FUGRO CONSULTANTS, INC.

SANTA MARIA GROUNDWATER BASIN CHARACTERIZATION AND PLANNING ACTIVITIES STUDY
FINAL REPORT

Prepared for:
San Luis Obispo County Flood Control and Water Conservation District

December 2015

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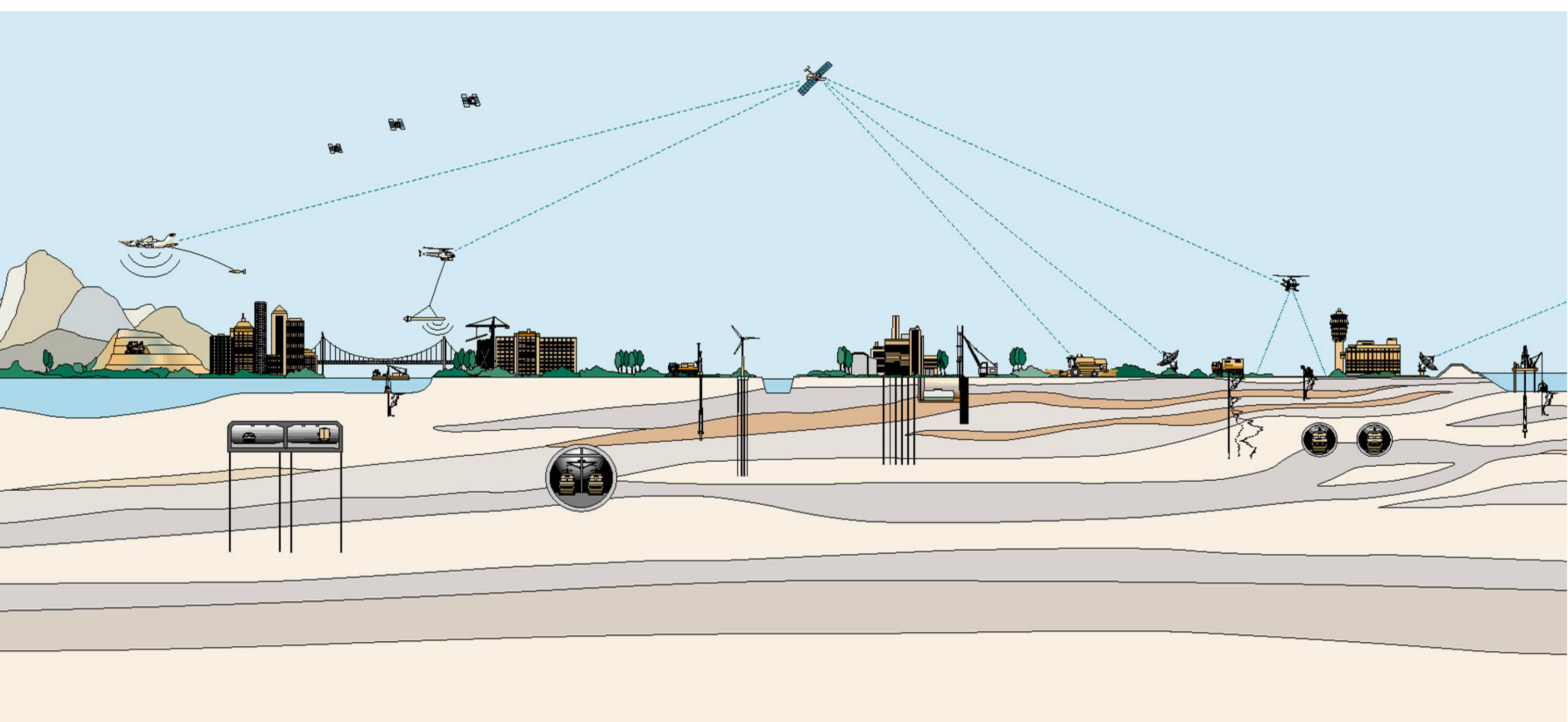

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December 30, 2015
Project No. 04.62130111

San Luis Obispo County Flood Control and Water Conservation District
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Attention: Mr. Raymond Dienzo, P.E.
Program Manager/Project Engineer

Subject: Final Report
Santa Maria Groundwater Basin Characterization and Planning Activities Study

Fugro Consultants, Inc., in collaboration with GEI Consultants, Inc., is pleased to submit this report for a groundwater basin characterization study of the Santa Maria Groundwater Basin. The objectives of the overall study are to compile previous studies and data, develop a lithologic database and prepare geologic cross-sections, perform and analyze pumping tests, and evaluate several key hydrogeologic issues for the study area.

It is important to understand that this Report is primarily intended to be a basis for future studies related to a Salt and Nutrient Management Plan and the development of a numerical groundwater model. It includes the results of our efforts to compile existing data, gather new data, and organize and prepare key lithologic and aquifer parameter databases for use in the future studies.

If you have any questions, please do not hesitate to contact us.

Sincerely,

FUGRO CONSULTANTS, INC.

Paul Sorensen, PG, CHg
Principal Hydrogeologist

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1.0 INTRODUCTION

This Final Report was prepared to document work performed by Fugro Consultants, Inc. and GEI Consultants, Inc. on behalf of the County of San Luis Obispo Flood Control and Water Conservation District (SLOFCWCD or District) for the Santa Maria Groundwater Basin Characterization and Planning Activities project (study).

1.1 PURPOSE OF STUDY

The SLOCFCWCD is leading the development of the San Luis Obispo Regional Integrated Regional Water Management (IRWM) Plan Update. The Santa Maria Groundwater Basin Characterization and Planning Activities (SMBC) project is being funded by an IRWM planning grant. The project was intended to be included as a component of the IRWM Plan update; however, the respective schedules did not allow for results of this study to be fully incorporated into the IRWM Plan update.

The District conducted the SMBC study with the intention to provide a foundation for future development of a Salt and Nutrient Management Plan and development of a numerical groundwater flow model. This report provides a summary of available hydrogeologic studies and databases that have previously been developed for the study area. An extensive effort was devoted to requesting and obtaining available California Department of Water Resources (DWR) Well Completion Reports (well logs) and associated data (e.g., geophysical logs, pumping test data) from the various water purveyors within the SMBC study area and a formal well log request was submitted to the DWR. The databases developed from this effort are included in this report.

This report also documents groundwater basin characterization efforts that included preparation of thirteen geologic cross-sections, performance of six pumping tests, assessment of areas for supplemental recharge, and evaluation of offshore aquifers and seawater intrusion. The selection of four wells for installation of permanent pressure transducers to continuously monitor and record groundwater levels is also described in this report.

1.2 BACKGROUND

The Santa Maria Groundwater Basin (SMGB or Basin) provides an essential component of the water supply for the southern portion of San Luis Obispo County. The Basin went through an adjudication process beginning in 1997, with a resulting 2008 Court Judgment that divided it into three different management areas: Northern Cities Management Area (NCMA), Nipomo Mesa Management Area (NMMA), and Santa Maria Valley Management Area (SMVMA). The Northern Cities Management Area and Nipomo Mesa Management Area are included in this study, whereas the Santa Maria Valley Management Area lies outside the boundaries of this study (Plate 1). However, limited data (e.g., well logs) were compiled for SMVMA and are included in this study to assess the hydrogeologic relationships between Nipomo Mesa and Santa Maria Valley management areas.

2.0 PREVIOUS HYDROGEOLOGIC STUDIES

2.1 INTRODUCTION

A number of previous geologic and hydrogeologic studies have been conducted within the SMBC study area and the adjacent Santa Maria Valley Management Area (Plate 1). In addition, there are ongoing data collection programs within the study area. Several previous studies and ongoing data collection programs are identified and summarized in the following sections of this report.

A bibliography of many previous hydrogeologic studies and reports conducted within and adjacent to the SMBC study area is included as Appendix A. These studies were obtained from Fugro's in-house files, internet research, and from NMMA Technical Group members. Authors of the various studies include the Management Area technical groups, DWR, United States Geological Survey (USGS), United States Department of Agriculture (USDA), and various consultants. Brief summaries of the major studies are included in the following paragraphs. More detailed technical summaries are provided in Appendix A for previous studies that are particularly relevant to subtasks completed during this study.

2.2 MANAGEMENT AREA TECHNICAL GROUP REPORTS

The NMMA Technical Group includes several hydrogeologic consultants who have been retained by most of the water purveying entities within the Management Area, along with staff from one water purveying entity. They compile and analyze hydrogeologic data collected by each water purveying entity, and data obtained from other sources (e.g., water demand, groundwater levels, and groundwater quality), and prepare an annual report summarizing groundwater conditions. The available annual reports are listed in Appendix A. Each annual report provides a summary of water demand, climatic, surface water, and groundwater conditions over the previous year, and updates groundwater hydrographs, groundwater contour maps, and groundwater quality plots, with the latest data collected over the most recent year. Important changes in groundwater conditions are noted, along with conclusions and recommendations. Technical recommendations included development of a supplemental water supply, evaluation of subsurface inflow and outflow, installation of transducers to measure water levels, improved methods of estimating/calculating groundwater pumping, and more detailed delineation of aquifers and aquitards.

The NCMA Technical Group is comprised primarily of staff from the various water purveying entities within the Management Area. They have elected to retain outside consultants to collect and compile hydrogeologic data (e.g., water demand, groundwater levels, groundwater quality) each year and prepare an annual report summarizing groundwater conditions. The available annual reports are listed in Appendix A. Each annual report provides a summary of water demand, climatic, surface water, and groundwater conditions over the past year, including groundwater level contour maps, groundwater hydrographs, groundwater chemistry plots, and other graphics to illustrate the latest hydrogeologic data collected over the previous year. Important changes in groundwater conditions are noted, along with an overall assessment of current groundwater conditions.

2.3 DWR REPORTS

Five reports covering all or portions of the SMBC study area were prepared by DWR between 1958 and 2002. The first report was county-wide (DWR, 1958), two reports focused on seawater intrusion (DWR, 1970; DWR, 1975), another report addressed the Arroyo Grande Area (DWR, 1979), and most recently, (DWR 2002), was a broad and comprehensive hydrogeologic study of the Tri-Cities Mesa–Arroyo Grande Plain, Nipomo Mesa, and northern Santa Maria Valley areas.

The DWR (1958) report encompassed all of San Luis Obispo County; therefore, only a small portion of the report applies to the SMBC study area. The report was prepared at a time of rapidly increasing population and irrigated agriculture in San Luis Obispo County. It described the overall geology and hydrology (climate, surface water, soils, groundwater) of several hydrologic units, including the Arroyo Grande Subunit (which includes most of NCMA and NMMA) of the Coastal Unit. Within the Arroyo Grande Subunit, the Arroyo Grande Basin comprised an area of 12,500 acres recharged by stream infiltration, precipitation, irrigation return flow and subsurface inflow (from Nipomo Mesa). The Nipomo Mesa (as defined by DWR) was comprised of 16,000 acres recharged primarily by percolation of precipitation. Groundwater discharge from both Arroyo Grande Basin and Nipomo Mesa was through pumping, subsurface outflow, and evapotranspiration. It was noted that Pismo Beach had obtained water from the Oceano area of Arroyo Grande Basin since 1929. A more detailed summary of hydrogeologic data and analyses from DWR (1958) is presented in Appendix A.

The DWR (1970) report covers sea water intrusion specific to the Pismo-Guadalupe area. A DWR field investigation conducted in the mid to late 1960's included the drilling and installation of multi-level completion monitoring wells along the coast (including POO-1 through POO-5: denoted as well log numbers 90021, 90022, 90015, 90016, and 40-1518 in this report), and subsequent monitoring of water levels and quality in these and other wells. The report conclusions stated the elevated chloride levels in shallow coastal groundwater (less than 100 feet below ground surface) were not attributed to lateral sea water intrusion, but were more likely related to other factors such as the natural salinity of the geologic environment, salt concentration from evapotranspiration, and/or downward percolation of sea water through channels during high tide. A more detailed summary of hydrogeologic data and analyses from DWR (1970) is presented in Appendix A. Several DWR multi-level completion monitoring wells installed for the 1970 study were incorporated into the current NCMA and NMMA monitoring programs as described later in this report.

The DWR (1975) report covers the entire state of California with respect to sea water intrusion in coastal basins. The Arroyo Grande Basin was discussed briefly, and the report stated there was no evidence of sea water intrusion and the hydraulic gradient was generally seaward. The report noted that chloride concentrations ranged from 100 to 200 parts per million (ppm) in shallow coastal groundwater, but that elevated chloride appeared to be related to a non-sea water source. However, it was noted that increased pumping could create a threat of sea water intrusion. The report also noted that basin geologic conditions near and off-shore are conducive to an extensive accumulation of fresh water in off-shore aquifers.

The DWR (1979) report described water supply and demand, hydrogeologic conditions (formations, structure, water levels, storage, quality), and potential for sea water intrusion in the

Arroyo Grande area. The study included drilling of two additional deep, multi-completion monitoring wells (PSBO-1 and PSBO-2; denoted as well log numbers 90019 and 90020 in this report). The report stated that the on-shore aquifer appeared to extend some distance off-shore, although the details of stratigraphic relationships off-shore remain uncertain. Between the mid-1960s and mid-1970s groundwater storage in the NCMA area was estimated to have increased by 5,800 acre-feet (AF), whereas groundwater storage in Nipomo Mesa area declined by 22,000 AF. The authors also stated that no evidence of sea water intrusion was found based on the previously constructed series of coastal piezometers. Additional details regarding hydrogeologic data and analyses from DWR (1979) are presented in Appendix A.

The DWR (2002) report was comprehensive in addressing geology, water demand and supply, hydrogeology (groundwater levels, flow, storage, aquifer parameters, etc.), water quality, and the water budget. The study area of the report was bounded by the San Luis Obispo–Santa Barbara County line on the south, the Wilmar Avenue Fault on the east, the City of Pismo Beach on the north, and the Pacific Ocean on the west. The overall study area was subdivided into the Tri-Cities Mesa–Arroyo Grande Plain (approximately equal to the area of NCMA), Nipomo Mesa (approximately equal to NMMA), and the northern portion of the Santa Maria Valley. The total inflows were about equal to outflows for the study period in the Tri-Cities Mesa–Arroyo Grande Plain area, but outflows in Nipomo Mesa were estimated to exceed inflows by 1,400 acre-feet per year (AFY). The study defined a “dependable yield” for each area as follows: 4,000 to 5,600 AFY for Tri-Cities Mesa–Arroyo Grande Plain and 4,800 to 6,000 AFY for Nipomo Mesa. The report also provides extensive discussion of the geology of the groundwater basin and includes geologic formation descriptions, cross-sections, and evaluation of fault offsets and stratigraphic relationships. A more detailed summary of hydrogeologic data and analyses from DWR (2002) is presented in Appendix A.

2.4 USGS REPORTS

Two foundational reports for the region prepared by USGS in the 1950s were Woodring and Bramlette (1950) and Worts (1951). The 1950 report described the geology and paleontology of the region, and the 1951 report addressed groundwater resources in the Santa Maria Valley. Neither report is directly focused on the Nipomo Mesa or Northern Cities areas, but they provided important geologic formation descriptions and other information/data that are relevant to the SMBC study area. Other USGS reports summarized below are Miller and Evenson (1966) and Hall (1973).

The Woodring and Bramlette (1950) study is strictly geologic in nature (does not address groundwater), but provides detailed descriptions of the color, texture, and sequence of lithologic units that comprise the primary geologic formations in the SMBC study area (e.g., Paso Robles Formation, Careaga sandstone, Sisquoc Formation). This geologic information was useful for interpretation of lithologic descriptions from well logs (i.e., assigning each layer to a particular geologic formation) in the SMBC study area, and preparation of geologic cross-sections for this report. A more detailed summary of hydrogeologic data and analyses from USGS (Woodring and Bramlette, 1950) is presented in Appendix A.

The Worts (1951) report describes how regional geologic conditions (sequence of formations, geologic structure) relate to the occurrence of groundwater in the Santa Maria Valley. Again, the report is not focused on the SMBC study area, but provided some useful information nonetheless since Nipomo Mesa borders Santa Maria Valley on the north. In addition, the hydrogeologic implications of geologic structure and stratigraphic relationships are discussed in detail. The report also included a detailed water budget, and assessment of perennial yield for the Santa Maria Valley. A more detailed summary of hydrogeologic data and analyses from USGS (Worts, 1951) is presented in Appendix A.

Miller and Evenson (1966) prepared a brief report to update the Worts (1951) report. Specifically, the 1966 report updated the perennial yield analysis, and evaluated the magnitude of overdraft in Santa Maria Valley and its effects on groundwater storage and seawater intrusion. The northern end of the study area for the 1966 report did include the southern end of Nipomo Mesa, but the main focus of the report is in the Santa Maria Valley. Overall, the 1966 report did not include any additional information specifically related to Nipomo Mesa (beyond that already included in the 1951 report).

Hall (1973) is a USGS Map Sheet showing the geology of the Arroyo Grande 15 minute quadrangle. It covers nearly the entire study area – just missing the southeastern-most portion of Nipomo Mesa. The map shows the surficial geology of the study area, which largely consists of older (vegetated) dune sand throughout Nipomo and Tri-Cities mesas and alluvium in the Arroyo Grande Creek and Los Berros Creek valleys. Younger dune sands are present in the western portion of the study area, and a thin layer of Paso Robles Formation is mapped between Los Berros Creek and Highway 101. A few very small and isolated knobs of Jurassic Franciscan and Tertiary tuffs are present in the area surrounding Los Berros Creek valley. The Map Sheet also provides detailed descriptions of the various geologic formations.

2.5 CONSULTANTS REPORTS

Consultant reports summarized below include Chipping (1994), Hoover and Associates (1985), Cleath and Associates (1996), Luhdorff & Scalmanini Consulting Engineers (LSCE, 2000), Papadopulos & Associates (2004), Fugro/Cleath (2005), Todd (2007), Fugro West (2008a), and Cleath-Harris Geologists (2013). The Chipping report addressed the Black Lake Canyon area of Nipomo Mesa, the Hoover report covered Arroyo Grande Creek stream flow percolation, the Cleath study was for the Woodlands development, the LSCE study covered Santa Maria Valley and southern Nipomo Mesa, the Papadopulos report involved the Nipomo Mesa area, and the Todd report was a water balance for the NCMA. Three additional reports by Fugro and Cleath that document individual well pumping tests are also summarized below.

The Chipping (1994) report was funded by the Land Conservancy of San Luis Obispo County to evaluate the hydrogeology of Black Lake Canyon and assess management options relative to canyon wetlands. The report stated that the canyon geology is comprised of older dune sands that overlie Paso Robles Formation. Chipping stated that their review of groundwater level data indicated canyon water tables had been declining at a rate of 0.37 feet/year since 1975 (as of early 1990's). It was determined that the upper part of the canyon is underlain by a clay layer that supports a perched (upper) aquifer, where water levels appeared to be rising (possibly due to changed land use in the area). The upper aquifer is not present in the central to western portion of the canyon where the canyon floor has cut through the perching clay layer. The groundwater table in the lower canyon had been falling since the 1970's and the springs had reportedly dried up – thereby causing wetland degradation. The report included various recommendations to enhance wetlands within the canyon. Additional details regarding hydrogeologic data and analyses from Chipping (1994) are presented in Appendix A.

Cleath and Associates (1996) conducted a hydrogeologic study for the Woodlands development. The primary purpose of the study was to evaluate potential groundwater impacts from proposed development of four new production wells for the property. The report includes a detailed evaluation of geologic formations present in the area (e.g., cross-sections, structure contour maps), groundwater conditions (levels, quality, etc.), and development of a groundwater model. Potential impacts to groundwater levels, storage, and quality from the proposed development were analyzed and quantified in the report. A more detailed summary of hydrogeologic data and analyses from Cleath (1996) is presented in Appendix A.

A copy of the Hoover (1985) report was unable to be obtained for this study. However, the Hoover report results were briefly described by Todd Engineers (2007). Todd reported that the Hoover study included collection of synoptic stream flow measurements in June 1984 on Los Berros Creek. A flow of 3 cubic feet per second (cfs) was observed at the upstream USGS gauge station, while no flow was observed in the stream at 22nd Street Bridge. Thus, Hoover concluded 3 cfs of stream flow percolated into the subsurface between the two locations.

Luhdorff & Scalmanini Consulting Engineers (2000) developed a numerical groundwater flow model (MODFLOW) for the Santa Maria Valley basin. The primary focus of the LSCE study area was the Santa Maria Valley, but it also encompassed the southern portion of Nipomo Mesa (the area south of Black Lake Canyon). The purpose of the model was to assess basin conditions, evaluate potential future projects and land use, and to assess the perennial yield of the basin. The basin was determined to have a perennial yield of 124,000 AFY and was not in overdraft. Additional details regarding hydrogeologic data and analyses from LSCE (2000) are presented in Appendix A.

The Papadopulos and Associates (2004) Resource Capacity report for Nipomo Mesa was largely a review of previous studies by DWR and various consultants, which had varying conclusions regarding sustainable groundwater pumping. The purpose of the study was to evaluate the existing studies and make recommendations regarding groundwater management and the appropriate level of severity designation by the County. Papadopulos concluded that the Nipomo Mesa was in overdraft (based on reinterpretation of data presented in the DWR 2002 report), and corresponded to the County designation of Level of Severity III (i.e., existing water demand equals or exceeds the dependable supply). Despite these findings, Papadopulos concluded there was not imminent danger of sea water intrusion. Additional details from Papadopulos (2004) are included in Appendix A.

The Fugro/Cleath (2005) report was an evaluation of Pismo Beach Wells 9 and 10 and the surrounding geology to evaluate the continuity of the aquifer, to evaluate if separate perennial yield calculations were required, and to calculate individual production capacities. It was determined that the aquifer tapped by Wells 9 and 10 is in hydraulic communication with the Tri-Cities Mesa/Arroyo Grande Plain portion of Santa Maria Groundwater Basin; thus, a separate perennial yield calculation was not needed. Pumping tests were conducted on Wells 9 and 10 and well capacities on both wells were calculated to be 150 to 175 gallons per minute (gpm). Additional details of the Fugro/Cleath (2005) study are described in the pumping test section of this report.

The Todd Engineers (2007) report was a water balance for the NCMA that quantified the various recharge and discharge components. The recharge components included rainfall percolation, stream flow infiltration, irrigation recharge, subsurface inflow, and infiltration from storm water basins. The main components of recharge were determined to be stream flow infiltration (2,015 AFY), rainfall percolation (1,615 AFY), and subsurface inflow (3,470 AFY). The total average annual inflows of 8,500 AFY were balanced by 8,500 AFY of average annual outflows comprised of urban pumping (2,270 AFY), agricultural pumping (3,300 AFY), and subsurface outflow (2,960 AFY). The Todd report also included some field work to collect synoptic stream flow measurements and better quantify stream flow infiltration on Los Berros Creek. Additional technical details from the Todd (2007) report are included in Appendix A.

Fugro West (2008a) completed a study for the Nipomo Community Services District (NCSD) Southland Waste Water Treatment Facility (WWTF) that included pumping tests and near-site groundwater modeling. The overall purpose of the study was to evaluate feasibility of extracting treated discharge water from the groundwater mound beneath the percolation basins for subsequent disposal at other sites. In general, the preliminary investigation indicated the proposed concept appeared to be viable, but that additional testing was needed and the project design concept needed to be further developed. The results of pumping tests included in the Fugro (2008a) study are described in more detail in the pumping test section (Section 5) of this report.

The Cleath-Harris Geologists (2013) report documented their evaluation of the current production capacity of City of Pismo Beach Well 5 and Well 23. The wells were reported to have had a decrease in pumping capacity in 2009. The assessment included collection of existing data on well construction, pumping tests, production, and water levels; performance of pumping tests that included measurement of sand production and field water quality parameters; and determination of specific capacity and current production capacity. Additional details of the Cleath-Harris (2013) report are provided in the pumping test section (Section 5) of this report.

2.6 US DEPARTMENT OF AGRICULTURE

The United States Department of Agriculture (USDA) Soil Conservation Service conducted a soil survey of the coastal part of San Luis Obispo County in 1984. The General Soil Map shows the Nipomo Mesa covered by Oceano–Dune land–Baywood Unit, which is comprised of excessively drained fine sand and sand deposits (windblown deposits). The NCMA area is comprised of the Oceano-Dune land-Baywood Unit in the Tri-Cities Mesa area, and the Salinas-Marimel soil in the Arroyo Grande Plain area (somewhat poorly drained to well drained silty clay loam and sandy clay loam soils on alluvial plains). The soil survey contains maps that delineate and describe soil types in more detail over the SMBC study area. A more detailed summary of the distribution of soil types from USDA (1984) is presented in Section 10.0 of this report, the Evaluation of Areas for Enhanced Recharge.

2.7 ENVIRONMENTAL IMPACT REPORTS

Environmental Impact Reports (EIRs) have been prepared for various proposed projects in the SMBC study area. Several of these EIRs are listed in Appendix A. Our review indicates that, in general, EIR documents do not provide significant hydrogeologic information and data that would be useful for the SMBC study. However, some EIRs are based on separate hydrogeologic technical reports that provide good sources of information and data, and are incorporated in relevant sections of this report. For example, the Cleath (1996) report summarized above was used to support the Woodlands Development EIR, and pumping test data are from the Cleath study are incorporated in the pumping test section (Section 5) of this report.

2.8 APPLICATION OF PREVIOUS STUDIES TO SMBC HYDROGEOLOGIC EVALUATIONS

Previous studies provide a significant amount of information and data that were applicable to work conducted for the SMBC study documented in this report. In particular, the development of geologic cross-sections described in Section 7.0 of this report included interpretation of geologic formation contacts between Older Dune Sand, Paso Robles Formation, and Careaga sandstone. Several previous studies (e.g., Woodring and Bramlette (1950); Worts (1951); Cleath (1996), LSCE (2000); DWR (2002); NMMA and NCMA annual reports) provide discussions, data, and cross-sections that describe/illustrate geologic structure, geologic formation characteristics, and geologic interpretations that were considered in preparation of the geologic cross-sections developed for this study.

Evaluation of stream flow infiltration in Section 9.0 was facilitated by past studies conducted by Hoover (1985), Todd (2007), and USDA (1984). The seawater intrusion analysis in Section 11.0 utilized previous studies by DWR (2002), Papadopulos (2004), and NCMA annual reports (GEI Consultants (2011, 2012, 2013), Fugro (2014)). The discussion of recharge areas included a review of USDA (1984) and Todd Engineers (2007). In addition, the geologic cross-sections developed for this study provided input to assessment of seawater intrusion, stream flow infiltration, and enhanced recharge areas described in subsequent sections of this report.

3.0 ONGOING HYDROGEOLOGIC DATA COLLECTION PROGRAMS

The NMMA Technical Group (TG) coordinates an ongoing groundwater monitoring and data collection program that focuses on groundwater levels, groundwater quality, and water demand. The data are compiled and databases updated each year during preparation of the NMMA Annual Report. The current monitoring program involves compilation of semi-annual (April and October) groundwater level measurements from approximately 80 to 100 wells collected by the SLOCFCWCD, NCSD, Phillips 66, Woodlands, Golden State Water Company (GSWC), Cypress Ridge Golf Course, and the USGS. Nine key wells have been designated in the NMMA to evaluate longer term water level trends. The most recent review of the key wells water level trends indicated a general decline in key wells groundwater levels since 2000, and development of a persistent pumping depression in the west-central part of Nipomo Mesa.

NMMA water quality data are collected from a number of sources including the California Department of Public Health (DPH), the Regional Water Quality Control Board (RWQCB), the State Water Resources Control Board (SWRCB), the California Department of Toxic Substances and Control (DTSC), the USGS, and other groundwater production monitoring data. The NMMA groundwater quality database contains data for about 200 wells that contain records for at least one sampling event. Longer term trends for electrical conductivity, total dissolved solids (TDS), and chloride show relatively stable concentrations in the coastal area. For inland areas, chloride and TDS concentrations have generally remained stable over the long term, and nitrate concentrations for most wells in the primary aquifers (except for two potable water supply wells) remained below the Maximum Contaminant Level (MCL).

Similar to NMMA, the focus of the NCMA monitoring program is on groundwater levels, groundwater quality, and water demand. The data are published each year in the NCMA Annual Report. The current monitoring program involves measurement of groundwater levels in 38 wells by the SLOCFCWCD and NCMA agencies in the NCMA on a semi-annual basis (April and October), and quarterly water level measurements in coastal sentry wells by NCMA.

Pressure transducers were installed in the deep wells at three of the sentry well sites (24B03, 30F03, and 30N02) in February 2011 to measure potential short-term water level fluctuations due to pumping, tidal fluctuation, or other factors. A similar pressure transducer was installed in well 24B01 at the North Beach Campground in March 2011 to gain insight into tidal fluctuation effects on groundwater levels, as well as tidal and other events (such as storm surge) that may influence salinity in shallow formations. To understand water level fluctuation and water quality variation in the area between the NCMA and NMMA, another pressure transducer was installed in well 32C03 in April 2012.

NCMA groundwater quality monitoring includes quarterly sampling from five sentry wells (which include several monitoring wells described in the DWR 1970 report) and District MW #3 (32C03), and compilation of DPH data for municipal wells. In general, coastal monitoring well TDS, chloride, and nitrate concentrations have remained stable or improved (decreased) compared to 2008-2010 levels. Water quality data from DPH for municipal wells continued to show generally stable concentrations over the long term.

4.0 DEVELOPMENT OF WELL LOG DATABASE

4.1 INTRODUCTION

As part of this study, the Fugro/GEI Team obtained a relatively complete set of well logs, plotted individual well locations, and developed an extensive well log database based on review of previous studies and data, requests to SMBC study area stakeholders, and a well log request to DWR. Well log information/data was obtained from the following sources: DWR; California State Division of Oil, Gas, and Geothermal Resources (DOGGR); NCSD; GSWC; Woodlands; Rural Water Company (RWC); Cypress Ridge; City of Arroyo Grande; County of San Luis Obispo Public Works (limited due to confidentiality agreements); City of Grover Beach; Oceano Community Services District; and City of Pismo Beach.

The well log data obtained was quite voluminous (due to the 3,781 pages of well logs and data obtained from DWR. There are typically one to four pages per well depending on whether or not the one-page DWR form was accompanied by a separate well location map(s) and/or a driller's own standard forms for recording lithology and well construction details. Ultimately, the vast majority of well logs that could be located relatively accurately were plotted in Google Earth and those well locations subsequently converted to a GIS well location map (Plate 2). In some cases of multiple wells on single or adjacent small properties, only a representative well was plotted and included in the database. The lithologies described on well logs that could be located were given lithologic symbols (Appendix B) and entered into an Excel spreadsheet database (Appendix C). The well log database is organized by well log number, top of lithologic layer, bottom of lithologic layer, lithologic material symbol, supplemental lithologic descriptions, color, presence of shells, and the township/range/section (T/R/S) assigned by DWR. Copies of the confidential DWR well logs are provided in Appendix D (on CD, presented separately). Additional details of the lithology database are described below.

4.2 WELL LOG NUMBER AND LAYER TOP/BOTTOM

The vast majority of the well logs have a unique well log number that was preassigned to each well log form. However, a small number of logs were recorded on non-standard (or very old) DWR well log forms, in which case they have no preassigned well log number. Due to the need in the SMBC study for a unique identifying number for each well log for input to the database, these logs were assigned numbers beginning with 90001 and running through 90025. The Excel database column labeled “Point ID” contains the well log number.

Each lithologic description on a well log has a depth interval recorded by the driller. In the database, separate columns are provided for the top and bottom of each layer. The bottom depth of a given layer is the top depth of the layer just below it. The Excel database columns labeled “Depth” and “Layer Bottom” contain the depth (in feet) to the top and bottom of each layer, respectively.

4.3 LITHOLOGIC SYMBOLS

A system for lithologic symbols was developed based on the United Soil Classification System (USCS). Additional lithologic symbols were added to be more descriptive of the individual lithologic descriptions. For example, the USCS symbol for sandy clay is CL, whereas the system used in this study designates that lithologic description as CL-S. Similarly, poorly sorted gravel with sand (or Sandy Gravel) is GP in the USCS, whereas the symbol assigned in this study for that lithology is GP-S. A complete listing of lithologic symbols used in this study is provided in Appendix B. The goal of the lithologic symbol system used in this study is to provide as much lithologic descriptive information as possible in a short-hand format. The Excel database column labeled “Material Graphic” contains the lithologic symbol for each layer.

There are some important aspects of our interpretation of lithologic descriptions for this study that should be noted. For example, the term “Shale Gravel” is commonly used by drillers for layers in the Paso Robles Formation. Based on Fugro field experience with drilling in the Paso Robles Formation, the material that drillers describe as Shale Gravel typically includes a clay component. Thus, the symbol GPGC was assigned to Shale Gravel. If clay is emphasized in the description, such as clay and shale gravel, the assigned symbol is CL-GPGC. Similarly, if sand is emphasized, such as sand and shale gravel, the assigned symbol is SP-GPGC. Also worth noting is that many driller lithologic descriptions use the word “and”; for example, sand and clay or gravel and sand. In these cases, the first term is assumed to represent the primary lithology and the second term is the minor lithology. Thus, these two lithologic descriptions are assumed equivalent to clayey sand and sandy gravel, respectively.

4.4 SUPPLEMENTAL LITHOLOGIC DESCRIPTIONS

This column in the database is commonly blank if there is nothing additional to note, and the assigned lithologic symbol readily identifies the components of the lithologic description. However, driller lithologic descriptions may include additional details not indicated by the symbol alone (e.g., “hard” clay, “cemented” sand), in which case the drillers descriptive comment is noted in this column. In addition, the lithologic symbol system does not readily handle mixed descriptions that include both unconsolidated and consolidated rock names (e.g., Clay and Shale, Sand and Shale). In these cases, the first unit mentioned is the basis for assigning a lithologic symbol (e.g., CL or SP), but the full description is given in this column. Also, a notation of bedrock or consolidated rock (e.g., Shale, Sandstone) is specifically noted in this column. The column heading in the Excel database is “Material Description.”

4.5 COLOR AND SHELLS

The notations with regard to color and presence of sea shells were deemed important in trying to distinguish geologic formations (e.g., Older Dune Sand, Paso Robles Formation, Careaga sandstone), and for lithologic correlations on cross-sections. Therefore, separate columns are included in the database to denote these characteristics for each lithologic unit. If no color is given, this column is blank. The presence of sea shells is noted with an X; otherwise this column is left blank. It should be noted that drillers may not always notice or make note of shells even if they are present; thus the absence of an X in the shells column does not necessarily mean no shells are present. These columns in the Excel database are labeled “Color” and “Seashells.”

4.6 ASSIGNED T/R/S

The notations in the column for township, range, and section are based on designations and organization of the well logs by DWR and/or the County Environmental Health Department. The particular assignment of T/R/S on a given log by either the driller (and subsequently adopted by DWR) or as assigned by DWR, may or may not accurately reflect where the particular well is located. However, this column contains the T/R/S assigned by DWR to make tracking the hard copy of the log easier (because we have retained the organization of the well logs by DWR assigned T/R/S). This column in the database is labeled “TRS.”

4.7 DEVELOPMENT OF GEOLOGIC CROSS-SECTIONS

The lithology database described above is provided in Appendix C, and was used to develop thirteen geologic cross-sections across the study area (presented in Section 7.0). The lithology database and extensive compilation of hard copy well logs (Appendix D) completed for this study will facilitate any number of additional cross-sections that others may wish to develop in the future beyond those prepared as part of the SMBC study.

5.0 PUMPING TEST AND SPECIFIC CAPACITY DATABASE

5.1 INTRODUCTION

Pumping test and specific capacity data were included in our data request from SMBC study area stakeholders. In addition, in the course of reviewing well logs received from DWR, specific capacity data (i.e., for logs that reported both a pumping rate and drawdown) were compiled into a table. The specific capacity data obtained from study area water purveyors and DWR well logs are summarized in Table 1, and the pumping test data are described in Section 8.0 of this report.

Table 1 includes the conversion of specific capacity data to estimated transmissivity values (based on methodology of Driscoll, 1986) which, when divided by saturated aquifer thickness, provide estimated hydraulic conductivity values. Interpreted formation(s) within well screen intervals are provided for each well. In addition, a zone is defined for each well location as follows: Zone 0 is northeast of Wilmar Avenue Fault, Zone 1 is between Wilmar Avenue Fault and Santa Maria River Fault, Zone 2 is between Santa Maria River Fault and Oceano Fault, and Zone 3 is west of Oceano Fault.

Overall, the existing pumping test data (i.e., several measurements of time versus drawdown and/or plots of these measurements) are limited in comparison to specific capacity data. The vast majority of data collected are specific capacity data that consist of a single measurement of drawdown at a given pumping rate after several hours of pumping. The following sections discuss the available data in more detail. It should also be pointed out that data related to full saturated aquifer thickness is not always known; well screen length, or cumulative lengths of screened intervals, are often used as a means of estimating saturated aquifer thickness. However, improper use of screened intervals in lieu of aquifer thickness in estimating hydraulic conductivity may result in overestimating the hydraulic conductivity value. Thus, the data presented in Table 1 is understood to be based on the best available data, and should be viewed with that in mind if used for other specific purposes, such as groundwater flow model input values.

5.2 PUMPING TEST DATA

For the purposes of the SMBC study, pumping test data are defined as a data set consisting of several measurements of drawdown versus (vs.) time that are sufficient for plotting and allow for calculation of transmissivity (T) values. Such data were requested from local water purveyors/stakeholders in our overall well log data request. Well logs from DWR typically do not contain pumping test data (with exception of Cypress Ridge wells), although some DWR well logs include specific capacity data (described in following section). The wells with pumping test data that were able to be collected for this study included four Pismo Beach wells (5, 9, 10, and 23), four Woodlands wells, three NCSD wells (Bevington and Southland WWTF MW-1 and MW-3), four Cypress Ridge Golf Course wells, and a Grover Beach well. These data sets were obtained from NMMA, NCMA, DWR well logs (for Cypress Ridge Golf Course wells), and Fugro in-house files. The pumping test data are tabulated and described in Section 8.0 of this report.

5.3 SPECIFIC CAPACITY DATA

Specific capacity is defined as the pumping rate divided by drawdown at some given duration of pumping. The conversion factor of 2,000 used to estimate T (in units of gallons per day per foot of aquifer (gpd/ft)) from specific capacity (Q/s, in units of gallons per minute per foot of drawdown (gpm/ft)) is derived from Driscoll (1986). Several assumptions are used to derive this conversion factor, as described in the cited reference. Included in these assumptions are that the well is pumped for 24 hours, that it is a 100 percent efficient pumping well, there was no vertical leakage, and that no boundary (recharge and discharge) conditions were encountered over the pumping duration. The various assumptions need to be considered in each individual case, and can lead to over or under estimation of T values using the conversion factor. The intent of the conversion factor is to provide a general approximation of the T values for well tests that only have a specific capacity value. T values derived from a full set of pumping test data (time-drawdown, recovery data, distance-drawdown data) should be considered more reliable estimates than those obtained from conversion of specific capacity values.

The available specific capacity data are summarized in Table 1, and locations of these wells are shown on Plate 3. Based on preliminary interpretations of geologic formations screened in several wells and conversion of Q/s values to T and hydraulic conductivity (K) values, average K values have been calculated as summarized at the bottom of Table 1. Many of the wells with Q/s data appear to be screened exclusively within the Paso Robles Formation in either Zone 2 or Zone 3. These wells have an estimated geometric mean K of 4 to 8 feet/day. A very limited number of wells were screened exclusively in the Careaga sandstone (and only in Zone 2). The Careaga wells had an estimated geometric mean hydraulic conductivity of 3 feet/day. The formations underlying the Careaga, either Sisquoc or Tertiary undifferentiated, had geometric mean K values of 0.10 to 0.14 feet/day. Slightly higher K values were calculated for wells that were screened in both Paso Robles Formation and Careaga sandstone with geometric mean K values of 12 to 35 feet/day for Zones 2 and 3. Wells screened in Paso Robles Formation within NCMA had a relatively high geometric mean K value of 109 feet/day, whereas wells screened in Careaga sandstone in NCMA had a geometric mean K value of 10 feet/day.

5.4 PUMPING TEST SITE SELECTION

Based on review of Table 1 and Plate 3, and the general lack of pumping test data (i.e., most existing data is specific capacity data), essentially the entire SMBC study area was considered for potential pumping test site selection for this study. Even in areas with abundant specific capacity data, it is preferable to collect pumping test data to better quantify aquifer parameters. Other considerations for pumping test site selection were wells located near known or suspected fault traces (if observation wells were available) in order to develop greater understanding of hydraulic continuity across fault zones, wells located in both NMMA and NCMA, and wells screened in different aquifers to allow characterization of multiple aquifers and depth zones. The pumping tests conducted as part of this study are described in Section 8.0 of this report.

6.0 IDENTIFICATION OF DATA GAPS

6.1 LITHOLOGY DATABASE

The locations of wells with available borehole lithology data are relatively evenly distributed throughout most of the Nipomo and Tri-Cities mesas. Areas lacking in lithologic data include the Arroyo Grande Alluvial Plain between the Nipomo and Tri-Cities mesas, and the area between Highway 1 and the Pacific Ocean in the southern portion of NCMA and western portion of NMMA (see Plate 2).

6.2 PUMPING TEST DATA

The locations of wells with pumping test and specific capacity data tend to mirror the overall distribution of wells with lithologic data (Plate 3). However, there are additional data gaps along the upper portion of Black Lake Canyon north of Oceano Fault, and in the northwestern portion of Nipomo Mesa north of Santa Maria River Fault.

6.3 GEOPHYSICAL LOGS

The locations of water wells with geophysical logs compiled for the SMBC study are shown in Plate 4, and geophysical log hard copies are provided in Appendix E. In addition to the lack of geophysical logs in areas mentioned as generally lacking lithologic data, wells with geophysical logs are generally lacking in the northern portion of Nipomo Mesa. It is likely that a significantly greater number of geophysical logs exist for the study area than were able to be compiled for this study. NMMA (2010) references approximately 65 geophysical logs for just the NMMA area, however due to confidentiality constraints, some of those logs were not available for this study. Because availability of geophysical logs in DWR well log files is limited, the majority of the 25 geophysical logs reviewed for this study were obtained directly from well owners.

6.4 OIL WELL LOG DATA

Oil well log data were obtained from DOGGR (Appendix F). Data were available for about 10 oil wells within the SMBC study area (Plate 5). In general, the oil well log data were of somewhat limited value for a water resources study due to lack of detailed lithologic descriptions in the upper 1,000 feet of sediments and geophysical logs that sometimes bypass the upper several hundred feet of sediments. Nonetheless, oil well log data are incorporated to the extent that it is useful for the depths of interest in this study.

