a monthly time step.

Initial Conditions

The 1D Models require assignment of initial conditions for head, pre-consolidation head, and initial compaction for each model cell. An initial head of 750.5 feet above sea level (ft-amsl) was assigned to all model cells based on measured heads in 1930 at wells located in the vicinity of the 1D Models. The assumption here is that 1930 was a time before significant head declines and compaction of the aquifer-system sediments in Northwest MZ-1. The initial pre-consolidation head was also set at 750.5 ft-amsl. The initial compaction was set to zero for all model cells.

Boundary Conditions

The Sand cells in the 1D Models were modeled as a specified-head boundary with the Flow and Head Boundary Package (Leake and others, 1997). Figures 4 and 5 show the time-series of groundwater elevations by CVM Layer that were used in the 1D Models for the PX and MVWD-28 sites, respectively. Historical measured heads at several wells located in the vicinity of the 1D Models are also shown on Figures 4 and 5.

For the period 1930-1977, the measured heads at nearby wells were used to estimate the time-series of groundwater elevations by CVM Layer. Figure 6 shows that during this period, virtually all pumping wells that existed in Northwest MZ-1 had well screens that penetrated Layer 1 only. Figures 4 and 5 show that during 1930-1977 it was assumed that heads in the deeper CVM Layers equilibrated simultaneously with the head declines that were occurring in Layer 1.

For the period 1977-2018, the CVM-simulated heads at the 1D Model locations were used as the time-series of groundwater elevations by CVM Layer. This period is the calibration period for the 2020 CVM. Figure 6 shows that during this period, deeper pumping wells were constructed in Northwest MZ-1. Figures 4 and 5 show that after about 1977, the deeper pumping caused head declines in the deeper confined CVM Layers, which in turn resulted in downward vertical hydraulic gradients.

Initial Aquifer/Aquitard Properties

Table 1 lists the initial estimates for vertical hydraulic conductivity, specific storage, and the inelastic and elastic storage coefficients that were assigned to all Sand and Clay cells in both 1D Models. These initial estimates were obtained based on literature reviews and were adjusted during calibration.

Calibration of the 1D Models

The calibration of the 1D Models was performed in a manual and iterative manner in the following steps:

1. The initial estimates of parameter values for the Sand and Clay cells were assigned to the 1D Models.
2. The 1D Models were executed from 1930 to 2018 using the prescribed heads by model layer in Figures 4 and 5 as boundary conditions for the Sand cells in the 1D Models.
3. The model-simulated compaction values in the combined Clay cells were compared with the InSAR estimates of vertical ground motion over the period of InSAR records, and the goodness of fit was determined via visual and statistical methods.
4. A new set of parameter values for the Clay[6] cells were determined based on the results of step 3, and steps 1 to 3 were repeated for a new calibration iteration.

The iterative calibration process described above was repeated until a good match between model-simulated aquifer-system deformation and the InSAR estimates of vertical ground motion was achieved with parameter values within reasonable bounds. The initial parameter values in Table 1 were used in calibration iteration V1, and then manually adjusted in subsequent calibration iterations.

Table 2 is a list of calibration iterations (V1 to V21) and parameter values for the Clay cells in both 1D Models. Figures 7 and 8 show the time series of the simulated aquifer-system deformation and observed vertical ground motion for all calibration iterations for the PX 1D Model and the MVWD-28 1D Model, respectively. The time-series of vertical ground motion from the benchmark surveys are also displayed on these figures to validate the calibration results. The calibration process was focused on matching model results with the recent InSAR data (i.e., 2005 to 2020), since these are considered the most reliable InSAR data for calibration targets.

For the PX 1D Model, the parameters values for calibration iterations V13 and V21 provided the best match between the simulated and observed values. For the MVWD-28 1D Model, the parameter values for calibration iterations V7 and V21 provided the best match between the simulated and observed values. For both models, V21 matches the InSAR data from 1992 to 1999 better. V21 also results in less total subsidence compared to V7 and V13, which is more consistent with no reported observations of ground fissuring or subsidence-related impacts to overlying infrastructure.

The final calibration results for V21 are displayed in the following figures and tables for both 1D Models:

[6] The potential for compaction in the Sand cells was assumed to be negligible, hence, the parameter values for the Sand cells were set to their initial values in Table 1 and were not adjusted during 1D Model calibration.

- Figures 9 and 10 are time series charts that compare simulated versus observed data for calibration iteration V21 for the PX 1D Model and the MVWD-28 1D Model, respectively.
- Figures 11 and 12 are scatter plots that compare simulated versus observed data, which quantifies the goodness of fit of the calibration iterations. On these charts, the X-axis represents measured ground motion and the Y-axis represents the model-simulated aquifer-system deformation. The orange diagonal line represents the line of perfect fit.
- Tables 3 and 4 shows the calibration statistics for all calibration iterations, which indicate that V21 is the best calibration for both 1D Models.

Figures 9 and 10 also display the ground-level survey data from 1990-2020 that validate the model calibration for V21. There are no ground-level survey data near the PX and MVWD-28 sites prior to the 1990s that can be used to validate V21. However, Figure 1 shows that 3.5 feet of subsidence occurred at benchmark EV3052 from 1923-1974 and 1.64 feet of subsidence occurred at benchmark EV3054 from 1968-1978. These early ground-level survey data are consistent with the timing and magnitude of the compaction that was estimated by the 1D Models prior to the 1990s.

In conclusion, the 1D Model parameters of V21 resulted in the best fit between simulated compaction and the observed subsidence data. The final calibrated parameters for both 1D Models are listed below:

Final Calibrated Parameter Values for the Clay Cells in the PX and MVWD-28 1D Models

Iteration	VK [ft/day]	Ss [1/ft]	Sfv [-]	Sfe [-]
V21	2.00E-07	1.14E-05	4.50E-04	4.50E-06

Simulation of Historical Subsidence

Figure 7 shows that the final calibration run (V21) for the PX 1D Model resulted in a total of about 9.6 feet of aquifer-system compaction from 1930 to 2018. Most of the compaction (about 6.4 feet) occurred between 1930 and 1978—the period of gradual and persistent lowering of groundwater levels by about 190 feet in Northwest MZ-1.

Figure 8 shows that the final calibration run (V21) for the MVWD-28 1D Model resulted in a total of about 5.5 feet of aquifer-system compaction from 1930 to 2018. About three feet of compaction occurred between 1930 and 1978—the period of gradual and persistent lowering of groundwater levels by about 190 feet in Northwest MZ-1.

The final calibration run (V21) also generated end-of-calibration (2018) estimates of the compaction and critical head in the 1D Model cells, which are displayed on Figures 13 and 14 for the PX and MVWD-28 1D Models, respectively. The higher critical head and lower compaction in the center of thicker fine-grained sediment layers indicate that the pore pressures there have not yet dissipated and, therefore, these sediment layers are susceptible to compaction should the internal pore pressures continue to decline in the future. As thicker fine-grained layers are primarily located in the deep aquifer-system, this indicates that the potential for future compaction is more likely to occur in the deep aquifer system (Layers 2, 3, 4, and 5) compared to the shallow aquifer-system (Layer 1).

Sensitivity Analysis

In early 2022, the GLMC reviewed the calibration results of the 1D Models described above and recommended an analysis to evaluate the sensitivity of the 1D Model calibrations to the estimates of historical heads. This sensitivity analysis is prudent given the lack of historical data, and hence, uncertainty in knowledge of depth-specific historical heads (i.e., the time series of historical heads in each model layer).

The sensitivity analysis was performed using the following methods:

1. Adjust the time series of historical heads shown in Figures 4 and 5 to prepare six additional calibration runs—three for the PX 1D Model and three for the MVWD-28 1D Model:
   i. **Calibration Run V22 for the PX 1D Model**. Figure 15 displays a time series of historical heads at the PX site where declines in heads in Layer 5 lag behind the declines in heads in Layers 1 and 3 over the period of 1930-1977. This time series is plausible since there are no records of pumping wells in Northwest MZ-1 with well screens that penetrate Layer 5 during 1930-1973 (see Figure 6).

   ii. **Calibration Run V23 for the PX 1D Model**. Figure 16 displays a time series of historical heads at the PX site where: (i) heads in Layer 1 were adjusted upward from 1978-2018 to better match recent heads measured at the PX1-1 piezometer (Layer 1) in 2020 and (ii) heads in Layer 5 were adjusted downward from 1978-2018 to better match recent heads measured at the PX2-3 piezometer (Layer 5) in 2020.

   iii. **Calibration Run V24 for the PX 1D Model**. Figure 17 displays a time series of historical heads at the PX site where heads were adjusted as described in V22 and V23.

   iv. **Calibration Run V22 for the MVWD-28 1D Model**. Figure 18 displays a time series of historical heads at the MVWD-28 site where declines in heads in Layer 5 lag behind the declines in heads in Layers 1 and 3 over the period of 1930-1977. This time series is plausible since there are no records of pumping wells in Northwest MZ-1 with well screens that penetrate Layer 5 during 1930-1973.

   v. **Calibration Run V23 for the MVWD-28 1D Model**. Figure 19 displays a time series of historical heads at the MVWD-28 site where: (i) heads in Layer 1 were adjusted upward from 1978-2018 to better match recent heads measured at the PX1-1 piezometer (Layer 1) in 2020 and (ii) heads in Layer 5 were adjusted downward from 1978-2018 to better match recent heads measured at the PX2-3 piezometer (Layer 5) in 2020.

   vi. **Calibration Run V24 for the MVWD-28 1D Model**. Figure 20 displays a time series of historical heads at the MVWD-28 site where heads were adjusted as described in v22 and V23.

2. The 1D Models were executed from 1930 to 2018 using the prescribed heads by model layer in V22, V23, and V24 as boundary conditions for the Sand cells in the 1D Models.

3. The model-simulated compaction values in the combined Clay cells were compared with the InSAR estimates of vertical ground motion over the period of InSAR records, and the goodness of fit was determined:

- Figures 21, 22, and 23 are time series charts that compare simulated versus observed data for calibration iterations V22, V23, and V24 for the PX 1D Model.
- Figures 24, 25, and 26 are time series charts that compare simulated versus observed data for calibration iterations V22, V23, and V24 for the MWWD-28 1D Model.
- Tables 3 and 4 shows the calibration statistics for calibration iterations V22, V23, and V24 for PX 1D Model and the MWWD-28 1D Model, respectively.

The main observations and conclusions from the sensitivity analysis are:

- The adjustment in historical heads in the sensitivity analysis did not significantly affect the simulated compaction in the 1D Models. This observation indicates that the 1D Models are not sensitive to minor differences in the assumptions for historical heads. More likely, the 1D Models are most sensitive to the number and thicknesses of the Clay layers and the long-term declining trends in historical heads that drive the delayed drainage and compaction of the Clay layers.
- The 1D Model calibrations with V24 were virtually identical to V21 with no changes to the parameter values for the Clay cells as determined in V21.
- V24 also resulted in less total compaction compared to V21 in both 1D Models, which is more consistent with no reported observations of ground fissuring or subsidence related impacts to overlying infrastructure. Therefore, V24 replaces V21 as the final calibration iteration, but with no changes to the model parameters determined in V21.
- The 1D Models are well calibrated and capable of accurately estimating future aquifer-system compaction under various plans for pumping and recharge. Therefore, the GLMC should proceed with the use of the 1D Models to develop subsidence management strategies for Northwest MZ-1, if necessary.

MODEL ERRORS AND LIMITATIONS

In general, a groundwater model is a simplified mathematical representation of a complex hydrogeologic system. Because of this, there are limits to the accuracy of the model and the use and interpretation of the model results. There are various sources of error and uncertainty. Model error commonly stems from the conceptual model, practical limitations of grid cell size and time discretization, parameter structure, insufficient calibration data, and the effects of processes not simulated by the model. These factors, along with error in observations, result in uncertainty in model results.

The potential errors and limitations associated with the 1D Models and their calibration include:

- The 1D Models were based on the limited resolution, depth, and accuracy of the description of the aquifer-system sediments as documented on the driller's logs of PX and MVWD-28 boreholes.
- The resolution by depth interval of the lithologic descriptions in this log are typically greater than five feet, which may not be a fine enough resolution to characterize any thinner

interbedding of aquifer and aquitard layers that are an important control on aquifer-system deformation.

- The boreholes did not penetrate the full thickness of the semi-consolidated bedrock formations; there may be deforming sediments at depths below the borehole bottom that are responsible for some of the vertical ground motion estimated by InSAR.
- Most wells in Northwest MZ-1 have well screens that only penetrate the shallow aquifer-system or penetrate both the shallow and deep aquifer-systems. There are no wells in Northwest MZ-1 that existed during the calibration period that are screened only across the deep aquifer-system, meaning that there are no historical measured water-level data for only the deep aquifer-system. As such, there is some uncertainty in the long-term time-series of heads for Layers 2 and 3 that were used as the boundary conditions for the 1D Model calibration, which adds uncertainty to the model results.
- Water-level data at wells is scarce in Northwest MZ-1 prior to the 1930s. This 1D modeling effort assumes that the significant lowering of heads in Northwest MZ-1 began after 1930, which may not be an accurate assumption. If head declines began before 1930, then this could impact the calibration of the 1D models and add uncertainty to the model results.
- The 1D models used InSAR-derived estimates of vertical ground motion as calibration targets for aquifer-system compaction. The limitations of using InSAR-derived estimates as calibration targets are: (1) the InSAR record begins in 1992, which limits the length of the calibration period; (2) there are multiple data gaps in the InSAR record because of satellite malfunctions and satellite replacement; and (3) InSAR produces an aggregate estimate of aquifer-system deformation and therefore provides no depth-specific calibration targets. Due to the lack of depth-specific calibration there is greater uncertainty in the depth-specific estimates for the aquifer and aquitard properties, and hence, the model results.

Continued monitoring and enhanced understanding of hydrogeologic conditions is crucial to minimizing model error and uncertainty, especially the monitoring of the PX in Northwest MZ-1. Future monitoring and data analysis can identify local anomalies associated with geologic complexity that are not currently represented in the model. Model error and uncertainty can be reduced by incorporating new monitoring information into future model updates, if recommended by the GLMC.

NEXT STEPS

Members of the GLMC were asked to review a draft of this technical memorandum and provide comments and suggestions to Andy Malone (amalone@westyost.com) and Edgar Tellez-Foster (etellezfoster@cbwm.org) by October 21, 2022. Specifically, Watermaster staff and Engineer asked that the GLMC members answer the following question in their comments: Are the 1D Models as described in this technical memorandum sufficiently calibrated to estimate the potential for future subsidence under the Baseline Management Alternative (BMA)? The BMA is a planning scenario that represents the Parties' current plans for pumping and recharge in the Chino Basin.

The comments received from the GLMC, along with the Watermaster Engineer's response to comments, are documented in Appendix B. The majority of GLMC members concurred that the 1D Models are sufficiently calibrated to be used to estimate the potential for future subsidence.

The next steps are as follows:

1. The 1D Models are intended to be used to characterize the mechanical response of the aquifer-system to the BMA. A draft technical memorandum will be prepared that summarizes the evaluation of the BMA, particularly, the ability of the BMA to manage piezometric levels in Northwest MZ-1 so that future subsidence is minimized or abated. The draft technical memorandum may also include a recommendation for the Initial Subsidence Management Alternative (ISMA) if the BMA is not successful at managing future subsidence. The assumptions of the ISMA, including the groundwater production and replenishment plans of the Chino Basin parties, will be described in the technical memorandum, and must be reviewed by the GLMC. A GLMC meeting will be held to review the technical memorandum and the recommended ISMA.
2. After the recommended ISMA is reviewed by the GLMC, the Watermaster's MODFLOW model will be updated to run the ISMA and will be used to estimate the hydraulic head response to the ISMA at the MVWD-28 and PX locations. The projected hydraulic heads generated from the MODFLOW model using the ISMA will be extracted from the MODFLOW model results at the MVWD-28 and PX locations and will be used as input files for both 1D Models. The 1D Models will then be run to characterize the mechanical response of the aquifer-system to the ISMA at both the MVWD-28 and PX locations to evaluate the effectiveness of the ISMA at managing future subsidence.
3. A draft technical memorandum will be prepared that summarizes the evaluation of the ISMA, particularly, the ability of the ISMA to manage hydraulic heads in Northwest MZ-1 so that future subsidence is minimized or abated. The draft technical memorandum may also include a recommendation for a second Subsidence-Management Alternative (SMA-2), if the ISMA is not successful at managing future subsidence. The assumptions of the SMA-2, including the groundwater production and replenishment plans of the Chino Basin parties, will be described, and must be reviewed by the GLMC. A GLMC meeting will be held to review the technical memorandum and the recommended SMA-2.
4. If necessary and recommended by the GLMC, additional subsidence management alternative scenarios may be run in FY 2022/23. It is currently envisioned that, based on the results of the 1D Model results, the GLMC may recommend an update to the Watermaster's Subsidence Management Plan in FY 2023/24 to minimize or abate the future occurrence of land subsidence in Northwest MZ-1.

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Table 1. Initial Estimates of Model Parameters		
Cell Type	Model Parameter	Parameter Value
Sand	Vertical hydraulic conductivity VK	5.00E-01 [ft/day]
Sand	Specific storage Ss	1.83E-06 [1/ft]
Sand	Inelastic storage coefficient Sfv	1.00E-06 [-]
Sand	Elastic storage coefficient Sfe	1.00E-06 [-]
Clay	Vertical hydraulic conductivity VK	2.50E-05 [ft/day]
Clay	Specific storage Ss	1.14E-05 [1/ft]
Clay	Inelastic storage coefficient Sfv	1.65E-04[-]
Clay	Elastic storage coefficient Sfe	4.50E-06 [-]

Table 2. Parameter Values for Clay Cells by Calibration Iteration

Iteration	VK [ft/day]	Ss [1/ft]	Sfv [-]	Sfe [-]
V1	2.00E-05	1.14E-05	1.65E-04	4.50E-06
V2	1.00E-05	1.14E-05	1.65E-04	4.50E-06
V3	1.00E-06	1.14E-05	1.65E-04	4.50E-06
V3a	1.00E-06	5.00E-06	1.65E-04	4.50E-06
V3b	1.00E-06	7.00E-06	1.65E-04	4.50E-06
V4	2.00E-05	1.14E-05	1.00E-04	4.50E-06
V5	2.00E-05	1.14E-05	2.00E-04	4.50E-06
V6	1.00E-06	1.14E-05	2.00E-04	4.50E-06
V7	1.00E-06	1.14E-05	3.00E-04	8.00E-06
V8	1.00E-06	1.14E-05	5.00E-04	8.00E-06
V9	1.00E-06	1.14E-05	4.50E-04	4.50E-06
V10	5.00E-06	1.14E-05	4.50E-04	8.00E-06
V11	5.00E-06	5.00E-05	4.50E-04	8.00E-06
V12	2.00E-06	1.14E-05	4.50E-04	4.50E-06
V13	1.00E-06	1.14E-05	4.00E-04	4.50E-06
V14	1.00E-06	7.00E-06	4.00E-04	4.50E-06
V15	6.00E-07	1.14E-05	4.50E-04	4.50E-06
V16	8.00E-07	1.14E-05	4.50E-04	4.50E-06
V17	1.00E-06	1.14E-05	3.50E-04	8.00E-06
V18	1.00E-06	1.14E-05	4.00E-04	2.00E-06
V19	4.00E-05	1.14E-05	1.00E-04	4.50E-06
V20	1.00E-06	1.14E-05	3.50E-04	4.50E-06
V21	2.00E-07	1.14E-05	4.50E-04	4.50E-06

Table 3. Calibration Statistics for the PX 1D Model						
Iteration	Total Subsidence (ft)	Mean of Differences (Observed - Modeled) (ft)	Standard Deviation (ft)	Root Mean Square Deviation (ft)	R^2	NSE
V1	9.99	0.29	0.35	0.45	0.91	0.47
V2	9.39	0.32	0.35	0.47	0.94	0.45
V3	6.56	0.37	0.31	0.48	0.96	0.27
V4	6.65	0.37	0.31	0.48	0.93	0.28
V5	6.62	0.37	0.31	0.48	0.97	0.28
V3a	6.19	0.29	0.30	0.41	0.86	0.09
V3b	11.97	0.29	0.38	0.48	0.91	0.57
V6	7.69	0.38	0.33	0.50	0.97	0.37
V7	10.69	0.40	0.39	0.56	0.97	0.55
V8	16.04	0.46	0.52	0.70	0.96	0.67
V9	14.78	0.45	0.49	0.66	0.97	0.65
V10	20.39	0.41	0.59	0.72	0.96	0.71
V11	19.83	0.42	0.58	0.71	0.96	0.71
V12	17.13	0.43	0.53	0.68	0.96	0.68
V13	13.47	0.43	0.46	0.63	0.97	0.62
V14	13.54	0.43	0.46	0.63	0.97	0.63
V15	13.08	0.46	0.47	0.66	0.97	0.62
V16	14.04	0.46	0.48	0.66	0.97	0.64
V17	12.11	0.41	0.42	0.59	0.97	0.60
V18	13.48	0.43	0.46	0.63	0.97	0.62
V19	6.34	0.28	0.30	0.41	0.67	-0.08
V21	9.64	0.03	0.08	0.09	0.99	0.98
V22	9.54	0.03	0.08	0.09	0.99	0.98
V23	9.57	0.05	0.09	0.10	0.99	0.97
V24	9.46	0.04	0.09	0.10	0.99	0.97

Table 4. Calibration Statistics for the MVWD-28 1D Model						
Iteration	Total Subsidence (ft)	Mean of Differences (Observed - Modeled) (ft)	Standard Deviation (ft)	Root Mean Square Deviation (ft)	R^2	NSE
V1	6.60	0.23	0.22	0.31	0.83	0.46
V2	6.41	0.21	0.20	0.30	0.85	0.49
V3	4.94	0.12	0.13	0.18	0.96	0.82
V4	4.03	0.27	0.23	0.36	0.72	-0.03
V5	7.96	0.20	0.21	0.29	0.87	0.62
V3a	5.02	0.12	0.13	0.18	0.95	0.82
V3b	4.99	0.12	0.13	0.18	0.95	0.82
V6	5.75	0.07	0.11	0.13	0.97	0.92
V7	7.78	-0.05	0.05	0.07	0.99	0.98
V8	11.09	-0.25	0.11	0.27	0.99	0.85
V9	10.33	-0.21	0.09	0.22	0.99	0.89
V10	15.34	-0.20	0.09	0.21	0.99	0.93
V11	14.98	-0.21	0.09	0.23	0.99	0.92
V12	12.75	-0.25	0.10	0.27	0.99	0.88
V13	9.53	-0.16	0.06	0.17	0.99	0.93
V14	9.60	-0.16	0.06	0.17	0.99	0.93
V15	8.59	-0.14	0.06	0.15	0.99	0.93
V16	9.56	-0.18	0.08	0.20	0.99	0.91
V17	8.68	-0.10	0.05	0.11	0.99	0.97
V18	9.54	-0.16	0.06	0.17	0.99	0.93
V19	4.09	0.28	0.24	0.36	0.72	-0.01
V21	5.53	0.00	0.05	0.05	0.99	0.99
V22	5.41	-0.01	0.05	0.05	0.99	0.99
V23	5.59	-0.01	0.05	0.05	0.99	0.99
V24	5.48	-0.02	0.05	0.05	0.99	0.99

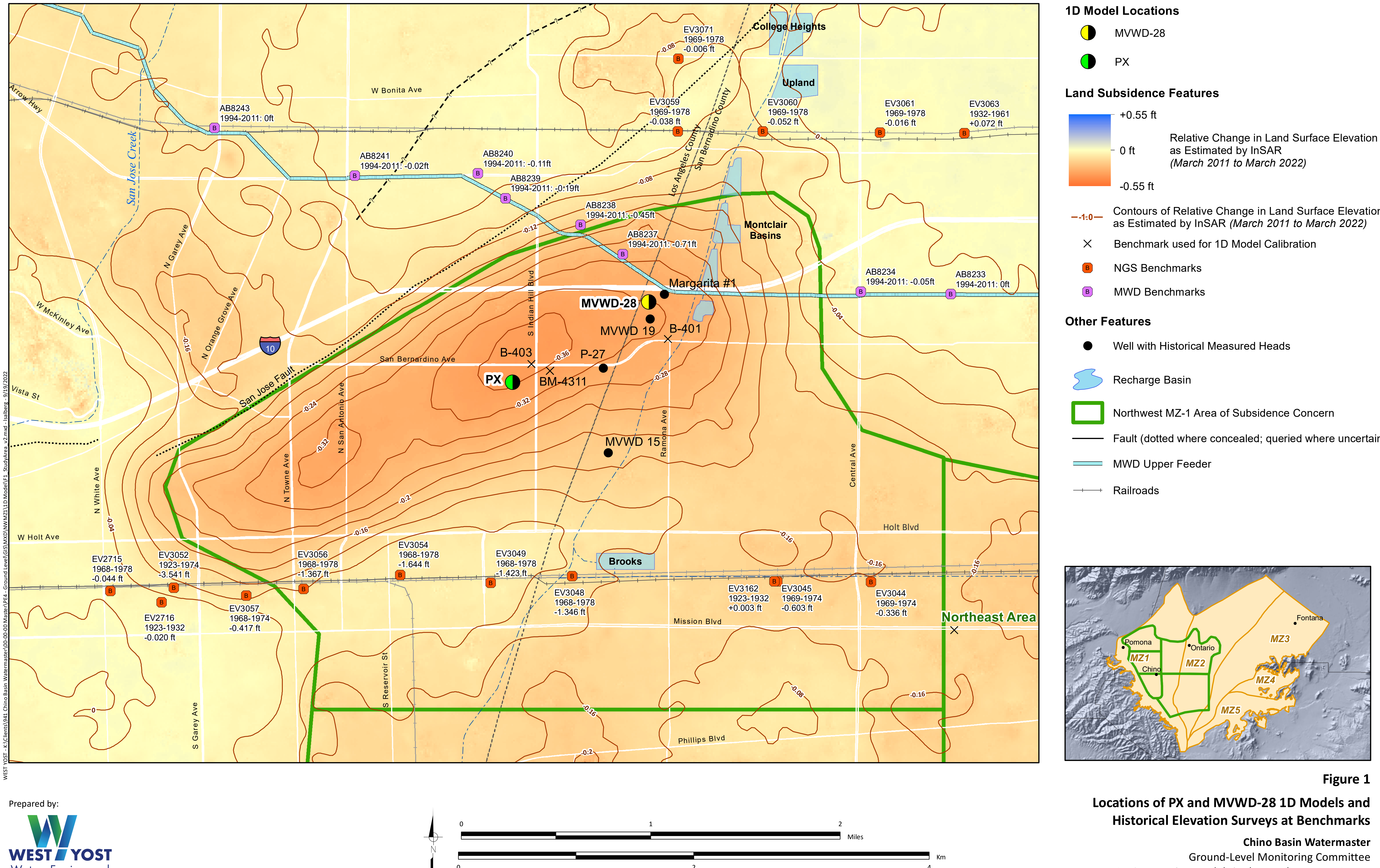


Figure 1

Locations of PX and MVWD-28 1D Models and Historical Elevation Surveys at Benchmarks

Chino Basin Watermaster

Ground-Level Monitoring Committee

1D Compaction Models in the Northwest MZ-1 Area

Prepared by:

WEST YOST
Water. Engineered.

Figure 2. PX Site: CVM Layers, Borehole Lithology, 1D Model Cells, and Resistivity Log

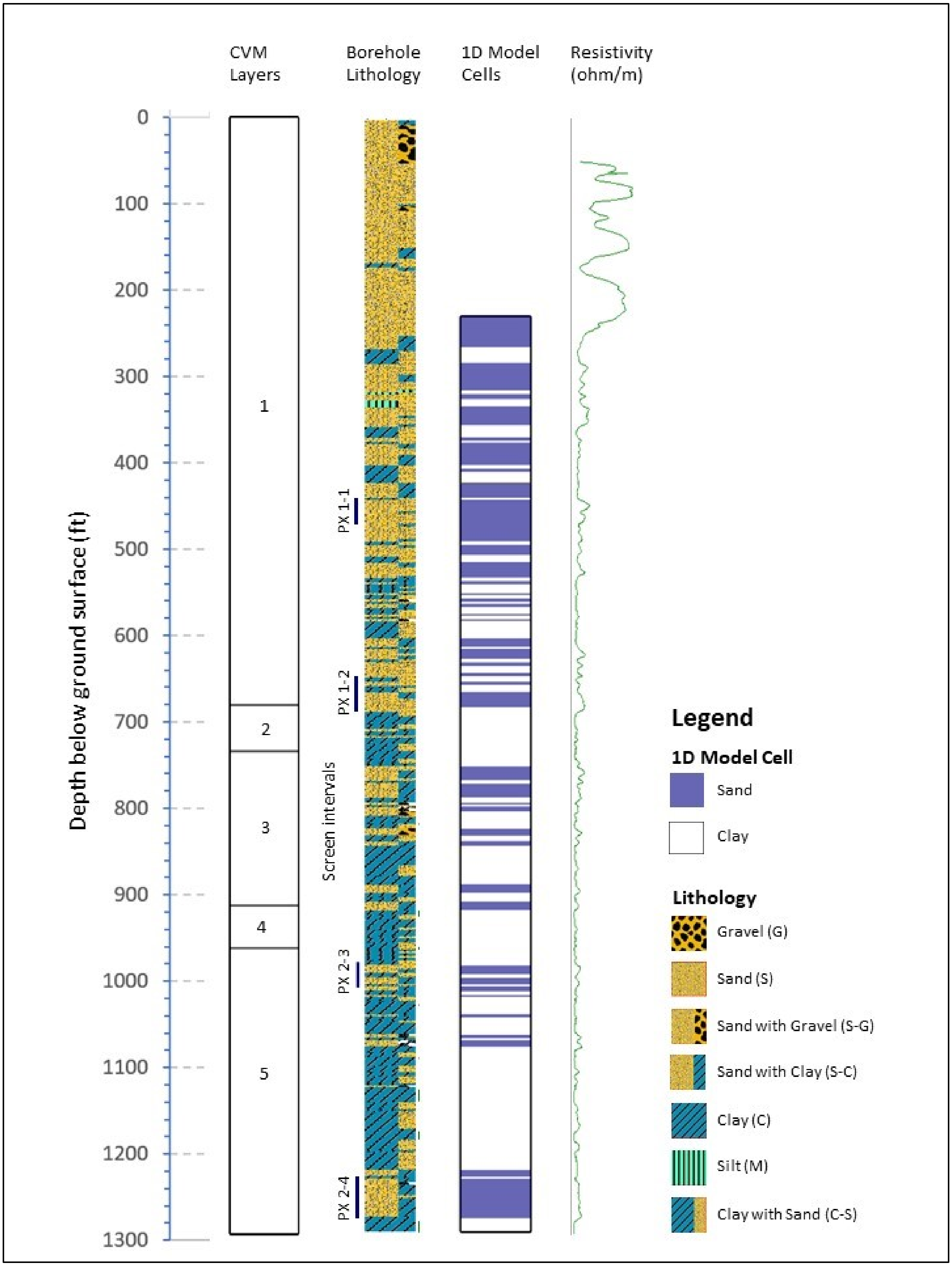


Figure 3. MVWD-28 Site: CVM Layers, Borehole Lithology, 1D Model Cells, and Resistivity Log

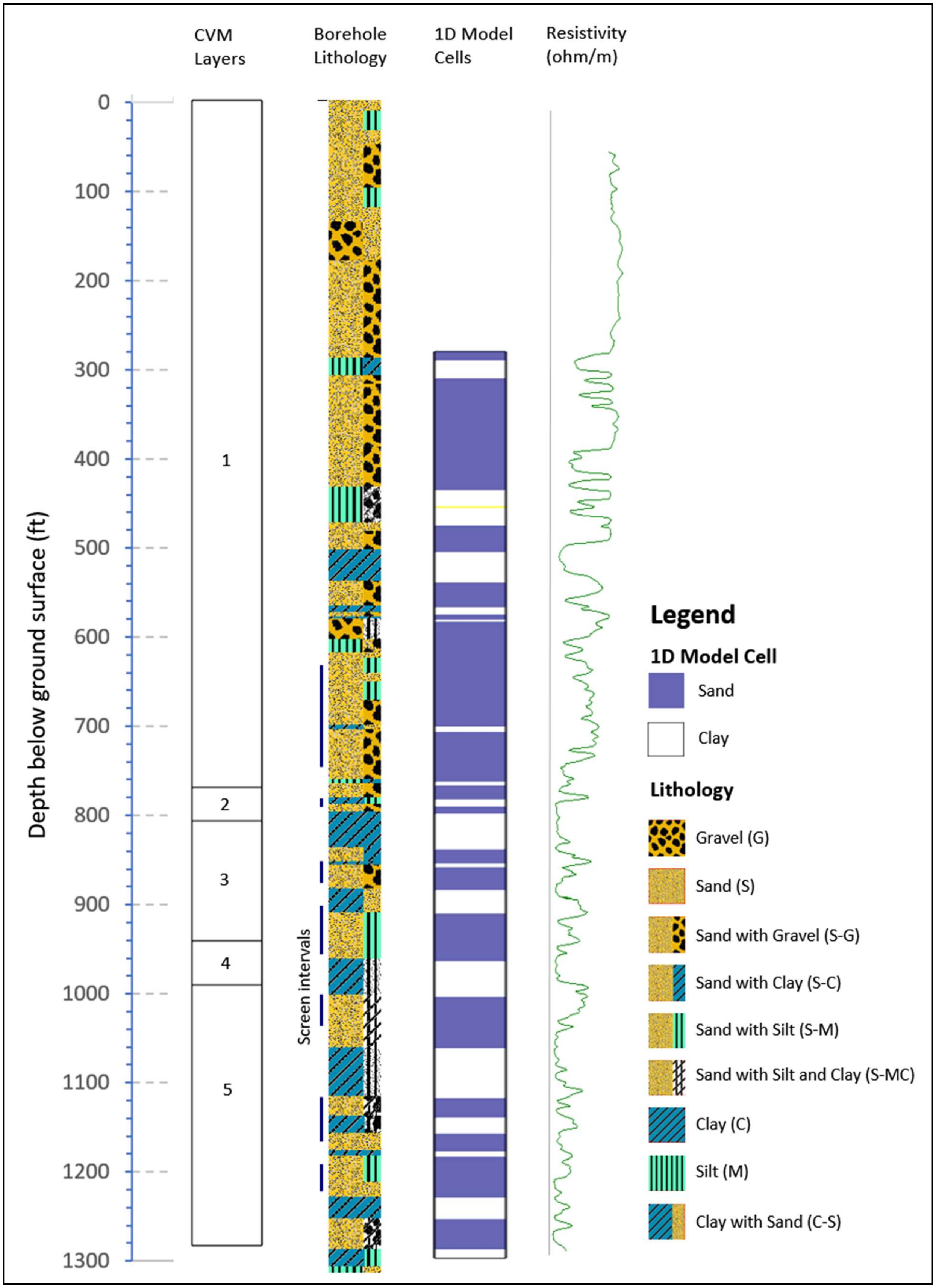
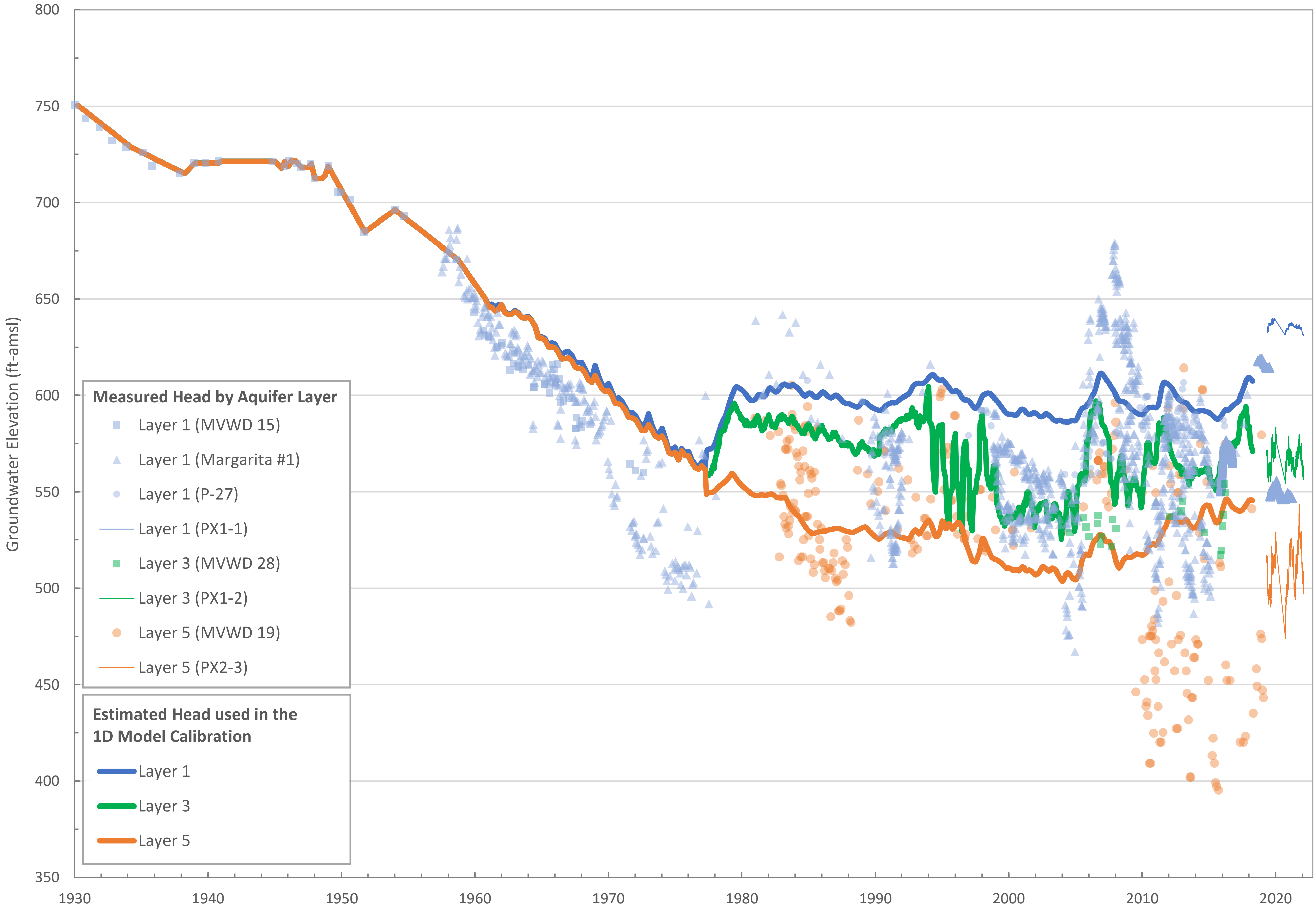


Figure 4. Measured Heads vs. Heads Used in Calibration of PX 1D Model - Calibration Run V21



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1D Compaction Models in the Northwest MZ-1 Area
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Figure 5. Measured Heads vs. Heads Used in Calibration of MVWD-28 1D Model - Calibration Run V21

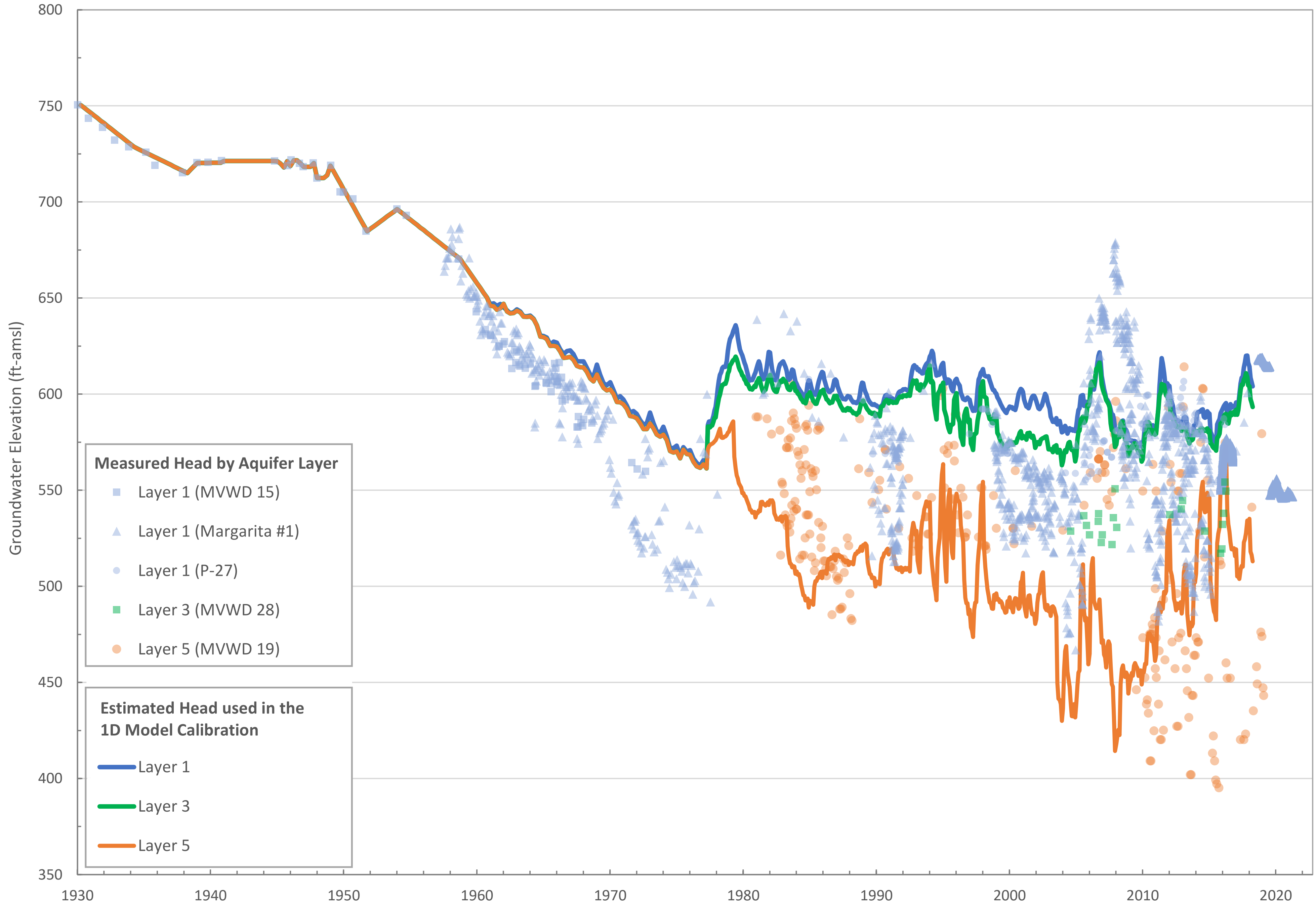


Figure 6. Wells Constructed in Northwest MZ-1 Over Time by Model Layer

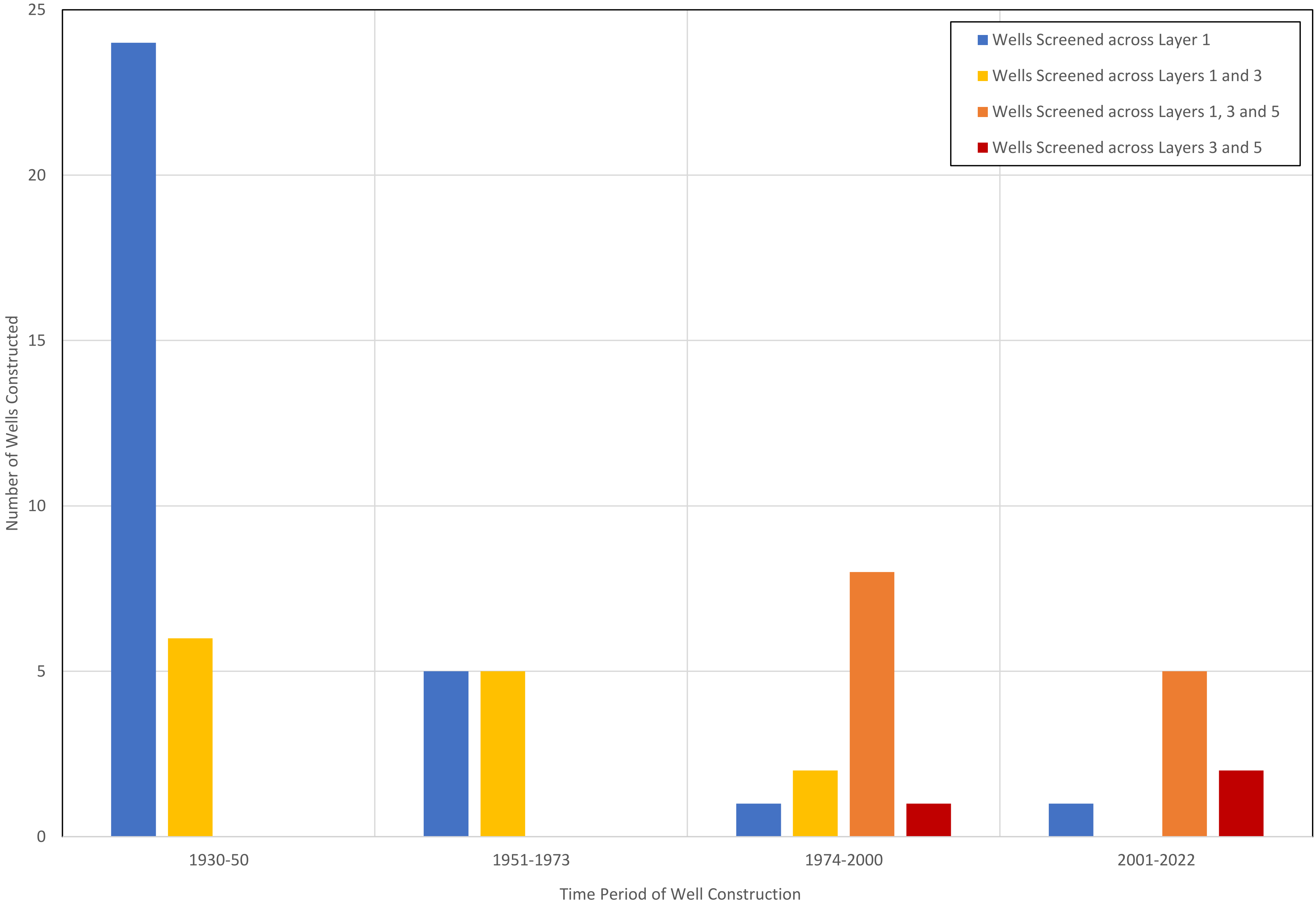


Figure 7. Time Series of the Simulated and Observed Subsidence Values of Selected Calibration Iterations for PX

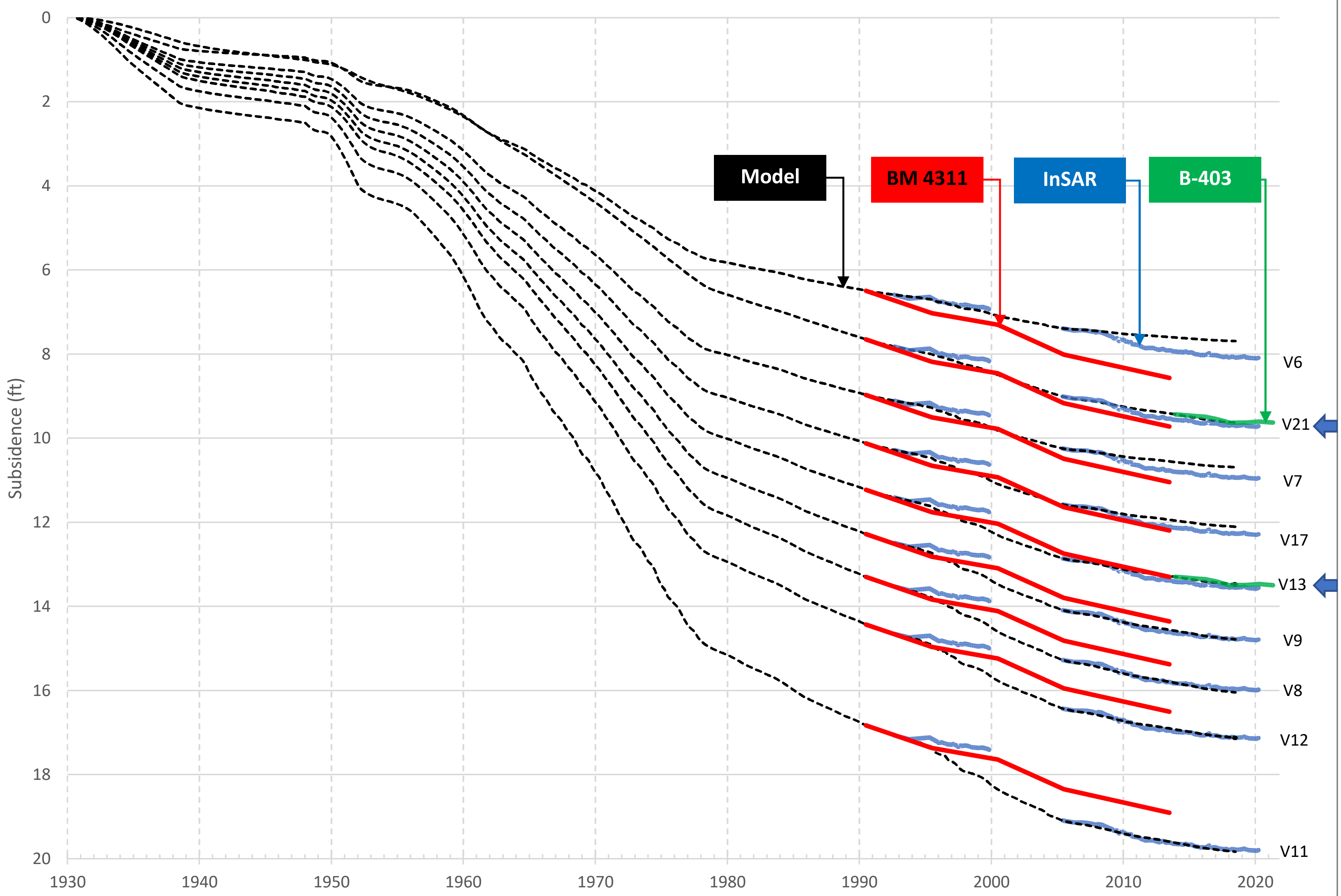


Figure 8. Time Series of the Simulated and Observed Subsidence Values of Selected Calibration Iterations for MVWD-28

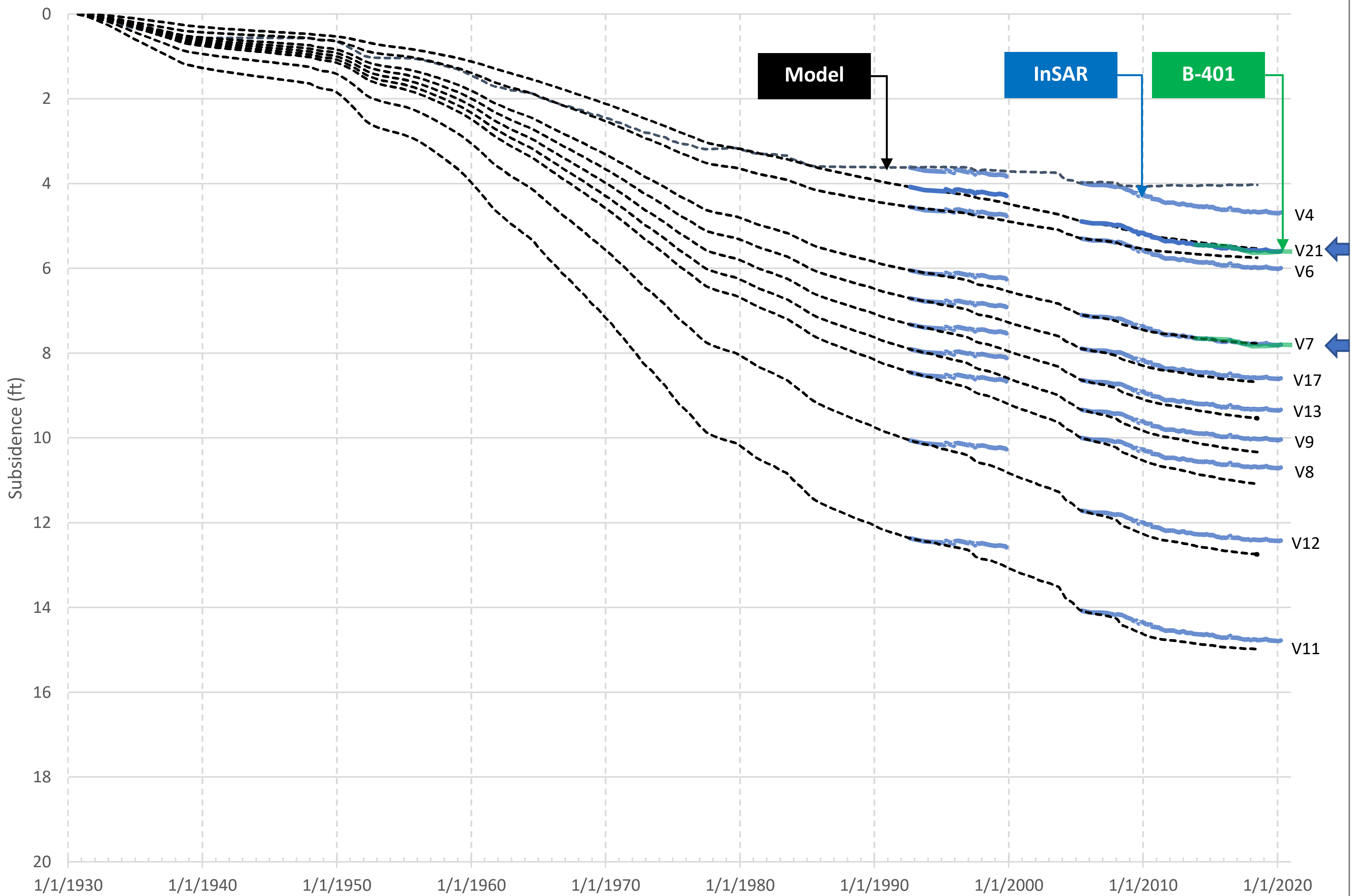


Figure 9. Measured Subsidence vs. Compaction Simulated by PX 1D Model - Calibration Run V21

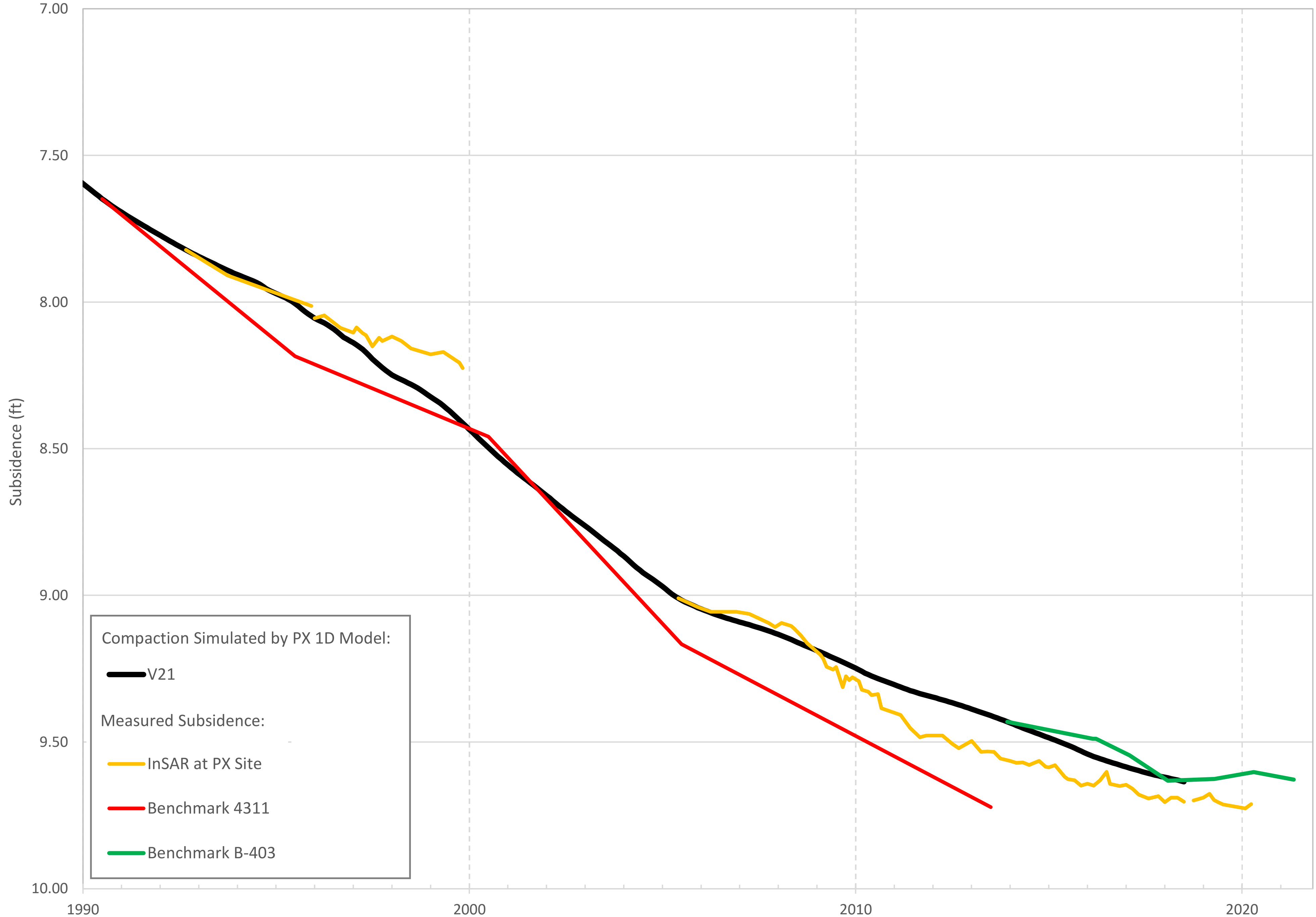


Figure 10. Measured Subsidence vs. Compaction Simulated by MVWD-28 1D Model - Calibration Run V21

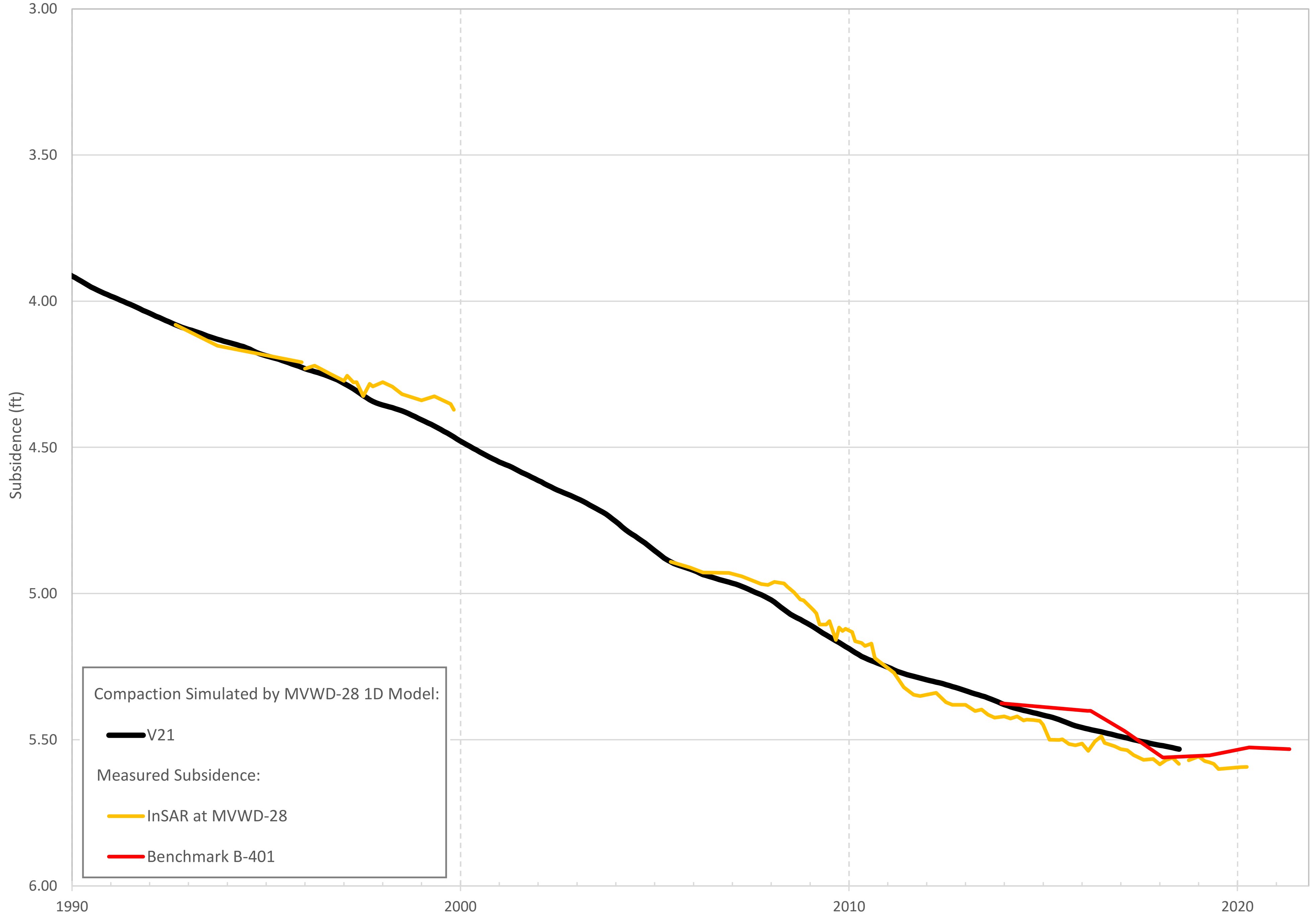


Figure 11. Scatter Plot of the Simulated and Observed Subsidence Values of Calibration Iteration V21 for PX

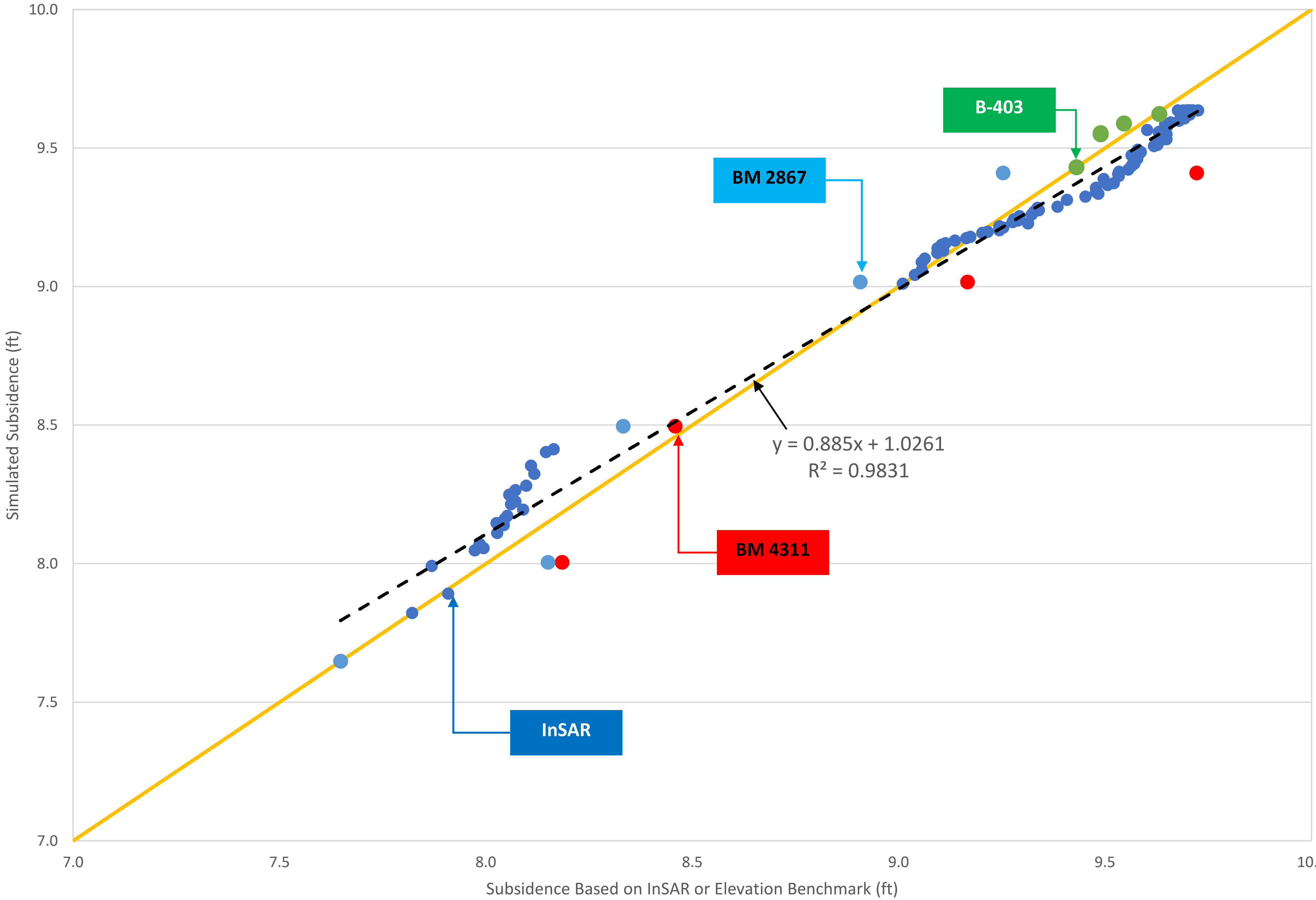


Figure 12. Scatter Plot of the Simulated and Observed Subsidence Values of Calibration Iteration V21 for MVWD-28

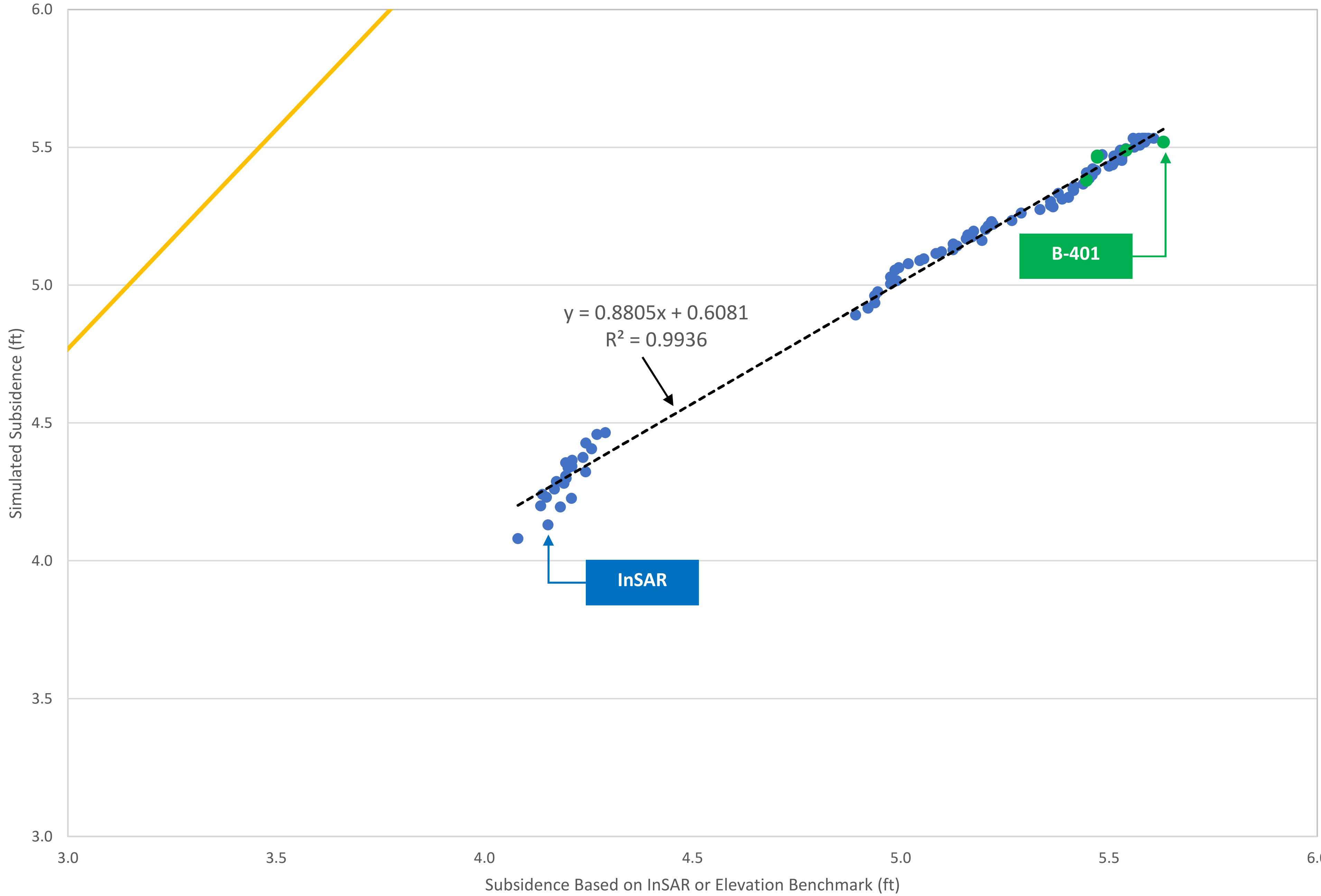


Figure 13. Simulated Compaction and Critical Head on 6/30/2018 for PX

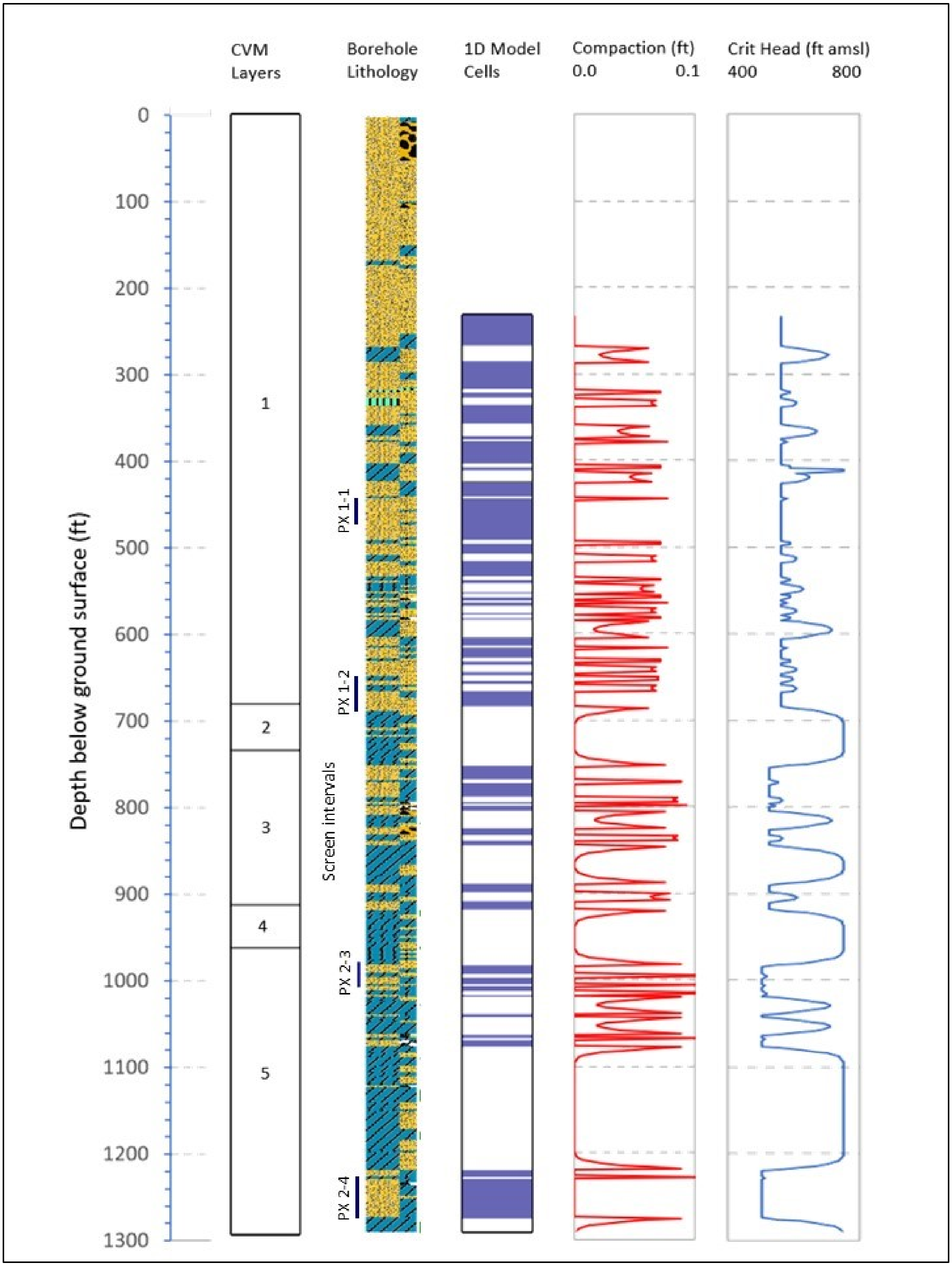


Figure 14. Simulated Compaction and Critical Head on 6/30/2018 for MVWD-28

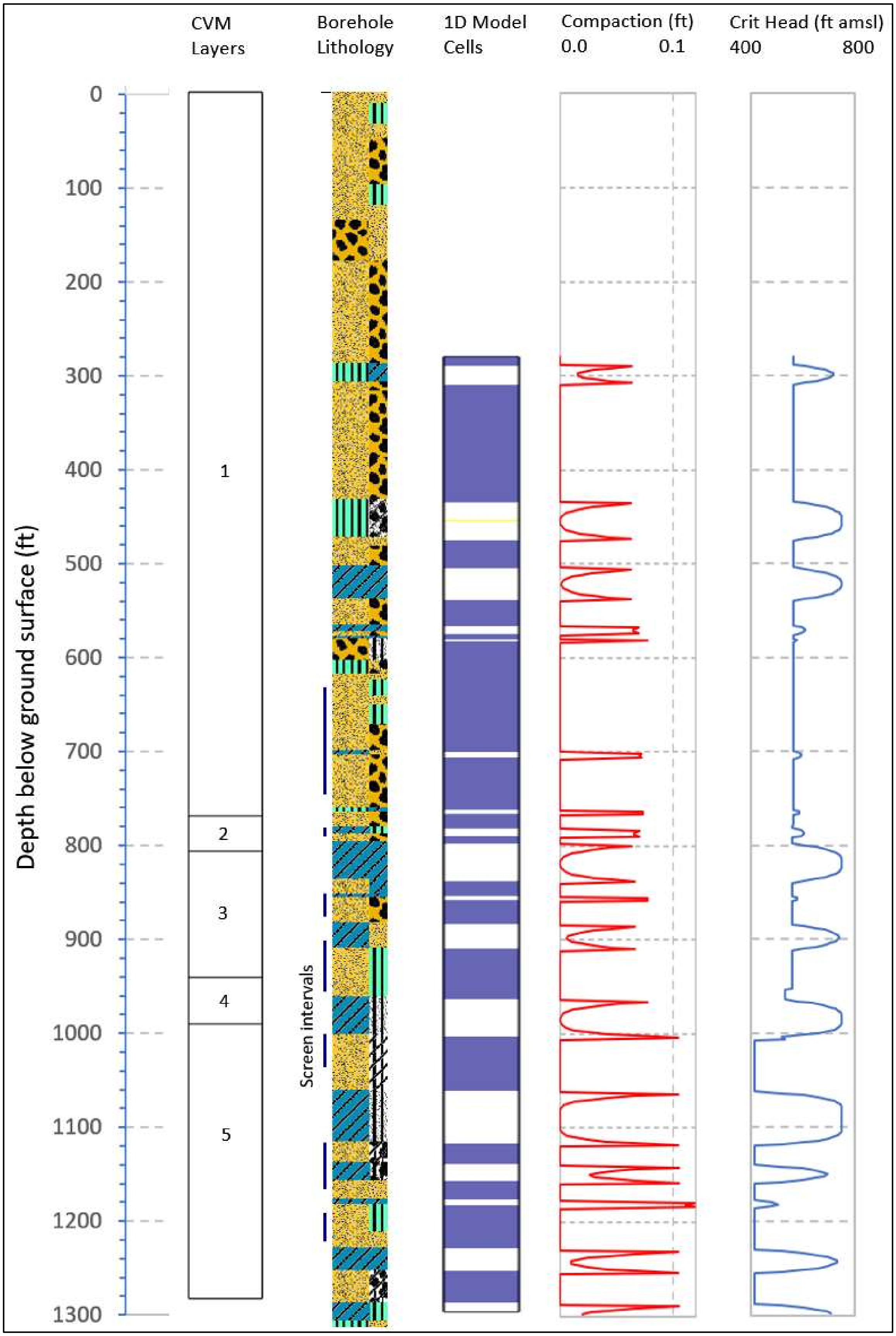


Figure 15. Measured Heads vs. Heads Used in Calibration of PX 1D Model - Calibration Run V22

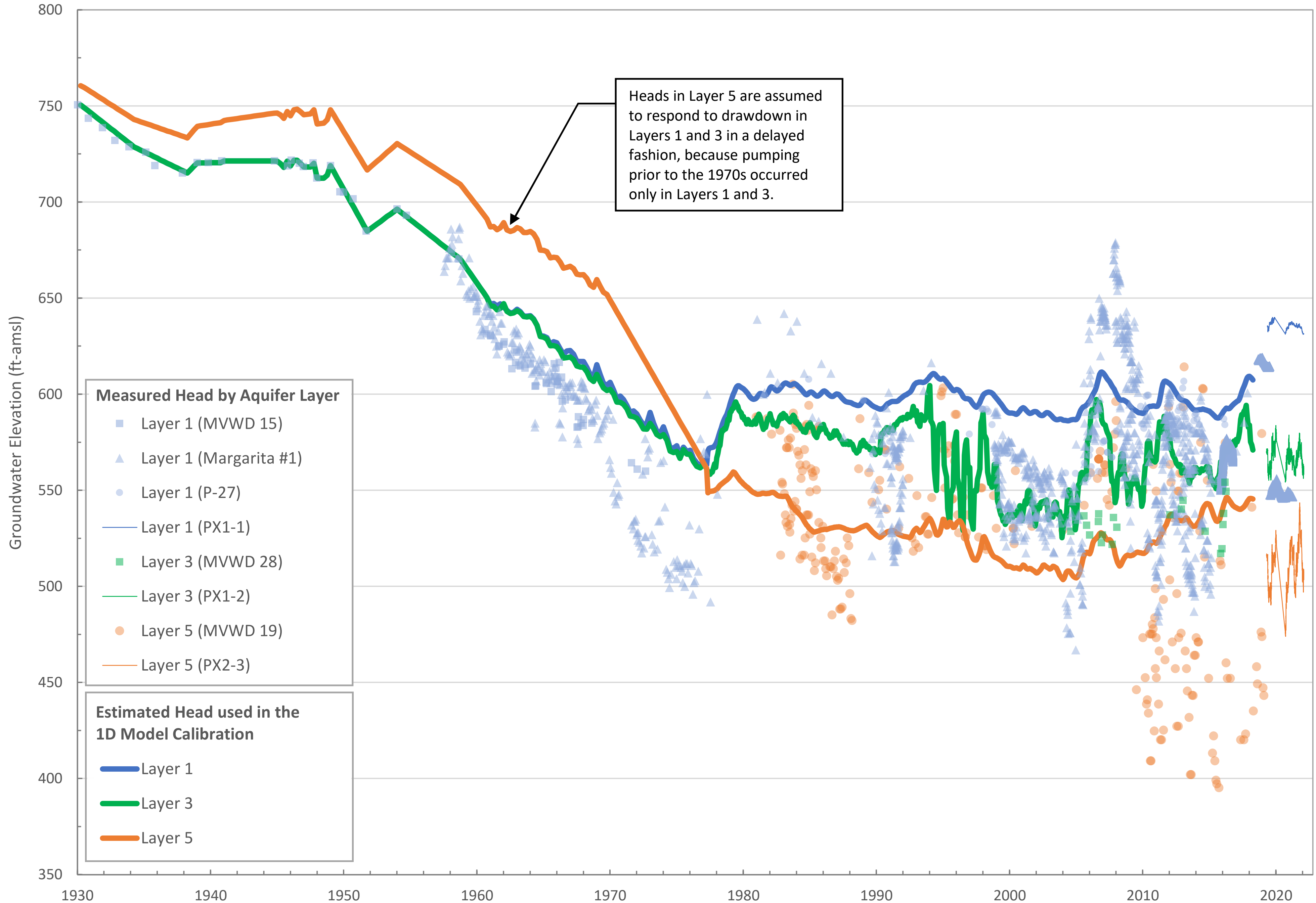


Figure 16. Measured Heads vs. Heads Used in Calibration of PX 1D Model - Calibration Run V23

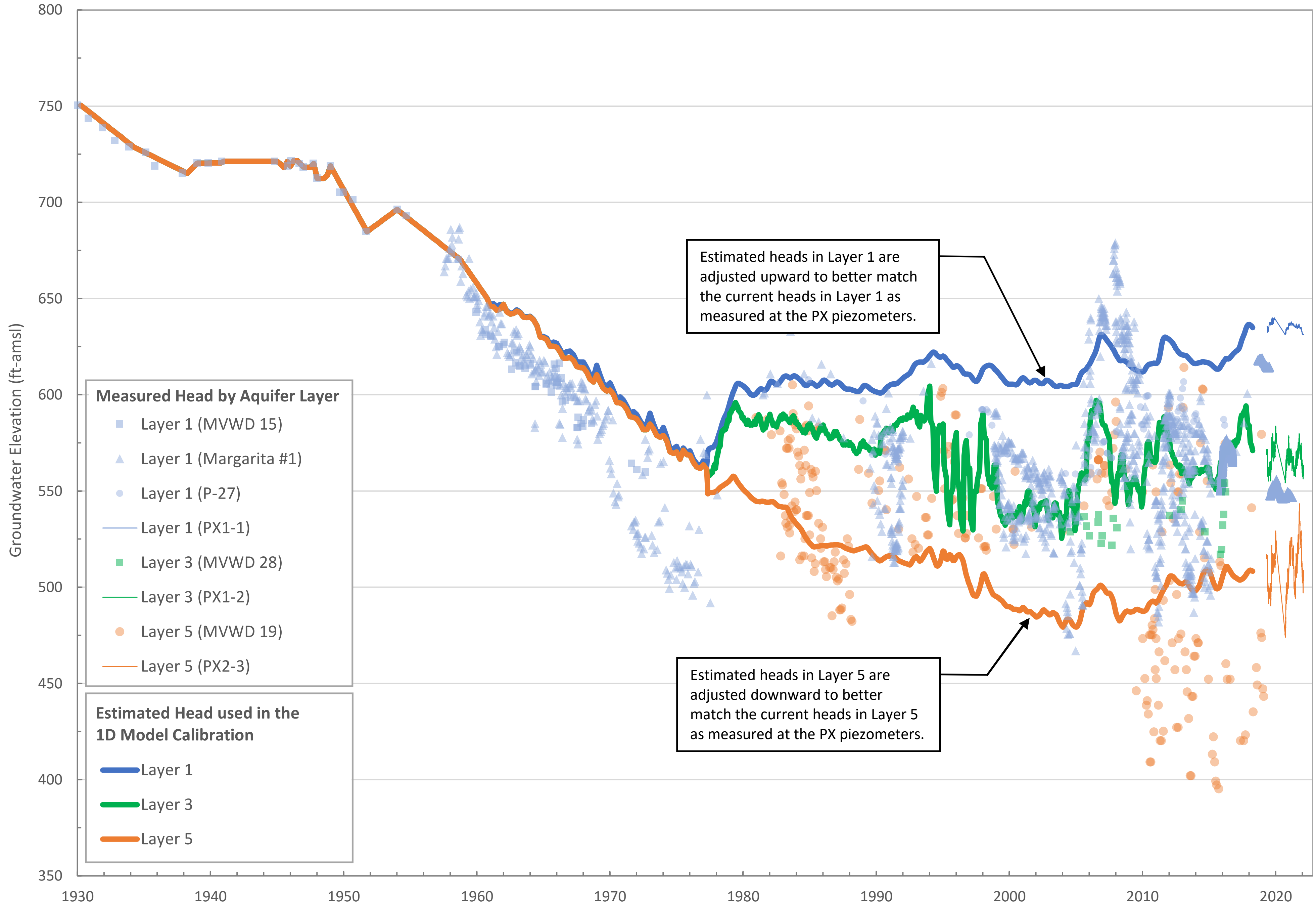


Figure 17. Measured Heads vs. Heads Used in Calibration of PX 1D Model - Calibration Run V24

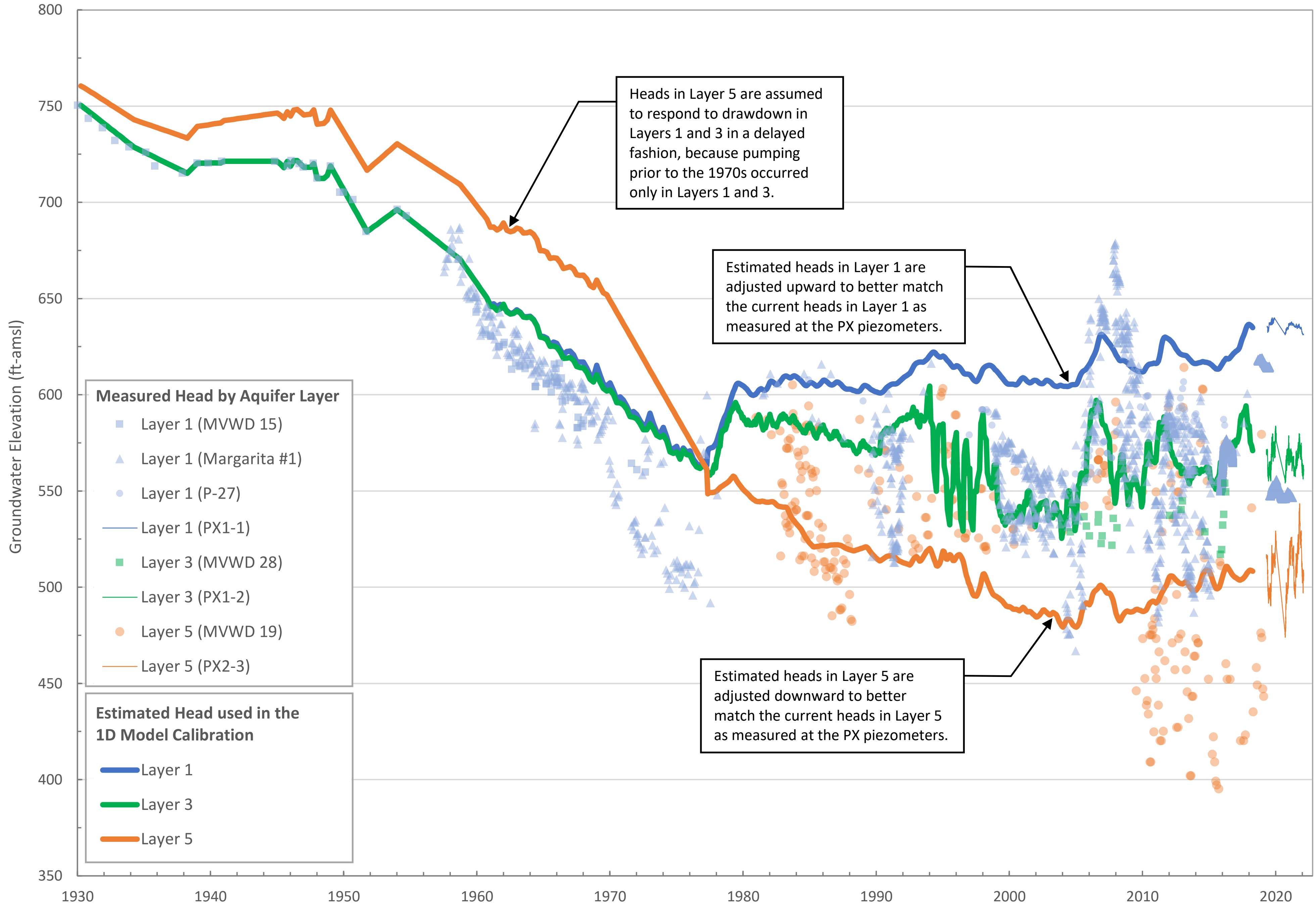


Figure 18. Measured Heads vs. Heads Used in Calibration of MVWD-28 1D Model - Calibration Run V22

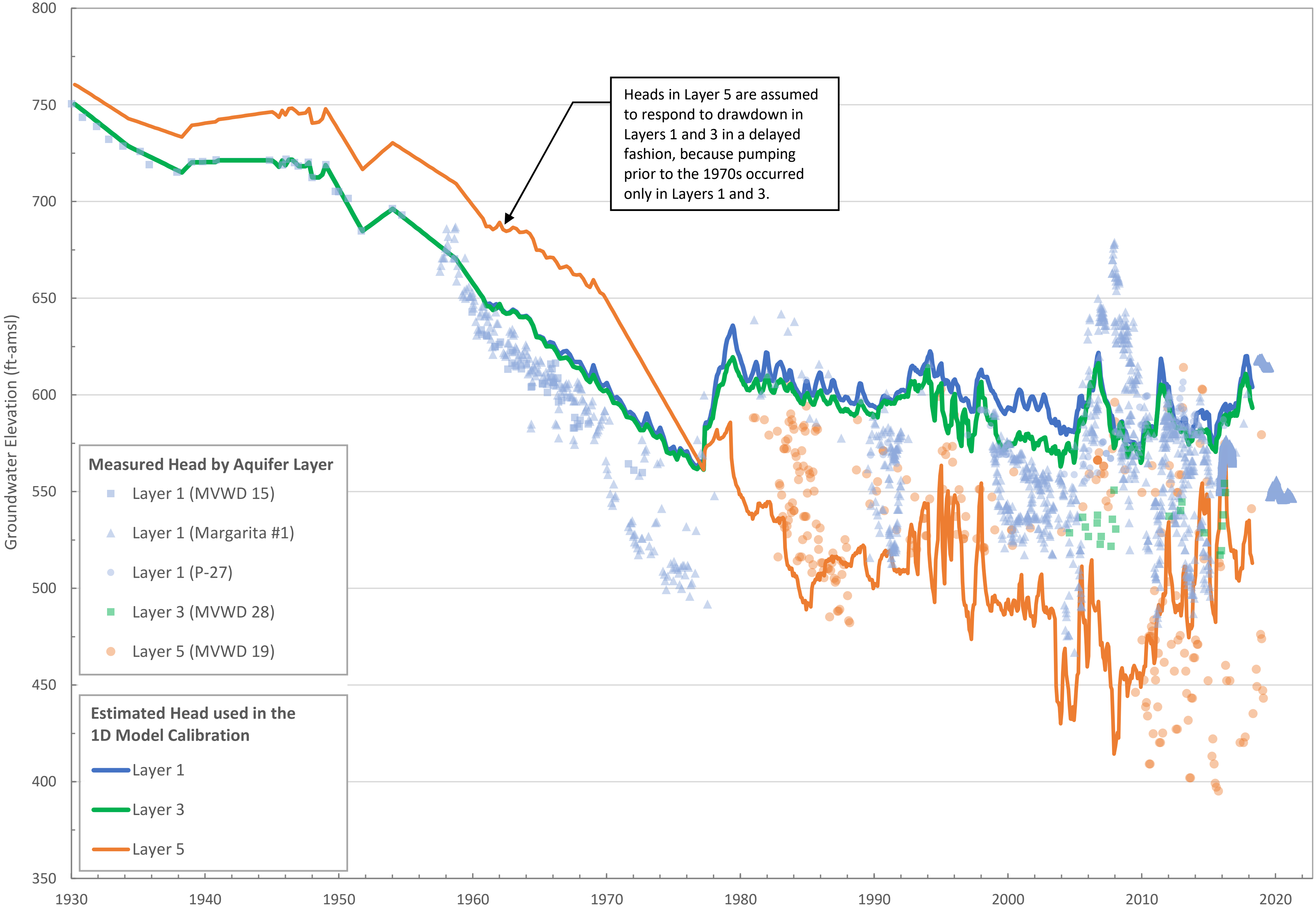


Figure 19. Measured Heads vs. Heads Used in Calibration of MVWD-28 1D Model - Calibration Run V23

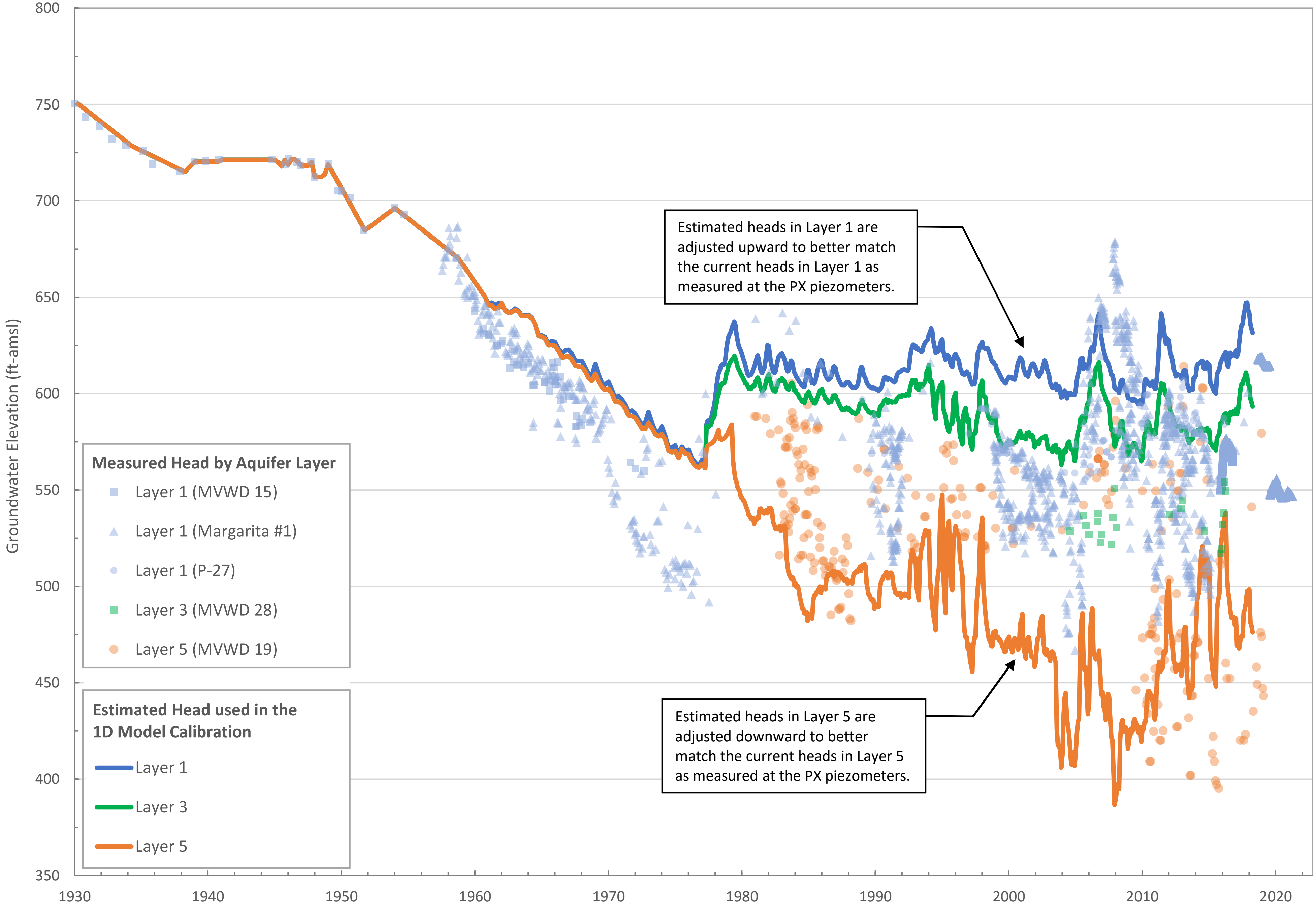


Figure 20. Measured Heads vs. Heads Used in Calibration of MVWD-28 1D Model - Calibration Run V24

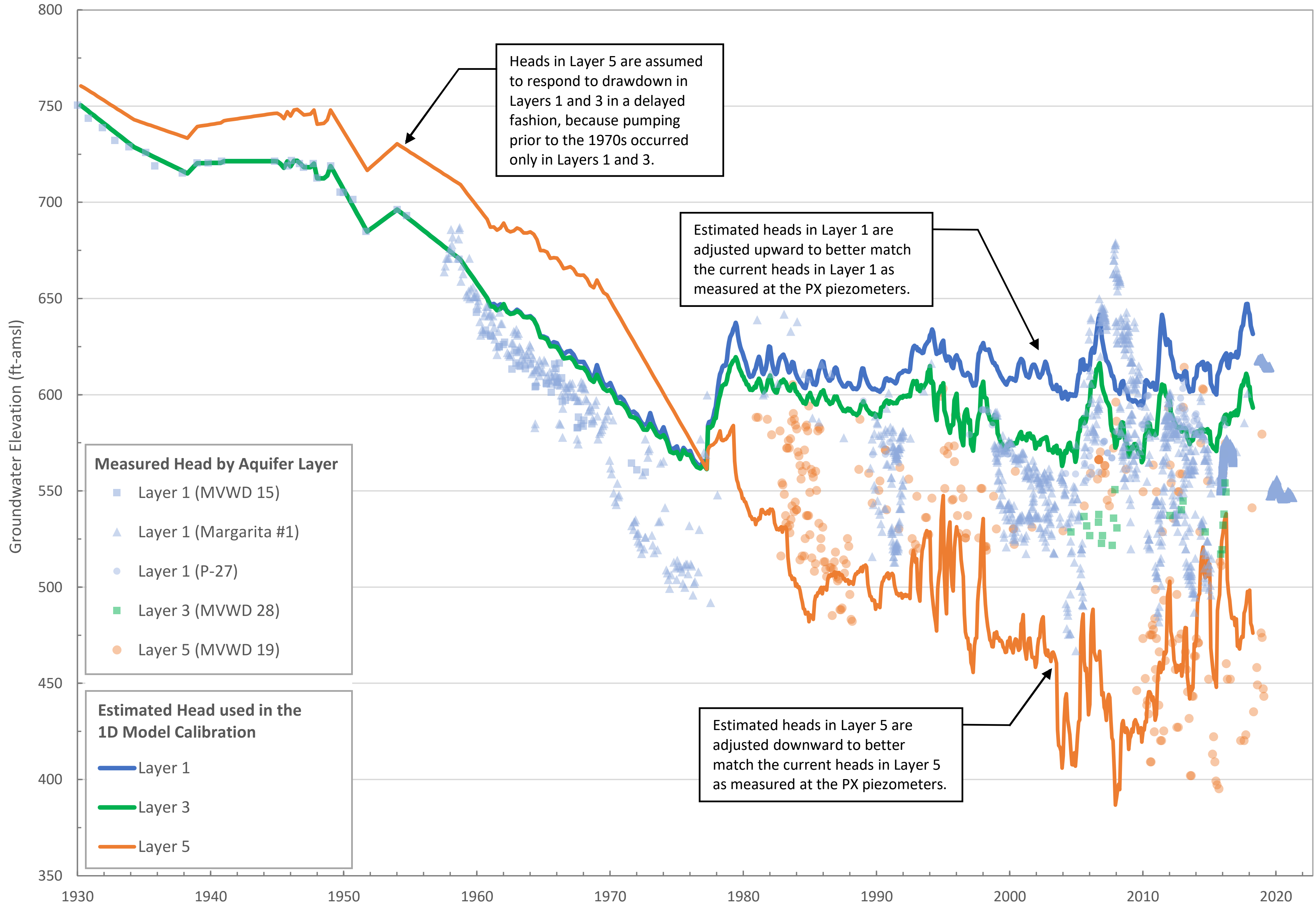


Figure 21. Measured Subsidence vs. Compaction Simulated by PX 1D Model - Calibration Run V22)

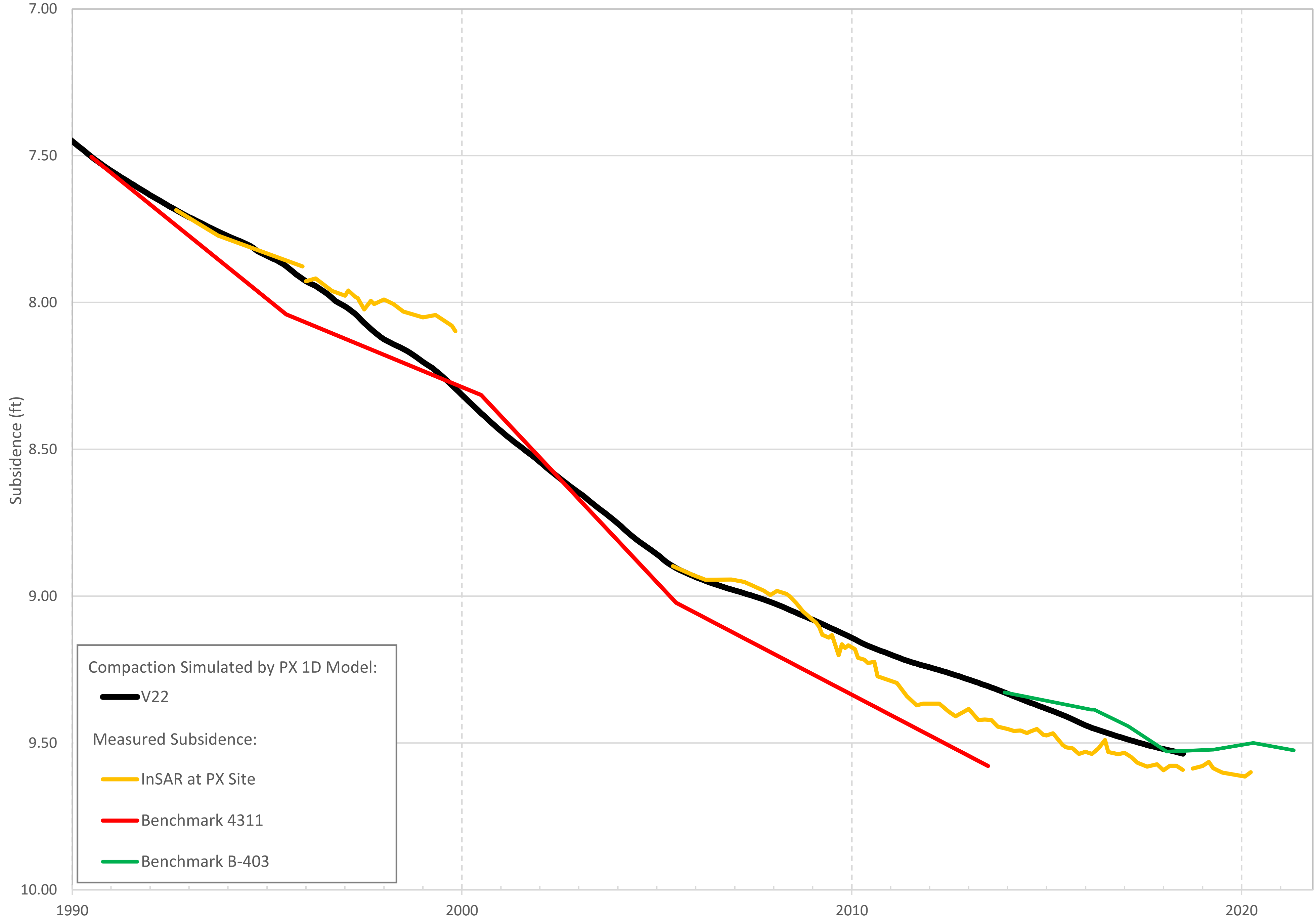


Figure 22. Measured Subsidence vs. Compaction Simulated by PX 1D Model - Calibration Run V23

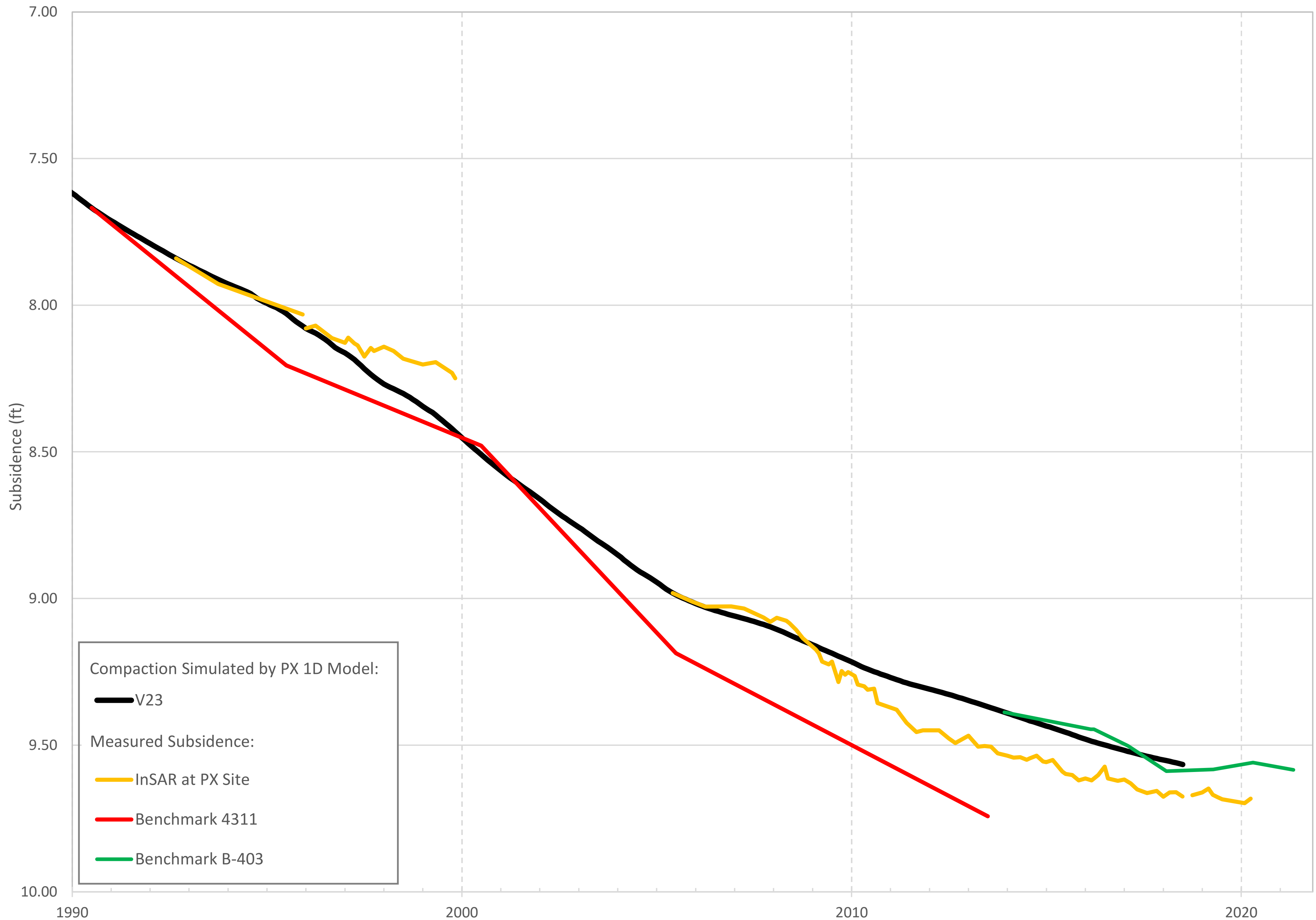


Figure 23. Measured Subsidence vs. Compaction Simulated by PX 1D Model - Calibration Run V24

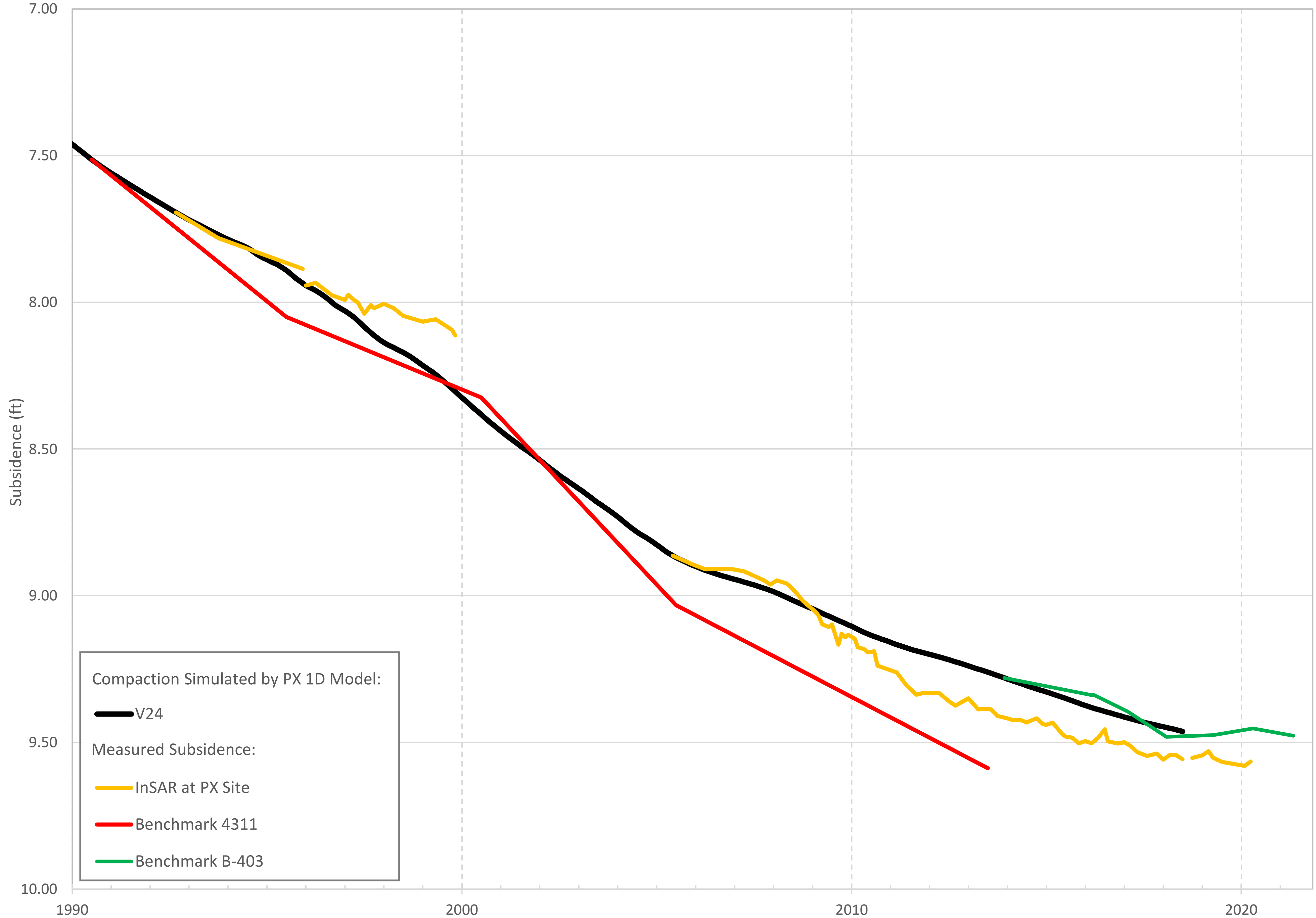
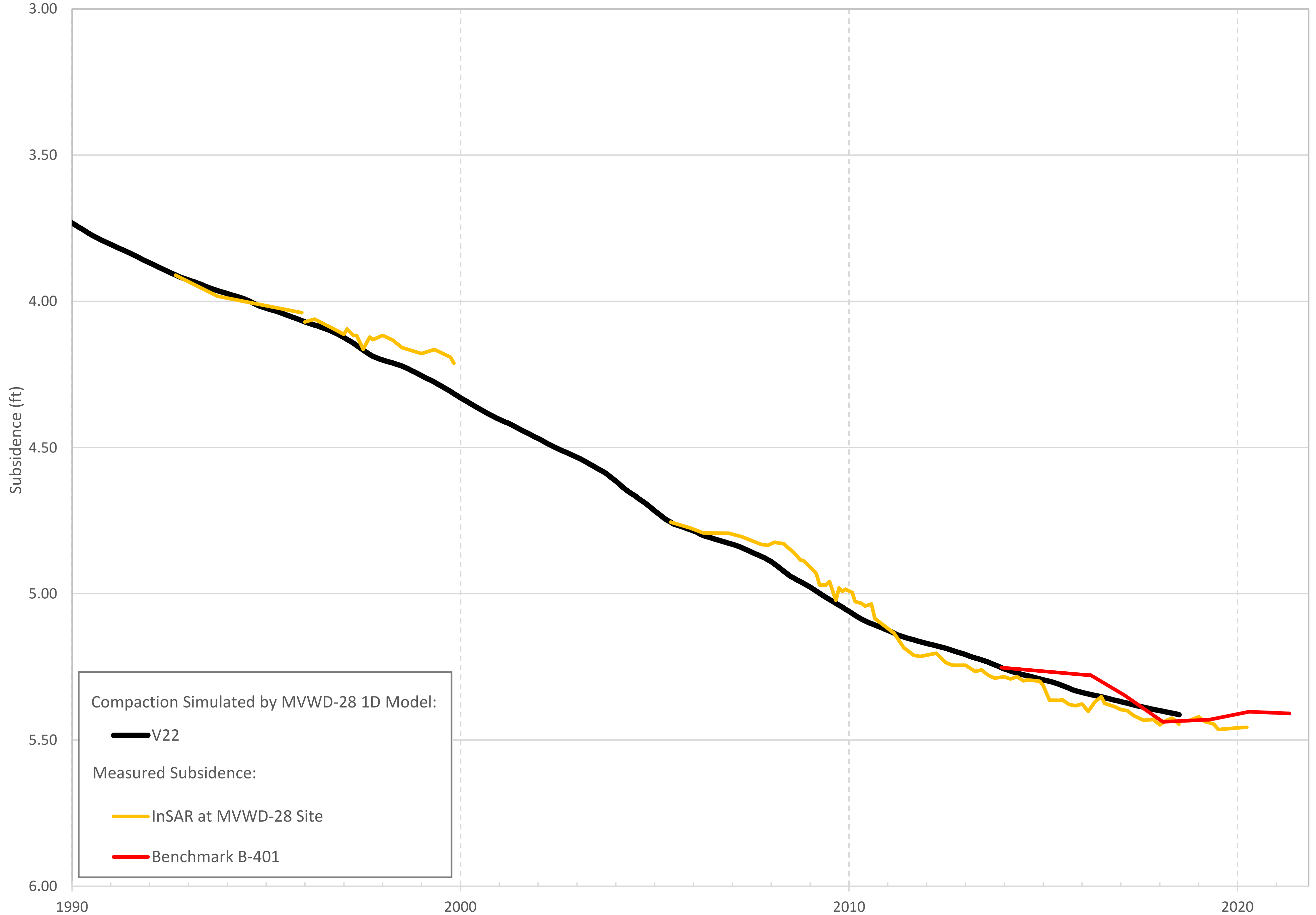


Figure 24. Measured Subsidence vs. Compaction Simulated by MVWD-28 1D Model - Calibration Run V22



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1D Compaction Models in the Northwest MZ-1 Area
Last Revised: 09-08-22

Figure 25. Measured Subsidence vs. Compaction Simulated by MVWD-28 1D Model - Calibration Run V23