7.0 REGIONAL GEOLOGY AND GEOLOGIC CROSS-SECTIONS

7.1 INTRODUCTION

A number of previous geologic and hydrogeologic studies have been conducted within the SMBC study area and the adjacent Santa Maria Valley. In addition, this study has included compilation and review of well and geophysical log data. This information provides the basis for descriptions of the geologic formations and structure described in the following paragraphs. The geologic cross-sections developed for this study are then presented and described, with particular emphasis on interpretation of formation contacts and potential offsets across fault zones.

7.2 GEOLOGIC FORMATIONS

The major geologic formations in the NMMA and NCMA areas from youngest to oldest are Recent Alluvium, Young and Old Dune Sand, Paso Robles Formation, Careaga sandstone, Sisquoc Formation (and/or other formations older than Careaga sandstone such as the Squire Member of the Pismo Formation), Monterey Formation, and the Franciscan Formation bedrock (Plate 6). The primary water-bearing formations in the study area include Recent Alluvium, Paso Robles Formation, and Careaga sandstone.

7.2.1 Alluvium

Holocene Alluvium (Qa) occurs on the floor of Arroyo Grande Plain and valley bottoms of Arroyo Grande and Pismo creeks, and in Santa Maria Valley (Plates 1 and 6). It is comprised of sand, gravel, silt, and clay, with cobbles and boulders. Within Santa Maria Valley, the alluvium is comprised of a lower coarse-grained member and an upper fine-grained member, but the lower member is missing in the Oso Flaco District. Alluvium of Arroyo Grande Plain ranges in thickness from 40 feet near the coast to 130 feet near the confluence of Los Berros and Arroyo Grande creeks, and is about 50 feet thick near Pismo Beach. Alluvium is about 60 feet thick in Oso Flaco District and about 30 feet thick in Black Lake Canyon. Individual beds in the formation are laterally discontinuous and difficult to correlate between wells – nonetheless, DWR cross-sections did identify fairly continuous clayey silt to silty clay beds is some areas (DWR, 2002). Alluvium is most commonly brown in color.

7.2.2 Dune Sand

The Dune Sand (Qds) includes older dune deposits (Qos) with developed soil mantle and vegetation, and younger actively drifting dune sand (Qs). The Dune Sand is generally above the main aquifer, but does contain locally perched aquifers on top of interbedded clay layers (aquitards). Dune Sand ranges from late Pleistocene to Holocene age with older Dune Sand that forms the Tri-Cities Mesa and Nipomo Mesa (Plates 1 and 6) from 40,000 to 120,000 years old. Dune Sand is fine to coarse-grained sand with some silt and clay. Older Dune Sand ranges up to 60 feet thick in Tri-Cities Mesa to 300 feet thick beneath Nipomo Mesa (Worts, 1951; DWR, 1979, 2002). Dune Sand is typically brown to yellow in color.

As stated above, clay layers within the Older Dune Sands create perched groundwater in some areas, including in the Black Lake Canyon area. Cleath (1996) described the perched layers as widespread but discontinuous across the Nipomo Mesa, and defined an elevation surface for the bottom of a shallow aquitard (clay layer with low vertical permeability) and an isopach (thickness) map of the clay layer. The base of the shallow aquitard is indicated to range from about -60 feet Mean Sea Level (MSL) along the southwestern edge of Nipomo Mesa to +120 feet MSL in northeastern Nipomo Mesa with an aquitard thickness ranging from less than 10 feet (southwestern area) to 70 feet (northwestern area).

7.2.3 Paso Robles Formation

The Paso Robles Formation (QTpr) is upper Pliocene to lower Pleistocene in age. It is comprised of lenses of fine to coarse sand and gravel, clayey to silty sand and gravel, fine to medium silty sand, silt, and clay. In general, the base of Paso Robles Formation is comprised of 50 to 100 feet of clay or clay and limestone. In some areas the clay may be missing at the base of Paso Robles Formation, in which case the base may consist of conglomerate that is difficult to distinguish from the upper Careaga sandstone. The Paso Robles Formation is typically either brown or gray in color, and contains light brown silty clay and silty sand beds in the upper part of the formation. However, a variety of colors have been described in lithologic logs including gray, brown, tan, white, blue, green, and/or yellow. Where Paso Robles Formation overlies Careaga sandstone or Pismo Formation it can be difficult to distinguish in well logs (Woodring and Bramlette, 1950; Worts, 1951; DWR, 1970, 1979, 2002; Cleath, 1996).

The lenticular nature of the sediments (due to its largely non-marine origin) makes it difficult to correlate clay layer or sand/gravel layers from one well log to the next. Within the Paso Robles Formation, sand and gravel zones are typically separated by gray to greenish-gray clay beds. Gravels in the Paso Robles Formation are primarily porcelaneous shale from the Monterey Formation, but also include porphyries and sandstone pieces. Chert and cherty shale pieces may also be present in the upper portion of Paso Robles Formation. The Paso Robles Formation generally becomes finer grained near the coast (predominantly sand and clay) and locally may be of marine origin (Woodring and Bramlette, 1950; Worts, 1951; DWR, 1979, 2002; Cleath, 1996). DWR (2002) suggested that the Paso Robles Formation was deposited under a range of conditions from fluvial to estuarine-lagoonal in inland areas and nearshore marine at the coast.

The formation was described by Worts (1951) as being 280 to 400 feet thick beneath Nipomo Mesa and becoming thicker as it extends beneath Santa Maria Valley (Plate 1). Cleath (1996) stated that the formation thickness ranges from about 600 feet in the southwest portion of Nipomo Mesa to less than 100 feet in the northeast portion along the Los Berros Creek area. DWR (1979) stated the Paso Robles Formation attains its maximum thickness of 1,000 feet beneath the Santa Maria River. Vertical offset of the formation across the Oceano Fault was estimated to be 370 feet (Cleath, 1996).

7.2.4 Careaga Sandstone

The Careaga sandstone (Tca) is considered to be upper (late) Pliocene in age and of marine origin. It is not exposed at ground surface in the study area. It is generally described in lithologic logs as fine to coarse grained, blue, blue-gray, white, gray, green, yellow, brown, and/or yellow-brown sand, gravel, silty sand, silt, and clay. Shell fragments are common in clays and sometimes in sands/gravels. It is comprised of two units/members, a lower member (Cebada) that is finer-grained than the upper member (Graciosa). The Graciosa member is comprised of unconsolidated to consolidated sandstone and conglomerate. The lower portion of Graciosa contains gray to brown coarse-grained sandstone and conglomerate, with localized interbeds of medium-grained sandstone. The upper portion of Graciosa contains gray coarse-grained sand/sandstone with localized thin interbeds of gravel/conglomerate. The upper portion of the Graciosa member typically has a distinct sandy horizon between the clay at the base of Paso Robles Formation and conglomerate of the lower portion of Graciosa member. The Cebada member is comprised of unconsolidated very fine to fine-grained sand. The lower portion of Cebada is light gray to white and very fine-grained, but other portions of the Cebada are light yellow-brown. The distinction of members described above is very common throughout the Santa Maria Valley region but locally the members are not well defined and the formation is considered undifferentiated (Woodring and Bramlette, 1950; Worts, 1951; DWR, 2002). It should be noted that member descriptions described above from Woodring and Bramlette (1950) were derived from outcrops/data to the south of the study area, and it is unknown how distinct the member characterization is within the study area.

Woodring and Bramlette (1950) stated the gravel in the lower portion of Graciosa is mostly porcelaneous shale except for red-gray quartzite and rhyolite porphyry in the upper third of the lower part of the member. Cleath (1996) stated the Graciosa member is generally gray in color and can be further subdivided into upper red-gray coarse sand with quartzite and rhyolite porphyry constituents and a lower conglomerate comprised of porcelaneous shale.

Worts (1951) showed the formation to be 85 to 130 feet thick beneath Nipomo Upland and becoming thicker beneath Santa Maria Valley. Woodring and Bramlette (1950) said the overall thickness of Careaga sandstone in the region was 50 to 1,425 feet, with the Cebada member ranging from 0 to 1,000 feet and the Graciosa member ranging from 25 to 425 feet in thickness. According to DWR (2002), the Careaga sandstone is about 150 feet thick under Nipomo Mesa (south of Santa Maria River Fault) but thickens to 700 feet under the Santa Maria River (Plate 1). Cleath (1996) stated that the Careaga thins to the east and northeast beneath Nipomo Mesa, and is offset across the Oceano Fault.

7.2.5 Sisquoc Formation

Woodring and Bramlette (1950) stated the two primary lithologic units of the Sisquoc Formation (Tms) are a fine-grained basin facies and a marginal sandstone facies. The fine-grained unit is comprised of white to buff and brown or gray diatomaceous and porcelaneous mudstone and claystone. The coarse-grained unit consists of fine to coarse sandstone and siltstone.

Worts (1951) described the Sisquoc Formation as being Miocene to Pliocene in age, with a coarse-grained shallow water facies and a fine-grained deep water facies. The coarse-grained unit described by Worts included hard siltstone beds and some conglomerate, while the fine-grained unit was composed primarily of diatomaceous mudstone with some porcelaneous shale and claystone beds.

7.2.6 Obispo Formation

Dibblee (2006a,b) described Obispo Formation (Tov/Tot) as extrusive volcanic rocks and/or marine pyroclastic rocks of early to middle Miocene age. The Tov unit consists of black basalt with some dark gray andesitic rock, and tan rhyolitic (silicified or zeolitized) tuff. The Tot unit is light tan tuff breccia comprised of rhyolitic fragments in a zeolitized rhyolitic matrix and white fine to medium grained tuff, and may occur as lenses in basaltic rocks.

DWR (2002) described Obispo Formation as silicified or zeolitized tuff and fine to coarse grained crystalline tuff, basaltic and andesitic lavas, calcareous siltstone/claystone, and mudstone. The tuff is locally cut by dikes and sills that are black to green in color and may contain up to 40 percent montmorillonite clay. On water well logs the Obispo Formation is often described as volcanic sandstone, black or gray volcanic shale or volcanic rock, interbedded with hard or soft black shale or clay, and occasionally with crystals of quartz or pyrite.

7.2.7 Franciscan Formation

Dibblee (2006a, b) described Franciscan Formation (KJf) as marine submetamorphosed sedimentary and mafic volcanic rocks of Jurassic-Cretaceous age. Franciscan Formation occurs as a mixture of graywacke, greenstone (metabasalt), and green to red chert within a claystone matrix. DWR (2002) described the Franciscan Formation as a heterogeneous assemblage of marine and continental metasedimentary rocks. The primary rock type is greywacke, but includes shale, altered mafic volcanic rocks, chert, and minor limestone.

7.3 GEOLOGIC STRUCTURE

The Santa Maria Groundwater Basin is effectively bounded by the Wilmar Avenue Fault on the north and east – separating it from Pismo Creek Valley, Arroyo Grande Valley, and Nipomo Valley (Plate 6). The western boundary is the Pacific Ocean, although geologic units (aquifers and aquitards) do extend offshore. The water-bearing sediments in the basin are underlain by bedrock, which is vertically displaced across the Wilmar Avenue, Santa Maria River, and Oceano faults (DWR, 2002). These faults also displace the Paso Robles Formation, Careaga sandstone, and older units that overlie bedrock in the basin. The Santa Maria River and Oceano Faults are concealed by younger sediments, and their existence was initially determined from oil well logs. Fault movement is thought to be dominantly vertical (Worts, 1951; DWR, 2002).

A major syncline occurs in the study area and site vicinity with its axis beneath the south side of Santa Maria Valley. The north limb of the syncline extends beneath Nipomo Mesa, resulting in Paso Robles Formation and older beds dipping towards the south. The overall syncline structure appears to extend out beneath the ocean along with the geologic formations.

Thus, there are no known structural or depositional features that would preclude contact between the fresh water body and seawater (Worts, 1951).

DWR identified the Oceano and Wilmar Avenue faults as northeast-dipping reverse faults. The Santa Maria River Fault is noted as being proposed by Hall (1982), and is postulated to occur between the Wilmar and Oceano faults within the study area. DWR noted evidence of Santa Maria River Fault from differences in groundwater levels between Highway 1 and one mile east of Zenon Way. DWR geologic cross-sections show vertical offset along these faults of 90 to 250 feet. The faults are shown as offsetting Paso Robles and older formations beneath Nipomo Mesa. The Santa Maria River and Oceano faults are shown as merging at the coast and evidence indicates the fault extends offshore south of Oceano (DWR, 2002).

The Oceano Fault was first recognized by DWR (1970) and later by Pacific Gas & Electric onshore/offshore seismic reflection and oil well data. The Oceano Fault extends offshore south of Oceano. Previous work indicates downward (on the coast side) vertical movement along the Oceano and Santa Maria River faults of up to hundreds of feet. Well logs suggest overlapping/multiple slip surfaces along these faults, interpretation of which is complicated by general lack of continuity of layers within the Paso Robles Formation (NMMA Technical Group, 2010).

7.4 GEOLOGIC HISTORY

During upper Pliocene time the sea advanced inland and the Careaga sandstone was deposited. In lower Pleistocene time the Paso Robles Formation was deposited; generally of continental origin but locally of lagoonal or brackish water origin due to deposition in synclinal troughs submerged near the coastline. Deformation and folding occurred during middle Pleistocene time to establish the present configuration of the groundwater basin. During this time period there was some erosion/removal of Paso Robles Formation in the Nipomo Mesa and Arroyo Grande areas (and/or there were some areas of non-deposition). The deformation included formation of the syncline and associated faulting. A period of quiescence occurred into the upper Pleistocene, although there did appear to be some time periods of extended uplift in upper Pleistocene time based on extent/elevation of marine terraces. At the end of Pleistocene time sea level was considerably lower and streams further entrenched. Subsequent rise in sea level after last glacial period caused backfilling of coastal valleys (DWR, 1970).

It is thought that ancestral Arroyo Grande Creek discharged to ocean further south than its present-day location, but was forced northward to current location by dune sands. In addition, DWR noted that the Santa Maria River formerly flowed out to sea near present-day Oso Flaco Lake, but this channel is now blocked from the ocean by sand dunes that form Oso Flaco Lake. The offshore topography shows a very gentle and smooth slope with no submarine canyons or extensions of present-day (or former) channels, thereby allowing offshore extensions of water-bearing formations to continue beneath the ocean bed for some distance offshore (DWR, 1970).

7.5 GEOLOGIC CROSS-SECTIONS

Thirteen geologic cross-sections were prepared for this study based on the well log database compiled for this report. Seven cross-sections are aligned northeast to southwest across Nipomo Mesa, one cross-section is aligned northeast-southwest across Tri-Cities Mesa, one cross-section extends northwest-southeast across Tri-Cities Mesa and Arroyo Grande Plain, two cross-sections are aligned between the Santa Maria River and Oceano faults across Arroyo Grande Plain and Nipomo Mesa, and two cross-sections are located along the coast line extending from the northern portion of NCMA to Santa Maria Valley. An insufficient number of geophysical logs were available to be useful in correlations on the cross-sections except for M-M' (although they were used to assist in determining geologic formation contact elevations where available on other cross-sections).

7.5.1 Distinction of Formation Boundaries

An attempt was made to distinguish between geologic formations on the basis of DWR well log lithologic descriptions, geologist logs, geophysical logs, and location of wells relative to geologic faults. The process utilized and assumptions made in assigning geologic formations are described below.

Within Nipomo Mesa, each well was assigned to one of three zones: Zone 1 is located southwest of the Wilmar Avenue Fault and northeast of the Santa Maria River Fault, Zone 2 is located between the Santa Maria River and Oceano faults, and Zone 3 is located southwest of the Oceano Fault. Based upon previous studies and review of the many well logs compiled for this study, Zone 1 is generally characterized by thin or missing Paso Robles and Careaga sandstone formations (50 feet or less), but rather tends to be characterized by Older Dune Sand (up to 300 feet) underlain by Sisquoc Formation (up to 150 feet). Zone 2 is typically characterized by Older Dune Sand at the surface to depths of up to 300 feet. The Older Dune Sand is underlain by a thickness of 150 to 300 feet of Paso Robles Formation and/or Careaga sandstone, and 150 to 300 feet of Sisquoc Formation. Franciscan Formation bedrock is present beneath Sisquoc Formation in both Zones 1 and 2. Zone 3 is characterized by 150 to 300 feet of Older Dune Sand underlain by 200 to 650 feet of Paso Robles Formation and 150 to 300 feet of Careaga sandstone.

In terms of the formations, the Older Dune Sand is generally present at land surface to depths up to about 300 feet. Older Dune Sand is typically brown fine sand, but may also include coarse sand and thin clay layers and may be red in color. Paso Robles Formation is largely comprised of alternating beds of clay and sand/gravel, and so-called shale gravel. The top of the formation may consist of clay and/or silt with sand, and the bottom of the formation is commonly about 20 feet or more of clay. The basal clay may be of different colors including brown, blue, green, and white. The description of white clay possibly may include limestone that is sometimes present in the basal unit of the Paso Robles Formation. The top of the Careaga sandstone is commonly coarse sand and gravel or clean sand (i.e., little or no clay). Another distinctive feature of Careaga sandstone is presence of shells, which are typically indicative of marine deposition (a characteristic of Careaga but not Paso Robles Formation, except near the coast).

The primary formation in the region beneath the Careaga sandstone is interpreted to be the Sisquoc Formation. This formation is generally not considered to yield significant quantities of water to wells. Sisquoc Formation is commonly screened in wells located in Zone 1 where Paso Robles Formation and Careaga sandstone appear to be thin or missing. The available specific capacity data from well logs were used to further confirm the likely presence of the Sisquoc Formation, which is characterized by Q/s values of 0.1 gpm/ft or less, T values of less than 250 gpd/ft, and K values of less than 0.5 feet/day. The Paso Robles Formation and Careaga sandstone have typical Q/s value in excess of 1 gpm/ft, T values of greater than 1,000 gpd/ft, and K values in excess of 1 ft/day.

In the Tri-Cities Mesa area the general geologic unit sequence is 20 to 60 feet of Dune Sand, underlain by 100 to 300 feet of Paso Robles Formation. Approximately 100 to 300 feet of Careaga sandstone underlie the Paso Robles Formation. T and K values in the Paso Robles Formation beneath Tri-Cities Mesa are much higher than in the Nipomo Mesa area, as described under the pumping test section of this report. Aquifer parameters for the Careaga sandstone in the Tri-Cities Mesa are generally similar to aquifer parameters for the Careaga sandstone beneath Nipomo Mesa.

7.5.2 DWR Zones

DWR (1970) identified five stratigraphic zones that they labeled A, B, C, D, and E in Paso Robles Formation in the Santa Maria Plain. In general, each zone is comprised of coarse-grained sediments (e.g., sand, gravel) separated by fine-grained layers (e.g., clay, silt). These zones are still present to a degree along the coast in the Arroyo Grande-Tri Cities area, but the zones begin to merge to the northwest of Santa Maria Plain along the coast and inland as various clay layers become discontinuous and/or pinch out. In addition, while the zones are limited to the Paso Robles Formation from the Santa Maria Plain to the Oceano Fault, they extend into what is interpreted to be the underlying Careaga sandstone in the Arroyo Grande-Tri Cities area. The DWR zone locations are labeled on cross-sections H-H’, I-I’, L-L’, and M-M’ (Plates 15, 16, 19, and 20).

7.5.3 Discussion/Interpretation of Geologic Cross-Sections

The geologic cross-sections prepared for this report are labeled A-A’ through M’-M’, and the locations of each are shown on Plates 6 and 7. A summary of the top and thickness of Paso Robles Formation (QTpr) and Careaga sandstone (Tca) is provided in Table 2. Cross-sections A-A’ through G-G’, J-J’, and K-K’ cover the NMMA area, cross-sections H-H’ through I-I’ generally represent the NCMA area, and cross sections L-L’ and M-M’ are aligned along the coast (Plates 8 through 20). The cross-sections display lithology, screen intervals, faults, and interpretations of geologic formation contacts (see key on Plate 21). Each geologic cross-section is described in the following paragraphs.

Cross-section A-A’ is aligned from southwest to northeast in the far eastern portion of Nipomo Mesa (Plate 8). It extends from Santa Maria Valley on the south, across Nipomo Mesa, to north of Highway 101 and into Nipomo Valley on the north. Faults crossing the section include Wilmar Avenue Fault at the far northern end and Santa Maria River Fault across the middle of the section. Interpretation of geologic formations penetrated by well logs south of Santa Maria River Fault in this section indicate about 100 feet of alluvium in Santa Maria Valley underlain by up to 200 feet of predominantly coarse-grained Paso Robles Formation, with at least 80 feet of Careaga sandstone. The Santa Maria Valley alluvium forms a lateral contact with Older Dune Sand of the Nipomo Mesa, with the Paso Robles and Careaga sandstone formations laterally continuous until encountering the Santa Maria River Fault. The limited well log data shown on this section indicates vertical offset (north side up) across the Santa Maria River Fault in excess of 150 feet. The geologic units present between the Santa Maria River and Wilmar Avenue faults (Zone 1) consist of Older Dune Sand, a thin (10-20 feet) layer of

Careaga sandstone, Sisquoc Formation (about 150 feet), and Franciscan Formation bedrock. This geologic unit sequence is in turn further offset vertically with only Franciscan Formation bedrock present beneath Dune Sand or alluvium north of Wilmar Avenue Fault.

Cross-section B-B' is generally parallel to A-A' and located slightly more than one mile northwest of A-A', still in the eastern portion of Nipomo Mesa (Plate 9). The southern portion of this section extends about 8,000 feet into Santa Maria Valley. The interpreted thickness of Santa Maria Valley alluvium is from 120 to 180 feet, and it forms a lateral contact with Older Dune Sand of Nipomo Mesa that has a typical thickness of about 200 feet south of Santa Maria River Fault. The thickness of Paso Robles Formation ranges from in excess of 400 feet beneath Santa Maria Valley alluvium to about 120 feet where it abuts the Santa Maria River Fault zone. Screened zones intervals of wells on this section occur in Paso Robles Formation under confined to semi-confined conditions. The top of Careaga sandstone and top of Sisquoc Formation are vertically offset upwards north of the Santa Maria River Fault. The geologic formations (and thicknesses) present between Santa Maria and Wilmar Avenue faults (Zone 1) include Older Dune Sand (20 to 140 feet), Paso Robles Formation (50 to 140 feet), Careaga sandstone (40 to 50 feet), and Sisquoc Formation (in excess of 80 feet). The Wilmar Avenue Fault has significant vertical offset with only Franciscan Bedrock present northeast of the fault.

Cross-section C-C' is generally parallel to B-B' and located about 4,000 to 5,000 feet northwest of B-B' in the eastern portion of Nipomo Mesa (Plate 10). The Santa Maria Valley alluvium is 60 to 150 feet thick, and underlain by more than 300 feet of Paso Robles Formation. The Nipomo Mesa between the Santa Maria River and Oceano faults (Zone 2) is comprised of 200 to 300 feet of Older Sand Dunes, underlain by 230 to 300 feet of Paso Robles Formation and at least 70 feet of Careaga sandstone. There appears to be about 200 feet of vertical offset of the formations beneath the Older Sand Dunes across the Santa Maria River Fault. Between the Santa Maria River Fault and Wilmar Avenue Fault (Zone 1) the Paso Robles Formation is 40 to 160 feet thick, the Careaga sandstone is 30 to 80 feet thick, and the Sisquoc Formation is in excess of 250 feet thick. The Franciscan Formation is present beneath a thin covering of alluvium on the north side of Wilmar Avenue Fault.

Cross-section D-D' is located in the central portion of Nipomo Mesa and aligned in a southwest to northeast direction (Plate 11). The Santa Maria Valley alluvium is about 120 feet thick at 3,000 feet away from the edge of Nipomo Mesa, where it is underlain by at least 600 feet of Paso Robles Formation. The thickness of Older Dune Sand southwest of Oceano Fault ranges from 200 to 400 feet. The vertical offset across the Oceano Fault cannot be determined for this cross-section because the Careaga sandstone was not encountered on either side of the fault in logs examined during this study. Significant vertical offset is apparent across the Santa Maria River Fault, where the Careaga sandstone and Sisquoc formations were encountered northeast of but not southwest of the fault. The Paso Robles Formation is at least 250 feet thick southwest of Santa Maria Valley Fault (Zone 2), but only about 150 feet thick northeast of the fault (Zone 1). The Careaga sandstone is 20 to 60 feet thick and Sisquoc Formation is in excess of 130 feet thick northeast of the fault. Franciscan Formation is again the primary geologic unit present northeast of the Wilmar Avenue Fault.

Cross-section E-E' is aligned southwest to northeast across central Nipomo Mesa (Plate 12). The section includes two deep oil well logs that help to define the deeper units southwest of Oceano Fault. The Paso Robles Formation ranges from 470 to 630 feet thick beneath the Santa River Valley alluvium that is in excess of 80 feet thick and Older Dune Sand (100 to 250 feet thick) beneath the Nipomo Mesa southwest of Oceano Fault (Zone 3). The Careaga sandstone is approximately 170 to 200 feet thick, and Sisquoc Formation is in excess of 500 feet southwest of Oceano Fault. The vertical offset across Oceano Fault is approximately 230 feet with formations northeast of the fault at the higher elevations. Geologic formation thicknesses between the Oceano Fault and Santa Maria River Fault (Zone 2) are up to 200 feet of Older Dune Sand, 180 to 310 feet for Paso Robles Formation and 190 to 300 feet for Careaga sandstone. Between the Santa Maria Valley and Wilmar Avenue faults (Zone 1) the Paso Robles Formation is 160 to 200 feet thick beneath 100 to 200 feet of Older Dune Sand. Northeast of the Wilmar Avenue Fault the geologic units include Paso Robles Formation (up to 100 feet), Obispo Formation (60 to 170 feet), and Franciscan Formation.

Cross-section F-F’ (Plate 13) is aligned southwest to northeast and located in western Nipomo Mesa. The Older Dune Sand is 200 to 260 feet thick southwest of Oceano Fault (Zone 3) and underlain by at least 380 feet of Paso Robles Formation (well logs not deep enough to encounter Careaga sandstone). Based on interpretation of well logs near the Santa Maria River Fault zone, there may be at least two strands of the fault in this area. The Paso Robles Formation is notably thinner and the Careaga sandstone is interpreted to be encountered between -20 and -120 feet MSL north of the southern fault strand (Zone 2). The Careaga sandstone is interpreted to be missing with the Paso Robles directly overlying Sisquoc Formation across the northern strand of the Santa Maria River Fault (Zone 1). Further northeast along the cross-section line the Paso Robles Formation is present at ground surface north of Los Berros Creek. The boring logs along the cross-section suggest the Wilmar Avenue Fault is further south than shown on the geologic map (Plate 6). The Franciscan Formation is present within about 20 feet of ground surface in logs 158730 and 153002, but much deeper in oil well log 07900592. The Wilmar Avenue Fault appears to be located between logs 07900592 and 158730.

Cross-section G-G’ is the westernmost section that is aligned southwest to northeast across Nipomo Mesa, and includes some deeper well logs to help define the deeper units southwest of the Oceano Fault (Plate 14). Along the section south of Oceano Fault (Zone 3) the top of Paso Robles Formation is about 240 to 290 feet thick (at -150 to -10 feet MSL), and the Careaga sandstone is up to 400 feet thick (at -650 to -250 feet MSL). The top of Careaga sandstone rises from south to north until it reaches Oceano Fault, where there may be some vertical upwards offset of the top of Careaga sandstone. However, the boring logs are not deep enough to penetrate the top of Careaga sandstone between the Oceano and Santa Maria River faults; therefore offset across the fault is not defined nor is the thickness of Paso Robles Formation defined in Zone 2. Further north across the Santa Maria River Fault the Paso Robles Formation occurs between 50 and 260 feet MSL and its thickness ranges from a minimum in excess of 100 feet to a maximum of at least 340 feet. Where encountered in one well log, the top of Careaga sandstone was encountered at an elevation of -80 feet MSL.

Cross-section H-H’ is aligned approximately west to east across Tri-Cities Mesa from the ocean to Highway 101 (Plate 15). The western portion of the section includes the Oceano CSD monitoring well and a production well, and the middle of the section includes some Grover Beach and Arroyo Grande wells. The Paso Robles Formation is encountered below a surficial layer of dune sand that is 30 to 40 feet thick. The Paso Robles Formation ranges from 110 to 280 feet thick and the contact between Paso Robles and Careaga occur between -30 and -290 feet MSL. The Careaga sandstone is greater than 300 feet thick. The deeper boring logs indicate Sisquoc Formation (or other Tertiary Formation) is encountered between -500 and -620 feet MSL.

Cross-section I-I' is oriented northwest to southeast from Tri-Cities Mesa and across Arroyo Grande Plain to Nipomo Mesa (Plate 16). Older Dune Sand deposits range up to 80 feet in thickness, and top of Paso Robles Formation is encountered from 10 to 30 feet MSL. The top of Careaga sandstone is encountered from -40 to -230 feet MSL beneath Tri-Cities Mesa, defining a thickness of 50 to 250 feet for Paso Robles Formation. The base of Careaga sandstone was encountered in only one well, but the thickness appears to be in excess of 400 feet thick below Tri-Cities Mesa. Well logs are generally lacking in the Arroyo Grande Plain to define thickness of alluvium and underlying formations. However, based upon the limited available well logs and various references (DWR, 2002; Todd, 2007) the thickness of alluvium deposited by Arroyo Grande Creek along I-I' is estimated to range up to about 100 feet.

Cross-sections J-J' (Plate 17) and K-K' (Plate 18) represent one continuous section aligned northwest to southeast across the middle of Nipomo Mesa and generally perpendicular to cross-sections A-A' though G-G'. It begins in the Arroyo Grande alluvial plain and ends in Santa Maria Valley alluvium. It is aligned in between the Oceano and Santa Maria River faults (Zone 2). The thickness of Older Dune Sand across this section generally ranges from 200 to 300 feet. The Paso Robles Formation thickness ranges from 110 to 330 feet. Where encountered (i.e., where borings/wells are deep enough), the Careaga sandstone ranges from about 30 feet to greater than 150 feet. The top of Sisquoc Formation is only encountered in the eastern portion of cross-section K-K' (boring logs are not deep enough in other areas), where the thickness of Sisquoc Formation appears to be in excess of 200 feet.

Cross-sections L-L' and M-M' define a continuous section generally parallel to the coast (Plates 19 and 20). Cross-section L-L' occurs entirely within the NCMA area, whereas most of M-M' is located within the NMMA area. Along L-L' the top of Paso Robles Formation is encountered either below a thin surficial layer of dune sand at elevation near 0 feet MSL, or beneath 20 to 50 feet of alluvium. The top of top of Careaga sandstone is encountered at -180 to -400 feet MSL, indicating a Paso Robles Formation thickness of 130 to 390 feet. The top of Sisquoc Formation (or other Tertiary Formation) ranges from -560 to -740 feet MSL in along L-L'. The thickness of Careaga sandstone in this area is 200 to 380 feet. Cross-section L-L' crosses near the combined Oceano/Santa Maria River fault zone near well 40-1518. No offset of the top of Careaga sandstone is shown according to our well log interpretation in this area as occurs at other locations; however, the top of Sisquoc may be offset by about 150 feet. The interpreted thickness of Careaga sandstone increases significantly to the north of well log 40-1518.

The relatively deep monitoring well and oil well logs along M-M' (Plate 20) help to define the top of formation and thickness of Paso Robles and Careaga sandstone. Available geophysical logs (resistivity) are posted on M-M' to assist in the interpretation. The top of Paso Robles Formation is encountered between 30 and -130 feet MSL along M-M' with a thickness of 380 to 520 feet. Careaga sandstone was encountered at -400 to -650 feet MSL with a thickness of 200 to 290 feet where defined. The top of Sisquoc Formation was encountered at -600 to below -900 feet MSL.

8.0 REGIONAL HYDROGEOLOGY AND PUMPING TESTS

This section describes the general regional hydrogeology, pumping test data collected and analyzed for this study, and overall assessment of aquifer parameters.

8.1 REGIONAL HYDROGEOLOGY

8.1.1 Previous Studies

The Santa Maria Groundwater Basin consists of aquifers under unconfined conditions, semi-confined to confined aquifer conditions, and perched zones, with discontinuous clay layers separating the aquifer zones. The most productive aquifers are in alluvium and Paso Robles Formation (DWR, 2002). Paso Robles Formation contains 2 to 5 aquifers labeled by DWR (top to bottom) as A to E zones, and these aquifers are separated by silt and clay confining beds near the coast but merge inland (DWR, 1970). In general, aquifers/aquitards are noted as being more continuous near the coast than inland (NMMA, 2010). The groundwater basin extends offshore to the west – possibly extending to the Hosgri Fault zone (about 10 miles offshore).

A study conducted by DWR (1958) indicated that groundwater flow in the Arroyo Grande Basin (as of 1954) was generally towards the ocean, although a pumping depression was noted in the area north of Oceano since 1945. However, groundwater elevations were still above sea level – indicating that sea water intrusion likely had not occurred. The report stated this cone of depression occurred within the Paso Robles Formation, which was less permeable than alluvium in the basin. It was believed that the area west of the pumping depression had a discontinuous clay layer that allowed deep percolation from the Old Dune Sands into Paso Robles Formation that helped maintain a seaward hydraulic gradient. Groundwater contours also indicated flow from Nipomo Mesa to the Arroyo Grande Basin (DWR, 1958).

The DWR (1970) report included hydrogeologic cross-sections parallel and perpendicular to the coast in the Tri-Cities-Arroyo Grande Plain area. The Paso Robles Formation at the coast was depicted as extending from sea level to about -300 feet MSL and was divided into three zones (A, B, and C) – each with overlying confining clay layers. The contact with the underlying Careaga sandstone was shown as sloping upward towards the City of Arroyo Grande well field where the base of the Paso Robles Formation was at -150 to -200 feet MSL. The cross-sections showed clay confining layers pinching out beneath the Grover Beach and Arroyo Grande well fields, and coarse-grained layers in the Paso Robles Formation were more continuous in the vertical direction. In Grover Beach well field, the Well 4 report (LeRoy Crandall and Associates, 1978) showed the Paso Robles Formation – Careaga sandstone contact at a higher elevation than in DWR (1970). Essentially, the upper Careaga sandstone in the Grover Beach Well 4 report is equivalent to Paso Robles Zone C in DWR (1970). Aquifers in Paso Robles Formation were considered to occur under confined conditions near the coast, and ranged from unconfined to confined beneath the mesas (DWR, 1970). DWR (1979) stated that the coastal aquifer system for Nipomo Mesa was comprised of an upper aquifer overlain by not more than 20 feet of clay and underlain by 60 feet of clay.

In Nipomo Mesa the surficial 200 to 300 feet of Older Dune Sand commonly contains perched groundwater above the regional water table. Although the perching clay layer in the

Older Dune Sand is not continuous, it is prevalent enough that the base of the aquitard has been mapped as ranging from -60 feet MSL in the southwestern portion of the mesa to +120 feet MSL in northeastern Nipomo Mesa (Cleath, 1996). In most areas of Nipomo Mesa, the Dune Sand is underlain by Paso Robles Formation with estimated formation thicknesses ranging from 600 feet in southwestern Nipomo Mesa to 100 feet in the northeastern portion of the mesa. It has been estimated that there is approximately 370 feet of offset of the base of Paso Robles Formation along the Oceano Fault, resulting in a significantly thinner section of the formation northeast of the fault zone (Cleath, 1996). The base of Careaga sandstone has been estimated to range from -900 feet MSL along the southwest edge of Nipomo Mesa to +100 feet MSL near Highway 101. The Careaga sandstone things to the east and northeast beneath Nipomo Mesa and is offset across the Oceano Fault (Cleath, 1996).

DWR (2002) showed the regional water table beneath Nipomo Mesa being located in either the lower portion of Dune Sand or the upper portion of Paso Robles Formation. Except near the coast where confined conditions prevail, the cross-sections are generally indicative of unconfined to semi-confined conditions across Nipomo Mesa. DWR geologic cross-sections show vertical offset along the Oceano Fault ranging up to 250 feet.

8.1.2 Discussion

Based upon review of previous studies and geologic cross-sections constructed for this study, the delineation of unconfined and confined aquifer conditions remains a challenge. However, cross-sections constructed for this study are consistent with previous work with respect to the presence of relatively continuous clay layers in the coastal area within the Paso Robles Formation. There are relatively clearly defined confined to semi-confined aquifers alternating with clay aquitards in the Paso Robles Formation near the coast. These aquifers and aquitards are best illustrated on Cross-sections L-L’ and M-M’ (Plates 19 and 20), which combine to form one continuous cross-section along the coastline. A 30 to 60-foot thick clay layer is present from -100 feet MSL in the northern part of Cross-section L-L’ and dips southward to -400 feet MSL at the south end of Cross-section M-M’. A thinner 10 to 30-foot thick clay layer is present at the base of the Paso Robles Formation from -200 feet MSL in the north to -650 feet MSL in the south. These two clay layers serve as confining layers for the coarse-grained aquifers beneath them.

Further inland the continuous clay layers present at the coastline tend to pinch out or become discontinuous. The depths to water become much greater in inland areas of NMMA (200 to 350 feet), which means clay layers that are present up to 350 feet below ground surface are not acting as semi-confining or confining layers. The Nipomo Mesa area is further complicated by the presence of the Oceano and Santa Maria River faults. In general, the Careaga sandstone and underlying units are displaced upwards north of the faults, and the Paso Robles Formation decreases in thickness northward across each fault zone. The Careaga sandstone and underlying formations likely decrease in thickness northward across each fault as well, although the base of Careaga sandstone is not well defined because it is not encountered in most well logs.

Review of geologic cross-sections prepared for this study generally indicate alternating coarse and fine-grained layers beneath Nipomo Mesa south of Santa Maria River Fault in cross-sections A-A’ through C-C’, and south of Oceano Fault. Further north along cross-sections A-A’ through D-D', the Paso Robles Formation is comprised of a greater percentage of fine-grained sediments. North of Wilmar Avenue Fault is mostly Obispo Formation and Franciscan Formation bedrock, which typically has very low well yields. The area of Nipomo Mesa covered by cross-sections E-E' through G-G' shows considerable interbedding of fine and coarse-grained sediments and a general lack of continuity of the clay layers that is observed at the coast. Characterization of aquifers (as unconfined, semi-confined, or confined) within Paso Robles Formation across the inland portion of Nipomo Mesa is a function of coarse- and fine-grained layers described above and depth to water. However, it should be pointed out that characterization of an aquifer by interpretation of geologic and hydrogeologic conditions and setting (cross sections) may, at times, not necessarily be confirmed by calculated aquifer parameters based on aquifer pumping tests (see Sections 5.1, 5.3, and 8.2). Caution must be used on placing too much dependence on any one methodology of estimating aquifer parameters if the values are used for specific purposes, such as groundwater flow model input.

8.2 PUMPING TESTS

The aquifer parameters described in this section were obtained from three general types of sources: 1) previous studies (that don't include time-drawdown data), 2) previous pumping tests (that include time-drawdown data either plotted by others or plotted by Fugro), and 3) pumping tests conducted specifically for this study. The data obtained from these various sources are described in the following paragraphs, summarized in tables following the text, and detailed data, plots, and tables are provided in appendices.

8.2.1 Previous Studies

Several previous studies have described the aquifer parameter values of various geologic formations in the study area. The previously defined aquifer parameter most often quantified in previous studies is hydraulic conductivity (K). However, transmissivity (T) and storativity (S) values are also mentioned in a few reports. Transmissivity is equal to K times aquifer thickness, and S represents the amount of water extracted from a unit volume of geologic formation for a unit drop in water level. Q/s values, defined as pumping rate (Q) divided by drawdown (s), are also described in some previous reports. The following paragraphs provide summaries of aquifer parameter values described in previous reports, and these data are summarized in Table 3.

Worts (1951) briefly mentioned that the K for Paso Robles Formation derived from a recovery test at one well (T11N/R35W-20E1) was about 9 feet/day. Laboratory testing of Careaga sandstone samples from the Santa Ynez Basin (about 20 miles south of study area where the formation was assumed to be similar) indicated hydraulic conductivities were also on the order of 9 feet/day (Table 3).

According to DWR (1970), the Arroyo Grande Creek alluvium upper zone has an estimated K value of 110 feet/day, and the lower zone an estimated K range of 300 to 400 feet/day. The range of K values estimated for Paso Robles Formation is 70 to 230 feet/day. No wells were reported to be screened exclusively in the Careaga sandstone at this time, so no K values were provided for this geologic formation. The upper portion of the Pismo Formation is considered to be equivalent to Careaga sandstone. The Pismo Formation is stated to be limited to the San Luis Hills, where it is unconfined and tapped by domestic wells (DWR, 1970).

Cleath (1996) indicated their review of pumping test data showed a range of hydraulic conductivity from 5 to 50 feet/day and storativity of 0.002 to 0.003 (indicative of semi-confined aquifer conditions) for Paso Robles Formation in the Woodlands area. Hydraulic conductivity values assigned to various geologic formations by Todd (2007) for the NCMA water balance study are included in Table 1. Todd stated these K values are approximately equal to the geometric mean values of data provided by DWR (2002). K values estimated for Paso Robles Formation range from 13 to 52 feet/day south of Nipomo Mesa and from 2 to 15 feet/day beneath Nipomo Mesa (NMMA, 2010).

Aquifer characteristics in Santa Maria Valley were evaluated by LSCE (2000) based upon pumping test data presented in Worts (1951), specific capacity data from USGS (Hughes and Freckleton, 1976), and specific capacity data from Water Well Drillers Reports. Hydraulic conductivity values ranged from 270 to 600 feet/day for Santa Maria Valley alluvium, 2 to 15 feet/day for Paso Robles Formation beneath the Nipomo Mesa and western part of Santa Maria Valley, and 13 to 50 feet/day for Paso Robles Formation in the Sisquoc Plain/Orcutt Upland/central valley areas. Careaga sandstone was assumed to be 9.5 feet/day based on very limited laboratory test data from Worts (1951). No data were available for Older Dune Sand and it was assumed to have a hydraulic conductivity value of 175 feet/day. Specific yield values of 8 to 12 percent for Paso Robles and Careaga sandstone formations, and 13 percent for Older Dune Sand were derived from DWR (2002).

DWR (2002) reported that lower K values occur north of Santa Maria River Fault beneath Nipomo Mesa. T values for alluvium in Santa Maria River Valley were reported to range from 200,000 to 400,000 gpd/ft and up to 100,000 gpd/ft in Arroyo Grande Valley alluvium. T values of 100 to 160,000 gpd/ft were reported for Paso Robles Formation in the Nipomo Mesa/Santa Maria Valley area, with the higher values occurring south of Oceano Fault and in Santa Maria Valley. Paso Robles Formation T values in the Tri-Cities/-Arroyo Grande Plain area were reported to be 20,000 to 130,000 gpd/ft. T values of 3,000 to 30,000 gpd/ft were reported for the Squire Member (also referred to as Careaga sandstone) in the Tri-Cities/-Arroyo Grande Plain. Transmissivity values for the Careaga sandstone were stated to be similar to Paso Robles Formation, with the lowest values of 100 to 4,000 gpd/ft occurring north of Santa Maria River Fault in Nipomo Mesa. The range of hydraulic conductivity values cited from DWR based on pumping tests and specific capacity (pump efficiency) tests are summarized in Table 1.

A summary of hydraulic conductivity data from existing studies for the NMMA and NCMA is provided in Table 3. With the exception of Paso Robles Formation, the data are limited for most formations. The range of K for Paso Robles Formation from existing data is less than 1 to 360 feet/day. The values for the other formations are 175 feet/day for Dune Sand, 5 to 10 feet/day for Careaga sandstone, 100 to 800 feet/day Santa Maria Valley alluvium, and 27 to 400 feet/day for Arroyo Grande Plain alluvium.

8.2.2 Existing Pumping Test Data

The previously derived pumping test data collected for this study were reviewed and analyzed, and results summarized in Table 4. The data analysis plots for existing pumping test data are provided in Appendix G. Results from evaluation of existing aquifer pumping test data indicate transmissivities of about 30,000 gpd/ft for Careaga sandstone and 7,500 to 11,500 gpd/ft for Squire Member of Pismo Formation beneath Tri-Cities Mesa; and transmissivities of 1,000 to 85,000 gpd/ft for Paso Robles Formation beneath Nipomo Mesa. Paso Robles Formation transmissivity was notably higher in Zone 3 (27,000 to 85,000 gpd/ft) as compared to Zone 2 (1,000 to 18,000 gpd/ft). Existing data were not available for wells screened exclusively in Paso Robles Formation beneath Tri-Cities Mesa or wells screened exclusively in Careaga sandstone beneath Nipomo Mesa.

8.2.3 2014 Pumping Tests

A major task in this study was to conduct aquifer pumping tests in the NMMA and NCMA. Several groups of wells were targeted for conducting pumping tests, based on obtaining a good geographic distribution and emphasizing pumping wells with nearby observation/monitoring wells. A brief technical memorandum (TM) was prepared with a list of proposed aquifer pumping test sites (Fugro, March 18, 2014), and is included as Appendix H. The proposed pumping test TM was submitted to the District and circulated to the Technical Groups for review. The well owners considered for pumping tests included: NCSD, GSWC, RWC, agricultural well owners in Arroyo Grande Plain, City of Arroyo Grande, Oceano Community Services District (OCSD), and City of Grover Beach. It was determined that sufficient pumping test data were already available for City of Pismo Beach wells; therefore, additional pumping tests were not requested from Pismo Beach.

There were many logistical hurdles to overcome in conducting these tests, and some agencies were better able to accommodate the proposed testing schedule than others. The ideal pumping test procedure/schedule proposed to each entity was as follows: installation of pressure transducers, no pumping from both the pumping and observation wells for two days prior to testing, pumping of the designated pumping well for 12 hours continuously (monitor drawdown during this pumping phase in both pumping and observation wells), no pumping from both the pumping and observation wells for 12 hours after pumping stopped (monitor groundwater levels during the recovery phase), and remove transducers from the wells.

The pumping test program required no pumping from multiple wells for most of a three day time period. Five of the seven targeted well owners were able to accommodate such a pumping schedule with at least one set of wells. RWC and agricultural well owners were not able to conduct the requested pumping tests due to logistical constraints. A summary of pumping tests conducted on wells from the other five well owners are described in the following paragraphs. A total of six aquifer pumping tests were able to be conducted at five locations (Plate 22). Two aquifer pumping tests were completed at City of Grover Beach well field, because transducers were installed for a longer time period and recorded drawdown from pumping of a well screened in a separate deeper aquifer that is isolated from the shallower aquifer targeted for the primary test at this location. The aquifer parameter calculations are summarized in Table 5 and the plots and raw data are provided in Appendices I and J.

8.2.3.1 City of Arroyo Grande

The proposed pumping test at Arroyo Grande targeted the use of Well 8 (339665) as the pumping well, and Wells 3 (90008) and 7 (90010) as the observation wells (Plate 22). Based on conversations with City of Arroyo Grande staff at the pre-test field meeting for transducer installation, it was determined that Well 1, Well 4, and Well MW-7 were also available to be added to the observation well network. Review of geologic conditions at this pumping test location indicate a thin surficial layer of Dune Sand (about 35 feet) underlain by Paso Robles Formation (to a depth of about 290 feet), and Careaga sandstone (to a depth of at least 610 feet). Well 8 (136 to 230 feet below ground surface (bgs)), Well 1 (total depth of 175 feet), Well 3 (100 to 219 feet bgs), and Well 4 (92 to 232 feet bgs) are screened in Paso Robles Formation. Well 7 (290 to 460, 475 to 490, 500 to 515, 525 to 545, and 555 to 570 feet bgs), and Well 7 monitoring well (screen interval is unknown) are screened just in the Careaga sandstone.

A clay layer is present in the shallow portion of the Paso Robles Formation (about 35 to 65 feet bgs), but is in the unsaturated zone based on measured static groundwater levels of about 75 feet bgs. No other substantial clay layers appear to be present in the upper 180 feet with only very thin clay layers (about 5 feet) present at 75, 110, 130, and 185 feet bgs, indicating mostly unconfined conditions to this depth interval. A substantial clay layer is present at the base of the Paso Robles Formation from 220 to 290 feet bgs but its thickness may be locally variable. No substantial clay layers appear to be present in the Careaga sandstone from 290 to 610 feet bgs, although several very thin (less than 5 feet) clay layers may be present. The clay layer present at the base of the Paso Robles Formation may reduce hydraulic communication of the screen zone of the pumping well with the underlying Careaga sandstone (Well 7); however, pumping test results indicate a delayed response from Careaga sandstone wells.

Transducers were successfully installed in Wells 3, 4, 7, and MW-7 on April 25, 2014. Transducer installation was attempted but unsuccessful for the pumping well (Well 8); therefore, the only measurements able to be obtained for Well 8 were airline measurements. Manual sounder measurements were collected from Well 1. The pumping phase of the test occurred between approximately 8:30 AM and 8:30 PM on April 28, 2014. Recovery measurements were collected until the morning of April 29, 2014. Groundwater level hydrographs and pumping test data analysis plots are provided in Appendix I. The pumping test data are provided in Appendix J (separately, on CD).

Well 8 was pumped at an average rate of 470 gpm – starting out at 480 gpm and declining to 465 gpm. Drawdown was observed at wells 1, 3, and 4 soon after pumping began – each of these observation wells has overlapping relatively shallow well screens that are generally similar to the pumping well, except that Well 1, 3, and 4 well screens extend to shallower depths than Well 8. A relatively small amount of drawdown (0.33 to 1.63 feet) was observed in wells 1, 3, and 4, and the most representative transmissivity values calculated from drawdown data were considered to be 117,000 gpd/ft (from distance-drawdown analysis) to 123,000 gpd/ft (from observation Well 3). The total amount of drawdown and shape of the drawdown curves suggests unconfined to semi-confined conditions. The transmissivity calculated from Well 8 drawdown data was 30,000 gpd/ft, but Well 8 data have less accuracy and greater uncertainty due to the indirect (airline) measurement method. In addition, well efficiency issues sometimes results in lower calculated T values for pumping wells compared to observation wells. Overall representative aquifer parameter values for Paso Robles Formation are considered to be 120,000 gpd/ft for transmissivity, 115 feet/day for hydraulic conductivity, and 0.01 for storativity (Table 5). The term overall representative values as applied in this study are based on an average of pumping and observation well data (and/or time-drawdown and recovery data) or by emphasizing a data set thought to be more reliable and representative of the aquifer parameter values.

Analysis of recovery data for Arroyo Grande Wells 3 and 4 resulted in T values of 171,000 to 174,000 gpd/ft, while Well 8 recovery data yields a T value of 29,000 gpd/ft. The recovery T values from Wells 3 and 4 are likely too high and not representative due to the semi-confined type response not being suitable for the Theis Recovery analysis method. As mentioned above, Well 8 recovery data are impacted by indirect (airline) measurement method.

Well 7 and MW-7 are screened deeper and below the bottom of Well 8, and drawdown was observed starting about 100 minutes after the onset of pumping. Approximately 0.9 feet of drawdown was observed in Well 7 and MW-7 at the end of the 12-hour pumping period, and drawdown continued for the duration of the 12-hour recovery period with a final drawdown measurement of 1.2 feet in both deep wells.

8.2.3.2 Oceano CSD

The proposed pumping test at Oceano CSD utilized Well 8 (219080) as the pumping well, and Wells 7 (219084) and the Oceano CSD nested monitoring well cluster as the observation wells (221036) (Plate 22). The Oceano CSD nested monitoring well cluster casings are designated by the colors green, blue, yellow, and silver from top to bottom, with each casing screened at the depth intervals stated below. Review of geologic conditions at this pumping test location indicate a thin surficial layer of Dune Sand (about 30 feet) underlain by Paso Robles Formation (to a depth of about 280 feet), Careaga sandstone (to a depth of about 650 feet), and Sisquoc Formation. Well 7 (90 to 140 feet bgs), the Oceano CSD green monitoring well (110 to 130 feet bgs), and the blue monitoring well (190 to 210 and 245 to 265 feet bgs) are screened in Paso Robles Formation. Well 8 (380 to 520 feet bgs), the silver monitoring well (395 to 435 and 470 to 510 feet bgs), and the yellow monitoring well (625 to 645 feet bgs) are screened in the Careaga sandstone.

A clay layer is present in the shallow portion of the Paso Robles Formation (about 40 to 75 feet bgs), which suggests semi-confined to confined conditions for the upper Paso Robles Formation screened in Well 7 and the green monitoring well. Other thin clay layers are present at 170 to 185 bgs and 215 to 225 bgs in the Paso Robles Formation, indicating some further confinement and potential isolation of the blue monitoring well zone (located in lower Paso Robles Formation) from wells screened above. A thin clay layer from 300 to 310 feet bgs and a thin sandy clay layer at about 370 feet provide some limited hydraulic isolation of the screen zone of the pumping well from the overlying lower Paso Robles Formation (blue monitoring well). There does not appear to be a distinct clay layer within the Careaga sandstone between the bottom of the pumping well screen (520 feet) and the yellow monitoring well screen zone (625 to 645 feet). Based on the sediments present, the screen zone of the pumping well is considered to occur under confined conditions, with potential for some vertical leakage from the overlying Paso Robles Formation.

Transducers were successfully installed in the four Oceano CSD monitoring wells on April 29, 2014, and in Wells 7 and 8 on May 1, 2014. The pumping phase of the test occurred between approximately 8:00 AM and 8:00 PM on May 3, 2014. Recovery measurements were collected until the morning of May 5, 2014. The average pumping rate was about 800 gpm, starting out at a rate of 850 and declining to 795 gpm. The well pumped 850 gpm for the initial 10 minutes, and then stayed within a relatively narrow range and averaged about 820 to 825 from 10 to 85 minutes. The pumping rate gradually declined down to 800 gpm at about 200 minutes of pumping and stayed near 800 gpm through about 370 minutes of pumping. The pumping rate for the remainder of the testing period averaged approximately 795 gpm.

Groundwater level hydrographs and pumping test data analysis plots are provided in Appendix I. Drawdowns in the Oceano CSD monitoring wells after 12 hours of pumping were 0, 0.05, 14.8, and 11.5 feet for the green, blue, silver, and yellow wells, respectively. Drawdowns in Wells 7 and 8 were 0 and 105.3 feet, respectively. It should be noted that drawdown continued in the blue monitoring well from 0.05 feet at the end of pumping to 0.53 feet 24 hours after pumping ceased. This observation in the blue monitoring well indicates that the zone from 190 to 265 feet bgs that is located above the screened zone of the pumping well (380 to 520 feet bgs) contributes some vertical leakage to the cone of depression.

The time-drawdown data indicate a transmissivity of 17,500 gpd/ft in the Oceano CSD silver monitoring well and 26,000 gpd/ft in the Well 8 pumping well. Minimal (if any) drawdown was observed in Well 7 and the two shallow Oceano CSD green and blue monitoring wells, which are screened no deeper than 140 feet compared to the pumping well screen from 380 to 520 feet. These two shallower wells appear to be responding to stresses other than pumping of Well 8, but overall fluctuations are less than about 0.5 feet. The deeper Oceano CSD yellow monitoring well (screened 625 to 645 feet) showed significant drawdown of 11.5 feet – generally indicating the deeper aquifer zone screened in the yellow monitoring well and the pumping well zone from 380 to 520 feet are hydraulically connected. Representative aquifer parameter values include a transmissivity of 21,500 gpd/ft, hydraulic conductivity of 11 feet/day, and storativity of 0.003 (Table 5).

8.2.3.3 Nipomo CSD

The preferred well sites for Nipomo CSD were not able to be tested due to logistical issues. However, the two wells available for use in an aquifer pumping test (Black Lake No. 3 (222813) and No. 4 (276929) provided for a good test as they were relatively close together (about 240 feet apart) and had similar screen zones (330 to 550 and 310 to 520 feet, respectively) (Plate 22). Both wells are screen in the Paso Robles Formation and are located just north of the Oceano Fault. Transducers were installed in the two wells on May 5, 2014, the pumping phase of the test was conducted on May 8, 2014, and the transducers were removed on May 9, 2014.

Black Lake No. 4 (was pumped at an average rate of 360 gpm, with a range of 340 to 380 gpm. Pumping rates fluctuated due to system pressure fluctuations. The pumping rate ranged from 365 to 380 gpm over the first 90 minutes of the test, and gradually declined to 345 gpm by 300 minutes or pumping. The pumping rate remained at 345 gpm until about 480 minutes of pumping. The pumping rate quickly increased to 365 gpm over the next 30 minutes and remained at that rate until the end of the pumping period. Given the fluctuations in pumping rate and resulting influence on time-drawdown data during the pumping period, the recovery data are particularly useful for confirmation of aquifer parameters.

Groundwater level hydrographs and pumping test data analysis plots are provided in Appendix I. The drawdowns at the end of 12 hours of pumping were 1.4 feet at the observation well 240 feet away and 57.4 feet in the pumping well. The calculated transmissivity value for the observation well was 70,000 gpd/ft. The pumping well transmissivity was 25,000 gpd/ft based on time-drawdown data from the pumping phase. Recovery data transmissivity values were 85,000 gpd/ft for the observation well and 18,000 gpd/ft for the pumping well. The calculated K values range from 10 to 15 feet/day for the pumping well and 41 to 50 feet/day for the observation well. Based on an average of pumping and observation well data, the transmissivity value is 45,000 gpd/ft, hydraulic conductivity is 26 feet/day, and storativity is 0.02 (Table 5).

8.2.3.4 Golden State Water Company

The preferred well sites for Golden State Water Company (GSWC) were not able to be tested due to logistical issues. Nonetheless, two wells that were available for use were identified and provided useful pumping test data. Alta Mesa 2 (161355) and Vista 4 (103045) have overlapping screen intervals and are about 100 feet apart. The well logs at the site show approximately 380 feet of dune sand, underlain by Paso Robles Formation to the maximum well depth of 620 feet (a thickness of 240 feet). The pumping well (Alta Mesa 2) is screened within the Paso Robles Formation from 385 to 435 and 485 to 570 feet. Based upon review of the lithologic and geophysical logs and a pumping well static water level of 297 feet bgs, the upper screen is apparently within an unconfined aquifer, whereas the lower screen is within a confined aquifer. The observation well (Vista 4) is screened across both the Dune Sand and Paso Robles Formation from 80 to 600 feet. The depth to water of about 270 to 280 feet bgs in Vista 4 indicates that the lower 100 feet of Dune Sand is saturated. The pumping well (Alta Mesa 2) is located about 360 southwest of the map trace of the Oceano Fault, and the observation well is located about 260 feet southwest of the fault (Plate 22). The fault, if it is a barrier to groundwater flow, could affect the test results.

Transducers were installed in both wells on May 9, 2014 and pumping for 12 hours was conducted on May 12, 2014. Alta Mesa 2 was pumped at an average rate of 380 gpm, although the substantial pumping rate fluctuations were observed (305 to 560 gpm) due to the nitrate treatment system and/or changing system pressures. After a pumping rate of about 500 gpm over the initial 13 minutes of pumping, the rate declined to about 400 gpm after 60 minutes of pumping. The pumping rate then declined to a range of 375 to 380 gpm between 90 and 120 minutes of pumping. The pumping rate briefly spiked back up to 560 gpm at 150 minutes of pumping, followed by a decline to 380 gpm at 210 minutes of pumping. The pumping rate gradually declined to a low of 305 gpm at 510 minutes of pumping, followed by a gradual rise back up to 370 to 380 gpm by the end of the pumping phase.

Interpretation of recovery data is less dependent on maintaining a constant discharge rate as compared to pumping data (Todd, 1980; Kruseman and de Ridder, 2000). Therefore, given the unavoidable pumping rate fluctuations during this test, the recovery data provided more reliable data and useful confirmation of aquifer parameters calculated from time-drawdown data impacted by pumping rate fluctuations. Interpretation of recovery data is less dependent on maintaining a constant discharge rate as compared to pumping data.

Groundwater level hydrographs and pumping test data analysis plots are provided in Appendix I. The total amount of drawdown measured at the end of 12 hours of pumping was 11.4 feet in the Vista 4 observation well and 50 feet in the Alta Mesa 2 pumping well. Evaluation of Vista 4 observation well data during the pumping phase by the Theis and Cooper-Jacob methods yield T values of 15,200 to 19,800 gpd/ft and an S value of 0.002. Observation Well Vista 4 recovery data analysis showed a T value of 19,700 gpd/ft and a K value of 8 feet/day. The pumping well recovery data analysis yields a T value of 11,000 gpd/ft, and a K value of 6 feet/day. The overall representative aquifer parameters include transmissivity of 15,500 to 19,700 gpd/ft, hydraulic conductivity of 7 to 8 feet/day, and storativity of 0.002 (Table 5). The aquifer parameter values derived from this test should be considered representative of the Paso Robles Formation at this location.

The pumping test data at this site also provided potentially useful information regarding boundary conditions in the site vicinity. In particular, the recovery data show the occurrence of a distinct discharge boundary, which may represent the Oceano Fault. A break in slope on the recovery data plot occurs at about 230 minutes after pumping ceased (a value of about 4.1 in terms of t/t' on the X axis). The change in slope (about double the slope used to calculate the T value) is indicative of a planar no-flow type of boundary on one side of the wells that was encountered within the cone of depression. Normally, this boundary condition would be present on time-drawdown data as well, but the pumping rate fluctuations may be masking the boundary during the pumping phase of the test.

8.2.3.5 City of Grover Beach

Production wells for the City of Grover Beach are located relatively close together in a park area (Plate 22). The proposed pumping test targeted Well 1 (90012), because two other wells (well 2 (90013) and Well 3 (90014) screened within the same zone were available for use as observation wells within 500 feet. In addition, a deeper screened well (Well 4 (22118)) was also located nearby for use in evaluating the connection between the Paso Robles Formation and Careaga sandstone aquifer zones at this location. The standard pumping test procedure for this study was followed using Well 1 as the pumping well from May 18 to May 20, 2014. Wells 1, 2, and 3 are screened in Paso Robles Formation, and Well 4 is screened in the underlying Careaga sandstone.

An added benefit of this test occurred as a result of transducers being installed on May 15 in Wells 2, 3, and 4 – two full days before the start of the Well 1 pumping period. Well 4 was being pumped on a daily cycle from May 15 until the morning of May 18, thereby allowing collection of drawdown and recovery data from the Careaga sandstone aquifer prior to the onset of the three-day testing period for the Paso Robles Formation aquifer (Well 1). Therefore, there were effectively two separate pumping tests conducted on City of Grover Beach wells, and data were analyzed for both tests.

The pumping rate for Well 1 over the 12-hour pumping period stayed within a relatively narrow range of 630 to 640 gpm, with a 12-hour average of 632 gpm. A transducer was unable to be installed in the pumping well (Well 1) and manual sounder measurements were not able to be collected either. Therefore, only airline measurements were available for Well 1, which have limited accuracy and resolution. The static water levels ranged from about 52 to 55 feet below top of casing for the shallow aquifer, which extends to a depth of approximately 175 feet bgs based on geologic and geophysical logs for the well field. The static water level in Well 4 was about 59 feet below top of casing, which represents the deep confined aquifer from 200 to 530 feet bgs. The shallow zone (upper 200 feet of sediments) in this area has been classified as Paso Robles Formation, whereas the deeper zone (200 to 550 feet) has been classified as the Careaga sandstone.

Groundwater level hydrographs and pumping test data analysis plots are provided in Appendix I. The measured drawdowns in the shallow aquifer observation wells ranged from about 0.2 to 0.6 feet at distances of 440 and 170 feet from the pumping well, respectively. The measured drawdown in the pumping well was two feet based on airline measurements. The relatively minimal drawdowns at a pumping rate of 632 gpm are indicative of a highly efficient well pumping from a formation of high K. The small amount of drawdown also may indicate unconfined conditions and/or a vertical recharge to the pumped aquifer (such as occurs with a semi-confined aquifer). Hydrogeologic conditions at the well field suggest the shallow aquifer is unconfined; however, a considerably longer pumping test would likely be needed to further evaluate this based strictly on time-drawdown data.

The time-drawdown data do fit a pattern of a semi-confined aquifer, which may be a result of the thin clay layer interbeds that occur in the predominantly sand, gravel, and cobble sediments comprising the screened interval. Assuming that semi-confined analytical techniques are most appropriate for the available data, the calculated transmissivity values from observation Wells 2 and 3 ranged from 112,000 to 121,000 gpd/ft. These T values divided by an aquifer thickness of 120 feet yield K values of 125 to 135 feet/day. The Cooper-Jacob and Theis Recovery analytical techniques yield transmissivity values of 500,000 to 1,200,000 gpd/ft, which are extremely high values and likely not realistic (i.e., these methods are not applicable). Storativity values from the semi-confined analysis were 0.02 and leakage coefficients were 1.0 to 1.75 – indicative of unconfined aquifer conditions and/or high rates of vertical/lateral leakage.

A distance-drawdown analysis provided an estimated transmissivity of 360,000 gpd/ft, hydraulic conductivity of 400 feet/day, and storativity of 0.10. Average aquifer parameters for this test based on both time-drawdown and distance-drawdown analyses are 240,000 gpd/ft for T, 270 feet/day for K, and 0.05 for S (Table 5). There was no influence on Well 4 water levels from pumping of Well 1 for 12 hours, indicating the two aquifers have little to no hydraulic connection.

In terms of the pumping test conducted on the deep aquifer (Careaga sandstone), the only available pumping test data are from pumping Well 4. Given this was an informal pumping test, no record of pumping rates over time was collected. However, the operator indicated that a typical pumping rate for Well 4 was approximately 530 gpm. Analysis of the available pumping test data indicate a transmissivity value of 27,000 to 32,000 gpd/ft for the deep aquifer, and an associated K value of 11 to 13 feet/day.

8.2.4 Conclusions from Pumping Test Data

Aquifer parameter values, and especially hydraulic conductivity, are available from previous reports, previous (existing) pumping test data, and from pumping test data collected in 2014 as part of this study. A summary of all available hydraulic conductivity data is provided in Table 6. As a note of caution and as previously discussed (Section 5.1), it should be pointed out that data related to full saturated aquifer thickness is not always known; well screen length, or cumulative lengths of screened intervals, are often used as a means of estimating saturated aquifer thickness. However, uncertain use of screened intervals because of limited data in lieu of aquifer thickness in estimating hydraulic conductivity may result in overestimating the hydraulic conductivity value. The highest K values are generally associated with recent alluvium of Santa Maria Valley and Arroyo Grande Plain. Previous reports indicate K values ranging from 100 to 800 feet/day for Santa Maria Valley alluvium, and 27 to 270 feet/day for Arroyo Grande Plain alluvium. Documented K values (from pumping test data reviewed or analyzed for this study) for Paso Robles Formation, beneath the Nipomo Mesa, range from 3 to 47 feet/day and from 115 to 270 feet/day beneath Tri-Cities Mesa. The overall range of K values for Paso Robles Formation is somewhat greater when incorporating reported results from previous studies.

The available data for wells screened exclusively in Careaga sandstone is limited – the reported K range is 5 to 10 feet/day for Nipomo Mesa based on previous studies, and from 12 to 13 feet/day for Tri-Cities Mesa based on previous studies and analysis of pumping test data. Data are also limited for the Squire Member of Pismo Formation, and available pumping test data indicate a K value of 5 feet/day. Limited data for the surficial Dune Sand suggest K values of 20 to 175 feet/day in Nipomo Mesa and 47 feet/day for Tri-Cities Mesa.

Overall, aquifer parameter data from previous studies and pumping test data reviewed/analyzed for this study provide a good data base for future studies (such as groundwater modeling). In addition to K values provided for various geologic units, aquifer pumping test data provided in this report (see Appendices) will be useful for model calibration of both horizontal and vertical hydraulic conductivity values. Three tests conducted for this study in Tri-Cities Mesa included monitoring of deeper or shallow units than were screened in the pumping well. The pumping test response (or lack thereof) in these monitoring wells can be used in the groundwater modeling effort to help calibrate vertical hydraulic conductivity values.

8.3 ALTERNATIVE HYDROGEOLOGIC INTERPRETATION OF PORTION OF TRI-CITIES MESA AREA

Based upon review of surface topography and geology, subsurface geologic cross-sections, existing pumping test data, and pumping tests conducted for this study, an alternative geologic conceptual model for the central portion of the Tri-Cities Mesa may be warranted. Previous studies and well log interpretations have all considered the stratigraphic column in this area to consist of 20 to 60 feet of dune sand, 150 to 200 feet of Paso Robles Formation, and 300 feet or more of Careaga sandstone (or Squire Member of Pismo Formation). Production wells are generally screened in either the shallow Paso Robles Formation aquifer (upper 200 feet), or the deeper Careaga sandstone aquifer.

In the adjacent Nipomo Mesa, Paso Robles Formation is the primary aquifer screened by wells and K values are well documented to range from 2 to 15 feet/day, with some higher values in the 15 to 50 feet/day range. However, K values of the shallow aquifer beneath central Tri-Cities Mesa are consistently much higher than 50 feet/day and generally range from 115 to 270 feet/day. These K values are more characteristic of coarse-grained recent alluvium than they are of the older Paso Robles Formation. In addition, a detailed geologic log at the Grover Beach well field documents the abundance of cobbles (some exceeding 6 inches in diameter) within relatively clean (no fines) sand, gravel, and cobble layers. This geologic layer description is more diagnostic of recent coarse-grained alluvium than it is of Paso Robles Formation.

Review of topographic and surface geology maps show that the lower portion of Arroyo Grande Creek Canyon extends from the hills with Arroyo Grande Creek heading towards the middle of Tri-Cities Mesa. However, the recent dune sands comprising the Mesa cause the creek channel to bend to the south and around the mesa. It is possible that in the geologic past, prior to deposition of the dune sands, the ancestral Arroyo Grande Creek flowed through the area presently occupied by the central portion of the mesa, including the Arroyo Grande and Grover Beach well fields. If this is the case, the upper 200 feet of sediments may contain alluvium from ancestral Arroyo Grande Creek, which better explains the presence of 6-inch diameter cobbles and the associated high hydraulic conductivity values. This hypothesis likely warrants further consideration as additional wells are drilled and logged in the future – more detailed geologic logs would be helpful in this evaluation. Regardless of the name of the formation present in the shallow aquifer beneath Tri-Cities Mesa, a future groundwater modeling effort needs to account for the extremely high transmissivity and hydraulic conductivity values of this layer, which is likely connected to alluvium in the Arroyo Grande Plain.

9.0 EVALUATION OF STREAM INFILTRATION

9.1 INTRODUCTION

Stream infiltration in the study area is primarily limited to Arroyo Grande Creek, and possibly Los Berros Creek (Plate 23). Review of existing studies and the permeable nature of Dune Sand soils suggest runoff and stream infiltration is limited for the Mesa areas, because rainfall tends to infiltrate the permeable soils as opposed to becoming runoff to stream channels. In recent years, the District has been collecting stream stage data (but not flow data) at selected locations along Arroyo Grande and Los Berros creeks. The data were provided just prior to publication of this report, so an extensive review and analysis of the data were not conducted. The full data set are appended to this report as Appendix K.

9.2 PREVIOUS STUDIES

A Hoover Associates study (1985) conducted synoptic surveys on two days in June 1984, one day with “very low” streamflow and another day with approximately 3 cubic feet per second (cfs) recorded at the USGS gauge on Arroyo Grande Creek. Based on the day with higher flows, Hoover estimated that 3.0 cfs infiltrated between the USGS gauge and 22nd Street Bridge (Plate 23). This equated to an average streambed infiltration rate of about 2 acre-feet per day (AFD). Hoover reported the creek reach with highest infiltration rate is between Fred Brieb Bridge and Highway 1 Bridge. Todd (2007) reported that the Hoover study showed net loss of about 200 acre-feet per year (AFY) between the USGS gauge and Traffic Way. Todd also stated that bedrock occurs at USGS gauge such that subsurface flow upstream is forced up into the creek at this point.

Todd (2007) conducted a synoptic survey on April 18, 2006 for Arroyo Grande Creek. Todd measured a streamflow loss of 2.2 cfs between the USGS gauge and the Highway 1 Bridge, and a streamflow gain of 0.5 cfs between the Highway 1 Bridge and 22nd Street Bridge. Thus, the net streamflow loss in the Todd survey between USGS gauge and 22nd Street Bridge was 1.7 cfs (3.4 AFD). Todd suggested that recent rains just prior to their survey may have raised the water table and/or resulted in unaccounted for seepage into the creek that may have caused lower streamflow infiltration rates on the day of the survey. Todd recommended additional synoptic surveys be conducted in late summer/early fall.

DWR (2002) generally estimated Arroyo Grande Creek stream infiltration to be about 10 percent of total inflow, with a range from 300-500 AFY in dry years to 1,600-2,400 AFY in wet years. DWR (1979) states that perennial flow is maintained in Arroyo Grande Creek via natural runoff, underflow from hills, irrigation return flows, and Lopez Dam releases. Todd (2007) reported that District staff had previously estimated up to 5 cfs (9.9 AFD) of streamflow percolation over the study area based upon informal observations; however, this estimate has not been documented.

The limited data available from previous studies regarding the amount of surface water infiltration along Arroyo Grande Creek are summarized in Table 7. The previous estimates of streamflow percolation include Hoover (1985), DWR (2002), Todd (2007), and the District (undocumented). The previous estimates are based on synoptic surveys to measure stream loss between various points on the stream on a given day, and review of available stream gaging records. The previous studies indicate that typical streamflow losses between the USGS gauge and 22nd Street Bridge range from 1.7 to 5 cubic feet per second (cfs); however, stream flow losses (and groundwater basin recharge) would be less than these measured rates at times of low stream discharge (e.g., less than 2 cfs) when the rate of infiltration is limited to the total amount of incoming streamflow.

The estimated average annual stream infiltration amounts by DWR and Todd include consideration of stream infiltration being limited at low flows, whereas the average annual stream infiltration amounts listed in Table 7 for Hoover and the District are based on the measured stream losses being maintained throughout the year. Review of the previous studies indicates the likely range for average annual streamflow infiltration along Arroyo Grande Creek ranges from about 800 to 2,100 AFY with a potential maximum ranging up to 3,600 AFY.

9.3 EVALUATION

The amount of stream infiltration likely varies substantially based on the amount of flow in Arroyo Grande Creek and groundwater levels. The limited available data indicates net streamflow percolation of about 3 cubic feet per second (cfs) in June 1984 with measured streamflow of 3 cfs at the USGS gauge and no flow at the 22nd Street Bridge. A streamflow percolation of 1.7 cfs was measured in April 2006 based on 24.2 cfs at the USGS gauge, a 5.4 cfs contribution to Arroyo Grande Creek from Los Berros Creek, and measured flow of 27.9 cfs at 22nd Street Bridge (24.3+5.4-27.9=1.7 cfs). In addition, another set of measurements in June 1984 indicate very low flow, which indicates minimal streamflow percolation.

The available data do not indicate that higher streamflow equates to higher streamflow percolation, likely because times of higher streamflow also correspond to higher groundwater elevations. There is likely a time of maximum streamflow percolation as both streamflow and groundwater level decline seasonally.

Available USGS stream gauge data after Lopez Dam construction were used to evaluate streamflow percolation. Based upon review of available data related to streamflow and streamflow percolation, the following assumptions were used in the analysis:

1. When streamflow at USGS gauge is 5 cfs or less, streamflow percolation between USGS gauge and 22nd St. Bridge is assumed to be equal to streamflow at USGS gauge.
2. When streamflow at USGS gauge is 10 cfs or more, streamflow percolation between USGS gauge and 22nd St. Bridge is assumed to be equal to 1.7 cfs.

3. When streamflow at USGS gauge is between 5 and 10 cfs, streamflow percolation between USGS gauge and 22nd St. Bridge is assumed to decline linearly from 5 cfs to 1.7 cfs.

The available Arroyo Grande Creek streamflow data from the USGS gauge range from 1939 to 1986. However, the construction of Lopez Dam changed the streamflow pattern downstream of the dam. Thus, only data from Water Year 1970 through 1986 were used in this analysis. The streamflow data used for input to the analysis and the detailed analysis results are provided in Appendix K. The streamflow data used as input were the average daily flows at the gauge for each month and year in the period of record. The overall results are summarized in Table 8. The analysis resulted in an average annual streamflow infiltration of 2,350 AFY, with a range from approximately 1,830 to 2,850 AFY.

Review of the total amount of streamflow vs. the amount of streamflow percolation shows that maximum streamflow percolation tends to occur in low to average water years. The reason for the observed relationship is that when streamflows are higher during wet years the groundwater basin is receiving significant recharge from various sources such as rainfall percolation. The overall greater recharge (from non-streamflow sources) causes higher groundwater elevations to occur in wet years, which serves to reduce streamflow percolation compared to when groundwater levels are lower in normal to dry years. However, when more detailed streamflow data become available from the District monitoring program, additional analyses are warranted to evaluate streamflow infiltration.

9.3.1 Data Gaps

Aside from the need for additional synoptic surveys to be conducted under different water table and streamflow conditions, two specific data gaps have been identified. The first data gap is the need to know how much of the previously estimated streamflow infiltration along Arroyo Grande creek occurs between the USGS gauge and Highway 101. The reason this data is needed is because this creek reach lies outside the boundary of NCMA, and streamflow percolation along this reach is presumably already accounted for in subsurface flow calculations (and thus needs to be subtracted from assumed streamflow infiltration along Arroyo Grande Creek within NCMA boundaries). A second data gap is the need to understand streamflow gain/loss between 22nd Street Bridge and the Pacific Ocean – Todd (2007) states this is a gaining reach of Arroyo Grande Creek. The net streamflow gain between 22nd Street Bridge and the ocean needs to be subtracted from total basin streamflow infiltration.

Future synoptic streamflow surveys should include previous synoptic stations (USGS, Los Berros Creek at Valley Road, Highway 1 Bridge, and 22nd Street Bridge). It is also recommended to add synoptic stations at Highway 101 Bridge, near 3rd Street, and near the Pacific Ocean along Arroyo Grande Creek, and two synoptic stations along Los Berros Creek.

10.0 EVALUATION OF AREAS FOR ENHANCED RECHARGE

10.1 INTRODUCTION

This section briefly assesses potential areas for enhanced recharge. The potential sources of water for enhanced recharge include storm water runoff, recycled water, and surface water. Potential methods that may be used for enhanced recharge are surface infiltration basins (recharge basins, storm water retention/detention basins), dry wells, and injection wells.

10.2 PREVIOUS STUDIES

The cities of Arroyo Grande and Grover Beach capture a portion of rainfall runoff and route it to infiltration basins to provide supplemental groundwater recharge. The City of Arroyo Grande is divided into three drainage zones (A, B, and C). The infiltration basins are located in Drainage Zone A (670 acres and 37% of City surface area), where soils have infiltration rates estimated to be 6 inches/day. Zone B is underlain by fine-grained soils and recharge basins are not effective, and Zone C is located in the hills north of Highway 101 and does not overlie the aquifer. Eight infiltration basins are located in Arroyo Grande, encompassing a total basin area of 145 acres with contributing watershed areas of 752 acres. The City of Grover Beach has one infiltration basin covering 48.5 acres, and with a contributing watershed area of 229 acres (Todd, 2007).

Historic infiltration from the six older Arroyo Grande infiltration basins was estimated at 175 AFY (Todd, 2007). Todd's analysis indicated a low of about 50 AF in a dry year to as much as 775 AF in a wet year. Todd estimates that 15-20% of current runoff is captured by the existing basin system. Todd estimated that the amount of storm water infiltration could be increased up to 1,000 AFY with expansion of the basin system in Arroyo Grande, Grover Beach, and Oceano.

The cities of Arroyo Grande, Grover Beach, Oceano, and Pismo Beach prepared storm water management plans in 2008. Each city anticipated that new retention/detention basins would be associated with new developments to help address local storm runoff water quality issues. These new retention/detention basins may provide additional groundwater recharge (GEI Consultants, 2013). We understand from conversations with NCMA Technical Group members that many small retention/detention basins have been installed for new developments in recent years.

Cannon (2014) recently completed the San Luis Obispo County Regional Recycled Water Strategic Plan. The areas covered in the report included essentially all of NCMA and the Nipomo CSD service area. The draft report addressed the potential for groundwater reuse in these areas along with several other reuse alternatives (e.g., agricultural irrigation, urban reuse, industrial reuse). The two groundwater reuse options evaluated were surface infiltration basins and injection wells.

Nipomo CSD has two wastewater treatment plants (WWTPs) – Blacklake and Southland. Blacklake treated effluent is already used for irrigation at Blacklake Golf Course, and Southland treated effluent is disposed through percolation basins. Southland treated effluent is already accounted for in the NMMA water balance as a groundwater recharge component. The conclusion of the Plan was that no new significant water supply benefit would be obtained through a new Nipomo CSD recycled water project; however, the need for alternative disposal methods in the future may serve as incentive for future development of such a project.

Wastewater treatment facilities in the NCMA include City of Pismo Beach and South San Luis Obispo County Sanitation District (SSLOCSD) treatment facilities. Current treated effluent disposal for both Pismo Beach and SSLOCSD is through an ocean outfall. Groundwater recharge concepts were developed along with landscape irrigation, agricultural irrigation, surface water augmentation, and industrial reuse project concepts (Cannon, 2014).

Potential groundwater replenishment options for NCMA were evaluated by Cleath and included in an appendix to the plan (Cannon, 2014). Cleath stated potential areas for surface recharge are not well defined at this time, in part because the target aquifers for municipal supply wells are at significant depth beneath surficial Dune Sand and/or alluvium. More detailed studies are needed to define areas where surface recharge can effectively migrate vertically downward through the surficial sediments to the underlying municipal well aquifers. With respect to injection wells, Cleath identified several potential locations for such wells that were sited based upon a calculated required setback distance of 2,300 feet. The 2,300 foot distance calculated by Cleath was intended to represent a 12-month residence time in the subsurface based on assumed inputs of K = 20 feet/day, porosity = 0.30, and hydraulic gradient associated with an injection mound of 0.1. Potential injection well locations identified by Cleath included the north side of Tri-Cities Mesa, interspersed among the municipal production wells in the middle of Tri-Cities Mesa, along Arroyo Grande Creek, and along the coast line (to serve as a sea water barrier).

A map of the distribution of soil units across the study area is shown on Plate 24 and the soil unit key is on Plate 25. In the discussion below, it should be noted that soil surveys use the term “permeability” for rate of infiltration. The primary soil type across Nipomo Mesa and Tri-Cities Mesa is Oceano Sand with 0 to 9 percent slopes (Unit 184), and the secondary soil type is Oceano Sand with 9 to 30 percent slopes (Unit 185). These two soil units generally correspond to the occurrence of Older Dune Sand on the geologic map (Plate 6). The Oceano Sand soil units are characterized by rapid permeability (6 to 20 inches per hour) and a Hydrologic Group A designation. Group A soils are characterized by high infiltration rates and low runoff potential, and are generally comprised of well drained sands and/or gravelly sands (USDA, 1984) and would be favorable groundwater recharge areas.

The Younger Dune Sands along the coast on the geologic map are classified primarily as the Dune land soil unit (Unit 134) with a few small areas designated as Psamments and Fluvents wet (Unit 193). The Dune land soil unit consists of sand-sized particles subject to movement by wind and is characterized by very rapid permeability, low surface runoff potential, and would be consistent with Hydrologic Group A (the Soil Survey does not assign it to a specific hydrologic group) and would be favorable groundwater recharge areas. The Psamments and Fluvents soil unit occurs in Dune land areas and consists of loamy sand that commonly contains organic matter. This soil unit is comprised of poorly drained, water logged soils subject to occasional flooding (USDA, 1984) and would not be favorable areas for groundwater recharge.

The most common soil units in the Arroyo Grande Alluvial Plain include Mocho Variant fine sandy loam (Soil Unit 176) in the northwest portion of the plain, Marimel sandy clay loam (Soil Unit 169) in the southwest portion of the plain, and Marimel silty clay loam (Soil Unit 170) in the northeastern portion of the plain. Soil Units 169 and 170 are characterized by moderately slow permeability (0.2 to 0.6 inches/hour), slow runoff, and belong to Hydrologic Groups D and C, respectively. Hydrologic Groups C and D are characterized by slow to very slow infiltration, and high runoff potential depending on slopes. Soil Unit 176 has moderately fast permeability (2 to 20 inches/hour), slow runoff, and belongs to Hydrologic Group A (USDA, 1984), which would be favorable groundwater recharge areas.

The soil groups along the valley bottom of Los Berros Creek in NMMA are Psamments and Fluvents, occasionally flooded (Soil Unit 192) and Still gravelly sandy clay loam (Soil Unit 209). The Psamments and Fluvents soil unit is located in the western portion of Los Berros Creek valley in NMMA and is described above in the Soil Unit 193 description. The Still gravelly sandy clay loam soil unit belongs to Hydrologic Group B, and is characterized by a moderate infiltration rate and slow runoff (USDA, 1984).

10.3 EVALUATION

10.3.1 NMMA Soil and Geologic Conditions

The major soil unit in Nipomo Mesa is the Oceano Sand, which has a relatively high infiltration rate and low runoff potential. Geologic cross-sections completed for this study (Plates 8 through 14) show most areas of Nipomo Mesa south of the Santa Maria River Fault, with 200 to 300 feet of surficial Dune Sand and production wells screened at depths below 300 feet. Depths to regional groundwater (i.e., not including perched water) are typically in excess of 250 feet across Nipomo Mesa. Various studies conducted by Cleath (e.g.,1996), Fugro (e.g., 2008), and others indicate that Dune Sands at many locations include one or more thin clay layers that may create perched groundwater tables at depths considerably shallower than the regional water table. These thin clay layers do not appear to be regionally continuous.