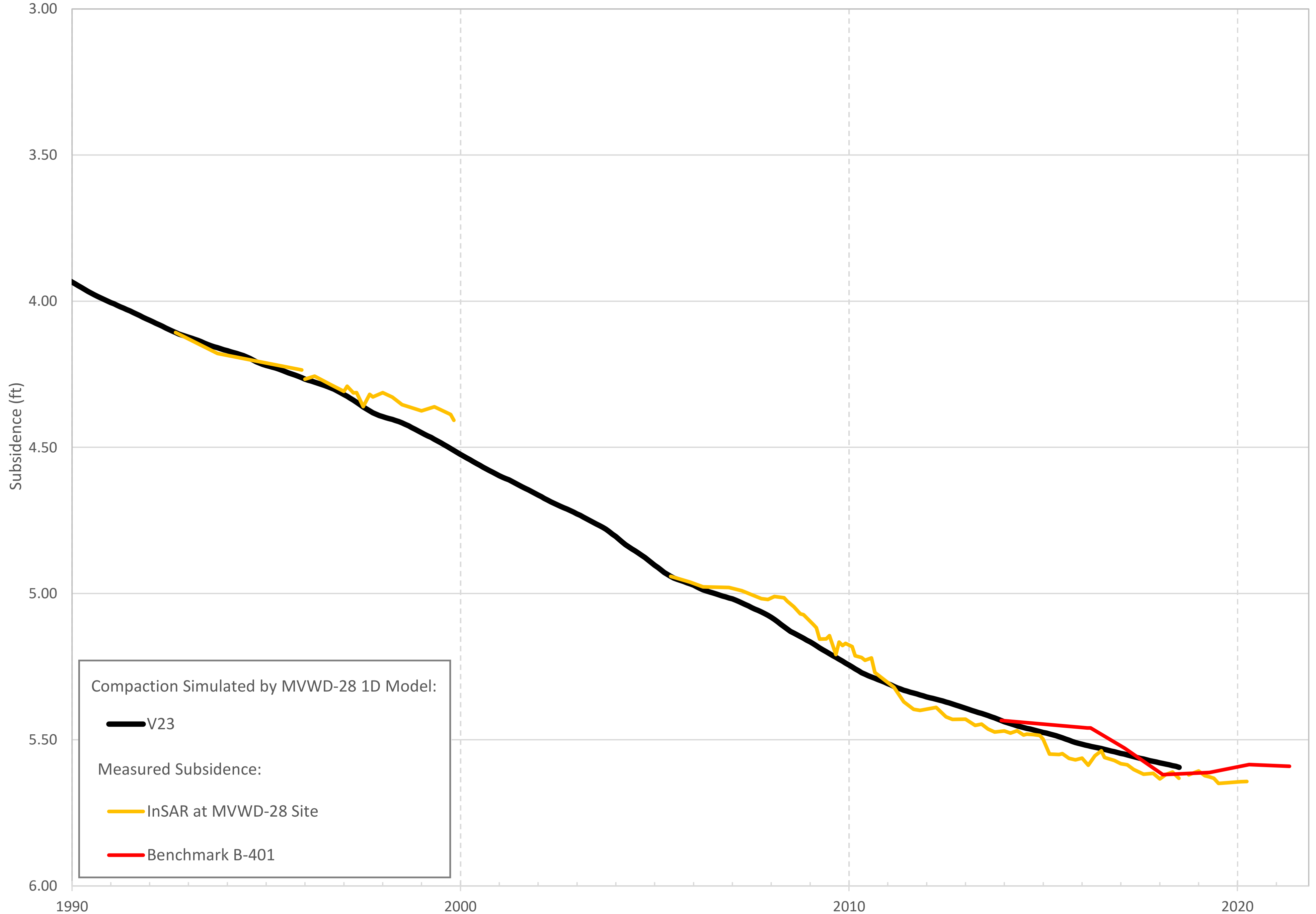
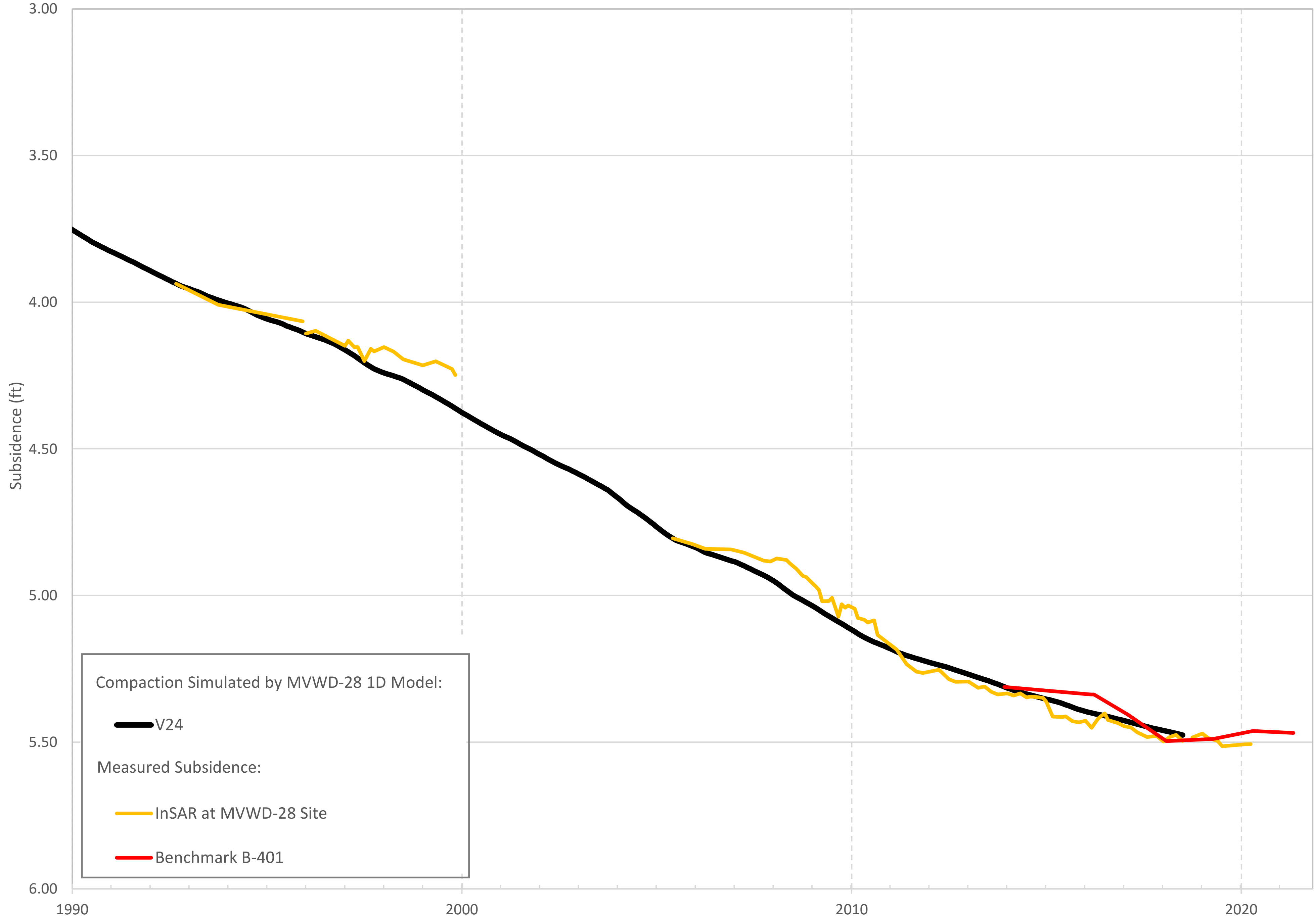


Figure 26. Measured Subsidence vs. Compaction Simulated by MVWD-28 1D Model - Calibration Run V24



Appendix A

Driller's Logs of PX and MVWD

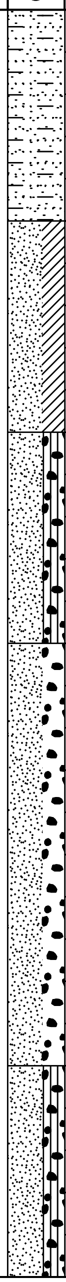
Project Name:	**Pomona Extensometer Facility**
Project Location:	**Montvue Park - Pomona, CA**
Project Number:	**007-018-762**
Client:	**Chino Basin Watermaster**

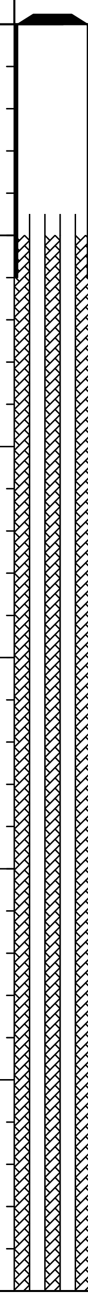
Boring Log / PX2

Date Started	**1/4/19**	Date Finished	**1/29/19**	Borehole Depth	**1305.0 feet**
Lat.	**34° 4' 28.7934"**	Long.	**-117° 43' 17.2554"**	Drill Bit Size/Type	**17 1/2 in**
Ground Surface Elevation	**984.7**			Screened Interval(s)	**980-1,010; 1,235-1,275**
Top of Casing Elevation				Depth to Groundwater	**N/A**
Logged By	**N. Seles, PG; R. Thacker**			Reviewed By	**M. Blazevic, PG, CHG**

Drilling Contractor	**Cascade**
Driller	**J. Saldera; J. Martinez**
Drill Rig Type	**Foremost DR-24**
Drilling Method	**Flooded Reverse Circulation**
Sampling Method	**Grab**

Elevation, feet-msl	Depth, feet-bgs	Sample Interval	Sample Time	Graphic Log	MATERIAL DESCRIPTION	WELL SCHEMATIC AND CONSTRUCTION DETAILS	FIELD NOTES
	0				Poorly graded SAND with silt (SP-SM); 85% fine-coarse, subangular-subrounded sand; 10% fines (few silt); 5% fine-coarse, subangular gravel; very loose, brown (10YR 4/3), dry, top soil		
980	5				Poorly graded SAND with clay (SP-SC); 80% fine-coarse, subangular-subrounded sand; 10% fine-coarse, subangular-subrounded gravel; 10% fines (few silt, few clay); loose, dark brown (10YR 3/3), dry		
975	10				Poorly graded SAND with silt and gravel (SP-SM); 65% fine-coarse, subangular-subrounded sand; 25% fine-coarse, angular-subangular gravel; 10% fines (few silt); very loose, olive brown (2.5Y 4/3), dry		
970	15				Poorly graded SAND with gravel (SP); 80% fine-coarse, angular-subangular sand; 20% fine-coarse, subangular-subrounded gravel; very loose, dark grayish brown (2.5Y 4/2), moist		
965	20				Poorly graded SAND with gravel (SP); 55% fine-coarse, subangular-subrounded sand; 40% fine-coarse, subangular-subrounded gravel; 5% fines (trace silt); loose, light olive brown (2.5Y 5/3), moist		
960	25				Poorly graded SAND with silt and gravel (SP-SM); 75% fine-coarse, subangular-subrounded sand; 15% fine-coarse, subangular-subrounded gravel; 10% fines (few silt); very loose, dark yellowish brown (10YR 4/4), moist		
955	30						





Project Name:	**Pomona Extensometer Facility**
Project Location:	**Montvue Park - Pomona, CA**
Project Number:	**007-018-762**
Client:	**Chino Basin Watermaster**

Boring Log / PX2

Elevation, feet-msl	Depth, feet-bgs	Sample Interval	Sample Time	Graphic Log	MATERIAL DESCRIPTION	WELL SCHEMATIC AND CONSTRUCTION DETAILS	FIELD NOTES
	30				Poorly graded SAND with silt and gravel (SP-SM); 55% fine-coarse, subangular-subrounded sand; 35% fine-coarse, subangular-subrounded gravel; 10% fines (few silt); loose, dark yellowish brown (10YR 4/4), moist		
950	35				As Above		
945	40				As Above		
940	45		21:15		As Above		
935	50				As Above		
			[0.0]				
930	55				Poorly graded SAND (SP); 100% fine-coarse, subangular-subrounded sand; loose, grayish brown (2.5Y 5/2)		
925	60		03:15				
			03:15		As Above		
			[0.0]				
920	65		06:07				

Elevation, feet-msl	Depth, feet-bgs	Sample Interval	Sample Time	Graphic Log	MATERIAL DESCRIPTION	WELL SCHEMATIC AND CONSTRUCTION DETAILS	FIELD NOTES
	65		06:07 [0.0]		As Above		
915	70		08:02 / 08:02 [0.5]		As Above		
910	75		08:12 / 08:12 [0.1]		As Above		
905	80		08:50 / 08:50 [0.0]		As Above		
900	85		11:06 / 11:06 [0.0]		As Above		
895	90		12:58 / 12:58 [0.0]		As Above		
890	95		14:43 / 14:43 [0.1]		As Above		
885	100		15:30				

Elevation, feet-msl	Depth, feet-bgs	Sample Interval	Sample Time	Graphic Log	MATERIAL DESCRIPTION	WELL SCHEMATIC AND CONSTRUCTION DETAILS	FIELD NOTES
	100		15:30 [0.2] 15:43		As Above		
			15:43		CLAYEY SAND (SC); 70% medium-coarse, angular-subangular sand; 20% fines (mostly clay, trace silt); 10% fine, angular-subangular gravel; very loose, light yellowish brown (2.5Y 6/3)		
880	105		[0.1] 18:13		Poorly graded SAND with gravel (SP); 80% medium-coarse sand; 20% fine-coarse gravel; grayish brown (2.5Y 5/2)		
875	110		18:13		Poorly graded SAND (SP); 100% fine-coarse, angular-subangular sand; trace fine, angular-subangular gravel; loose, grayish brown (2.5Y 5/2)		
870	115				As Above		
865	120		[0.1]		As Above		
860	125		20:50		As Above		
855	130		20:50		As Above		
850	135						

Elevation, feet-msl	Depth, feet-bgs	Sample Interval	Sample Time	Graphic Log	MATERIAL DESCRIPTION	WELL SCHEMATIC AND CONSTRUCTION DETAILS	FIELD NOTES
	135				As Above		
845	140		[0.0]		As Above		
840	145				As Above		
835	150		06:05 / 06:05		As Above		
			[0.0]		Poorly graded SAND with clay (SP-SC); 90% medium-coarse, subangular-subrounded sand; 10% fines (mostly clay, trace silt); loose, light yellowish brown (2.5Y 6/3)		
830	155		09:50 / 09:50		As Above		
			[0.1]				
			10:15 / 10:15				
825	160		[0.1]		As Above		
			11:14 / 11:14				
			[0.0]				
820	165		12:20 / 12:20		Poorly graded SAND (SP); 100% medium-coarse, subangular-subrounded sand; loose, pale yellow (2.5Y 7/4), particles slightly more rounded; slight color change (more K feldspar)		
			[0.1]				
815	170		13:15				

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Elevation, feet-msl	Depth, feet-bgs	Sample Interval	Sample Time	Graphic Log	MATERIAL DESCRIPTION	WELL SCHEMATIC AND CONSTRUCTION DETAILS	FIELD NOTES
	170		13:15 [0.0] 15:13		Sandy LEAN CLAY (CL); 50% medium-coarse, subangular-subrounded sand; 50% fines (mostly clay, trace silt); soft, strong brown (7.5YR 5/8)		
810	175		15:13 [0.5] 15:23		CLAYEY SAND (SC); 60% medium-coarse, subangular-subrounded sand; 40% fines (mostly clay, trace silt); medium dense, strong brown (7.5YR 4/6), trace organics (leaves and roots)		
805	180		15:23 [0.8] 15:26		Poorly graded SAND (SP); 95% medium-coarse, subangular sand; 5% fines (mostly clay); medium dense, pale yellow (2.5Y 7/4), trace clay		
			15:26 [0.1] 15:45				
800	185		15:45 [0.1] 16:50		Poorly graded SAND (SP); 100% medium-coarse, subangular sand; loose, pale yellow (2.5Y 7/4)		
795	190		16:50 [0.1] 17:45		As Above		
790	195		17:45 [0.1] 18:38		As Above		
785	200		18:38 18:38		Poorly graded SAND (SP); 100% medium-coarse, subangular sand; trace fine, angular-subangular gravel; loose, pale yellow (2.5Y 7/4)		
780	205						

Elevation, feet-msl	Depth, feet-bgs	Sample Interval	Sample Time	Graphic Log	MATERIAL DESCRIPTION	WELL SCHEMATIC AND CONSTRUCTION DETAILS	FIELD NOTES
	205		18:38 [0.0]		As Above		
775	210		23:28 / 23:28 [0.0]		As Above		
770	215		00:14 / 00:14 [0.1]		As Above		
765	220		01:13 / 01:13 [0.1]		As Above		
760	225		02:15 / 02:15 [0.1]		As Above		
755	230		03:20 / 03:20 [0.1]		Poorly graded SAND (SP); 95% medium-coarse, subangular-subrounded sand; 5% fine, angular-subangular gravel; loose, pale yellow (2.5Y 7/4), organic material present (roots, grass)		
750	235		04:15 / 04:15 [0.1]		Poorly graded SAND (SP); 100% medium-coarse, subangular sand; trace fine, angular-subangular gravel; loose, pale yellow (2.5Y 7/4), visible organic material (roots, grass)		
745	240		05:16				

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Boring Log / PX2

Elevation, feet-msl	Depth, feet-bgs	Sample Interval	Sample Time	Graphic Log	MATERIAL DESCRIPTION	WELL SCHEMATIC AND CONSTRUCTION DETAILS	FIELD NOTES
	240		05:16 [0.1] 05:50		As Above		
740	245		05:50 [0.1] 06:45		As Above		
735	250		06:45		As Above		
730	255		[0.2]		CLAYEY SAND (SC); 70% medium-coarse, subangular-subrounded sand; 30% fines (mostly clay, trace silt); medium dense, yellowish brown (10YR 5/8), clay balls (1/4 inch)		
725	260		07:48		CLAYEY SAND (SC); 65% medium sand; 35% fines (mostly clay, trace silt); loose, yellowish brown (10YR 5/8)		
			07:48 [0.5] 07:53		CLAYEY SAND (SC); 60% medium sand; 40% fines (mostly clay, trace silt); medium dense, yellowish brown (10YR 5/8)		
720	265		07:53 [0.1] 08:32		CLAYEY SAND (SC); 75% medium sand; 25% fines (mostly clay, trace silt); loose, yellowish brown (10YR 5/6)		
			08:32 [0.3] 08:42		CLAYEY SAND (SC); 85% medium sand; 15% fines (mostly clay, trace silt); loose, yellowish brown (10YR 5/6)		
715	270		08:42 [1.0]		LEAN CLAY (CL); 95% fines (mostly clay, trace silt); 5% medium sand; medium-stiff, strong brown (7.5YR 4/6)		
			08:47		LEAN CLAY with sand (CL); 80% fines (mostly clay, trace silt); 20% medium sand; soft, strong brown (7.5YR 4/6)		
710	275						

Elevation, feet-msl	Depth, feet-bgs	Sample Interval	Sample Time	Graphic Log	MATERIAL DESCRIPTION	WELL SCHEMATIC AND CONSTRUCTION DETAILS	FIELD NOTES
	275		08:47 [0.3]		As Above		
					LEAN CLAY with sand (CL); 75% fines (mostly clay, trace silt); 25% medium-coarse, subangular-subrounded sand; soft, strong brown (7.5YR 4/6)		
705	280		09:03 / 09:03 [0.2]		Sandy LEAN CLAY (CL); 60% fines (mostly clay, trace silt); 40% medium-coarse, subangular-subrounded sand; soft, dark yellowish brown (10YR 4/6)		
700	285		09:28 / 09:28 [0.1] 10:05		Sandy LEAN CLAY (CL); 65% fines (mostly clay, trace silt); 35% medium-coarse, subangular-subrounded sand; medium-stiff, dark yellowish brown (10YR 4/6), trace fine gravel		
			10:05 [0.1]		Poorly graded SAND (SP); 100% medium sand; loose, yellow (10YR 7/6), trace organics		
695	290		10:30 / 10:30 [0.1]		Poorly graded SAND (SP); 100% medium-coarse, subangular sand; trace fines; loose, yellow (10YR 7/6), trace organics		
690	295		11:26 / 11:26 [0.2]		Poorly graded SAND (SP); 100% medium sand; loose, yellow (10YR 7/6), trace fine-sand, trace organic material		
685	300		11:58 / 11:58 [0.3]		CLAYEY SAND (SC); 85% medium sand; 15% fines (mostly clay, trace silt); loose, yellowish brown (10YR 5/8), trace organics		
680	305		12:17 / 12:17 [0.0] 01:30		CLAYEY SAND (SC); 70% medium sand; 30% fines (mostly clay, trace silt); loose, yellowish brown (10YR 5/6)		
			01:30 [0.1] 02:00		Poorly graded SAND (SP); 95% medium-coarse, subangular-subrounded sand; 5% fine, angular-subangular gravel; loose, light yellowish brown (2.5Y 6/3), trace organics		
675	310						

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Elevation, feet-msl	Depth, feet-bgs	Sample Interval	Sample Time	Graphic Log	MATERIAL DESCRIPTION	WELL SCHEMATIC AND CONSTRUCTION DETAILS	FIELD NOTES
	310		02:00 [0.1] 02:50		As Above		
670	315		02:50 [0.2] 03:05		As Above		
			03:05 [0.3] 03:13		SILTY SAND (SM); 60% medium-coarse, subangular-subrounded sand; 40% fines (mostly silt, little clay); trace fine, angular-subangular gravel; loose, brown (10YR 4/3)		
665	320		03:13 [0.1] 03:32		Sandy SILT (ML); 70% fines (mostly silt, little clay); 30% medium-coarse, subangular-subrounded sand; trace fine, angular-subangular gravel; very soft, brown (10YR 4/3)		
			03:32 [0.1] 03:58		Poorly graded SAND (SP); 95% medium-coarse, subangular-subrounded sand; 5% fine, angular-subangular gravel; loose, light yellowish brown (2.5Y 6/3)		
660	325		03:58 [0.1] 04:35		Poorly graded SAND (SP); 90% medium-coarse, subangular-subrounded sand; 10% fine, angular-subangular gravel; loose, light yellowish brown (2.5Y 6/3)		
655	330		04:35 [0.2] 04:47		SILT with sand (ML); 80% fines (mostly silt, some clay); 20% medium-coarse, subangular-subrounded sand; very soft, yellowish brown (10YR 5/4), trace organics		
			04:47 [0.1] 05:05		Sandy SILT (ML); 60% fines (mostly silt, little clay); 40% medium-coarse, subangular-subrounded sand; very soft, yellowish brown (10YR 5/6), trace organics		
650	335		05:05 [0.1] 05:28		As Above		
			05:28 [0.0] 06:30		Poorly graded SAND (SP); 95% medium-coarse, subangular-subrounded sand; 5% fine, angular-subangular gravel; loose, light yellowish brown (2.5Y 6/3), trace organics		
645	340		06:30 [0.2] 06:45		As Above		
			06:45 [0.2] 07:00				
640	345						

Elevation, feet-msl	Depth, feet-bgs	Sample Time	MATERIAL DESCRIPTION	WELL SCHEMATIC AND CONSTRUCTION DETAILS	FIELD NOTES
	345	07:00 [0.1] 07:45	As Above		
		07:45 [0.1] 08:03	CLAYEY SAND (SC); 80% medium sand; 20% fines (mostly clay, few silt); loose, yellowish brown (10YR 5/8)		
635	350	08:03 [0.1] 09:15	Poorly graded SAND (SP); 95% medium sand; 5% fine, subangular gravel; loose, very pale brown (10YR 7/4)		
630	355	09:15 [0.1] 09:49	As Above		
		09:49 [0.3] 09:57	CLAYEY SAND (SC); 85% medium sand; 15% fines (mostly clay, trace silt); medium dense, reddish yellow (7.5YR 6/6)		
625	360	09:57 [0.4] 10:10	Sandy LEAN CLAY (CL); 60% fines (mostly clay, trace silt); 40% medium sand; medium-stiff, strong brown (7.5YR 4/6)		
620	365	10:10 [0.1] 11:30	Sandy LEAN CLAY (CL); 70% fines (mostly clay, trace silt); 30% medium sand; medium-stiff, strong brown (7.5YR 4/6)		
615	370		LEAN CLAY with sand (CL); 85% fines (mostly clay, trace silt); 15% medium sand; medium-stiff, strong brown (7.5YR 4/6)		
		11:30 [0.1] 12:08	Poorly graded SAND (SP); 100% medium-coarse, subangular-subrounded sand; loose, very pale brown (10YR 7/4)		
610	375		As Above		
		12:08 [0.4] 12:14	Sandy LEAN CLAY (CL); 60% fines (mostly clay, trace silt); 40% medium-coarse, subangular sand; trace fine, subangular gravel; medium-stiff, strong brown (7.5YR 4/6)		
605	380				

Elevation, feet-msl	Depth, feet-bgs	Sample Interval	Sample Time	Graphic Log	MATERIAL DESCRIPTION	WELL SCHEMATIC AND CONSTRUCTION DETAILS	FIELD NOTES
	380		12:14 [0.2] 12:41		CLAYEY SAND (SC); 60% medium sand; 40% fines (mostly clay, trace silt); loose, strong brown (7.5YR 5/6)		
600	385		12:41 [0.1] 14:00		Poorly graded SAND (SP); 95% medium-coarse, subangular-subrounded sand; 5% fines (mostly clay, trace silt); loose, very pale brown (10YR 7/4)		
595	390		14:00 [0.1] 14:20		Poorly graded SAND (SP); 100% medium-coarse, subangular-subrounded sand; loose, very pale brown (10YR 7/4)		
			14:20 [0.1] 14:38		CLAYEY SAND (SC); 65% medium-coarse, subangular-subrounded sand; 35% fines (mostly clay, trace silt); medium dense, very pale brown (10YR 7/4)		
590	395		14:38 [0.3] 14:54		CLAYEY SAND (SC); 60% medium-coarse, subangular-subrounded sand; 40% fines (mostly clay, trace silt); loose, strong brown (7.5YR 5/6)		
585	400		14:54 [0.2] 15:18		As Above		
580	405		15:18 [0.2] 15:30		LEAN CLAY with sand (CL); 80% fines (mostly clay, trace silt); 20% medium sand; medium-stiff, strong brown (7.5YR 5/6)		
			15:30 [0.0] 22:35		Sandy LEAN CLAY (CL); 60% fines (mostly clay, trace silt); 40% medium sand; medium-stiff, reddish yellow (7.5YR 7/6)		
575	410		22:35 [0.1] 23:15		CLAYEY SAND (SC); 60% medium-coarse, subangular-subrounded sand; 40% fines (mostly clay, little silt); medium dense, yellowish brown (10YR 5/6)		
			23:15 [0.5] 23:20		LEAN CLAY with sand (CL); 75% fines (little silt, trace clay); 25% medium-coarse, subangular-subrounded sand; medium-stiff, dark yellowish brown (10YR 4/4), clay balls		
570	415						

Elevation, feet-msl	Depth, feet-bgs	Sample Interval	Sample Time	Graphic Log	MATERIAL DESCRIPTION	WELL SCHEMATIC AND CONSTRUCTION DETAILS	FIELD NOTES
	415		23:20 [0.2] 23:35		As Above		
			23:35 [0.2] 23:50		Sandy LEAN CLAY (CL); 60% fines (mostly clay, few silt); 40% medium-coarse, subangular-subrounded sand; soft, yellowish brown (10YR 5/6), clay balls		
565	420		23:50 [0.0] 00:15		As Above		
			00:15 [0.1] 00:45		As Above		
560	425		00:45 [0.2] 00:56		CLAYEY SAND (SC); 70% medium-coarse, subangular-subrounded sand; 30% fines (mostly clay, trace silt); trace fine, angular gravel; loose, yellowish brown (10YR 5/4), clay balls		
			00:56 [0.1] 01:43		As Above		
555	430		01:43 [0.2] 01:55		As Above		
			01:55 [0.3] 02:05		CLAYEY SAND (SC); 60% medium-coarse, subangular-subrounded sand; 40% fines (mostly clay, trace silt); trace fine, angular gravel; loose, yellowish brown (10YR 5/4), clay balls		
550	435		02:05 [0.3] 02:15		CLAYEY SAND (SC); 70% medium-coarse, subangular-subrounded sand; 30% fines (mostly clay, trace silt); trace fine, angular gravel; loose, yellowish brown (10YR 5/4), clays balls		
			02:15 [0.3] 02:25		As Above		
545	440		02:25 [0.3] 02:35		As Above		
			02:35 [0.1] 03:15		Sandy LEAN CLAY (CL); 60% fines (mostly clay, trace silt); 40% medium-coarse, subangular-subrounded sand; soft, yellowish brown (10YR 5/4), clay balls, trace organic material		
540	445		03:15 [0.0] 04:30		Poorly graded SAND (SP); 95% medium-coarse, subangular-subrounded sand; 5% fine, angular gravel; loose, light yellowish brown (2.5Y 6/3), trace organic material		
			04:30 [0.0] 05:50		As Above		
535	450						

Elevation, feet-msl	Depth, feet-bgs	Sample Time	MATERIAL DESCRIPTION	WELL SCHEMATIC AND CONSTRUCTION DETAILS	FIELD NOTES
	450	05:50 [0.1] 06:48	As Above		
530	455	06:48 [0.1] 07:24	As Above		
		07:24 [0.1] 07:49	CLAYEY SAND (SC); 70% medium-coarse, subangular-subrounded sand; 30% fines (mostly clay, trace silt); trace fine, angular gravel; loose, yellowish brown (10YR 5/4)		
525	460	07:49 [0.1] 08:27	Poorly graded SAND (SP); 100% medium-coarse, subangular sand; trace fines; loose, yellow (10YR 7/6)		
		08:27 [0.1] 09:06	Poorly graded SAND (SP); 100% medium-coarse, subangular sand; trace undefined gravel; trace fines; loose, yellow (10YR 7/6)		
520	465	09:06 [0.0] 10:06	Poorly graded SAND (SP); 100% medium-coarse, subangular sand; trace fines; loose, yellow (10YR 7/6)		
		10:06 [0.2] 10:22			
515	470	10:22 [0.1] 10:45	As Above		
		10:45 [0.3] 10:53	CLAYEY SAND (SC); 85% medium sand; 15% fines (mostly clay, trace silt); loose, yellowish brown (10YR 5/4), trace fine sand		
510	475	10:53 [0.1] 11:38	Poorly graded SAND (SP); 95% medium sand; 5% fines (mostly clay, trace silt); loose, yellow (10YR 7/6), trace fine sand Poorly graded SAND (SP); 100% medium-coarse, subangular sand; trace fines; loose, yellow (10YR 7/6)		
505	480	11:38 [0.2] 11:53	CLAYEY SAND (SC); 70% medium-coarse, subangular-subrounded sand; 30% fines (mostly clay, trace silt); trace fine, angular gravel; loose, yellowish brown (10YR 5/4)		
		11:53 [0.2] 12:09	CLAYEY SAND (SC); 85% medium sand; 15% fines (mostly clay, trace silt); loose, yellowish brown (10YR 5/4)		
500	485				

Elevation, feet-msl	Depth, feet-bgs	Sample Interval	Sample Time	Graphic Log	MATERIAL DESCRIPTION	WELL SCHEMATIC AND CONSTRUCTION DETAILS	FIELD NOTES
	485		12:09 [0.0] 13:09		Poorly graded SAND (SP); 95% medium sand; 5% fines (mostly clay, trace silt); loose, yellow (10YR 7/6), trace fine sand		
495			13:09 [0.1] 13:30				
	490		13:30 [0.1] 14:04		CLAYEY SAND (SC); 85% medium sand; 15% fines (mostly clay, trace silt); loose, yellow (10YR 7/6), trace fine sand; trace organics		
490			14:04 [0.4] 14:10		LEAN CLAY with sand (CL); 85% fines (mostly clay, trace silt); 15% medium sand; medium-stiff, yellowish brown (10YR 5/4)		
	495		14:10 [0.1] 14:30		Sandy LEAN CLAY (CL); 60% fines (mostly clay, trace silt); 40% medium sand; medium-stiff, brownish yellow (10YR 6/6)		
485			14:30 [0.1] 14:48		CLAYEY SAND (SC); 70% medium sand; 30% fines (mostly clay, trace silt); medium dense, yellow (10YR 7/6)		
	500		14:48 [0.1] 15:30		Poorly graded SAND (SP); 95% medium-coarse, subangular sand; 5% fines (mostly clay, trace silt); loose, yellow (10YR 7/6)		
480	505		15:30 [0.0] 17:32		As Above		
475	510		17:32 [0.1] 18:15		Sandy LEAN CLAY (CL); 60% fines (mostly clay, trace silt); 40% medium-coarse, subangular-subrounded sand; soft, dark yellowish brown (10YR 4/4), clay balls		
			18:15 [0.1] 18:36		As Above		
470	515		18:36 [0.3] 18:45		As Above		
			18:45 [0.1] 19:30		CLAYEY SAND (SC); 70% medium-coarse, subangular-subrounded sand; 30% fines (mostly clay, trace silt); loose, yellowish brown (10YR 5/4), clay balls		
465	520						

Elevation, feet-msl	Depth, feet-bgs	Sample Time	MATERIAL DESCRIPTION	WELL SCHEMATIC AND CONSTRUCTION DETAILS	FIELD NOTES
	520	19:30 [0.1] 19:54	As Above		
460	525	19:54 [0.1] 20:15	Poorly graded SAND (SP); 100% medium-coarse, subangular-subrounded sand; trace fine, angular-subangular gravel; loose, pale brown (10YR 6/3), trace fines		
		20:15 [0.0] 21:44	Poorly graded SAND (SP); 90% medium-coarse, subangular-subrounded sand; 5% fine, angular-subangular gravel; 5% fines (mostly clay); loose, light yellowish brown (10YR 6/4), very small clay balls, trace fines		
455	530	21:44 [0.0] 22:39	Poorly graded SAND (SP); 95% medium-coarse, subangular-subrounded sand; 5% fine, angular-subangular gravel; loose, light yellowish brown (10YR 6/4), trace fines		
		22:39 [0.1] 22:58	Poorly graded SAND (SP); 90% medium-coarse, subangular-subrounded sand; 10% fine, angular-subangular gravel; loose, light yellowish brown (10YR 6/4), trace fines		
450	535	22:58 [0.3] 23:08	CLAYEY SAND (SC); 60% fine-coarse, subangular-subrounded sand; 40% fines (mostly clay, trace silt); medium dense, olive brown (2.5Y 4/4), clay balls		
		23:08 [0.2] 23:20	LEAN CLAY (CL); 90% fines (mostly clay, trace silt); 10% fine-coarse, subangular-subrounded sand; medium-stiff, brown (10YR 5/3), clay balls		
445	540	23:20 [0.3] 23:30	As Above		
		23:30 [0.2] 23:45	CLAYEY SAND (SC); 65% medium-coarse, subangular-subrounded sand; 35% fines (mostly clay, trace silt); loose, light olive brown (2.5Y 5/4), clay balls		
440	545	23:45 [0.2] 23:58	LEAN CLAY (CL); 90% fines (mostly clay, trace silt); 10% fine-coarse, subangular-subrounded sand; medium-stiff, brown (10YR 5/3), clay balls		
		23:58 [0.0] 00:05	Sandy LEAN CLAY (CL); 65% fines (mostly clay, trace silt); 35% fine-coarse, subangular-subrounded sand; soft, brown (10YR 5/3), clay balls		
435	550	00:05 [0.1] 00:55	LEAN CLAY (CL); 90% fines (mostly clay, trace silt); 10% fine-coarse, subangular-subrounded sand; medium-stiff, brown (10YR 5/3), clay balls		
		00:55 [0.1] 01:34	Sandy LEAN CLAY (CL); 60% fines (mostly clay, trace silt); 40% fine-coarse, subangular-subrounded sand; soft, brown (10YR 5/3), clay balls		
430	555	01:34 [0.2] 01:48	CLAYEY SAND (SC); 60% medium-coarse, subangular-subrounded sand; 40% fines (mostly clay, trace silt); loose, brown (10YR 5/3), clay balls		

Elevation, feet-msl	Depth, feet-bgs	Sample Time	MATERIAL DESCRIPTION	WELL SCHEMATIC AND CONSTRUCTION DETAILS	FIELD NOTES
	555	01:48 [0.4] 01:55	Sandy LEAN CLAY (CL); 60% fines (mostly clay, trace silt); 40% medium-coarse, subangular-subrounded sand; trace fine, angular-subangular gravel; soft, brown (10YR 4/3), clay balls		
		01:55 [0.3] 02:05	As Above		
425	560	02:05 [0.3] 02:15	CLAYEY SAND with gravel (SC); 60% medium-coarse, subangular-subrounded sand; 20% fine, angular-subangular gravel; 20% fines (mostly clay, trace silt); loose, light olive brown (2.5Y 5/4), clay balls		
		02:15 [0.2] 02:30	Sandy LEAN CLAY (CL); 60% fines (mostly clay, trace silt); 40% medium-coarse, subangular-subrounded sand; soft, olive brown (2.5Y 4/4), clay balls		
420	565	02:30 [0.2] 02:44	CLAYEY SAND (SC); 60% medium-coarse, subangular-subrounded sand; 40% fines (mostly clay, trace silt); loose, light olive brown (2.5Y 5/4), clay balls		
		02:44 [0.0] 03:45	CLAYEY SAND (SC); 70% medium-coarse, subangular-subrounded sand; 30% fines (mostly clay, trace silt); loose, light olive brown (2.5Y 5/4), clay balls		
415	570	03:45 [0.2] 04:00	LEAN CLAY (CL); 90% fines (mostly clay, trace silt); 10% fine-medium sand; soft, brown (10YR 5/3), clay balls		
		04:00 [0.0] 04:53	Sandy LEAN CLAY (CL); 70% fines (mostly clay, trace silt); 30% fine-coarse, subangular-subrounded sand; soft, brown (10YR 5/3)		
410	575	04:53 [0.1] 05:23	As Above		
		05:23 [0.0] 06:58	Poorly graded SAND (SP); 95% fine-coarse, subangular-subrounded sand; 5% fine, angular-subangular gravel; loose, light olive brown (2.5Y 5/3)		
405	580	06:58 [0.1] 07:20	Sandy LEAN CLAY (CL); 70% fines (mostly clay, trace silt); 30% fine-coarse, subangular-subrounded sand; soft, brown (10YR 5/3)		
		07:20 [0.3] 07:28	CLAYEY SAND with gravel (SC); 60% medium-coarse, subangular-subrounded sand; 20% fine, angular-subangular gravel; 20% fines (mostly clay, trace silt); loose, light olive brown (2.5Y 5/4)		
400	585	07:28 [0.1] 08:20	Sandy LEAN CLAY (CL); 70% fines (mostly clay, trace silt); 30% fine-coarse, subangular-subrounded sand; soft, brown (10YR 5/3) Sandy LEAN CLAY (CL); 60% fines (mostly clay, trace silt); 40% fine-coarse, subangular-subrounded sand; soft, brown (10YR 5/3)		
395	590				

Project Name:	**Pomona Extensometer Facility**
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Client:	**Chino Basin Watermaster**

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Elevation, feet-msl	Depth, feet-bgs	Sample Time	MATERIAL DESCRIPTION	WELL SCHEMATIC AND CONSTRUCTION DETAILS	FIELD NOTES
	590	08:20 [0.3] 08:38	Sandy LEAN CLAY (CL); 70% fines (mostly clay, trace silt); 30% fine-coarse, subangular-subrounded sand; soft, brown (10YR 5/3), trace fine cobbles		
390	595	08:38 [0.2] 09:00	Sandy LEAN CLAY (CL); 60% fines (mostly clay, trace silt); 40% medium-coarse, subangular-subrounded sand; trace fine, angular-subangular gravel; soft, brown (10YR 4/3)		
385	600	09:00 [0.1] 10:15	Sandy LEAN CLAY (CL); 70% fines (mostly clay, trace silt); 30% fine-medium sand; soft, strong brown (7.5YR 5/8)	High-Solids Bentonite Grout	
380	605	10:15 [0.2] 10:40	CLAYEY SAND (SC); 60% medium-coarse, subangular-subrounded sand; 40% fines (mostly clay, trace silt); loose, strong brown (7.5YR 5/8)		
375	610	10:40 [0.3] 11:00	CLAYEY SAND (SC); 70% fine-coarse, subangular-subrounded sand; 30% fines (mostly clay, trace silt); loose, light olive brown (2.5Y 5/3)		
370	615	11:00 [0.1] 11:40	Sandy LEAN CLAY (CL); 55% fines (mostly clay, trace silt); 45% medium sand; trace coarse, subrounded gravel; soft, reddish yellow (7.5YR 6/6), trace coarse gravel		
		11:40 [0.1] 12:25	CLAYEY SAND (SC); 65% fine-medium sand; 35% fines (mostly clay, trace silt); loose, light olive brown (2.5Y 5/6)		
365	620	12:25 [0.0] 13:26	CLAYEY SAND (SC); 85% medium-coarse, subangular-subrounded sand; 15% fines (mostly clay, trace silt); loose, light olive brown (2.5Y 5/4)		
		13:26 [0.1] 13:50	Poorly graded SAND (SP); 95% fine-medium sand; 5% fines (mostly clay, trace silt); loose, olive gray (5Y 5/2)		
360	625				

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Elevation, feet-msl	Depth, feet-bgs	Sample Time	MATERIAL DESCRIPTION	WELL SCHEMATIC AND CONSTRUCTION DETAILS	FIELD NOTES
	625	13:50 [0.1] 14:30	CLAYEY SAND (SC); 60% fine-medium sand; 40% fines (mostly clay, trace silt); loose, light yellowish brown (10YR 6/4)		
355	630	14:30 [0.1] 15:15	Sandy LEAN CLAY (CL); 60% fines (mostly clay, trace silt); 40% fine-medium sand; medium-stiff, light yellowish brown (10YR 6/4)		
		15:15 [0.1] 15:53	Poorly graded SAND (SP); 95% fine-medium sand; 5% fines (mostly clay, trace silt); loose, olive gray (5Y 5/2)		
350	635	15:53 [0.1] 16:30	Poorly graded SAND (SP); 95% fine-coarse, subangular-subrounded sand; 5% fine, subrounded gravel; trace fines (mostly clay, trace silt); loose, olive gray (5Y 5/2)		
		16:30 [0.3] 16:40	LEAN CLAY (CL); 90% fines (mostly clay, trace silt); 10% fine-medium sand; soft, light olive brown (2.5Y 5/6)		
345	640	16:40 [0.2] 16:54	LEAN CLAY (CL); 100% fines (mostly clay, trace silt); trace fine sand; soft, light olive brown (2.5Y 5/6)		
		16:54 [0.1] 17:19	As Above		
340	645	17:19 [0.0] 18:50	Poorly graded SAND (SP); 95% medium-coarse, subangular-subrounded sand; 5% fines (mostly clay, trace silt); loose, light olive brown (2.5Y 5/4)		
		18:50 [0.2] 19:05	Poorly graded SAND (SP); 95% medium-coarse, subangular-subrounded sand; 5% fine, angular-subangular gravel; loose, light olive brown (2.5Y 5/4)		
335	650	19:05 [0.1] 19:30	LEAN CLAY with sand (CL); 80% fines (mostly clay, trace silt); 20% medium-coarse, subangular-subrounded sand; trace fine, angular gravel; soft, brown (10YR 4/3), clay balls		
		19:30 [0.1] 20:05	Sandy LEAN CLAY (CL); 70% fines (mostly clay, trace silt); 30% fine-coarse, subangular-subrounded sand; soft, light olive brown (2.5Y 5/3), clay balls		
330	655	20:05 [0.0] 22:10	Poorly graded SAND (SP); 95% medium-coarse, subangular-subrounded sand; 5% fine, angular-subangular gravel; trace fines (mostly clay, trace silt); loose, light olive brown (2.5Y 5/4), dry, trace clay balls		
325	660				

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Elevation, feet-msl	Depth, feet-bgs	Sample Interval	Sample Time	Graphic Log	MATERIAL DESCRIPTION	WELL SCHEMATIC AND CONSTRUCTION DETAILS	FIELD NOTES
	660		22:10 [0.1] 22:30		LEAN CLAY (CL); 95% fines (mostly clay, trace silt); 5% fine-coarse, subangular-subrounded sand; soft, light brownish gray (2.5Y 6/2), clay balls		
			22:30 [0.1] 22:50		Sandy LEAN CLAY (CL); 60% fines (mostly clay, trace silt); 40% fine-coarse, subangular-subrounded sand; soft, light brownish gray (2.5Y 6/2)		
320	665		22:50 [0.2] 23:04		LEAN CLAY with sand (CL); 80% fines (mostly clay, trace silt); 20% medium-coarse, subangular-subrounded sand; soft, olive brown (2.5Y 4/3), clay balls		
			23:04 [0.0] 00:40		CLAYEY SAND (SC); 60% medium-coarse, subangular-subrounded sand; 30% fines (mostly clay, trace silt); 10% fine, angular-subangular gravel; loose, light yellowish brown (2.5Y 6/3), trace fine-grained sand.		
315	670		00:40 [0.1] 01:55		CLAYEY SAND (SC); 75% medium-coarse, subangular-subrounded sand; 15% fines (mostly clay, trace silt); 10% fine, angular-subangular gravel; loose, light yellowish brown (2.5Y 6/3) As Above		
310	675		01:55 [0.1] 03:27		Poorly graded SAND (SP); 90% medium-coarse, subangular-subrounded sand; 10% fine, angular-subangular gravel; trace fines (mostly clay, trace silt); loose, light yellowish brown (2.5Y 6/3)		
305	680		03:27 [0.0] 05:10		Poorly graded SAND (SP); 85% medium-coarse, subangular-subrounded sand; 10% fine, angular-subangular gravel; 5% fines (mostly clay, trace silt); loose, light yellowish brown (2.5Y 6/3)		
300	685		05:10 [0.1] 06:30		As Above		
295	690		06:30 [0.4] 06:43		LEAN CLAY with sand (CL); 80% fines (mostly clay, trace silt); 20% fine-coarse sand; soft, olive yellow (2.5Y 6/6)		
290	695						

Elevation, feet-msl	Depth, feet-bgs	Sample Interval	Sample Time	Graphic Log	MATERIAL DESCRIPTION	WELL SCHEMATIC AND CONSTRUCTION DETAILS	FIELD NOTES
	695		06:43 [0.3] 07:00		LEAN CLAY (CL); 90% fines (mostly clay, trace silt); 10% fine-medium sand; medium-stiff, light yellowish brown (2.5Y 6/4)		
285	700		07:00 [0.5] 07:10		As Above		
280	705		07:10 [0.0] 10:15		LEAN CLAY with sand (CL); 80% fines (mostly clay, trace silt); 20% fine-coarse sand; soft, olive yellow (2.5Y 6/6)		
275	710		10:15 [0.1] 10:40		Poorly graded SAND with clay (SP-SC); 90% fine-medium sand; 10% fines (mostly clay, trace silt); loose, light yellowish brown (2.5Y 6/3)		
			10:40 [0.3] 10:48		LEAN CLAY (CL); 90% fines (mostly clay, trace silt); 10% fine-coarse sand; soft, olive yellow (2.5Y 6/6)		
270	715		10:48 [0.1]		As Above		
			11:40		Poorly graded SAND (SP); 85% medium-coarse, subangular-subrounded sand; 10% fine, angular-subangular gravel; 5% fines (mostly clay, trace silt); loose, light yellowish brown (2.5Y 6/3)		
265	720		11:40 [0.3] 11:49		LEAN CLAY (CL); 90% fines (mostly clay, trace silt); 10% fine-coarse sand; soft, olive yellow (2.5Y 6/6)		
260	725		11:49 [0.1] 12:43		As Above		
			12:43 [0.5] 12:48		LEAN CLAY with sand (CL); 80% fines (mostly clay, trace silt); 20% fine-coarse sand; soft, olive yellow (2.5Y 6/6)		
255	730						

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Elevation, feet-msl	Depth, feet-bgs	Sample Interval	Sample Time	Graphic Log	MATERIAL DESCRIPTION	WELL SCHEMATIC AND CONSTRUCTION DETAILS	FIELD NOTES
	730		12:48 [0.5] 12:58		As Above		
250	735		12:58 [0.3] 13:15		LEAN CLAY (CL); 90% fines (mostly clay, trace silt); 10% fine-coarse sand; soft, olive yellow (2.5Y 6/6)		
245	740		13:15 [0.3] 13:35		As Above		
240	745		13:35 [0.1] 14:30		LEAN CLAY with sand (CL); 80% fines (mostly clay, trace silt); 20% fine-coarse sand; soft, olive yellow (2.5Y 6/6)		
235	750		14:30 [0.1] 15:10		LEAN CLAY (CL); 90% fines (mostly clay, trace silt); 10% fine-coarse sand; soft, olive yellow (2.5Y 6/6)		
			15:10 [0.5] 15:15		Poorly graded SAND (SP); 85% medium-coarse, subangular-subrounded sand; 10% fine, angular-subangular gravel; 5% fines (mostly clay, trace silt); loose, light yellowish brown (2.5Y 6/3)		
230	755		15:15 [0.0] 16:55		Poorly graded SAND (SP); 100% fine-medium sand; loose, dark greenish gray (5GY 4/1), broken sand by drilled - looks pulzerized		
			16:55		Poorly graded SAND with clay (SP-SC); 90% medium-coarse, subangular-subrounded sand; 10% fines (mostly clay, trace silt); trace fine, angular-subangular gravel; loose, light yellowish brown (2.5Y 6/3)		
225	760		[0.1] 17:45				
			17:45 [0.1] 18:02		As Above		
220	765						

Elevation, feet-msl	Depth, feet-bgs	Sample Time	MATERIAL DESCRIPTION	WELL SCHEMATIC AND CONSTRUCTION DETAILS	FIELD NOTES
	765	18:02 [0.1] 18:47	CLAYEY SAND (SC); 60% medium-coarse, subangular-subrounded sand; 40% fines (mostly clay, trace silt); loose, light olive brown (2.5Y 5/3)		
215	770	18:47 [0.8] 18:50	Poorly graded SAND (SP); 100% medium-coarse, subangular-subrounded sand; trace fine, angular-subangular gravel; trace fines (mostly clay, trace silt); very loose, light yellowish brown (2.5Y 6/3)		
		18:50 [0.2] 19:05	LEAN CLAY (CL); 100% fines (mostly clay, trace silt); trace medium-coarse sand; medium-stiff, olive brown (2.5Y 4/4), clay balls		
210	775	19:05 [0.2] 19:20	CLAYEY SAND (SC); 65% medium-coarse, subangular-subrounded sand; 30% fines (mostly clay, trace silt); 5% fine, angular-subangular gravel; very loose, light yellowish brown (2.5Y 6/4)		
		19:20 [0.1] 19:38	Poorly graded SAND with clay (SP-SC); 80% medium-coarse, subangular-subrounded sand; 10% fine, subangular-subrounded gravel; 10% fines (mostly clay, trace silt); very loose, light yellowish brown (2.5Y 6/3)		
205	780	19:38 [0.4] 19:45	CLAYEY SAND (SC); 70% medium-coarse, subangular-subrounded sand; 30% fines (mostly clay); trace fine, angular-subangular gravel; loose, olive brown (2.5Y 4/4)		
200	785	19:45 [0.2] 20:10	CLAYEY SAND (SC); 75% medium-coarse, subangular-subrounded sand; 15% fines (mostly clay, trace silt); 10% fine, angular-subangular gravel; very loose, light yellowish brown (2.5Y 6/3) As Above		
195	790	20:10 [0.1] 21:30	As Above As Above		
190	795	21:30 [0.1] 22:06	FAT CLAY (CH); 100% fines (mostly clay); medium-stiff, olive brown (2.5Y 4/3)		
		22:06 [0.2] 22:20	CLAYEY SAND with gravel (SC); 60% medium-coarse, subangular-subrounded sand; 25% fine, angular-subangular gravel; 15% fines (mostly clay, trace silt); very loose, light olive brown (2.5Y 5/3)		
185	800	22:20	Sandy LEAN CLAY (CL); 70% fines (mostly clay, trace silt); 25% medium-coarse, subangular-subrounded sand; 5% fine, angular gravel; medium-stiff, light olive brown (2.5Y 5/3)		

Elevation, feet-msl	Depth, feet-bgs	Sample Interval	Sample Time	Graphic Log	MATERIAL DESCRIPTION	WELL SCHEMATIC AND CONSTRUCTION DETAILS	FIELD NOTES
	800		[0.1] 23:11		Poorly graded SAND with clay and gravel (SP-SC); 70% medium-coarse, subangular-subrounded sand; 20% fine, angular-subangular gravel; 10% fines (mostly clay, trace silt); very loose, light yellowish brown (2.5Y 6/3)		
180	805		23:11 [0.0] 03:26		FAT CLAY (CH); 100% fines (mostly clay); trace medium-coarse, subangular-subrounded sand; medium-stiff, olive brown (2.5Y 4/3)		
			03:26 [0.2] 03:38		LEAN CLAY (CL); 90% fines (mostly clay); 10% medium-coarse, subangular-subrounded sand; medium-stiff, olive brown (2.5Y 4/3)		
175	810		03:38 [0.1] 03:56		LEAN CLAY with sand (CL); 80% fines (mostly clay); 20% fine-medium sand; medium-stiff, olive brown (2.5Y 4/3)		
			03:56 [0.3] 04:05		FAT CLAY (CH); 100% fines (mostly clay); medium-stiff, olive brown (2.5Y 4/3)		
170	815		04:05 [0.3] 04:13		LEAN CLAY (CL); 100% fines (mostly clay); trace medium-coarse, subangular-subrounded sand; medium-stiff, olive brown (2.5Y 4/3)		
			04:13 [0.2] 04:24		As Above		
165	820		04:24 [0.1] 04:41		LEAN CLAY with sand (CL); 80% fines (mostly clay); 20% fine-medium sand; medium-stiff, olive brown (2.5Y 4/3)		
			04:41 [0.1] 05:07		Sandy LEAN CLAY (CL); 65% fines (mostly clay); 35% fine-medium sand; medium-stiff, olive brown (2.5Y 4/3)		
160	825		05:07 [0.0] 09:19		Poorly graded SAND with gravel (SP); 80% medium-coarse, subangular-subrounded sand; 15% fine, angular-subangular gravel; 5% fines (mostly clay, trace silt); very loose, light yellowish brown (2.5Y 6/4)		
155	830		09:19 [0.1] 09:39		As Above		
			09:39 [0.6] 09:43		Sandy LEAN CLAY (CL); 65% fines (mostly clay, some silt); 35% fine-medium sand; trace fine gravel; medium-stiff, light yellowish brown (2.5Y 6/4)		
150	835						

Elevation, feet-msl	Depth, feet-bgs	Sample Interval	Sample Time	Graphic Log	MATERIAL DESCRIPTION	WELL SCHEMATIC AND CONSTRUCTION DETAILS	FIELD NOTES
	835		09:43		Sandy LEAN CLAY (CL); 60% fines (mostly clay, some silt); 40% fine-medium sand; trace fine gravel; soft, light yellowish brown (2.5Y 6/4)		
			[0.1]		Sandy LEAN CLAY (CL); 50% medium sand; 50% fines (mostly clay, little silt); soft, olive yellow (2.5Y 6/6)		
145	840		10:17 / 10:17		CLAYEY SAND (SC); 70% medium sand; 30% fines (mostly clay, little silt); soft, olive yellow (2.5Y 6/6)		
			[0.2]				
140	845		10:40 / 10:40		LEAN CLAY (CL); 95% fines (mostly clay, trace silt); 5% fine sand; soft, olive yellow (2.5Y 6/8)		
			[0.2]				
135	850		11:05 / 11:05		LEAN CLAY (CL); 95% fines (mostly clay, some silt); 5% fine sand; soft, light yellowish brown (2.5Y 6/3)		
			[0.2]				
130	855		11:30 / 11:30				
			[0.6]				
125	860		11:38 / 11:38				
			[0.3]				
120	865		11:53 / 11:53		As Above		
			[0.1]		LEAN CLAY with sand (CL); 80% fines (mostly clay, some silt); 20% fine sand; soft, light yellowish brown (2.5Y 6/3)		
115	870		12:42				

Elevation, feet-msl	Depth, feet-bgs	Sample Interval	Sample Time	Graphic Log	MATERIAL DESCRIPTION	WELL SCHEMATIC AND CONSTRUCTION DETAILS	FIELD NOTES
	870		12:42 [0.5] 12:52				
110	875		12:52 [0.7] 12:59		As Above		
105	880		12:59 [0.4] 13:13		LEAN CLAY (CL); 100% fines (mostly clay, some silt); trace fine sand; soft, light yellowish brown (2.5Y 6/3)		
100	885		13:13 [0.2] 13:40		LEAN CLAY (CL); 100% fines (mostly clay, some silt); trace fine sand; soft, light yellowish brown (2.5Y 6/3)		
95	890		13:40 [0.2] 14:08		CLAYEY SAND (SC); 70% medium sand; 30% fines (mostly clay, little silt); soft, olive yellow (2.5Y 6/6)		
90	895		14:08 [0.1] 14:43		CLAYEY SAND (SC); 60% medium sand; 40% fines (mostly clay, little silt); soft, olive yellow (2.5Y 6/6) CLAYEY SAND (SC); 45% fine-medium sand; 45% fines (mostly clay, trace silt); 10% fine, angular gravel; loose, grayish brown (2.5Y 5/2), gravel appears to be broken by drilling		
85	900		14:43 [0.7] 14:50		LEAN CLAY (CL); 100% fines (mostly clay, some silt); trace fine sand; soft, light yellowish brown (2.5Y 6/3)		
80	905						

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Elevation, feet-msl	Depth, feet-bgs	Sample Time	MATERIAL DESCRIPTION	WELL SCHEMATIC AND CONSTRUCTION DETAILS	FIELD NOTES
	905	14:50 [0.1] 15:53	LEAN CLAY with sand (CL); 85% fines (mostly clay, some silt); 15% medium sand; soft, light yellowish brown (2.5Y 6/3)		
75	910	15:53 [0.1] 16:20	CLAYEY SAND (SC); 60% medium sand; 40% fines (mostly clay, some silt); trace undefined gravel; soft, light yellowish brown (2.5Y 6/3)		
		16:20 [0.2] 16:34			
70	915	16:34 [0.6] 16:42	As Above		
65	920	16:42 [0.4] 16:55	LEAN CLAY (CL); 100% fines (mostly clay, some silt); trace fine sand; soft, light yellowish brown (2.5Y 6/3)		
60	925	16:55 [0.1] 17:32	LEAN CLAY with sand (CL); 85% fines (mostly clay, some silt); 15% medium sand; soft, light yellowish brown (2.5Y 6/3)		
		17:32 [0.3] 17:40	LEAN CLAY with sand (CL); 85% fines (mostly clay, some silt); 15% medium sand; soft, light yellowish brown (2.5Y 6/3)		
55	930	17:40 [0.3] 17:55	LEAN CLAY (CL); 100% fines (mostly clay, some silt); trace fine sand; soft, light yellowish brown (2.5Y 6/3)		
50	935	17:55 [0.1] 18:43	LEAN CLAY (CL); 90% fines (mostly clay, trace silt); 10% fine-medium sand; soft, light olive brown (2.5Y 5/3) As Above		
45	940				

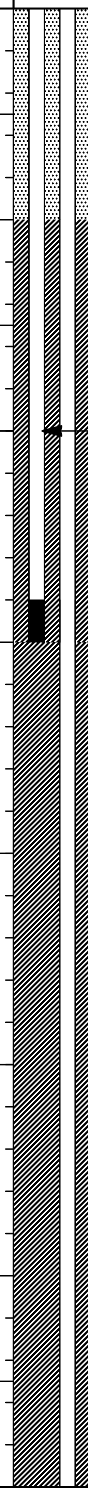
Elevation, feet-msl	Depth, feet-bgs	Sample Time	MATERIAL DESCRIPTION	WELL SCHEMATIC AND CONSTRUCTION DETAILS	FIELD NOTES
	940	18:43 [0.4] 18:50	Sandy LEAN CLAY (CL); 60% fines (mostly clay, trace silt); 40% fine-coarse, subangular-subrounded sand; soft, light olive brown (2.5Y 5/3)		
		18:50 [0.3] 18:58	FAT CLAY (CH); 100% fines (mostly clay); soft, light olive brown (2.5Y 5/3)		
-40	945	18:58 [0.1] 19:20	LEAN CLAY (CL); 100% fines (mostly clay); trace medium-coarse sand; soft, light olive brown (2.5Y 5/3)		
		19:20 [0.3] 19:29	LEAN CLAY (CL); 90% fines (mostly clay); 10% fine-medium sand; soft, light olive brown (2.5Y 5/3)		
-35	950	19:29 [0.2] 19:40	LEAN CLAY with sand (CL); 80% fines (mostly clay); 20% fine-medium sand; medium-stiff, light olive brown (2.5Y 5/3)		
		19:40 [0.3] 19:48	LEAN CLAY (CL); 95% fines (mostly clay); 5% fine-medium sand; medium-stiff, light olive brown (2.5Y 5/3)		
-30	955	19:48 [0.3] 19:58	As Above		
		19:58 [0.1] 20:16	LEAN CLAY with sand (CL); 80% fines (mostly clay, trace silt); 20% fine-medium sand; medium-stiff, light olive brown (2.5Y 5/3), contains think pockets of fine-grained sand		
-25	960	20:16 [0.2] 20:28	As Above		
		20:28 [0.3] 20:36	LEAN CLAY with sand (CL); 80% fines (mostly clay, trace silt); 20% fine-coarse, subangular-subrounded sand; medium-stiff, olive brown (2.5Y 4/3)		
-20	965	20:36 [0.1] 20:53	LEAN CLAY (CL); 90% fines (mostly clay, trace silt); 10% fine-coarse, subangular-subrounded sand; stiff, olive brown (2.5Y 4/3)	Transition Bentonite Seal	
		20:53 [0.4] 21:00	LEAN CLAY with sand (CL); 80% fines (mostly clay, trace silt); 20% fine-coarse, subangular-subrounded sand; medium-stiff, olive brown (2.5Y 4/3)		
-15	970	21:00 [0.5] 21:05	LEAN CLAY (CL); 90% fines (mostly clay, trace silt); 10% fine-medium sand; soft, light olive brown (2.5Y 5/3)	Transition Sand Seal	
		21:05 [0.2] 21:16	LEAN CLAY with sand (CL); 75% fines (mostly clay, trace silt); 25% medium-coarse, subangular-subrounded sand; trace fine, angular-subangular gravel; soft, olive brown (2.5Y 4/3)		
-10	975				

Project Name:	**Pomona Extensometer Facility**	**Boring Log / PX2**
Project Location:	**Montvue Park - Pomona, CA**	Sheet 29 of 38
Project Number:	**007-018-762**	
Client:	**Chino Basin Watermaster**	

Elevation, feet-msl	Depth, feet-bgs	Sample Interval	Sample Time	Graphic Log	MATERIAL DESCRIPTION	WELL SCHEMATIC AND CONSTRUCTION DETAILS	FIELD NOTES
	975		21:16 [0.6] 21:20		FAT CLAY (CH); 100% fines (mostly clay, trace silt); trace fine, angular-subangular gravel; trace medium-coarse, angular-subangular sand; soft, olive brown (2.5Y 4/3)		
			21:20 [0.5] 21:25		LEAN CLAY with sand (CL); 75% fines (mostly clay, trace silt); 25% medium-coarse, subangular-subrounded sand; trace fine, angular-subangular gravel; soft, olive brown (2.5Y 4/3)		
5	980		21:25 [0.5] 21:30		Sandy LEAN CLAY (CL); 65% fines (mostly clay, trace silt); 35% medium-coarse, subangular-subrounded sand; trace fine, angular-subangular gravel; soft, olive brown (2.5Y 4/3)		
			21:30 [0.1] 22:20		Poorly graded SAND (SP); 85% medium-coarse, subangular-subrounded sand; 10% fine, angular-subangular gravel; 5% fines (mostly clay, trace silt); very loose, light yellowish brown (2.5Y 6/3)		
0	985		22:20 [0.1] 23:04		As Above	Filter Pack	
			23:04 [0.1] 23:27		CLAYEY SAND (SC); 55% medium-coarse, angular-subangular sand; 40% fines (mostly clay, trace silt); 5% fine, angular-subangular gravel; loose, light olive brown (2.5Y 5/3)		
-5	990		23:27 [0.2] 23:38		CLAYEY SAND (SC); 75% medium-coarse, angular-subangular sand; 20% fines (mostly clay, trace silt); 5% fine, angular-subangular gravel; loose, light yellowish brown (2.5Y 6/3)		
			23:38 [0.4] 23:45		LEAN CLAY with sand (CL); 75% fines (mostly clay, trace silt); 25% fine-coarse, angular-subangular sand; medium-stiff, dark yellowish brown (10YR 3/6)		
-10	995		23:45 [0.2] 23:58		As Above		
			23:58 [0.0] 00:30		CLAYEY SAND (SC); 60% medium-coarse, subangular-subrounded sand; 40% fines (mostly clay, trace silt); trace fine, angular-subangular gravel; loose, light olive brown (2.5Y 5/3)		
-15	1000		00:30 [0.1] 00:55		As Above	Screen	
			00:55 [0.1] 01:12		CLAYEY SAND (SC); 70% medium-coarse, angular-subangular sand; 20% fines (mostly clay, trace silt); 10% fine, angular-subangular gravel; very loose, light yellowish brown (2.5Y 6/3)		
-20	1005		01:12 [0.0] 03:05		LEAN CLAY with sand (CL); 75% fines (mostly clay, trace silt); 25% fine-coarse, angular-subangular sand; soft, light olive brown (2.5Y 5/3)		
			03:05 [0.2] 03:17		CLAYEY SAND (SC); 65% medium-coarse, subangular-subrounded sand; 35% fines (mostly clay, trace silt); trace fine, angular-subangular gravel; loose, light olive brown (2.5Y 5/3)		
-25	1010						

Project Name:	**Pomona Extensometer Facility**		**Boring Log / PX2**
Project Location:	**Montvue Park - Pomona, CA**		
Project Number:	**007-018-762**		
Client:	**Chino Basin Watermaster**		

Elevation, feet-msl	Depth, feet-bgs	Sample Interval	Sample Time	Graphic Log	MATERIAL DESCRIPTION	WELL SCHEMATIC AND CONSTRUCTION DETAILS	FIELD NOTES
	1010		03:17 [0.4] 03:23		CLAYEY SAND (SC); 70% medium-coarse, subangular-subrounded sand; 30% fines (mostly clay, trace silt); trace fine, angular-subangular gravel; loose, light olive brown (2.5Y 5/3)		
			03:23 [0.5] 03:28		LEAN CLAY (CL); 95% fines (mostly clay, trace silt); 5% fine-medium sand; medium-stiff, brown (10YR 5/3)		
-30	1015		03:28 [0.1] 03:49		LEAN CLAY (CL); 95% fines (mostly clay, trace silt); 5% fine-medium sand; medium-stiff, light olive brown (2.5Y 5/3)		
			03:49 [0.3] 03:58		Poorly graded SAND with clay (SP-SC); 80% medium-coarse, subangular-subrounded sand; 10% fine, angular-subangular gravel; 10% fines (mostly clay, trace silt); very loose, light yellowish brown (2.5Y 6/3)		
-35	1020		03:58 [0.5] 04:03		Sandy LEAN CLAY (CL); 65% fines (mostly clay, trace silt); 35% fine-coarse, subangular-subrounded sand; medium-stiff, light olive brown (2.5Y 5/3)	Blank Casing with Sump	
			04:03 [0.2] 04:15		Sandy LEAN CLAY (CL); 60% fines (mostly clay, trace silt); 40% fine-coarse, subangular-subrounded sand; soft, light olive brown (2.5Y 5/3)		
-40	1025		04:15 [0.0] 05:33		LEAN CLAY (CL); 95% fines (mostly clay, trace silt); 5% fine-medium sand; medium-stiff, brown (10YR 5/3)		
			05:33 [0.4] 05:40		LEAN CLAY (CL); 100% fines (mostly clay, trace silt); trace fine-medium sand; medium-stiff, brown (10YR 5/3)		
-45	1030		05:40 [0.3] 05:49		As Above		
			05:49 [0.2] 06:00		LEAN CLAY (CL); 95% fines (mostly clay, trace silt); 5% fine-medium sand; medium-stiff, brown (10YR 4/3)		
-50	1035		06:00 [0.3] 06:18		As Above		
-55	1040		06:18 [0.2] 06:32		CLAYEY SAND (SC); 75% medium-coarse, subangular-subrounded sand; 15% fines (mostly clay, trace silt); 10% fine, angular-subangular gravel; loose, light yellowish brown (2.5Y 6/3)		
			06:32 [0.3] 06:42		LEAN CLAY (CL); 95% fines (mostly clay, some silt); 5% fine-medium sand; soft, light yellowish brown (2.5Y 6/4)		
-60	1045						



Elevation, feet-msl	Depth, feet-bgs	Sample Time	MATERIAL DESCRIPTION
	1045	06:42 [0.2] 07:08	LEAN CLAY (CL); 100% fines (mostly clay, few silt); trace fine-medium sand; soft, light yellowish brown (2.5Y 6/4)
			LEAN CLAY with sand (CL); 85% fines (mostly clay, few silt); 15% fine-medium sand; soft, light yellowish brown (2.5Y 6/4)
-65	1050	07:08 [0.4] 07:20	LEAN CLAY (CL); 100% fines (mostly clay, few silt); trace fine-medium sand; soft, light yellowish brown (2.5Y 6/4)
			LEAN CLAY (CL); 100% fines (mostly clay, few silt); trace fine-medium sand; soft, reddish yellow (7.5YR 6/6), iron oxide staining
-70	1055	07:20 [0.2] 07:43	As Above
			LEAN CLAY (CL); 95% fines (mostly clay, some silt); 5% fine-medium sand; soft, light yellowish brown (2.5Y 6/4)
-75	1060	07:43 [0.1] 08:30	As Above
			CLAYEY SAND with gravel (SC); 70% medium-coarse, subangular sand; 15% fine-coarse, subangular gravel; 15% fines (mostly clay, little silt); loose, grayish brown (2.5Y 5/2), coarse gravel fragments
-80	1065	08:30 [0.1] 09:56	Poorly graded SAND with gravel (SP); 80% medium-coarse, subangular sand; 15% fine-coarse, subangular gravel; 5% fines (mostly clay, little silt); loose, grayish brown (2.5Y 5/2)
			LEAN CLAY (CL); 95% fines (mostly clay, trace silt); 5% fine-medium sand; soft, olive yellow (2.5Y 6/6)
-85	1070	09:56 [0.1] 10:30	CLAYEY SAND with gravel (SC); 70% medium-coarse, subangular sand; 15% fine-coarse, subangular gravel; 15% fines (mostly clay, little silt); loose, grayish brown (2.5Y 5/2)
		10:30 [0.1] 10:53	
-90	1075	10:53 [0.1] 11:30	As Above
		11:30 [0.4] 11:36	LEAN CLAY (CL); 90% fines (mostly clay, some silt); 10% medium sand; soft, brownish yellow (10YR 6/6)
-95	1080		

WELL SCHEMATIC AND CONSTRUCTION DETAILS

FIELD NOTES

Elevation, feet-msl	Depth, feet-bgs	Sample Interval	Sample Time	Graphic Log	MATERIAL DESCRIPTION	WELL SCHEMATIC AND CONSTRUCTION DETAILS	FIELD NOTES
	1080		11:36 [0.4] 11:50		LEAN CLAY (CL); 100% fines (mostly clay, trace silt); trace fine-medium sand; stiff, light yellowish brown (10YR 6/4)		
					LEAN CLAY (CL); 100% fines (mostly clay, some silt); trace fine-medium sand; stiff, yellowish brown (10YR 5/8)		
-100	1085		11:50 [0.2] 12:16		LEAN CLAY with sand (CL); 80% fines (mostly clay, some silt); 15% fine-medium sand; 5% fine gravel; soft, olive yellow (2.5Y 6/6)		
-105	1090		12:16 [0.4] 12:30		LEAN CLAY (CL); 90% fines (mostly clay, some silt); 10% medium sand; soft, brownish yellow (10YR 6/6)		
-110	1095		12:30 [0.3] 12:45		LEAN CLAY (CL); 95% fines (mostly clay, some silt); 5% fine-medium sand; stiff, olive yellow (2.5Y 6/6)		
-115	1100		12:45 [0.1] 13:02; 13:02 [0.1] 13:30		LEAN CLAY with sand (CL); 80% fines (mostly silt, some clay); 20% fine sand; medium-stiff, light yellowish brown (2.5Y 6/4)		Silty-fine sand cemented with clay
-120	1105		13:30 [0.0] 15:41		As Above		
			15:41 [0.3] 15:50		LEAN CLAY (CL); 100% fines (mostly clay, trace silt); trace fine-medium sand; soft, brownish yellow (10YR 6/6), rich iron oxides		
-125	1110		15:50 [0.2] 16:18		LEAN CLAY (CL); 90% fines (mostly clay, trace silt); 10% fine-medium sand; soft, brownish yellow (10YR 6/6)		
					Sandy LEAN CLAY (CL); 70% fines (mostly silt, some clay); 20% fine sand; 10% fine-coarse, subangular gravel; medium-stiff, light yellowish brown (2.5Y 6/4)		
-130	1115						

Project Name:	Pomona Extensometer Facility
Project Location:	Montvue Park - Pomona, CA
Project Number:	007-018-762
Client:	Chino Basin Watermaster

Boring Log / PX2

Elevation, feet-msl	Depth, feet-bgs	Sample Time	MATERIAL DESCRIPTION	WELL SCHEMATIC AND CONSTRUCTION DETAILS	FIELD NOTES
	1115	16:18 [0.2] 16:48	LEAN CLAY with sand (CL); 75% fines (mostly clay, some silt); 25% fine-medium sand; soft, olive yellow (2.5Y 6/6)		
-135	1120	16:48 [0.3]	LEAN CLAY (CL); 90% fines (mostly clay, some silt); 10% fine-medium sand; soft, olive yellow (2.5Y 6/6)		
		17:08	CLAYEY SAND with gravel (SC); 70% fine-medium sand; 15% fine, angular gravel; 15% fines (mostly clay, some silt); loose, light yellowish brown (2.5Y 6/3)		
-140	1125	17:08 [0.2] 17:34	LEAN CLAY (CL); 100% fines (mostly clay, few silt); trace fine sand; stiff, brownish yellow (10YR 6/6)	Sand:Bentonite Mixture	
-145	1130	17:34 [0.2] 17:45	As Above		
		17:45 [0.3] 17:54			
-150	1135	17:54 [0.2] 18:15	As Above		
-155	1140	18:15 [0.3] 18:25	As Above		
		18:25 [0.2] 18:38	Sandy LEAN CLAY (CL); 60% fines (mostly clay, trace silt); 40% medium-coarse, subangular-subrounded sand; trace fine, angular-subangular gravel; soft, light olive brown (2.5Y 5/3)		
-160	1145	18:38 [0.0] 08:00	As Above		
-165	1150				

Elevation, feet-msl	Depth, feet-bgs	Sample Interval	Sample Time	Graphic Log	MATERIAL DESCRIPTION	WELL SCHEMATIC AND CONSTRUCTION DETAILS	FIELD NOTES
	1150		08:00 [0.2] 08:12		LEAN CLAY (CL); 90% fines (mostly clay, some silt); 10% medium sand; medium-stiff, light brown (7.5YR 6/4)		
			08:12 [0.1] 08:32		Sandy LEAN CLAY (CL); 65% fines (mostly clay, little silt); 35% fine-medium sand; soft, light yellowish brown (2.5Y 6/4)		
-170	1155		08:32 [0.1] 08:55				
			08:55 [0.2] 09:10				
-175	1160		09:10 [0.1] 09:29		As Above		
			09:29 [0.1] 09:55		Sandy LEAN CLAY (CL); 60% fines (mostly clay, little silt); 35% fine-medium sand; 5% fine gravel; soft, light yellowish brown (2.5Y 6/4)		
-180	1165		09:55 [0.0] 10:52		Sandy LEAN CLAY (CL); 65% fines (mostly clay, little silt); 35% fine-medium sand; soft, light yellowish brown (2.5Y 6/4)		
			10:52 [0.2] 11:04		Sandy LEAN CLAY (CL); 50% fine-medium sand; 50% fines (mostly clay, little silt); soft, light yellowish brown (2.5Y 6/4)		
-185	1170		11:04 [0.2] 11:34		As Above		
					LEAN CLAY (CL); 100% fines (mostly clay, trace silt); trace fine-medium sand; medium-stiff, reddish yellow (7.5YR 6/6)		
-190	1175		11:34 [0.3] 11:50				
-195	1180		11:50 [0.3] 12:07		As Above		
-200	1185						

Elevation, feet-msl	Depth, feet-bgs	Sample Interval	Sample Time	Graphic Log	MATERIAL DESCRIPTION	WELL SCHEMATIC AND CONSTRUCTION DETAILS	FIELD NOTES
	1185		12:07 [0.1] 12:53		Sandy LEAN CLAY (CL); 65% fines (mostly clay, little silt); 35% fine-medium sand; soft, light yellowish brown (2.5Y 6/4)		
			12:53 [0.1] 13:10				
-205	1190		13:10 [0.1] 13:47		As Above		
			13:47				
-210	1195		[0.2] 14:20		As Above		
			14:20 [0.2] 14:32		LEAN CLAY (CL); 95% fines (mostly clay, some silt); 5% fine-medium sand; soft, reddish yellow (7.5YR 7/8)		
-215	1200		14:32 [0.1] 14:54		LEAN CLAY with sand (CL); 80% fines (mostly clay, some silt); 20% fine-medium sand; soft, light yellowish brown (2.5Y 6/4)		
			14:54 [0.1] 15:11				
-220	1205		15:11 [0.0] 17:00		As Above		
-225	1210		17:00 [0.0] 17:58		Sandy LEAN CLAY (CL); 65% fines (mostly clay, little silt); 35% fine-medium sand; soft, light yellowish brown (2.5Y 6/4)		
			17:58 [0.1] 18:20				
-230	1215		18:20 [0.2] 18:35		Sandy LEAN CLAY (CL); 60% fines (mostly clay, trace silt); 40% fine-coarse, subangular-subrounded sand; very soft, light olive brown (2.5Y 5/3)		
			18:35 [0.0] 19:44		As Above		
-235	1220						

Elevation, feet-msl	Depth, feet-bgs	Sample Time	MATERIAL DESCRIPTION	WELL SCHEMATIC AND CONSTRUCTION DETAILS	FIELD NOTES
	1220	19:44 [0.1] 20:15	CLAYEY SAND (SC); 55% fine-coarse, subangular-subrounded sand; 45% fines (mostly clay, few silt); loose, light olive brown (2.5Y 5/3)	Transition Bentonite Seal	
		20:15 [0.1] 20:43	As Above		
-240	1225	20:43 [0.0] 22:05	As Above	Transition Sand Seal	
		22:05 [0.2] 22:20	LEAN CLAY (CL); 100% fines (mostly clay, trace silt); trace medium-coarse, subangular-subrounded sand; soft, olive brown (2.5Y 4/4)		
-245	1230	22:20 [0.1] 22:55	CLAYEY SAND (SC); 60% fine-coarse, subangular-subrounded sand; 40% fines (mostly clay, few silt); trace fine, angular-subangular gravel; loose, light olive brown (2.5Y 5/3)		
		22:55 [0.0] 00:04	As Above		
-250	1235	00:04 [0.0] 01:46	CLAYEY SAND with gravel (SC); 50% medium-coarse, subangular-subrounded sand; 30% fines (mostly clay, trace silt); 20% fine-coarse, angular gravel; very loose, light yellowish brown (2.5Y 6/3)		Very slow drilling, possibly drilling through a granitic boulder; odor
		01:46 [0.1] 02:26	CLAYEY SAND (SC); 60% fine-coarse, subangular-subrounded sand; 40% fines (mostly clay, few silt); trace fine, subangular-subrounded gravel; very loose, light olive brown (2.5Y 5/3)		Possibly cemented bed between 1,237 and 1,253 ft-bgs
-255	1240	02:26 [0.1] 02:59	CLAYEY SAND (SC); 70% medium-coarse, subangular-subrounded sand; 30% fines (mostly clay, trace silt); very loose, light yellowish brown (2.5Y 6/3)	Filter Pack	
		02:59 [0.1] 03:40	CLAYEY SAND (SC); 80% medium-coarse, subangular-subrounded sand; 15% fines (mostly clay, trace silt); 5% fine, angular gravel; very loose, light yellowish brown (2.5Y 6/3)		
-260	1245	03:40 [0.0] 04:35	Poorly graded SAND with clay (SP-SC); 90% medium-coarse, subangular-subrounded sand; 10% fines (mostly clay, little silt); trace fine, angular gravel; very loose, light yellowish brown (2.5Y 6/3)		
		04:35 [0.1] 05:09	As Above		
-265	1250	05:09 [0.0] 06:49	Poorly graded SAND (SP); 95% medium-coarse, subangular-subrounded sand; 5% fines (mostly clay, trace silt); loose, light yellowish brown (2.5Y 6/3)		
		06:49 [0.1] 07:25	Poorly graded SAND with clay (SP-SC); 90% medium-coarse, subangular-subrounded sand; 10% fines (mostly clay, trace silt); loose, light yellowish brown (2.5Y 6/3)		
-270	1255				

Elevation, feet-msl	Depth, feet-bgs	Sample Interval	Sample Time	Graphic Log	MATERIAL DESCRIPTION	WELL SCHEMATIC AND CONSTRUCTION DETAILS	FIELD NOTES
	1255		07:25 [0.1] 08:05				
			08:05 [0.1] 08:28				
-275	1260		08:28 [0.1] 08:56			Screen	
			08:56 [0.2] 09:12				
-280	1265		09:12 [0.1] 10:35				
-285	1270		10:35 [0.0] 23:07		As Above		
-290	1275		23:07 [0.0] 03:01		FAT CLAY (CH); 100% fines (mostly clay); soft, brown (10YR 4/3)	Blank Casing with Sump	
-295	1280		03:01 [0.0] 06:37		As Above		
			06:37 [0.0] 16:34		As Above		
-300	1285		16:34 [0.0] 17:34		As Above		
			17:34 [0.0] 00:22				
-305	1290						

Project Name:	Pomona Extensometer Facility
Project Location:	Montvue Park - Pomona, CA
Project Number:	007-018-762
Client:	Chino Basin Watermaster

Boring Log / PX2

Elevation, feet-msl	Depth, feet-bgs	Sample Interval	Sample Time	Graphic Log	MATERIAL DESCRIPTION	WELL SCHEMATIC AND CONSTRUCTION DETAILS	FIELD NOTES
	1290		00:22 [0.0] 03:42		As Above		
-310	1295						
-315	1300						
-320	1305						
-325	1310						
-330	1315						
-335	1320						
-340	1325						

Camp Dresser & McKee, Inc.
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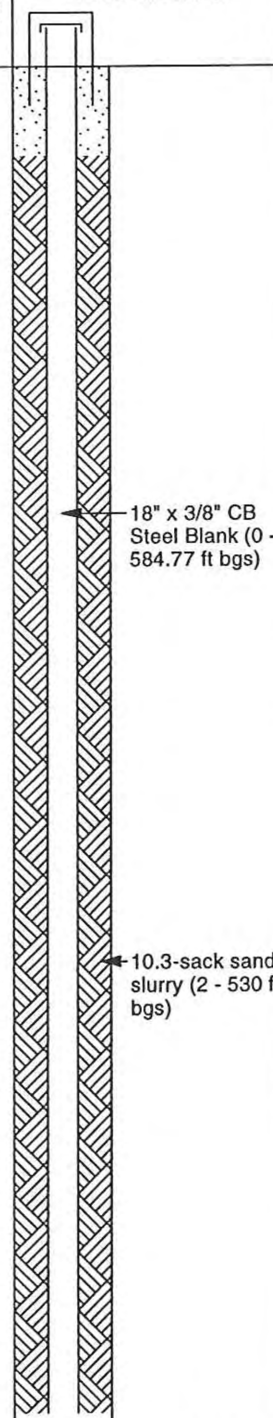
Irvine, CA 92612
(949) 752-5452
(949) 752-1307 (FAX)

BORING/WELL CONSTRUCTION LOG

PROJECT NUMBER	10490-21966-WELL28.DRILL	**BORING/WELL NUMBER**	Well #28
PROJECT NAME	Monte Vista Water District	**DATE DRILLED**	1/25/01-2/23/01
LOCATION	Montclair, CA	**CASING TYPE/DIAMETER**	3/8" CB Steel & 5/16" S. Steel/18"
DRILLING METHOD	Reverse Circulation	**SCREEN TYPE/SLOT**	Ful Flo Shutter/0.070"
SAMPLING METHOD	Grab	**GRAVEL PACK TYPE**	Colorado Silica 6 x 16
GROUND ELEVATION		**GROUT TYPE/QUANTITY**	10.3-sack slurry / 55 yds^3
TOP OF CASING		**DEPTH TO WATER (feet bgs)**	540.00
LOGGED BY	M. Hoffman, S. Coffey, K. Williams	**GROUND WATER ELEVATION**	
REMARKS			

PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft. BGL)	U.S.C.S.	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
								ASPHALT is 6 inches thick.	0.5
						SM		SILTY SAND: very dark grayish brown (10YR3/2); 60% poorly graded sand, fine, angular to rounded, low to high sphericity; 20% silt in matrix; 10% well graded gravel, fine to coarse, subangular to subrounded, moderate sphericity; 10% cobbles, 12-inch maximum diameter, subangular to subrounded, moderate sphericity; slightly moist.	3.0
					5	SP		POORLY GRADED SAND: brown (10YR4/3); 80% sand, fine to medium, trace coarse, angular to subrounded, low to moderate sphericity; 10% well graded gravel, fine to coarse, subangular to subrounded, low to moderate sphericity; 10% cobbles, 12-inch maximum diameter, subangular to subrounded, moderate sphericity; slightly moist.	
					10				13.0
					15	SM		SILTY SAND: dark yellowish brown (10YR4/4); 70% poorly graded sand, fine, subangular to subrounded, moderate sphericity; 20% silt in matrix; 10% cobbles, 12-inch maximum diameter, subangular to subrounded, moderate sphericity; slightly moist.	
					20				23.0
					25	SM		SILTY SAND: dark yellowish brown (10YR4/4); 70% poorly graded sand, fine, subangular to subrounded, moderate sphericity; 20% silt in matrix; 10% cobbles, 12-inch maximum diameter, subangular to subrounded, moderate sphericity; slightly moist.	
					30				

WELL DIAGRAM



Continued Next Page

NEWGINT MVWD.GPJ NEWGINT.GDT 4/3/01

CDM
Camp Dresser & McKee, Inc.
18881 Von Karman Avenue, Suite 650
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(949) 752-5452
(949) 752-1307 (FAX)

BORING/WELL CONSTRUCTION LOG

PROJECT NUMBER 10490-21966-WELL28.DRILL **BORING/WELL NUMBER** Well #28
PROJECT NAME Monte Vista Water District **DATE DRILLED** 1/25/01-2/23/01

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PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft. BGL)	U.S.C.S.	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH	WELL DIAGRAM
						SM		SILTY SAND: dark yellowish brown (10YR4/4); 70% poorly graded sand, fine, subangular to subrounded, moderate sphericity; 20% silt in matrix; 10% cobbles, 12-inch maximum diameter, subangular to subrounded, moderate sphericity; slightly moist.	33.0	
					35	SP		POORLY GRADED SAND: brown (7.5YR4/4); 80% sand, fine to medium, trace coarse, subangular to subrounded, moderate sphericity; 20% cobbles, 12-inch maximum diameter, subangular to subrounded, low to moderate sphericity; trace poorly graded gravel, fine, 1/2-inch maximum diameter, angular to subrounded, low sphericity; slightly moist.	35.0	18" x 3/8" CB Steel Blank (0 - 584.77 ft bgs)
					40					
					45	SP		POORLY GRADED SAND: brown (7.5YR4/4); 80% sand, fine to medium, trace coarse, subangular to subrounded, moderate sphericity; 20% cobbles, 12-inch maximum diameter, subangular to subrounded, low to moderate sphericity; trace poorly graded gravel, fine, 1/2-inch maximum diameter, angular to subrounded, low sphericity; slightly moist.	45.0	10.3-sack sand slurry (2 - 530 ft bgs)
					50	SP		POORLY GRADED SAND WITH GRAVEL: brown (10YR5/4); 90% sand, fine to medium; 10% poorly graded gravel, fine, trace coarse, angular to subangular; trace silt.	51.0	34" Mild Steel Conductor (0-51 ft bgs)
					55					
					60			POORLY GRADED SAND WITH GRAVEL: brown (10YR5/4); 90% sand, fine to medium; 10% poorly graded gravel, fine, trace coarse, angular to subangular; trace silt.	60.0	

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PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft. BGL)	U.S.C.S.	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH	WELL DIAGRAM
					65	SP				
					70			POORLY GRADED SAND WITH GRAVEL: brown (10YR5/4); 90% sand, fine to medium; 10% poorly graded gravel, fine, trace coarse, angular to subangular; trace silt.	70.0	18" x 3/8" CB Steel Blank (0 - 584.77 ft bgs)
					75	SP				
					80			WELL GRADED SAND WITH GRAVEL: brown (10YR5/4); 80% sand, fine to coarse, 20% well graded gravel, fine to coarse.	80.0	10.3-sack sand slurry (2 - 530 ft bgs)
					85	SW				
					90			WELL GRADED SAND WITH GRAVEL: brown (10YR5/4); 80% sand, fine to coarse, 20% well graded gravel, fine to coarse.	90.0	
					95	SW				

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					100	SM		SILTY SAND: yellowish brown (10YR5/6); 85% sand, fine to medium; 15% silt; trace poorly graded gravel, fine, subangular to subrounded.	100.0
					105				
					110	SM		SILTY SAND: yellowish brown (10YR5/6); 85% sand, fine to medium; 15% silt; trace poorly graded gravel, fine, subangular to subrounded.	110.0
					115				
					120	SM		SILTY SAND: yellowish brown (10YR5/6); 85% sand, fine to medium; 15% silt; trace poorly graded gravel, fine, subangular to subrounded.	120.0
					123	SP		POORLY GRADED SAND: yellowish brown (10YR5/6); 90% sand fine to medium; 5% poorly graded gravel, fine, subangular to subrounded; 5% silt.	123.0
					125				
					130				

WELL DIAGRAM

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PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft. BGL)	U.S.C.S.	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH	WELL DIAGRAM
					135	SP		POORLY GRADED SAND: yellowish brown (10YR5/6); 90% sand fine to medium; 5% poorly graded gravel, fine, subangular to subrounded; 5% silt.	133.0	
					140	SW		WELL GRADED SAND WITH GRAVEL: brown (10YR5/4); 90% sand, fine to coarse, 10% well graded gravel, fine to coarse; subangular to subrounded.	137.0	18" x 3/8" CB Steel Blank (0 - 584.77 ft bgs)
					145, 150	GW		WELL GRADED GRAVEL WITH SAND: grayish brown (10YR5/2); 60% gravel, fine to coarse, subrounded; 40% poorly graded sand, medium to coarse.	144.0	10.3-sack sand slurry (2 - 530 ft bgs)
					155, 160	GW		WELL GRADED GRAVEL WITH SAND: grayish brown (10YR5/2); 60% gravel, fine to coarse, subrounded; 40% poorly graded sand, medium to coarse.	154.0	
					165			WELL GRADED GRAVEL WITH SAND: grayish brown (10YR5/2); 60% gravel, fine to coarse, subrounded; 40% poorly graded sand, medium to coarse.	164.0	

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NEWGINT MVWD.GPJ NEWGINT.GDT 4/3/01

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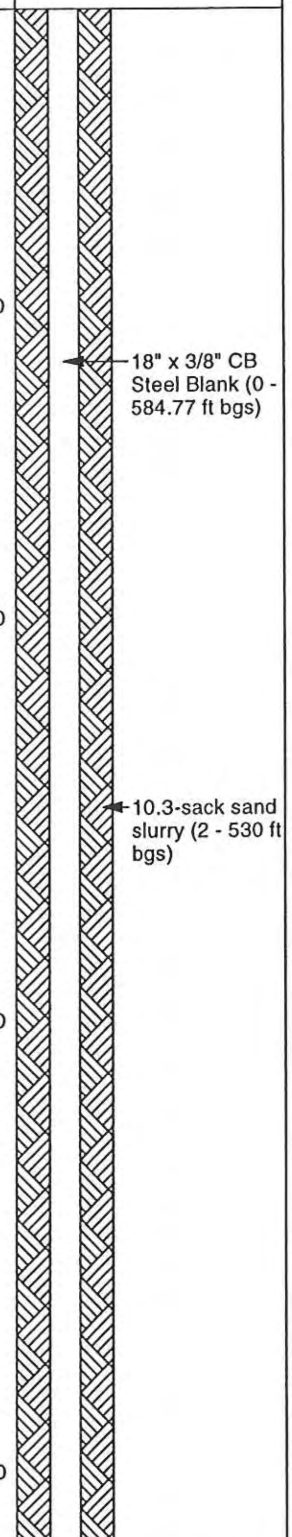
					170	GW			
					175	GW		WELL GRADED GRAVEL WITH SAND: grayish brown (10YR5/2); 60% gravel, fine to coarse, subrounded; 40% poorly graded sand, medium to coarse.	174.0
					180				
					185	SP		POORLY GRADED SAND WITH GRAVEL: yellowish brown (10YR5/4); 90% sand, fine to medium, some coarse; 10% poorly graded gravel, coarse, subangular to subrounded.	181.0
					190				
					195	SP		POORLY GRADED SAND WITH GRAVEL: yellowish brown (10YR5/4); 90% sand, fine to medium, some coarse (increasing downward); 10% poorly graded gravel, coarse, subangular to subrounded.	190.0
					200			POORLY GRADED SAND WITH GRAVEL: pale brown (10YR6/3); 90% sand, medium to coarse; 10% well	200.0

WELL DIAGRAM



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PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft. BGL)	U.S.C.S.	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH	WELL DIAGRAM
					205	SP		graded gravel, fine to coarse.		
					210 / 215	SP SM		POORLY GRADED SAND WITH SILT AND GRAVEL: dark yellowish brown (10YR4/4); 80% sand, fine to medium; 10% well graded gravel, fine to coarse, subrounded; 10% silt as oxidized balls with gravel.	210.0	18" x 3/8" CB Steel Blank (0 - 584.77 ft bgs)
					220 / 225	SP		POORLY GRADED SAND WITH GRAVEL: light yellowish brown (10YR6/4); 80% sand, medium to coarse; 15% well graded gravel, fine to coarse; 5% silt.	220.0	10.3-sack sand slurry (2 - 530 ft bgs)
					230 / 235	SP		POORLY GRADED SAND WITH SILT AND GRAVEL: dark yellowish brown (10YR4/4); 80% sand, fine to medium; 10% well graded gravel, fine to coarse, subrounded; 10% silt as oxidized balls with gravel.	230.0	

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PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft. BGL)	U.S.C.S.	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH	WELL DIAGRAM
						SM				
					240	SW		WELL GRADED SAND WITH GRAVEL: pale brown (10YR6/3); 80% sand, fine to coarse, 20% well graded gravel, fine to coarse; subangular to subrounded; trace cobbles.	240.0	
					245					18" x 3/8" CB Steel Blank (0 - 584.77 ft bgs)
					250	SW		WELL GRADED SAND WITH GRAVEL: pale brown (10YR6/3); 80% sand, fine to coarse, 20% well graded gravel, fine to coarse; subangular to subrounded; trace cobbles; coarsening downward.	249.0	
					255					10.3-sack sand slurry (2 - 530 ft bgs)
					260	SW		WELL GRADED SAND WITH GRAVEL: pale brown (10YR6/3); 80% sand, fine to coarse, 20% well graded gravel, fine to coarse; subangular to subrounded.	260.0	
					265					
					270				270.0	

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PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft. BGL)	U.S.C.S.	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH	WELL DIAGRAM
					275	SW		WELL GRADED SAND WITH GRAVEL: pale brown (10YR6/3); 80% sand, fine to coarse, 20% well graded gravel, fine to coarse; subangular to subrounded.		
					280, 285	SW SM		WELL GRADED SAND WITH SILT AND GRAVEL: yellowish brown (10YR5/4); 70% sand, fine to coarse; 20% well graded gravel, fine to coarse; 10% silt; trace clay.	280.0	18" x 3/8" CB Steel Blank (0 - 584.77 ft bgs)
					290, 295	ML		CLAYEY SILT: strong brown (7.5YR5/6); 70% silt, inelastic, soft; 20% clay, nonplastic, soft; 10% poorly graded sand, fine to medium.	290.0	10.3-sack sand slurry (2 - 530 ft bgs)
					300			SANDY SILT WITH CLAY: yellowish brown (10YR5/8); 60% silt, inelastic, soft; 30% poorly graded sand, medium; 10% clay, nonplastic, soft.	300.0	

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					305	ML				
					310			WELL GRADED SAND WITH GRAVEL: light yellowish brown 910YR6/4); 70% sand, fine to coarse; 25% poorly graded gravel, fine, trace coarse, subrounded; 5% silt.	310.0	
					315	SW				18" x 3/8" CB Steel Blank (0 - 584.77 ft bgs)
					320			SILTY SAND WITH GRAVEL: brownish yellow (10YR 6/6); 75% sand, fine to coarse; 15% silt; 10% well graded gravel, fine to coarse, subangular to subrounded; trace clay.	320.0	
					325	SM				10.3-sack sand slurry (2 - 530 ft bgs)
					330			SILTY SAND WITH GRAVEL: brownish yellow (10YR 6/6); 75% sand, fine to coarse; 15% silt; 10% well graded gravel, fine to coarse, subangular to subrounded; trace clay.	330.0	
					335	SM				

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					340			SILTY SAND WITH GRAVEL: brownish yellow (10YR 6/6); 75% sand, fine to coarse; 15% silt; 10% well graded gravel, fine to coarse, subangular to subrounded; trace clay.	340.0	
					345	SM				18" x 3/8" CB Steel Blank (0 - 584.77 ft bgs)
					350			SILTY SAND WITH GRAVEL: brownish yellow (10YR 6/6); 80% sand, fine to coarse; 10% silt; 10% well graded gravel, fine to coarse, subangular to subrounded; trace clay.	350.0	
					355	SM				10.3-sack sand slurry (2 - 530 ft bgs)
					360			WELL GRADED SAND WITH SILT AND GRAVEL: brownish yellow (10YR6/6); 75% sand, fine to coarse; 15% well graded gravel, fine to coarse, subangular to subrounded; 10% silt; trace clay.	360.0	
					365	SW SM				
					370			WELL GRADED SAND WITH GRAVEL: pale brown (10YR6/3); 80% sand, fine to coarse; 20% well graded gravel, fine to coarse, subangular to subrounded.	370.0	

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					375	SW				
					380			WELL GRADED SAND WITH GRAVEL: pale brown (10YR6/3); 80% sand, fine to coarse; 20% well graded gravel, fine to coarse, subangular to subrounded.	380.0	18" x 3/8" CB Steel Blank (0 - 584.77 ft bgs)
					385	SW				
					390			WELL GRADED SAND WITH SILT AND GRAVEL: light yellowish brown (10YR6/4); 70% sand, fine to coarse; 20% well graded gravel, fine to coarse; 10% silt as balls, yellowish brown; trace clay.	390.0	10.3-sack sand slurry (2 - 530 ft bgs)
					395	SW SM				
					400			SILTY SAND WITH GRAVEL: brownish yellow (10YR 6/6); 50% sand, fine to coarse; 35% silt, inelastic; 10% poorly graded gravel, subrounded; 5% clay.	400.0	
					405	SM				

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					410	SM		SILTY SAND WITH GRAVEL: brownish yellow (10YR 6/8); 50% sand, fine to coarse; 35% silt, inelastic; 10% poorly graded gravel, subrounded; 5% clay.	410.0
					415				
					420	SM		SILTY SAND WITH GRAVEL: brownish yellow (10YR 6/8); 50% sand, fine to coarse; 35% silt, inelastic; 10% poorly graded gravel, subrounded; 5% clay.	420.0
					425				
					430	SM		SILTY SAND WITH GRAVEL: brownish yellow (10YR 6/8); 50% sand, fine to coarse; 35% silt, inelastic; 10% poorly graded gravel, subrounded; 5% clay.	430.0
					435				
								CLAYEY SILT WITH SAND: yellowish red (5YR5/6); 70% silt, moderately elastic, medium stiffness; 20% poorly graded sand, fine to medium; 10% clay, moderately plastic, medium stiffness.	436.0
					440				

WELL DIAGRAM

- 18" x 3/8" CB Steel Blank (0 - 584.77 ft bgs)
- 10.3-sack sand slurry (2 - 530 ft bgs)

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						ML				
					445					
								CLAYEY SILT WITH SAND AND GRAVEL: yellowish red (5YR4/6); 60% silt, dark reddish brown (5YR3/4), oxidized; 20% poorly graded sand, fine to medium; 15% poorly graded gravel, fine, subrounded; 5% clay.	448.0	
					450					18" x 3/8" CB Steel Blank (0 - 584.77 ft bgs)
						ML				
					455					
								CLAYEY SILT WITH SAND AND GRAVEL: yellowish red (5YR4/6); 60% silt, dark reddish brown (5YR3/4), oxidized; 20% poorly graded sand, fine to medium; 15% poorly graded gravel, fine, subrounded; 5% clay.	458.0	
					460					10.3-sack sand slurry (2 - 530 ft bgs)
						ML				
					465			CLAYEY SILT WITH SAND: yellowish brown (10YR5/8); 70% silt, inelastic, soft; 20% poorly graded sand, medium, subrounded; 10% clay, nonplastic, soft.	465.0	
						ML				
					470					
					475			POORLY GRADED SAND: fine sand. No sample was collected due to faulty splitter box gate. The drillers shut down and fixed the problem.	474.0	

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NEWGINT MVWD.GPJ NEWGINT.GDT 4/3/01

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					480	SP		
					485	ML	SILT WITH SAND: yellowish brown (10YR5/4); 85% silt as balls, inelastic, soft; 15% poorly graded sand, medium to coarse, angular to subangular, low sphericity.	484.0
					490, 495	SP	POORLY GRADED SAND WITH GRAVEL: pale brown (10YR6/3); 90% sand, coarse, some fine and medium, angular to subangular, low sphericity; 10% poorly graded gravel and rock fragments, fine, 1/2-inch maximum diameter, angular to subrounded, low sphericity.	486.0
					500, 505	SP	POORLY GRADED SAND WITH GRAVEL: pale brown (10YR6/3); 90% sand, coarse, some fine and medium, angular to subangular, low sphericity; 10% poorly graded gravel and rock fragments, fine, 1/2-inch maximum diameter, angular to subrounded, low sphericity.	496.0
					510		CLAY: yellowish brown (10YR5/8); 100% clay, nonplastic, soft to medium stiff.	506.0

WELL DIAGRAM
18" x 3/8" CB Steel Blank (0 - 584.77 ft bgs)
10.3-sack sand slurry (2 - 530 ft bgs)

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					515	CL				18" x 3/8" CB Steel Blank (0 - 584.77 ft bgs)
					520	CL		CLAY: yellowish brown (10YR5/8); 100% clay, nonplastic, soft to medium stiff; trace sand.	516.0	
					525	CL		CLAY: yellowish brown (10YR5/8); 90% clay, nonplastic, very soft to soft; 10% sand.	523.0	10.3-sack sand slurry (2 - 530 ft bgs)
					530, 535	CL		CLAY: yellowish brown (10YR5/8); 95% clay, nonplastic, stiff to very stiff; 5% sand.	533.0	Colorado Silica 6 x 16 Gravel Pack (530 - 1265 ft bgs)
					540	SM		SILTY SAND: yellowish brown (10YR5/8); 80% well graded sand, fine to coarse, angular to subrounded, low sphericity; 20% silt.	540.0	4" CB Steel, Permanent Gravel Feed Tube (0-540 ft bgs)

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NEWGINT MVWD.GPJ NEWGINT.GDT 4/3/01

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					545	SM		SILTY SAND WITH GRAVEL: yellowish brown (10YR5/8); 60% sand, coarse, angular to subrounded, low sphericity; 20% silt; 20% gravel, angular to subrounded, low sphericity.	545.0	18" x 3/8" CB Steel Blank (0 - 584.77 ft bgs)
					550					
						GM		SILTY GRAVEL WITH SAND: yellowish brown (10YR5/8); 50% poorly graded gravel, fine, angular to subrounded, low sphericity; 30% poorly graded sand, coarse, angular to subrounded, low sphericity; 20% silt.	553.0	
					555					
						SM		SILTY SAND WITH GRAVEL: yellowish brown (10YR5/8); 60% poorly graded sand, coarse, angular to subrounded, low sphericity; 20% silt; 20% gravel, angular to subrounded, low sphericity.	557.0	
					560					Colorado Silica 6 x 16 Gravel Pack (530 - 1265 ft bgs)
					565					
						CL		CLAY: yellowish brown (10YR5/8); 95% clay, nonplastic, stiff to very stiff; 5% sand.	568.0	
					570					
					575					
								SILTY SAND WITH GRAVEL: yellowish brown (10YR5/8); 65% poorly graded sand, coarse, angular to subrounded, low sphericity; 20% silt; 15% gravel, angular to subrounded, low sphericity.	576.0	

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BORING/WELL CONSTRUCTION LOG

PROJECT NUMBER 10490-21966-WELL28.DRILL **BORING/WELL NUMBER** Well #28
PROJECT NAME Monte Vista Water District **DATE DRILLED** 1/25/01-2/23/01

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PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft. BGL)	U.S.C.S.	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH	WELL DIAGRAM
					580	SM				18" x 3/8" CB Steel Blank (0 - 584.77 ft bgs)
						CL		CLAY: brownish yellow (10YR6/8); 85% clay; 10% poorly graded sand, medium to coarse; 5% poorly graded gravel, fine, subangular to subrounded.	581.0	
					585, 590	GW GM		WELL GRADED GRAVEL WITH SAND AND SILT: brownish yellow (10YR6/6); 60% gravel, fine to coarse, angular to subrounded; 30% poorly graded sand, medium to coarse; 10% silt.	584.0	18" x 3/8" CB Steel Blank W/ 2" Sounding Tube Splice (584.77 - 622.92 ft bgs)
					595, 600, 605	GW		WELL GRADED GRAVEL WITH SAND: brownish yellow (10YR6/6); 60% gravel, fine to coarse, angular to subrounded; 30% poorly graded sand, medium to coarse; 5% silt.	594.0	Colorado Silica 6 x 16 Gravel Pack (530 - 1265 ft bgs)
						ML		SILT WITH SAND AND GRAVEL: yellowish brown (10YR5/6); 50% silt; 25% well graded gravel and rock fragments, fine to coarse, angular to subrounded; 25% poorly graded sand, medium to coarse, angular to subrounded.	606.0	
					610	SM		SILTY SAND WITH GRAVEL: brownish yellow (10YR6/6); 60% poorly graded sand, medium to coarse; 20% well graded gravel and rock fragments, fine to coarse; 20% silt.	609.0	
								SILT WITH SAND: yellowish brown (10YR5/4); 85% silt as balls, inelastic, soft; 15% poorly graded sand, medium to coarse, angular to subangular, low sphericity.	611.0	

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PROJECT NUMBER 10490-21966-WELL28.DRILL **BORING/WELL NUMBER** Well #28

PROJECT NAME Monte Vista Water District **DATE DRILLED** 1/25/01-2/23/01

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PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft. BGL)	U.S.C.S.	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH	WELL DIAGRAM
					615	ML				18" x 3/8" CB Steel Blank W/ 2" Sounding Tube Splice (584.77 - 622.92 ft bgs)
					620					Splice Opening (616.12 - 619.22 ft bgs)
					625	SP		POORLY GRADED SAND: yellowish brown (10YR5/4); 100% sand, medium to coarse, some fine, angular to subangular, low sphericity.	621.0	Mechanical Coupling (622.92 - 625.02 ft bgs)
					630	SP SM		POORLY GRADED SAND WITH SILT: yellowish brown (10YR5/4); 90% sand, medium to coarse, some fine, angular to subangular, low sphericity; 10% silt as balls, inelastic, medium stiff, sand in matrix.	628.0	18" x 5/16" 304 SS Blank (625.02 - 635 ft bgs)
					635	ML		SANDY SILT: yellowish brown (10YR5/4); 70% silt as balls, inelastic, soft to medium stiff; 30% poorly graded sand, medium to coarse, angular to subangular.	634.0	18" x 5/16" 304 SS, 0.070" Ful-Flo (635 - 750.15 ft bgs)
					640	SM		SILTY SAND: yellowish brown (10YR5/4); 80% poorly graded sand, medium to coarse, angular to subangular; 20% silt as balls, inelastic, soft to medium stiff.	640.0	
					645			POORLY GRADED SAND: yellowish brown (10YR5/4); 90% poorly graded sand, medium to coarse, angular to subangular; 5% silt as balls, inelastic, soft to medium stiff; 5% poorly graded gravel, fine, 3/4-inch maximum diameter, angular to subrounded, low sphericity.	644.0	Colorado Silica 6 x 16 Gravel Pack (530 - 1265 ft bgs)

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BORING/WELL CONSTRUCTION LOG

PROJECT NUMBER 10490-21966-WELL28.DRILL **BORING/WELL NUMBER** Well #28

PROJECT NAME Monte Vista Water District **DATE DRILLED** 1/25/01-2/23/01

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PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft. BGL)	U.S.C.S.	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH	WELL DIAGRAM
					650	SP				
					655			POORLY GRADED SAND WITH SILT: yellowish brown (10YR5/4); 90% poorly graded sand, medium to coarse, angular to subangular; 10% silt as balls, inelastic, soft to medium stiff.	654.0	18" x 5/16" 304 SS, 0.070" Ful-Flo (635 - 750.15 ft bgs)
					660	SP SM				
					665			POORLY GRADED SAND WITH SILT: yellowish brown (10YR5/4); 85% poorly graded sand, medium to coarse, angular to subangular; 10% silt as balls, inelastic, soft to medium stiff; 5% poorly graded gravel and rock fragments, fine, 3/4-inch maximum diameter, angular to subrounded, low sphericity.	664.0	Colorado Silica 6 x 16 Gravel Pack (530 - 1265 ft bgs)
					670	SP SM				
					675			POORLY GRADED SAND WITH GRAVEL: yellowish brown (10YR5/4); 85% sand, medium to coarse; 10% poorly graded gravel and rock fragments, fine, 3/4-inch maximum diameter, angular to subangular, low sphericity; 5% silt as balls.	674.0	
					680	SP				

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PROJECT NUMBER 10490-21966-WELL28.DRILL **BORING/WELL NUMBER** Well #28

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PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft. BGL)	U.S.C.S.	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH	WELL DIAGRAM
					685					
						SP		POORLY GRADED SAND WITH GRAVEL: yellowish brown (10YR5/4); 80% sand, medium to coarse; 15% poorly graded gravel and rock fragments, fine, 3/4-inch maximum diameter, angular to subangular, low sphericity; 5% silt as balls.	686.0	18" x 5/16" 304 SS, 0.070" Ful-Flo (635 - 750.15 ft bgs)
					690					
					695					
						SP		POORLY GRADED SAND WITH GRAVEL: yellowish brown (10YR5/4); 80% sand, medium to coarse; 15% poorly graded gravel and rock fragments, fine, 3/4-inch maximum diameter, angular to subangular, low sphericity; 5% silt as balls.	696.0	Colorado Silica 6 x 16 Gravel Pack (530 - 1265 ft bgs)
					700					
						CL		CLAY WITH SAND: yellowish brown (10YR5/4); 85% clay as balls, nonplastic, soft to medium stiff; 15% well graded sand, fine to coarse, angular to subangular, low sphericity.	702.0	
					705					
						SP		POORLY GRADED SAND WITH GRAVEL: yellowish brown (10YR5/4); 80% sand, medium to coarse; 15% poorly graded gravel and rock fragments, fine, 3/4-inch maximum diameter, angular to subangular, low sphericity; 5% silt as balls.	707.0	
					710					
					715					

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NEWGINT MVWD.GPJ NEWGINT.GDT 4/3/01

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PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft. BGL)	U.S.C.S.	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH	WELL DIAGRAM
					720	SP		POORLY GRADED SAND WITH GRAVEL: yellowish brown (10YR5/4); 80% sand, medium to coarse; 15% poorly graded gravel and rock fragments, fine, 3/4-inch maximum diameter, angular to subangular, low sphericity; 5% silt as balls.	717.0	
					725					18" x 5/16" 304 SS, 0.070" Ful-Flo (635 - 750.15 ft bgs)
					730	SP		POORLY GRADED SAND WITH GRAVEL: yellowish brown (10YR5/4); 80% sand, medium to coarse; 15% poorly graded gravel and rock fragments, fine, 3/4-inch maximum diameter, angular to subangular, low sphericity; 5% silt as balls.	727.0	
					735 / 740	SP		POORLY GRADED SAND WITH GRAVEL: light yellowish brown (10YR6/4); 70% sand, medium to coarse, angular to subangular, low sphericity; 25% poorly graded gravel and rock fragments, fine, 3/4-inch maximum diameter, angular to subangular, low sphericity; 5% silt as balls.	735.0	Colorado Silica 6 x 16 Gravel Pack (530 - 1265 ft bgs)
					745 / 750	SP		POORLY GRADED SAND WITH GRAVEL: light yellowish brown (10YR6/4); 60% sand, medium to coarse, angular to subangular, low sphericity; 30% poorly graded gravel and rock fragments, fine, 3/4-inch maximum diameter, angular to subangular, low sphericity; 5% silt as balls.	745.0	

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PROJECT NUMBER 10490-21966-WELL28.DRILL **BORING/WELL NUMBER** Well #28

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PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft. BGL)	U.S.C.S.	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH	WELL DIAGRAM
					755	SM		SILTY SAND WITH GRAVEL: brownish yellow (10YR6/6); 40% poorly graded sand, fine to medium, angular to subangular; 40% silt as balls; 20% poorly graded gravel, fine, subrounded.	754.0	
					760					18" x 5/16" 304 SS Blank (750.15 - 784.95 ft bgs)
					765	ML		SILT WITH CLAY: yellowish brown (10YR5/4); 80% silt, moderately elastic, medium stiff; 15% clay, moderately plastic, medium stiff; 5% poorly graded sand, fine to medium.	763.0	
					770, 775	SM		SILTY SAND WITH GRAVEL: yellowish brown (10YR5/6); 40% poorly graded sand, fine to medium, angular to subangular; 40% silt as balls, moderate to highly inelastic, medium stiff; 20% poorly graded gravel, fine, angular to subangular.	768.0	Colorado Silica 6 x 16 Gravel Pack (530 - 1265 ft bgs)
					780	SM		SILTY SAND WITH GRAVEL: brownish yellow (10YR6/6); 60% poorly graded sand, fine to medium, angular to subangular; 30% silt as balls; 10% poorly graded gravel and rock fragments, fine, 1/4-inch maximum diameter, angular.	778.0	
						ML		CLAYEY SILT WITH SAND: light brownish yellow (10YR6/4); 60% silt as balls, inelastic, soft; 20% clay as	783.0	

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NEWGINT MVWD.GPJ NEWGINT.GDT 4/3/01

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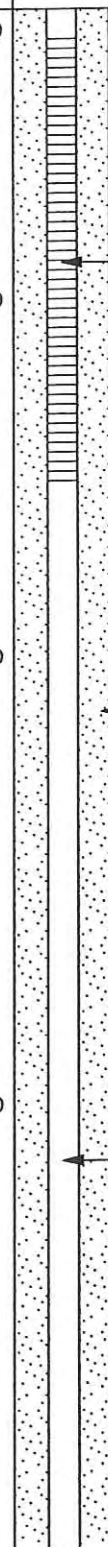
PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft. BGL)	U.S.C.S.	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH	WELL DIAGRAM
					785			balls, nonplastic soft; 20% poorly graded sand, fine, some medium.	785.0	
					785–790	CL		SILTY CLAY: yellowish brown (10YR5/8); 60% clay, moderately plastic, medium stiff; 35% silt, moderately elastic, medium stiff; 5% poorly graded sand, medium, some coarse, angular to subangular.	791.0	18" x 5/16" 304 SS, 0.070" Ful-Flo (784.95 - 794.91 ft bgs)
					795	SP		POORLY GRADED SAND WITH GRAVEL: light olive brown (2.5Y5/3); 85% sand, medium to coarse, some fine, angular to subangular, low sphericity; 15% poorly graded gravel and rock fragments, fine, 1/2-inch maximum diameter, angular to subangular, low sphericity.	799.0	
					800–805	CL		CLAY: yellowish brown (10YR5/8); 100% clay as balls, nonplastic, soft; trace poorly graded sand, medium to coarse, angular to subangular, low sphericity; trace silt in clay matrix.	809.0	Colorado Silica 6 x 16 Gravel Pack (530 - 1265 ft bgs)
					810–815	CL		CLAY: light olive brown (2.5Y5/3); 90% clay as balls, nonplastic, soft; 10% well graded sand, fine to coarse, angular to subangular, low sphericity; trace silt in clay matrix.		18" x 5/16" 304 SS Blank (794.91 - 854.91 ft bgs)



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DATE DRILLED 1/25/01-2/23/01

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PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft. BGL)	U.S.C.S.	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH	WELL DIAGRAM
					820, 825	CL		CLAY: light olive brown (2.5Y5/3); 90% clay as balls, nonplastic, soft; 10% well graded sand, fine to coarse, angular to subangular, low sphericity; trace silt in clay matrix.	819.0	18" x 5/16" 304 SS Blank (794.91 - 854.91 ft bgs)
					830, 835	CL		CLAY: light olive brown (2.5Y5/3); 90% clay as balls, nonplastic, soft; 10% well graded sand, fine to coarse, angular to subangular, low sphericity; trace silt in clay matrix.	829.0	Colorado Silica 6 x 16 Gravel Pack (530 - 1265 ft bgs)
					840, 845	SC		CLAYEY SAND: yellowish brown (10YR5/8); 60% poorly graded sand, medium to coarse, some fine, angular to subangular, low sphericity; 35% clay as balls and coating gravel, nonplastic, soft to medium stiff; 5% poorly graded gravel and rock fragments, fine, 3/4-inch maximum diameter, angular to subangular, low sphericity.	839.0	
					850	SC		CLAYEY SAND: yellowish brown (10YR5/8); 75% poorly graded sand, medium to coarse, some fine, angular to subangular, low sphericity; 20% clay as balls and coating gravel, nonplastic, stiff to very stiff; 5% poorly graded gravel and rock fragments, fine, 3/4-inch maximum diameter, angular to subangular, low sphericity.	849.0	

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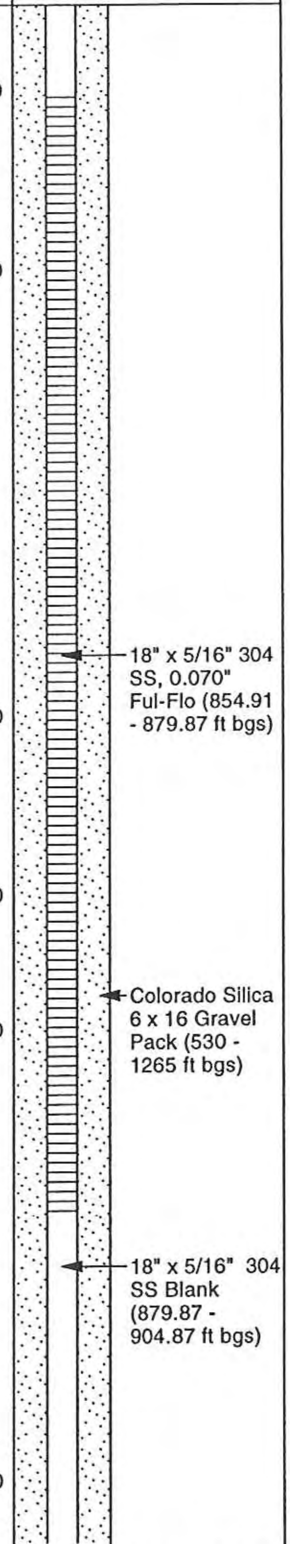
					855	CL		CLAY: light olive brown (2.5Y5/3); 90% clay as balls, nonplastic, soft; 10% well graded sand, fine to coarse, angular to subangular, low sphericity; trace silt in clay matrix.	855.0
					860, 865	SP		POORLY GRADED SAND WITH GRAVEL: yellowish brown (10YR5/8); 85% sand, medium to coarse, angular to subangular, low sphericity; 10% poorly graded gravel and rock fragments, fine, 1/2-inch maximum diameter, angular to subangular, low sphericity; 5% silt as balls, inelastic, soft.	859.0
					870	SP		POORLY GRADED SAND WITH GRAVEL: yellowish brown (10YR5/8); 85% sand, medium to coarse, angular to subangular, low sphericity; 10% poorly graded gravel and rock fragments, fine, 1/2-inch maximum diameter, angular to subangular, low sphericity; 5% silt as balls, inelastic, soft.	869.0
					875	CL		CLAY: light yellowish brown (7.5YR5/6); 90% silty clay as balls, nonplastic, soft to medium stiff; 10% well graded sand, fine to coarse, angular to subangular, low sphericity.	873.0
					880, 885	SP		POORLY GRADED SAND WITH GRAVEL: yellowish brown (10YR5/8); 85% sand, medium to coarse, angular to subangular, low sphericity; 10% poorly graded gravel and rock fragments, fine, 1/2-inch maximum diameter, angular to subangular, low sphericity; 5% silt as balls, inelastic, soft.	876.0
								CLAY: light yellowish brown (7.5YR5/6); 90% silty clay as	886.0

WELL DIAGRAM



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PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft. BGL)	U.S.C.S.	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH	WELL DIAGRAM
					890	CL		balls, nonplastic, soft to medium stiff; 10% well graded sand, fine to coarse, angular to subangular, low sphericity.	892.0	18" x 5/16" 304 SS Blank (879.87 - 904.87 ft bgs)
						SP		POORLY GRADED SAND WITH GRAVEL: yellowish brown (10YR5/8); 85% sand, medium to coarse, angular to subangular, low sphericity; 10% poorly graded gravel and rock fragments, fine, 1/2-inch maximum diameter, angular to subangular, low sphericity; 5% silt as balls, inelastic, soft.	893.0	
					895	CL		SANDY CLAY: light yellowish brown (7.5YR5/6); 70% clay as balls, nonplastic, soft to medium stiff; 25% poorly graded sand, medium to coarse, angular to subangular, low sphericity; poorly graded gravel with rock fragments, fine, 1/4-inch maximum diameter, angular to subangular, low sphericity.	897.0	
					900	CL		CLAY: light yellowish brown (7.5YR5/6); 90% silty clay as balls, nonplastic, soft to medium stiff; 10% well graded sand, fine to coarse, angular to subangular, low sphericity.		Colorado Silica 6 x 16 Gravel Pack (530 - 1265 ft bgs)
					905, 910	CL		CLAY: yellowish brown (10YR5/8); 100% clay as balls, nonplastic, soft to medium stiff; trace poorly graded sand, fine to medium, angular to subangular, low sphericity; trace silt in matrix.	906.0	18" x 5/16" 304 SS, 0.070" Ful-Flo (904.87 - 959.79 ft bgs)
					915	SP		POORLY GRADED SAND WITH GRAVEL: yellowish brown (10YR5/8); 85% sand, medium to coarse, angular to subangular, low sphericity; 10% poorly graded gravel and rock fragments, fine, 1/2-inch maximum diameter, angular to subangular, low sphericity; 5% silt as balls, inelastic, soft.	912.0	
					920	SP		POORLY GRADED SAND WITH GRAVEL AND SILT: brownish yellow (10YR6/6); 75% poorly graded sand, medium to coarse, angular to subangular, low sphericity; 15% poorly graded gravel and rock fragments, fine, 3/4-inch maximum diameter, angular to subrounded; 10% silt as balls, soft.	918.0	

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						SM			924.0	
					925	SP		POORLY GRADED SAND: brown (10YR5/3); 100% sand, medium to coarse, angular to subangular, low sphericity, clean; trace silt.	926.0	
					930	SP SM		POORLY GRADED SAND WITH GRAVEL AND SILT: yellowish brown (10YR5/4); 75% poorly graded sand, medium to coarse, angular to subangular, low sphericity; 15% poorly graded gravel and rock fragments, fine, 1/2-inch maximum diameter, angular to subrounded; 10% silt as balls.	936.0	18" x 5/16" 304 SS, 0.070" Ful-Flo (904.87 - 959.79 ft bgs)
					935	CL		SILTY CLAY: dark yellowish brown (10YR4/6); 100% silty clay, moderately to highly plastic, medium stiff to stiff.	940.0	
					940, 945	SM		SILTY SAND: brownish yellow (10YR6/6); 80% poorly graded sand, fine to medium, angular to subangular, low sphericity; 20% silt as balls.	950.0	Colorado Silica 6 x 16 Gravel Pack (530 - 1265 ft bgs)
					950	SM		SILTY SAND: brownish yellow (10YR6/6); 80% poorly graded sand, fine to medium, angular to subangular, low sphericity; 20% silt as balls.	953.0	
					955			SILTY SAND: brownish yellow (10YR6/6); 80% poorly graded sand, fine to medium, angular to subangular, low sphericity; 20% silt as balls.		