The geologic formation immediately below the Dune Sand across most of NMMA is Paso Robles Formation. Thicknesses are quite variable but typically in the range from 100 to 300 feet, and the majority of wells are screened either entirely or partially within this formation. Geologic cross-sections constructed for this study show that the upper portion of the Paso Robles Formation is often comprised of clayey sediments, thereby creating another potential surface for perched groundwater. Wells screened in Paso Robles Formation are typically screened below the upper clayey sediments of the formation. However, as shown on Plates 8 through 14, recharge to the Older Dune Sands could migrate horizontally into the Santa Maria Valley alluvium. Water recharged into the Older Dune Sands as shown on Plates 11 through 14 could recharge the Paso Robles Formation.

10.3.2 NCMA Soil and Geologic Conditions

The major soil unit in the Tri-Cities Mesa is the Oceano Sand, which has a relatively high infiltration rate and low runoff potential. Geologic cross-sections completed for this study (Plates 15 and 16) show most areas of Tri-Cities Mesa to be underlain with 20 to 60 feet of surficial Dune Sand and production wells screened at depths below 100 feet. Depths to regional groundwater are typically from 20 to 80 feet across Tri-Cities Mesa. Geologic cross-sections and review of well logs for this study indicate clay layers are prevalent along the coast, but pinch out inland to create a range of confined to unconfined conditions in the Paso Robles Formation aquifer. These unconfined areas have potential for artificial recharge projects (Plates 7 and 24).

The geologic formation immediately below the Dune Sand across NCMA is Paso Robles Formation. Thicknesses are quite variable but typically in the range from 100 to 300 feet, and several wells are screened either entirely or partially within this formation. Geologic cross-sections constructed for this study show that the upper portion of the Paso Robles Formation is relatively coarse-grained in the central inland area, thereby creating potentially good pathways for vertical migration of water and, based on 2014 aquifer tests, have some interconnection with the underlying Careaga sandstone aquifer. In coastal areas and the southern portion of Tri-Cities Mesa the upper Paso Robles Formation has more clayey sediments that likely restrict potential vertical migration of surface recharge waters to the aquifers screened in production wells.

The Arroyo Grande Plain portion of NCMA is characterized by three major soil types, only one of which is considered to have good infiltration rates (northwest portion of the plain). Limited well log data in this area make it difficult to evaluate the occurrence or absence of clay layers in the subsurface above the screened interval of typical production wells.

10.3.3 Recharge Basins

Based upon the assessment of soils and geologic conditions described above, it is likely that use of surface recharge basins to effectively recharge production aquifers is limited to the inland central part of Tri-Cities Mesa (located within the cities of Arroyo Grande and Grover Beach). This is because of the presence of clay layers in the Dune Sand and/or upper Paso Robles Formation across NMMA, in coastal areas of NCMA, and in the southern part of Tri-Cities Mesa. These clay layers tend to either create perched groundwater conditions (if present in the unsaturated zone) or impede vertical migration of recharge water for clay layers within the saturated zone. Thus, the area of suitable soils (and vadose zone) for effective use of recharge basins is generally limited to the sandy soils of the central Tri-Cities Mesa area (Plates 7 and 24), which corresponds to an urban area occupied by the cities of Arroyo Grande and Grover Beach. However, the urban development of this area greatly restricts the amount of available land for infiltration basins.

It is likely, based on inspection of well logs and cross sections extending into the Santa Maria Valley south of the study area, that sites favorable for recharge exist at the base of the Nipomo Mesa. Although some of the recharged water may be lost to the Santa Maria Valley Management Area, there may be some benefit to the NMMA, upgradient of the pumping depression that exists in the central portion of the region, given groundwater flow directions that exist in the area between the Santa Maria River and the pumping depression.

10.3.4 Dry Wells and Injection Wells

The difference between dry wells and injection wells is that dry wells only extend into the vadose zone above the water table, whereas injection wells are screened below the water table in the saturated zone. One major advantage of wells over infiltration basins is that considerably less space is required for these facilities, which is an important consideration in urban areas. Another advantage of wells is that recharge water can be placed below the impeding clay layers that may restrict vertical downward flow of water from recharge basins. A disadvantage of wells is that a significant level of water treatment is required when using either dry wells or injection wells both to meet regulatory requirements and to minimize clogging of wells.

Dry wells are likely of limited advantage over surface infiltration basins where clay layers are present near the water table and/or just above the production well screen intervals, because vertical migration of recharge water from dry wells to production well screen zones will still be impeded in these areas. In areas where such clay layers are not present or are of limited thickness and lateral extent (e.g., central Tri-Cities Mesa), surface infiltration basins have the advantage of less strict water quality requirements while likely still allowing a similar potential for vertical migration to the production aquifer afforded by dry wells in this area. In this case, the only advantage of dry wells over recharge basins is that less area is required for the facilities.

Injection wells have a major advantage over recharge basins and dry wells in areas where clay layers are prevalent above production screen intervals, because they allow for recharge water to be directly injected into the production aquifer zone. Thus, the recharge water becomes readily available for extraction by pumping wells. Another advantage of injection wells over recharge basins is that considerably less land is required for well facilities versus infiltration basin facilities. However, these advantages for injection wells are balanced against a major disadvantage of much stricter requirements for water quality and treatment of the recharge water prior to injection, higher operation and maintenance costs, as well as requirements for residence time in the aquifer prior to extraction of the recharge water. Many potential locations exist for injection wells because siting of the wells is not limited/restricted by the presence of clay layers; thus, most locations are suitable for injection wells from a hydrogeologic standpoint. However, it would be important to maximize injection rates for each well to derive the greatest water supply benefit per unit cost; therefore, it is important to site injection wells in areas of higher specific capacity (e.g., southwest of Santa Maria River and Oceano faults on Nipomo Mesa) and in geologic formations with higher specific capacities (e.g., Paso Robles Formation preferred over Careaga sandstone in Tri-Cities Mesa area). The Black Lake Canyon area may also prove to be a suitable target area because wells drilled along the bottom of the canyon (see Plates 12, 13, and 14) would not need to be drilled as deep as other parts of the area to encounter the Paso Robles Formation.

10.3.5 Sources of Water

The potential sources of water for enhanced recharge include storm water runoff, recycled water, and surface water. The only existing source of water developed for enhanced recharge is storm water runoff in the Tri-Cities Mesa. It is estimated that 15-20% of storm water runoff within the area of permeable soils in the Tri-Cities Mesa area of Arroyo Grande and Grover Beach is captured and recharged by the existing infiltration basin system. There is potential to utilize more storm water in this region for enhanced recharge via recharge basins; however, the large undeveloped areas necessary for development of recharge basins are difficult to find in this highly developed urban area. Storm water is difficult to utilize for injection wells because it requires capture, storage, and treatment prior to injection. Given the presence of clay layers in the vadose zone and/or saturated zone above production well screens, the available storm water in other areas likely has limited potential benefit to production aquifers if used for enhanced recharge via recharge basins.

A second potential source of new water is recycled water. A recent draft report prepared by Cannon (2014) documented the amounts of available recycled water, current level of treatment, and potential reuse options. In general, the most common reuse of recycled water is for irrigation (in-lieu conjunctive use management). However, utilization of highly treated recycled water for enhanced recharge has been successful in some areas (e.g., Orange

County, California). While the use of recycled water for enhanced recharge via any method poses some regulatory challenges, those obstacles are much greater for use with injection wells than for recharge basins. As discussed previously in this section, the portion of the study area where recharge basins would provide significant benefit to production aquifers are likely limited to the central portion of the Tri-Cities Mesa and portions of the Nipomo Mesa. New areas developed as recharge basins in this area might face less stringent regulatory requirements if they are able to use storm water runoff as the source of water during the wet season. However, an optimum use of recycled water in the cities of Arroyo Grande and Grover Beach might be for recharge in new and/or existing infiltration recharge basins during the dry season.

A third potential source of new water is surface water. Surface water could be derived from streams flowing into the study area (e.g., Arroyo Grande Creek, Los Berros Creek), or imported water. With respect to streams flowing into the area, water would primarily be available in the wet season during high flow events. Short duration high flow events require infrastructure for capture, storage, and infiltration of the water, thereby limiting the enhanced recharge methods to recharge basins. A source of imported water may allow for more uniform flow of water throughout the year, and provides more flexibility in terms of potential methods of enhanced recharge that may be utilized.

Overall, recharge basins will work best when located further inland over semi-confined to unconfined aquifers, whereas injection wells will work best when located near the coast in confined aquifer conditions. Recharge basins would be best supplied by capturing storm water runoff, whereas injection wells would be best supplied with recycled water from local treatment plants. This type of recharge scenario would allow for aerially dispersed recharge at the inland, upgradient side of the major production zones, and specific aquifer focused recharge along the coast to prevent seawater intrusion.

11.0 EVALUATION OF OFFSHORE AQUIFER AND SEAWATER INTRUSION

11.1 INTRODUCTION

The potential for sea water intrusion in the study area has been an ongoing concern dating back to the 1950's. Many of the studies conducted by DWR in the region were the result of concerns related to seawater intrusion. The threat of sea water intrusion is a major limiting factor on development of the groundwater basin.

11.2 PREVIOUS STUDIES

According the DWR (1958), groundwater flow in NCMA area (as of 1954) was generally towards the ocean, although a pumping depression was noted in the area north of Oceano since 1945. However, the report stated that groundwater elevations were still above sea level and sea water intrusion likely had not occurred. The report indicated this cone of depression occurred within the Paso Robles Formation, which is less permeable than alluvium in the basin. It was believed that the area west of the pumping depression had a discontinuous clay layer that allowed deep percolation from the Older Dune Sands into Paso Robles Formation that helped maintain a seaward hydraulic gradient. Groundwater level fluctuations during the 1933 to 1954 period indicated that while groundwater levels may decline significantly at times, the Arroyo Grande Basin tends to refill during wet seasons – resulting in wide fluctuations in water levels.

Groundwater contours also indicated flow from Nipomo Mesa to the Arroyo Grande Basin at this time (DWR, 1958).

The DWR (1970) study of seawater intrusion in the Pismo-Guadalupe area documents results of a field investigation conducted in the 1960's due to suspected seawater intrusion in the study area, including installation of 32 piezometers. The field work completed for the investigation established a coastal monitoring well network through drilling and installation of several nested monitoring wells, five of which are still monitored today. The overall study objective was to evaluate the extent and rate of seawater intrusion via three tasks: 1) establish a coastal monitoring system; 2) characterize hydrogeologic and water quality conditions in the basin; and 3) evaluate the present and future potential extent of sea water intrusion. The study also included an assessment of probable offshore aquifer conditions.

The seafloor adjacent to the study area slopes very gently such that the ocean is only 1,100 to 1,400 feet deep at 20 miles off the coast. Evaluation of hydrogeologic conditions suggested that the production aquifers may extend several miles offshore, and it is likely fresh water is stored offshore in these aquifers. Groundwater level data available at the time of the study suggested that water levels fluctuated seasonally and annually with climatic conditions, but were generally stable over the long term (no net decline) in the Nipomo Mesa and Tri-Cities areas.

The overall conclusions of the DWR (1970) study were: 1) shallow groundwater in the upper 100 feet of sediments north of Arroyo Grande Creek contain chlorides at 100 to 1,630 parts per million (ppm), but the elevated concentrations were attributed to sources other than sea water intrusion; 2) with the exception noted above, the major aquifers at the coast contain fresh water with chloride concentrations of 20 to 70 ppm; 3) groundwater in inland wells ranged from 30 to 190 ppm chloride, but elevated concentrations were attributed to excess irrigation water percolation and treated effluent percolation; 4) hydrogeologic conditions indicate storage of a considerable amount of fresh water in offshore aquifers, but the potential for sea water intrusion exists in the Paso Robles Formation and Careaga sandstone aquifers if the hydraulic gradient is reversed; and 5) groundwater levels in the Arroyo Grande and Nipomo Mesa areas fluctuate with climatic conditions but did not show net declines.

The DWR (1979) report documents drilling of two exploratory boreholes/nested wells (shown on Plate 26) to depths of 850 and 1,000 feet near the coast (PSBO-1 or 90019 and PSBO-2 or 90020). These boreholes showed discrete aquifer zones near the coast that are less well defined inland. Based on available onshore geologic data and offshore seismic profiles, projection of coastal aquifers offshore showed two aquifer systems that measure 9 miles along the beach and 12 miles oceanward. The study defined an upper aquifer as being 190 feet thick and the lower aquifer that was 430 feet thick near the coast.

DWR (2002) concluded that aquifers in NMMA and NCMA extend offshore and are in hydraulic communication with the onshore portion of the aquifers. Thus, a reversal of the hydraulic gradient from offshore to onshore would result in seawater intrusion of the inland portion of the basin and ultimately into municipal, agricultural, and domestic production wells. They concluded that the offshore versus onshore direction of the hydraulic gradient may change depending on climatic conditions (i.e., dry conditions may initiate seawater intrusion that is subsequently reversed during average to wet years). DWR concluded that inadequate data exist to characterize the configuration of aquifers offshore and the location of the fresh water – salt water interface. Therefore, an early detection monitoring program was necessary to facilitate protection of the groundwater basin. DWR recommended the seawater intrusion monitoring program include mitigation actions that could be implemented in the event that seawater intrusion is detected in monitoring wells. Groundwater quality samples were collected in 1996 from seven nested coastal monitoring wells as part of their evaluation of sea water intrusion. Analytical results showed no indication of seawater intrusion at that time along the coast west of the NCMA and NMMA (DWR, 2002).

Papadopulos (2004) stated that the aquifer system is continuous offshore. Groundwater samples collected as of the time of their study did not indicate seawater intrusion. However, there was concern about exposure of Careaga sandstone as a conduit for seawater intrusion – especially given slightly elevated chloride concentrations in two coastal monitoring wells screened in that formation. Groundwater modeling indicated there may be significant lag times for seawater intrusion to occur from inland pumping depressions depending on the location of the salt water/fresh water interface.

Todd (2007) conducted a water balance study for NCMA, which included a component for subsurface outflow to the ocean. It was estimated that the average annual subsurface outflow to the ocean was about 3,000 AFY over the study period from 1986 to 2004. The calculated 3,000 AFY of outflow was sufficient to prevent seawater intrusion; however, the minimum amount of subsurface outflow needed to prevent seawater intrusion is not known. Todd's calculations assume steady-state conditions (i.e., the same conditions are maintained one year after another) – it is considerably more difficult to evaluate the effect of the more transient conditions that actually occur with annual variations in recharge and pumping. A numerical model is likely required to address these transient effects.

Elevated chloride and TDS concentrations were reported for NCMA sentry wells 30N02 and 30N03 in 2009 (Todd, 2010) when chloride concentrations increased in August 2009 and October 2009 from normal levels of 50 to 70 mg/L to as high as 190 mg/L in 30N03 and 600 mg/L in 30N02. Concurrently, TDS concentrations increased in 30N02 and 30N03 from a normal range of approximately 1,000 mg/L to as high as 2,080 mg/L in 30N02 in October 2009. In response to the concern of seawater intrusion, the NCMA municipal water agencies reduced groundwater pumping from in excess of 6,000 AFY in 2008 and prior years to approximately 4,000 AFY in 2010 and 2011. The reduction in groundwater pumping was compensated by increased use of State Project surface water and reduced overall water demands during 2010 and 2011. The concentrations of chloride and TDS in sentry wells 30N02 and 30N03 subsequently returned to pre-2009 levels.

The NCMA 2013 Annual Report (Fugro, 2014) documents the historic groundwater level data pertaining to seawater intrusion monitoring. Four coastal sentry wells with nested completions are located within about 2,000 feet of the coastline, and another nested completion is located about 4,000 feet inland. Groundwater levels in the four nested wells nearest the coastline have fluctuated over time dating back to 1967. The wells typically fluctuate in an elevation range from +4 to +10 feet above mean sea level, with occasional fluctuations above or below this range. Water level fluctuations below this range occurred between 2007 and 2009, during a time when precipitation was well below average. Groundwater levels at sentry wells subsequently recovered since 2009 to within their historic ranges.

Due to concerns about potential for seawater intrusion in the 2007 to 2009 time period, the NCMA implemented a quarterly water quality monitoring program for the sentry wells and Oceano CSD observation wells. In addition, the agencies in the NCMA voluntarily reduced groundwater pumping, implemented conservation measures, and have been working towards development of additional surface water supplies.

The NCMA has developed a deep well index for coastal monitoring of groundwater levels as an indication of risk for seawater intrusion. The three wells in the index are 32S/12E-24B3 (with a screened interval 270-435 feet below ground surface (bgs)), 32S/13E-30F3 (305-372 feet bgs), and 32S/13E-30N2 (175-255 feet bgs), located along the coastline west of the cities of Pismo Beach, Grover Beach, and Oceano. It has been suggested that an average water level elevation of the three deep sentry wells of 7.5 feet above mean sea level (MSL) is the minimum elevation to maintain over an extended time period to minimize the potential for seawater intrusion. Groundwater levels were below the deep well index (minimum desired level) from October 2007 to August 2009, and a spike in chloride and sodium concentrations were observed in Well 32S/13E-30N3 (60-135 feet bgs) in late 2009. NCMA coastal groundwater levels recovered to above the minimum threshold level during 2010 to 2012, but again declined below 7.5 feet MSL from June to December 2013 (Fugro, 2014), and have continued to remain below the deep well index throughout the first six months of 2014. The NCMA supplements their monitoring program with periodic monthly water level measurements and groundwater sampling, such as in the Spring 2014, to improve the monitoring program during the severe dry conditions (e.g., over the 2013 to 2014 time period).

The NMMA conducts a monitoring program that includes groundwater level and groundwater quality data. In contrast to the degraded water quality and potential seawater intrusion event of October 2009 in the 30N02 sentry well in NCMA, consistent long-term water levels and water quality persisted in NMMA coastal well 12C, at least up until the current drought conditions. The most recent annual report (NMMA Technical Group, 2014) indicated that the inland region represented by the NMMA Key Wells Index is experiencing Potentially Severe Water Shortage Conditions (i.e., the normalized groundwater elevation derived from measurements in several wells is below 31.5 feet above mean sea level). Spring 2013 groundwater elevations, as represented by the Key Wells Index, showed a sharp decline from 2012 levels. However, it is important to note that coastal water quality was substantially better than the threshold for Potentially Severe Water Shortage Conditions (based on consistent chloride concentrations between approximately 60 and 90 mg/L), and inland groundwater quality was relatively unchanged in 2013.

11.2.1 Geologic Conditions

Although continuity of lithologic units (e.g., clay layers) and geologic formations extending offshore are not well defined, our review of data (including from previous studies) and geologic cross-sections developed for this study suggest that onshore geologic formations likely continue offshore for several miles. An interface (i.e., contact) between freshwater and salt water exists between the coastline and some unknown distance offshore. The fresh water/salt water interface may be at different locations for the various aquifers separated by substantial clay layers, depending on the amount of recharge, pumping, and subsurface outflow associated with each aquifer. The fact that the locations of these fresh water/salt water interfaces (in the various aquifers) are unknown is not meant to imply a minimal threat of seawater intrusion. It should be assumed that the interface is near the shoreline, and groundwater levels need to be maintained at elevations sufficient to allow adequate offshore flow of freshwater to prevent seawater intrusion.

Available data suggest aquifers providing potable groundwater to NCMA and NMMA are subject to seawater intrusion if hydraulic gradients are reversed for a sufficient period of time (i.e., no geologic barriers to seawater intrusion are known to exist). Seawater intrusion can occur laterally through subsea geologic unit outcrops on the ocean floor and/or through vertical migration through overlying layers. Geologic conditions along the study area coastline and offshore (i.e., continuation of aquifers westward beneath the ocean floor until they pinch out or outcrop on the ocean floor) indicate that it is necessary to maintain a certain amount of subsurface outflow towards the ocean to prevent seawater intrusion.

11.3 EVALUATION

Although offshore geologic data are limited, it is likely that geologic formations present along the coastline and inland continue offshore beneath the ocean floor. There are no documented geologic features that would serve to help restrict the potential for seawater intrusion (e.g., faulting or folding of geologic formations at the coastline or just offshore). Previous studies suggest aquifers present in these geologic formations likely continue offshore for up to several miles before intersecting the shallow slope of the ocean floor. However, vertical pathways for seawater to migrate through the ocean floor and into the aquifers likely exist, and such vertical movement of seawater may occur depending on hydraulic gradients. Thus, it is critical that groundwater levels onshore be maintained at high enough elevations to prevent the vertical and lateral migration of seawater inland across the coastline.

An evaluation of seawater intrusion for NCMA and NMMA is primarily contingent upon an assessment of groundwater elevations and groundwater gradients – particularly near the coast. In addition, historic groundwater quality data during times of lower groundwater elevations may be useful in evaluating seawater intrusion. An important factor to consider in this overall analysis was mentioned by Papadopulos (2004) regarding the lag time that may be associated with lowered groundwater elevations onshore and appearance of saline water at inland water supply wells. It should be noted that Papadopulos evaluated seawater intrusion lag times for Nipomo Mesa, where production wells and pumping depressions are further inland than in NCMA. Thus, it should not be assumed that the significant lag times (several years) shown in modeling results for Nipomo Mesa are applicable to NCMA.

Groundwater level fluctuations in recent years have been correlated with climatic conditions and basin groundwater pumping. A notable decline in groundwater levels along the coast occurred in the 2007 to 2009 period related to consecutive years of below normal rainfall, followed by recovery of water levels during a high rainfall year (Fugro, 2014). In particular, water level declines during 2007 to 2009 were noted in wells 30F3 (screened 305-372 feet bgs), 30N2 (175-255 feet bgs), OCSD Silver (395-435 and 470-510 feet bgs), and OCSD Yellow (625-645 feet bgs). As described under the Previous Studies section of this report, the NCMA municipal water agencies reduced groundwater pumping and increased surface water use during 2010 and 2011 to help mitigate groundwater level declines. Although groundwater levels subsequently recovered during 2010 and 2011, notable groundwater level declines began to occur again in some wells by late 2013 and into 2014.

The NMMA has designated eight key wells to track overall groundwater elevations across Nipomo Mesa. In addition, NMMA tracks water level and water quality data from nested coastal monitoring wells 12C and 36L to help evaluate water shortage conditions for NMMA. The period of record for the key wells extends back to the 1960s or 1970s for five of the nine wells, and at least back to the late 1990s for all key wells. Several key wells were at or near historic lows in 2013, likely related, at least in part, to the extremely dry climatic conditions since fall of 2012. NMMA groundwater contour maps for spring and fall 2013 generally show groundwater flow towards the coast, although insufficient data points are available in the western portion of NMMA to document flow directions near the coast. A large pumping depression was present in 2013 (and has been recognized in previous years by NMMA) in the west central portion of Nipomo Mesa, and included some wells with groundwater elevations slightly below sea level. As described below, recent groundwater quality data for the NMMA area do not indicate the presence of sea water intrusion.

Recent groundwater quality data collected in the NMMA area includes one coastal monitoring well cluster (11N/36W-12C1, 2, 3) and several inland wells. Chloride concentrations since 2007 in monitoring well cluster 12C have remained generally consistent from year to year with overall concentrations ranging from about 40 to 50 milligrams per liter (mg/l) in well 12C2 (screened 450 to 460 feet bgs) to 90 to 100 mg/l in well 12C3 (screened 720 to 730 feet bgs). Chloride and TDS concentrations at inland well locations were reported to be relatively unchanged in 2013 compared to previous years (NMMA Technical Group, 2014). Although data points for water quality data collection are limited within the NMMA, especially near the coast, available data show no indication of seawater intrusion as of 2013 even though groundwater elevations at some wells have declined slightly below sea level.

The NCMA coastal sentry well network is also monitored closely for groundwater quality changes – especially rising chloride and TDS levels that may be indicative of sea water intrusion. Chloride/TDS spikes were noted in late 2009 in wells 30N3 (60-135 feet bgs) and OCSD Blue (190-210 and 245-265 feet bgs) The chloride/TDS spikes in 30N3 and OCSD Blue were one time measurements in late 2009, and returned to normal levels by the next sampling event in 2010. Thus, the relationship of elevated chloride/TDS levels and seawater intrusion is not yet clear. However, it should be noted that NCMA municipal water agencies acted quickly to reduce groundwater pumping, and this action likely helped to mitigate the elevated chloride/TDS concentrations.

Review of groundwater level and groundwater chemistry data indicate that water level declines are more prevalent in deeper screened wells, and spikes in chloride/TDS more prevalent in shallower screened wells. Additional data are being collected for the NCMA groundwater monitoring program, and will need to be reviewed in future studies to better understand how susceptible the various aquifers may be to seawater intrusion. The current extremely dry conditions since the beginning of 2013 and associated water level declines may provide greater insight on potential seawater intrusion pathways. However, based on data collected to date, it is clear that it will be important to maintain groundwater elevations a sufficient distance above sea level to avoid seawater intrusion in the future.

Based on review of available data and under existing pumping conditions, it appears that the current drought has not resulted in seawater intrusion. However, an extended multiple year drought has not occurred under current pumping conditions, and it remains to be seen if such a drought will lead to problems with seawater intrusion in the NCMA and/or NMMA. In addition, if long-term overdraft were to occur in the study area (independent of shorter term dry climatic conditions) the most likely detrimental effect would be the occurrence of seawater intrusion and resulting inability to pump potable groundwater from certain existing production wells.

12.0 INSTALLATION OF PERMANENT PRESSURE TRANSDUCERS

This section briefly summarizes the rationale for well selection, types of transducers installed, and initial programming of the four pressure transducers installed in wells as part of this basin characterization study. A brief TM was initially prepared (June 18, 2014) to document existing monitoring wells with permanent transducers already installed (Appendix L), and to obtain input from the District and Steering Committee on selection of an additional four wells for transducer installation which were to be purchased and installed as part of this project. Appendix L includes a list of wells that were evaluated for potential transducer installation as well as a list of wells with previously installed transducers (note that the table of information included in the TM in Appendix L has been updated as Table 9 of this report). The list of potential new instrumentation was developed on the basis of direct discussions and input from the NCMA and NMMA technical groups.

12.1 WELL SELECTION

Based on review of existing transducer locations, a review of 2013 NCMA and NMMA annual reports, and direct discussions with NCMA and NMMA TG members, coastal monitoring is considered the highest priority due to increasing risk of seawater intrusion from declining groundwater levels. Secondary priority is monitoring the groundwater flow relationships between management areas. Existing well locations with transducers installed are summarized in Table 9 and locations shown on Plate 26. Eight potential candidate wells, with 10 unique screen intervals and transducer settings, were evaluated for new permanent transducer installations, including 32S/13E-30N03 (60-135 feet bgs); 12N/35W-32 blue (190-210 and 245-265 feet bgs); 12N/35W-32 silver (395-435 and 470-510 feet bgs); 12N/36W-36L01 (227 to 237 and 535-545 feet bgs) ; 11N/34W-19Q01 (screen unknown); 11N/35W-22M01 (430-680 feet bgs); 11N/35W-23G01 (400-460 feet bgs); and 11N/36W-12C01 (280-290 and 450-460 feet bgs). All well locations are summarized in Table 9 and shown on Plate 26.

On the basis of both verbal and written responses from District staff and the NCMA and NMMA technical groups, the need to enhance the coastal monitoring network was clearly a priority. As a result, transducers were installed in the following two monitoring wells and associated horizons:

- 12N/36W-36L01 – screened interval of 227-237 feet bgs.
- 12N/36W-36L01 – screened interval of 535-545 feet bgs.
- 11N/36W-12C01 – screened interval of 280-290 feet bgs.

- 11N/36W-12C01 – screened interval of 450-460 feet bgs.

Well 12N/36W-36L is the Oceano Dunes well, represented as well 90019 on Plate 26. Well 11N/36W-12C is represented as well 90020 on Plate 26.

12.2 INSTALLATION AND PROGRAMMING

The installed transducers record water levels, electrical conductivity, and temperature, with a reading and monitoring frequency at 4 hour intervals. The transducers were set in the 12N/36W-36L monitoring wells in April 2015, and set in Well 11N/36W-12C in October 2015.

13.0 CLIMATE CHANGE

Consistent with California state guidelines for Integrated Regional Water Management (IRWM) planning, Climate Change Analysis is now considered a critical component in the planning and implementation of water resources management projects and programs. The 2014 IRWM Guidelines require that IRWM Plans address both adaptation to the effects of climate change and mitigation of greenhouse gas (GHG) emissions resulting the potential effect of climate change and GHG on the region to identify and prioritize the Region's vulnerabilities to the effects of climate change.

A Climate Change section is a requirement of the IRWM Plan grant process, and is developed from the San Luis Obispo County IRWM Plan. The Climate Change section, prepared for this report by GEI Consultants and presented in full in Appendix M, focuses on the Santa Maria Groundwater Basin (or Santa Maria Basin Region), which is a portion of the South County Sub-Region of the IRWM Plan. In the process of evaluating climate change for the Santa Maria Basin Region (Region), a Vulnerability Assessment Checklist has been modified to consider GHG emissions between possible project alternatives occurring specifically in the Santa Maria Basin Region. The checklist of prioritized vulnerabilities assists in the ranking and selection process of project alternatives. As with any climate change analysis, a large component of the Region's implementation of adaption is through data management and monitoring to provide a continuous analysis of climate change as it takes place in the future.

The purpose of this Climate Change analysis is to:

1. **Educate the reader on the contributing factors and measurements of climate change** – a brief introduction to define the terminology used in the section and how each contributes to the understanding of climate change
1. **Describe how Climate Change Analysis is performed** – a discussion of the global models and downscaled data used in the analysis performed in the section's Climate Change Analysis
2. **Summarize the climate change results** – a summary of the Climate Change Analysis results
3. **Present a ranking of vulnerabilities** – a rating and explanation of vulnerabilities stemming from a thorough vulnerability assessment

The scientific study for this section is derived from both the Climate Change Analysis for the San Luis Obispo County IRWM Region and for the Santa Barbara County IRWM Region, and from various climate change related websites.

The Climate Change Analysis assumes mid-century (2050) carbon production conditions, and runs those conditions through 40 years of monthly hydrology and 20 years of daily hydrology to develop a statistical average of the various climate variables. In this way, the model results are presented so the mid-century results of climate variables are representative of an average over a hydrologic period of record to account for the naturally occurring dry- and wet-period hydrology.

The table, below, provides results of the Climate Change Analysis using monthly data aggregated to seasonal time periods for the mid-century (2050) point in time. The table illustrates the change in average seasonal amounts for each of the key climate variables utilized in the analysis.

Variable	Change in Variables Medium Warming Scenario				
	Winter	Spring	Summer	Fall	Annual
Precipitation (see note)	7.0%	-27.5%	-32.5%	0.9%	-5.02%
Maximum Temp	6.6%	4.6%	6.1%	6.0%	5.81%
Minimum Temp	23.2%	14.1%	11.2%	18.8%	15.40%
Wind Speed	0.2%	-1.2%	-0.8%	0.7%	-0.32%
Evapotranspiration	-1.8%	3.8%	7.1%	6.0%	4.90%
Runoff	12.8%	-33.7%	-4.4%	1.7%	-8.78%

Note: Percentage amounts also provide the level of sensitivity of the current average amount to the model change (i.e., current small value amounts of rainfall in spring are more sensitive to change than larger values in winter.)

In the table above, the cells with green backgrounds indicate increases of 3 percent change for current seasonal average or more; red backgrounds indicate decreases of 3 percent or more; and white backgrounds indicate no significant change. The table values provide a sense of the order of magnitude of change projected in 2050 as a result of climate change.

The full analysis is presented in Appendix M.

14.0 SUMMARY

This report presents the results of several subtasks conducted for the Santa Maria Basin Characterization project. The subtasks included review of previous studies, compilation of databases, geologic cross-sections, aquifer pumping tests, streamflow infiltration, enhanced recharge areas, seawater intrusion, and selection of wells for permanent transducer installation. The geologic cross-sections were based on the well log database developed for this study. The pumping tests were conducted in coordination with NCMA and NMMA agencies to obtain aquifer parameters. The other subtasks were based on previous studies and data collected during the course of this project.

14.1 PREVIOUS STUDIES

A number of previous hydrogeology studies have been conducted by the NCMA, NMMA, DWR, USGS, consultants, and others. These existing studies have contributed to development of a greater understanding of hydrogeologic conditions in the SMBC study area. In addition, extensive databases of key hydrogeologic data (e.g., groundwater levels, water quality, water demands) have been compiled and continue to be updated on an annual basis for each management areas. This report provided detailed summaries of several previous studies, the data and results of which were applied to subsequent tasks in the overall SMBC study.

14.2 ONGOING DATA COLLECTION PROGRAMS

The NMMA and NCMA have ongoing data collection programs for groundwater levels, groundwater quality, water demands, and other hydrologic data. These data are compiled on an annual basis, databases are updated, and results are summarized in annual reports. Each annual report presents key data and describes recent and longer term trends in groundwater levels, groundwater quality, and other data sets. Points of emphasis in both management areas include monitoring for seawater intrusion (based on coastal groundwater elevations, maintaining a seaward hydraulic gradient, and chloride/TDS concentrations), and monitoring of groundwater elevations associated with inland pumping depressions.

14.3 DATABASES

Two primary databases were developed as a result of the SMBC study: a lithology database, and a specific capacity/pumping test database. The lithology database consists of water well and oil well logs that could be located relatively accurately. Each log was plotted in Google Earth and transferred to GIS. A lithologic symbol system was used to characterize lithologic layers described on each log and entered into an Excel database. The lithology database includes the well log number, top and bottom of each lithologic layer, a lithologic layer symbol, supplemental lithologic layer description notes, color, presence of shells, and DWR assigned T/R/S.

The specific capacity/pumping test database includes wells for which specific capacity or pumping test data are available. The database includes a number of column entries for each well, including well log number, test date, pumping rate, drawdown, specific capacity, duration of pumping, estimated transmissivity (based on conversion of specific capacity or calculated directly from time-drawdown data), screen length, estimated K, T, and S values, and formation screened.

Other important databases (e.g., groundwater levels, groundwater quality) have been developed and are maintained by the respective Technical Groups for each Management Area (i.e., NCMA and NMMA).

14.4 DATA GAPS

The distribution of wells associated with the two primary databases developed for the SMBC study was reviewed to identify data gaps. In general, lithologic data, specific capacity/pumping test data, and geophysical logs are lacking in the Arroyo Grande Plain and in coastal areas. Specific capacity/pumping test data are also sparse in the area surrounding the upper reaches of Black Lake Canyon and in the northwestern portion of Nipomo Mesa north of

Santa Maria River Fault. Geophysical logs compiled for this study are lacking in the same areas where lithologic logs are sparse and generally throughout the entire northern half of Nipomo Mesa.

14.5 GEOLOGY AND GEOLOGIC CROSS-SECTIONS

A total of thirteen geologic cross-sections were constructed across the NMMA and NCMA. The cross-sections are based on the lithologies recorded in the well log database compiled for this study, and depict the interpreted geologic formation contacts, well screen intervals, faults and associated offsets, and possible correlations of fine and coarse-grained units within the geologic formations.

In the NCMA area, Paso Robles Formation is present beneath 20 to 60 feet of Dune Sand sediments beneath Tri-Cities Mesa. The Paso Robles Formation is typically 100 to 300 feet thick in this area and underlain by Careaga sandstone. Production well screen intervals are typically screened exclusively in one formation or the other in Tri-Cities Mesa. The Arroyo Grande Plain has up to 140 feet of alluvium underlain by Paso Robles Formation and/or Careaga sandstone. Distinct aquifer zones separated by relatively continuous clay layers are present along the coast in the Paso Robles Formation, but these clay layers pinch out and/or become discontinuous inland.

In the NMMA area, there is typically 200 to 300 feet of Dune Sand underlain by Paso Robles Formation and Careaga sandstone. Paso Robles Formation generally is thicker near the coast and becomes thinner inland as it crosses each respective fault zone. The Careaga sandstone is variable and often undefined in thickness (because well logs commonly are not deep enough to define the base of the formation), but generally the top of Careaga sandstone is deeper near the coast and becomes shallower inland and across each fault zone. Although not explicitly depicted on cross sections (e.g., Plates 11 and 12), clay layers are present within the Dune Sand deposits in the southern portion of the Nipomo Mesa, giving rise to a relatively shallow aquifer of potentially limited regional extent (see Sections 7.2.2, 8.1.1, and 10.3.1 of this report).

14.6 PUMPING TESTS

Six pumping tests were conducted with the cooperation of five different agencies across NMMA and NCMA including: City of Arroyo Grande, Oceano CSD, City of Grover Beach, Nipomo CSD, and Golden State Water Company; additional tests were proposed but could not be performed due to logistical issues (e.g., inability to shut down wells to allow for recovery ahead of pumping test, inability to pump a well continuously for 8 to 12 hours). Each test included one or more monitoring wells near the pumping well. Of the four tests conducted in NCMA (two for City of Grover Beach), two tests were conducted with pumping wells screened in Paso Robles Formation and two tests were conducted with pumping wells screened in the deeper Careaga sandstone. Both tests conducted in NMMA utilized pumping wells screened in the Paso Robles Formation. The overall results of the pumping test program conducted in the Spring of 2014 indicate Paso Robles Formation transmissivity values in the NCMA of 120,000 to 240,000 gpd/ft, Careaga sandstone transmissivity values in the NCMA of 21,500 to 29,500 gpd/ft, and Paso Robles Formation transmissivity values in the NMMA of 15,500 to 45,000 gpd/ft.

Hydraulic conductivity values reported in previous studies were compiled and documented in this report. In addition, previous pumping test data were reviewed, analyzed, and summarized for this report. Overall, this report provides a comprehensive summary of existing and new pumping test data, and provides a good basis for future development of a Salt/Nutrient Management Plan and a numerical groundwater model.

14.7 STREAM INFILTRATION

Previous studies related to stream infiltration are described and summarized in this report. Based on the limited record of synoptic streamflow studies documented in previous studies, general assumptions were developed to conduct an analysis of available Arroyo Grande Creek streamflow data. The USGS stream gauge on Arroyo Grande Creek was maintained by USGS between 1939 and 1986, but our analysis was limited to 1970 to 1986 in order to correspond to construction of Lopez Dam in the late 1960's. The results of our analysis showed streamflow infiltration along Arroyo Grande Creek ranging from approximately 1,800 to 2,900 AFY, with an overall average of 2,353 AFY. These results agree well with previous analyses by Hoover (1985) and Todd (2007). Stream bed infiltration (recharge) along Arroyo Grande Creek is estimated to be between 15% to 20%, indicating 2,000 to 2,400 AFY of runoff could be available for recharge.

14.8 RECHARGE

The City of Arroyo Grande has eight storm water infiltration basins covering an area of 145 acres, and City of Grover Beach has one basin with an area of 48.5 acres. The use of recharge basins for enhanced recharge that has substantial benefits to production aquifers is likely limited to the central portion of Tri-Cities Mesa in the cities of Arroyo Grande and Grover Beach. In other areas, clay layers in the vadose zone or upper portion of the saturated zone likely impede the direct vertical migration of water to the production zone. Injection wells are potentially feasible in terms of delivering recharge water directly to the production zone throughout the NMMA and NCMA; however, the episodic nature of potential water sources such as storm water runoff or surface water from streams may not be particularly amenable to use of injection wells. In addition, injection wells have more stringent requirements for water quality and significant treatment of source water would likely be needed prior to injection. Highly treated recycled water is a potential source of water for enhanced recharge, given it is a steady source of supply. However, it may be more challenging to utilize for groundwater recharge than it is for irrigation applications due to regulatory requirements related to residence time and setback distances from production wells.

14.9 OFFSHORE AQUIFERS AND SEAWATER INTRUSION

Previous studies in the NCMA and NMMA areas were largely conducted out of concern for potential sea water intrusion. The most significant detrimental effect should overpumping of the groundwater basin occur would be seawater intrusion, because it is likely that onshore aquifers continue a significant distance offshore beneath the ocean floor. Thus, the primary means of preventing seawater intrusion is to maintain sufficient offshore flow of groundwater to keep the fresh water/salt water interface at or seaward of the coastline. In order to maintain sufficient offshore flow of groundwater, groundwater elevations must be maintained a sufficient distance above mean sea level and westward groundwater flow directions must be maintained.

Previous studies and data indicate that groundwater levels may fluctuate significantly related to climatic conditions. A period of dry years from 2007-2009 resulted in notable groundwater level declines in some coastal observation wells, and temporary spikes in chloride/TDS concentrations in a limited number of coastal observation wells. Groundwater management actions undertaken by the municipal water suppliers in the NCMA during this time helped to mitigate the effects of seawater intrusion.

Past experience has shown that a coastal monitoring well network of sufficient well density is critical to long-term management of seawater intrusion in the NMMA and NCMA. The NCMA generally has a good coastal (sentry) well monitoring network both in terms of geographic well distribution and vertical distribution of screen zones at the well clusters. The NCMA has increased the frequency of sentry well monitoring from semi-annual to quarterly, with periodic monthly monitoring events during critical dry conditions such as occurred in 2014. The NMMA coastal monitoring well network could benefit from additional coastal (sentry) monitoring wells to provide better geographic and vertical coverage of potential seawater intrusion pathways to the south of existing coastal monitoring wells.

14.10 INSTALLATION OF PERMANENT PRESSURE TRANSDUCERS

Several monitoring wells within the NCMA area have permanent transducers installed to collect water levels, electrical conductivity, and temperature measurements. The scope of work for this study included the purchase and installation of four additional permanent transducers. Two clustered coastal monitoring wells, each with two distinct screened-interval depths, were selected for transducer installation. Two transducers were installed in 12N/36W-36L01 and 36L02 on April 15, 2015, and two transducers were installed in 11N/36W-12C01 and 12C02 in October 2015.