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PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft. BGL)	U.S.C.S.	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH	WELL DIAGRAM
						SM				18" x 5/16" 304 SS, 0.070" Ful-Flo (904.87 - 959.79 ft bgs)
					960					
						SM		SILTY SAND: brownish yellow (10YR6/6); 80% poorly graded sand, fine to medium, angular to subangular, low sphericity; 20% silt as balls.	963.0	
					965	CL		CLAY WITH SAND: brownish yellow (10YR6/6); 60% clay, moderately plastic, medium stiff to stiff; 20% poorly graded sand, medium, subangular to subrounded; 20% silt.	965.0	Colorado Silica 6 x 16 Gravel Pack (530 - 1265 ft bgs)
					970					
					975	SP		POORLY GRADED SAND: pale brown (10YR6/3); 100% sand, medium, some fine, subangular to subrounded; trace silt in balls.	973.0	
						CL		SILTY CLAY WITH SAND: yellowish brown (10YR5/6); 60% clay, moderately plastic, medium stiff; 25% silt; 15% poorly graded sand, fine to medium, subangular to subrounded.	976.0	18" x 5/16" 304 SS Blank (959.79 - 1004.73 ft bgs)
					980					
					985					
					990	CL		SILTY CLAY WITH SAND: yellowish brown (10YR5/6); 60% clay, moderately plastic, medium stiff; 25% silt; 15% poorly graded sand, fine to medium, subangular to subrounded.	986.0	

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Camp Dresser & McKee, Inc.
18881 Von Karman Avenue, Suite 650
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(949) 752-5452
(949) 752-1307 (FAX)

BORING/WELL CONSTRUCTION LOG

PROJECT NUMBER 10490-21966-WELL28.DRILL **BORING/WELL NUMBER** Well #28

PROJECT NAME Monte Vista Water District **DATE DRILLED** 1/25/01-2/23/01

Continued from Previous Page

PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft. BGL)	U.S.C.S.	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH	WELL DIAGRAM
					995	CL		SILTY CLAY WITH SAND: dark yellowish brown (10YR4/6); 60% clay, moderately plastic, medium stiff; 25% silt; 15% poorly graded sand, fine to medium, subangular to subrounded.	993.0	18" x 5/16" 304 SS Blank (959.79 - 1004.73 ft bgs)
						SM		SILTY SAND: light yellowish brown (10YR6/4); 60% poorly graded sand, fine to medium, trace coarse, subangular to subrounded, low sphericity; 40% silt.	996.0	
					1000	CL		SILTY CLAY WITH SAND: yellowish brown (10YR5/6); 60% clay, moderately to highly plastic, very stiff; 25% silt; 15% poorly graded sand, fine to medium, subangular to subrounded.	999.0	
					1005, 1010	SP SM		POORLY GRADED SAND WITH SILT: light yellowish brown (10YR4/6); 85% sand, medium to coarse, some fine, angular to subangular, low sphericity; 10% silt as balls, inelastic, medium stiff to stiff; 5% poorly graded gravel and rock fragments, fine, 1/2-inch maximum diameter; angular to subangular, low sphericity.	1005.0	Colorado Silica 6 x 16 Gravel Pack (530 - 1265 ft bgs)
					1015	CL		CLAY: yellowish brown (10YR5/6); 100% clay, nonplastic, medium stiff.	1015.0	18" x 5/16" 304 SS, 0.070" Ful-Flo (1004.73 - 1039.62 ft bgs)
					1020	SP SM		POORLY GRADED SAND WITH SILT: light yellowish brown (10YR4/6); 85% sand, medium to coarse, some fine, angular to subangular, low sphericity; 10% silt as balls, inelastic, medium stiff to stiff; 5% poorly graded gravel and rock fragments, fine, 1/2-inch maximum diameter; angular to subangular, low sphericity.	1017.0	

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BORING/WELL CONSTRUCTION LOG

PROJECT NUMBER 10490-21966-WELL28.DRILL
BORING/WELL NUMBER Well #28
PROJECT NAME Monte Vista Water District
DATE DRILLED 1/25/01-2/23/01

Continued from Previous Page

PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft. BGL)	U.S.C.S.	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH	WELL DIAGRAM
					1025					
						SP		POORLY GRADED SAND: light yellowish brown (10YR4/6); 90% sand, medium to coarse, some fine, angular to subangular, low sphericity; 5% silt as balls, inelastic, medium stiff to stiff; 5% poorly graded gravel and rock fragments, fine, 1/2-inch maximum diameter; angular to subangular, low sphericity.	1027.0	18" x 5/16" 304 SS, 0.070" Ful-Flo (1004.73 - 1039.62 ft bgs)
					1030					
					1035					
						SP SM		POORLY GRADED SAND WITH SILT: light yellowish brown (10YR4/6); 85% sand, medium to coarse, some fine, angular to subangular, low sphericity; 10% silt as balls, inelastic, medium stiff to stiff; 5% poorly graded gravel and rock fragments, fine, 1/2-inch maximum diameter; angular to subangular, low sphericity.	1037.0	Colorado Silica 6 x 16 Gravel Pack (530 - 1265 ft bgs)
					1040					
					1045					
					1050	CL		CLAY: yellowish brown (10YR5/4); 100% clay, nonplastic, medium stiff.	1050.0	18" x 5/16" 304 SS Blank (1039.62 - 1119.74 ft bgs)
					1055			SILTY SAND: light yellowish brown (10YR4/6); 80% poorly graded sand, medium to coarse, some fine, angular to subangular, low sphericity; 15% silt as balls, inelastic, medium stiff; 5% poorly graded gravel and rock fragments, fine, 1/2-inch maximum diameter; angular to subangular, low sphericity.	1055.0	

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BORING/WELL CONSTRUCTION LOG

PROJECT NUMBER 10490-21966-WELL28.DRILL **BORING/WELL NUMBER** Well #28
PROJECT NAME Monte Vista Water District **DATE DRILLED** 1/25/01-2/23/01

Continued from Previous Page

DEPTH (ft. BGL)	U.S.C.S.	LITHOLOGIC DESCRIPTION	CONTACT DEPTH	WELL DIAGRAM
1060	SM			
1065	CL	CLAY AND SILT: 50% clay as balls, dark yellowish brown (10YR4/6), nonplastic, soft; 50% silt as balls, yellowish brown (10YR5/6), inelastic, medium stiff.	1064.0	18" x 5/16" 304 SS Blank (1039.62 - 1119.74 ft bgs)
1070				
1075	CL	CLAY: yellowish brown (10YR5/6); 100% clay, nonplastic, medium stiff; trace well graded sand, fine to coarse, angular to subangular, low sphericity.	1074.0	Colorado Silica 6 x 16 Gravel Pack (530 - 1265 ft bgs)
1080	CH	CLAY: yellowish brown (10YR5/4); 100% clay, plastic, medium stiff.	1080.0	
1085	CL	CLAY: yellowish brown (10YR5/6); 100% clay, nonplastic, medium stiff; trace well graded sand, fine to coarse, angular to subangular, low sphericity.	1086.0	
1090		SILTY SAND: light yellowish brown (10YR4/6); 80%	1092.0	

PID (ppm) | BLOW COUNTS | RECOVERY (inches) | SAMPLE ID. | EXTENT | GRAPHIC LOG

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PROJECT NUMBER 10490-21966-WELL28.DRILL **BORING/WELL NUMBER** Well #28

PROJECT NAME Monte Vista Water District **DATE DRILLED** 1/25/01-2/23/01

Continued from Previous Page

PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft. BGL)	U.S.C.S.	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH	WELL DIAGRAM
					1095	SM		poorly graded sand, medium to coarse, some fine, angular to subangular, low sphericity; 15% silt as balls, inelastic, medium stiff; 5% poorly graded gravel and rock fragments, fine, 1/2-inch maximum diameter; angular to subangular, low sphericity.	1096.0	
					1100	CL		CLAY: yellowish brown (10YR5/6); 100% clay, nonplastic, medium stiff; trace well graded sand, fine to coarse, angular to subangular, low sphericity.	1104.0	18" x 5/16" 304 SS Blank (1039.62 - 1119.74 ft bgs)
					1105	SP SM		POORLY GRADED SAND WITH SILT: light yellowish brown (10YR4/6); 85% sand, medium to coarse, some fine, angular to subangular, low sphericity; 10% silt as balls, inelastic, medium stiff to stiff; 5% poorly graded gravel and rock fragments, fine, 1/2-inch maximum diameter; angular to subangular, low sphericity.	1106.0	
						SP		POORLY GRADED SAND: light yellowish brown (10YR4/6); 90% sand, medium to coarse, some fine, angular to subangular, low sphericity; 5% silt as balls, inelastic, medium stiff to stiff; 5% poorly graded gravel and rock fragments, fine, 1/2-inch maximum diameter; angular to subangular, low sphericity.	1109.0	
					1110, 1115	CL		CLAY WITH SAND: brownish yellow (10YR6/6); 85% clay, nonplastic, medium stiff; 15% poorly graded sand, medium to coarse; trace rock fragments, 1/2-inch maximum diameter, angular to subangular low sphericity.	1119.0	Colorado Silica 6 x 16 Gravel Pack (530 - 1265 ft bgs)
					1120	SM		SILTY SAND: light yellowish brown (10YR4/6); 80% poorly graded sand, medium to coarse, some fine, angular to subangular, low sphericity; 15% silt as balls, inelastic, medium stiff; 5% poorly graded gravel and rock fragments, fine, 1/2-inch maximum diameter; angular to subangular, low sphericity.	1123.0	18" x 5/16" 304 SS, 0.070" Ful-Flo (1119.74 - 1169.74 ft bgs)
						SM		SILTY SAND: light yellowish brown (10YR4/6); 70% poorly graded sand, medium to coarse, some fine, angular to subangular, low sphericity; 25% silt as balls, inelastic, medium stiff; 5% poorly graded gravel and rock fragments, fine, 1/4-inch maximum diameter; angular to subangular, low sphericity.	1125.0	
					1125	CL		CLAY: yellowish brown (10YR5/6); 100% clay, nonplastic,	1126.0	

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BORING/WELL CONSTRUCTION LOG

PROJECT NUMBER 10490-21966-WELL28.DRILL **BORING/WELL NUMBER** Well #28
PROJECT NAME Monte Vista Water District **DATE DRILLED** 1/25/01-2/23/01

Continued from Previous Page

PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft. BGL)	U.S.C.S.	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH	WELL DIAGRAM
						SM		medium stiff to stiff; trace well graded sand, fine to coarse, angular to subangular, low sphericity.	1128.0	
					1130			SILTY SAND: light yellowish brown (10YR4/6); 80% poorly graded sand, medium to coarse, some fine, angular to subangular, low sphericity; 15% silt as balls, inelastic, soft to medium stiff; 5% poorly graded gravel and rock fragments, fine, 1/2-inch maximum diameter; angular to subangular, low sphericity.		
						SP		POORLY GRADED SAND: light yellowish brown (10YR4/6); 90% sand, medium to coarse, some fine, angular to subangular, low sphericity; 5% silt as balls, inelastic, medium stiff to stiff; 5% poorly graded gravel and rock fragments, fine, 1/2-inch maximum diameter; angular to subangular, low sphericity.		
					1135	ML		SILT WITH SAND: dark yellowish brown (10YR4/6); 75% silt; 15% well graded sand, fine to coarse, subrounded to rounded; 10% poorly graded gravel, fine, 3/4-inch maximum diameter.	1135.0	18" x 5/16" 304 SS, 0.070" Ful-Flo (1119.74 - 1169.74 ft bgs)
						SP		POORLY GRADED SAND WITH GRAVEL: dark grayish brown (10YR4/2); 75% sand, fine to medium, subrounded to rounded; 20% well graded gravel and rock fragments, fine to coarse, 1-inch maximum diameter, subrounded to rounded; 5% silt.	1137.0	
					1140	CL		SILTY CLAY: yellowish brown (10YR5/8); 100% silty clay; trace fine sand.	1141.0	
					1145	SP		POORLY GRADED SAND WITH GRAVEL: dark grayish brown (10YR4/2); 75% sand, fine to medium, subangular to subrounded; 20% well graded gravel and rock fragments, fine to coarse, 1-inch maximum diameter, subangular to subrounded; 5% silt.	1146.0	Colorado Silica 6 x 16 Gravel Pack (530 - 1265 ft bgs)
					1150	CL		SILTY CLAY: brownish yellow (10YR6/6); 95% silty clay, moderately plastic, medium stiff; 5% medium sand, subangular to subrounded.	1150.0	
					1155	CL		SILTY CLAY WITH GRAVEL: yellowish brown (10YR5/6); 50% clay, moderately plastic, medium stiff; 20% silt; 20% poorly graded gravel and rock fragments, coarse, 1-inch maximum diameter, angular to subrounded.	1155.0	
					1160			POORLY GRADED SAND: yellowish brown (10YR5/4); 90% sand, medium to coarse, angular to subangular, low	1160.0	

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BORING/WELL CONSTRUCTION LOG

PROJECT NUMBER 10490-21966-WELL28.DRILL **BORING/WELL NUMBER** Well #28

PROJECT NAME Monte Vista Water District **DATE DRILLED** 1/25/01-2/23/01

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PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft. BGL)	U.S.C.S.	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH	WELL DIAGRAM
								sphericity; 5% poorly graded gravel and rock fragments; fine, 3/4-inch maximum diameter, angular to subangular, low sphericity; 5% silt as balls, inelastic, medium stiff.		
					1165	SP				18" x 5/16" 304 SS, 0.070" Ful-Flo (1119.74 - 1169.74 ft bgs)
					1170			POORLY GRADED SAND: yellowish brown (10YR5/4); 90% sand, medium to coarse, angular to subangular, low sphericity; 5% poorly graded gravel and rock fragments; fine, 3/4-inch maximum diameter, angular to subangular, low sphericity; 5% silt as balls, inelastic, medium stiff.	1170.0	
					1175	SP				Colorado Silica 6 x 16 Gravel Pack (530 - 1265 ft bgs)
					1180	CL		CLAY: brownish yellow (10YR6/6); 100% clay, nonplastic, soft.	1179.0	
					1185			SILTY SAND: yellowish brown (10YR5/4); 60% poorly graded sand, medium to coarse, angular to subangular, low sphericity; 35% silt as balls, inelastic, soft; 5% poorly graded gravel and rock fragments, fine, 3/4-inch maximum diameter; angular to subangular, low sphericity.	1185.0	18" x 5/16" 304 SS Blank (1169.74 - 1194.68 ft bgs)
					1190	SM				
					1195			POORLY GRADED SAND WITH SILT: yellowish brown	1195.0	

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PROJECT NUMBER 10490-21966-WELL28.DRILL **BORING/WELL NUMBER** Well #28
PROJECT NAME Monte Vista Water District **DATE DRILLED** 1/25/01-2/23/01

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PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft. BGL)	U.S.C.S.	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH	WELL DIAGRAM
					1200	SP SM		(10YR5/4); 85% poorly graded sand, medium to coarse, angular to subangular, low sphericity; 10% silt as balls, inelastic, soft; 5% poorly graded gravel and rock fragments, fine, 3/4-inch maximum diameter; angular to subangular, low sphericity.		
					1205	SP		POORLY GRADED SAND: yellowish brown (10YR5/4); 90% sand, medium to coarse, angular to subangular, low sphericity; 5% poorly graded gravel and rock fragments; fine, 3/4-inch maximum diameter, angular to subangular, low sphericity; 5% silt as balls, inelastic, medium stiff.	1205.0	18" x 5/16" 304 SS, 0.070" Ful-Flo (1194.68 - 1224.67 ft bgs)
					1210	SM		SILTY SAND: yellowish brown (10YR5/4); 60% poorly graded sand, medium to coarse, angular to subangular, low sphericity; 35% silt as balls, inelastic, soft to medium stiff; 5% poorly graded gravel and rock fragments, fine, 1/2-inch maximum diameter; angular to subangular, low sphericity.	1212.0	
					1215	SP		POORLY GRADED SAND: yellowish brown (10YR5/4); 90% sand, medium to coarse, angular to subangular, low sphericity; 5% poorly graded gravel and rock fragments; fine, 3/4-inch maximum diameter, angular to subangular, low sphericity; 5% silt as balls, inelastic, medium stiff.	1216.0	Colorado Silica 6 x 16 Gravel Pack (530 - 1265 ft bgs)
					1220					
					1225	SP		POORLY GRADED SAND: yellowish brown (10YR5/4); 90% sand, medium to coarse, angular to subangular, low sphericity; 5% poorly graded gravel and rock fragments; fine, 3/4-inch maximum diameter, angular to subangular, low sphericity; 5% silt as balls, inelastic, medium stiff.	1226.0	18" x 5/16" 304 SS Blank W/ Shoe (1224.67 - 1244.79 ft bgs)
					1230					

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NEWGINT MVWD.GPJ NEWGINT.GDT 4/3/01

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PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft. BGL)	U.S.C.S.	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH	WELL DIAGRAM
					1232.0–1242.0 (1235, 1240)	CL		CLAY: light reddish brown (5YR6/4); 100% clay, nonplastic, stiff to very stiff; trace well graded sand, fine to coarse, angular to subangular, low sphericity.	1232.0	18" x 5/16" 304 SS Blank W/ Shoe (1224.67 - 1244.79 ft bgs)
					1242.0–1252.0 (1245, 1250)	CL		CLAY: brownish yellow (10YR6/6); 100% clay, nonplastic, soft to medium stiff; trace poorly graded sand, medium to coarse, angular to subangular, low sphericity.	1242.0	Colorado Silica 6 x 16 Gravel Pack (530 - 1265 ft bgs)
					1252.0–1256.0 (1255)	CL		CLAY: brownish yellow (10YR6/6); 100% clay, nonplastic, soft to medium stiff; trace poorly graded sand, medium to coarse, angular to subangular, low sphericity.	1252.0	
					1256.0– (1260)	SP SM		POORLY GRADED SAND WITH SILT: yellowish brown (10YR5/4); 85% sand, medium to coarse, angular to subangular, low sphericity; 10% silt as balls, inelastic, medium stiff; 5% poorly graded gravel and rock fragments; fine, 3/4-inch maximum diameter, angular to subangular, low sphericity.	1256.0	

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PROJECT NAME Monte Vista Water District
DATE DRILLED 1/25/01-2/23/01

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PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft. BGL)	U.S.C.S.	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH	WELL DIAGRAM
					1265					
						SP SM		POORLY GRADED SAND WITH SILT: yellowish brown (10YR5/4); 80% sand, medium to coarse, angular to subangular, low sphericity; 15% silt as balls, inelastic, medium stiff; 5% poorly graded gravel and rock fragments; fine, 3/4-inch maximum diameter, angular to subangular, low sphericity.	1266.0	
					1270					Sluff (1265 - 1317 ft bgs)
						ML		CLAYEY SILT: yellowish red (5YR4/6); 90% clayey silt, inelastic to moderately elastic, soft; 10% poorly graded sand, fine, trace medium, subangular to subrounded.	1274.0	
					1275					
					1280	SM		SILTY SAND WITH GRAVEL: light yellowish brown (10YR6/4); 40% poorly graded sand, medium to coarse, subangular to subrounded; 30% silt; 20% well graded gravel and rock fragments, fine to coarse, 1-inch maximum diameter, subangular to subrounded; 10% clay, nonplastic, soft.	1280.0	
					1285					
					1290					
						CL		SILTY CLAY: yellowish brown (10YR5/8); 50% clay, moderately plastic, medium stiff; 45% silt; 5% poorly graded sand, coarse, angular to subangular.	1291.0	
					1295					

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PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft. BGL)	U.S.C.S.	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH	WELL DIAGRAM
					1300					
						CL		SILTY CLAY: dark yellowish brown (10YR4/6); 50% clay, moderately plastic, medium stiff; 45% silt; 5% poorly graded sand, coarse, angular to subangular.	1301.0	Sluff (1265 - 1317 ft bgs)
					1305					
					1310	ML		SANDY SILT: brownish yellow (10YR6/6); 50% silt; 45% poorly graded sand, medium, trace coarse, subangular to subrounded; 5% clay.	1310.0	
					1315					
								Total Depth of Borehole is 1,317 feet bgs.	1317.0	

NEWGINT MVWD.GPJ NEWGINT.GDT 4/3/01

PACIFIC SURVEYS

ELECTRIC LOG
LATEROLOG 3
GAMMA-RAY

Job No. 25150

File No.

Company	CASCADE DRILLING
Well	IEUA PX2
Field	POMONA
County	LOS ANGELES
State	CA

Location:

WEST SIDE OF MONTVUE PARK: 1634 CORDOVA ST
GPS: 34.0747462 -117.214596

Sec. Twp. Rge.

Other Services:
LL3
CALIPER
SONIC
TMP
DEVIATION

Permanent Datum	G.L.		
Log Measured From	G.L.	0'	Elevation above perm. datum
Drilling Measured From	G.L.		

Elevation
K.B.
D.F.
G.L.

Date	01-17-2019		
Run Number	ONE		
Depth Driller	1295'		
Depth Logger	1295'		
Bottom Logged Interval	1295.6'		
Top Log Interval	40'		
Casing Driller	20" @ 50'		
Casing Logger	50'		
Bit Size	17.5"		
Type Fluid in Hole	BENTONITE		
Density / Viscosity	9.2 / 37		
pH / Fluid Loss	-- / 7		
Source of Sample	MUD TANK		
Rm @ Meas. Temp	6.2 @ 71.2 F		
Rmf @ Meas. Temp	5.96 @ 71.2 F		
Rmc @ Meas. Temp	N/A		
Source of Rmf / Rmc	MEASURED		
Rm @ BHT	N/A		
Time Circulation Stopped	0745		
Time Logger on Bottom	1230		
Max. Recorded Temperature	72.69 F		
Equipment Number	PS-5		
Location	VENTURA		
Recorded By	CALEB VILLALOBOS		
Witnessed By	ROBERT THACKER		

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Comments

Calibration Report

Database File	25150.db
Dataset Pathname	ELOG
Dataset Creation	Thu Jan 17 12:51:01 2019

ELOG Calibration Report

Serial:	D4
Model:	DTQ
Shop Calibration Performed:	Fri Jun 01 15:42:16 2018
Before Survey Verification Performed:	Thu Nov 16 12:27:34 2017
After Survey Verification Performed:	Thu Nov 16 12:28:17 2017

Shop Calibration

	Readings			References			Results	
	Zero	Cal		Zero	Cal		Gain	Offset
Short	0.417	44.861		0.500	50.000	Ohm-m	1.114	0.036
Long	3.373	181.647		2.000	200.000	Ohm-m	1.111	-1.746
IEE	99.060	25586.141	counts	0.108	28.001	A		
VSN	15.160	0.000	counts	0.289	0.000	V		
VLN	161.020	136.420	counts	3.071	2.602	V		

Before Survey Verification

	Readings			References			Results	
	Zero	Cal		Zero	Cal		Gain	Offset
Short	0.000	101.105		0.000	101.038	Ohm-m	0.999	0.000
Long	0.000	102.475		0.000	102.112	Ohm-m	0.996	0.000
IEE	0.000	3225.740	counts	0.000	3.530	A		
VSN	86.120	3664.180	counts	1.643	69.890	V		
VLN	76.720	928.460	counts	1.463	17.709	V		

After Survey Verification

	Readings			References			Results	
	Zero	Cal		Zero	Cal		Gain	Offset
Short	0.000	101.067		0.000	101.105	Ohm-m	1.000	0.000
Long	0.000	102.216		0.000	102.475	Ohm-m	1.003	0.000
IEE	0.000	3483.240	counts	0.000	3.812	A		
VSN	86.720	3955.200	counts	1.654	75.441	V		
VLN	77.260	1000.040	counts	1.474	19.075	V		

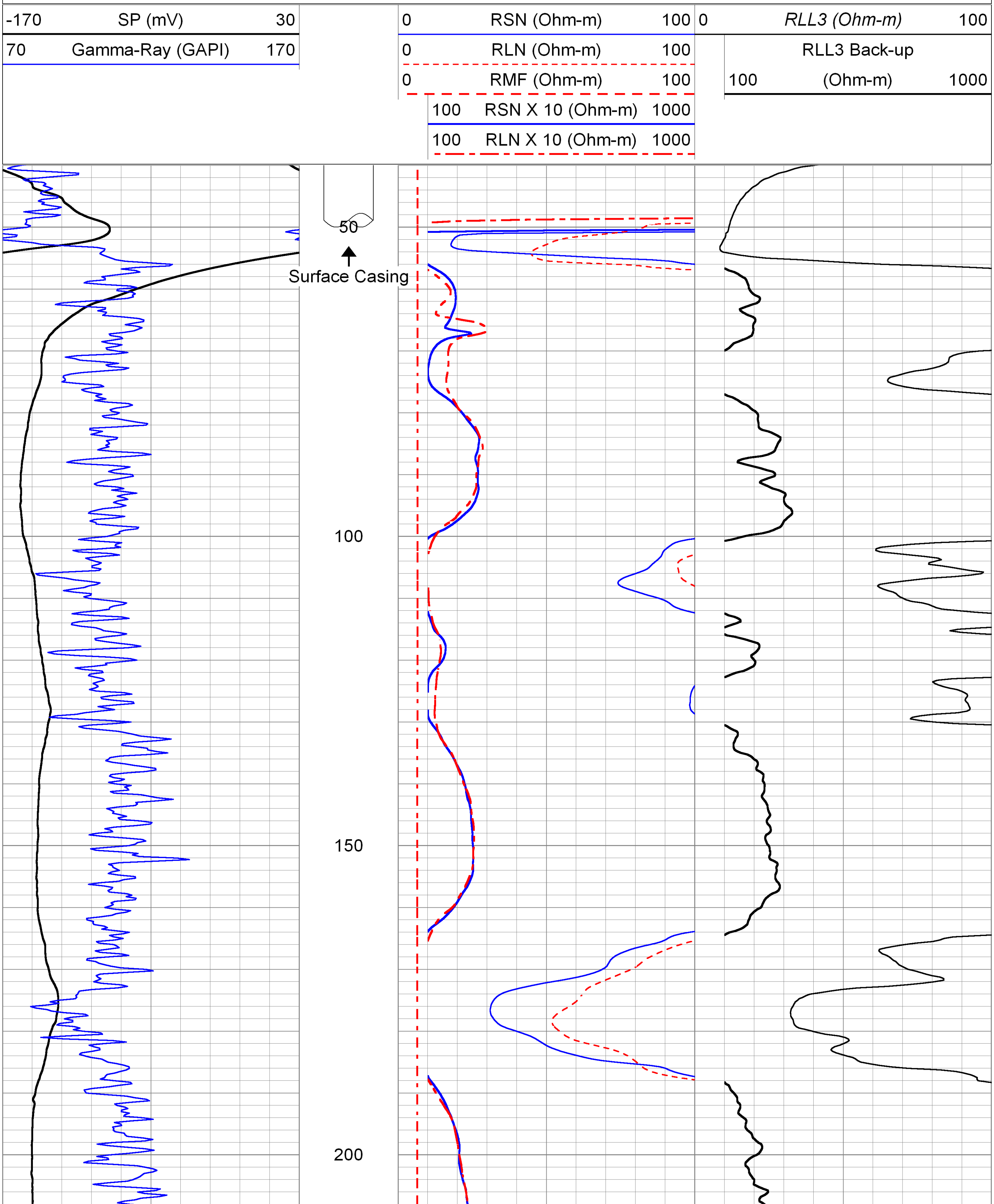
After Survey Verification compared to Before Survey Calibration

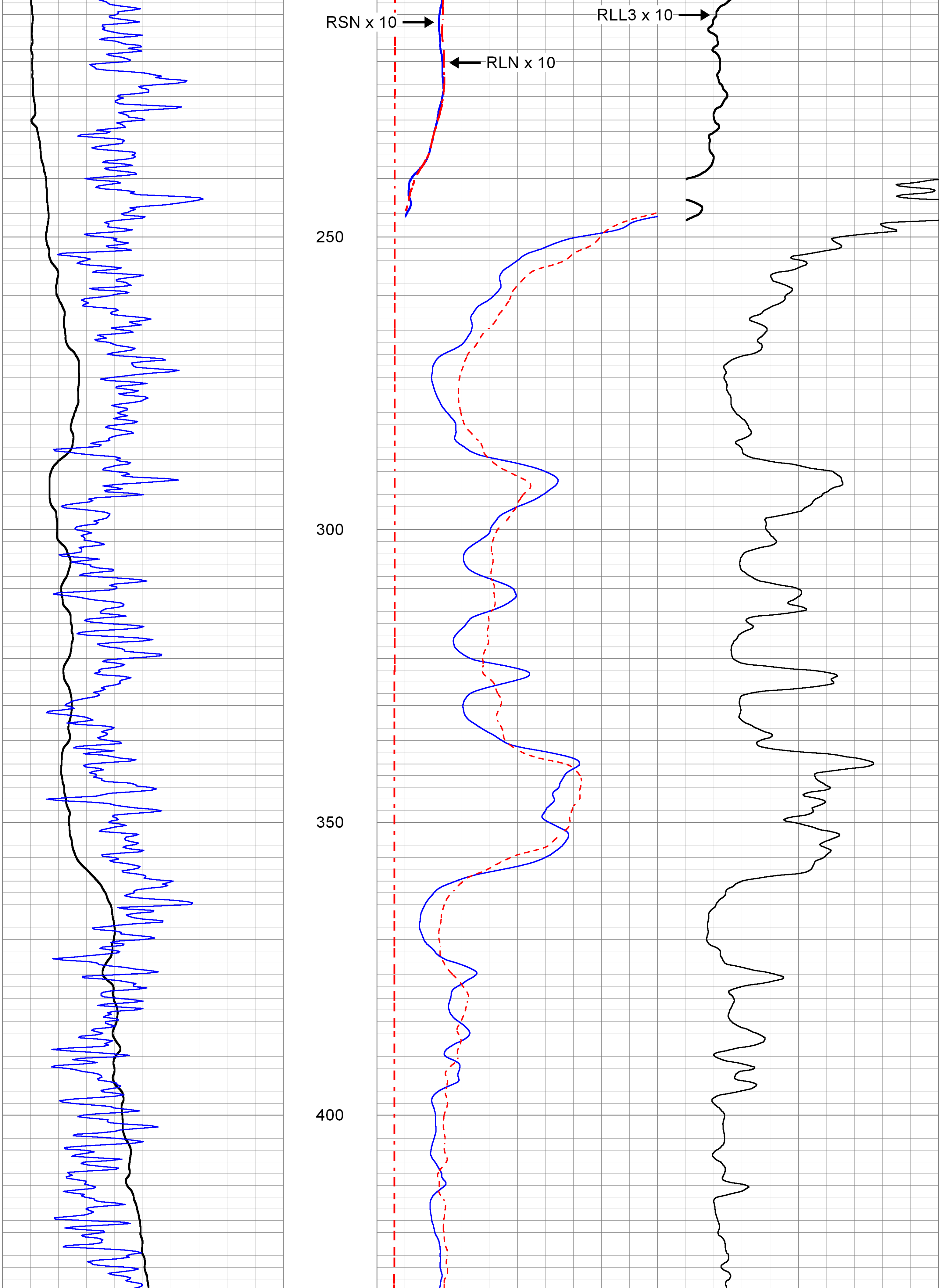
	Zero			Cal		
	Before	After		Before	After	
Short	0.000	0.000	Ohm-m	101.038	101.105	Ohm-m
Long	0.000	0.000	Ohm-m	102.112	102.475	Ohm-m

Gamma Ray Calibration Report

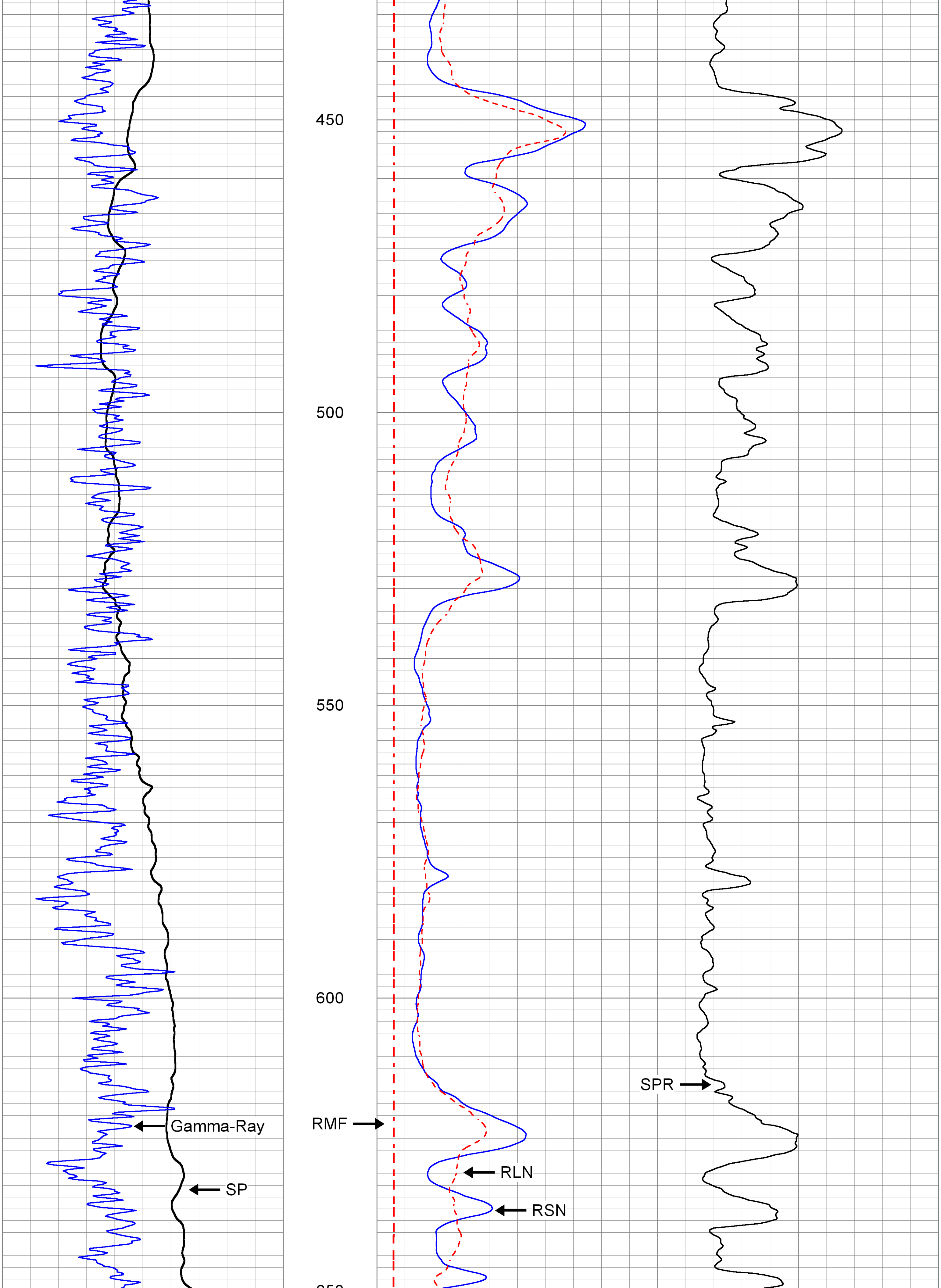
Serial Number:	D4	
Tool Model:	ELOG	
Performed:	Fri Dec 07 11:42:17 2018	
Calibrator Value:	162.0	GAPI
Background Reading:	101.7	cps
Calibrator Reading:	326.7	cps
Sensitivity:	0.7200	GAPI/cps

Database File	25150.db
Dataset Pathname	ELOG
Presentation Format	elog_cwa
Dataset Creation	Thu Jan 17 12:51:01 2019
Charted by	Depth in Feet scaled 1:240

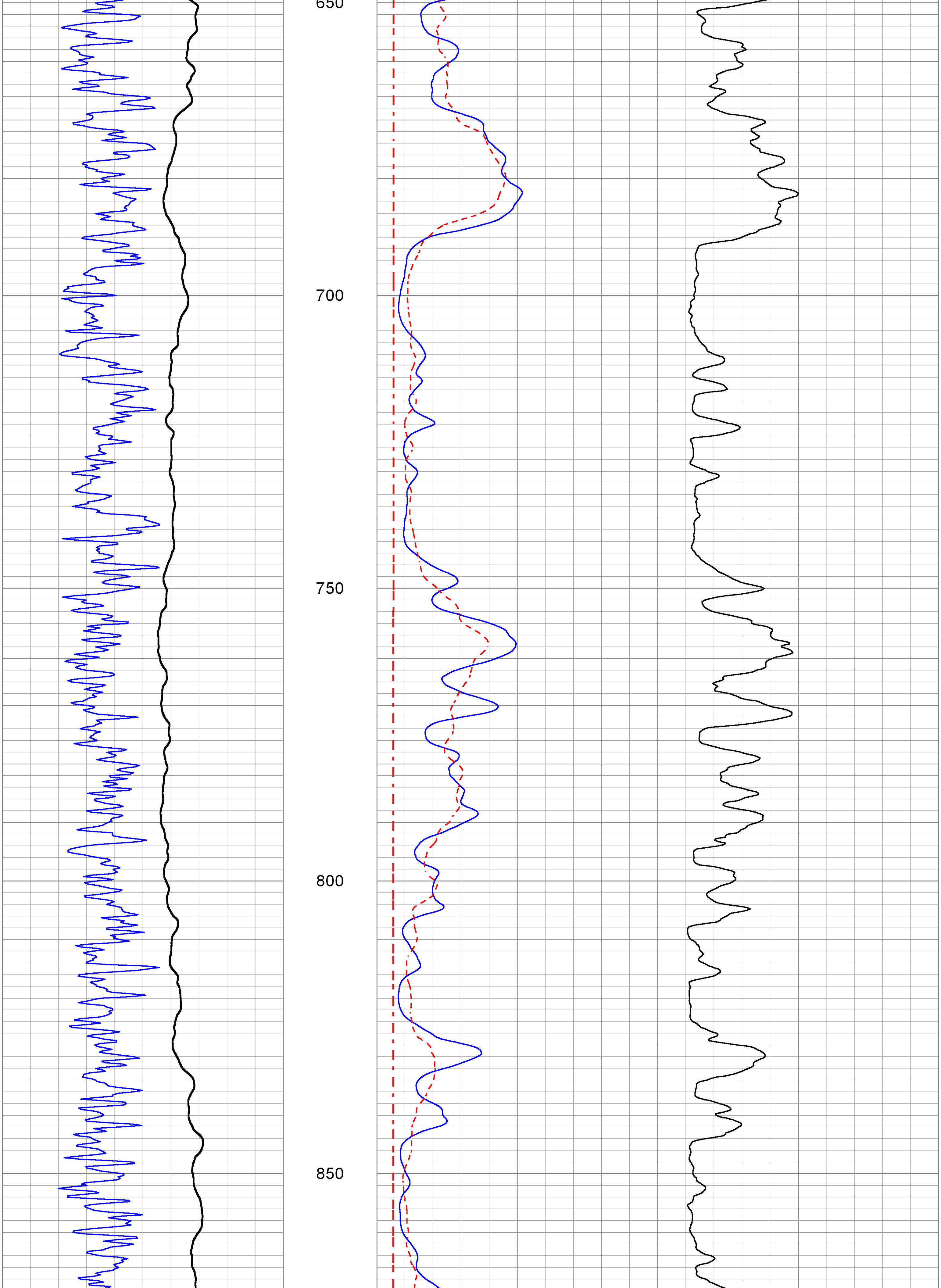


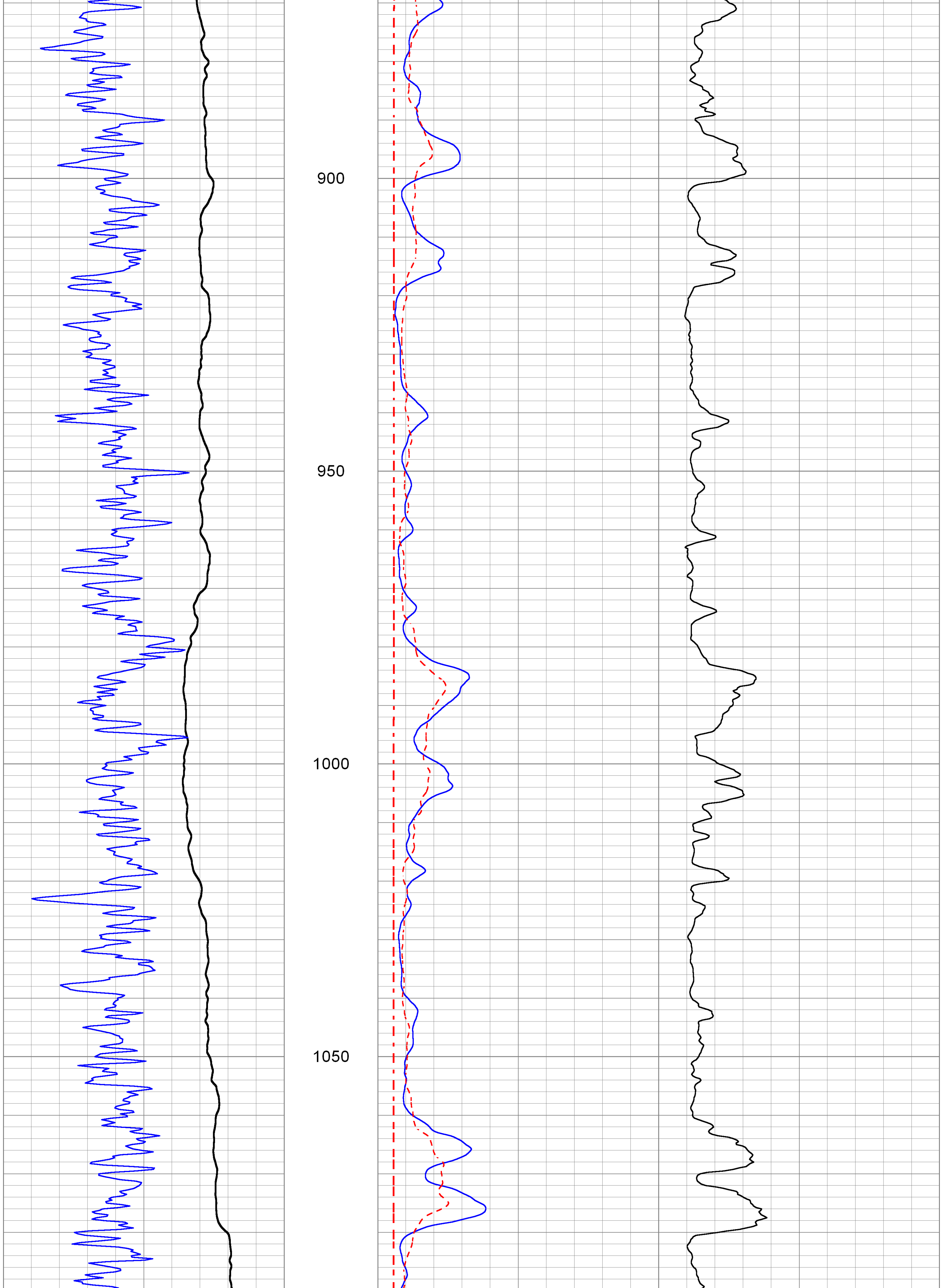


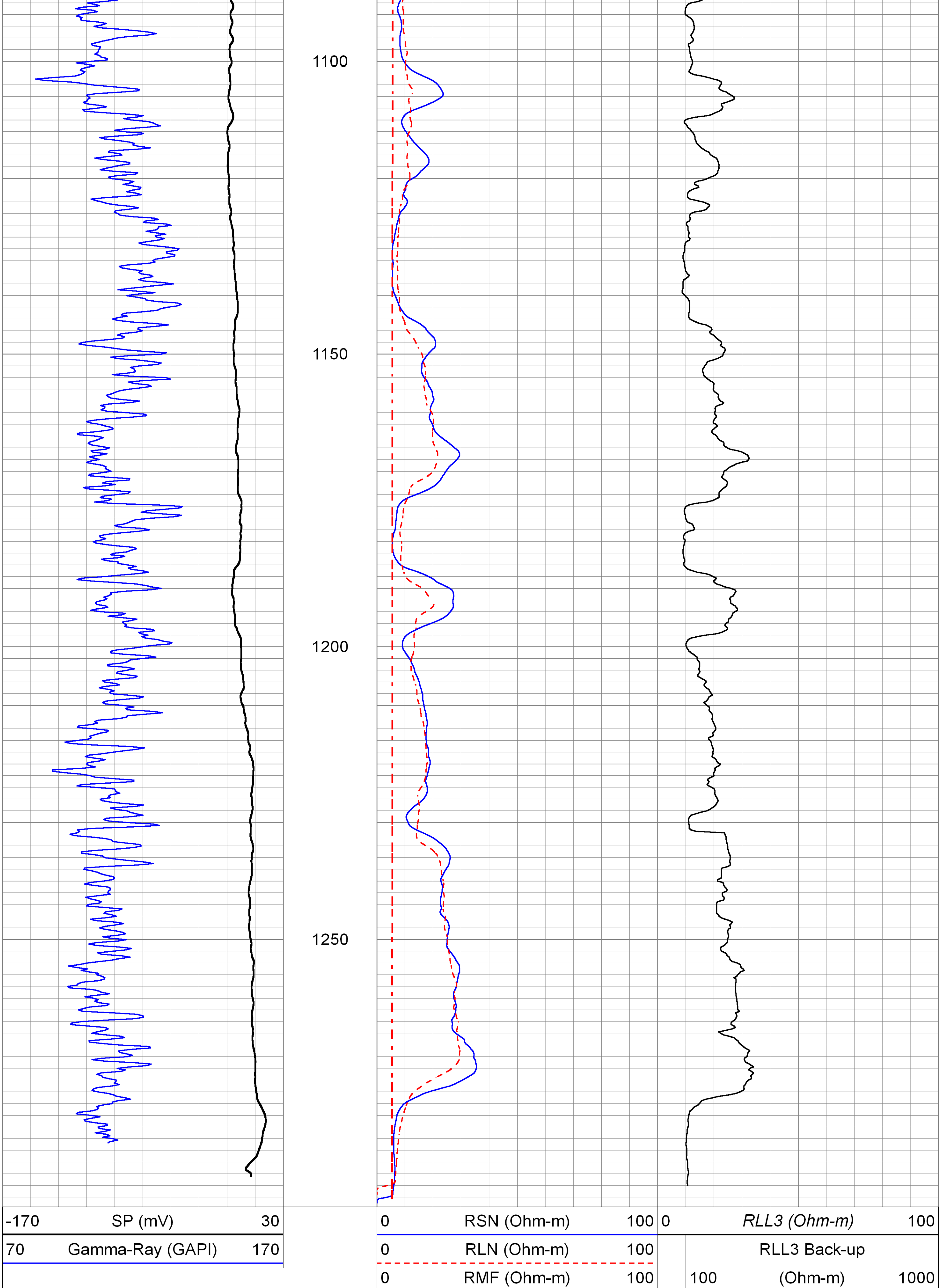
RSN x 10
RLN x 10
RLL3 x 10
250
300
350
400



450
500
550
600
Gamma-Ray
SP
RMF
RLN
RSN
SPR


650
700
750
800
850


900
950
1000
1050



1100
1150
1200
1250
-170 SP (mV) 30
70 Gamma-Ray (GAPI) 170
0 RSN (Ohm-m) 100
0 RLN (Ohm-m) 100
0 RMF (Ohm-m) 100
0 RLL3 (Ohm-m) 100
RLL3 Back-up
100 (Ohm-m) 1000

100	RSN X 10 (Ohm-m)	1000
100	RLN X 10 (Ohm-m)	1000

Log Variables

DatabaseC:\ProgramData\Warrior\Data\25150.db
Dataset field/well/run1/ELOG/_vars_

Top - Bottom

BOREID in	BOTTEMP degF	CASEOD in	CASETHCK in	PERFS	RM_MEAS_R Ohm-m	RM_MEAS_T degF
17.5	79.3	5.5	0	0	6.2	71.2

RMF Ohm-m	RSH Ohm-m	SPSHIFT mV	SRFTEMP degF	TDEPTH ft	TempGrad DegF/ft
5.96	20	7	63.5	1295	0.01235

PACIFIC SURVEYS

LATEROLOG 3
GAMMA-RAY

Job No. 25150

File No.

Company CASCADE DRILLING
Well IEUA PX2
Field POMONA
County LOS ANGELES State CA

Location:

WEST SIDE OF MONTVUE PARK: 1634 CORDOVA ST
GPS: 34.0747462 -117.214596

Sec. Twp. Rge.

Other Services:
ELOG/GR CALIPER
SONIC
TMP
DEVIATION

Permanent Datum G.L. Elevation
Log Measured From G.L. 0' above perm. datum
Drilling Measured From G.L.

Elevation
K.B.
D.F.
G.L.

Date	01-17-2019		
Run Number	ONE		
Depth Driller	1295'		
Depth Logger	1295'		
Bottom Logged Interval	1296.1'		
Top Log Interval	40'		
Casing Driller	20" @ 50'		
Casing Logger	50'		
Bit Size	17.5"		
Type Fluid in Hole	BENTONITE		
Density / Viscosity	9.2 / 37		
pH / Fluid Loss	-- / 7		
Source of Sample	MUD TANK		
Rm @ Meas. Temp	6.2 @ 71.2 F		
Rmf @ Meas. Temp	5.96 @ 71.2 F		
Rmc @ Meas. Temp	N/A		
Source of Rmf / Rmc	MEASURED		
Rm @ BHT	N/A		
Time Circulation Stopped	0745		
Time Logger on Bottom	1340		
Max. Recorded Temperature	72.69 F		
Equipment Number	PS-5		
Location	VENTURA		
Recorded By	CALEB VILLALOBOS		
Witnessed By	ROBERT THACKER		

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Comments

Calibration Report

Database File 25150.db
Dataset Pathname GUARD1
Dataset Creation Thu Jan 17 13:50:05 2019

Gamma Ray Calibration Report

Serial Number:	12
Tool Model:	GROH
Performed:	Thu Nov 16 12:19:03 2017
Calibrator Value:	162.0 GAPI
Background Reading:	54.1
Calibrator Reading:	193.3
Sensitivity:	1.1641 GAPI/

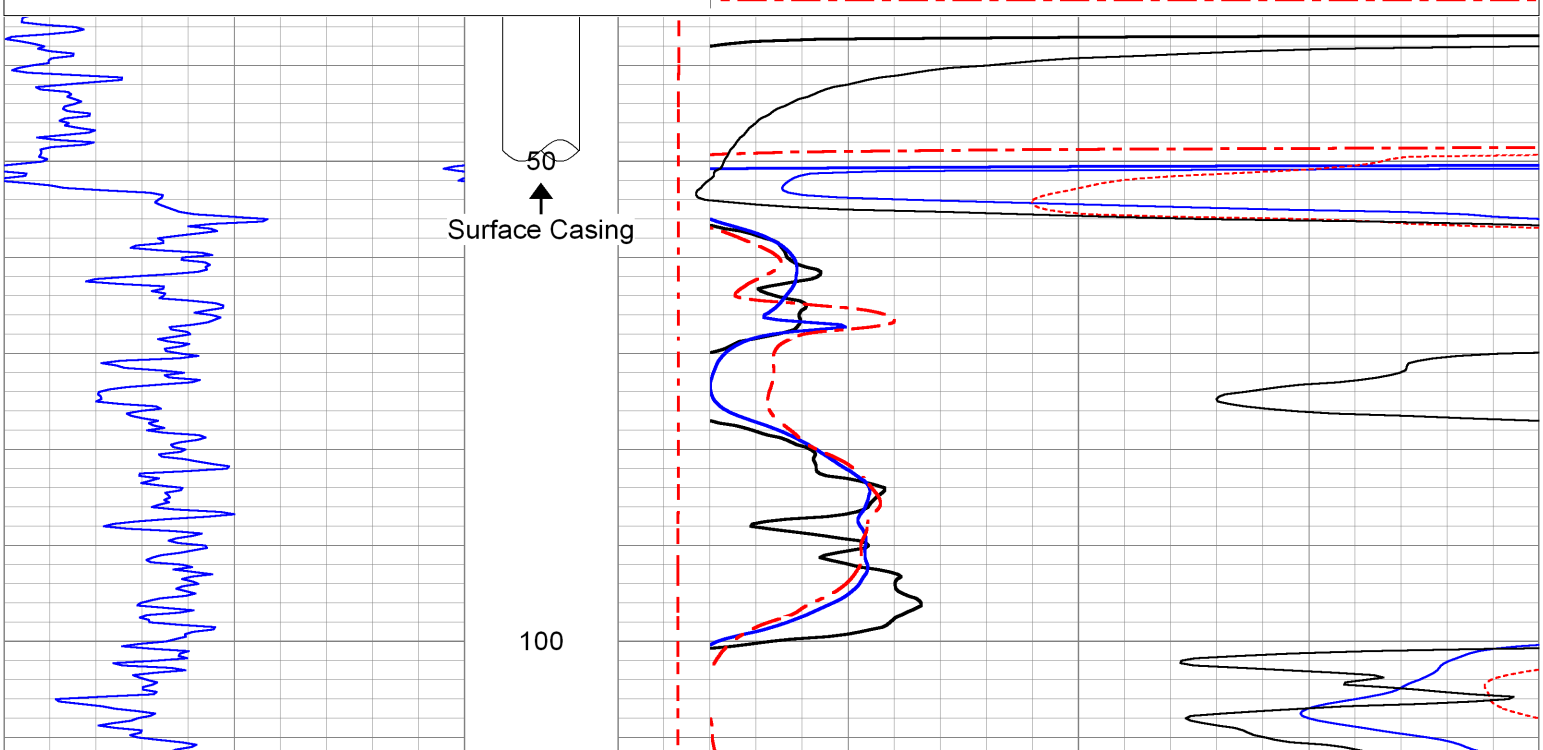
RLL3 (Resistivity Laterolog 3) Calibration Report:

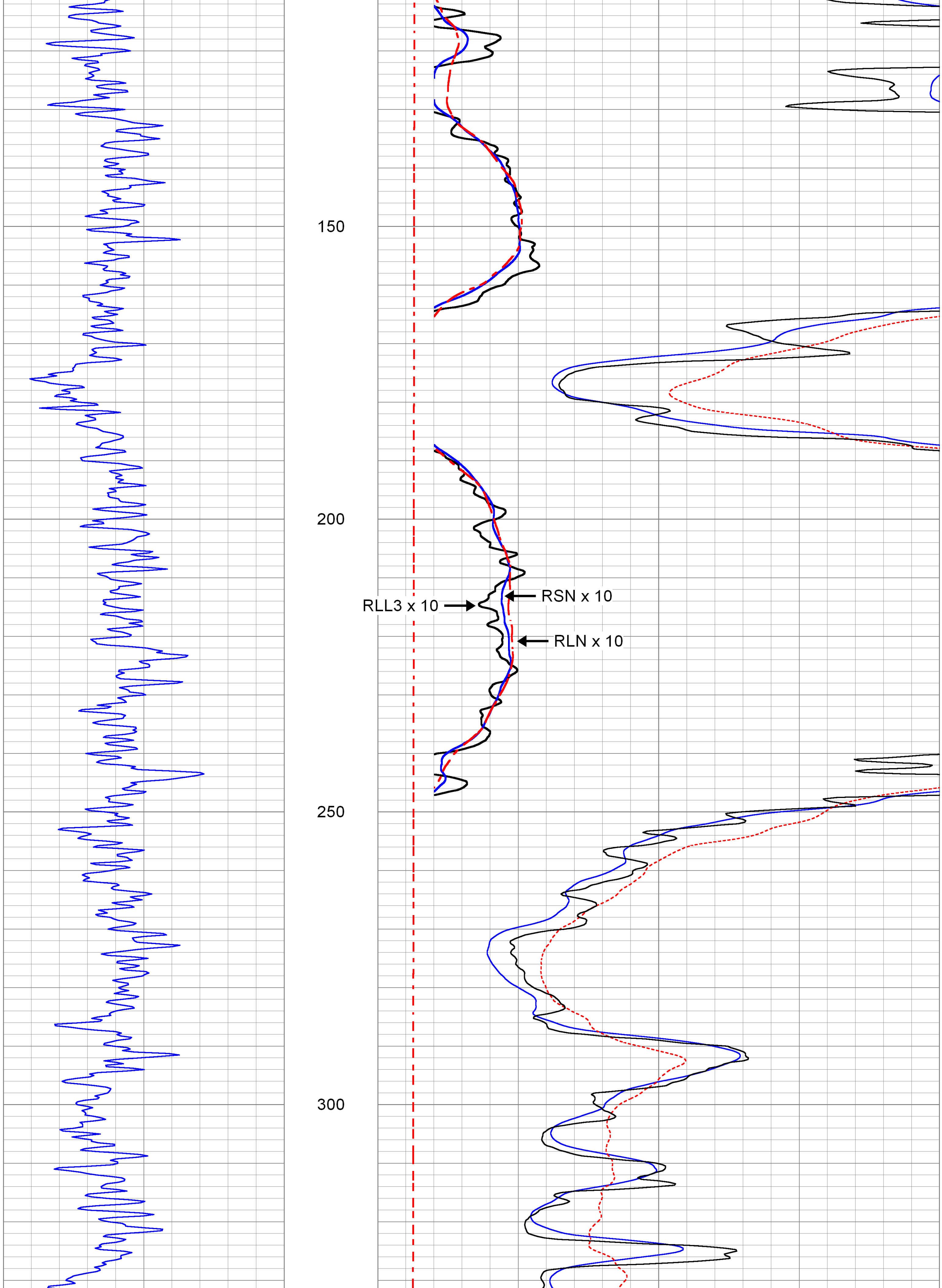
Serial Number:	128
Tool Model:	M&W
Performed:	Thu Nov 16 12:18:00 2017

System Reading	Calibration Reference
0.008	2.500 Ohm-m
0.015	5.000
0.154	50.000
0.787	250.000
1.646	500.000

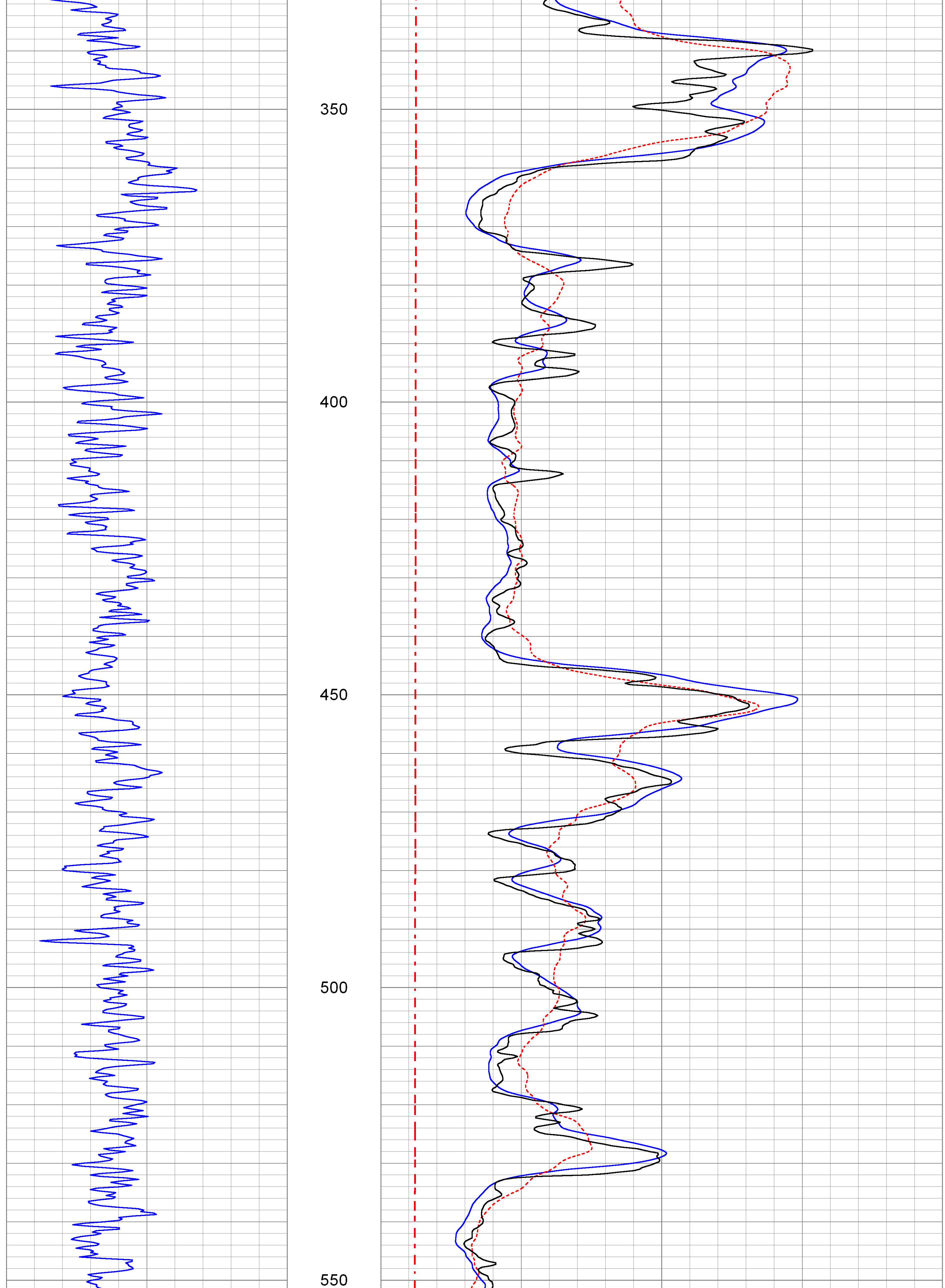
Database File	25150.db
Dataset Pathname	GUARD1
Presentation Format	guard
Dataset Creation	Thu Jan 17 13:50:05 2019
Charted by	Depth in Feet scaled 1:240

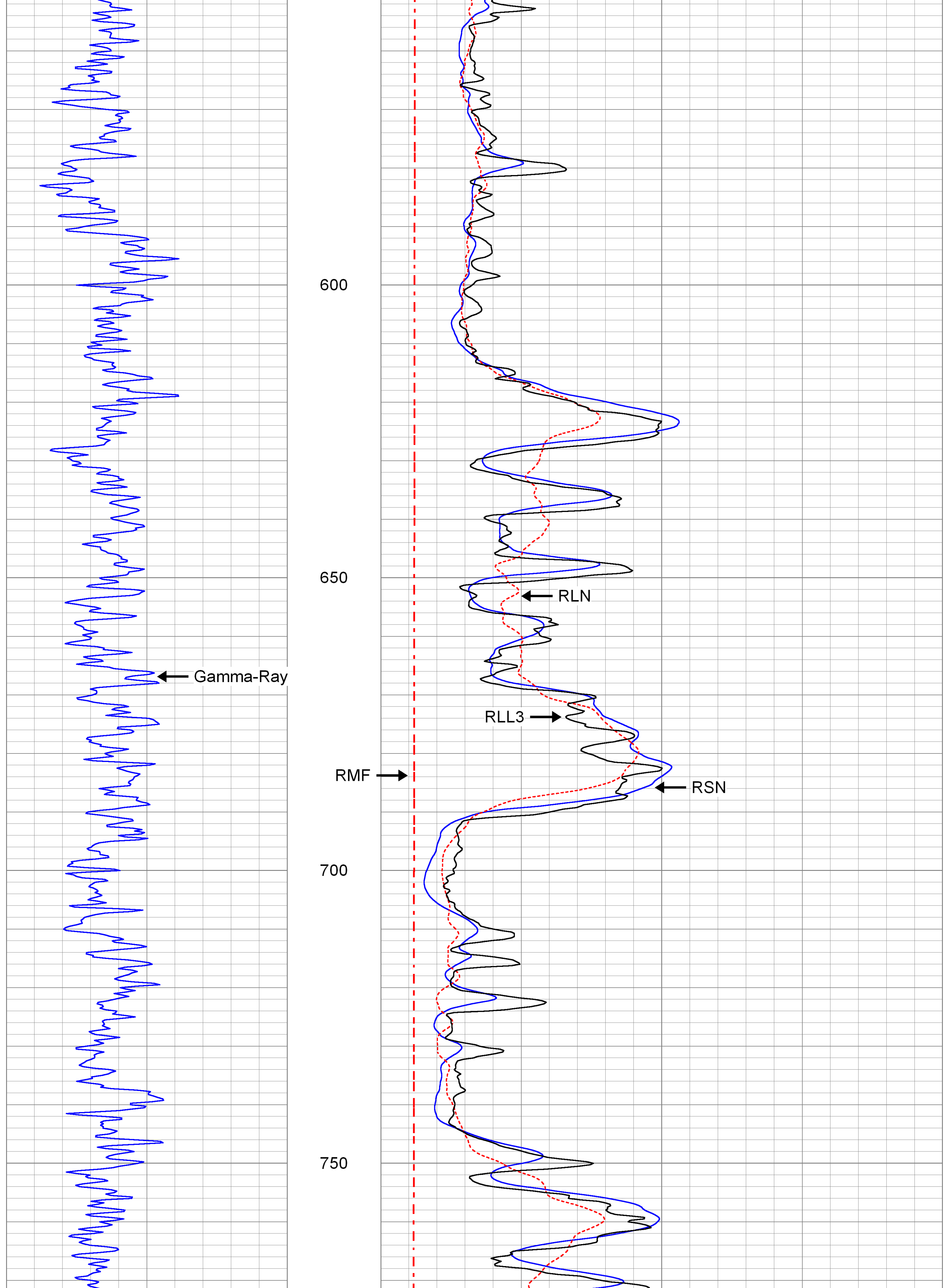
Track	Left	Curve	Right
1	70	Gamma-Ray (GAPI)	170
2	0	RSN (Ohm-m)	100
2	0	RLN (Ohm-m)	100
2	0	RMF (Ohm-m)	100
2	0	*RLL3 (Ohm-m)*	100
2	100	*RLL3 x 10 (Ohm-m)*	1000
2	100	RSN x 10 (Ohm-m)	1000
2	100	RLN x 10 (Ohm-m)	1000



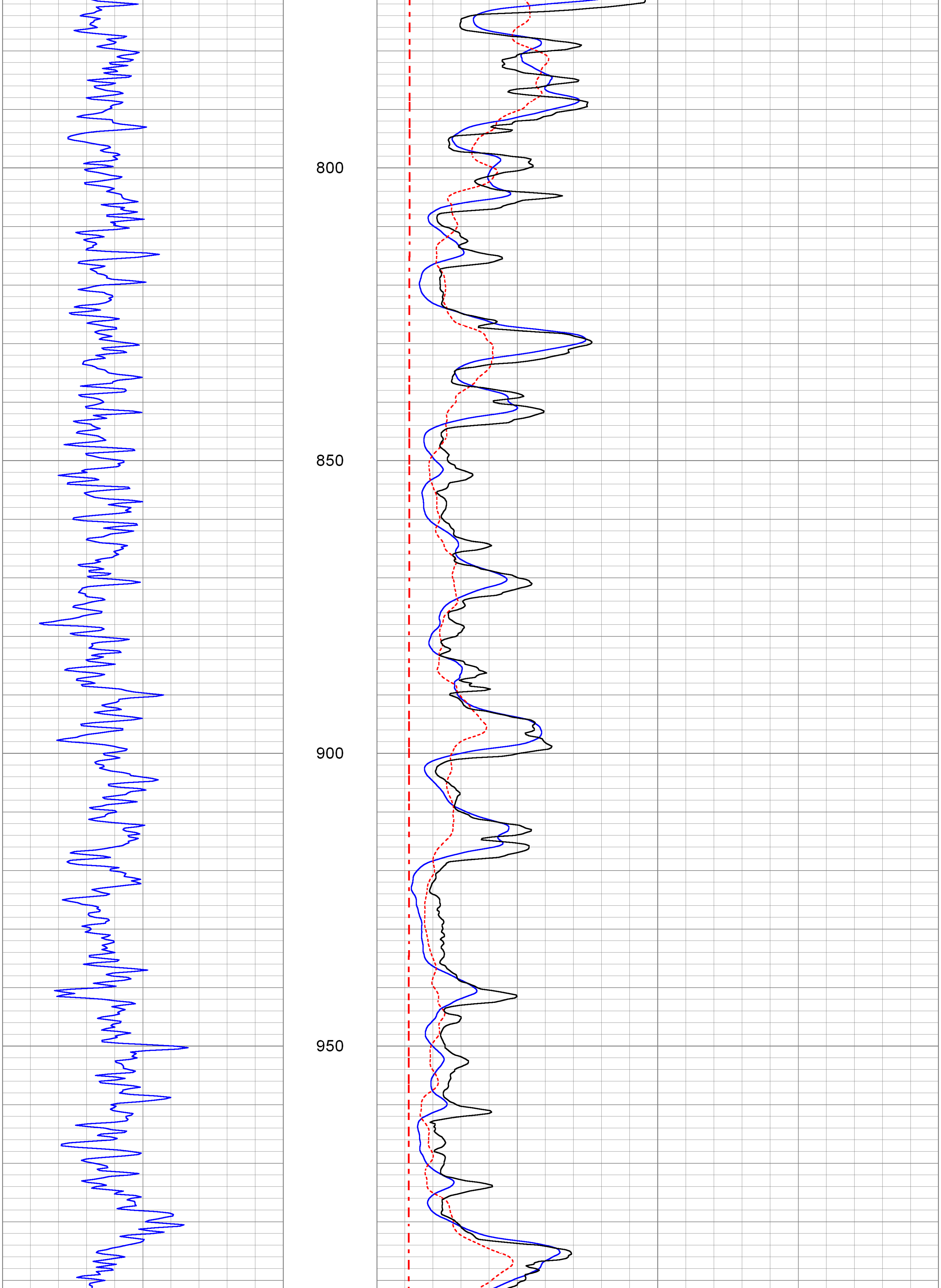


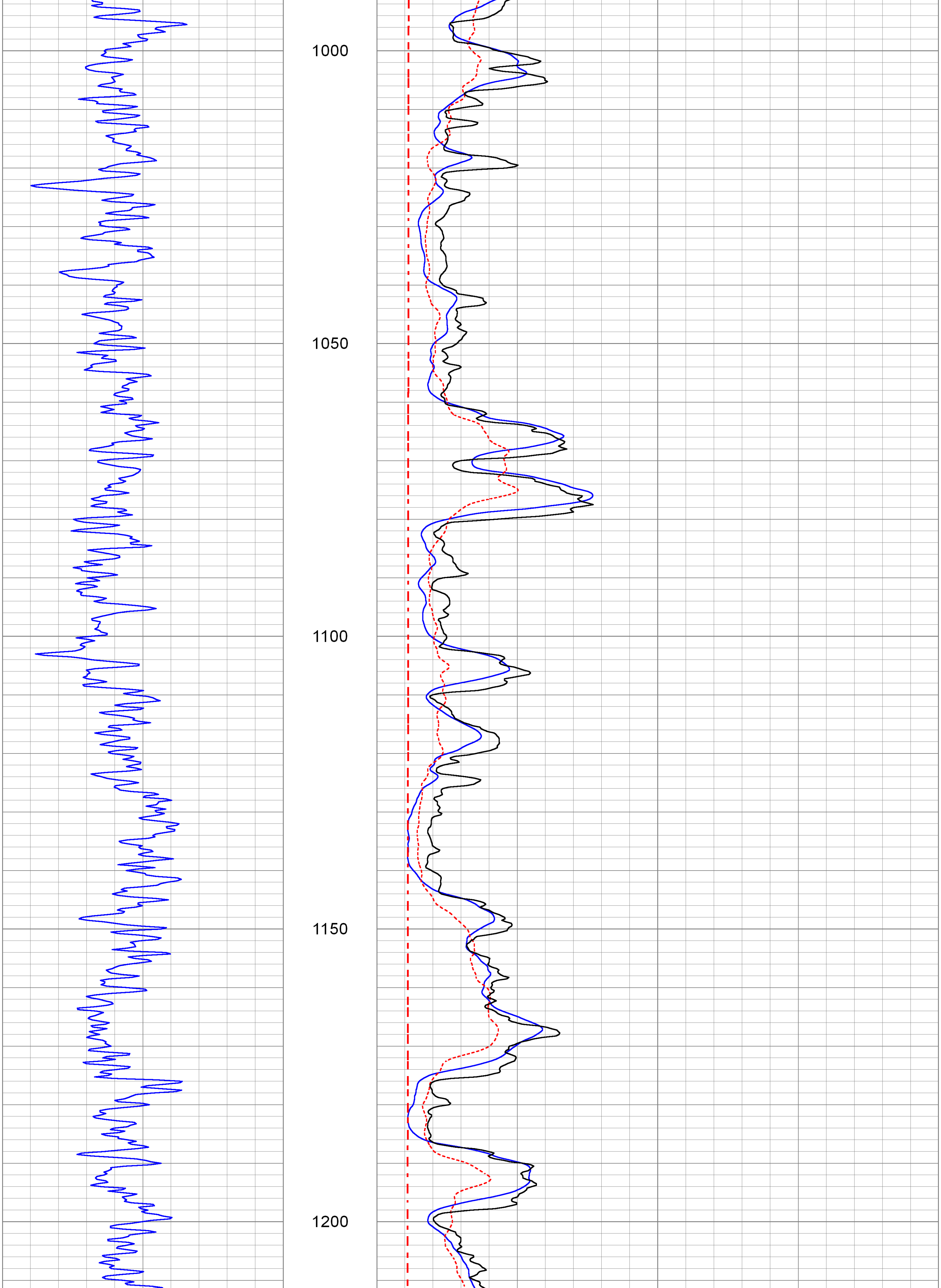
150
200
RSN x 10
RLL3 x 10
RLN x 10
250
300

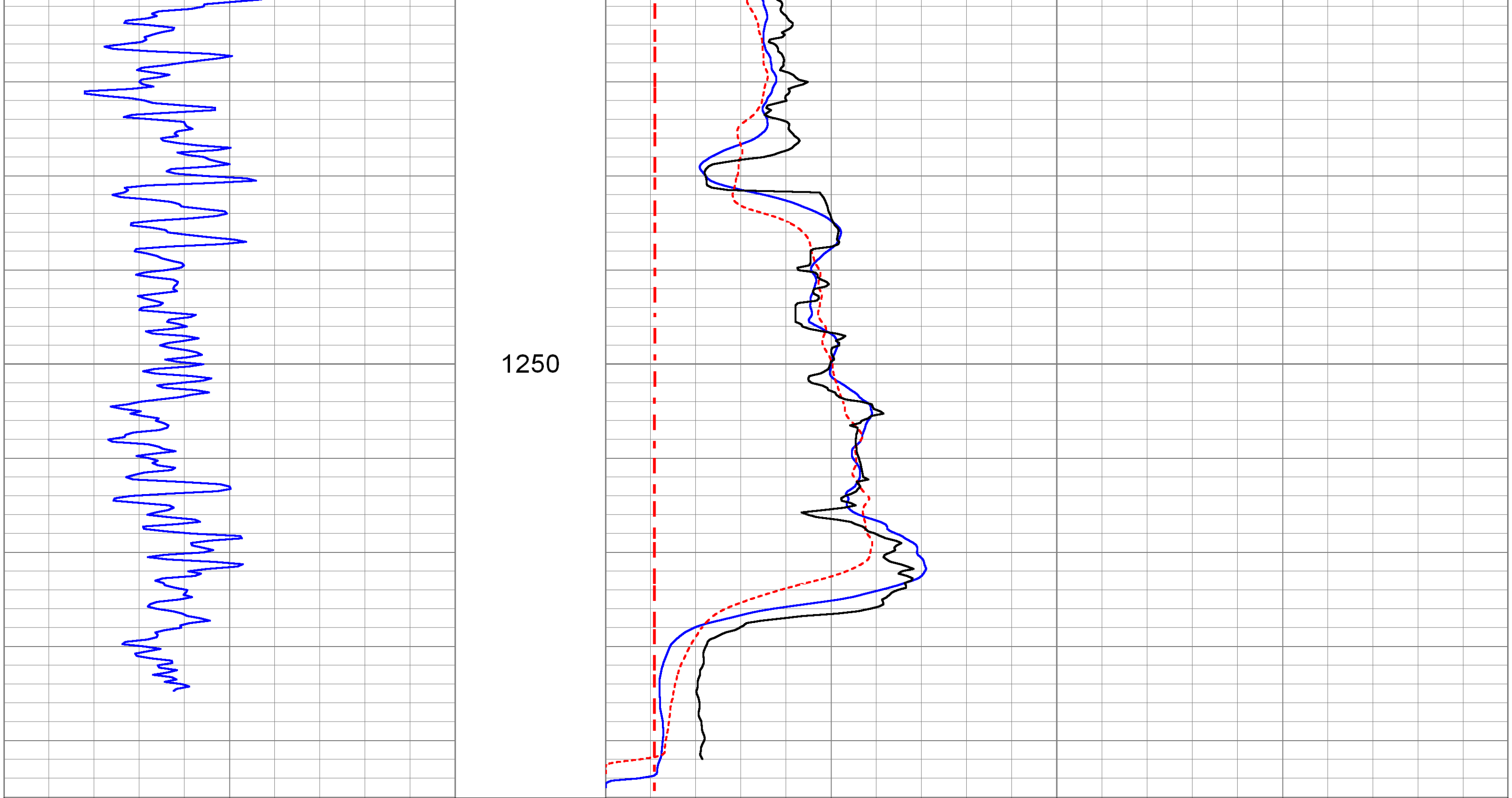

350
400
450
500
550



600
650
700
750
Gamma-Ray
RLN
RLL3
RMF
RSN


800
850
900
950


1000
1050
1100
1150
1200



70 Gamma-Ray (GAPI) 170

0 RSN (Ohm-m) 100

0 RLN (Ohm-m) 100

0 RMF (Ohm-m) 100

0 *RLL3 (Ohm-m)* 100

100 *RLL3 x 10 (Ohm-m)* 1000

100 RSN x 10 (Ohm-m) 1000

100 RLN x 10 (Ohm-m) 1000

Log Variables

DatabaseC:\ProgramData\Warrior\Data\25150.db
Dataset field/well/run1/GUARD1/_vars_

Top - Bottom

BOREID in	BOTTEMP degF	CASEOD in	CASETHCK in	PERFS	RM_MEAS_R Ohm-m	RM_MEAS_T degF
17.5	79.3	5.5	0	0	6.2	71.2

RMF Ohm-m	RSH Ohm-m	SPSHIFT mV	SRFTEMP degF	TDEPTH ft	TempGrad DegF/ft
5.96	20	7	63.5	1295	0.01235

PACIFIC SURVEYS

SONIC VELOCITY
VARIABLE DENSITY

Job No. 25150	Company	CASCADE DRILLING
	Well	IEUA PX2
	Field	POMONA
File No.	County	LOS ANGELES State CA

Location:

WEST SIDE OF MONTVUE PARK: 1634 CORDOVA ST
GPS: 34.0747462 -117.214596

Sec.   Twp.   Rge.

Other Services:

ELOG   CALIPER
LL3
TEMP
DEVIATION

Permanent Datum	G.L.		Elevation above perm. datum	Elevation
Log Measured From	G.L.	0'		K.B.
Drilling Measured From	G.L.			D.F.
				G.L.

Date	01-17-2019		
Run Number	ONE		
Depth Driller	1295'		
Depth Logger	1296.8 F		
Bottom Logged Interval	1296.8 F		
Top Log Interval	30'		
Casing Driller	20" @ 50'		
Casing Logger	50'		
Bit Size	17.5"		
Type Fluid in Hole	BENTONITE		
Density / Viscosity	9.2 / 37		
pH / Fluid Loss	-- / 7		
Source of Sample	MUD TANK		
Rm @ Meas. Temp	6.2 @ 71.2 F		
Rmf @ Meas. Temp	5.96 @ 71.2 F		
Rmc @ Meas. Temp	N/A		
Source of Rmf / Rmc	MEASURED		
Rm @ BHT	N/A		
Time Circulation Stopped	0745		
Time Logger on Bottom	1645		
Max. Recorded Temperature	72.69 F		
Equipment Number	PS-5		
Location	VENTURA		
Recorded By	CALEB VILLALOBOS		
Witnessed By	ROBERT THACKER		

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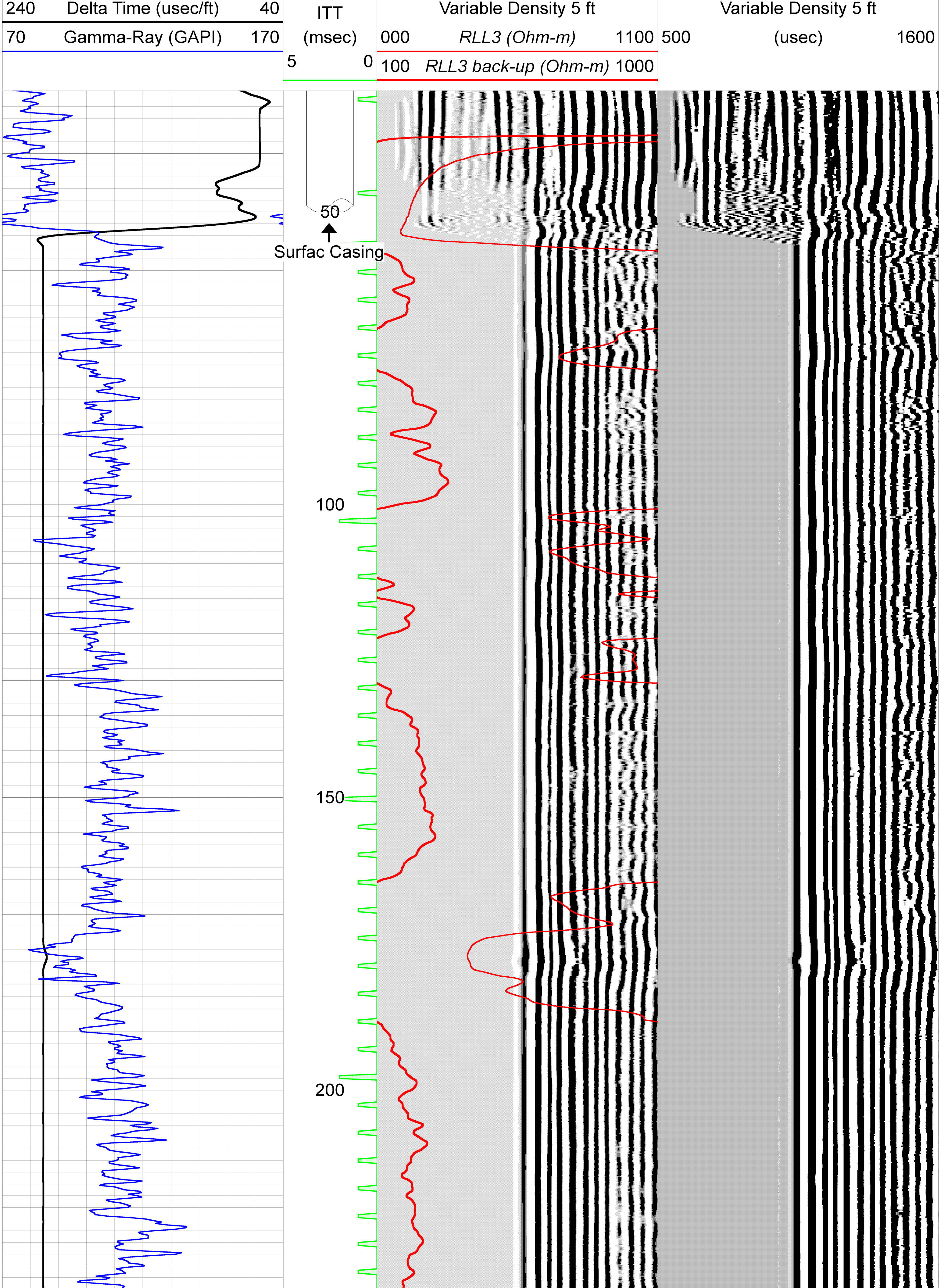
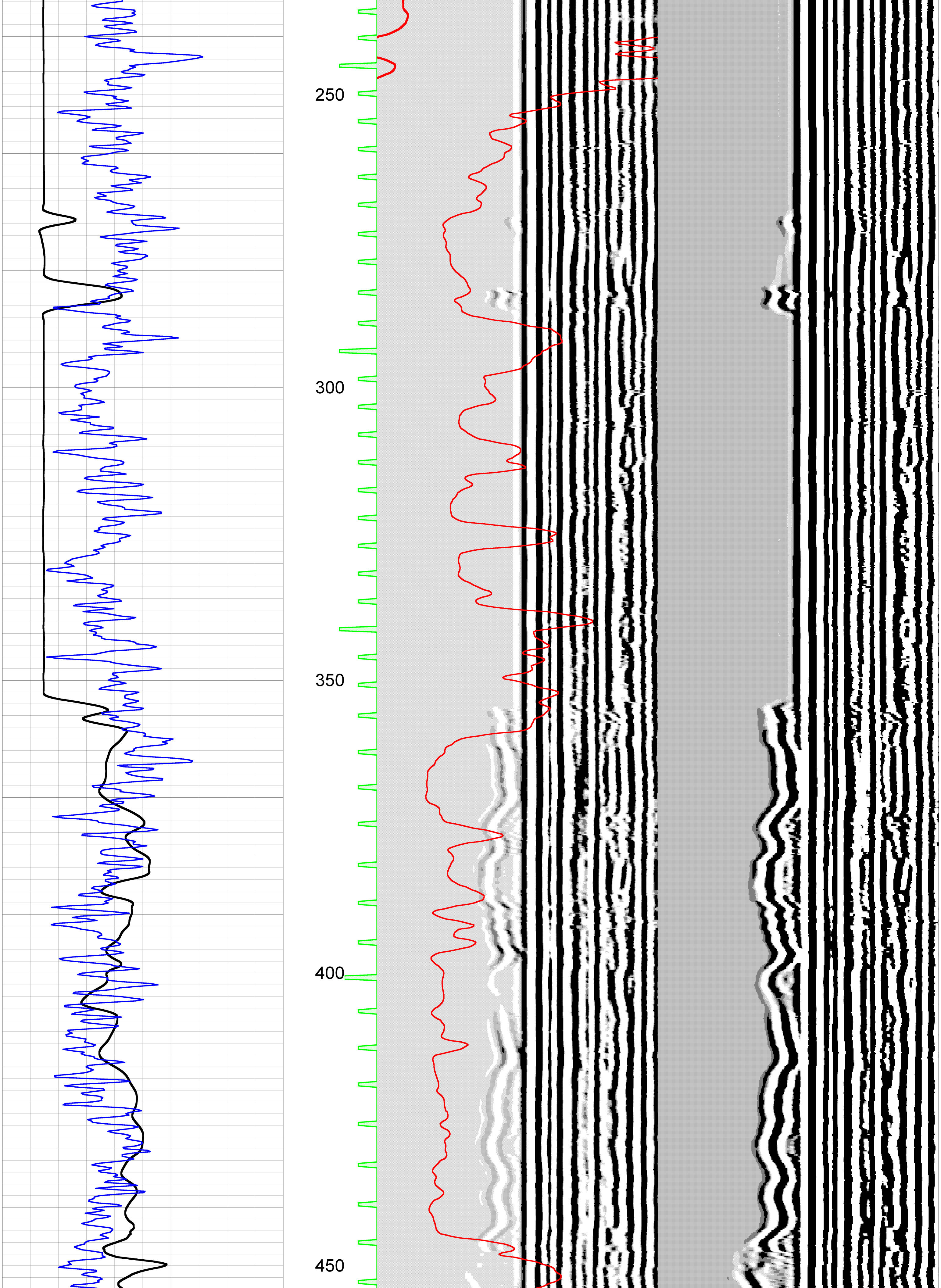
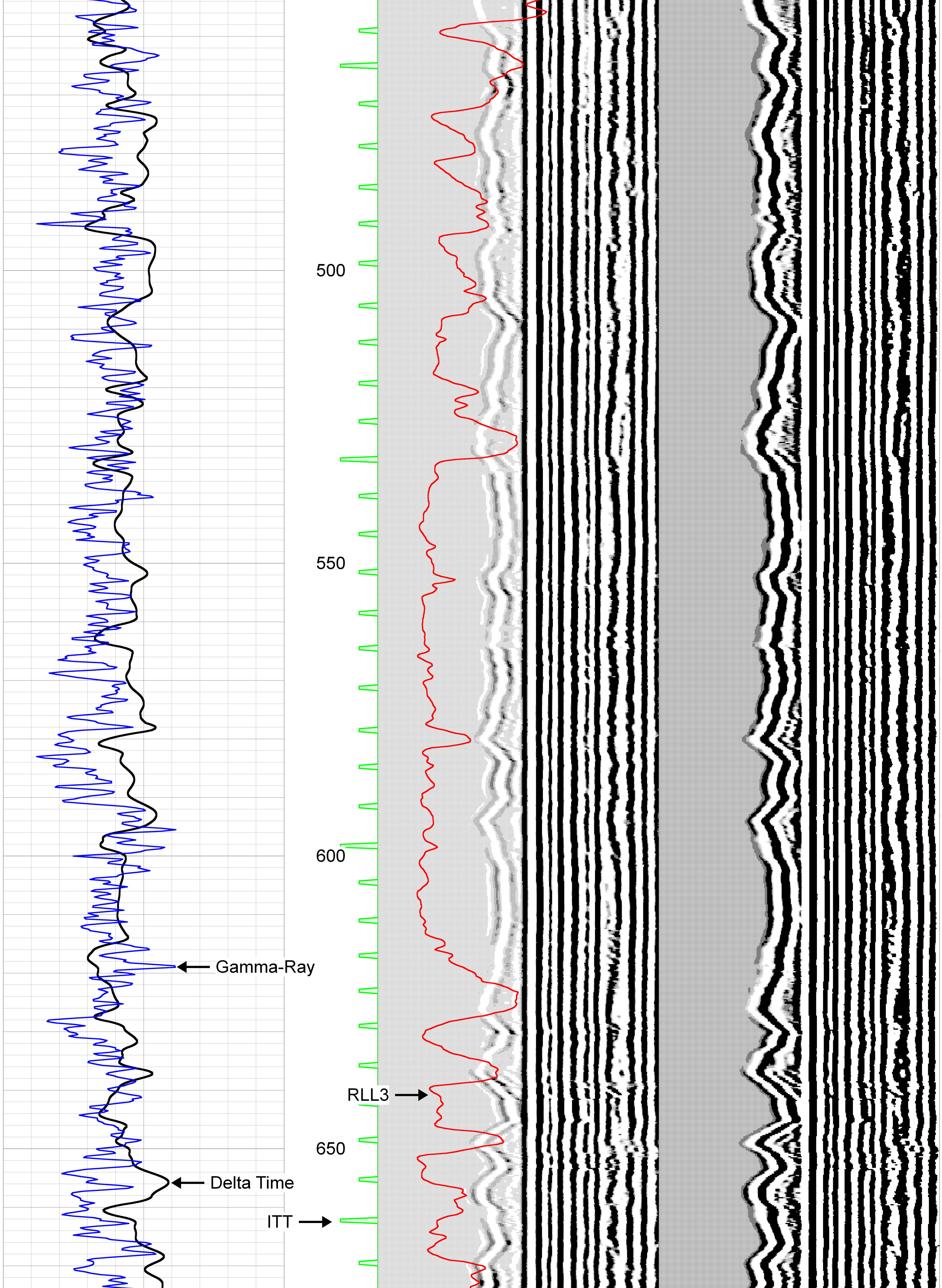
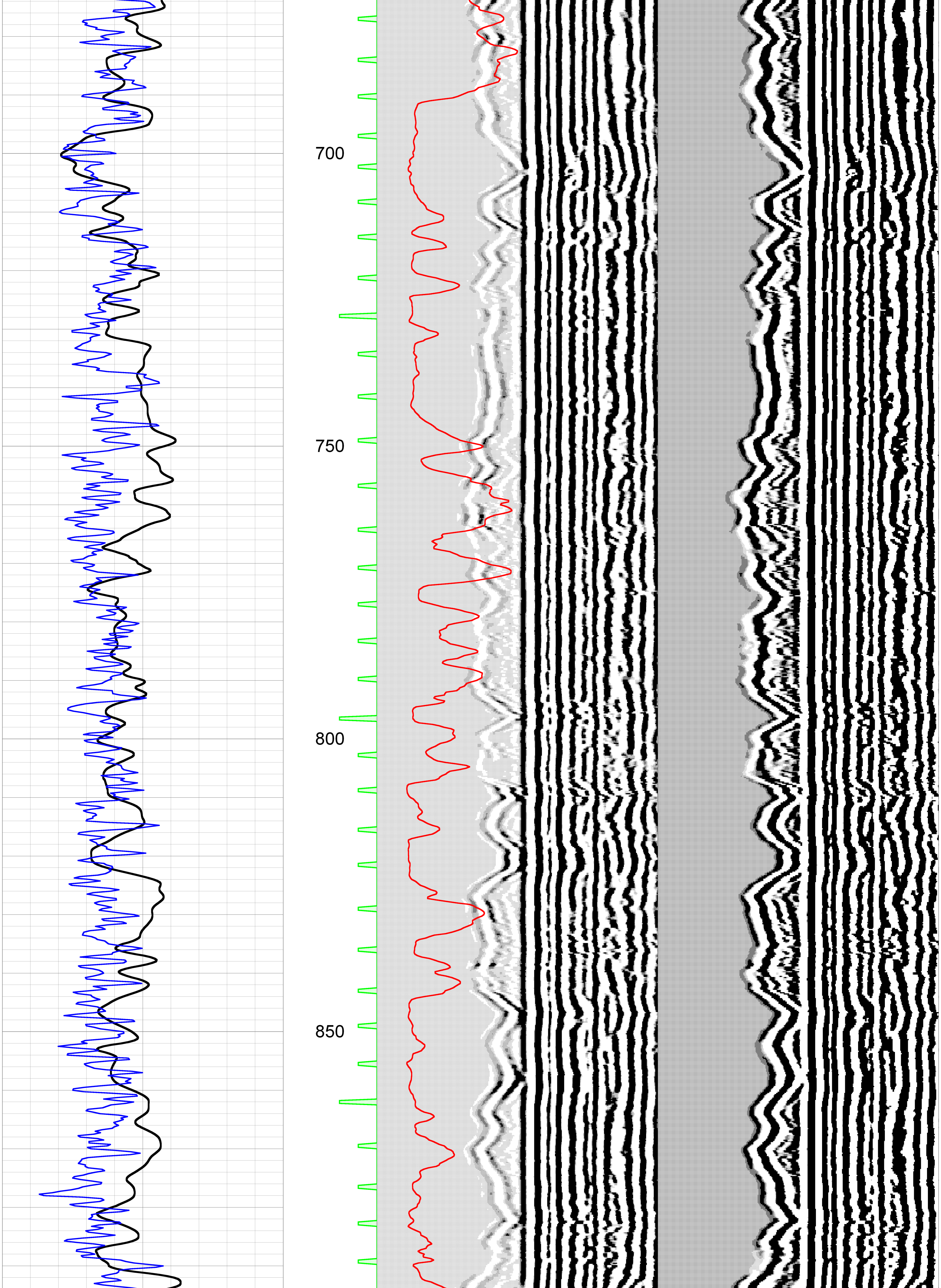
Comments

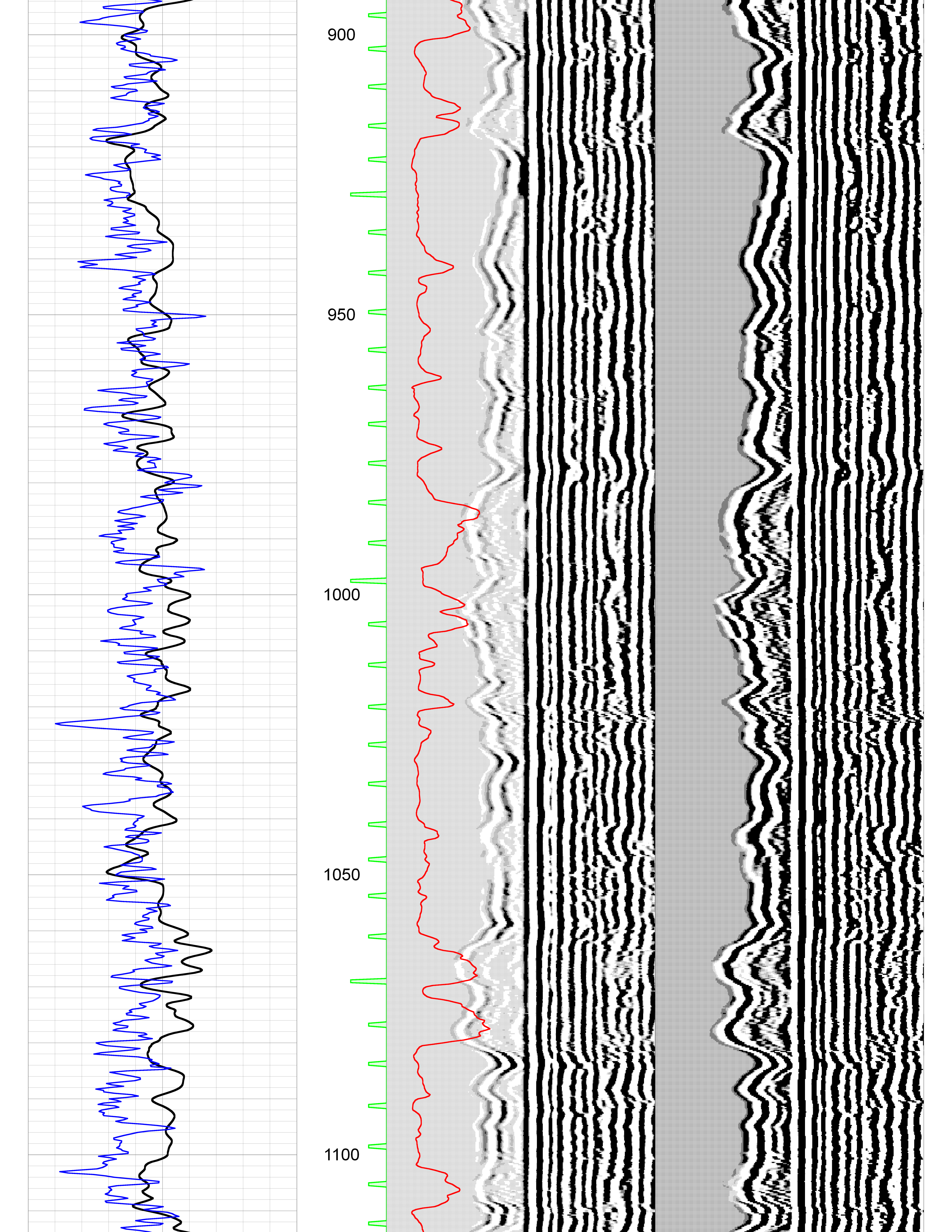
Database File	25150.db
Dataset Pathname	SONIC2
Presentation Format	slt
Dataset Creation	Thu Jan 17 16:43:12 2019
Charted by	Depth in Feet scaled 1:240

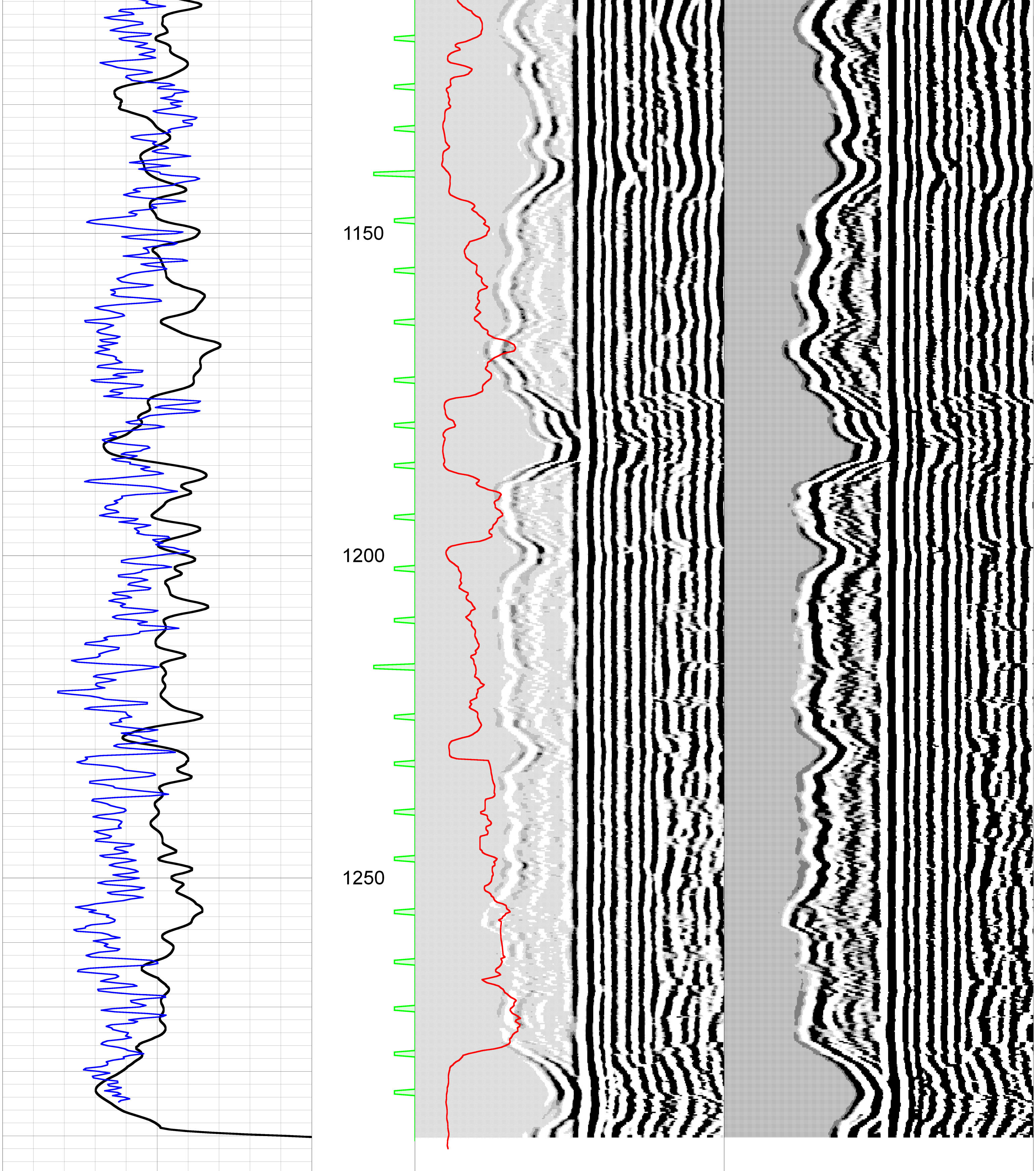

240 Delta Time (usec/ft) 40
70 Gamma-Ray (GAPI) 170
ITT
(msec)
5 0
Variable Density 5 ft
000 RLL3 (Ohm-m) 1100
100 RLL3 back-up (Ohm-m) 1000
Variable Density 5 ft
500 (usec) 1600
50
Surfac Casing
100
150
200


250
300
350
400
450


500
550
600
650
Gamma-Ray
Delta Time
ITT
RLL3


700
750
800
850


900
950
1000
1050
1100



Track	Scale left	Curve	Scale right
1	240	Delta Time (usec/ft)	40
1	70	Gamma-Ray (GAPI)	170
2	5	ITT (msec)	0
3	500	Variable Density 5 ft (usec)	1600
3	0	*RLL3 (Ohm-m)*	100
3	100	*RLL3 back-up (Ohm-m)*	1000
4	500	Variable Density 5 ft (usec)	1600

Log Variables

Database C:\ProgramData\Warrior\Data\25150.db
Dataset field/well/run1/SONIC2/_vars_

Top - Bottom

BHTEMP_Src TEMP	BOREID in 17.5	BOTTEMP degF 79.3	CASEOD in 5.5	CASETHCK in 0	COMPACT 1	FloatGate 0
PERFS 0	RM_MEAS_R Ohm-m 6.2	RM_MEAS_T degF 71.2	RMF Ohm-m 5.96	RSH Ohm-m 20	SPSHIFT mV 7	SRFTEMP degF 63.5
SVFLUID usec/ft 189	SVMATRIX usec/ft 47.6	TDEPTH ft 1295	TempGrad DegF/ft 0.01235			

PACIFIC SURVEYS

TEMPERATURE
DIFFERENTIAL TEMP

Job No. 25150	Company	CASCADE DRILLING
	Well	IEUA PX2
	Field	POMONA
File No.	County	LOS ANGELES State CA

Location:

WEST SIDE OF MONTVUE PARK: 1634 CORDOVA ST
GPS: 34.0747462 -117.214596

Sec. Twp. Rge.

Other Services:
ELOG CALIPER
LL3
SONIC
DEVIATION

Permanent Datum	G.L.		Elevation	Elevation
Log Measured From	G.L.	0'	above perm. datum	K.B.
Drilling Measured From	G.L.			D.F.
				G.L.