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TABLES

Table 1a. Specific Capacity Data - Data from Cities, Water Agencies, and Golf Courses

Log No.	Well T/R/S	Date Drilled	Test Date	RE	Q	SWL	PWL	DD	Q/s	Duration (Min)	Est. T	Screen Length	Est. K	Time-DD data?	Formation Screened/Zone
51612	11N/35W-9K5	3/30/1979	4/12/1979	173	1,500	149	210	61	24.6	?	49,180	355	19	No	Paso Robles/3
276929	11N/35W-10G5	7/27/1988	6/27/1989	301	350	297	366	69	5.1	?	10,145	140	10	Partial	Paso Robles/2
171358	11N/35W-10J2	8/20/1985	8/27/1985	317	400	300	382	82	4.9	350	9,756	240	5	Limited	Paso Robles/Careaga/2
336387	11N/35W-10L1	10/21/1992	?	263	500	276	357	81	6.2	143	12,346	300	6	Limited	Paso Robles/3
182644	11N/35W-11J3	2/10/1986	3/1/1988	389	125	347	419	72	1.7	300	3,472	75	6	Limited	Careaga/2
158739	11N/35W-13G1	2/22/1985	2/28/1985	346	200	281	382	101	2.0	480	3,960	90	6	No	Paso Robles and Carega/2
222813	11N/35W-10G4	5/3/1984	5/19/1984	319	350	300	345	45	7.8	4,320	15,556	220	9	No	Paso Robles/2
221031	11N/34W-19E1	12/14/1967	12/2/1982	307	218	257	259	2	109.0	?	218,000	120	243	No	?/2
NA	11N/34W-19L3	5/8/1967	3/5/1980	303	240	221	234	13	18.5	?	36,923	271	18	No	?/2
90024	11N/34W-20	1/24/2000	10/17/2007	300	33	39.4	55.9	16.5	2.0	2,880	4,000	40	13	Yes	?/1
90025	11N/34W-20	1/27/2000	10/22/2007	300	92	44.4	84.3	39.9	2.3	1,440	4,612	80	8	Yes	?/1
156769	11N/35W-4	6/10/1986	?	Location?	60	104	134	30	2.0	?	4,000	120	4	No	Location Uncertain
90005	12N/35W-33	8/8/1983	?	291	75	?	?	142	0.5	?	1,056	30	5	No	Paso Robles/2
290834	11N/35W-5B1	9/26/1989	?	292	150	221	320	99	1.5	240	3,030	60	7	No	Paso Robles/2
395064	11N/35W-5	3/1/1993	3/9/1993	247	100	224	250	26	3.8	240	7,692	80	13	No	Paso Robles/2
906322	11N/35W-5	9/3/2004	4/27/2005	109	105	101	139	38	2.8	330	5,526	60	12	Limited	Paso Robles/3
511080	11N/35W-4	12/1/1997	12/18/1997	293	60	273	299.1	26.1	2.3	1,440	4,598	50	12	Yes	Paso Robles/2
511078	11N/35W-4	12/19/1997	1/5/1998	231	55	212.3	285.3	73	0.8	665	1,507	50	4	Yes	Paso Robles/2
511086	11N/35W-4	1/7/1998	1/9/1998	267	100	254	300.6	46.6	2.1	1,140	4,292	80	7	Yes	Paso Robles/2
511087	11N/35W-4	12/31/1997	1/12/1998	248	55	228.2	297.4	69.2	0.8	1,200	1,590	46	5	Yes	Paso Robles/2
402088	11N/35W-16J	12/3/1993	12/15/1993	279	1,000	246	286	40	25.0	1,440	50,000	300	22	Yes	Paso Robles/3
490963	11N/35W-15D	6/13/1994	7/7/1994	246	1,200	244	295	51	23.5	1,440	47,059	240	26	Yes	Paso Robles/3
490919	11N/35W-15R	7/1/1994	7/21/1994	242	1,400	237	295	58	24.1	1,440	48,276	210	31	Yes	Paso Robles/3
490922	11N/35W-22M	7/13/1994	8/4/1994	184	1,400	171	251	80	17.5	1,440	35,000	250	19	Yes	Paso Robles/3
182660	11N/35W-24A1	4/28/1988	10/19/1989	328	132	261.5	292	30.5	4.3	?	8,656	185	6	No	Paso Robles/3
127249	11N/35W-24J1	7/3/1980	9/2/1980	320	444	272.5	294.5	22	20.2	?	40,364	235	23	No	Paso Robles/3
161355	11N/35W-24L2	4/16/1985	10/22/1992	349	265	328.5	351	22.5	11.8	?	23,511	135	23	No	Paso Robles/3
352734	11N/35W-24L3	6/27/1991	8/23/2006	311	202	317	370.1	53.1	3.8	?	7,608	80	13	No	Paso Robles/3
78836	32S/13E-19Q2	3/29/1973	1973	?	675	25	295	270	2.5	2,340	5,000	350	2	No	Paso Robles/Careaga/1
78836	32S/13E-19Q2	3/29/1973	11/14/1989	?	539	80	122	42	12.8	?	25,667	350	10	No	Paso Robles/Careaga/1
90023	32S/13E-19Q2	3/29/1973	3/5/2013	65	549	20.19	177	156.81	3.5	240	7,002	295	3	Yes	Paso Robles/Careaga/1
174229	32S/13E-19B	12/18/1985	12/30/1985	31	177	14.1	63.4	49.3	3.6	1,413	7,181	190	5	Yes	Pismo/1
174325	32S/13E-18Q	1/10/1986	1/10/1986	64	250	50.4	93.6	43.2	5.8	1,440	11,574	260	6	Yes	Pismo/1
		1990	12/21/1992	?	680	28	79	51	13.3	?	26,667	?	?	No	Careaga/1
NA	No Well Log	1990	3/4/2013	Location?	854	14.42	94.5	80.08	10.7	240	21,329	170	17	Yes	Careaga/1
NA	No Well Log		1/9/2014	86	320	76	80	4	80.0	?	160,000	?	?	No	Paso Robles/1
90008	?	8/11/1954	1/9/2014	87	400	82	89	7	57.1	?	114,286	119	128	No	Paso Robles/1
90026	?	7/9/1964	1/9/2014	85	402	76	82	6	67.0	?	134,000	140	128	No	Paso Robles/1
90009	32S/13E-29F1	3/9/1967	1/9/2014	74	971	64	71	7	138.7	?	277,429	125	297	No	Paso Robles/1
90010	?	12/10/1981	1/9/2014	86	674	82	181	99	6.8	?	13,616	235	8	No	Careaga/1
339665	?	12/17/1990	1/9/2014	87	479	82	108	26	18.4	?	36,846	94	52	No	Paso Robles/1
40-0651	32S/13E-32D3	5/15/1952	1/22/2014	89	304	79.5	90	10.5	29.0	?	57,905	14	553	No	Paso Robles/1
51670	32S/13E-32D11	11/9/1979	1/22/2014	?	380	87	255	168	2.3	?	4,524	207	3	No	Careaga/1
219080	32S/13E-31A	6/12/1984	1/22/2014	32	912	43	119	76	12.0	?	24,000	140	23	No	Careaga/1
22118	32S/13E-29E7	10/25/1978	1978	64	1,025	50	135	85	12.1	120	24,118	270	12	Yes	Careaga/1

Notes: See bottom of Table 1b for explanations

Table 1b. Specific Capacity Data - Data from DWR Water Well Drillers Reports

Log No.	Well T/R/S	Date Drilled	Test Date	RE	Q	SWL	PWL	DD	Q/s	Duration (Min)	Est. T	Screen Length	Est. K	Time-DD data?	Formation Screened/Zone
40-0909	11N/34W-18	3/5/1976	?	331	40	185	200	15	2.7	4,320	5,333	60	12	No	Paso Robles/2
401545	11N/34W-18	7/8/1992	7/28/1992	358	60	290	307	17	3.5	2,400	7,059	90	10	No	Paso Robles/Careaga/2
763353	11N/34W-19E2	4/24/2002	?	307	900	252	266	14	64.3	480	128,571	180	95	No	Paso Robles/Careaga/2
40-0826	11N/34W-19L1	3/19/1962	?	299	600	236	304	68	8.8	?	17,647	275	9	No	Paso Robles/Careaga/2
289187	11N/34W-19L4	1989	?	298	500	220	234	14	35.7	3,780	71,429	200	48	No	Paso Robles/Careaga/2
1082555	11N/34W-20	1/19/2009	1/22/2009	317	7	244	251	7	1.0	720	2,000	100	3	No	Paso Robles/Careaga/2
505486	11N/34W-20	1/12/2001	1/12/2001	311	10	71	280	209	0.05	?	96	120	0.1	No	Tert. Undiv./1
38350	11N/34W-20E2	12/4/1958	?	321	30	235	244	9	3.3	?	6,667	14	64	No	Paso Robles/2
538880	11N/34W-21	8/5/2000	8/22/2000	370	100	295	343	48	2.1	2,880	4,167	80	7	No	Paso Robles/Careaga/2
538355	11N/34W-21	9/29/1998	9/29/1998	322	80	209	360	151	0.5	?	1,060	80	2	No	Careaga/2
1090797	11N/34W-27	3/2/2007	3/8/2007	298	3	265	330	65	0.05	240	92	120	0.1	No	Tert. Undiv./1
1098046	11N/34W-29	2/17/2007	?	286	770	270	319	49	15.7	480	31,429	125	34	No	Paso Robles/Careaga/2
1082554	11N/34W-29	11/8/2008	11/2/2008	303	650	250	337	87	7.5	1,440	14,943	160	12	No	Paso Robles/Careaga/2
1082553	11N/34W-29	11/29/2008	9/10/2008	323	600	255	350	95	6.3	1,440	12,632	160	11	No	Paso Robles/Careaga/2
1098071	11N/34W-29	5/12/2008	5/1/2008	166	600	91	110	19	31.6	480	63,158	220	38	No	Paso Robles/Careaga/2
748810	11N/34W-35	3/12/2004	3/15/2004	213	30	81	104	23	1.3	240	2,609	135	3	No	?(Santa Maria Valley)/2
159144	11N/35W-2	12/5/1978	?	419	4	?	?	60	0.07	120	133	45	0.4	No	Sisquoc/1
143717	11N/35W-2	8/11/1980	?	434	4	80	177	97	0.04	360	72	100	0.1	No	Sisquoc/1
1085530	11N/35W-2	3/25/2006	3/25/2006	394	2	320	393	73	0.02	240	49	140	0.05	No	Sisquoc/1
491800	11N/35W-4	7/18/1991	7/19/1991	365	20	309	427	118	0.2	240	339	200	0.2	No	Paso Robles/2
139094	11N/35W-4	3/30/1982	?	195	90	202	235	33	2.7	240	5,455	156	5	No	Paso Robles/3
77808	11N/35W-5	12/14/1971	?	256	410	256	336	80	5.1	240	10,250	90	15	No	Paso Robles/2
77809	11N/35W-5	10/4/1971	?	72	314	220	300	80	3.9	240	7,850	135	8	No	Paso Robles/3
961854	11N/35W-5J	5/18/2012	5/16/2012	148	100	136	224	88	1.1	1,440	2,273	170	2	No	Paso Robles/3
None	11N/35W-7A1	5/19/1951	?	79	570	75	165	90	6.3	?	12,667	31	55	No	Paso Robles/Careaga/3
None	11N/35W-7A1	5/19/1951	?	79	600	75	275	200	3.0	?	6,000	31	26	No	Paso Robles/Careaga/3
5946	11N/35W-7R1	2/1/1954	?	87/112	1,500	55	109	54	27.8	?	55,556	133	56	No	Paso Robles/Careaga/3
907653	11N/35W-8	11/29/2004	12/15/2004	90	500	73	211	138	3.6	480	7,246	250	4	No	Paso Robles/3
223663	11N/35W-8	3/20/1989	?	172	10	209	239	30	0.3	240	667	40	2	No	Paso Robles/3
715654	11N/35W-8	8/16/2002	8/26/2002	268	30	256	266	10	3.0	240	6,000	80	10	No	Paso Robles/3
715663	11N/35W-8	8/16/2002	8/22/2002	265	30	266	280	14	2.1	480	4,286	80	7	No	Paso Robles/3
715655	11N/35W-8	8/16/2002	8/23/2002	266	30	257	270	13	2.3	240	4,615	100	6	No	Paso Robles/3
763499	11N/35W-9	2/25/2005	2/28/2005	179	10	145	149	4	2.5	480	5,000	100	7	No	Paso Robles/3
763500	11N/35W-9	2/28/2005	3/2/2005	163	50	137	147	10	5.0	240	10,000	100	13	No	Paso Robles/3
1090810	11N/35W-9	11/18/2006	12/11/2006	218	972	201	282	81	12.0	540	24,000	160	20	No	Paso Robles/Careaga (?)/3
1090811	11N/35W-9	11/4/2006	11/24/2006	201	800	237	281	44	18.2	300	36,364	140	35	No	Paso Robles (?)/3
1090226	11N/35W-9	12/6/2008	12/28/2008	188	600	189	270	81	7.4	240	14,815	200	10	No	Paso Robles (?)/3
1085512	11N/35W-10	5/31/2006	5/31/2006	280	250	223	286	63	4.0	240	7,937	180	6	No	Paso Robles/Careaga/2
907667	11N/35W-10	9/28/2005	10/4/2005	283	229	287	314.7	28	8.3	240	16,534	120	18	No	Paso Robles/Careaga/2
336363	11N/35W-11	6/29/1991	?	124	30	121	130	9	3.3	480	6,667	80	11	No	Paso Robles/3
763495	11N/35W-11	1/21/2005	1/21/2005	346	30	294	310	16	1.9	240	3,750	120	4	No	Paso Robles/2
139247	11N/35W-12	3/30/1984	?	394	11	104	201	97	0.11	240	227	137	0.2	No	Sisquoc (?)/1
1090807	11N/35W-13	12/1/2006	12/6/2006	321	15	160	254	94	0.16	240	319	180	0.2	No	Paso Robles/2
1089651	11N/35W-13	11/23/2007	11/27/2007	307	300	238	287	49	6.1	480	12,245	200	8	No	Paso Robles/Careaga (?)/2
786263	11N/35W-14	5/21/2004	5/20/2004	292	150	261	310	49	3.1	480	6,122	100	8	No	Paso Robles/Careaga (?)/2
1085548	11N/35W-14	1/23/2006	2/6/2006	311	30	237	290	53	0.6	240	1,132	120	1.3	No	Paso Robles/2
1085549	11N/35W-14	1/3/2006	2/6/2006	?	28	186	302	116	0.2	240	483	100	0.6	No	Paso Robles/2
34272	11N/35W-17	9/13/1969	?	92	270	?	?	132	2.0	2,880	4,091	145	4	No	?(Santa Maria Valley)/3
104151	11N/35W-22	10/11/1965	?	101	980	?	?	176	5.6	240	11,136	170	9	No	?(Santa Maria Valley)/3
1098051	11N/35W-23	1/0/1900	7/15/2007	289	700	280	340	60	11.7	1,440	23,333	260	12	No	Paso Robles/3
1097672	11N/35W-23	10/21/2006	10/19/2006	304	23	257	324	67	0.3	240	687	140	0.7	No	Paso Robles/3
1090806	11N/35W-23	11/28/2006	11/27/2006	355	30	276	299	23	1.3	240	2,609	80	4	No	Paso Robles/3
1097661	11N/35W-24	9/23/2006	9/27/2006	344	20	321	330	9	2.2	240	4,444	60	10	No	Paso Robles/3
103045	11N/35W-24L1	12/23/1976	?	348	527	276	374	98	5.4	3,750	10,755	226	6	No	Dune Sand/Paso Robles/3
1098062	11N/35W-25	6/5/2008	6/1/2008	135	1,500	80	89	9	166.7	720	333,333	200	223	No	?(Santa Maria Valley)/3
961855	11N/35W-25	3/1/2012	3/1/2012	?	1,600	65	97	32	50.0	240	100,000	180	74	No	?(Santa Maria Valley)/3
802734	11N/35W-26	8/7/2002	?	121	2,012	64	103	39	51.6	420	103,179	130	106	No	?(Santa Maria Valley)/3

Table 1b. Specific Capacity Data - Data from DWR Water Well Drillers Reports (Con't).

Log No.	Well T/R/S	Date Drilled	Test Date	RE	Q	SWL	PWL	DD	Q/s	Duration (Min)	Est. T	Screen Length	Est. K	Time-DD data?	Formation Screened/Zone
78140	11N/35W-27E1	2/26/1974	?	?	10	173	200	27	0.4	?	741	55	2	No (bail test)	Tca(?)/Tms(?)/1
961853	11N/35W-34	5/10/2012	5/2/2012	?	1,600	56	73	17	94.1	720	188,235	200	126	No	?(Santa Maria Valley)/3
40-1823	32S/13E-20N1	11/5/1950	?	95	50	68	73	5	10.0	300	20,000	18	149	No	Paso Robles/1
5774	32S/13E-28E1	1/22/1951	1/22/1951	112	25	93	98	5	5.0	120	10,000	40	33	No	Paso Robles/1
5775	32S/13E-28P3	12/30/1950	12/27/1950	112	700	99	169	70	10.0	3,000	20,000	130	21	No	Paso Robles/Careaga/1
90011	32S/13E-29B2	1/15/1957	?	73	60	69	76	7	8.6	?	17,143	27	85	No	Paso Robles/1
17801	32S/13E-29C3	6/19/1954	?	50	950	79	89	10	95.0	630	190,000	60	423	No	Paso Robles/1
39474	32S/13E-29F2	7/14/1967	?	72	1,020	63	143	80	12.8	1,080	25,500	51	67	No	Paso Robles/1
90009	32S/13E-29F1	Oct. 1964	?	74	2,050	65	97	32	64.1	240	128,125	125	137	No	Paso Robles/1
90012	32S/13E-29E1	9/18/1951	9/26/1951	60	1,400	50	62	12	116.7	?	233,333	144	217	No	Paso Robles/1
90013	32S/13E-29E2	9/21/1951	9/29/1951	61	1,400	50	62	12	116.7	?	233,333	141	221	No	Paso Robles/1
90014	32S/13E-29E3	5/19/1959	5/26/1959	64	2,100	58	81	23	91.3	?	182,609	120	203	No	Paso Robles/1
90017	32S/13E-30K5	1933	?	30	287	?	?	11	25.2	?	50,351	?	?	No	Paso Robles/1
90018	32S/13E-30K6	?	?	31	611	?	?	9.5	64.3	?	128,632	90	191	No	Paso Robles/1
50900	32S/13E-30K14	5/23/2006	?	49	1,500	?	?	60	25.0	840	50,000	102	66	No	Paso Robles/1
101595	32S/13E-30K16	8/5/1965	?	30	1,600	23	80	57	28.1	240	56,140	70	107	No	Paso Robles/1
31910	32S/13E-30R13	4/1/1966	?	51	1,200	36	61	25	48.0	240	96,000	80	160	No	Paso Robles/1
38509	32S/13E-32D9	2/20/1960	?	85	480	61	128	67	7.2	1,890	14,328	17	113	No	Paso Robles/1
223346	32S/13E-33M	6/9/1987	?	48	20	19	86	67	0.3	240	597	40	2	No	Alluvium/Paso Robles/1
77824	32S/13E-33	12/14/1971	?	257	410	256	376	120	3.4	240	6,833	90	10	No	Paso Robles(?)/Careaga (?)/2
792436	32S/13E-35N	1/27/2003	1/30/2003	182	35	17	32	15	2.3	240	4,667	180	3	No	?/1
792463	32S/13E-35	10/12/2004	10/6/2004	232	500	23	130	107	4.7	720	9,346	200	6	No	?/1
1085551	32S/13E-36	12/18/2005	12/29/2005	332	500	94	212	118	4.2	4,320	8,475	100	11	No	?/0

Notes: Zone 1 = between Wilmar Avenue Fault and Santa Maria River Fault
Zone 2 = between Santa Maria River Fault and Oceano Fault
Zone 3 = between Oceano Fault and Pacific Ocean
T/R/S = Township/Range/Section
RE = Reference (Land Surface) Elevation (feet MSL)
Q = Pumping Rate (gpm)
SWL = Depth (feet) to Static Water Level;
PWL = Depth (feet) to Pumping Water Level
DD = Drawdown (feet)
Q/s = Specific Capacity (gpm/foot)
Est. T = Estimated Transmissivity (gpd/ft) based on conversion (x 2000) from Specific Capacity; see Sections 5.1, 5.3, and 8.2 of this report
Est. K = Estimated Hydraulic Conductivity (feet/day) based on T divided by Screen Length (feet); see Sections 5.1, 5.3, and 8.2 of this report for discussion of appropriate use of screen length and aquifer thickness

Summary of Specific Capacity Data

Q/s	No. Samples	T	K (mean)	Formation Screened/Zone
1.3	1	2,609	3	?(Santa Maria Valley)/2
62	6	123,329	45	?(Santa Maria Valley)/3
1.3	17	2,642	4	Paso Robles/2
8.1	24	16,237	8	Paso Robles/3
1.1	2	2,266	3	Careaga/2
NA	0	NA	NA	Careaga/3
12	17	24,495	12	Paso Robles/Careaga/2
5.4	1	10,755	6	Dune Sand/Paso Robles/3
12	4	24,556	35	Paso Robles/Careaga/3
0.06	4	120	0.14	Sisquoc/1
0.05	2	94	0.10	Tert. Undiv./1
34.1	20	68,241	109	Paso Robles/1
7.5	5	15,362	10	Careaga/1
7.9	2	15,847	10	Paso Robles/Careaga/1

Table 2. Top Elevations of Geologic Formations for Cross-Sections

Cross-Section	Zone	Elevation of Top QTpr (Feet MSL)	Thickness of QTpr (Feet)	Elevation of Top Tca (Feet MSL)	Thickness of Tca (Feet)	Elevation of Top Tms (Feet MSL)
A-A’	1	NP	NP	200 to 270	10 to 20	180 to 260
B-B’	1	170 to 310	50 to 140	80 to 180	40 to 50	50 to 130
C-C’	1	170 to 320	40 to 160	80 to 220	30 to 80	20 to 200
D-D’	1	170 to 370	90 to 180	-10 to 230	20 to 60	-50 to 200
E-E’	1	210 to 370	160 to 210	NP	NP	10 to 170
F-F’	1	90 to 260	100 to 260	NP	NP	-20 to -10
G-G’	1	50 to 260	> 100	<-100 to -80	> 190	NA
I-I’	1	70 to 110	120 to >250	-40 and lower	> 40	NA
A-A’	2	40 to 200	80 to 150	-160 to 120	> 80	NA
B-B’	2	20 to 100	120 to 200	<-280 to 10	40 to 50	<-280 to -40
C-C’	2	0 to 160	230 to 300	-300 to -120	< 70	NA
D-D’	2	10 to 170	> 240	NA	NA	NA
E-E’	2	60 to 210	180 to 310	-250 to 30	190 to 300	-440 to -280
F-F’	2	20 to 230	140 to 250	-130 to -10	100 to >120	<-260 to -130
G-G’	2	-10 to -90	> 170	NA	NA	NA
J-J’	2	-60 to 130	120 to 330	<-200 to -80	160+	NA
K-K’	2	-30 to 180	110 to 260	-200 to 40	30 to >150+	<-300 to -70
D-D’	3	-100 to 30	> 320	NA	NA	NA
E-E’	3	-40 to 60	470 to 630	-650 to -470	170 to 200	-840 to -650
F-F’	3	-180 to 20	> 380	NA	NA	NA
G-G’	3	-150 to -10	230 to 430	-650 to -250	> 50 to 240	-930 to >-720
H-H’	1 (TCM)	0 to 90	110 to 280	-290 to -30	320 to 380+	-620 to -500
I-I’	1 (TCM)	10 to 30	50 to 250	-230 to -40	> 200	-670 +/-
L-L’	3 (Coastal)	-50 to 0	130 to 390	-400 to -180	200 to 380	-560 to -740
M-M’	3 (Coastal)	-130 to 30	380 to 520	-650 to -400	200 to 290+	<-900 to -600

Legend:
NA = Not Available; NE = Not Estimated; NP = Not Present ; TCM=Tri Cities Mesa; QTpr = Paso Robles Formation; Tca = Careaga sandstone; Tms = Sisquoc Formation

Table 3. Hydraulic Conductivity Values from Existing Studies (feet/day)

Study	Qds (NM)	Qds (TCM)	Qal (SMV)	Qal (AGP)	QTpr (SMV)	QTpr (NM)	QTpr (TCM-AGP)	QTpr (All Areas)	Tca (All Areas)	Tpps
NMMA (NMMA, 2010)					13 to 52	2 to 15				
NCMA (Todd, 2007)		47		27			13		7	7
Worts, 1951						9			9	
Cleath, 1996						5 to 50				
LSCE, 2000	175(2)		270 to 600			2 to 15			9.5	
LSCE, Model(1)			100 to 200			20 to 30			5 to 10	
DWR, 1970				110 to 400				70 to 230	<13 to 67	
DWR, 2002			270 to 800	95 to 270		<1 to 70	15 to 360			3 to 15
Overall Range	175	47	100 to 800	27 to 270		<1 to 70	13 to 360		5 to 10	3 to 15

Legend:

Qds = Dune Sand; Qal = Alluvium; QTpr = Paso Robles Formation; Tca = Careaga sandstone; Tpps = Pismo Formation;
NM = Nipomo Mesa; TCM = Tri-Cities Mesa; SMV = Santa Maria Valley; AGP = Arroyo Grande Plain

Footnote:

1. These K values are based on a calibrated model and are not directly derived from pumping tests or lab tests.
2. This is an assumed value and is not based on specific capacity or pumping test data.

Table 4. Existing Aquifer Pumping Test Results

Test Well	Well Log ID	Test Date	PW or OW	Unit	T (gpd/ft)	K (ft/d)	S	Comments
PB Well 5	90023	3/5/13	PW	QTpr/Tca	15,500	5	NA	Zone 1
PB Well 23	NA	3/4/13	PW	Tca	31,000	12	NA	Zone 1
PB Well 9	174229	12/30/85 and 7/13/05	PW	Tpps	7,500	5	NA	Zone 1
PB Well 10	174235	1/21/86 and 7/26/05	PW/OW	Tpps	11,500	5	0.0015	Zone 1
GB Well 4	22118	10/31/78	PW/OW	Tca	30,000	13	NA	Zone 1
Woodlands Well 1	962000	12/15/93	PW/OW	QTpr	70,000	31	0.002	Zone 3
Woodlands Dawn Rd.	490963	7/7/94	PW	QTpr	85,000	37	NA	Zone 3
Woodlands Mesa Rd.	490919	7/21/94	PW	QTpr	76,000	47	NA	Zone 3
Woodlands Homestead	490922	8/4/94	PW	QTpr	27,000	14	NA	Zone 3
CR Well 4	511080	12/04/97	PW	QTpr	5,000	11	NA	Zone 2
CR Well 5	511078	1/5/98	PW	QTpr	5,800	10	NA	Zone 2
CR Well 6	511086	1/7/98	PW	QTpr	6,300	10	NA	Zone 2
CR Well 7	511087	1/8/98	PW	QTpr	1,000	3	NA	Zone 2
NCSD Bev 2	171358	8/27/85	PW	QTpr/Tca	17,800	9	NA	Zone 2
NCSD WWTP MW-1	90024	10/17/07	PW	Qds		22	NA	Zone 1
NCSD WWTP MW-3	90025	10/19/07	PW	Qds		20	NA	Zone 1

Legend:
PB = Pismo Beach; GB = Grover Beach; CR Cypress Ridge; NCSD = Nipomo Community Services District; PW = Pumping Well; OW = Observation Well;
T = Transmissivity; K = Hydraulic Conductivity; S = Storativity; Qds = Dune Sand; QTpr = Paso Robles Formation; Tca = Careaga sandstone; Tpps = Pismo Formation; ; NA = Not Available or Not Applicable; PW/OW = Pumping test utilized one or more observation wells, but only the pumping well is listed in the left most column.

Table 5. Aquifer Pumping Test Results

Test Well	Area	PW or OW	Unit	T (gpd/ft)	K (ft/d)	S	Comments
AG Well 8	Zone 1	PW	QTpr	30,000	29	N/A	Unconfined aquifer conditions
(339665) AG Well 8		OW	QTpr	123,000	117	0.002	OW 3 top of screen is 36 feet shallow than PW 8
AG Well 8		Dist-DD	QTpr	117,000	112	0.02	
AG Well 8		N/A	QTpr	**120,000**	**115**	**0.01**	**Overall Representative Values**
OCSD Well 8	Zone 1	PW	Tca	26,000	13	NA	Semi-confined to confined aquifer conditions
(219080) OCSD Well 8		OW	Tca	17,500	9	0.003	
OCSD Well 8		N/A	Tca	**21,500**	**11**	**0.003**	**Overall Representative Values**
GB Well 1	Zone 1	OW	QTpr	117,000	130	0.02	Unconfined aquifer conditions
(90012) GB Well 1		Dist-DD	QTpr	360,000	400	0.10	
GB Well 1		N/A	QTpr	**240,000**	**270**	**0.05**	**Overall Representative Values Average of Observation Well and Distance-Drawdown Analyses**
GB Well 4 (22118)	Zone 1	PW	Tca	**29,500**	**12**	**N/A**	Semi-confined to confined aquifer conditions
NCSD BL 4	Zone 2	PW	QTpr	18,000	11	N/A	Unconfined aquifer conditions
(276929) NCSD BL 4		OW	QTpr	70,000	41	0.02	OW BL 3 bottom of screen is 30 feet deeper than PW BL 4
NCSD BL 4		N/A	QTpr	**45,000**	**26**	**0.02**	**Average of Pumping and Observation Wells Overall Representative Values**
GSWC AM 2	Zone 3	PW	QTpr	11,000	6	N/A	Semi-confined to confined aquifer conditions
(161355) GSWC AM 2		OW	QTpr	20,000	8	0.002	OW Vista 4 screen is 30 feet deeper and 100 feet shallower than PW AM2 screen
GSWC AM 2		N/A	QTpr	**15,500**	**7**	**0.002**	**Overall Representative Values**

Legend:
AG = Arroyo Grande; OCSD = Oceano Community Services District; GB = Grover Beach; NCSD = Nipomo Community Services District; GSWC = Golden State Water Company; PW = Pumping Well time-drawdown data used to calculate T/K values; OW = Observation Well time-drawdown data used to calculate T/K/S values; Dist-DD = Distance-Drawdown data used to calculate T/K/S values; T = Transmissivity; K = Hydraulic Conductivity; S = Storativity; QTpr = Paso Robles Formation; Tca = Careaga sandstone;
; NA = Not Available or Not Applicable

Table 6. Summary of Hydraulic Conductivity Values (feet/day)

Unit	Zone	Previous Studies	Existing Data	2014 Data	Overall Range
Qal	SMV	100-800	--	--	100-800
Qal	AGP	27-270	--	--	27-270
Qds	NMMA	175	20-22	--	20-175
Qds	NCMA	47	--	--	47
QTpr	Zone2	--	3-11	26	3-26
QTpr	Zone 3	--	14-47	7	7-47
QTpr	All Zones	<1-70	--	--	<1-70
QTpr	NCMA	13-360	--	115-270	13-270
QTpr/Tca	Zone 2	--	9	--	9
QTpr/Tca	NCMA	--	5	--	5
Tca	All Zones	5-10	--	--	5-10
Tca	NCMA	7	12-13	11-12	7-13
Tpps	NCMA	--	5	--	5

Legend:
Qds = Dune Sand; Qal = Alluvium; QTpr = Paso Robles Formation; Tca = Careaga sandstone; Tpps = Pismo Formation; NCMA = Northern Cities Management Area; NMMA = Nipomo Mesa Management Area; SMV = Santa Maria Valley; AGP = Arroyo Grande Plain

Table 7. Previous Arroyo Grande Creek Streamflow Infiltration Estimates

Reference	Measured Stream Loss (cfs)	Estimated Average Annual Stream Infiltration (AFY)
Hoover (1985)	3 (June 1984)	2,100
DWR (2002)	NA	800
Todd (2007)	1.7 (April 2006)	2,017
District (undocumented)	5	3,600

Table 8. Streamflow Infiltration Analysis

Reference	Calculated Average Annual Stream Infiltration (cfs)	Calculated Average Annual Stream Infiltration (AFY)
Minimum	2.6	1,830
Maximum	3.9	2,853
Average	3.2	2,353

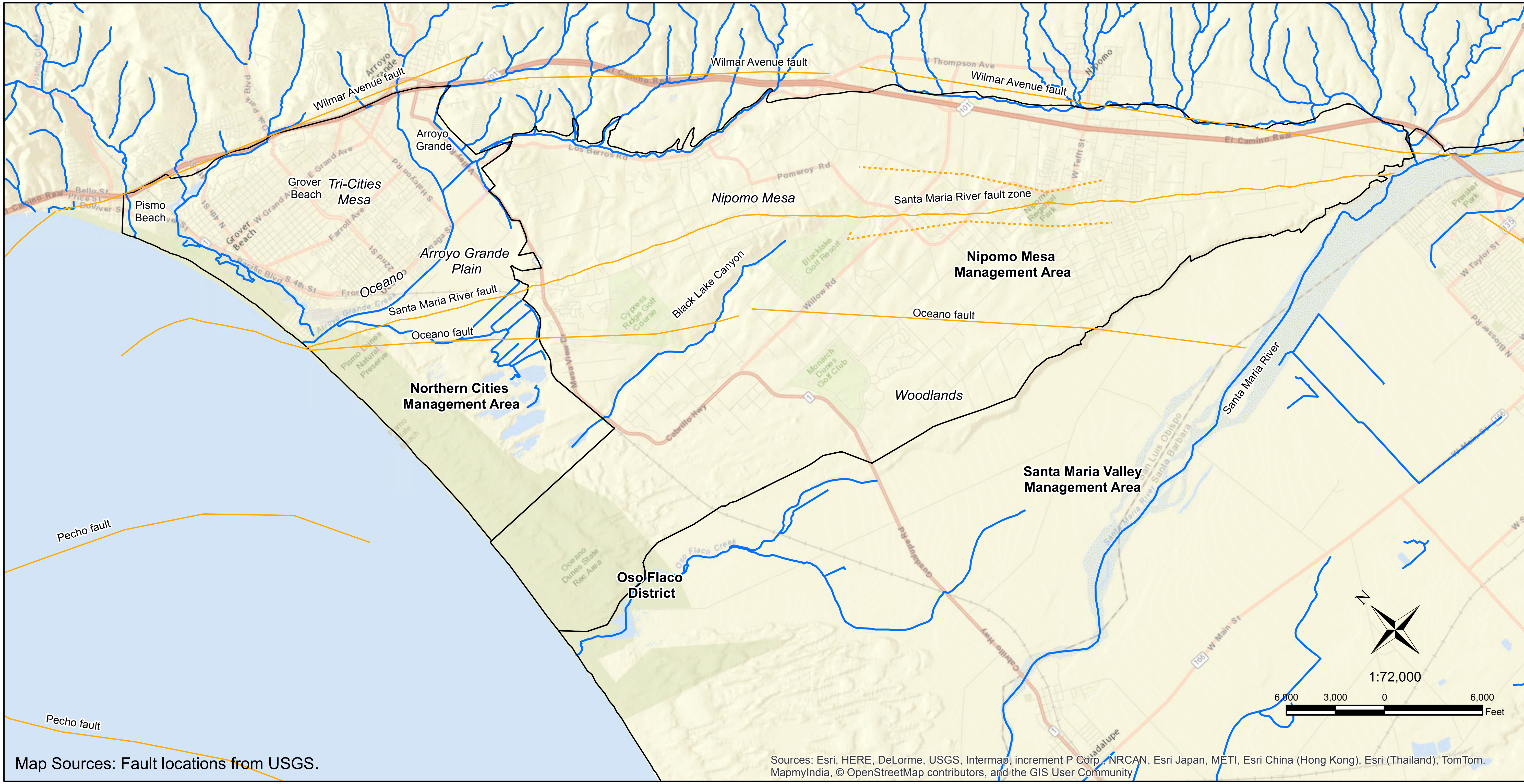
Table 9. Wells with Existing Transducers and Potential New Transducer Installations

Wells with Transducers	Management Area	Well Log No.	Screen (feet bgs)	Other Wells in Cluster/Screen Intervals (feet bgs)
32S/12E-24B01	NCMA	90021 (POO-1)	48-65	B2 = 120-145, B3 = 270-435
32S/12E-24B03	NCMA	90021 (POO-1)	270-435	B1 = 48-65, B2 = 120-145
32S/13E-30F03	NCMA	90015 (POO-3)	305-372	F1 = 15-30, 40-55; F2 = 75-100
32S/13E--30N02	NCMA	90016 (POO-4)	175-255	N1 = 15-40; N3 = 60-135
11N/35W-23G01 [1]	NMMA	1083178 (Co. MW-5)	400-460	None
11N/36W-12C01 [2]	NMMA	90020(PSBO-2)	280-290	C2 = 450-460; C3 = 720-730
11N/36W-12C01 [2]	NMMA	90020(PSBO-2)	280-290	C2 = 450-460; C3 = 720-730
12N/35W-32C03	NCMA/NMMA	961625 (Co. MW-3)	90-170	None
12N/36W-36L01 [4]	NCMA	90019 (PSBO-1)	227-237	L2 = 535-545
12N/36W-36L02 [5]	NCMA	90019 (PSBO-1)	535-545	L1 = 227-237

Potential New Locations	Management Area	Well Log No.	Screen (feet bgs)	Other Wells in Cluster/Screen Intervals (feet bgs)	Surface Elevation (Feet MSL)	Depth to Water (feet bgs)	Transducer Depth (below water level)
32S/13E-30N03	NCMA	90016 (POO-4)	60-135	N1 = 15-40; N2 = 175-255	14	5-10	55-60
11N/34W-19Q01	NMMA	Unknown (Division Rd.)	Unknown	Unknown	?	?	?
11N/35W-22M01	NMMA	490922 (Woodlands Homestead)	430-680	None	184	171 (in 1994)	264
12N/35W-32	NCMA	221036 (OCSD MW Blue)	190-210, 245-265	Green = 100-133, Silver = 395-510, Yellow = 625-645	32	13-31	164-182
12N/35W-32	NCMA	221036 (OCSD MW Silver)	395-435, 470-510	Green = 110-130, Blue = 190-265, Yellow = 625-645	32	13-31	369-387

Notes: (1) Transducer installed in December 2013 by SMVMA
(2) Transducer installed in October 2015 as part of Santa Maria Basin Characterization study
(3) Transducer installed in October 2015 as part of Santa Maria Basin Characterization study
(4) Transducer installed in April 2015 as part of Santa Maria Basin Characterization study
(5) Transducer installed in April 2015 as part of Santa Maria Basin Characterization study

PLATES



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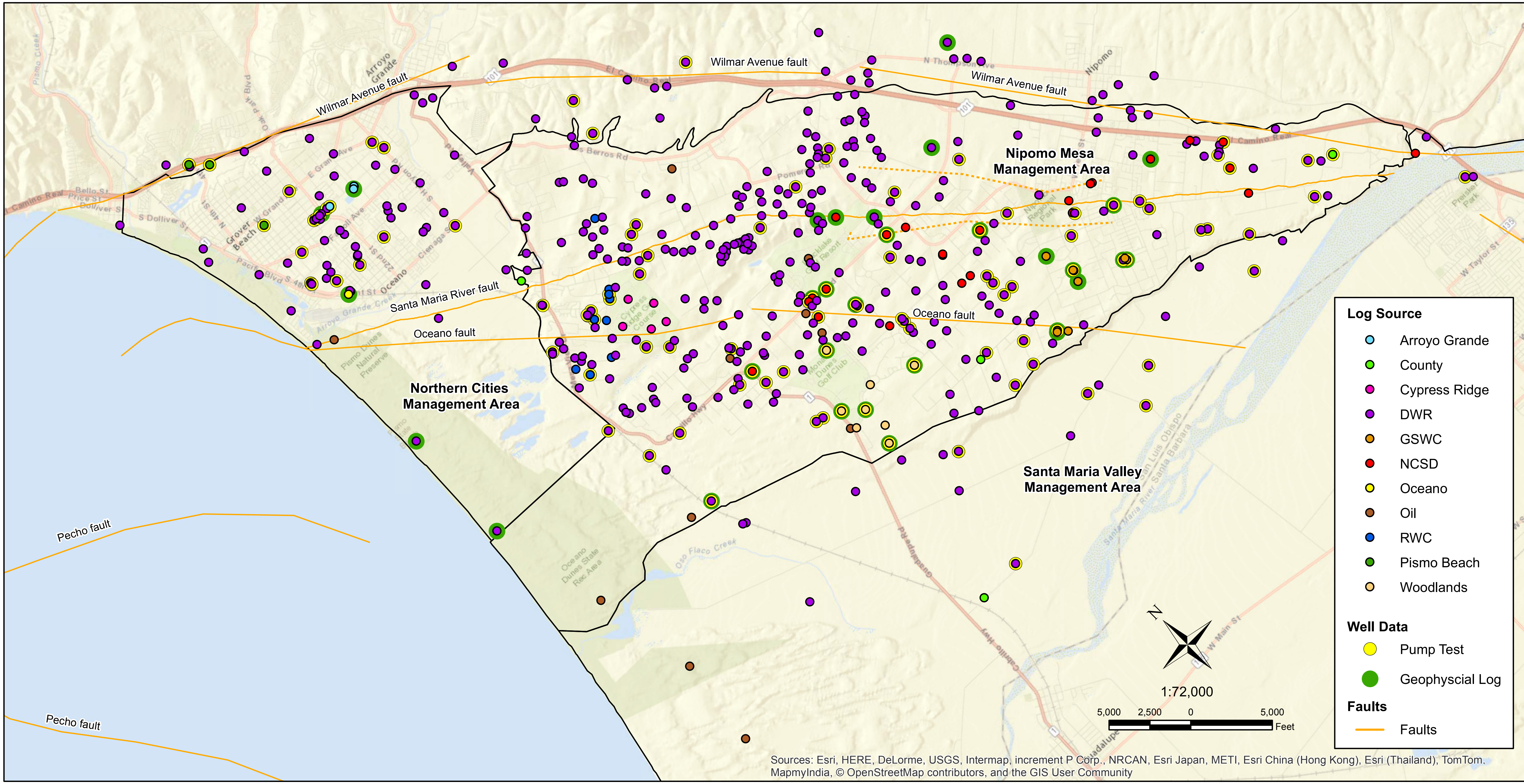
STUDY AREA LOCATION MAP
Santa Maria Groundwater Basin
Characterization and Planning Activities Study
San Luis Obispo County

PLATE 1



REGIONAL WELL LOCATION MAP

Santa Maria Groundwater Basin
Characterization and Planning Activities Study
San Luis Obispo County