Date	01-17-2019		
Run Number	ONE		
Depth Driller	1295'		
Depth Logger	1290.8'		
Bottom Logged Interval	1290.8'		
Top Log Interval	0'		
Casing Driller	20" @ 50'		
Casing Logger	50'		
Bit Size	17.5"		
Type Fluid in Hole	BENTONITE		
Density / Viscosity	9.2 / 37		
pH / Fluid Loss	-- / 7		
Source of Sample	MUD TANK		
Rm @ Meas. Temp	6.2 @ 71.2 F		
Rmf @ Meas. Temp	5.96 @ 71.2 F		
Rmc @ Meas. Temp	N/A		
Source of Rmf / Rmc	MEASURED		
Rm @ BHT	N/A		
Time Circulation Stopped	0745		
Time Logger on Bottom	1515		
Max. Recorded Temperature	72.69 F		
Equipment Number	PS-5		
Location	VENTURA		
Recorded By	CALEB VILLALOBOS		
Witnessed By	ROBERT THACKER		

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Comments

Calibration Report

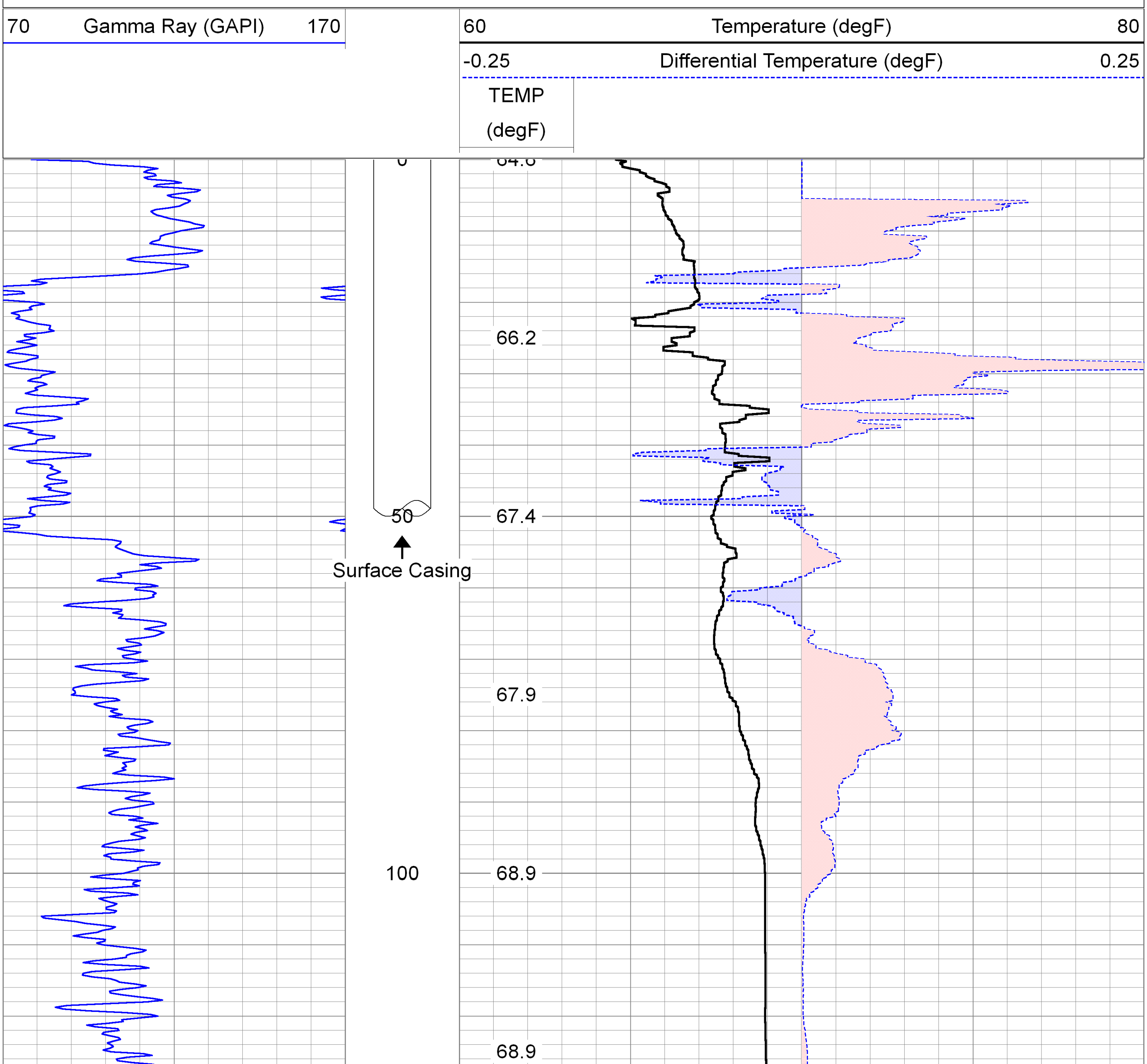
Database File 25150.db
Dataset Pathname TEMP
Dataset Creation Thu Jan 17 15:39:54 2019

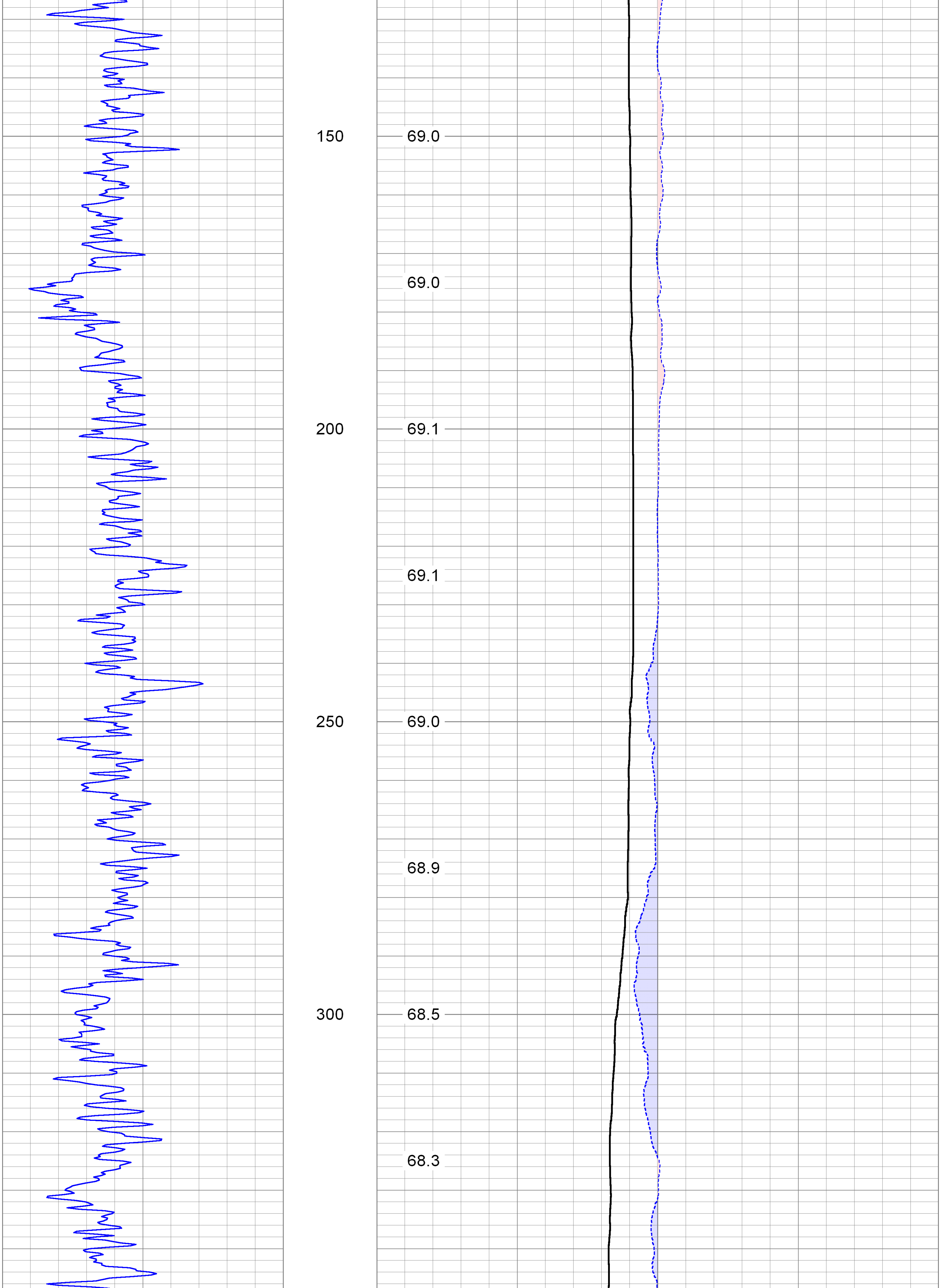
Inclinometer Calibration Report

Performed: Tue Oct 08 14:21:34 2013

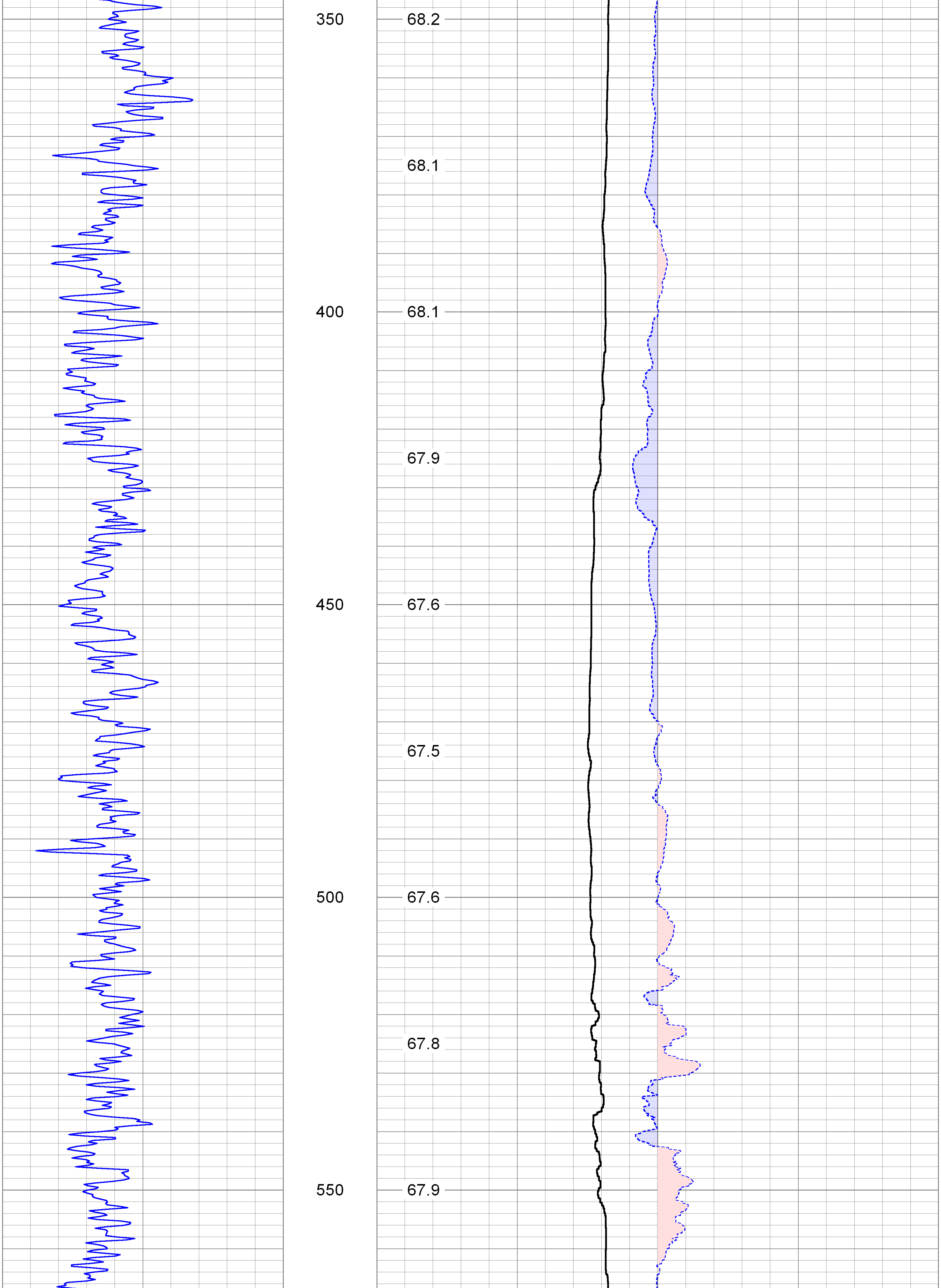
	Low Read.	High Read.		Low Ref.	High Ref.	
X Accelerometer	-90.00	90.00	deg	-1.00	1.00	gee
Y Accelerometer	-90.00	90.00	deg	-1.00	1.00	gee
Z Accelerometer			deg			gee

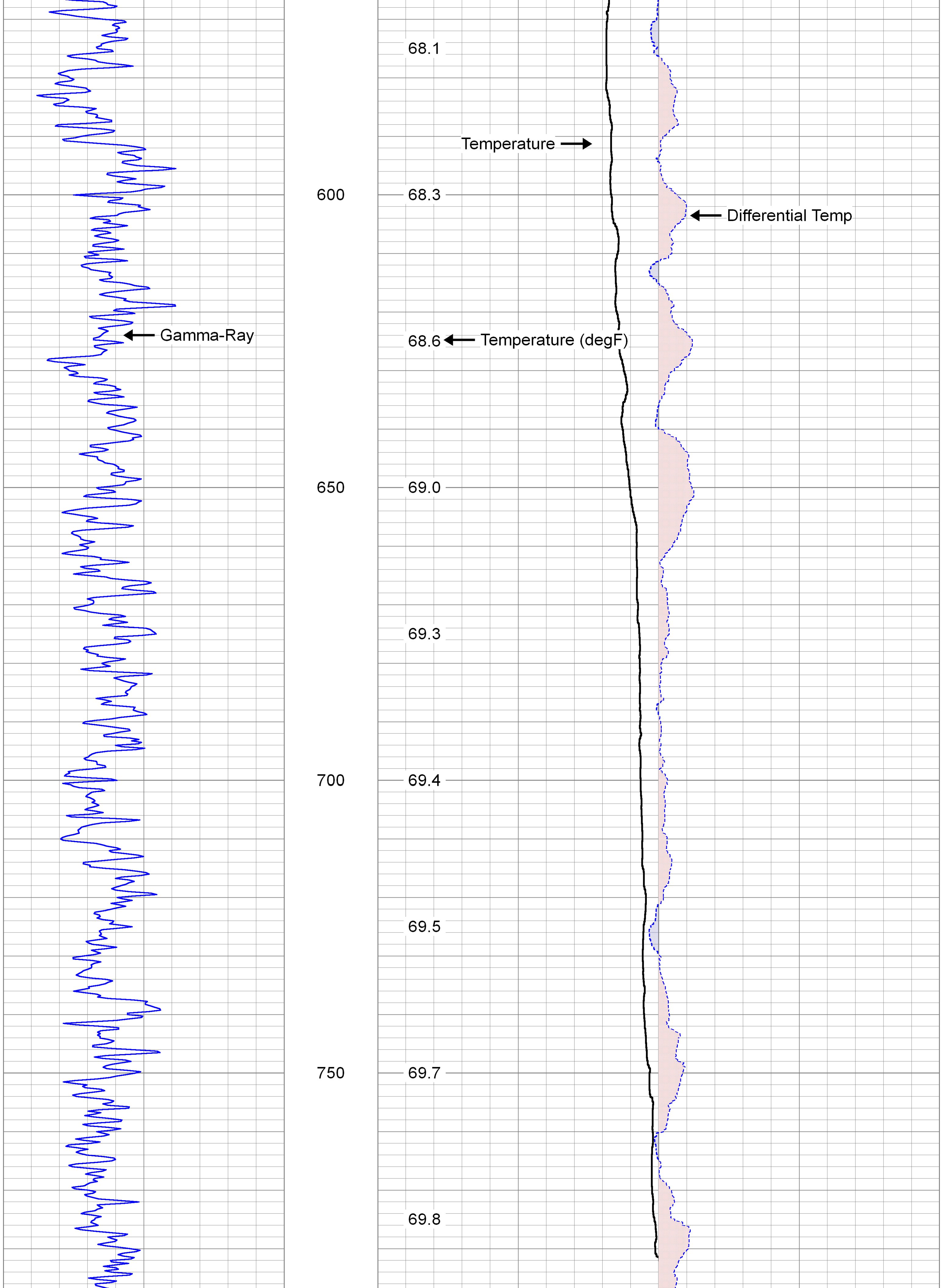
Database File	25150.db
Dataset Pathname	TEMP
Presentation Format	temp
Dataset Creation	Thu Jan 17 15:39:54 2019
Charted by	Depth in Feet scaled 1:240

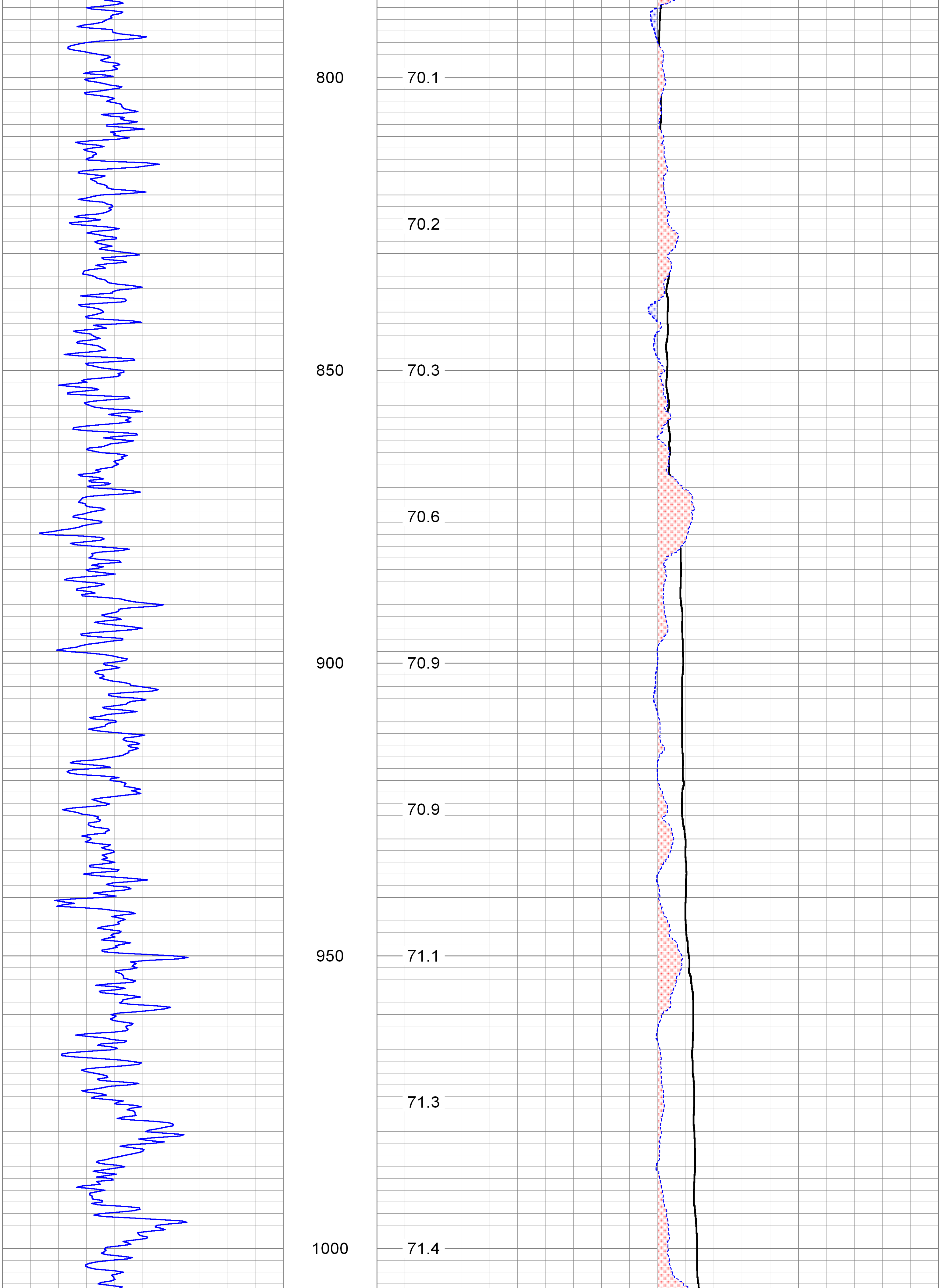


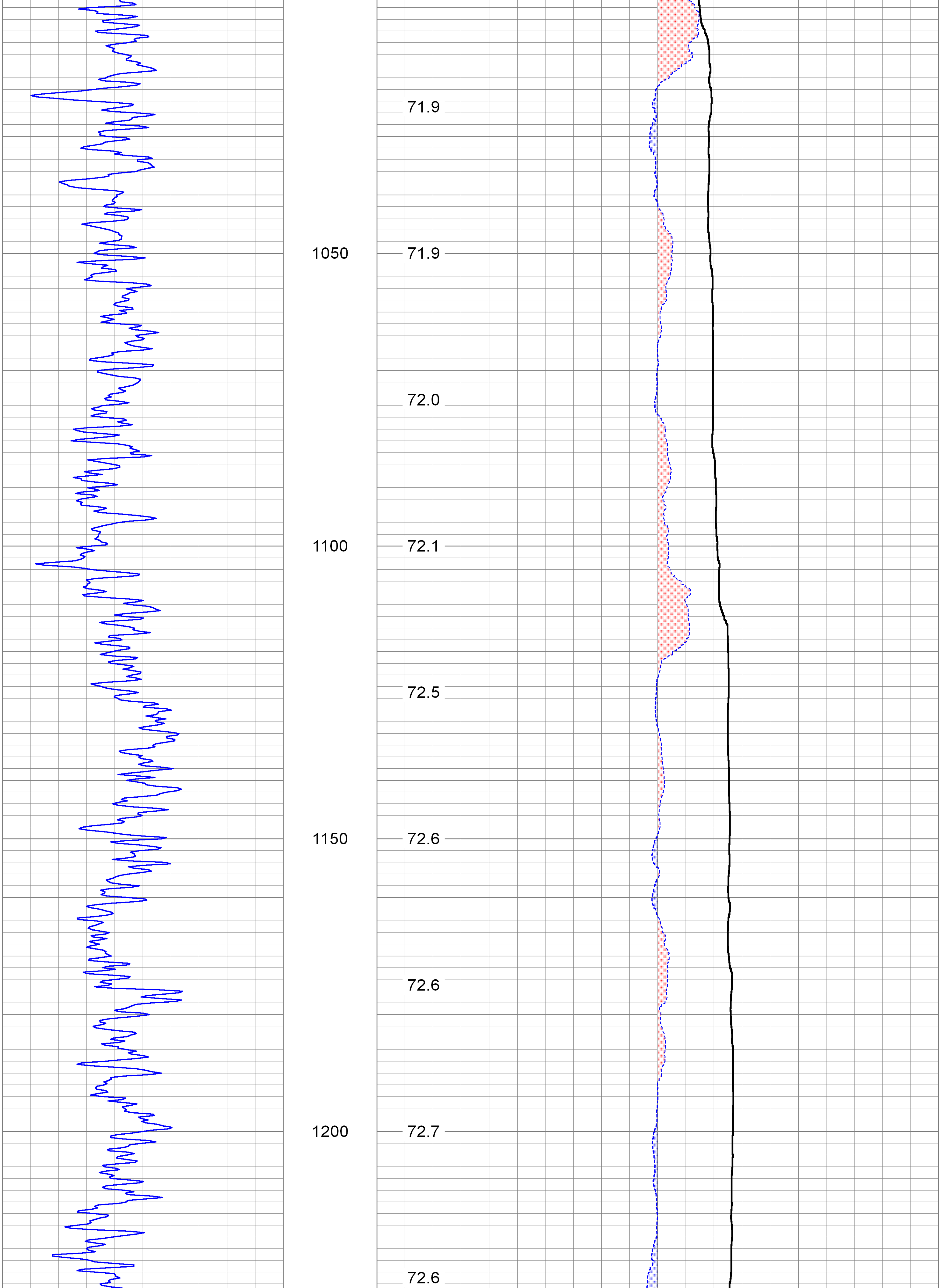


150
69.0
69.0
200
69.1
69.1
250
69.0
68.9
300
68.5
68.3

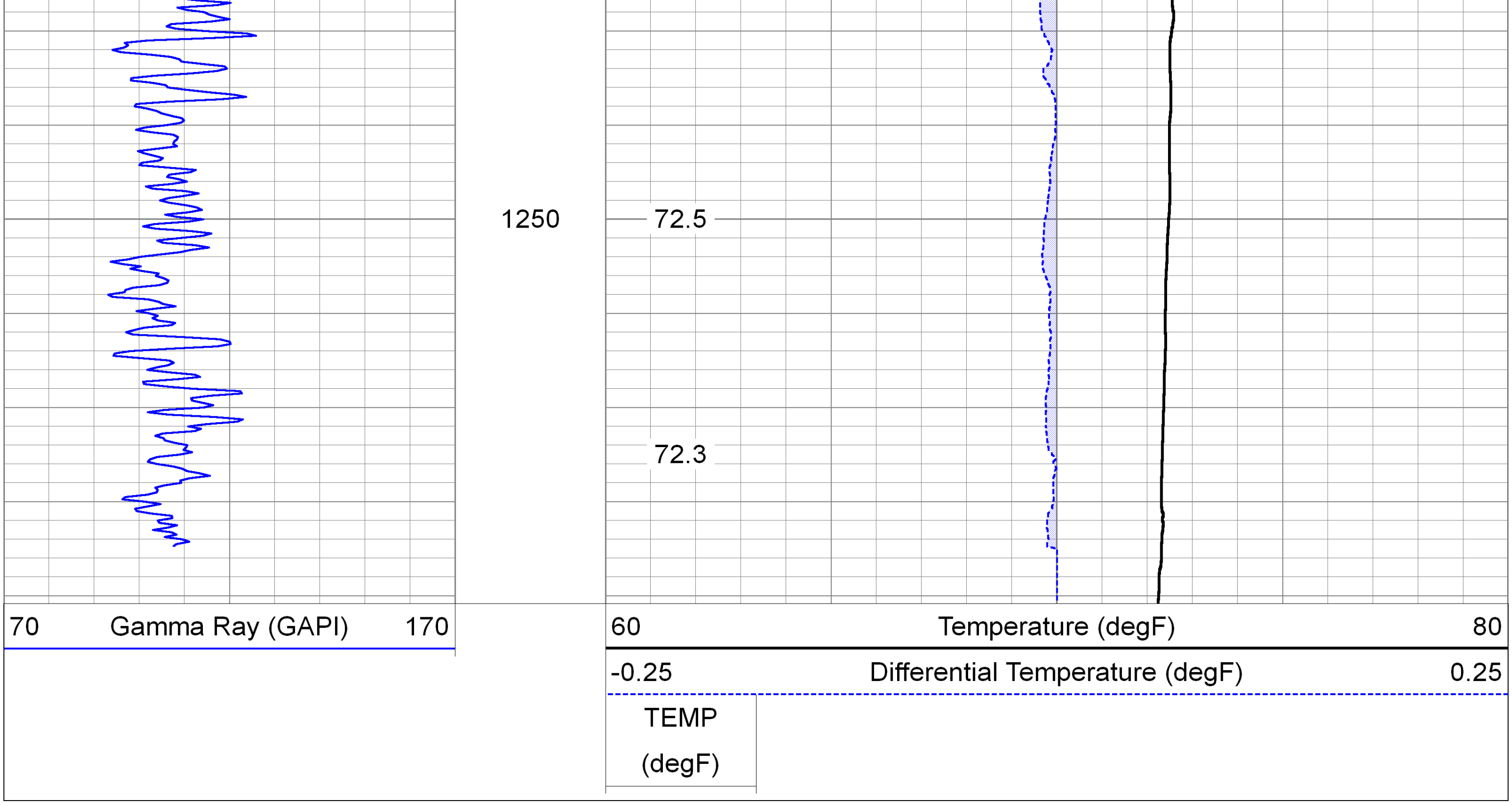

350
68.2
68.1
400
68.1
67.9
450
67.6
67.5
500
67.6
67.8
550
67.9


Gamma-Ray
Temperature
Temperature (degF)
Differential Temp
600
650
700
750
68.1
68.3
68.6
69.0
69.3
69.4
69.5
69.7
69.8


800
70.1
70.2
850
70.3
70.6
900
70.9
70.9
950
71.1
71.3
1000
71.4



71.9
1050
71.9
72.0
1100
72.1
72.5
1150
72.6
72.6
1200
72.7
72.6



Log Variables

DatabaseC:\ProgramData\Warrior\Data\25150.db
Dataset field/well/run1/TEMP/_vars_

Top - Bottom

BHTEMP_Src TEMP	BOREID in 17.5	BOTTEMP degF 79.3	CASEOD in 5.5	CASETHCK in 0	PERFS 0	RM_MEAS_R Ohm-m 6.2
RM_MEAS_T degF 71.2	RMF Ohm-m 5.96	RSH Ohm-m 20	SPSHIFT mV 7	SRFTEMP degF 63.5	TDEPTH ft 1295	TempGrad DegF/ft 0.01235

PACIFIC SURVEYS

DEVIATION SURVEY

Job No. 25150

File No.

Company CASCADE DRILLING

Well IEUA PX2

Field POMONA

County LOS ANGELES State CA

Location:

WEST SIDE OF MONTVUE PARK: 1634 CORDOVA ST
GPS: 34.0747462 -117.214596

Sec. Twp. Rge.

Other Services:

ELOG CALIPER
LL3
SONIC
TMP

Permanent Datum G.L.
Log Measured From G.L. 0'
Drilling Measured From G.L.

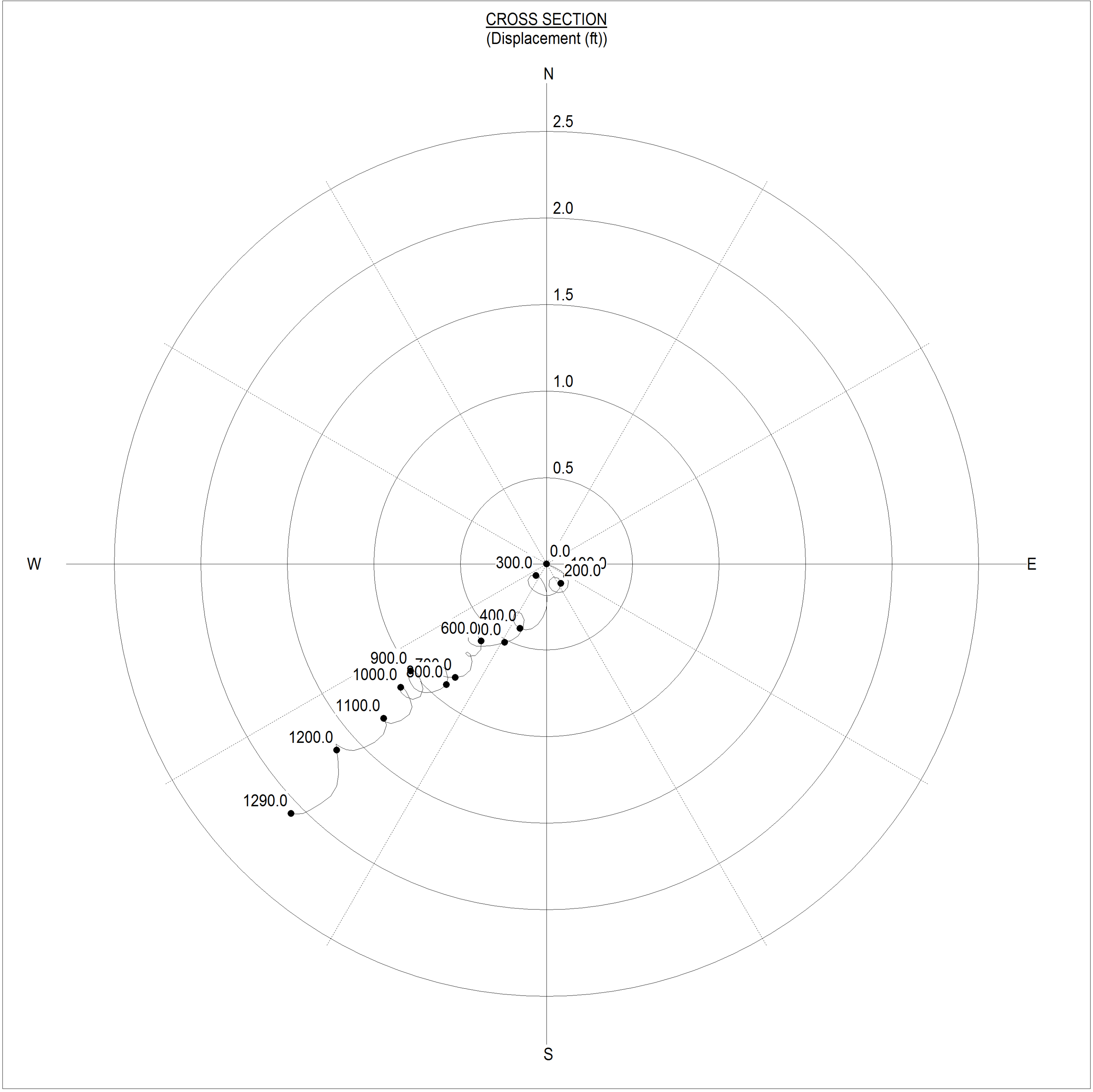
Elevation above perm. datum

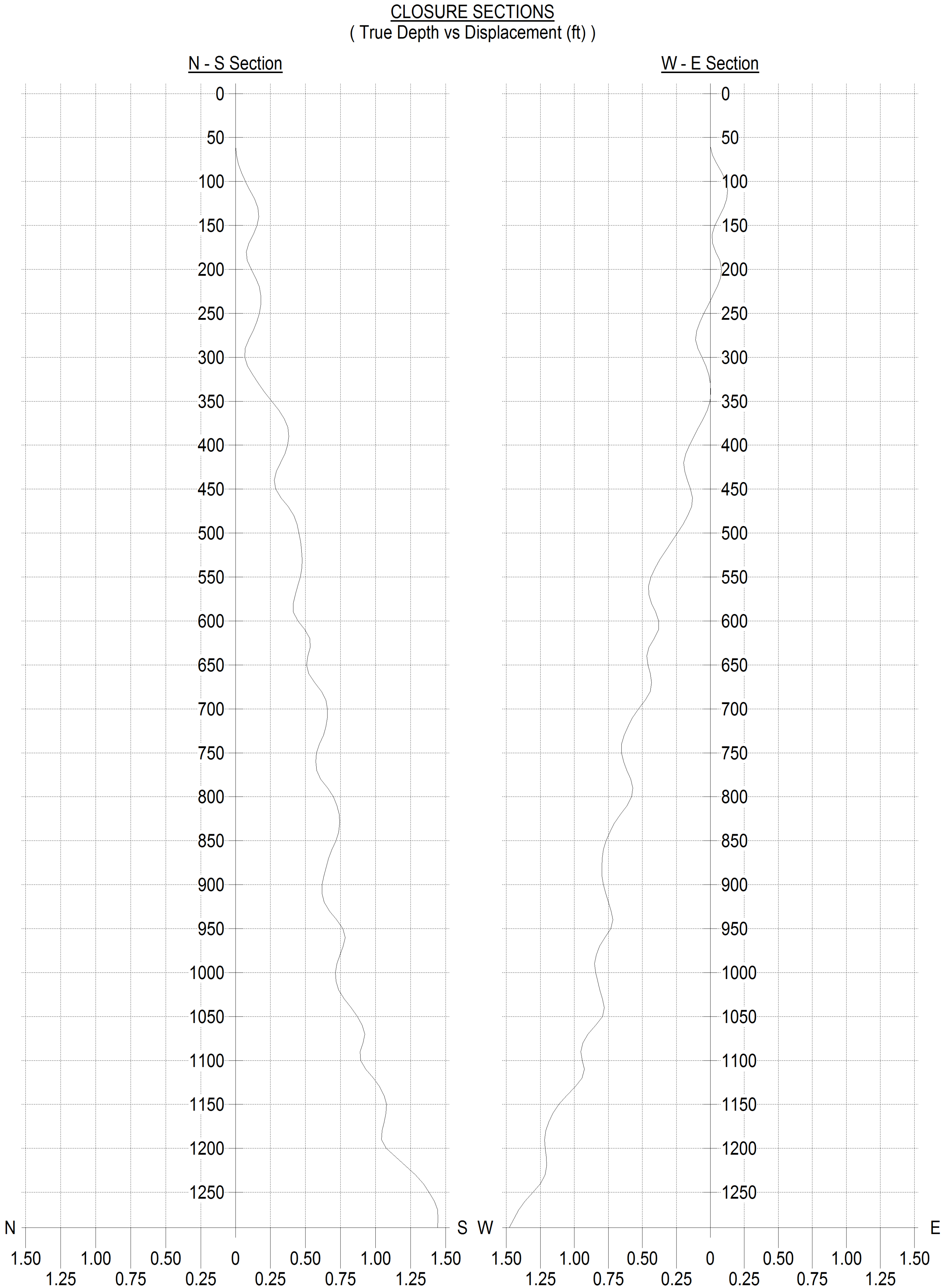
Elevation
K.B.
D.F.
G.L.

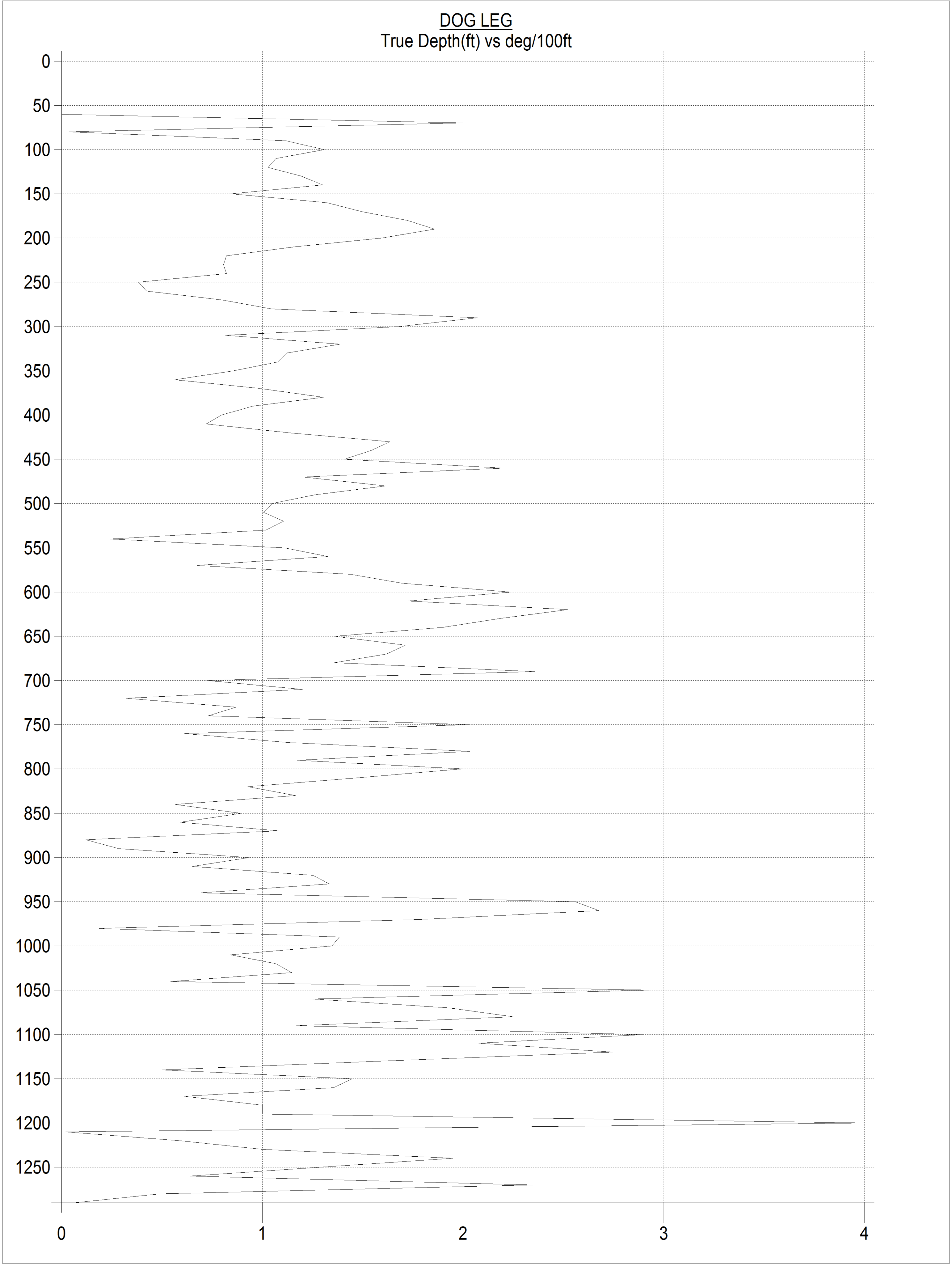
Date	01-17-2019		
Run Number	ONE		
Depth Driller	1295'		
Depth Logger	1295'		
Bottom Logged Interval	1295.6'		
Top Log Interval	0'		
Casing Driller	20" @ 50'		
Casing Logger	50'		
Bit Size	17.5"		
Type Fluid in Hole	BENTONITE		
Density / Viscosity	9.2 / 37		
pH / Fluid Loss	-- / 7		
Source of Sample	MUD TANK		
Rm @ Meas. Temp	6.2 @ 71.2 F		
Rmf @ Meas. Temp	5.96 @ 71.2 F		
Rmc @ Meas. Temp	N/A		
Source of Rmf / Rmc	MEASURED		
Rm @ BHT	N/A		
Time Circulation Stopped	0745		
Time Logger on Bottom	1230		
Max. Recorded Temperature	72.69 F		
Equipment Number	PS-5		
Location	VENTURA		
Recorded By	CALEB VILLALOBOS		
Witnessed By	ROBERT THACKER		

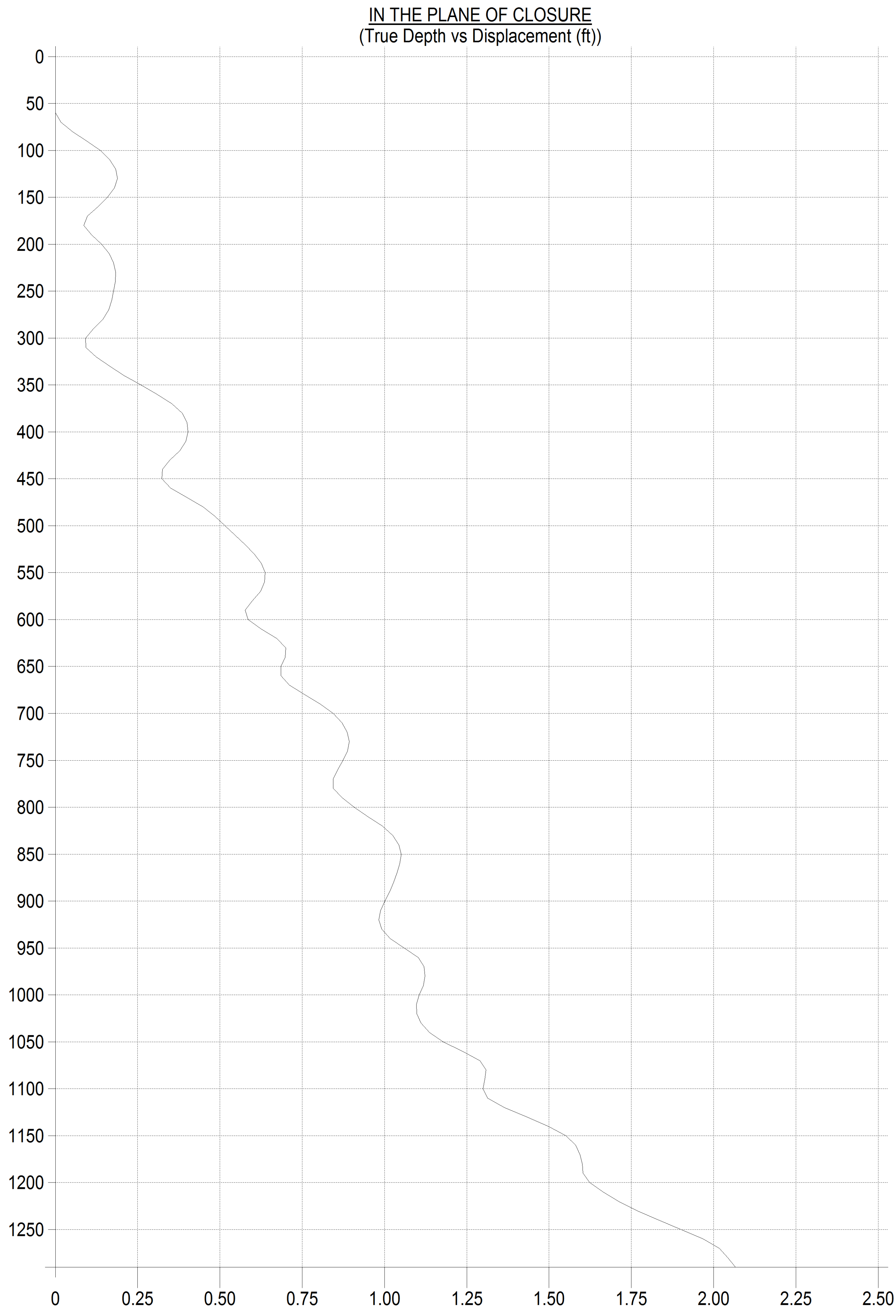
<<< Fold Here >>>

Comments


CROSS SECTION
(Displacement (ft))
N
S
E
W
2.5
2.0
1.5
1.0
0.5
0.0
200.0
300.0
400.0
600.0
900.0
1000.0
1100.0
1200.0
1290.0


CLOSURE SECTIONS
(True Depth vs Displacement (ft))
N - S Section
W - E Section
0
50
100
150
200
250
300
350
400
450
500
550
600
650
700
750
800
850
900
950
1000
1050
1100
1150
1200
1250
N
S
W
E
1.50
1.25
1.00
0.75
0.50
0.25
0
0.25
0.50
0.75
1.00
1.25
1.50


DOG LEG
True Depth(ft) vs deg/100ft
0
50
100
150
200
250
300
350
400
450
500
550
600
650
700
750
800
850
900
950
1000
1050
1100
1150
1200
1250
0
1
2
3
4


IN THE PLANE OF CLOSURE
(True Depth vs Displacement (ft))
0
50
100
150
200
250
300
350
400
450
500
550
600
650
700
750
800
850
900
950
1000
1050
1100
1150
1200
1250
0
0.25
0.50
0.75
1.00
1.25
1.50
1.75
2.00
2.25
2.50

TVD Report (Minimum Curvature Method)

Database File 25150.db
Dataset Pathname ./././_tvd_/1
Dataset Creation Thu Jan 17 14:58:05 2019

Meas. Depth (ft)	Incline (deg)	Azimuth (deg)	TVD (ft)	North (ft)	East (ft)	Dog Leg (deg/100ft)	Closure Dis (ft)	Closure Dir (deg)	Vert. Sec. (ft)
		Vertical Section Direction 0.00							
0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.0	0.00	67.60	10.00	0.00	0.00	0.00	0.00	0.00	0.00
20.0	0.00	179.00	20.00	0.00	0.00	0.00	0.00	0.00	0.00
30.0	0.00	228.50	30.00	0.00	0.00	0.00	0.00	0.00	0.00
40.0	0.00	224.20	40.00	0.00	0.00	0.00	0.00	0.00	0.00
50.0	0.00	279.80	50.00	0.00	0.00	0.00	0.00	0.00	0.00
60.0	0.00	90.40	60.00	0.00	0.00	0.00	0.00	0.00	0.00
70.0	0.20	112.50	70.00	-0.01	0.02	2.00	0.02	-67.50	-0.01
80.0	0.20	113.60	80.00	-0.02	0.05	0.04	0.05	-67.13	-0.02
90.0	0.30	125.30	90.00	-0.04	0.09	1.12	0.10	-63.62	-0.04
100.0	0.20	145.20	100.00	-0.07	0.12	1.31	0.14	-58.41	-0.07
110.0	0.20	176.20	110.00	-0.10	0.13	1.07	0.16	-51.01	-0.10
120.0	0.20	206.00	120.00	-0.14	0.12	1.03	0.18	-41.63	-0.14
130.0	0.20	240.70	130.00	-0.16	0.10	1.19	0.19	-31.51	-0.16
140.0	0.20	278.70	140.00	-0.17	0.07	1.30	0.18	-21.64	-0.17
150.0	0.20	303.10	150.00	-0.15	0.03	0.85	0.16	-12.51	-0.15
160.0	0.20	341.70	160.00	-0.13	0.01	1.32	0.13	-6.31	-0.13
170.0	0.20	25.60	170.00	-0.10	0.02	1.50	0.10	-9.60	-0.10
180.0	0.20	76.70	180.00	-0.08	0.04	1.73	0.09	-28.07	-0.08
190.0	0.20	132.10	190.00	-0.08	0.07	1.86	0.11	-40.03	-0.08
200.0	0.20	179.20	200.00	-0.11	0.08	1.60	0.14	-36.51	-0.11
210.0	0.20	212.90	210.00	-0.15	0.07	1.16	0.16	-27.18	-0.15
220.0	0.20	236.60	220.00	-0.17	0.05	0.82	0.18	-16.62	-0.17
230.0	0.20	259.90	230.00	-0.18	0.02	0.81	0.18	-5.92	-0.18
240.0	0.20	283.60	240.00	-0.18	-0.02	0.82	0.18	4.80	-0.18
250.0	0.20	294.60	250.00	-0.17	-0.05	0.38	0.18	15.79	-0.17
260.0	0.20	306.80	260.00	-0.15	-0.08	0.43	0.17	27.09	-0.15
270.0	0.20	329.90	270.00	-0.13	-0.10	0.80	0.16	38.45	-0.13
280.0	0.20	0.20	280.00	-0.09	-0.11	1.05	0.14	49.25	-0.09
290.0	0.20	62.60	290.00	-0.07	-0.09	2.07	0.12	53.77	-0.07
300.0	0.20	112.20	300.00	-0.07	-0.06	1.68	0.09	42.72	-0.07
310.0	0.20	135.80	310.00	-0.09	-0.03	0.82	0.09	21.37	-0.09
320.0	0.30	158.40	320.00	-0.12	-0.01	1.39	0.12	5.56	-0.12
330.0	0.20	170.30	330.00	-0.16	0.00	1.12	0.16	-0.20	-0.16
340.0	0.30	179.70	340.00	-0.21	0.00	1.08	0.21	-1.01	-0.21
350.0	0.30	196.10	350.00	-0.26	-0.00	0.86	0.26	0.76	-0.26
360.0	0.30	206.90	360.00	-0.31	-0.02	0.56	0.31	4.19	-0.31
370.0	0.30	225.80	370.00	-0.35	-0.05	0.99	0.35	8.65	-0.35
380.0	0.20	245.50	380.00	-0.38	-0.09	1.30	0.39	13.18	-0.38
390.0	0.20	273.10	390.00	-0.38	-0.12	0.95	0.40	17.62	-0.38
400.0	0.20	296.10	400.00	-0.37	-0.15	0.80	0.40	22.48	-0.37
410.0	0.20	316.90	410.00	-0.35	-0.18	0.72	0.40	27.30	-0.35
420.0	0.20	349.90	420.00	-0.32	-0.20	1.14	0.38	31.40	-0.32
430.0	0.20	38.20	430.00	-0.29	-0.19	1.64	0.35	32.97	-0.29
440.0	0.10	87.40	440.00	-0.28	-0.17	1.54	0.33	31.44	-0.28
450.0	0.20	128.50	450.00	-0.29	-0.15	1.41	0.32	27.08	-0.29
460.0	0.30	175.60	460.00	-0.32	-0.13	2.20	0.35	22.04	-0.32
470.0	0.30	198.80	470.00	-0.38	-0.14	1.21	0.40	20.16	-0.38
480.0	0.30	230.00	480.00	-0.42	-0.17	1.61	0.45	21.75	-0.42
490.0	0.20	248.10	490.00	-0.44	-0.20	1.26	0.49	24.70	-0.44

Meas. Depth (ft)	Incline (deg)	Azimuth (deg)	TVD (ft)	North (ft)	East (ft)	Dog Leg (deg/100ft)	Closure Dis (ft)	Closure Dir (deg)	Vert. Sec. (ft)
		Vertical Section Direction 0.00							
500.0	0.30	255.70	500.00	-0.45	-0.24	1.05	0.52	28.30	-0.45
510.0	0.20	253.00	510.00	-0.47	-0.29	1.01	0.55	31.61	-0.47
520.0	0.30	264.10	520.00	-0.47	-0.33	1.11	0.58	34.83	-0.47
530.0	0.20	268.50	530.00	-0.48	-0.37	1.02	0.60	38.04	-0.48
540.0	0.20	275.50	540.00	-0.47	-0.41	0.24	0.63	40.62	-0.47

550.0	0.20	307.80	550.00	-0.46	-0.44	1.11	0.64	43.47	-0.46
560.0	0.10	343.70	560.00	-0.44	-0.45	1.33	0.64	45.72	-0.44
570.0	0.10	23.20	570.00	-0.43	-0.45	0.68	0.62	46.74	-0.43
580.0	0.20	66.20	580.00	-0.41	-0.43	1.44	0.60	46.51	-0.41
590.0	0.20	116.40	590.00	-0.41	-0.40	1.70	0.58	44.30	-0.41
600.0	0.30	164.60	600.00	-0.45	-0.38	2.24	0.59	40.46	-0.45
610.0	0.30	198.10	610.00	-0.50	-0.38	1.73	0.63	37.56	-0.50
620.0	0.30	247.80	620.00	-0.53	-0.41	2.52	0.67	37.94	-0.53
630.0	0.20	294.50	630.00	-0.53	-0.45	2.18	0.70	40.40	-0.53
640.0	0.10	4.10	640.00	-0.52	-0.47	1.90	0.70	42.20	-0.52
650.0	0.10	89.80	650.00	-0.51	-0.46	1.36	0.69	42.11	-0.51
660.0	0.20	148.80	660.00	-0.52	-0.44	1.71	0.69	40.17	-0.52
670.0	0.30	178.90	670.00	-0.56	-0.43	1.62	0.71	37.45	-0.56
680.0	0.30	205.10	680.00	-0.61	-0.44	1.36	0.76	35.79	-0.61
690.0	0.30	251.40	690.00	-0.65	-0.48	2.36	0.80	36.53	-0.65
700.0	0.30	265.30	700.00	-0.66	-0.53	0.73	0.84	38.88	-0.66
710.0	0.20	280.90	710.00	-0.66	-0.57	1.20	0.87	41.15	-0.66
720.0	0.20	290.20	720.00	-0.65	-0.61	0.32	0.89	43.17	-0.65
730.0	0.20	315.30	730.00	-0.63	-0.64	0.87	0.89	45.32	-0.63
740.0	0.20	336.40	740.00	-0.60	-0.65	0.73	0.89	47.50	-0.60
750.0	0.10	53.80	750.00	-0.58	-0.65	2.03	0.87	48.52	-0.58
760.0	0.10	89.50	760.00	-0.57	-0.64	0.61	0.86	48.09	-0.57
770.0	0.20	110.50	769.99	-0.58	-0.61	1.13	0.84	46.64	-0.58
780.0	0.30	152.90	779.99	-0.61	-0.59	2.03	0.84	43.88	-0.61
790.0	0.30	175.50	789.99	-0.66	-0.57	1.18	0.87	40.96	-0.66
800.0	0.20	216.80	799.99	-0.70	-0.58	2.00	0.91	39.70	-0.70
810.0	0.30	242.50	809.99	-0.72	-0.61	1.48	0.95	40.26	-0.72
820.0	0.30	260.30	819.99	-0.74	-0.66	0.93	0.99	41.80	-0.74
830.0	0.20	274.40	829.99	-0.74	-0.71	1.17	1.03	43.49	-0.74
840.0	0.20	290.70	839.99	-0.74	-0.74	0.57	1.04	45.12	-0.74
850.0	0.20	316.60	849.99	-0.72	-0.77	0.90	1.05	46.93	-0.72
860.0	0.20	333.60	859.99	-0.69	-0.79	0.59	1.05	48.81	-0.69
870.0	0.10	350.20	869.99	-0.67	-0.80	1.08	1.04	50.15	-0.67
880.0	0.10	357.20	879.99	-0.65	-0.80	0.12	1.03	50.96	-0.65
890.0	0.10	13.60	889.99	-0.63	-0.80	0.29	1.02	51.65	-0.63
900.0	0.10	69.40	899.99	-0.62	-0.79	0.94	1.00	51.81	-0.62
910.0	0.10	107.50	909.99	-0.62	-0.77	0.65	0.99	51.24	-0.62
920.0	0.20	138.50	919.99	-0.63	-0.75	1.25	0.98	49.80	-0.63
930.0	0.30	159.30	929.99	-0.67	-0.73	1.33	0.99	47.36	-0.67
940.0	0.30	172.60	939.99	-0.72	-0.72	0.69	1.02	44.79	-0.72
950.0	0.30	223.10	949.99	-0.77	-0.73	2.56	1.06	43.63	-0.77
960.0	0.30	276.10	959.99	-0.78	-0.78	2.68	1.10	44.70	-0.78
970.0	0.20	311.10	969.99	-0.77	-0.81	1.78	1.12	46.64	-0.77
980.0	0.20	316.50	979.99	-0.75	-0.84	0.19	1.12	48.41	-0.75
990.0	0.10	356.10	989.99	-0.72	-0.85	1.38	1.12	49.66	-0.72

Meas. Depth (ft)	Incline (deg)	Azimuth (deg)	TVD (ft)	North (ft)	East (ft)	Dog Leg (deg/100ft)	Closure Dis (ft)	Closure Dir (deg)	Vert. Sec. (ft)
		Vertical Section Direction 0.00							
1000.0	0.10	80.80	999.99	-0.71	-0.84	1.35	1.11	49.79	-0.71
1010.0	0.10	130.60	1009.99	-0.72	-0.83	0.84	1.10	49.11	-0.72
1020.0	0.20	145.90	1019.99	-0.74	-0.81	1.07	1.10	47.75	-0.74
1030.0	0.30	159.10	1029.99	-0.78	-0.79	1.15	1.11	45.60	-0.78
1040.0	0.30	169.50	1039.99	-0.83	-0.78	0.54	1.14	43.30	-0.83
1050.0	0.30	227.90	1049.99	-0.87	-0.79	2.93	1.18	42.37	-0.87
1060.0	0.40	240.40	1059.99	-0.91	-0.84	1.25	1.24	42.99	-0.91
1070.0	0.30	268.00	1069.99	-0.92	-0.90	1.93	1.29	44.27	-0.92
1080.0	0.20	316.60	1079.99	-0.91	-0.94	2.25	1.31	45.83	-0.91
1090.0	0.10	341.50	1089.99	-0.89	-0.95	1.17	1.30	46.94	-0.89
1100.0	0.20	129.60	1099.99	-0.89	-0.94	2.90	1.30	46.53	-0.89
1110.0	0.30	173.30	1109.99	-0.93	-0.93	2.08	1.31	44.86	-0.93
1120.0	0.40	216.60	1119.99	-0.98	-0.94	2.74	1.36	43.78	-0.98
1130.0	0.40	239.80	1129.99	-1.03	-0.99	1.61	1.43	44.00	-1.03
1140.0	0.40	247.00	1139.99	-1.06	-1.06	0.50	1.50	44.88	-1.06
1150.0	0.30	264.40	1149.99	-1.08	-1.12	1.45	1.55	45.98	-1.08
1160.0	0.20	285.90	1159.99	-1.08	-1.16	1.35	1.58	47.12	-1.08
1170.0	0.20	303.50	1169.99	-1.06	-1.19	0.61	1.59	48.27	-1.06
1180.0	0.10	303.30	1179.99	-1.05	-1.21	1.00	1.60	49.17	-1.05

1190.0	0.00	55.50	1189.99	-1.04	-1.22	1.00	1.60	49.47	-1.04
1200.0	0.40	173.70	1199.99	-1.08	-1.21	4.00	1.62	48.45	-1.08
1210.0	0.40	173.40	1209.99	-1.15	-1.21	0.02	1.66	46.49	-1.15
1220.0	0.40	181.90	1219.99	-1.22	-1.20	0.59	1.71	44.73	-1.22
1230.0	0.40	196.30	1229.99	-1.28	-1.22	1.00	1.77	43.42	-1.28
1240.0	0.40	224.50	1239.99	-1.34	-1.25	1.95	1.83	42.95	-1.34
1250.0	0.40	243.10	1249.99	-1.38	-1.30	1.29	1.90	43.34	-1.38
1260.0	0.40	233.90	1259.99	-1.42	-1.36	0.64	1.97	43.87	-1.42
1270.0	0.20	259.00	1269.99	-1.44	-1.41	2.35	2.02	44.32	-1.44
1280.0	0.20	273.10	1279.99	-1.45	-1.44	0.49	2.04	44.97	-1.45
1290.0	0.20	275.00	1289.99	-1.44	-1.48	0.07	2.07	45.70	-1.44

PACIFIC SURVEYS

CALIPER
BOREHOLE VOLUME

Job No. 25150

File No.

Company	CASCADE DRILLING
Well	IEUA PX2
Field	POMONA
County	LOS ANGELES
State	CA

Location:

WEST SIDE OF MONTVUE PARK: 1634 CORDOVA ST
GPS: 34.0747462 -117.214596

Sec. Twp. Rge.

Other Services:
ELOG/GR LL3
SONIC
TMP
DEVIATION

Permanent Datum	G.L.		Elevation	Elevation
Log Measured From	G.L.	0'	above perm. datum	K.B.
Drilling Measured From	G.L.			D.F.
				G.L.