PLATE 2

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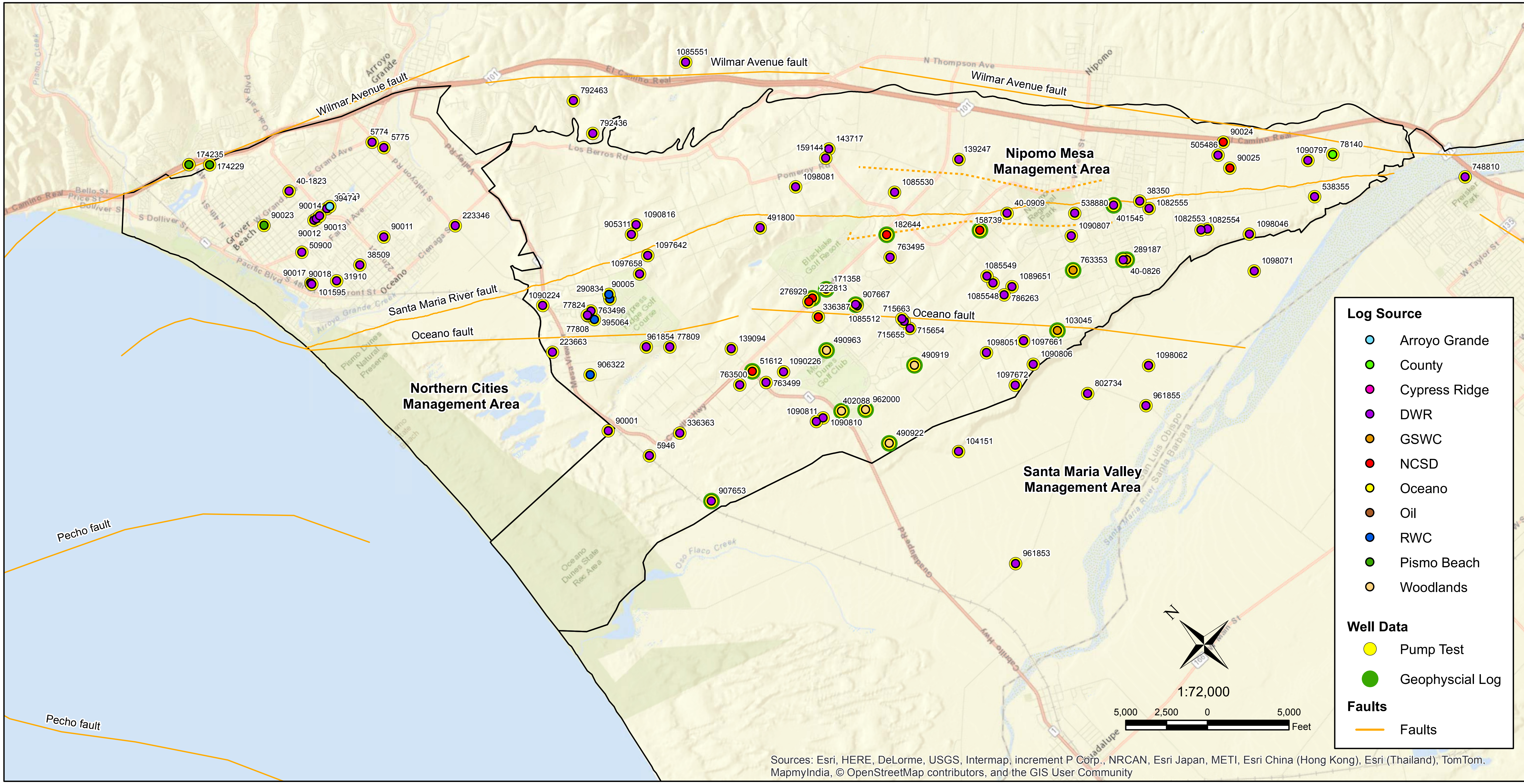

MAP OF WATER WELL LOCATIONS WITH AQUIFER TEST DATA

Santa Maria Groundwater Basin
Characterization and Planning Activities Study
San Luis Obispo County

PLATE 3

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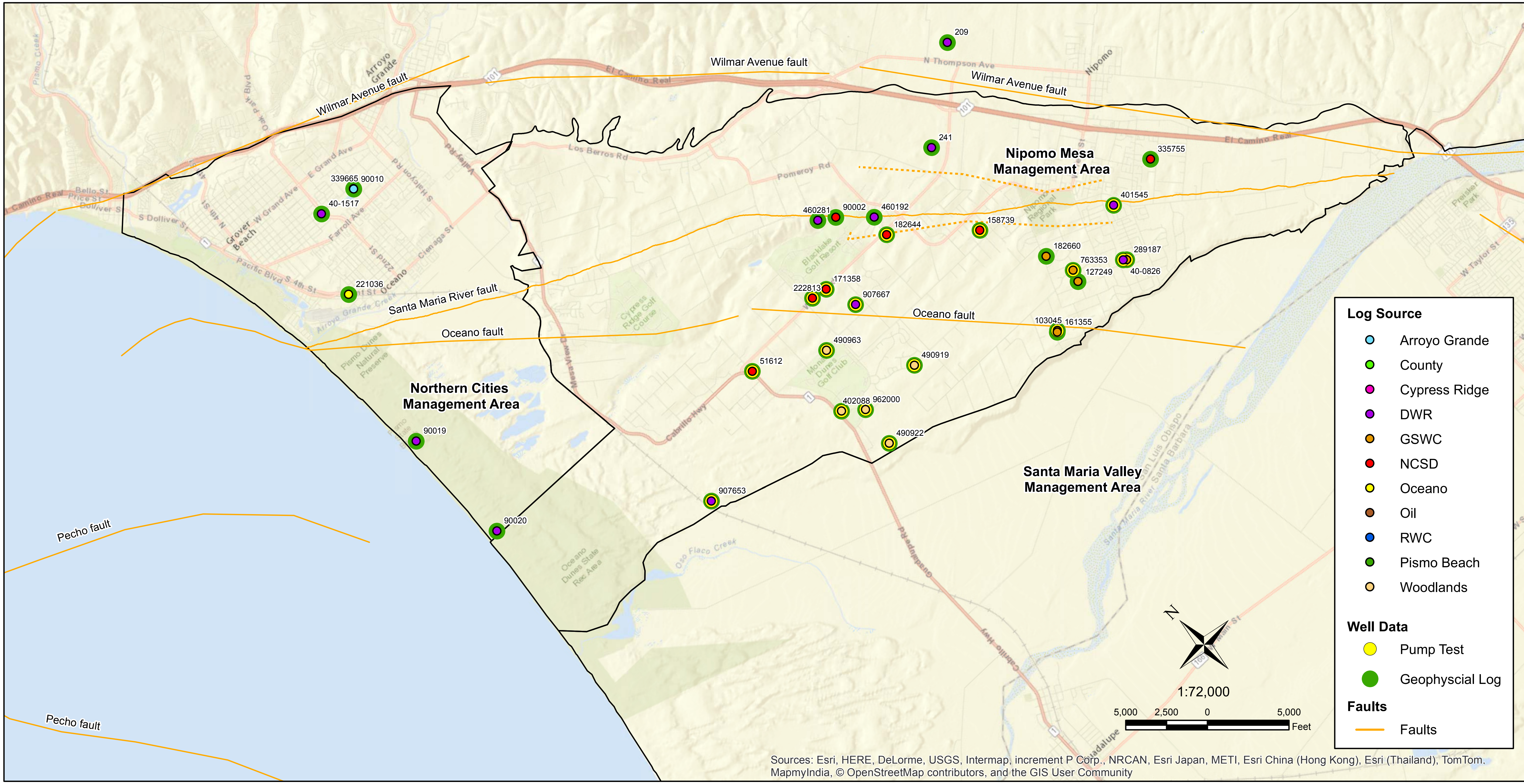

MAP OF WATER WELL LOCATIONS WITH GEOPHYSICAL LOG DATA

Santa Maria Groundwater Basin
Characterization and Planning Activities Study
San Luis Obispo County

PLATE 4

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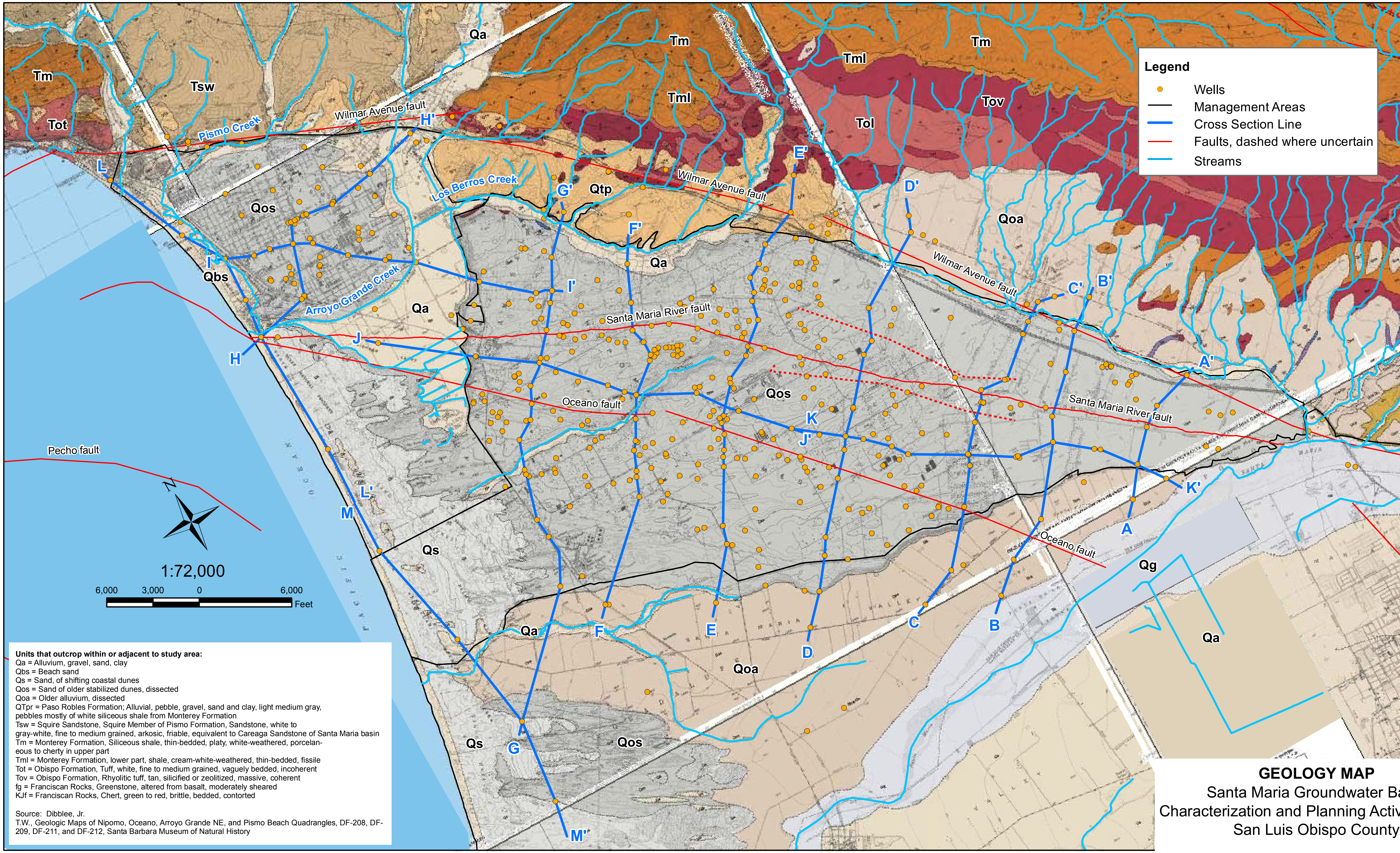
MAP OF OIL WELL LOCATIONS
Santa Maria Groundwater Basin
Characterization and Planning Activities Study
San Luis Obispo County

PLATE 5



GEOLOGY MAP
Santa Maria Groundwater Basin
Characterization and Planning Activities Study
San Luis Obispo County

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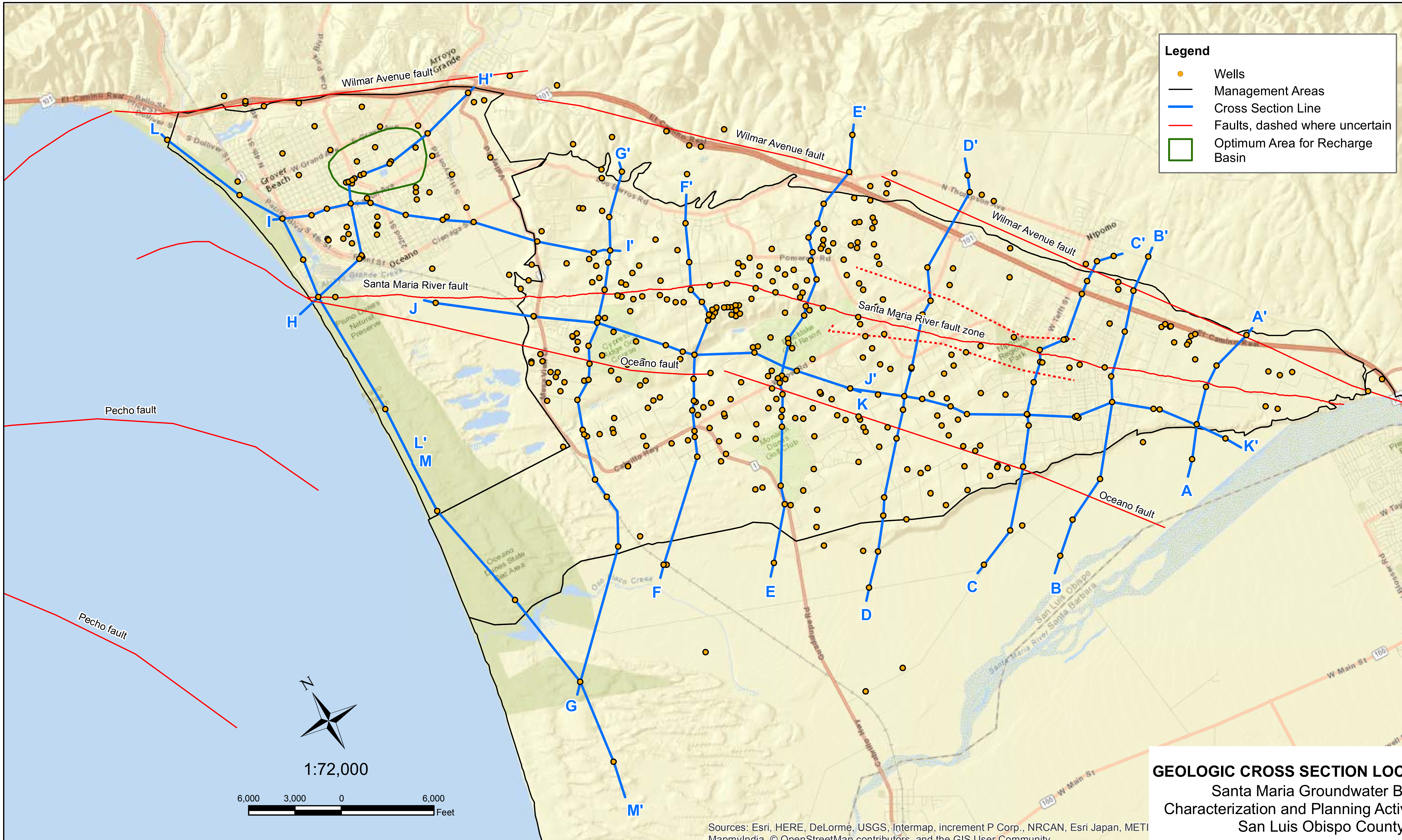

GEOLOGIC CROSS SECTION LOCATION MAP

Santa Maria Groundwater Basin
Characterization and Planning Activities Study
San Luis Obispo County

PLATE 7

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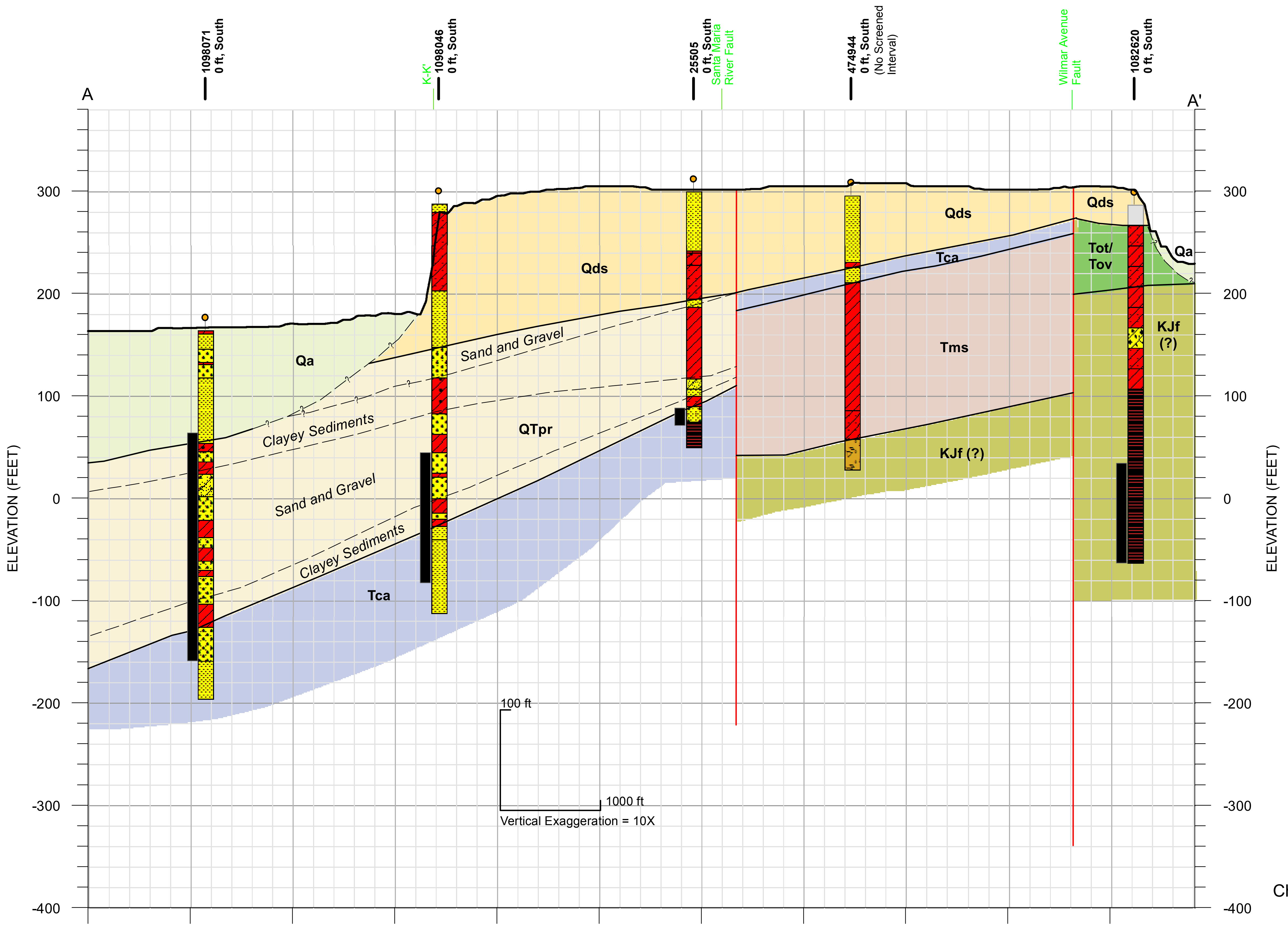

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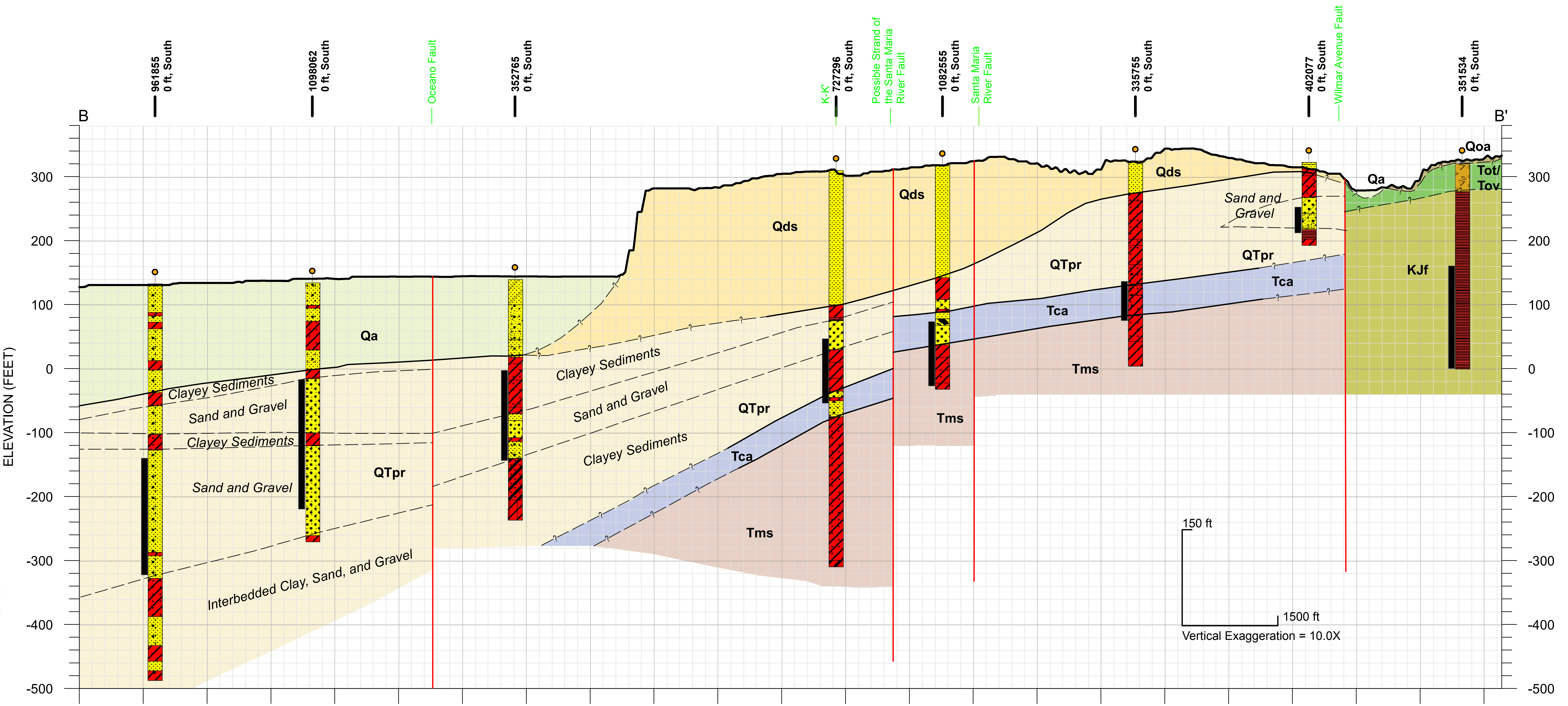
GEOLOGIC CROSS SECTION A-A'

Santa Maria Groundwater Basin
Characterization and Planning Activities Study
San Luis Obispo County



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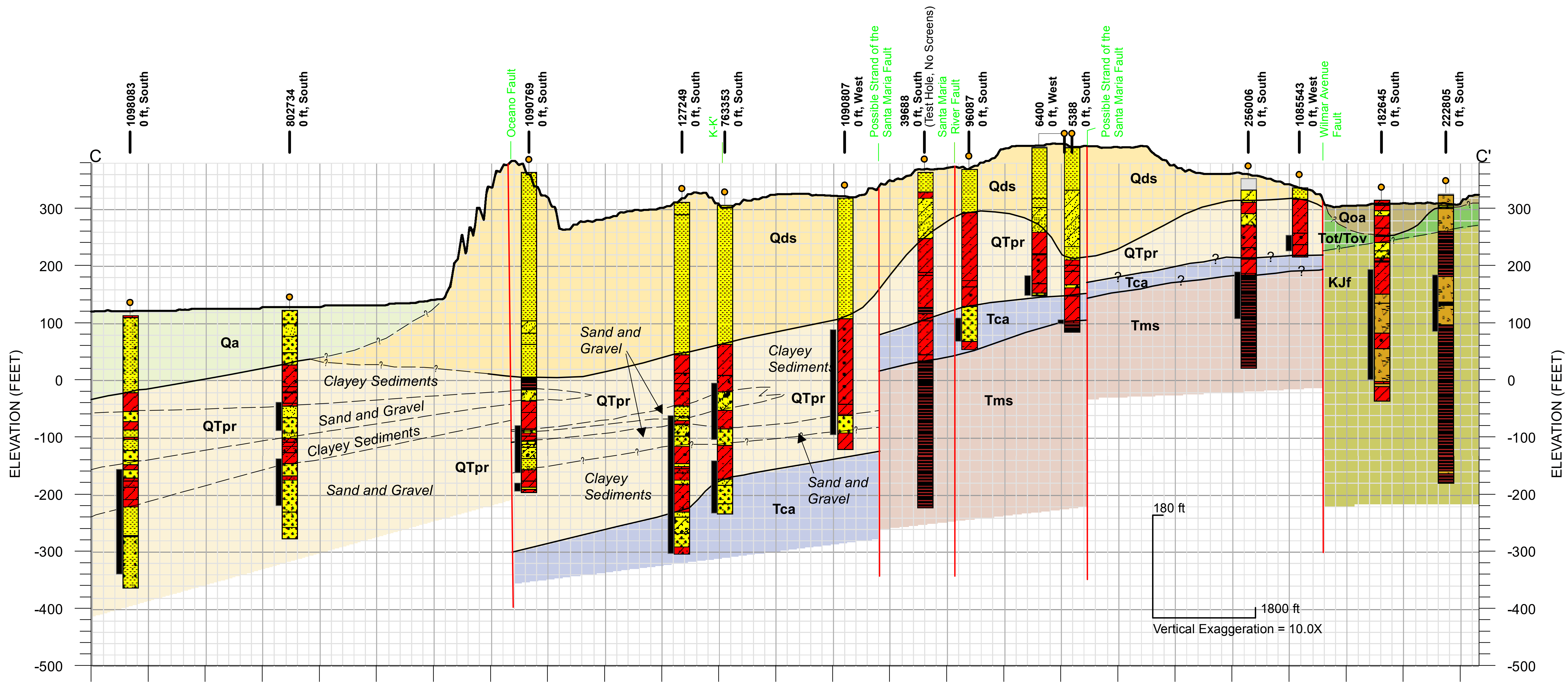
GEOLOGIC CROSS SECTION B-B'

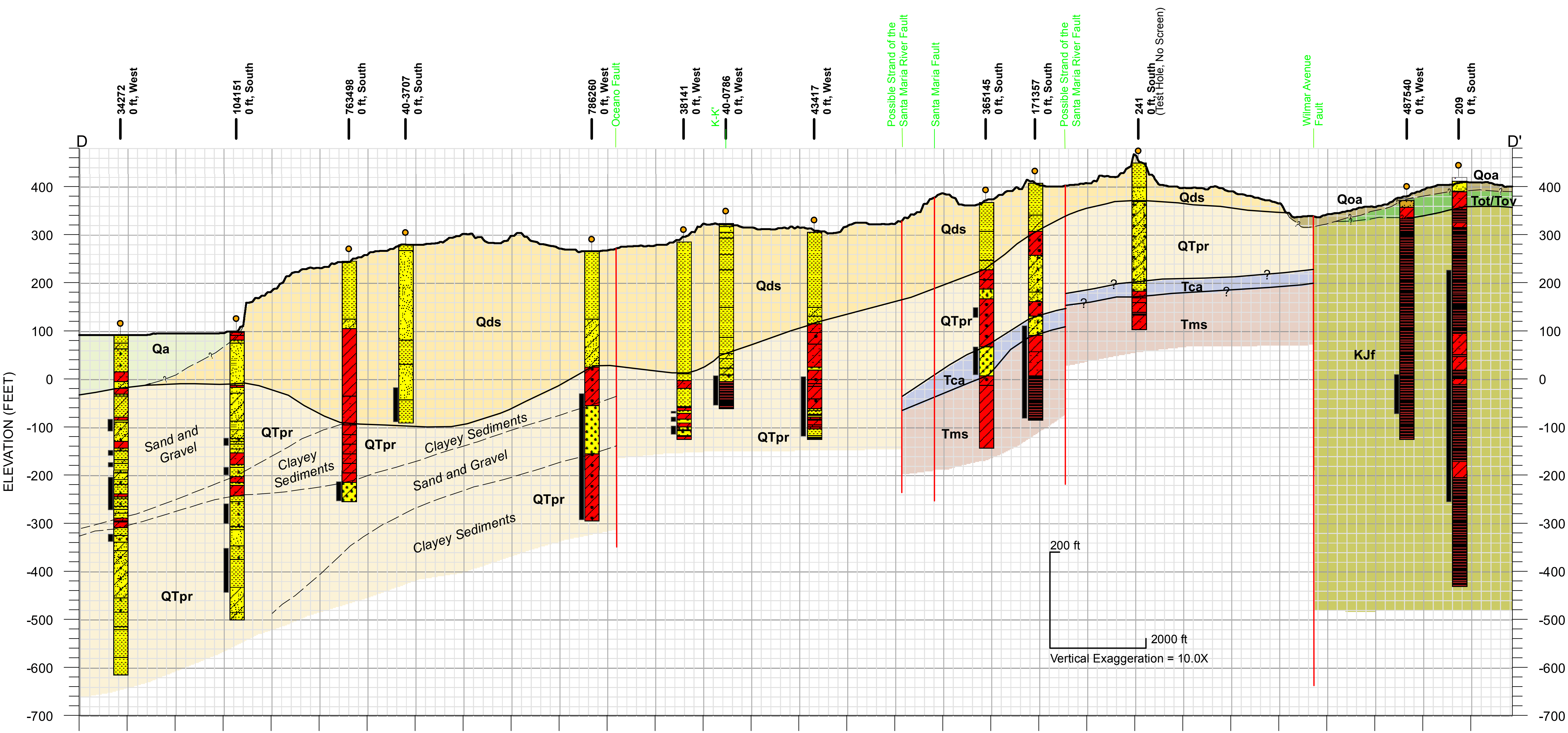
Santa Maria Groundwater Basin
Characterization and Planning Activities Study
San Luis Obispo County



GEOLOGIC CROSS SECTION C-C'

Santa Maria Groundwater Basin
Characterization and Planning Activities Study
San Luis Obispo County

PLATE 10



GEOLOGIC CROSS SECTION D-D'

Santa Maria Groundwater Basin
Characterization and Planning Activities Study
San Luis Obispo County

PLATE 11

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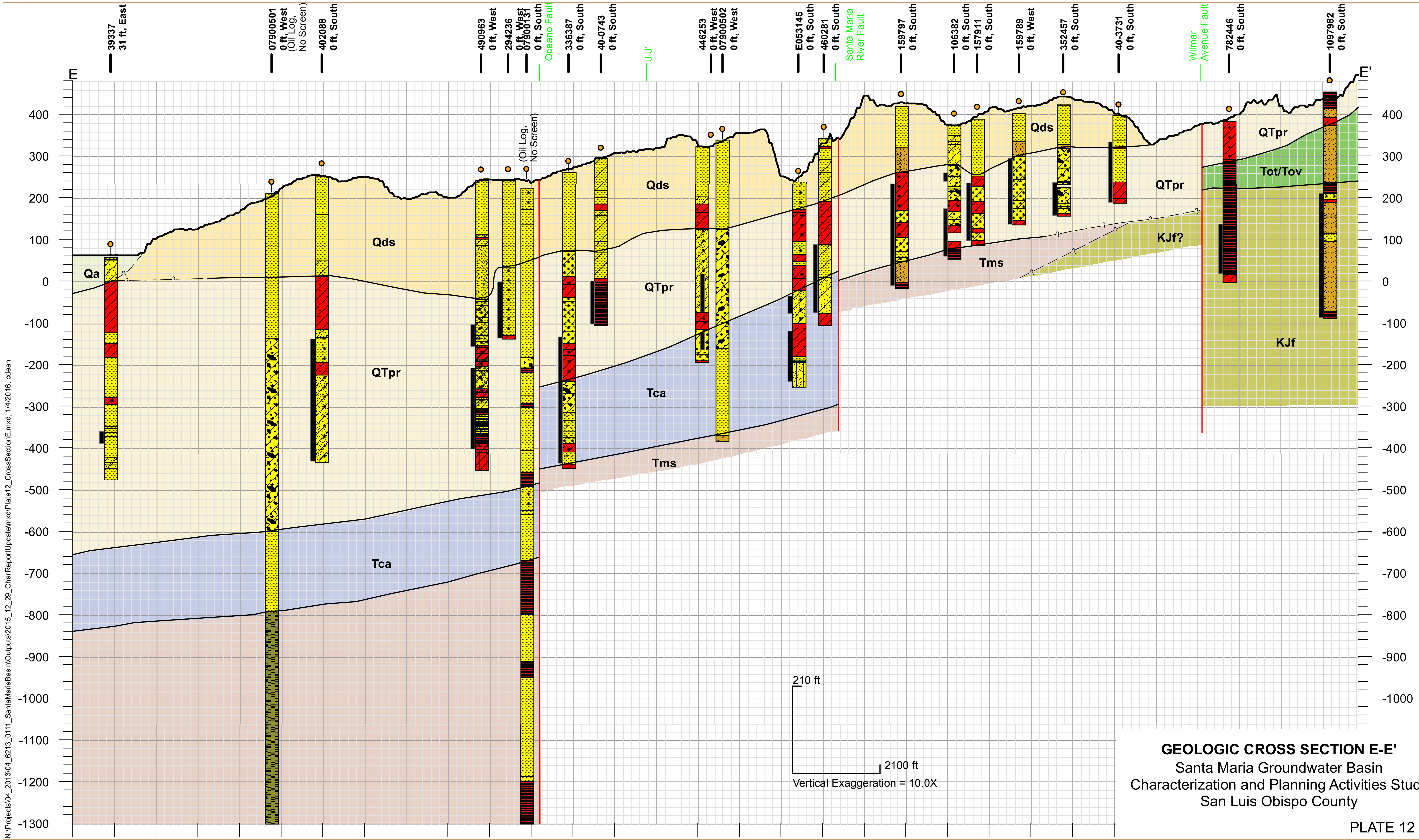
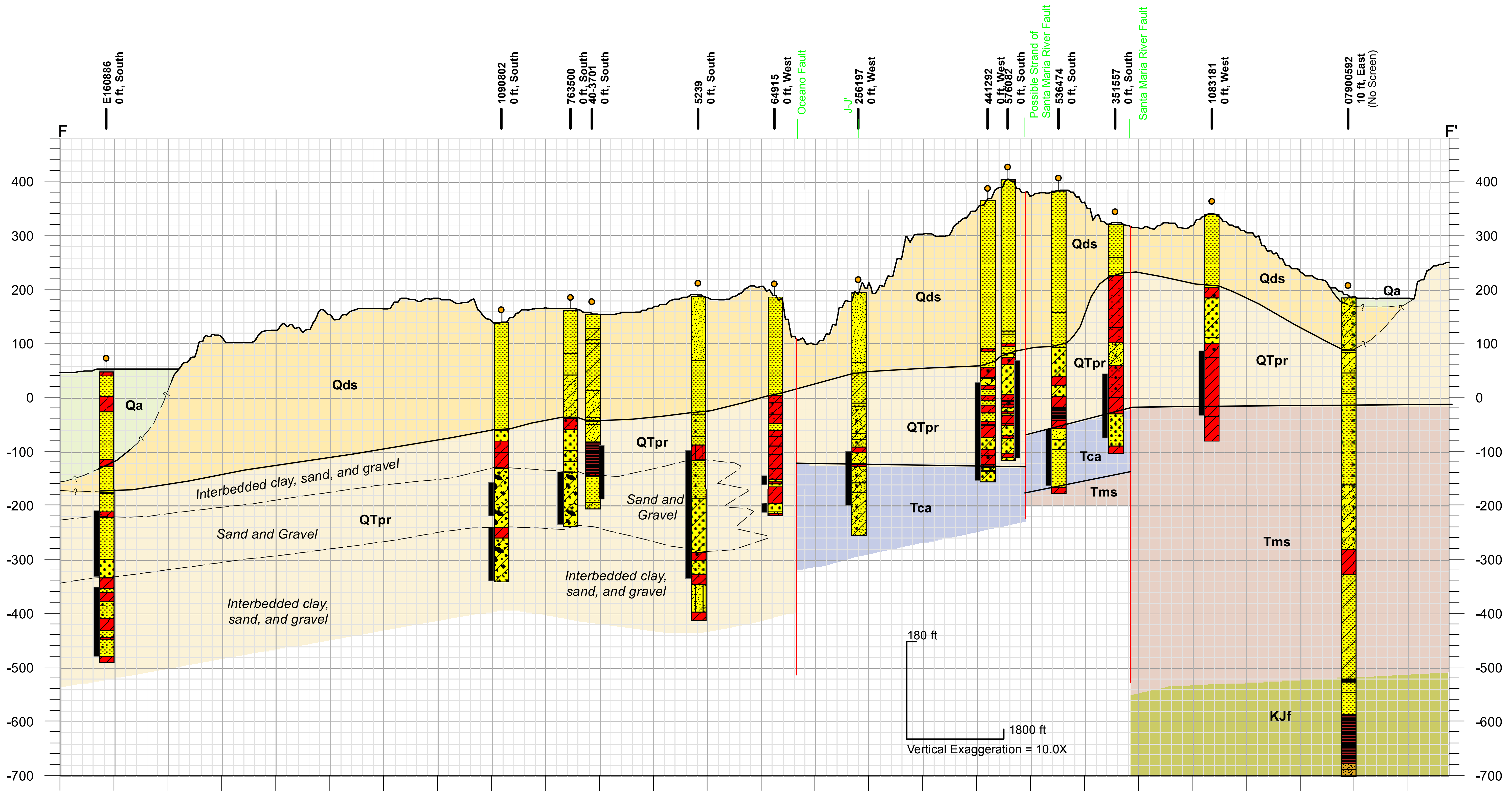


GEOLOGIC CROSS SECTION E-E'

Santa Maria Groundwater Basin
Characterization and Planning Activities Study
San Luis Obispo County

PLATE 12



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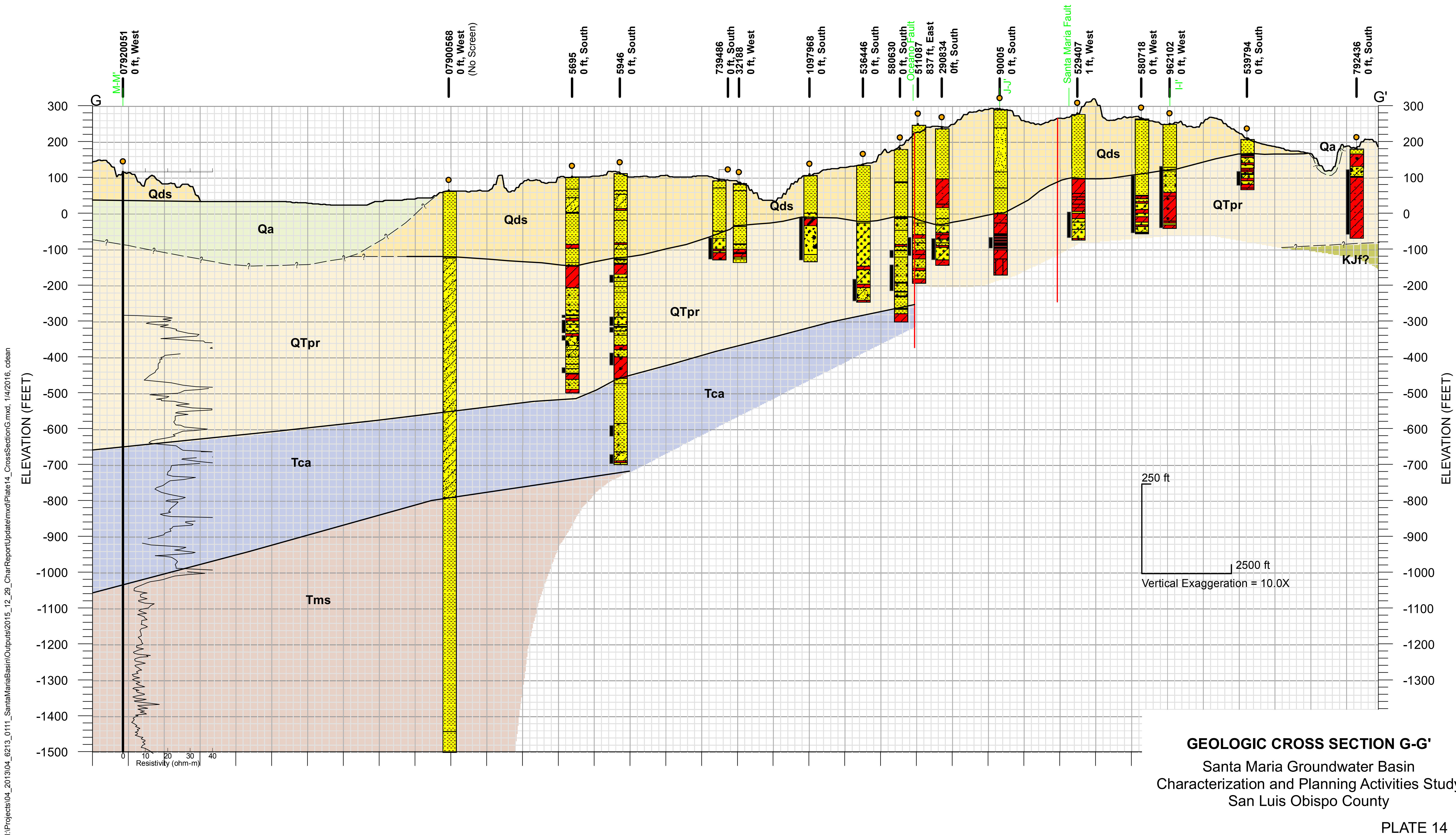
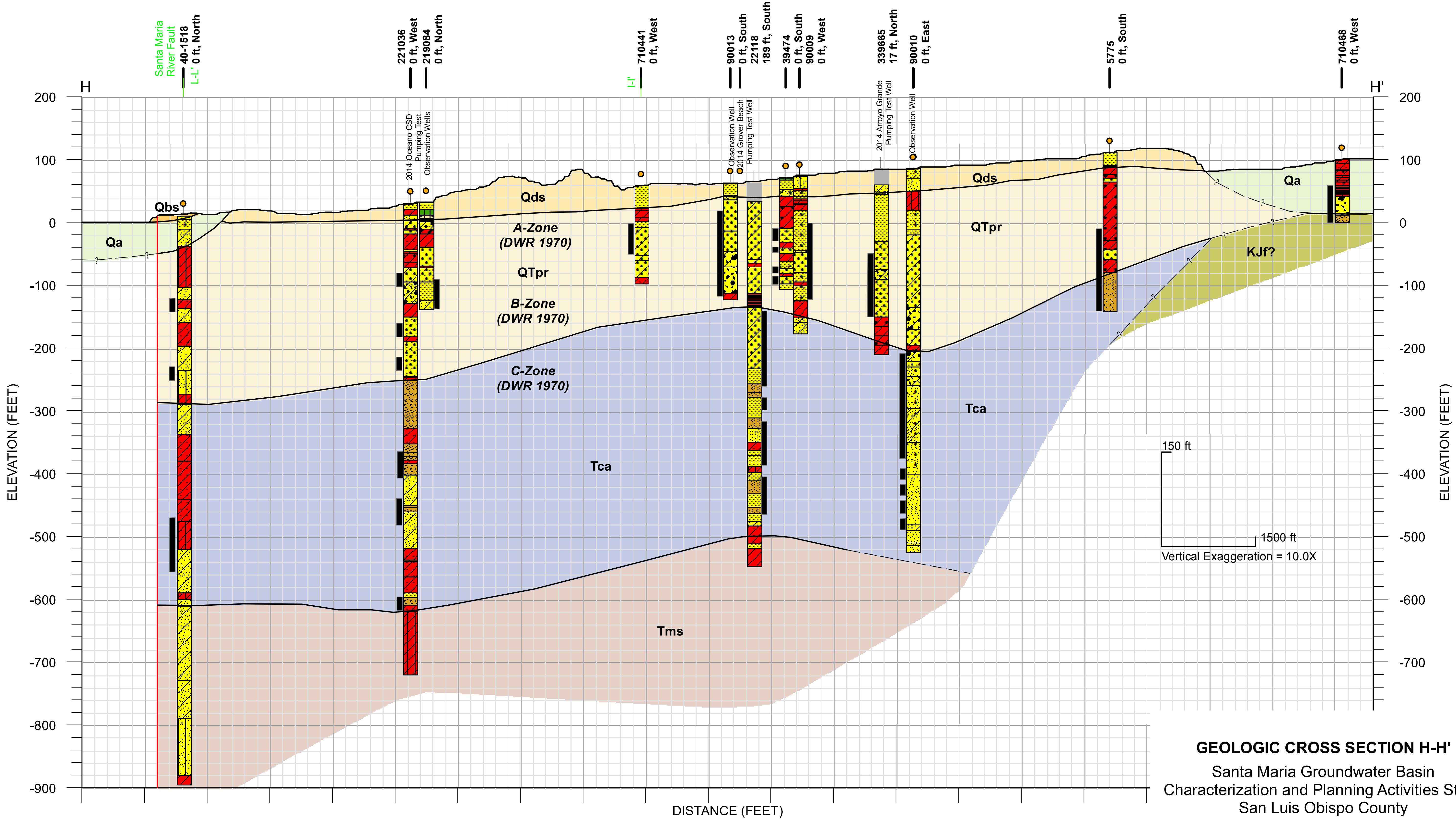
GEOLOGIC CROSS SECTION F-F'

Santa Maria Groundwater Basin
Characterization and Planning Activities Study
San Luis Obispo County



GEOLOGIC CROSS SECTION G-G'

Santa Maria Groundwater Basin
Characterization and Planning Activities Study
San Luis Obispo County

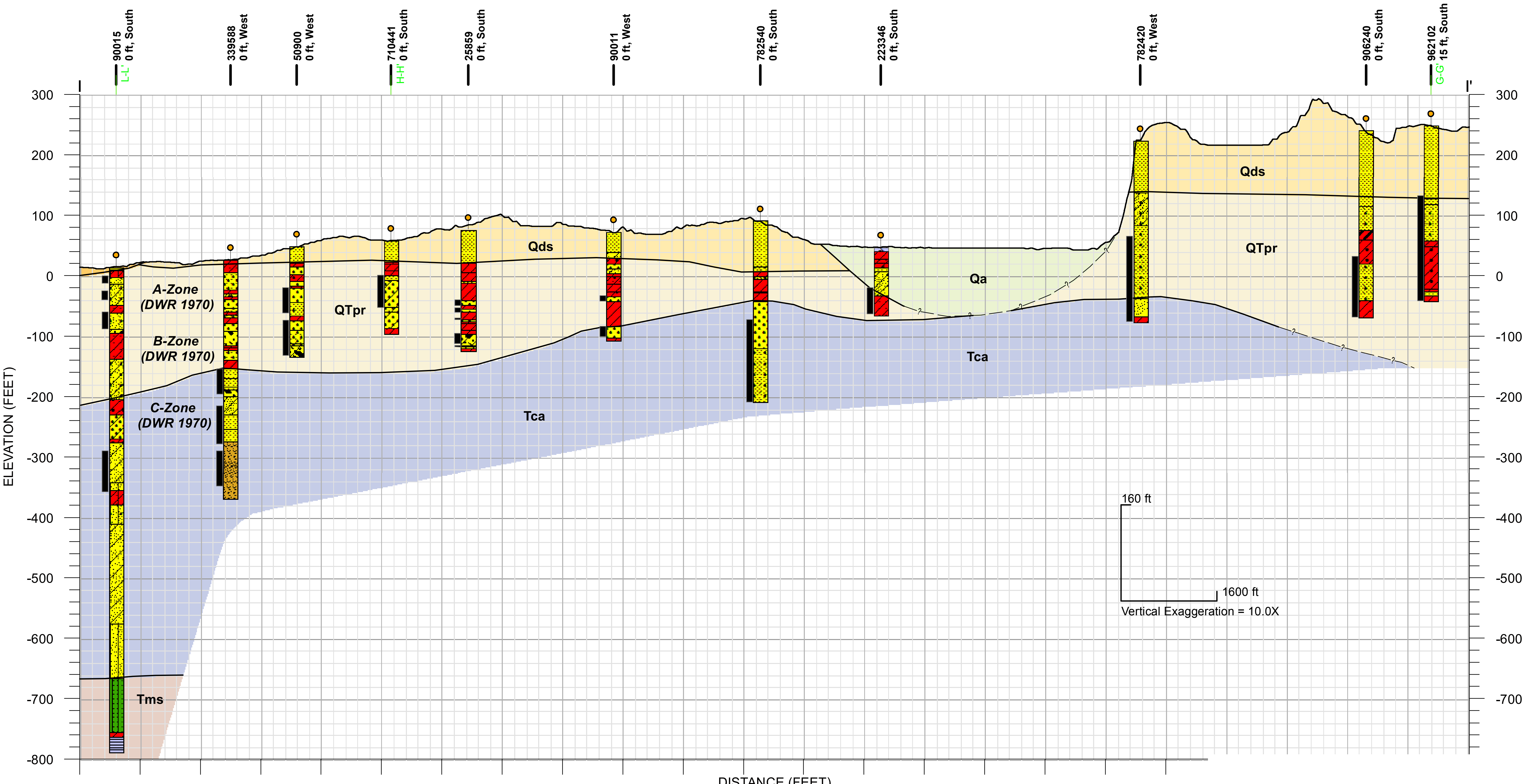


GEOLOGIC CROSS SECTION H-H'

Santa Maria Groundwater Basin
Characterization and Planning Activities Study
San Luis Obispo County

County of San Luis Obispo
Project No. 04.62130111

FUGRO



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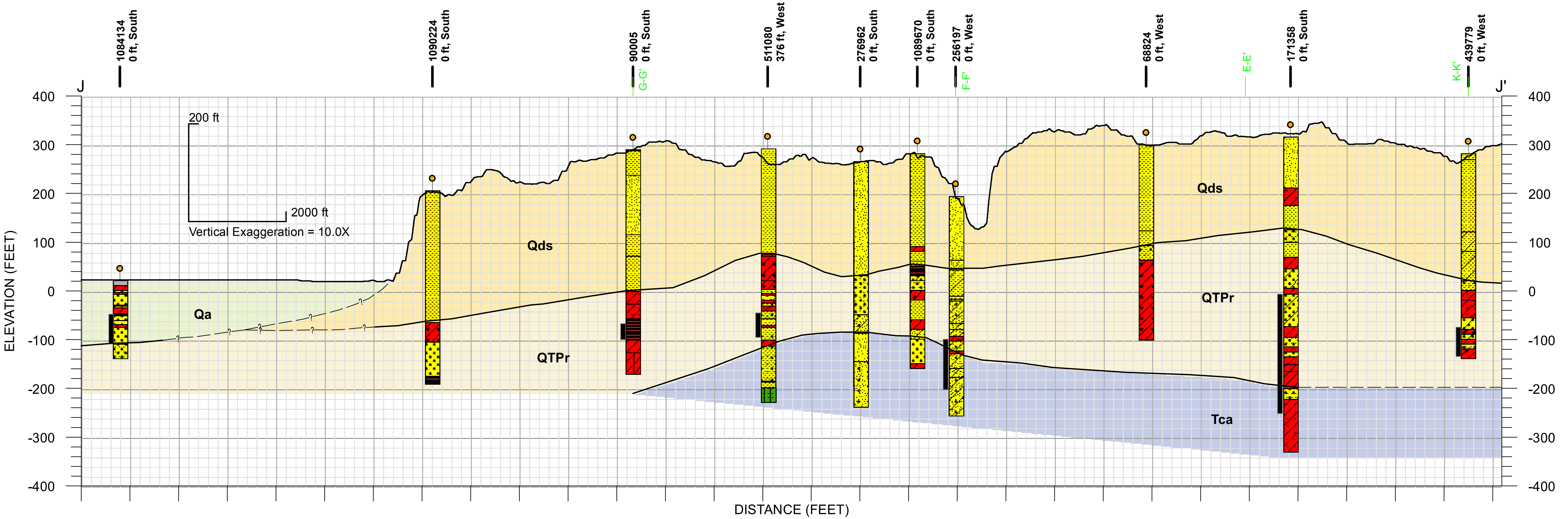
GEOLOGIC CROSS SECTION I-I'

Santa Maria Groundwater Basin
Characterization and Planning Activities Study
San Luis Obispo County

PLATE 16



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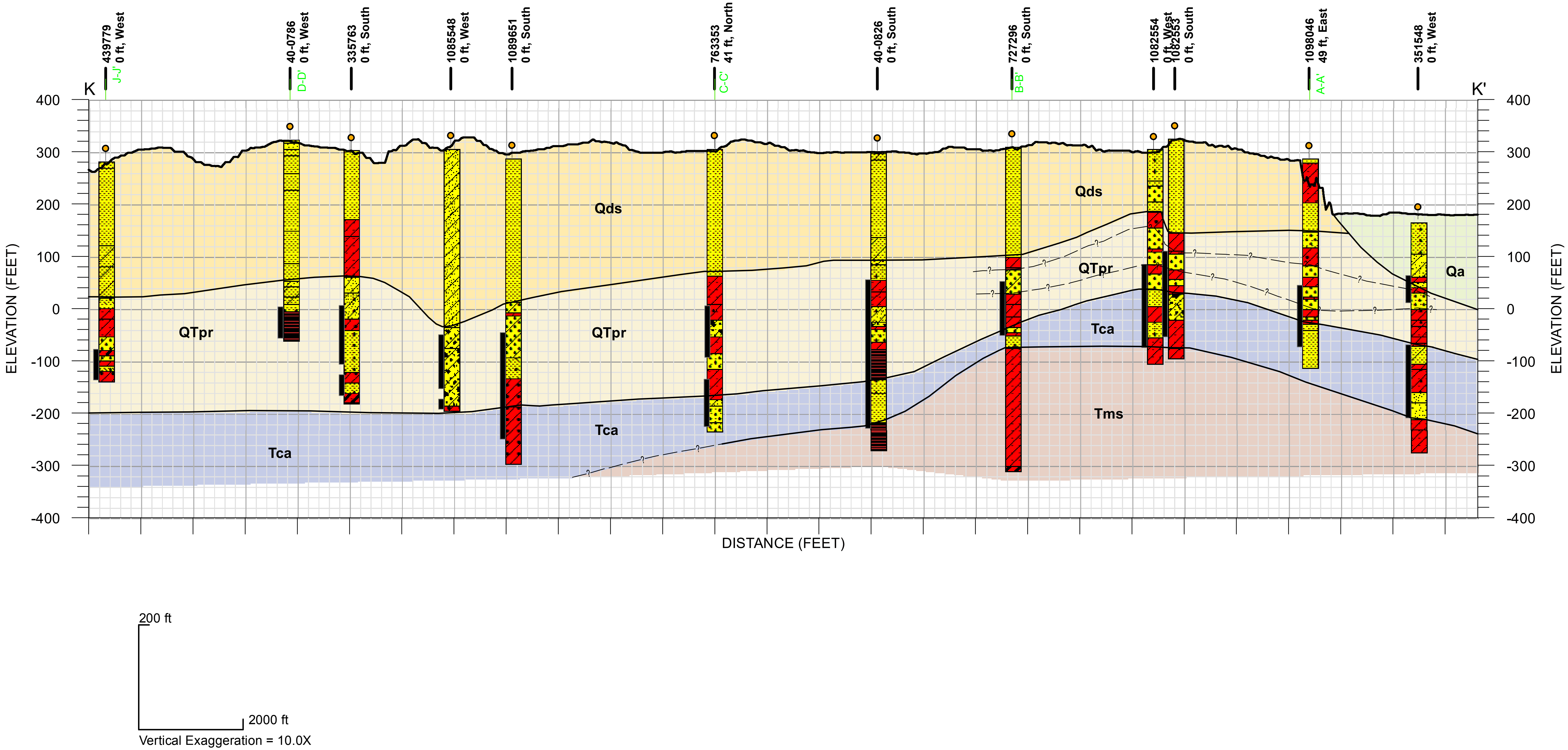
GEOLOGIC CROSS SECTION J-J'

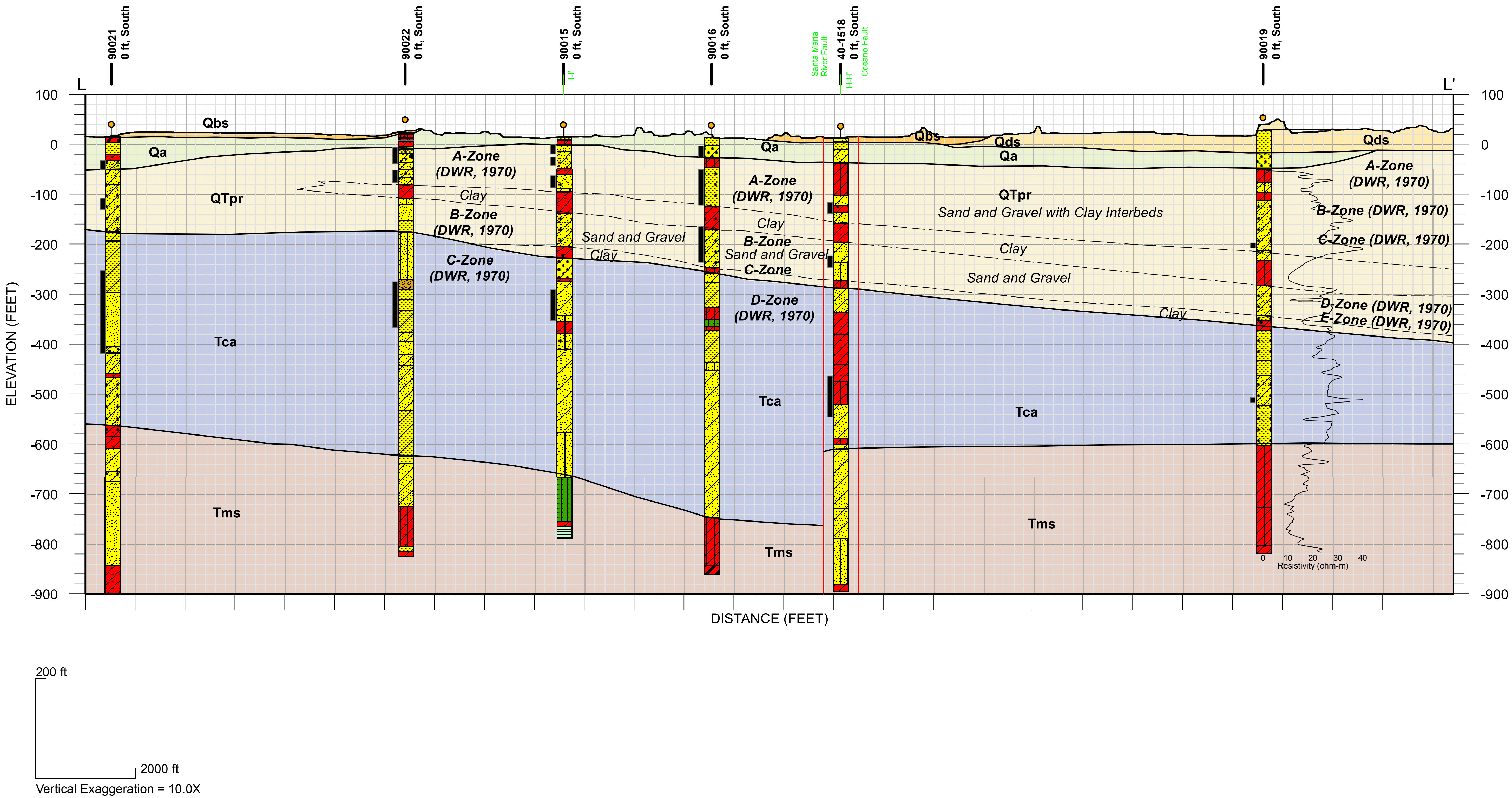
Santa Maria Groundwater Basin
Characterization and Planning Activities Study
San Luis Obispo County

PLATE 17



GEOLOGIC CROSS SECTION K-K'

Santa Maria Groundwater Basin
Characterization and Planning Activities Study
San Luis Obispo County



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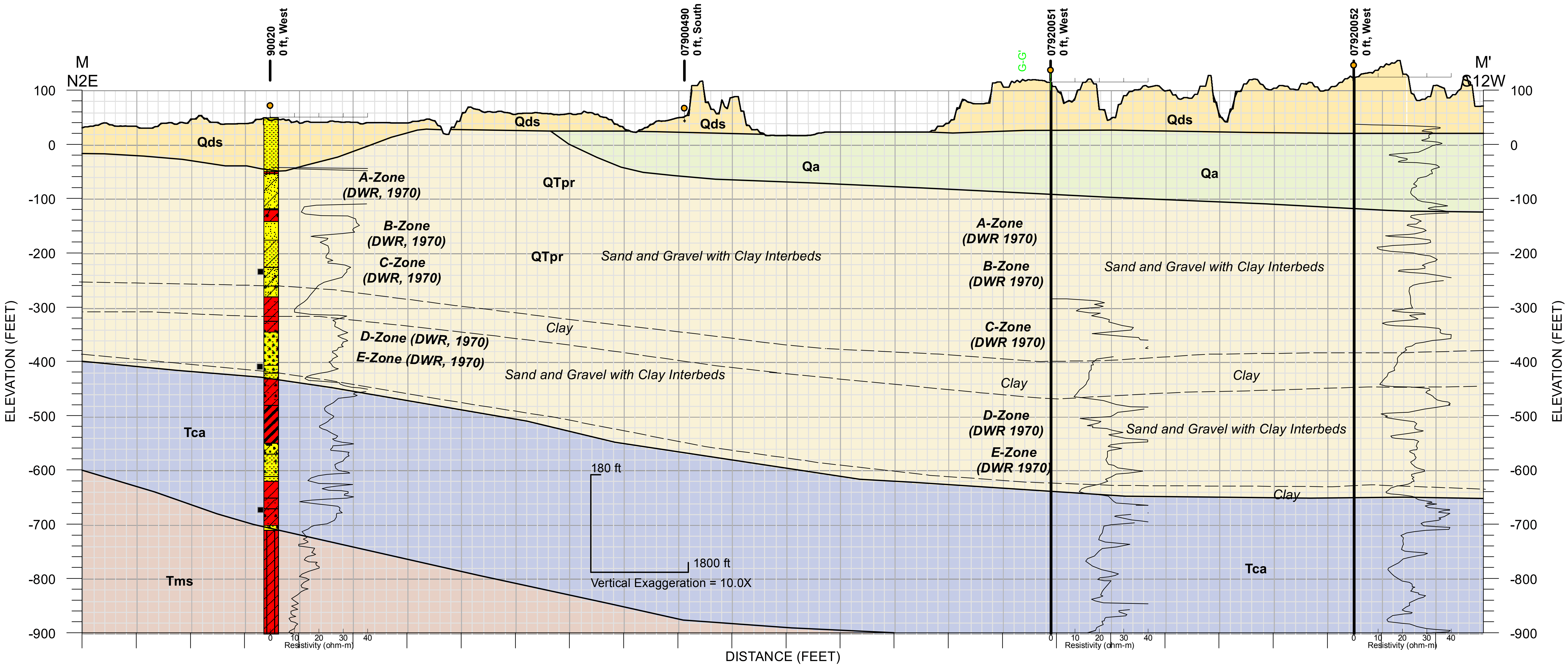
GEOLOGIC CROSS SECTION L-L'

Santa Maria Groundwater Basin
Characterization and Planning Activities Study
San Luis Obispo County

PLATE 19



GEOLOGIC CROSS SECTION M-M'

Santa Maria Groundwater Basin
Characterization and Planning Activities Study
San Luis Obispo County

Boring Legend

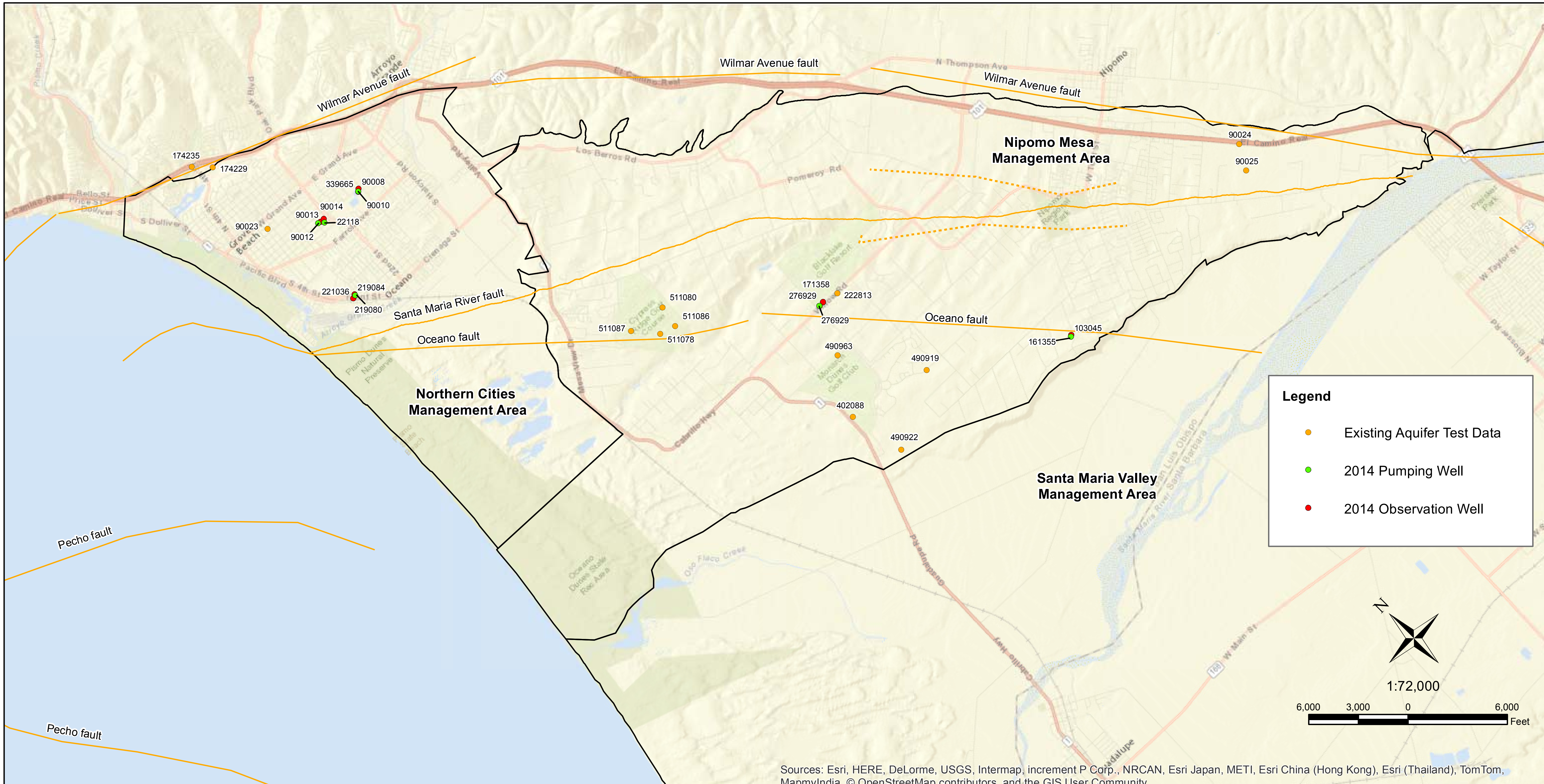
- Lean CLAY (CL)
- Silty CLAY (CL-ML)
- Silty CLAY with Sand (CL-ML)
- Lean CLAY with Sand (CL)
- Sandy Lean Clay (CL)
- Sandy, Gravelly Lean CLAY (CL)
- Gravelly Lean CLAY (CL)
- Fat CLAY (CH)
- Sandy Fat CLAY (CH)
- Silt (ML)
- Sandy SILT (ML)
- Gravelly SILT (ML)
- Poorly-Graded SAND (SP)
- Poorly-Graded SAND with Clay (SP-SC)
- Poorly-Graded SAND with Silt (SP-SM)
- Gravelly Poorly-Graded SAND (SP)
- Well-Graded SAND (SW)
- Well-Graded SAND with Clay (SW-SC)
- Well-Graded SAND with Silt (SW-SM)
- Gravelly Well-Graded SAND (SW)
- Clayey SAND (SC)
- Clayey to Silty SAND (SC-SM)
- Gravelly, Clayey SAND (SC)
- Silty SAND (SM)
- Gravelly Silty SAND (SM)
- Poorly-Graded GRAVEL (GP)
- Poorly-Graded GRAVEL with Clay (GP-GC)
- Sandy GRAVEL (GP)
- Well-Graded GRAVEL (GW)
- Well-Graded GRAVEL with Clay (GW-GC)
- Clayey GRAVEL (GC)
- Sandy, Clayey GRAVEL (GC)
- SHALE
- MUDSTONE
- SANDSTONE
- SANDSTONE to SILTSTONE
- ROCK Fragments

Geologic Units

- Qbs - Beach Sand
- Qds - Dune Sand
- Qa - Alluvium
- Qoa - Older Alluvium
- QTpr - Paso Robles Formation
- Tca - Careaga Sandstone
- Tms - Sisquoc Formation
- Tot/Tov- Obispo Formation
- KJf - Franciscan Formation

- Formation Contact
- Lithologic Contact within Formation
- Faults
- Screened Zone

CROSS SECTION KEY
Santa Maria Groundwater Basin
Characterization and Planning Activities Study
San Luis Obispo County



2014 PUMPING TEST LOCATIONS
Santa Maria Groundwater Basin
Characterization and Planning Activities Study
San Luis Obispo County

PLATE 22

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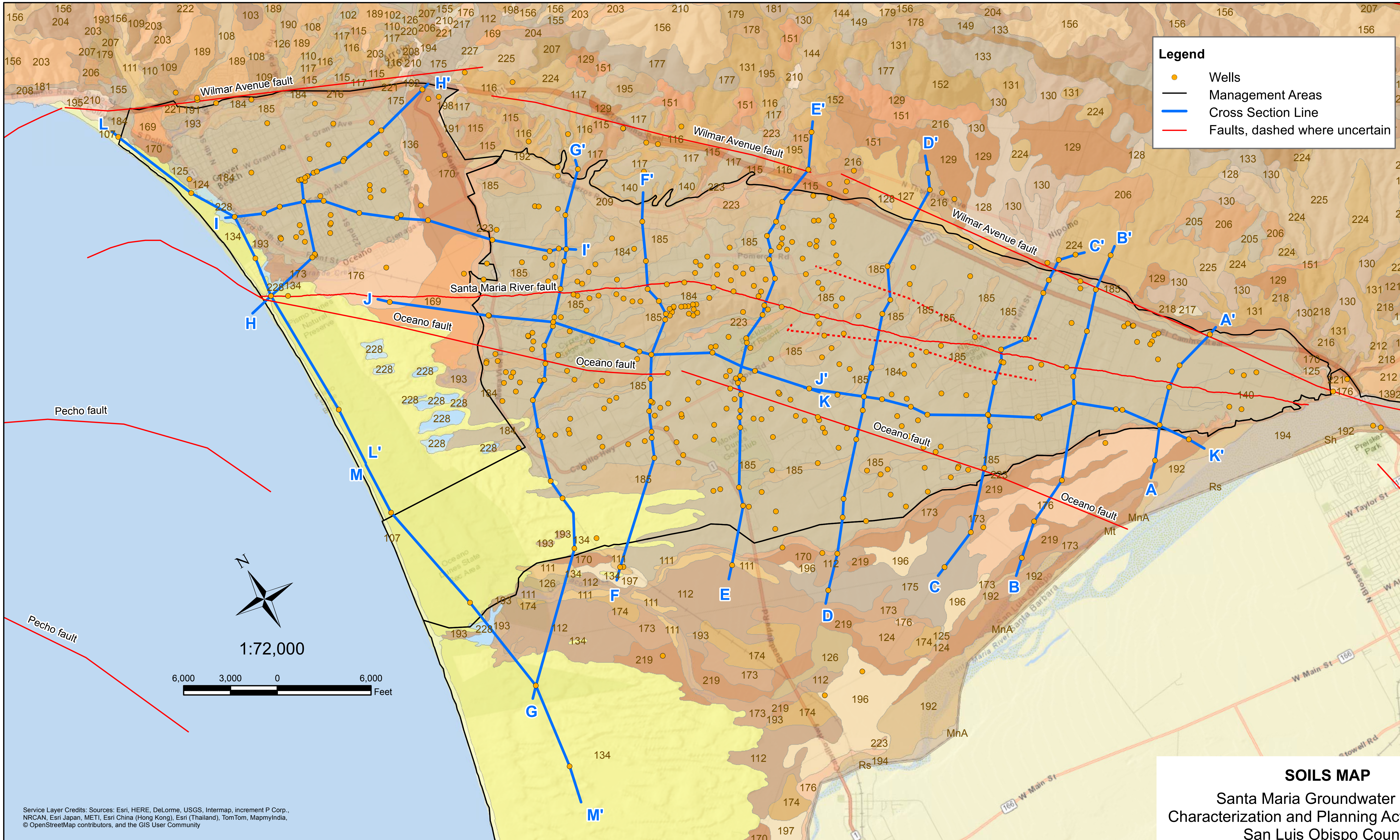
STREAM GAUGE AND SYNOPTIC LOCATIONS

Santa Maria Groundwater Basin
Characterization and Planning Activities Study
San Luis Obispo County



SOILS MAP

Santa Maria Groundwater Basin
Characterization and Planning Activities Study
San Luis Obispo County

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107	Beaches
109	Briones-Pismo loamy sands, 9 to 30 percent slopes, HSG-B
112	Camarillo loam, drained, HSG-C
111	Camarillo sandy loam, HSG-C
116	Chamise shaly loam, 15 to 30 percent slopes, HSG-C
115	Chamise shaly loam, 9 to 15 percent slopes, HSG-C
117	Chamise shaly sandy clay loam, 5 to 9 percent slopes, HSG-C
CnB	Coastal beaches
124	Corralitos sand, 0 to 2 percent slopes, HSG-A
125	Corralitos sand, 2 to 15 percent slopes, HSG-A
126	Corralitos variant loamy sand, HSG-C
127	Cropley clay, 0 to 2 percent slopes, HSG-D
129	Diablo clay, 5 to 9 percent slopes, HSG-D
134	Dune land
136	Elder sandy loam, 5 to 9 percent slopes, HSG-B
139	Elder sandy loam, occasionally flooded, 2 to 9 percent slopes, HSG-B
140	Garey sandy loam, 2 to 9 percent slopes, HSG-C
169	Marimel sandy clay loam, occasionally flooded, HSG-D
170	Marimel silty clay loam, drained, HSG-C
Mh	Marsh
MnA	Metz loamy sand, 0 to 2 percent slopes
173	Mocho fine sandy loam, HSG-B
174	Mocho loam, HSG-B
Mt	Mocho sandy loam, sandy substratum, overflow
175	Mocho silty clay loam, HSG-B
176	Mocho variant fine sandy loam, HSG-A
184	Oceano sand, 0 to 9 percent slopes, HSG-A
OcD3	Oceano sand, 2 to 15 percent slopes, severely eroded
185	Oceano sand, 9 to 30 percent slopes, HSG-A
189	Pismo loamy sand, 9 to 30 percent slopes, HSG-D
191	Pismo-Tierra complex, 9 to 15 percent slopes, HSG-D
192	Psamments and Fluvents, occasionally flooded
193	Psamments and Fluvents, wet
194/Rs	Riverwash
196	Salinas loam, 0 to 2 percent slopes, HSG-C
197	Salinas silty clay loam, 0 to 2 percent slopes, HSG-C
198	Salinas silty clay loam, 2 to 9 percent slopes, HSG-C
Sh	Sandy alluvial land
Sk	Sandy alluvial land, wet
StC	Sorrento sandy loam, 2 to 9 percent slopes
209	Still gravelly sandy clay loam, 0 to 2 percent slopes, HSG-B
214	Suey silt loam, 15 to 30 percent slopes, HSG-B
212	Suey silt loam, 2 to 9 percent slopes, HSG-B
218	Tierra loam, 15 to 30 percent slopes, HSG-D
216	Tierra sandy loam, 2 to 9 percent slopes, HSG-D
219	Tujunga loamy sand, 0 to 2 percent slopes, HSG-A
228	Water
221	Xererts-Xerolls-Urban land complex, 0 to 15 percent slopes
223	Xerorthents, escarpment
224	Zaca clay, 9 to 15 percent slopes, HSG-D
HSG	Hydrologic Soil Group

SOILS MAP KEY
Santa Maria Groundwater Basin
Characterization and Planning Activities Study
San Luis Obispo County

Service Layer Credits: Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, MapmyIndia, ©

EXISTING AND CANDIDATE WELLS FOR TRANSDUCER INSTALLATION

Santa Maria Groundwater Basin
Characterization and Planning Activities Study
San Luis Obispo County

PLATE 26

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APPENDICES

APPENDIX A
BIBLIOGRAPHY AND PREVIOUS STUDIES

APPENDIX A -- SUPPLEMENTAL DESCRIPTION OF PREVIOUS STUDIES

INTRODUCTION

Technical Memo No. 1 (TM No. 1) included brief summaries of several previous hydrogeologic studies performed in Santa Maria Groundwater Basin. The following paragraphs include more detailed summaries of selected previous studies that had data/information relevant for the Final Report. Important data and information summarized in this section is also incorporated in the main text of the report.

Woodring, W.P and Bramlette, M.N., 1950, *Geology and Paleontology of the Santa Maria District, CA,* USGS PP 222.

Woodring (1950) described Paso Robles Formation as a non-marine formation that conformably overlies Careaga Sandstone. The Paso Robles Formation is typically gray in color, but contains light brown silty clay and silty sand beds in the upper part of the formation. In general, the base of Paso Robles Formation is comprised of 50 to 100 feet of clay or clay and limestone. In some areas the clay may be missing at the base of Paso Robles Formation, in which case the base may consist of conglomerate that is difficult to distinguish from the upper Careaga Sandstone. Within the Paso Robles Formation, sand and gravel zones are separated from each other by gray to greenish-gray clay beds. Gravels in the Paso Robles Formation are primarily porcelaneous shale from the Monterey Formation, but also include porphyries and sandstone pieces. Chert and cherty shale pieces may also present in the upper portion of Paso Robles Formation.

Woodring (1950) described late Pliocene age Careaga Sandstone as being comprised of two units/members, a lower member (Cebada) that is finer-grained than the upper member (Graciosa). The overall thickness of Careaga Sandstone was said to be 50 to 1,425 feet, with the Cebada member ranging from 0 to 1,000 feet and the Graciosa member ranging from 25 to 425 feet in thickness. The Cebada member is comprised on unconsolidated very fine to fine-grained sand. The lower portion of Cebada is light gray to white and very fine-grained, but other portions of the Cebada are light yellow-brown. The Graciosa member is comprised on unconsolidated to consolidated sandstone and conglomerate. The lower portion of Graciosa contains gray to brown coarse-grained sandstone and conglomerate, with localized interbeds of medium-grained sandstone. The gravel in the lower portion of Graciosa is mostly porcelaneous shale except for red-gray quartzite and rhyolite porphyry in the upper third of the lower part of the member. The upper portion of Graciosa contains gray coarse-grained sand/sandstone with localized thin interbeds of gravel/conglomerate. The upper portion of the Graciosa member typically forms a distinct sandy horizon between the clay at the base of Paso Robles Formation and conglomerate of the lower portion of Graciosa member. The distinction of members described above is very common throughout the Santa Maria District, but locally the members are not well defined and the formation is considered undifferentiated. Woodring's descriptions were derived from outcrops/data to the south of the study area, and it is unknown how distinct the member characterization is within the study area.

Worts, G.F., 1951, *Geology and Ground-Water Resources of the Santa Maria Valley Area, California*, USGS Water-Supply Paper 1000.

The Paso Robles Formation (QTpr) was classified by Worts (1951) as upper Pliocene to lower Pleistocene in age. It is comprised of lenses of fine to coarse gravel, clay, fine to medium sand, and silt. Discontinuous and thin beds of limestone occur in the lower portion of the formation. The lenticular nature of the sediments (due to its largely non-marine origin) make it difficult to correlate clay layer or sand/gravel layers from one well log to the next. The formation was described by Worts as being 280 to 400 feet thick beneath Nipomo Mesa and becoming thicker as it extends beneath Santa Maria Valley. The Paso Robles Formation generally becomes finer grained near the coast (predominantly sand and clay) and locally may be of marine origin.

The Careaga Sand(stone) (Tc) is considered by Worts (1951) to be upper Pliocene in age and is generally comprised of white to yellow-brown fine to medium sand with silt and lenses of mega fossils. It also contains some lenses of conglomerate. It is considered to be of marine origin. Worts showed the formation to be 85 to 130 feet thick beneath Nipomo Upland and becoming thicker beneath Santa Maria Valley. Worts stated that the water-bearing properties of the Careaga were generally unknown (at the time of his study in 1951), and wells were generally not screened in this formation or were only screened in combination with screens in the overlying Paso Robles Formation. It was expected to be of relatively low permeability due to presence of silt (Worts, 1951).

The 1951 USGS report includes detailed discussion of the hydrogeologic properties (e.g., well yields, permeability) of various geologic formations (e.g., Paso Robles Formation, Careaga Sandstone). Few wells in Santa Maria Valley have been screened exclusively in Paso Robles Formation, but such wells had specific capacities of 5 to 10 gallons per minute per foot of drawdown (gpm/ft) with well yields ranging up to 1,000 gallons per minute (gpm). The permeability (hydraulic conductivity) for Paso Robles Formation derived from a recovery test at one well (T11N/R35W-20E1) was about 9 feet/day. The report stated no wells were available with screens exclusively in the Careaga Sandstone, and that well screens in this formation were generally avoided at this time due to sanding problems. Laboratory testing of Careaga Sandstone samples from the Santa Ynez Basin (where the formation was assumed to be similar) indicated permeabilites on the order of 9 feet/day.

A major syncline occurs in the study area and site vicinity with its axis beneath the south side of Santa Maria Valley. The north limb of the syncline extends beneath Nipomo Mesa, resulting in Paso Robles Formation and older beds gently dipping towards the south. The south limb of the syncline rises steeply beneath southern Santa Maria Valley. Several faults cut the Paso Robles Formation and Careaga Sand(stone) in the Santa Maria Valley - including the Santa Maria River Fault. The faults are covered/concealed by younger sediments, and their existence was determined from oil well logs. Fault movement is thought to be dominantly vertical. The Santa Maria River Fault has been characterized as a high angle thrust fault with uplift on the east side, and displacement of about 150 feet. The report only showed the Santa Maria River Fault below Santa Maria Valley and not beneath Nipomo Mesa – the Oceano and Wilmar Avenue Faults were not discussed. The overall syncline structure appears to extend out beneath the ocean along with the contained geologic formations. Thus, there are no known structural or depositional features that would preclude contact between the main fresh water body and seawater.

DWR, 1958, *San Luis Obispo County Investigation,* Bulletin No. 18, Vol. 1 and 2.

The alluvium of Arroyo Grande Basin (sand, gravel, and clay) is stated to be up to 200 feet thick, with occurrence of an extensive tidal lagoon clay deposit of silt and clay near the coast that forms a confining clay cap. Most wells in the area between Oceano and Arroyo Grande obtain groundwater from the Paso Robles Formation, with only a few wells obtaining water from the older dune sands in this area. Nipomo Mesa wells were reported to generally obtain water from Older dune sands and Paso Robles Formation, with Paso Robles Formation wells yielding more water than Older dune sand wells. Well yields in Arroyo Grande Basin ranged up to 1,200 gpm with an average of 360 gpm. Specific capacities averaged 40 gpm/ft with a maximum known of 500 gpm/ft. Nipomo Mesa wells yielded up to 1,500 gpm, but the average is only about 100 gpm. Specific capacities average 5 gpm/ft with a maximum of 29 gpm/ft. Geologic cross-sections included in the report provide DWR's interpretation of the stratigraphic relationships between various geologic formations in Arroyo Grande Basin and Nipomo Mesa.

Groundwater flow in Arroyo Grande Basin (as of 1954) was generally towards the ocean, although a pumping depression was noted in the area north of Oceano since 1945. However, groundwater elevations were still above sea level and sea water intrusion likely had not occurred. The report stated this cone of depression occurred within the Paso Robles Formation, which is less permeable than alluvium in the basin. It was believed that the area west of the pumping depression had a discontinuous clay layer that allowed deep percolation from the Old dune sands into Paso Robles Formation that helped maintain a seaward hydraulic gradient. Groundwater level fluctuations during the 1933-54 period indicate that while groundwater levels may decline significantly at times, the Arroyo Grande Basin tends to refill during wet seasons – resulting in wide fluctuations in water levels. Groundwater contours also indicated flow from Nipomo Mesa to the Arroyo Grande Basin. The estimated safe yields stated in the report were 9,500 AFY for Arroyo Grande Basin and 2,500 AFY for Nipomo Mesa.

With respect to Arroyo Grande Creek, the 1958 report stated a substantial amount of stream flow infiltrates in the upper portion of Arroyo Grande Basin, and that "effluent flow" of Arroyo Grande Creek (interpreted to mean groundwater discharging to the creek) begins three miles below the confluence of Lopez and Arroyo Grande creeks. Effluent flow increases downstream until it reaches the USGS gaging station at the town of Arroyo Grande. Below this point, stream flow percolates into the basin down to a location just below the Highway 1 Bridge at the edge of the alluvium clay cap. Upon reaching the clay cap essentially all stream flow continues on to the ocean.

For a base period of 1935-36 to 1950-51, the average annual streamflow measured at the USGS gauge (Arroyo Grande Creek at Arroyo Grande) was 20,700 AFY. Average monthly flows ranged from a low of 310 AF in September to 5,900 AF in March. The calculated longer-term (53-year) mean was 23,900 AFY.

DWR, 1970, *Sea-Water Intrusion: Pismo-Guadalupe Area*, Bulletin No. 63-3.