Date	01-17-2019		
Run Number	ONE		
Depth Driller	1295'		
Depth Logger	1296.1'		
Bottom Logged Interval	1296.1'		
Top Log Interval	0'		
Casing Driller	20" @ 50'		
Casing Logger	50'		
Bit Size	17.5"		
Type Fluid in Hole	BENTONITE		
Density / Viscosity	9.2 / 37		
pH / Fluid Loss	-- / 7		
Source of Sample	MUD TANK		
Rm @ Meas. Temp	6.2 @ 71.2 F		
Rmf @ Meas. Temp	5.96 @ 71.2 F		
Rmc @ Meas. Temp	N/A		
Source of Rmf / Rmc	MEASURED		
Rm @ BHT	N/A		
Time Circulation Stopped	0745		
Time Logger on Bottom	1415		
Max. Recorded Temperature	72.69 F		
Equipment Number	PS-5		
Location	VENTURA		
Recorded By	CALEB VILLALOBOS		
Witnessed By	ROBERT THACKER		

<<< Fold Here >>>

Comments

Calibration Report

Database File	25150.db
Dataset Pathname	CALIPER
Dataset Creation	Thu Jan 17 14:42:10 2019

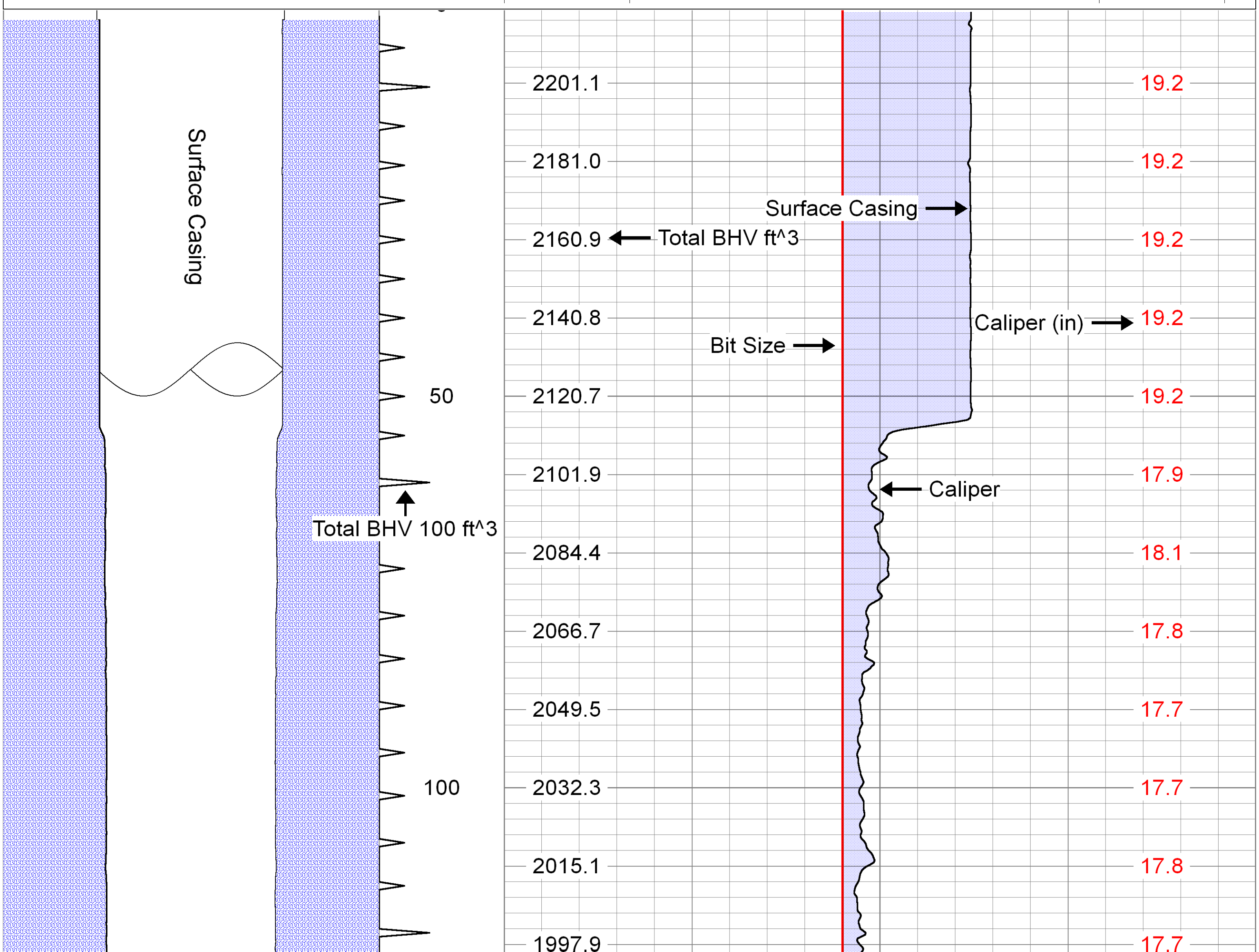
XY Caliper Calibration Report

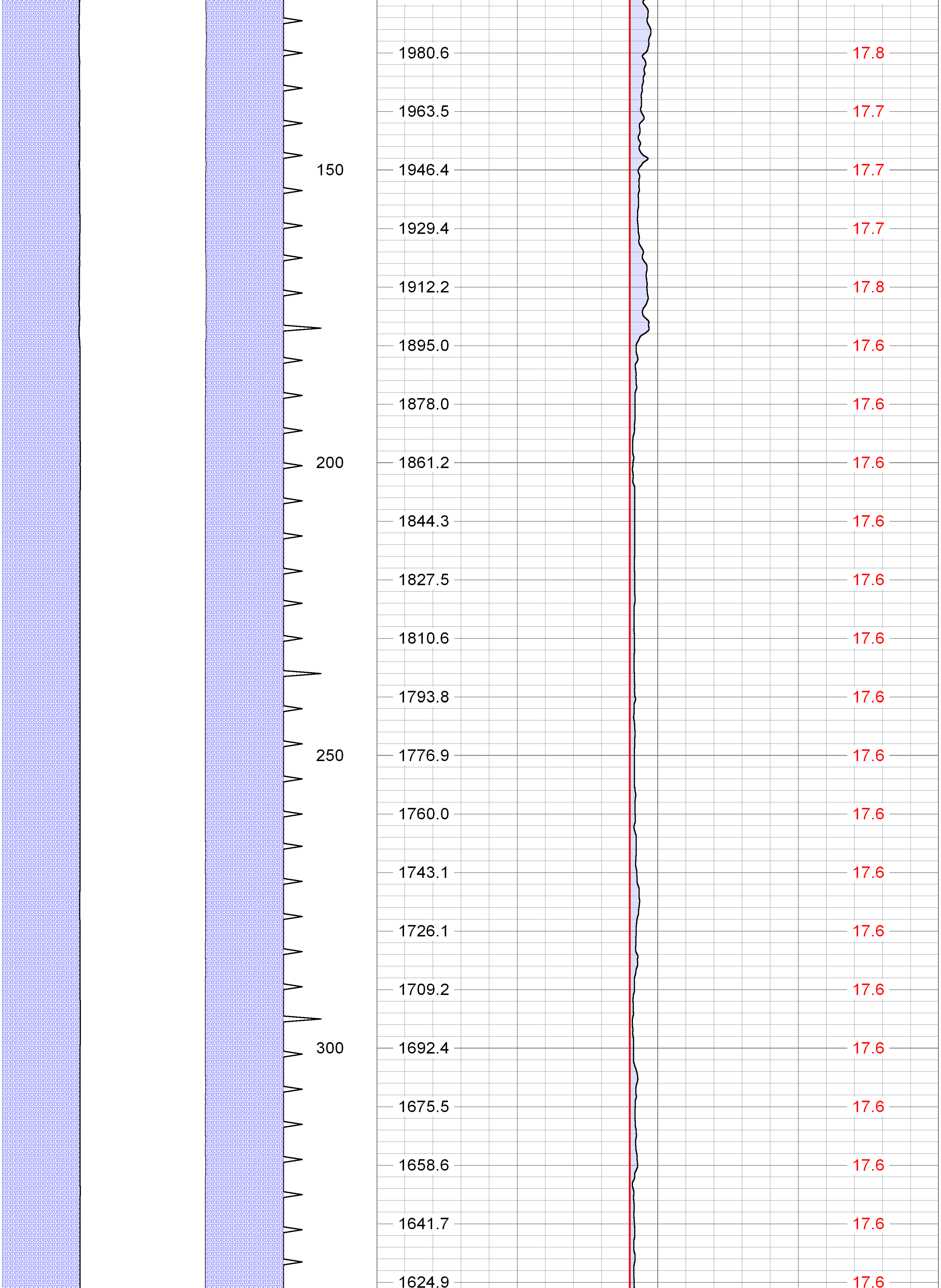
Serial Number/Model:	CAL-10_MEDIUM-ALLEN
Performed:	Wed Jan 24 09:39:35 2018

Ring			X Caliper		Y Caliper	
1:	2.1	in	635.979	cps	635.979	cps
2:	8	in	1178.22	cps	1178.22	cps
3:	14	in	1593.37	cps	1593.37	cps
4:	20	in	1985.65	cps	1985.65	cps
5:	26	in	2350.5	cps	2350.5	cps
6:	32	in	2768.67	cps	2768.67	cps
7:		in		cps		cps
8:		in		cps		cps
9:		in		cps		cps
10:		in		cps		cps

Database File	25150.db
Dataset Pathname	CALIPER
Presentation Format	xyc_gph_final
Dataset Creation	Thu Jan 17 14:42:10 2019
Charted by	Depth in Feet scaled 1:240

CSG SCHEDULE	BVTX (ft3)	13 Caliper (in) 23
Pipe(s) proportional to Hole Size		13 Bit Size (in) 23
		TBHV ft^3 (ft3) / Caliper (in)

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1980.6
1963.5
1946.4
1929.4
1912.2
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1878.0
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1844.3
1827.5
1810.6
1793.8
1776.9
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1726.1
1709.2
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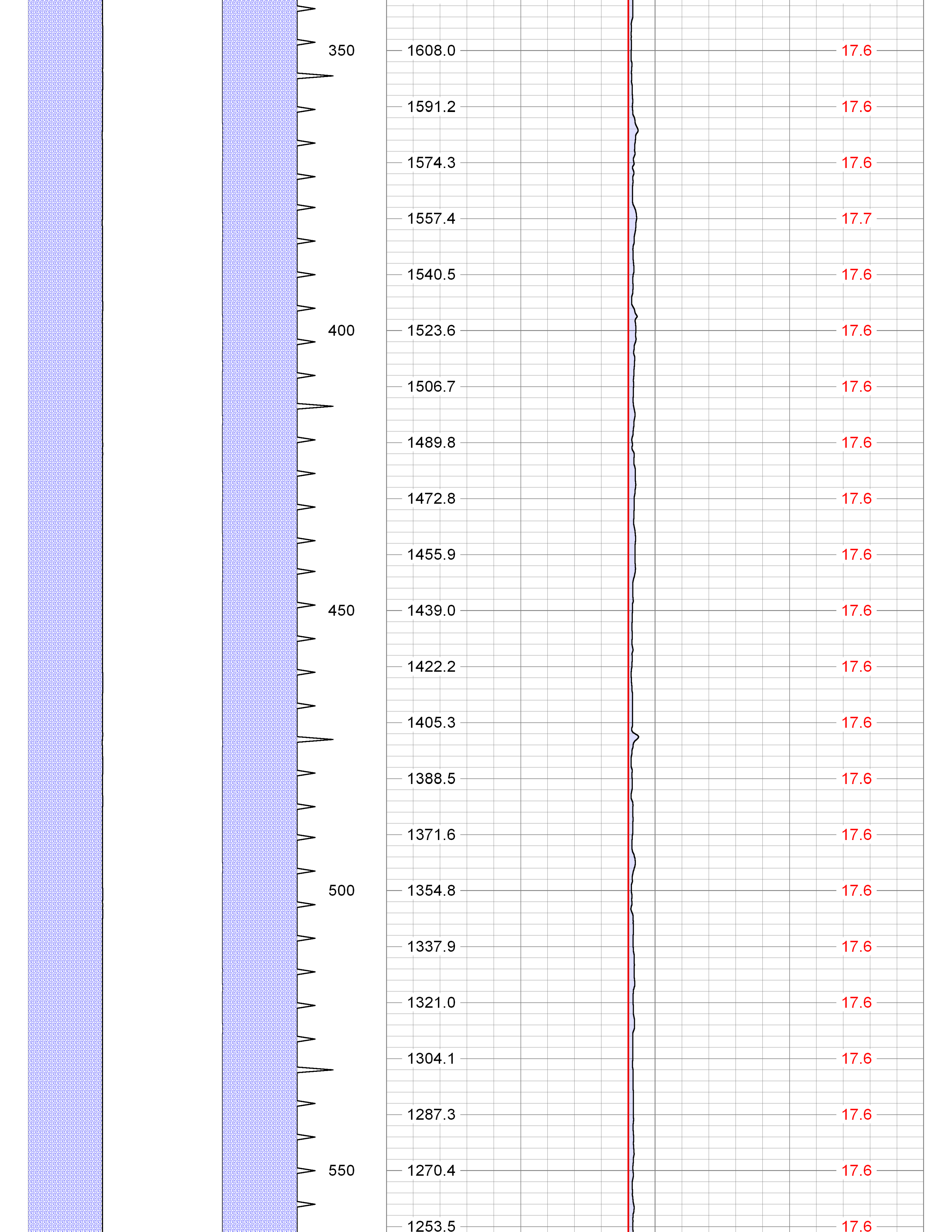

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1608.0
17.6
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1574.3
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1557.4
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400
1523.6
17.6
1506.7
17.6
1489.8
17.6
1472.8
17.6
1455.9
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450
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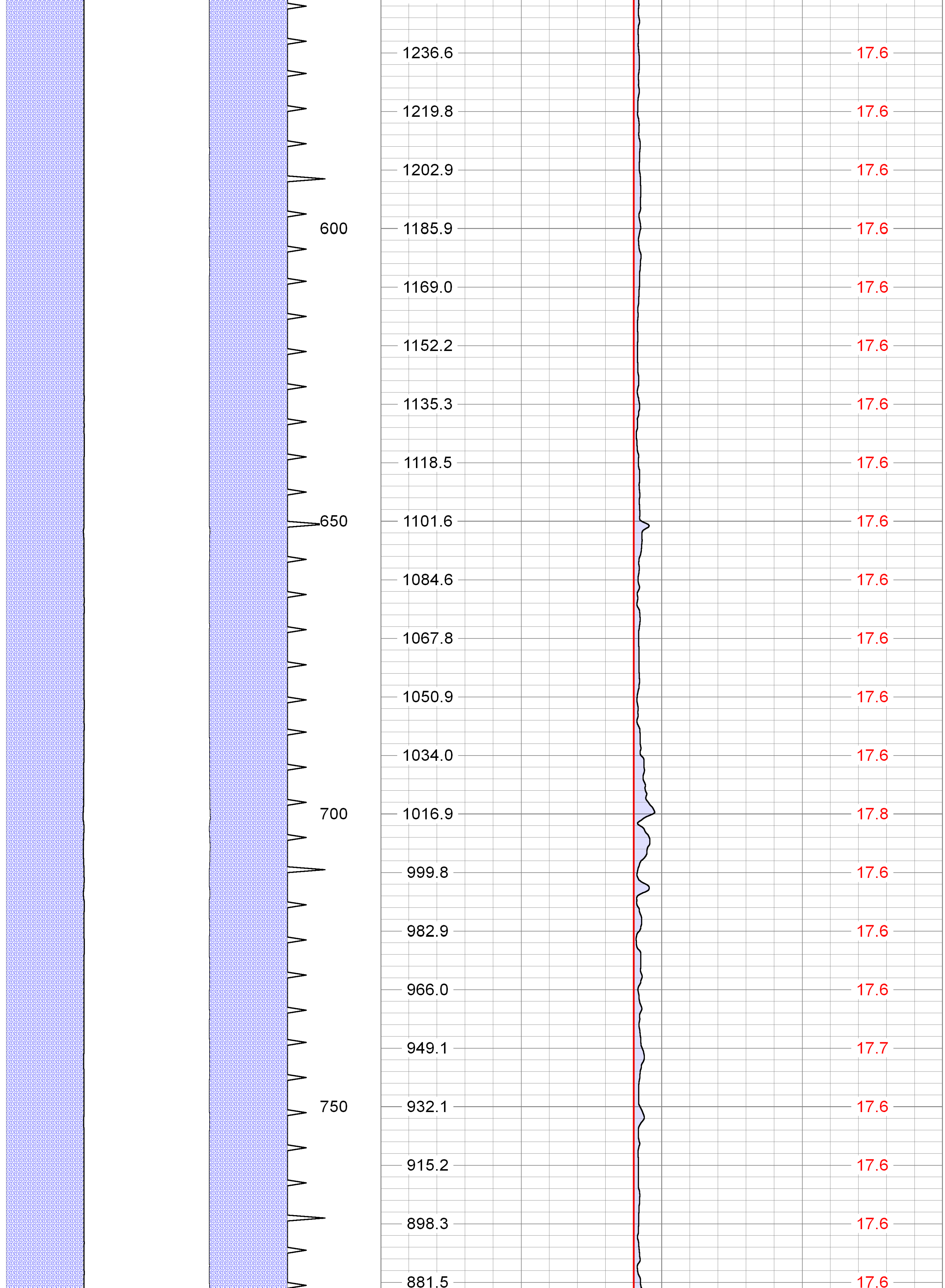
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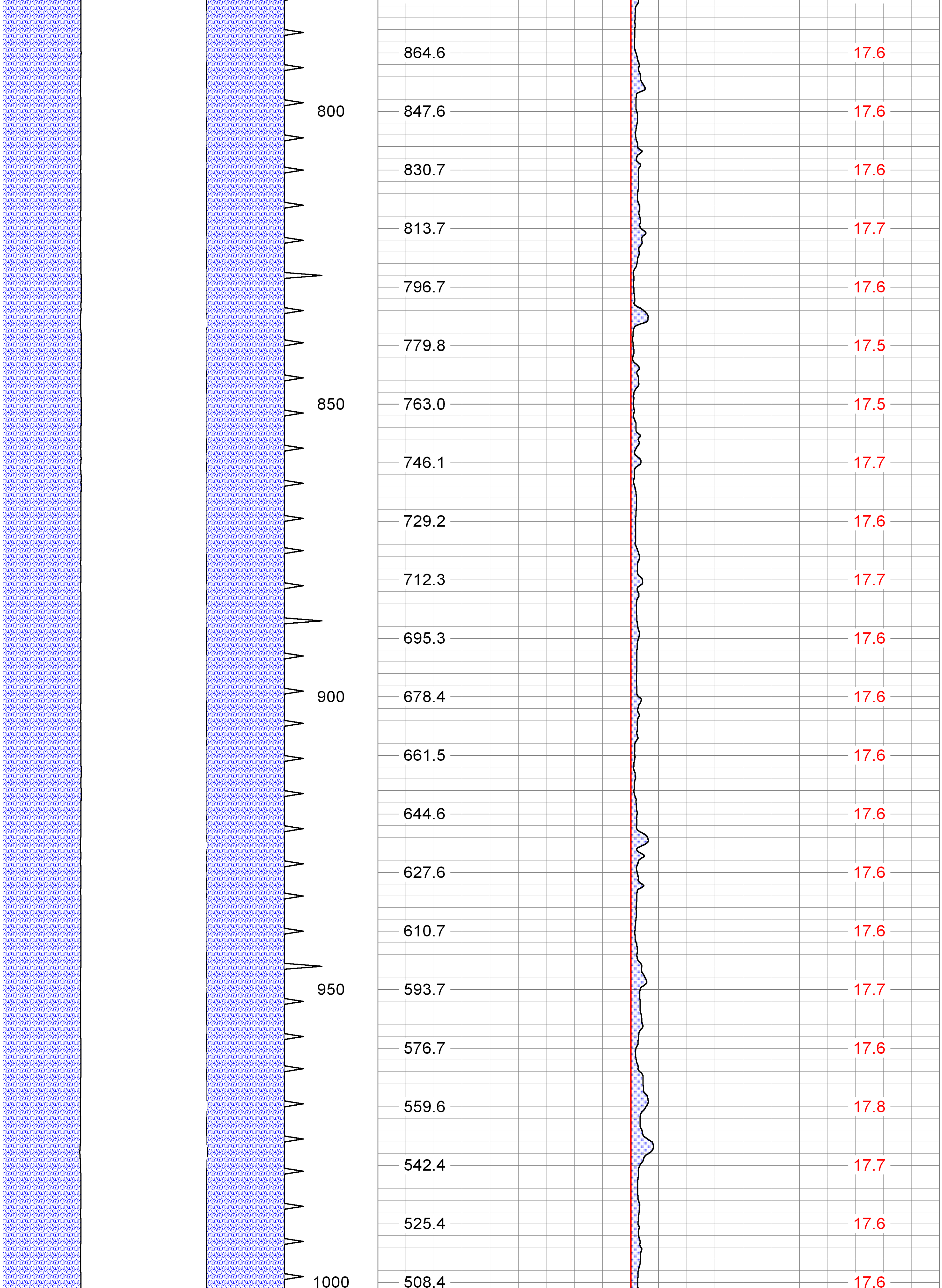
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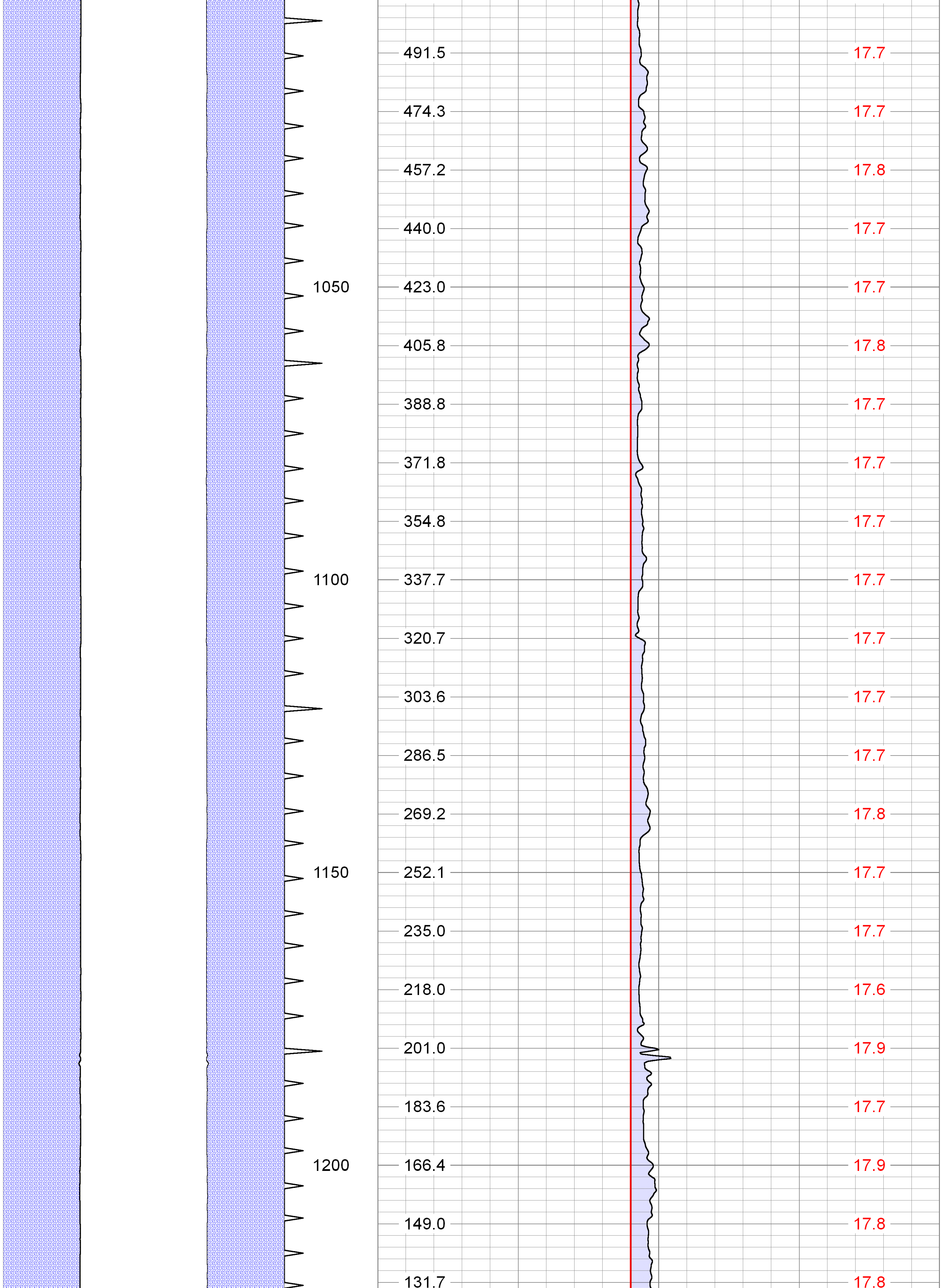
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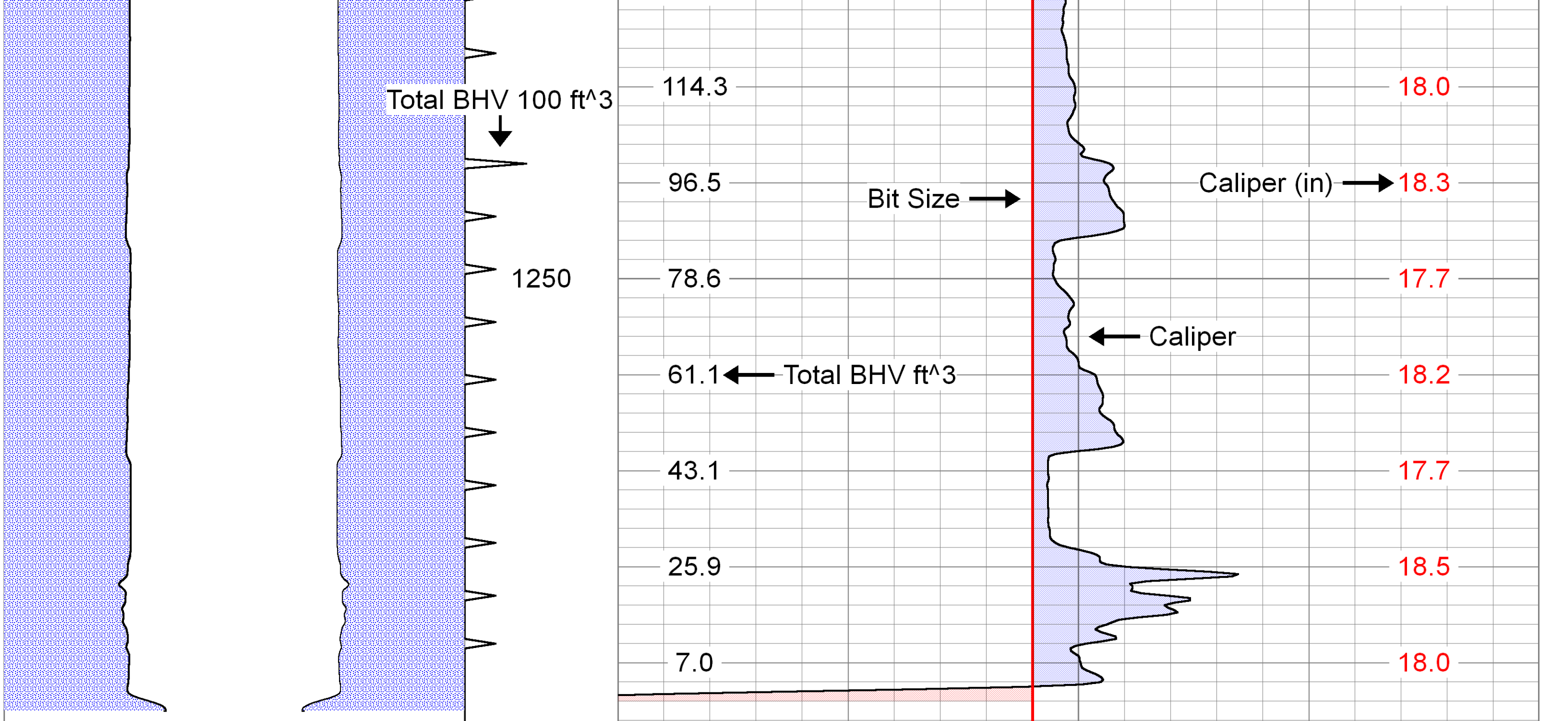


CSG SCHEDULE	BVTX (ft3)	13 Caliper (in) 23
Pipe(s) proportional to Hole Size		13 Bit Size (in) 23
		TBHV ft^3 (ft3) — Caliper (in)

Log Variables

Database C:\ProgramData\Warrior\Data\25150.db
Dataset field/well/run1/CALIPER/_vars_

Top - Bottom

BOREID in	BOTTEMP degF	CASEOD in	CASETHCK in	PERFS	RM_MEAS_R Ohm-m	RM_MEAS_T degF
17.5	79.3	5.5	0	0	6.2	71.2

RMF Ohm-m	RSH Ohm-m	SPSHIFT mV	SRFTEMP degF	TDEPTH ft	TempGrad DegF/ft
5.96	20	7	63.5	1295	0.01235

PACIFIC SURVEYS

ELECTRIC LOG
LATEROLOG 3
GAMMA-RAY

Job No.	00656
Company	BEYLIK DRILLING
Well	MVWD #28
Field	MONTE VISTA
County	SAN BERNARDINO
State	CA
Location:	ROMONA @ PALO VERDE
Other Services:	GR/LL3, SONIC/VDL, CALIPER
Sec.	
Twp.	
Rge.	
Permanent Datum	G.L.
Elevation	0
Log Measured From	G.L.
above perm. datum	
Drilling Measured From	G.L.
Elevation	K.B. / D.F. / G.L.

Date	2-8-01
Run Number	ONE
Depth Driller	1318'
Depth Logger	1318'
Bottom Logged Interval	1317'
Top Log Interval	51'
Casing Driller	34" @ 51'
Casing Logger	51'
Bit Size	17.5"
Type Fluid in Hole	WATER
Density / Viscosity	N/A
pH / Fluid Loss	N/A
Source of Sample	PIT
Rm @ Meas. Temp	25.6 @ 77F
Rmf @ Meas. Temp	25.6 @ 77F
Rmc @ Meas. Temp	N/A
Source of Rmf / Rmc	MEAS
Rm @ BHT	N/A
Time Circulation Stopped	4 HRS
Time Logger on Bottom	11:15
Max. Recorded Temperature	N/A
Equipment Number	PS-1
Location	L.A.
Recorded By	RIDDER
Witnessed By	M. HOFFMAN

<<< Fold Here >>>

Comments

Calibration Report

Serial-Model: 100-A
Calibration Performed: Thu Feb 08 11:11:11 2001

SP Calibration:

System Reading	Calibration Reference
-0.331 V	-98.800 mV
0.543 V	98.800 mV
Gain= 226.218	Offset= -23.962

16" Calibration:

System Reading	Calibration Reference
-0.008 V	0.000 Ohm-m
0.047 V	10.200 Ohm-m
0.347 V	102.200 Ohm-m

64" Calibration:

System Reading	Calibration Reference
-0.008 V	0.000 Ohm-m
0.021 V	10.200 Ohm-m
0.061 V	102.200 Ohm-m
0.473 V	1000.000 Ohm-m

Database File: 00656.db
Dataset Pathname: Beylik/MVWD28/LL3/merge1
Presentation Format: elog2
Dataset Creation: Thu Feb 08 12:49:35 2001
Charted by: Depth in Feet scaled 1:240

-40 S.P. (mV) 40	0 SN (Ohm-m) 100	0 RLL3 (Ohm-m) 100
30 Gamma Ray (GAPI) 80	0 LN (Ohm-m) 100	100 RLL3 back-up (Ohm-m) 1000
	100 SNx10 (Ohm-m) 1000	
	100 LNx10 (Ohm-m) 1000	

-40 S.P. (mV) 40	0 SN (Ohm-m) 100	0 RLL3 (Ohm-m) 100
30 Gamma Ray (GAPI) 80	0 LN (Ohm-m) 100	100 RLL3 back-up (Ohm-m) 1000
	100 SNx10 (Ohm-m) 1000	
	100 LNx10 (Ohm-m) 1000	

Appendix B

Response to GLMC Comments

State of California Department/John Wood Group PLC (Richard Rees, PG, CHG)

Comment 1 – Global Comment

We make the following comment on behalf of the State of California/California Department of Corrections and Rehabilitation, a member of the Agricultural Pool. We agree that the one-dimensional models appear to be sufficiently calibrated to use for estimation of potential future subsidence at the locations they represent, subject to the limitations identified in the technical memorandum.

Response:

Thank you for your comment.

City of Chino/Geopentech (Eric Fordham, PG, CEG, CHG)

Comment 1 – Background and Objectives

The first paragraph should identify that in addition to ground fissuring as the primary threat to infrastructure, permanent ground subsidence can also change hydraulic grade in gravity flow systems such as storm drains and sewers and differential subsidence over short distances could also pose significant threats to rigid infrastructure.

Response:

Thank you for your comments and suggestions. The text was updated, where appropriate, to address this comment.

Comment 2 – Boundary Conditions

The last sentence of page 8 should read "…deeper pumping caused head declines in the deeper confined CVM layers, which in turn resulted in ***upward*** vertical hydraulic gradients." ***Upward*** should be ***downward*** vertical hydraulic gradients.

Response:

Thank you for your comment and suggestions. The text was updated, where appropriate, to address this comment.

Comment 3 – Global Comment

We concur that the 1D compaction models that have been developed for this study are sufficiently calibrated to provide a useful tool for evaluating potential future subsidence under the Baseline Management Alternative.

Response:

Thank you for your comment.

Monte Vista Water District/Geoscience (Christofer Coppinger, PG, CHG)

Comment 1 – Calibration of the 1D Models

Can a figure showing residual and calibration statistics for water levels at the wells be included? Or some brief discussion of the residual and calibration statistics compared to adjusted heads from the CVM? Something to document that the sensitivity run included conditions outside the observed data.

Response:

Excerpts from the *2020 Safe Yield Recalculation Final Report*[1] are attached to Appendix B and document the calibration statistics and the residuals for the heads in the Chino Valley Model (CVM):

Figure 6-6. Location of Calibration Wells

Figure 6-7a. Comparison of Simulated and Measured Water Levels in the Wells of Chino Basin

Figure 6-9. Residual Relative Frequency Histogram in Chino Basin

Figure 6-11. Mean Residual Error of Calibration Wells

Figure 6-6 shows the location of all the wells used in the model calibration and Figure 6-7a plots the simulated vs measured heads for the calibration wells plotted in Figure 6-6. The coefficient of determination R2 is 0.932 and the points are distributed closely around the diagonal line, indicating "good inverse modeling performance and a robust calibration" (WEI, 2020). As shown in Figure 6-9, the mean of the hydraulic head residuals is around 0.06, which is near zero, with a standard deviation of about 21 feet. Figure 6-11 shows the spatial distribution of average residuals for each calibration well and shows that there was no spatial bias by the CVM in estimating heads in the Chino Basin.

Given the results from the calibration and residual analysis, the heads simulated by the CVM were assigned to the Sand cells in the 1D Models. During the sensitivity analysis of the 1D Models, the heads in Layers 1 and 5 were adjusted from 1978-2018 to better match recent heads measured at the PX1-1 piezometer (Layer 1) in 2020 and at the PX2-3 piezometer (Layer 5) in 2020. Historical measured heads at several wells located in the vicinity of the 1D Models were also used to adjust heads in the model layers.

Comment 2 – Appendix A

Can geologist's lithlogs be included as attachment?

Response:

The PX2 and MVWD-28 borehole lithologic and geophysical logs are provided in Appendix A.

[1] Wildermuth Environmental Inc. (2020). *2020 Safe Yield Recalculation Final Report.* Prepared for Chino Basin Watermaster.

Comment 3 – Figures 13 and 14

There was some discussion of the Compaction and Critical head columns during one of the meetings last year – I think Eric was explaining the critical head in upper vs lower systems. If any of that was captured, it would be a great addition to the figure.

Response:

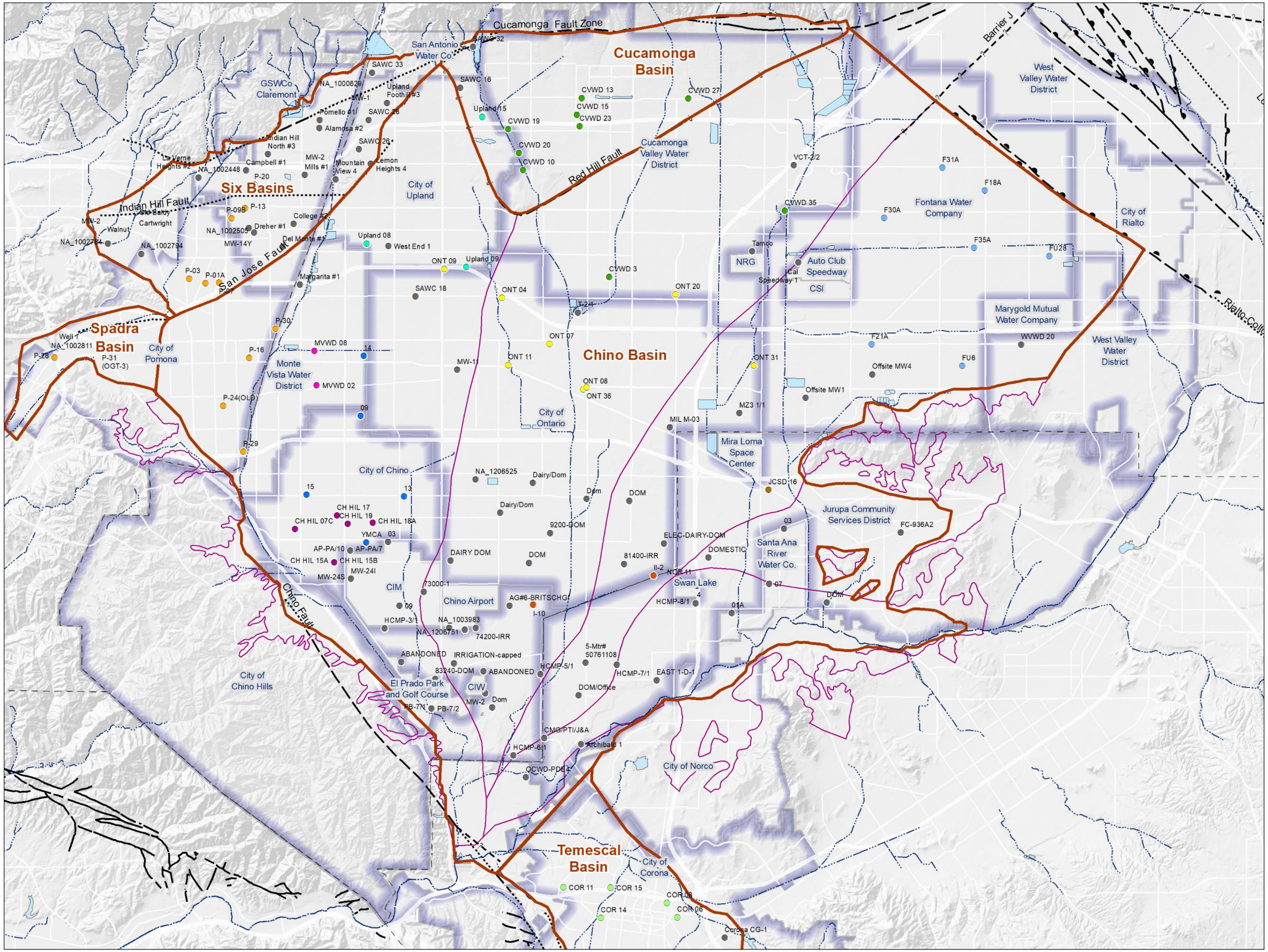
We are uncertain of the exact discussion that this comment is referring. Compaction and critical head are inversely related. In Layer 1, compaction has been relatively great in the Clay layers and hence, critical head is relatively low. In Layers 2, 3, 4, and 5, compaction has been relatively minor in the Clay layers (particularly the thick clay layers) and hence, critical head is relatively high. This model result indicates that the greatest potential for future compaction is within the thick Clay layers in Layers 2, 3, 4, and 5.

Comment 4 – Global Comment

Overall – the 1D sensitivity run results are very interesting – maybe the sensitivity to the clay layers explains the subsidence at whispering lakes away from the pumping center.

Response:

The Whispering Lake Subsidence Feature is located somewhat distant from Northwest MZ1. These 1D Model results in Northwest MZ1 should not be interpreted to represent the aquifer system processes underlying the Whispering Lake Subsidence Feature.



Groundwater Model Calibration Wells

- City of Chino
- City of Chino Hills
- City of Corona
- City of Ontario
- City of Pomona
- City of Upland
- Cucamonga Valley Water District
- Fontana Water Company
- Jurupa Community Services District
- Monte Vista Water District
- CDA
- Other

Streams & Flood Control Channels

Flood Control & Conservation Basins

Water Service Area

OBMP Management Zones

Faults

- Location Certain
- Location Approximate
- Approximate Location of Groundwater Barrier
- Location Concealed
- Location Uncertain

Prepared by:

WEI
WILDERMUTH ENVIRONMENTAL, INC.

Author: LS
Date: 4/1/2020
File: Figure 6-6 Calibration Wells.mxd

0 1 2 3 4 5 Miles
0 2 4 6 8 Km

Prepared for:

2020 Safe Yield Recalculation

Location of Calibration Wells

Chino Valley Model

Figure 6-6

Figure 6-7a
Comparison of Simulated and Measured Water Levels in the Wells of Chino Basin

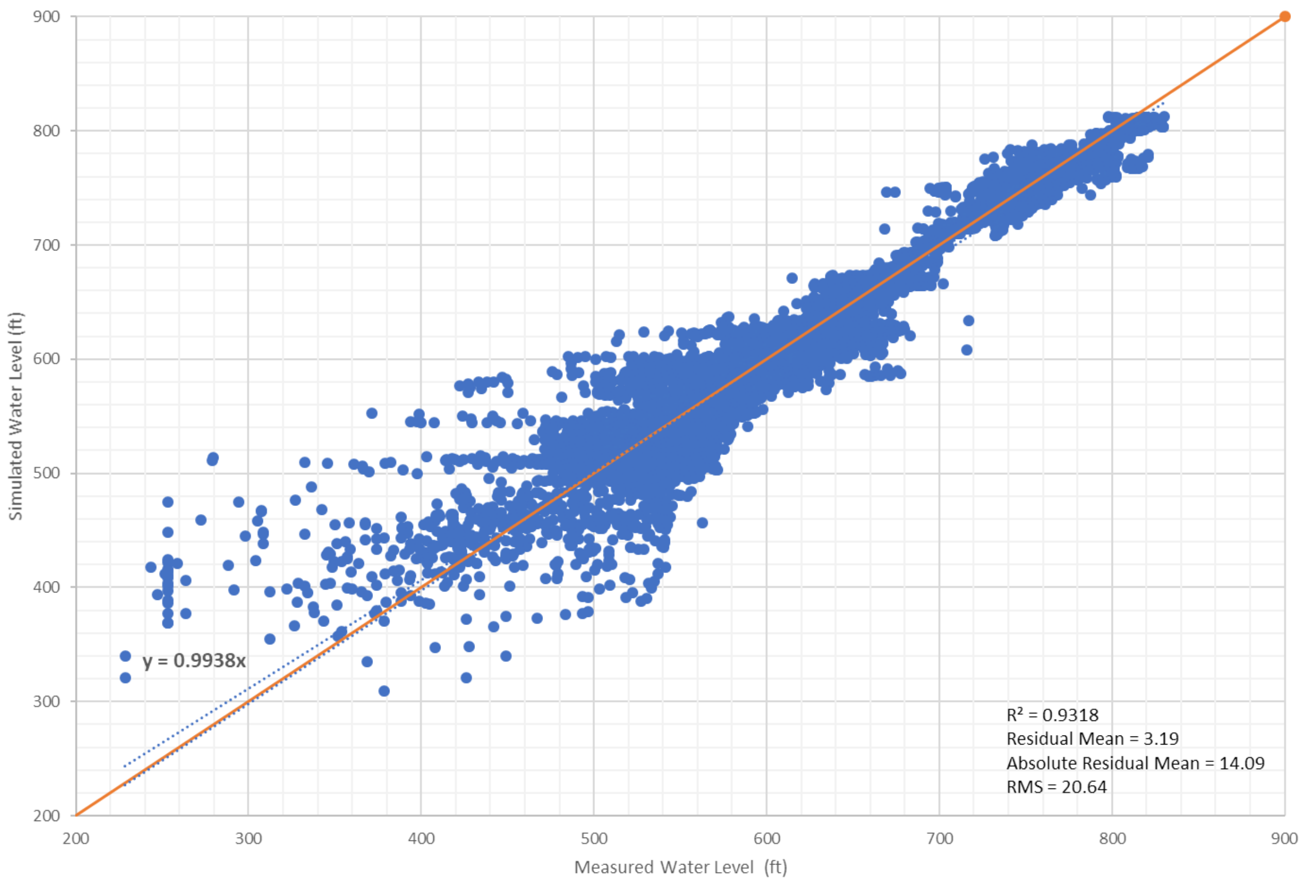


Figure 6-7b
Comparison of Simulated and Measured Water Levels in the Wells of Cucamonga Basin

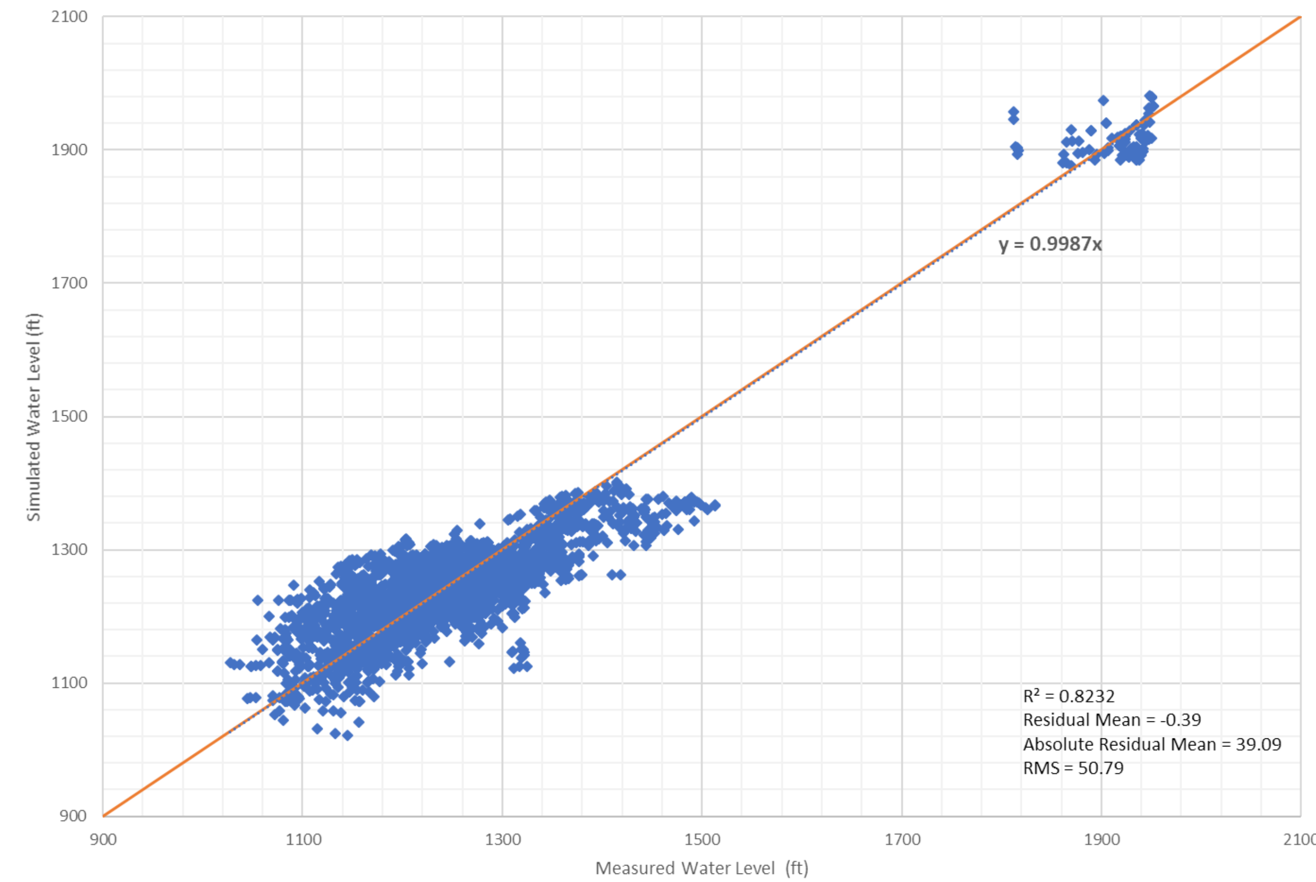


Figure 6-7c
Comparison of Simulated and Measured Water Levels in the Wells of Six Basin

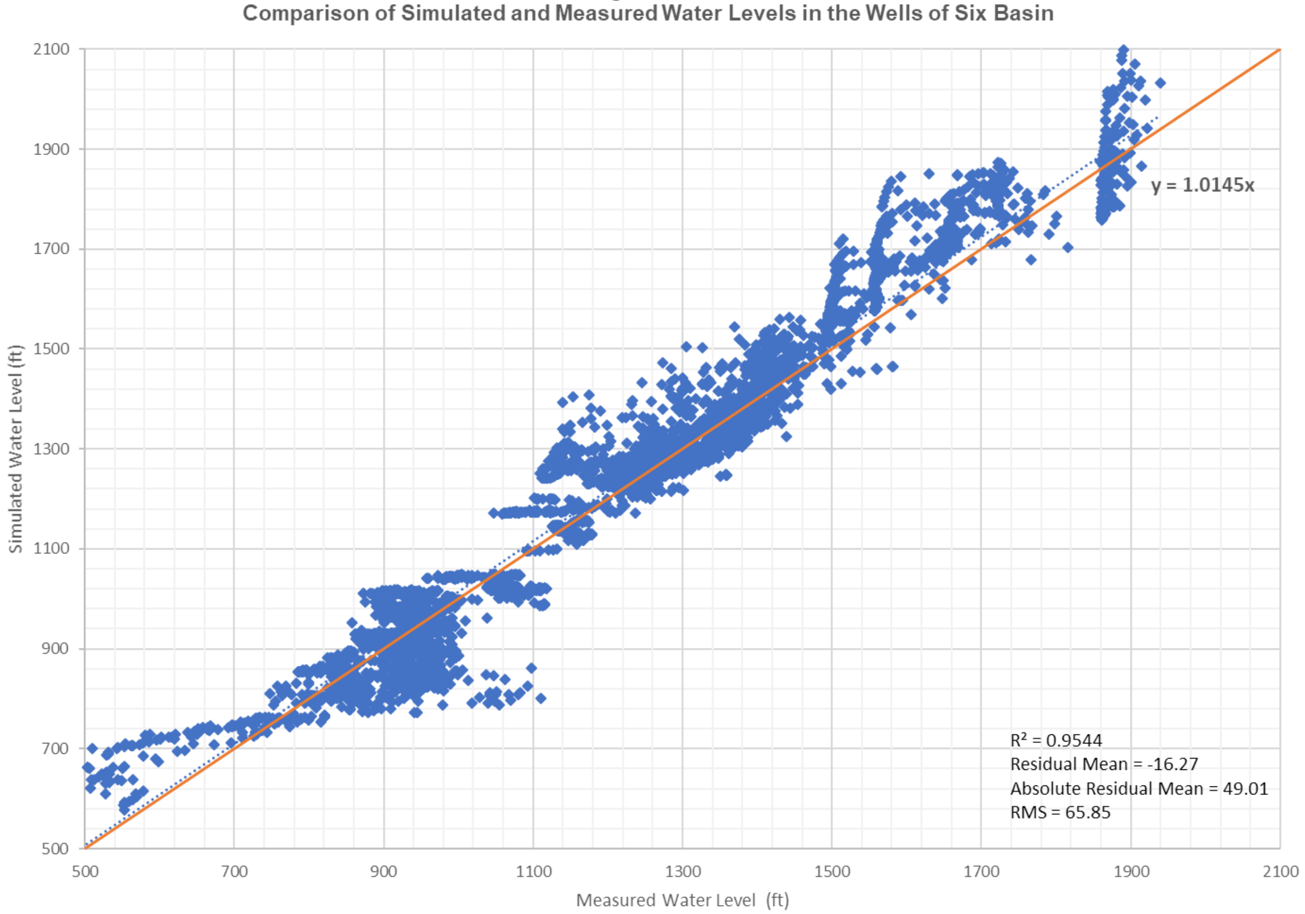


Figure 6-7d
Comparison of Simulated and Measured Water Levels in the Selected Chino Hills Wells with the other Wells of Chino Basin

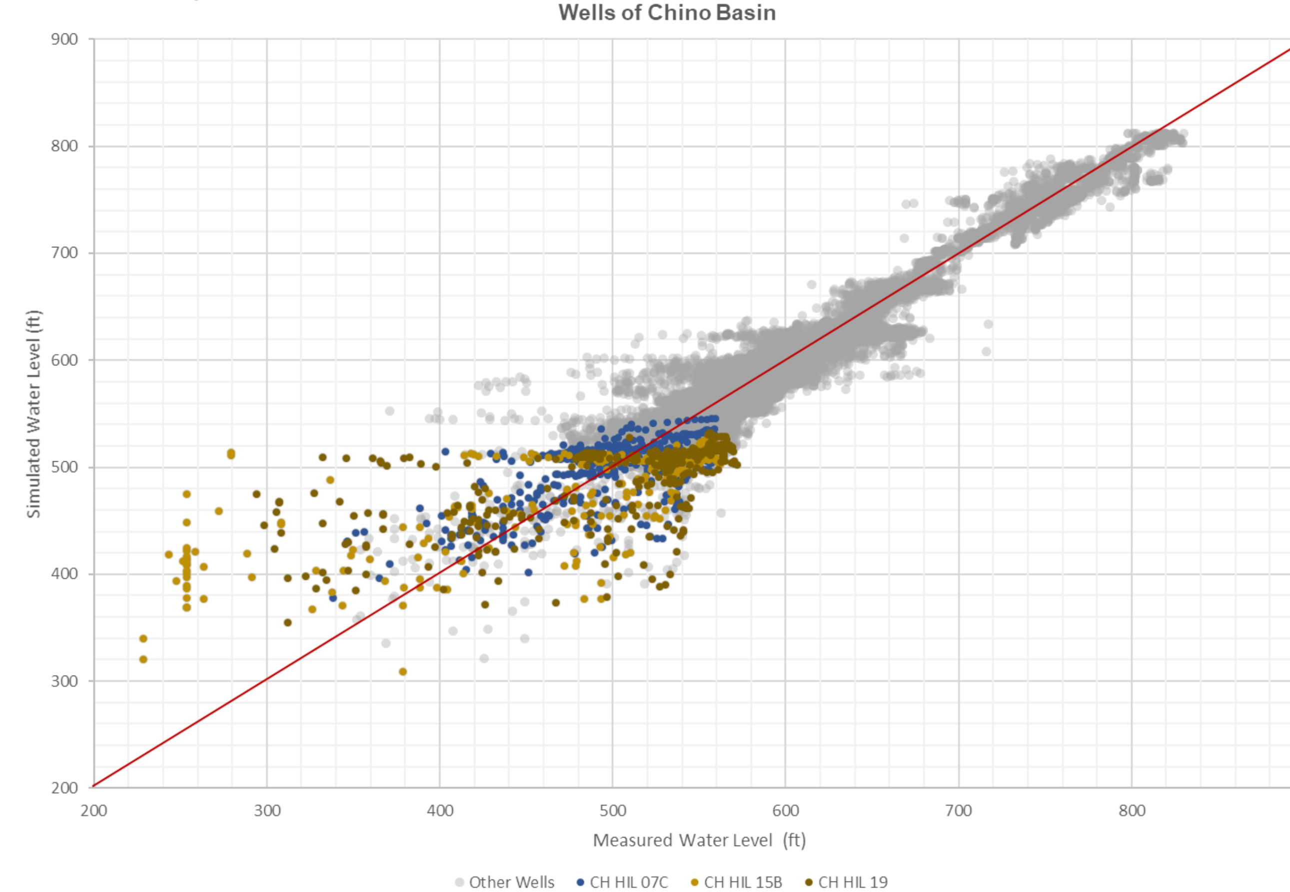
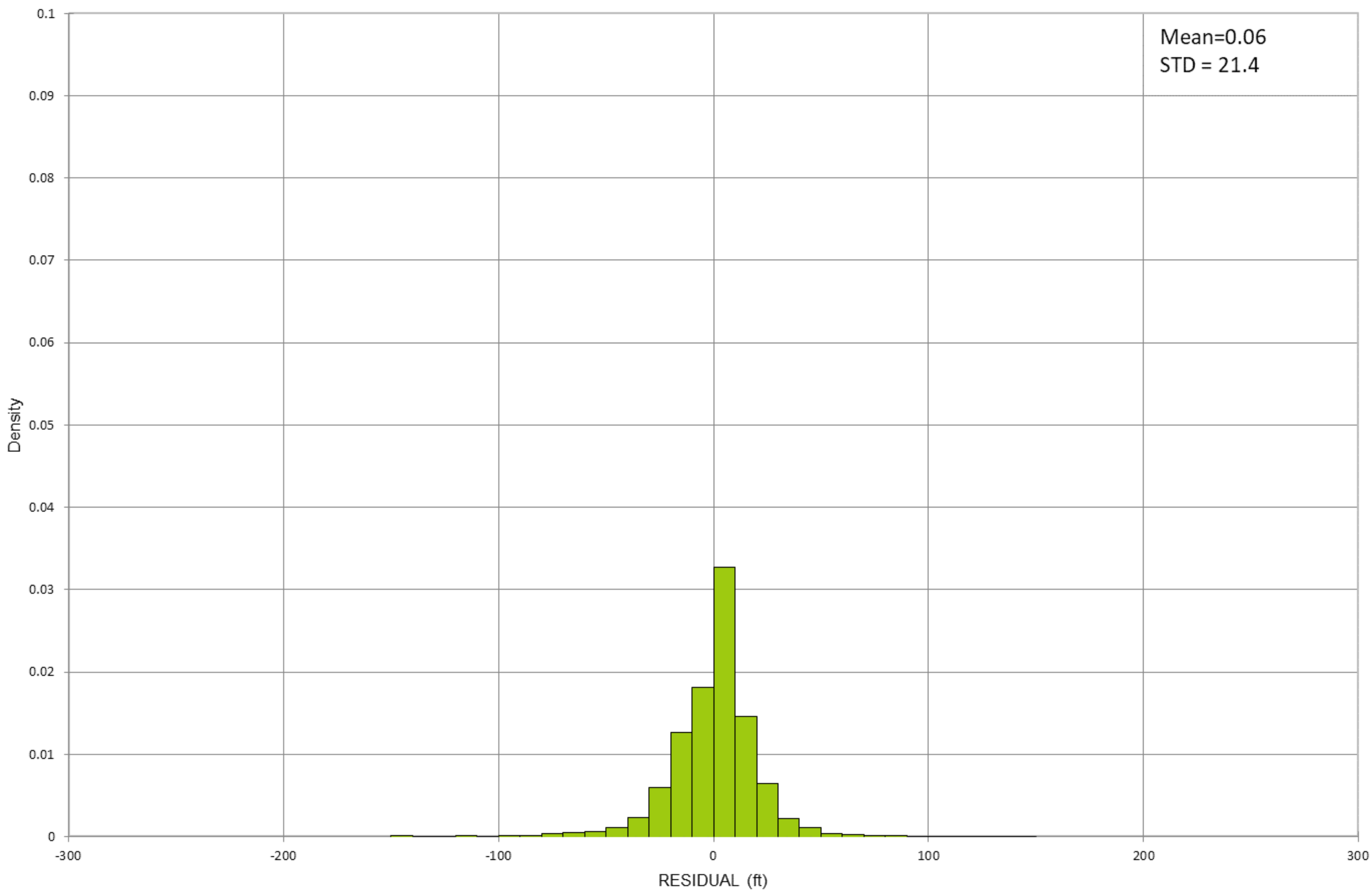
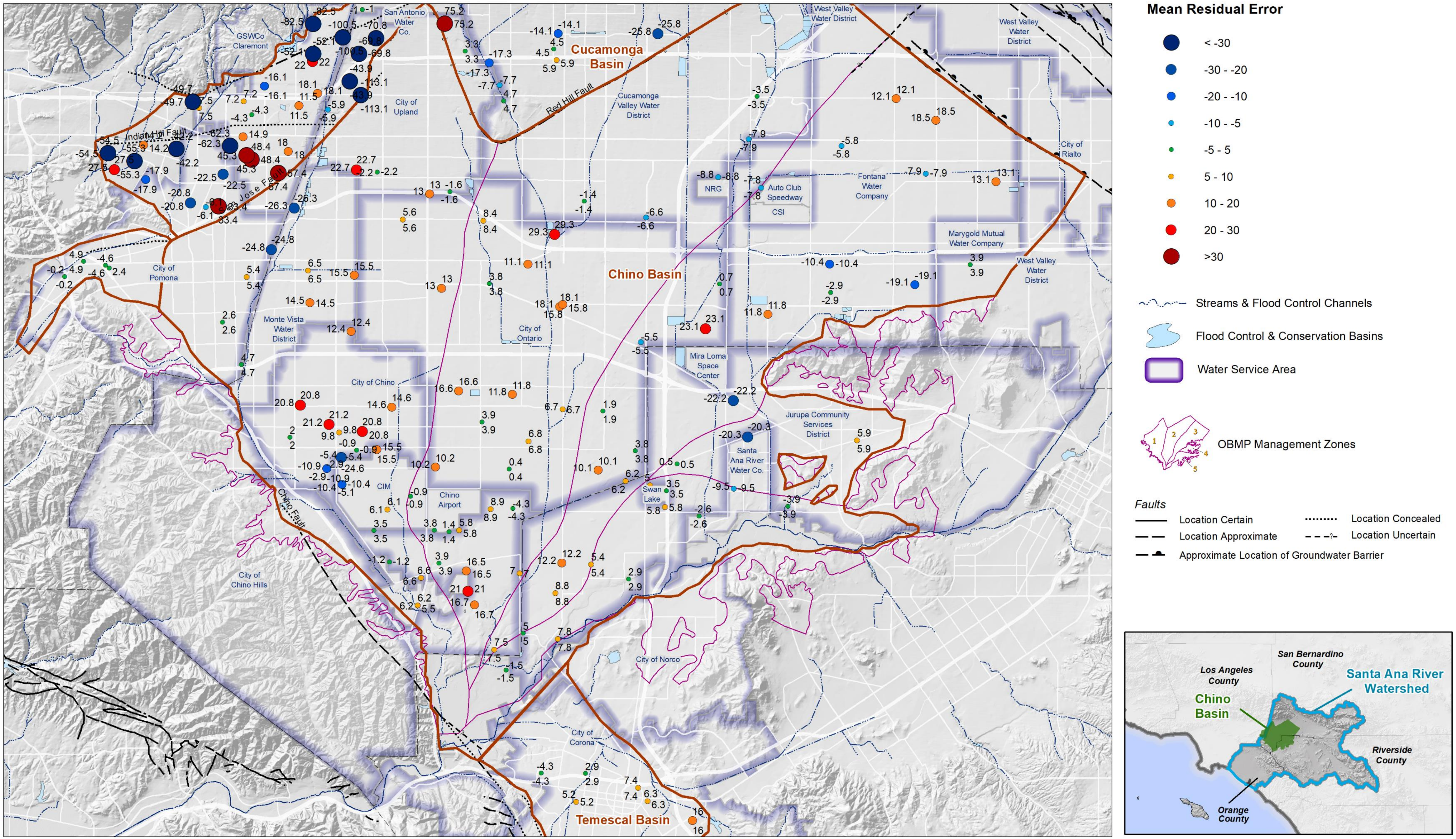


Figure 6-9
Residual Relative Freqency Histogram in Chino Basin





Prepared by:

WEI
WILDERMUTH ENVIRONMENTAL, INC.

Author: LS
Date: 5/11/2020
File: Figure 6-11 Mean Residual.mxd

0 1 2 3 4 5 Miles
0 2 4 6 8 Km

Prepared for:

2020 Safe Yield Recalculation

Chino Basin Watermaster — Partners in Basin Management

Mean Residual Error of Calibration Wells

Figure 6-11