According to DWR (1970, Figure 3): Dune Sand (fine to medium grain) is up to 190 feet thick. Pismo Creek alluvium (fine to coarse sand and gravel with sandy silt, silt, and clay) is up to 80 feet thick – limited to Pismo Plain. Arroyo Grande Creek alluvium (fine to coarse sand and gravel with sandy silt and clay) is up to 130 feet thick. Los Berros Creek alluvium (fine to coarse sand and gravel with sandy silt and clay) is up to 100 feet thick. Older Dune Sand (fine to medium grain) is up to 40 feet thick beneath Tri-Cities Mesa and up to 150 feet thick beneath Nipomo Mesa. The Paso Robles Formation is up to 780 feet thick. It consists of fine to coarse sand and gravel, silty to clayey sand and gravel, and fine to medium silty sand, and contains 2 to 5 aquifers labeled (top to bottom) as A to E zones. The aquifers are separated by silt and clay confining beds near the coast but merge inland.

The study includes hydrogeologic cross-sections parallel and perpendicular to the coast in the Tri-Cities-Arroyo Grande Plain area. The Paso Robles Formation at the coast extends from sea level to about -300 feet MSL and is divided into three zones (A, B, and C) – each with overlying confining clay layers. The contact with the underlying Careaga Sandstone slopes upward towards the City of Arroyo Grande wellfield where the base of the Paso Robles Formation is at -150 to -200 feet MSL. The clay confining layers pinch out beneath the Grover Beach and Arroyo Grande wellfields, and coarse-grained layers in the Paso Robles Formation are more continuous in the vertical direction. (Note: The Grover Beach Wellfield Well 4 report identified the formation contact at a higher elevation than in DWR, 1970. Essentially, the upper Careaga Sandstone in the Well 4 report is Paso Robles Zone C in DWR, 1970.)

DWR describes the general well yield and permeability of the major geologic units. Arroyo Grande Creek alluvium reaches a maximum thickness of 130 feet with an upper 50-foot thick zone of fine to coarse sand and gravel with sandy silt and clay of moderate to high permeability (13 to more than 67 ft/day), and a lower 80-foot thick zone of medium to coarse sand and gravel with local occurrence of cobbles with sandy silt and clay of high permeability (more than 67 ft/day). Maximum specific capacities are 14 gpm/ft in the upper zone and 50 gpm/ft in the lower zone. Paso Robles Formation is described as fine to coarse sand and gravel, clayey to silty sand and gravel, and fine to medium silty sand. Two to five aquifer zones are separated by clay layers near the coast but merge together inland. Paso Robles Formation is described as having moderate to high permeability (13 to more than 67 ft/day) and maximum specific capacity of 90 gpm/ft. It is considered to occur under confined conditions near the coast and under alluvium, and ranges from unconfined to confined beneath mesas. Careaga Sandstone is described as fine to coarse sand with gravel, fine to medium sand, and silty sand. Careaga typically consists of two to three undifferentiated aquifer zones separated by silt/clay layers. It is characterized by low to moderate permeability (less than 13 to 67 ft/day). The Pismo Formation consists of fine to coarse sand interbedded with hard sandstone, and is considered to be of low to moderate permeability (less than 13 to 67 ft/day). The upper portion of the Pismo Formation is considered to be equivalent to Careaga Sandstone. The Pismo Formation is stated to be limited to the San Luis Hills, where it is unconfined and tapped by domestic wells.

DWR, 1979, *Groundwater in the Arroyo Grande Area:* Southern District Report.

DWR stated the Paso Robles Formation attains its maximum thickness of 1,000 feet beneath the Santa Maria River. Monitoring well data indicate a fault is present between monitoring wells POO-5 and PSBO-1 near the Arroyo Grande Creek outlet to the ocean. A major syncline runs beneath Santa Maria Valley, the axis of which runs beneath the Santa Maria River outlet to the ocean and extends offshore. The north limb of the syncline is of more gentle slope and extends 8 miles to a fault near monitoring well POO-5, and the south limb is about 1.5 miles in length. A map of the base of fresh water ranges from -1300 feet MSL beneath the Santa Maria Valley at the syncline axis near the ocean to +100 in eastern Nipomo Mesa along Highway 1. Along the coast, DWR defined an Upper Aquifer System with a base ranging from about -250 to -350 feet MSL, and a Lower Aquifer System to a depth ranging from about -650 to -900 feet MSL (deeper beneath Santa Maria Valley to about -1150 feet MSL). The two-tier aquifer system bases become shallower inland and less well-defined.

DWR stated that the coastal aquifer system for Nipomo Mesa was comprised of upper aquifer overlain by not more than 20 feet of clay and underlain by 60 feet of clay. Paso Robles Formation well yields ranged from 200 gpm in eastern Nipomo Mesa to 1,600 gpm in western Nipomo Mesa.

Chipping, 1994, *Black Lake Canyon Geologic and Hydrologic Study*, prepared for the Land Conservancy of San Luis Obispo County.

Chipping (1994) notes that Morro Group (1990, South County Area Plan Draft EIR) interpreted the top of Paso Robles Formation to be exposed in the bottom of the upper Black Lake canyon. The soil units mapped in the central/western portion of Black Lake canyon are Ocean Sand (184/185) – noted as being high permeability. A low permeability soil unit (Xerothents/223) is mapped in the south portion of the eastern canyon area. In the western portion of the canyon, sediments containing gray clay/silt layers are exposed in the northern canyon walls. The dip of beds is towards the west/southwest at an angle that is slightly less than the slope of the western portion of the canyon floor (the slope of the eastern portion of the canyon floor is less than in the western portion). The perched aquifer is likely only supported (i.e., clay layer present at shallow horizon) in the upper part of the canyon. Older Dune Sands generally do not extend very far below the canyon floor.

There are two aquifers in Black Canyon – the “Upper Aquifer” extends to a depth of 55 feet below the floor of the upper canyon, and a “Lower Aquifer” at a depth of 200 feet below the canyon floor. SWLs in the upper/lower aquifers reportedly differ by 175 feet in the upper canyon and by 75 feet in the lower canyon. Chipping (1994) theorized that the aquitard between the Upper/Lower aquifers becomes leaky in the lower part of the canyon, and that regional drawdown from pumping of the Lower Aquifer has caused increased infiltration through the floor of the lower canyon.

Cleath and Associates, 1996, *USI Water Resources Management Study for The Woodlands*.

Cleath stated the Older Dune Sand contains clay layers that caused shallow perched groundwater conditions and, while not continuous, are prevalent enough to allow construction of a structure contour map of the bottom of the shallow aquitard (perching clay layer) and an isopach (thickness) map of the clay layer. The base of the shallow aquitard is indicated to range from about -60 feet MSL along the southwestern edge of Nipomo Mesa to +120 feet MSL in northeastern Nipomo Mesa with an aquitard thickness ranging from less than 10 feet (southwestern area) to 70 feet (northwestern area).

Cleath describes Paso Robles Formation as being comprised of alternating layers of sandy gravel and silt/clay, with the gravel composed of Monterey Shale pebbles in a sandy to clayey matrix. Cleath stated the formation thickness varies from 600 feet in the southwestern portion of the mesa to less than 100 feet in the northeast area. Cleath estimated 370 feet of displacement of the base of the Paso Robles Formation along the Oceano Fault, thereby causing a significantly decreased formation thickness northeast of the fault zone. Cleath indicated their review of pumping test data showed a range of hydraulic conductivity from 5 to 50 feet/day and storativity of 0.002 to 0.003 (indicative of semi-confined aquifer conditions) for Paso Robles Formation.

The effective base of fresh water is generally taken to be the base of the Careaga Sand(stone). The base of permeable sediments ranges from -900 feet MSL on the southwest edge of Nipomo Mesa to +100 feet MSL near Highway 101. The two members of the Careaga Sand(stone) are a lower (older) fine-grained yellow-brown Cebada member and an upper (younger) coarse-grained Graciosa member. The Graciosa member is generally gray in color and can be further subdivided into an upper red-gray coarse sand with quartzite and rhyolite porphyry constituents and a lower conglomerate comprised of porcelaneous shale. The Careaga thins to the east and northeast beneath Nipomo Mesa, and is offset across the Oceano Fault (Cleath, 1996).

Cleath (1996) noted that previous estimates of rainfall percolation on Nipomo Mesa ranged from 12 to 28 percent of total rainfall, and estimated percolation to be 25 percent of rainfall. Cleath (1996) describes stratigraphy at the Woodlands site as orange-brown sand from surface to 130 feet bags (silt content increasing with depth), tan to light brown sand with minor gravel from 130 to 270 feet bags, and Paso Robles Formation from 270 to 700 feet bags that includes five sand/gravel aquifer zones. Groundwater flow in the shallow perched zone was towards the southwest, whereas deep groundwater flow was towards the northwest and towards pumping depressions.

LSCE, 2000, *Development of a Numerical Ground-Water Flow Model and Assessment of the Ground-Water Basin Yield, Santa Maria Valley Ground-Water Basin,* prepared for the Santa Maria Valley Water Conservation District.

Aquifer characteristics were evaluated based upon aquifer test data presented in Worts (1951), specific capacity data from USGS (Hughes and Freckleton, 1976, Ground-Water Data for the Santa Maria Valley, California, OFR), and specific capacity data from Water Well Drillers Reports. Estimated hydraulic conductivity values ranged from 270 to 600 feet/day for alluvium, 2 to 15 feet/day for Paso Robles Formation in the Nipomo Mesa and western part of Santa Maria Valley, and 13 to 50 feet/day for Paso Robles Formation in the Sisquoc Plain/Orcutt Upland/central valley areas. Careaga Sandstone was assumed to be 9.5 feet/day based on very limited laboratory test data from Worts (1951). No data were available for Older Dune Sand and it was assumed to have a hydraulic conductivity value of 175 feet/day. Specific yield values of 8 to 12 percent for Paso Robles and Careaga Sandstone formations, and 13 percent for Older Dune Sand were derived from DWR (2002).

The calibrated MODFLOW model K values in the Nipomo Mesa area were 20 to 30 feet/day for the two uppermost layers (stated to represent Paso Robles Formation), a range of 5 to 10 feet/day for the lower portion of Paso Robles and Careaga Sand formations, and 100 to 200 feet/day for Santa Maria Valley alluvium adjacent to Nipomo Mesa.

DWR, 2002, *Water Resources of the Arroyo Grande – Nipomo Mesa Area*, Southern District Report.

The Santa Maria Groundwater Basin is bounded by the Wilmar Avenue Fault on the north and east – separating it from the Pismo Creek Valley, Arroyo Grande Valley, and Nipomo Valley Subbasins. The western boundary is the Pacific Ocean, although geologic units (aquifers and aquitards) extend offshore. The water-bearing sediments in the basin are underlain by bedrock, which is vertically displaced across the Wilmar Avenue, Santa Maria River, and Oceano faults. The Main Groundwater Basin has aquifers under unconfined conditions, semi-confined to confined aquifer conditions, and perched zones – discontinuous clay layers separate the aquifer zones. The most productive aquifers are in alluvium and Paso Robles Formation.

The Paso Robles Formation was deposited under a range of conditions from fluvial to estuarine-lagoonal in inland areas and nearshore marine at the coast. It is typically described in lithologic logs as gray, brown, tan, white, blue, green, yellow, fine to coarse grained gravel and clay, sand and clay, shale gravel, silt, clay, silty clay, sandy clay, lenses of gravel and sand. Where Paso Robles Formation overlies Careaga or Pismo it can be difficult to distinguish in well logs. The formation base may consist of beds of 50 to 100 feet thick clay and freshwater limestone, or conglomerate. Formation thickness ranges from 200 feet near northwest margin of basin to 700 feet at Santa Maria River. Individual beds in the formation are laterally discontinuous and difficult to correlate between wells – nonetheless, DWR cross-sections did identify fairly continuous clayey silt to silty clay beds.

The Careaga Formation was deposited in shallow marine water conditions in late Pliocene time. It is generally described in lithologic logs as fine to coarse grained, blue, blue-gray, white, gray, green, yellow, brown, yellow-brown sand, gravel, silty sand, silt, and clay. Shell fragments are common in clays and sometimes in sand/gravels. The Careaga Sandstone is about 150 feet thick under Nipomo Mesa (south of Santa Maria Fault) but thickens to 700 feet under the Santa Maria River (DWR, 2002).

DWR identified the Oceano and Wilmar Avenue faults as northeast-dipping reverse faults. The Santa Maria River Fault is noted as being proposed by Hall (1982), and is postulated to occur between the Wilmar and Oceano Faults within the study area. DWR (2002) notes evidence of Santa Maria River Fault from differences in groundwater levels between Highway 1 and one mile east of Zenon Way. DWR geologic cross-sections show vertical offset along these faults of 90 to 250 feet. The faults are shown as offsetting Paso Robles and older formations beneath Nipomo Mesa. The Santa Maria and Oceano faults are shown as merging at the coast, and evidence indicates the fault extends offshore south of Oceano.

DWR reported that lower K values occur north of Santa Maria River fault beneath Nipomo Mesa. T values for alluvium in Santa Maria River Valley were reported to range from

200,000 to 400,000 gallons per day per foot (gpd/ft), and up to 100,000 gpd/ft in Arroyo Grande Valley alluvium. Transmissivity (T) values of 100 to 160,000 gpd/ft were reported for Paso Robles Formation in the Nipomo Mesa/Santa Maria Valley area, with the higher values occurring south of Oceano fault and in Santa Maria Valley. Transmissivity values for the Careaga Sandstone were stated to be similar to Paso Robles Formation, with the lowest values of 100 to 4,000 gpd/ft occurring north of Santa Maria River fault in Nipomo Mesa. Paso Robles Formation T values in the Tri-Cities/Arroyo Grande Plain area were reported to be 20,000 to 130,000 gpd/ft. T values of 3,000 to 30,000 gpd/ft were reported for the Squire Member of the Pismo Formation (also referred to as Careaga Sandstone) in the Tri-Cities/Arroyo Grande Plain.

Papadopulos & Associates, 2004, *Nipomo Mesa Groundwater Resource Capacity Study, San Luis Obispo County, California*, prepared for San Luis Obispo County.

Papadoplous conducted a Resource Capacity Study for Nipomo Mesa. Their analysis was largely based on previous studies as of 2004, although some simplified sea water intrusion modeling was conducted as part of their study – primarily to evaluate lag times. The main inflow components for Nipomo Mesa were considered to be rainfall percolation (estimates of which vary widely) and subsurface inflow from Santa Maria Valley. The main outflow components were considered to be groundwater pumping and subsurface outflow.

Papadoupolus noted that perched groundwater in the older dune sands occurs on top of clay layers within the dune sands and fine-grained layers in the upper portion of Paso Robles Formation. It was believed that lateral flow of perched water along these fine-grained layers discharged to Black Lake Canyon and other coastal drainages and lakes west of Nipomo Mesa. Groundwater levels higher than 100 feet MSL likely reflected wells screened in a perched aquifer.

According to Papadopulos, water well lithologic logs indicate Nipomo Mesa Dune Sands are 150 to 250 feet thick. Groundwater in Dune Sand was stated to be of minor significance, with major aquifers being in underlying Paso Robles Formation, which is in hydraulic continuity with Santa Maria Valley groundwater basin. K values of Paso Robles Formation were estimated to range from 2 to 15 feet/day.

Papadopolus stated that the aquifer system was continuous offshore. Groundwater samples collected as of the time of their study did not indicate salt water intrusion. However, there was concern about exposure of Careaga Sandstone as a conduit for salt water intrusion – especially given slightly elevated chloride concentrations in two coastal monitoring wells screened in that formation. Groundwater modeling indicated there may be significant lag times for salt water intrusion to occur from inland pumping depressions depending on the location of the salt water – fresh water interface.

Todd Engineers, 2007, *Water Balance Study for the Northern Cities Area,* prepared for City of Pismo Beach, City of Grover Beach, and City of Arroyo Grande, and Oceano Community Services District.

Todd Engineers conducted a water balance study for the NCMA. The quantified components of inflow included rainfall percolation, streamflow percolation, artificial recharge, treated wastewater percolation, and irrigation return flows. The quantified components of outflow included urban pumping, agricultural pumping, and subsurface outflow. For subsurface inflow and outflow calculations, Todd assigned hydraulic conductivity values assigned to various geologic formations. Todd stated these K values are approximately equal to the geometric mean values of data provided by DWR (2002).

The report section on streamflow recharge described a previous study by Hoover and Associates (1985, Stream Infiltration Study, Arroyo Grande Creek, Zone 3 Conjunctive Use Study, San Luis Obispo County, CA) that included two streamflow synoptic surveys conducted in June 1984. Results of the Hoover survey indicated a net streamflow loss of 3 cubic feet per second (cfs) between the USGS gauge and 22nd Street Bridge when total streamflow at the USGS gauge was 3 cfs.

The study includes an appendix with results of a synoptic streamflow survey on Arroyo Grande Creek conducted in April 2006, the results of which indicated a streamflow loss of 2.2 cubic feet per second between the USGS guage and Highway 1 Bridge, a streamflow gain of 0.5 cfs between Highway 1 Bridge and 22nd Street Bridge, and a net overall streamflow loss of 1.7 cfs between USGS guage and 22nd Street Bridge. This synoptic streamflow survey was conducted with an overall measured streamflow of 24 cfs at the USGS gauge.

NMMA Technical Group, *2010, Nipomo Mesa Management Area*, 2nd Annual Report, Calendar Year 2009.

According to the Nipomo Mesa Management Area Technical Group (NMMA TG), Nipomo Mesa dune sands are 150 to 300 feet thick. The only Quaternary Alluvium within NMMA is in Black Lake Canyon and ranges up to 30 feet thick. Aquifers/aquitards were noted as being more continuous near the coast than inland (NMMA Technical Group, 2010).

The NMMA TG stated the Paso Robles Formation is about 150 feet thick near Nipomo Creek at eastern boundary of NMMA and becomes about 500 feet thick at the NMMA southwestern boundary. Paso Robles Formation was reported to consist of fine to coarse sand and gravel, silty to clayey sand and gravel, and fine to medium silty sand, and contains 2 to 5 aquifers labeled (top to bottom) as A to E zones. Aquifers/aquitards were noted as being more continuous near the coast than inland. K values estimated for Paso Robles Formation range from 13 to 52 ft/d south of Nipomo Mesa and from 2 to 15 ft/d beneath Nipomo Mesa (NMMA Technical Group, 2010).

The NMMA TG interpretation of the location of the Santa Maria River Fault differs from that presented in DWR (2002). The Oceano Fault was first recognized by DWR (1970; cross-section A-A') and later by PG&E onshore/offshore seismic reflection and oil well data. The Oceano Fault extends offshore south of Oceano. Previous work indicated downward (on the coast side) vertical movement along the Oceano and Santa Maria River faults of up to hundreds of feet. Well logs suggest overlapping/multiple slip surfaces along these faults, interpretation of which is complicated by general lack of continuity of layers within the Paso Robles Formation.

The NMMA TG analysis indicated that the deep aquifer is confined in much of the region between the coast and Oceano fault; however, further definition of areas of confined vs. unconfined conditions were considered to be subject to further study. Based on review of available groundwater elevation data, the NMMA TG concluded that the Santa Maria River fault does not impede groundwater flow in the deep aquifer.

Burton, C.A., Land, M.T., and K. Belitz, *2013, Status and Understanding of Groundwater Quality in the South Coast Range – Coastal Study Unit, 2008: California GAMA Priority Basin Project*, USGS Scientic Investigtions Report 2013-5053.

The USGS conducted a study of a relatively large region referred to as the South Coast Range-Coastal Study Unit as part of their Groundwater Ambient Monitoring and Assessment (GAMA) program. The USGS study area included NCMA and NMMA, as well as areas to the north and a large region to the south. The study was based on water quality and related data collected by USGS in 2008 from 55 wells spatially distributed throughout the South Coast study area. Approximately 4 of the 55 wells appear to be located within either NCMA or NMMA. The study purpose was to characterize current organic and inorganic groundwater quality, and to attempt to identify natural and human factors impacting groundwater quality.

The primary factor identified related to elevated concentrations of inorganic constituents (such as arsenic, iron, and manganese) was dissolved oxygen (DO). These inorganic constituent concentrations increased as DO decreased. Other potential factors identified included groundwater age – higher iron and manganese in older water, whereas there was higher nitrate, total dissolved solids (TDS), and sulfate in younger water; and land use with higher nitrate, TDS, and sulfate in agricultural areas compared to natural areas.

APPENDIX B
LITHOLOGIC SYMBOLS

Appendix B. Lithologic Symbols

Order	Symbol	Description	USCS	Soil_Type	Soil_Type_Main
01-CL-01	CL	Lean CLAY	CL	Clay	Clay
01-CL-02	CLML	Silty CLAY	CL-ML	Clay	Clay
01-CL-03	CLML-WS	Silty CLAY with Sand	CL-ML	Clay	Clay
	CLML-WS	Sandy Silty CLAY	CL	Clay	Clay
01-CL-04	CL-WS	Lean CLAY with Sand	CL	Clay	Clay
01-CL-05	CL-S	Sandy Lean Clay	CL	Clay	Clay
	CL-S	Sandy CLAY with Sand	CL	Clay	Clay
01-CL-06	CL-S-G	Sandy, Gravelly Lean CLAY	CL	Clay	Clay
	CL-S-G	CLAY, Sand, and Gravel	CL	Clay	Clay
	CL-S-G	Sandy CLAY and Gravel	CL	Clay	Clay
	CL-S-G	CLAY, Gravel, and Sand	CL	Clay	Clay
	CL-S-G	CLAY with Gravel and Sand	CL	Clay	Clay
	CL-S-G	Sandy CLAY with Gravel	CL	Clay	Clay
	CL-S-G	CLAY with Sand and Gravel	CL	Clay	Clay
01-CL-07	CL-G	Gravelly Lean CLAY	CL	Clay	Clay
	CL-G	Clay and Gravel	CL	Clay	Clay
	CL-G	CLAY with Gravel	CL	Clay	Clay
01-CL-08	CLCH	Lean to Fat CLAY	CL-CH	Clay	Clay
01-CL-09	CH	Fat CLAY	CH	Clay	Clay
01-CL-10	CHMH	Silty, Fat CLAY	CH	Clay	Clay
01-CL-11	CH-WS	Fat CLAY with SAND	CH	Clay	Clay
01-CL-12	CH-S	Sandy Fat CLAY	CH	Clay	Clay
01-CL-13	CH-G	Gravelly Fat CLAY	CH	Clay	Clay
01-CL-14	CL-GPGC	CLAY and Shale Gravel	CL	Clay	Clay
	CL-GPGC	Sandy CLAY and Shale Gravel	CL	Clay	Clay
	CL-GPGC	CLAY with Shale Gravel and Sand	CL	Clay	Clay
02-ML-01	ML	Silt	ML	Silt	Silt
02-ML-02	MLCL	Clayey SILT	ML	Silt	Silt
02-ML-03	ML-WS	SILT with Sand	ML	Silt	Silt
02-ML-05	ML-S-G	Sandy, Gravelly SILT	ML	Silt	Silt
02-ML-06	ML-S	Sandy SILT	ML	Silt	Silt
	ML-S	SILT and Sand	ML	Silt	Silt
02-ML-06	ML-G	Gravelly SILT	ML	Silt	Silt
02-ML-07	MH	Elastic Silt	MH	Silt	Silt
02-ML-08	MH-WS	Elastic Silt with Sand	MH	Silt	Silt
02-ML-09	MH-S	Sandy Elastic Silt	MH	Silt	Silt

Appendix B. Lithologic Symbols

Order	Symbol	Description	USCS	Soil_Type	Soil_Type_Main
03-SP-01	SP	Poorly-Graded SAND	SP	Sand/Gravel	Sand
03-SP-02	SPSC	Poorly-Graded SAND with Clay	SP-SC	Sand/Gravel	Sand
	SPSC	SAND, some Clay	SPSC	Sand/Gravel	Sand
	SPSC	SAND and Sandy Clay	SPSC	Sand/Gravel	Sand
03-SP-03	SPSM	Poorly-Graded SAND with Silt	SP-SM	Sand/Gravel	Sand
03-SP-04	SPSM-G	Gravelly Poorly-Graded SAND with Silt	SP-SM	Sand/Gravel	Sand
03-SP-05	SP-G	Gravelly Poorly-Graded SAND	SP	Sand/Gravel	Sand
	SP-G	SAND and Gravel	SP	Sand/Gravel	Sand
	SP-G	SAND with Gravel	SP	Sand/Gravel	Sand
03-SP-06	SW	Well-Graded SAND	SW	Sand/Gravel	Sand
03-SP-08	SWSC	Well-Graded SAND with Clay	SW	Sand/Gravel	Sand
03-SP-09	SWSM	Well-Graded SAND with Silt	SW-SM	Sand/Gravel	Sand
03-SP-10	SW-G	Gravelly Well-Graded SAND	SW	Sand/Gravel	Sand
03-SP-11	SC	Clayey SAND	SC	Sand/Gravel	Sand
	SC	SAND and Clay	SC	Sand/Gravel	Sand
03-SP-12	SCCL	Clayey SAND to Lean CLAY	SC-CL	Sand/Gravel	Sand
03-SP-13	SCSM	Clayey to Silty SAND	SC-SM	Sand/Gravel	Sand
	SCSM	SAND, Silt, some Clay	SM-CL	Sand/Gravel	Sand
03-SP-14	SC-G	Gravelly, Clayey SAND	SC	Sand/Gravel	Sand
	SC-G	Gravelly SAND and Clay	SC	Sand/Gravel	Sand
	SC-G	Clayey SAND and Gravel	SC	Sand/Gravel	Sand
	SC-G	SAND, Gravel, and Clay	SC	Sand/Gravel	Sand
	SC-G	SAND and Clay with Gravel	SPSC	Sand/Gravel	Sand
	SC-G	SAND with Gravel and Clay	SPSC	Sand/Gravel	Sand
	SC-G	SAND and Gravel with Clay	SPSC	Sand/Gravel	Sand
03-SP-15	SM	Silty SAND	SM	Sand/Gravel	Sand
03-SP-16	SMML	Silty SAND to Sandy SILT	SM-ML	Sand/Gravel	Sand
03-SP-17	SM-G	Gravelly Silty SAND	SM	Sand/Gravel	Sand
03-SP-18	FILL	Fill		Sand/Gravel	Sand
03-SP-19	SP-GPGC	SAND and Shale Gravel	SPSC	Sand/Gravel	Sand
04-GP-01	GP	Poorly-Graded GRAVEL	GP	Sand/Gravel	Gravel
04-GP-02	GPGC	Poorly-Graded GRAVEL with Clay	GP-GC	Sand/Gravel	Gravel
04-GP-03	GPGM	Poorly-Graded GRAVEL with Silt	GP-GM	Sand/Gravel	Gravel
04-GP-04	GPGM-S	Sandy GRAVEL with Silt	GP-GM	Sand/Gravel	Gravel
04-GP-05	GP-S	Sandy GRAVEL	GP	Sand/Gravel	Gravel
	GP-S	GRAVEL and Sand	GP	Sand/Gravel	Gravel
	GP-S	GRAVEL with Sand	GP	Sand/Gravel	Gravel
04-GP-06	GW	Well-Graded GRAVEL	GW	Sand/Gravel	Gravel
04-GP-07	GWGC	Well-Graded GRAVEL with Clay	GW-GC	Sand/Gravel	Gravel
04-GP-08	GWGM	Well-Graded GRAVEL with Silt	GW-GM	Sand/Gravel	Gravel
04-GP-09	GW-S	Sandy Well-Graded GRAVEL	GW	Sand/Gravel	Gravel

Appendix B. Lithologic Symbols

Order	Symbol	Description	USCS	Soil_Type	Soil_Type_Main
04-GP-10	GC	Clayey GRAVEL	GC	Sand/Gravel	Gravel
	GC	GRAVEL in Clay	GC	Sand/Gravel	Gravel
04-GP-11	GCCL	Clayey GRAVEL to Lean CLAY	GC-CL	Sand/Gravel	Gravel
04-GP-12	GCGM	Clayey to Silty GRAVEL	GC-CM	Sand/Gravel	Gravel
04-GP-13	GC-S	Sandy, Clayey GRAVEL	GC	Sand/Gravel	Gravel
	GC-S	GRAVEL with Sand and Clay	GP-GC	Sand/Gravel	Gravel
	GC-S	GRAVEL, Sand, and Clay	GC	Sand/Gravel	Gravel
	GC-S	Sandy GRAVEL with Clay	GP-GC	Sand/Gravel	Gravel
	GC-S	GRAVEL and Sandy Clay	GC	Sand/Gravel	Gravel
04-GP-14	GM	Silty Gravel	GM	Sand/Gravel	Gravel
04-GP-15	GM-S	Sandy, Silty GRAVEL	GM	Sand/Gravel	Gravel
04-GP-16	COBBLE	Cobble		Sand/Gravel	Gravel
04-GP-17	GPGC	Shale GRAVEL	GP-GC	Sand/Gravel	Gravel
	GPGC	Cemented Shale GRAVEL	GP-GC	Sand/Gravel	Gravel
	GPGC	Shale GRAVEL and Sand	GP-GC	Sand/Gravel	Gravel
	GPGC	Shale GRAVEL, Sand, and Clay	GP-GC	Sand/Gravel	Gravel
	GPGC	Shale GRAVEL and Sandy Clay	GP-GC	Sand/Gravel	Gravel
05-OG-01	OL	Low-Plasticity Organic	OL	Organic/Asphalt/Igneous	Organic
05-OG-02	OH	High-Plasticity Organic	OH	Organic/Asphalt/Igneous	Organic
05-OG-03	PEAT	PEAT		Organic/Asphalt/Igneous	Organic
06-CX-01	CX	Claystone		Clayey Sedimentary	Rock- Sedimentary
06-CX-03	SHALE	SHALE		Clayey Sedimentary	Rock- Sedimentary
06-CX-04	SHALE-O	Overburden SHALE		Clayey Sedimentary	Rock- Sedimentary
06-CX-05	SHALE-W	Weathered SHALE		Clayey Sedimentary	Rock- Sedimentary
06-CX-02	MUDST	MUDSTONE		Silty Sedimentary	Rock- Sedimentary
07-SX-01	MX	SILTSTONE		Silty Sedimentary	Rock- Sedimentary
07-SX-02	MX-W	Weathered SILTSTONE		Silty Sedimentary	Rock- Sedimentary
08-SX-01	SX	SANDSTONE		Coarse-Grained Sedimentary	Rock- Sedimentary
08-SX-02	SX-O	Overburden SANDSTONE		Coarse-Grained Sedimentary	Rock- Sedimentary
08-SX-03	SX-W	Weathered SANDSTONE		Coarse-Grained Sedimentary	Rock- Sedimentary
08-SX-04	SX-W-P	Weathered Pumiceous SANDSTONE		Coarse-Grained Sedimentary	Rock- Sedimentary
08-SX-05	SX-MX	SANDSTONE to SILTSTONE		Coarse-Grained Sedimentary	Rock- Sedimentary
08-SX-06	SX-FOS	Fossiliferous SANDSTONE		Coarse-Grained Sedimentary	Rock- Sedimentary
08-SX-07	SX-CON	Conglomeritic SANDSTONE		Coarse-Grained Sedimentary	Rock- Sedimentary
08-SX-08	SX-CAL	Calcareous SANDSTONE		Coarse-Grained Sedimentary	Rock- Sedimentary
08-SX-09	SX-P	Pumiceous SANDSTONE		Coarse-Grained Sedimentary	Rock- Sedimentary
08-SX-10	SX-TUFF	Tuffaceous SANDSTONE		Coarse-Grained Sedimentary	Rock- Sedimentary
08-SX-11	GX	Conglomerate		Coarse-Grained Sedimentary	Rock- Sedimentary
08-SX-12	GX-W	Weathered Congolmerate		Coarse-Grained Sedimentary	Rock- Sedimentary
08-SX-13	RF	ROCK Fragments		Coarse-Grained Sedimentary	Rock- Sedimentary
08-SX-14	BRECCIA	Breccia		Coarse-Grained Sedimentary	Rock- Sedimentary
09-SX-15	RX	Rock		Coarse-Grained Sedimentary	Rock- Sedimentary

Appendix B. Lithologic Symbols

Order	Symbol	Description	USCS	Soil_Type	Soil_Type_Main
09-LX-01	DX	Dolomite		Carbonate	Rock- Sedimentary
09-LX-02	LX	Limestone		Carbonate	Rock- Sedimentary
09-LX-03	LX-TUFF	Tuffaceous LIMESTONE		Carbonate	Rock- Sedimentary
09-LX-04	MARL	MARL		Carbonate	Rock- Sedimentary
09-LX-05	MARL-O	Overburden MARL		Carbonate	Rock- Sedimentary
09-LX-06	MARL-W	Weathered MARL		Carbonate	Rock- Sedimentary
10-IG-01	BASALT	Basalt		Organic/Asphalt/Igneous	Rock- Igneous
10-IG-02	BASALT-O	Overburden Basalt		Organic/Asphalt/Igneous	Rock- Igneous
10-IG-03	BASALT-W	Weathered Basalt		Organic/Asphalt/Igneous	Rock- Igneous
10-IG-04	BASALT-HW	Highly-Weathered BASALT		Organic/Asphalt/Igneous	Rock- Igneous
10-IG-05	BASALT-F	Fractured BASALT		Organic/Asphalt/Igneous	Rock- Igneous
10-IG-06	BASALT-B	Brecciated BASALT		Organic/Asphalt/Igneous	Rock- Igneous
10-IG-07	AGG	Agglomerate		Organic/Asphalt/Igneous	Rock- Igneous
10-IG-08	IG	Igneous Rock		Organic/Asphalt/Igneous	Rock- Igneous
10-IG-09	TUFF	TUFF		Organic/Asphalt/Igneous	Rock- Igneous
10-IG-10	TUFF-O	Overburden TUFF		Organic/Asphalt/Igneous	Rock- Igneous
10-IG-11	TUFF-W	Weathered TUFF		Organic/Asphalt/Igneous	Rock- Igneous
10-IG-12	TUFF-P	Pumiceous TUFF		Organic/Asphalt/Igneous	Rock- Igneous
10-IG-13	TUFF-AGG	Agglomeritic TUFF		Organic/Asphalt/Igneous	Rock- Igneous
	TUFF-ANDESITIC	TUFF/Andesitic		Organic/Asphalt/Igneous	Rock- Igneous
10-IG-14	TUFF-ASH	TUFF/Volcanic Ash		Organic/Asphalt/Igneous	Rock- Igneous
10-IG-15	TUFF-LAPILLI	Lapilli TUFF		Organic/Asphalt/Igneous	Rock- Igneous
10-IG-16	ANDESITE-F	Andesite- Fresh		Organic/Asphalt/Igneous	Rock- Igneous
10-IG-17	ANDESITE-SW	Andesite- Slightly Weathered		Organic/Asphalt/Igneous	Rock- Igneous
10-IG-18	ANDESITE-MW	Andesite- Moderately Weathered		Organic/Asphalt/Igneous	Rock- Igneous
10-IG-19	ANDESITE-HW	Andesite- Highly Weathered		Organic/Asphalt/Igneous	Rock- Igneous
10-IG-20	ANDESITE-CW	Andesite- Completely Weathered		Organic/Asphalt/Igneous	Rock- Igneous
10-IG-21	ANDESITIC_AGGL-F	Andesitic Agglomerate- Fresh		Organic/Asphalt/Igneous	Rock- Igneous
10-IG-22	ANDESITIC_AGGL-SW	Andesitic Agglomerate- Slightly Weathered		Organic/Asphalt/Igneous	Rock- Igneous
10-IG-23	ANDESITIC_AGGL-MW	Andesitic Agglomerate- Moderately Weathered		Organic/Asphalt/Igneous	Rock- Igneous
10-IG-24	ANDESITIC_AGGL-HW	Andesitic Agglomerate- Highly Weathered		Organic/Asphalt/Igneous	Rock- Igneous
10-IG-25	ANDESITIC_AGGL-CW	Andesitic Agglomerate- Completely Weathered		Organic/Asphalt/Igneous	Rock- Igneous
11-MT-01	MET	METAMORPHIC Rock		Metamorphic	Rock- Metamorphic
11-MT-02	CHERT	Chert		Metamorphic	Rock- Metamorphic
11-MT-03	FAULT-ZONE	Fault Zone/Shear Zone		Metamorphic	Rock- Metamorphic
12-MM-02	AC	Asphaltic Concrete		Organic/Asphalt/Igneous	Man-Made
12-MM-03	CONCRETE	Concrete		Organic/Asphalt/Igneous	Man-Made
12-MM-04	BASE	Base Material		Organic/Asphalt/Igneous	Man-Made

APPENDIX C
LITHOLOGY DATABASE

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
51612	51612	0	10	SP		brown		T11N/R35W-9K5	**T11N/R35W-9K5**	**NCSD**
51612		10	25	SP		yellow		T11N/R35W-9K5		
51612		25	143	SW				T11N/R35W-9K5		
51612		143	175	CLML		yellow		T11N/R35W-9K5		
51612		175	185	SW				T11N/R35W-9K5		
51612		185	210	SC		gray		T11N/R35W-9K5		
51612		210	216	SC-G				T11N/R35W-9K5		
51612		216	245	CL-G		brown		T11N/R35W-9K5		
51612		245	350	SC-G				T11N/R35W-9K5		
51612		350	362	SP				T11N/R35W-9K5		
51612		362	467	SW-G		white		T11N/R35W-9K5		
51612		467	470	CL-G		brown		T11N/R35W-9K5		
51612		470	512	SP-G				T11N/R35W-9K5		
51612		512	550	SC-G				T11N/R35W-9K5		
51612		550	572	GP-S		brown		T11N/R35W-9K5		
51612		572	620	SP-G		brown		T11N/R35W-9K5		
51612		620	643	CL-S-G		blue		T11N/R35W-9K5		
51612		643	653	CL-S		white		T11N/R35W-9K5		
51612		653	693	SP-G				T11N/R35W-9K5		
51612		693	727	CLML		blue		T11N/R35W-9K5		
276929	276929	0	31	SP		red		T11N/R35W-10G5	**T11N/R35W-10G5**	
276929		31	127	SP		red		T11N/R35W-10G5		
276929		127	140	SPSC		red		T11N/R35W-10G5		
276929		140	159	SP		red		T11N/R35W-10G5		
276929		159	191	SPSC		brown and red		T11N/R35W-10G5		
276929		191	222	SP-G		brown and red		T11N/R35W-10G5		
276929		222	254	SP-G				T11N/R35W-10G5		
276929		254	285	SC-G		brown		T11N/R35W-10G5		
276929		285	317	CL-S-G		brown		T11N/R35W-10G5		
276929		317	380	SC-G		brown		T11N/R35W-10G5		
276929		380	411	SC-G		blue		T11N/R35W-10G5		
276929		411	443	CL-S		blue and brown		T11N/R35W-10G5		
276929		443	474	CL-G		blue and brown		T11N/R35W-10G5		
276929		474	506	CL-G		blue and tan		T11N/R35W-10G5		
276929		506	537	CL-G		gray and blue		T11N/R35W-10G5		
276929		537	569	CH		gray		T11N/R35W-10G5		
171358	171358	0	103	SW		brown		T11N/R35W-10J2	**T11N/R35W-10J2**	
171358		103	140	CL-S		brown		T11N/R35W-10J2		
171358		140	189	SP		brown		T11N/R35W-10J2		
171358		189	216	GP-S		brown and white		T11N/R35W-10J2		
171358		216	245	SP		brown		T11N/R35W-10J2		
171358		245	270	CL		brown		T11N/R35W-10J2		
171358		270	310	GPGC				T11N/R35W-10J2		
171358		310	321	CL		brown		T11N/R35W-10J2		
171358		321	388	GPGC				T11N/R35W-10J2		
171358		388	410	CL		brown		T11N/R35W-10J2		
171358		410	430	GP-S				T11N/R35W-10J2		
171358		430	440	CL-S		brown		T11N/R35W-10J2		
171358		440	450	GP-S				T11N/R35W-10J2		
171358		450	465	CL-S		white		T11N/R35W-10J2		
171358		465	480	CL		blue		T11N/R35W-10J2		
171358		480	515	CL		white		T11N/R35W-10J2		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
171358		515	538	GP-S		white		T11N/R35W-10J2		
171358		538	646	CL-S		blue	x	T11N/R35W-10J2		
90002	90002	0	50	SP		brown		T11N/R35W-11C1	**T11N/R35W-11C1**	
90002		50	62	CL		blue		T11N/R35W-11C1		
90002		62	72	CL-S-G		brown		T11N/R35W-11C1		
90002		72	160	GC				T11N/R35W-11C1		
90002		160	190	CL-S-G				T11N/R35W-11C1		
90002		190	210	CL		brown		T11N/R35W-11C1		
90002		210	265	GP-S				T11N/R35W-11C1		
90002		265	270	CL-S		brown		T11N/R35W-11C1		
90002		270	285	GP-S				T11N/R35W-11C1		
90002		285	290	CL		white		T11N/R35W-11C1		
90002		290	307	SP				T11N/R35W-11C1		
336387	336387	0	190	SP				T11NR35W-10L1	**T11NR35W-10L1**	
336387		190	250	GPGC				T11NR35W-10L1		
336387		250	270	CL-G				T11NR35W-10L1		
336387		270	300	CL				T11NR35W-10L1		
336387		300	310	GP-S				T11NR35W-10L1		
336387		310	380	GP-S				T11NR35W-10L1		
336387		380	410	GPGC				T11NR35W-10L1		
336387		410	425	CL-G				T11NR35W-10L1		
336387		425	440	CL-G				T11NR35W-10L1		
336387		440	500	CL-G				T11NR35W-10L1		
336387		500	530	GC				T11NR35W-10L1		
336387		530	575	GC				T11NR35W-10L1		
336387		575	595	SP-G				T11NR35W-10L1		
336387		595	620	SP-G				T11NR35W-10L1		
336387		620	635	SP-G				T11NR35W-10L1		
336387		635	650	GP-S	boulders, sand, gravel			T11NR35W-10L1		
336387		650	670	CL-G				T11NR35W-10L1		
336387		670	700	SP-G				T11NR35W-10L1		
336387		700	710	CL	hard	blue		T11NR35W-10L1		
25518	25518	0	3	CL	Top Soil			T11N/R35W-11J1	**T11N/R35W-11J1**	
25518		3	159	SP				T11N/R35W-11J1		
25518		159	165	CL		gray		T11N/R35W-11J1		
25518		165	178	SP				T11N/R35W-11J1		
25518		178	185	CL-G		yellow		T11N/R35W-11J1		
25518		185	199	CL-G	hard	brown		T11N/R35W-11J1		
25518		199	210	CL		brown		T11N/R35W-11J1		
25518		210	239	GC	hard	gray and brown		T11N/R35W-11J1		
25518		239	245	CL		brown		T11N/R35W-11J1		
25518		245	267	GC		gray and brown		T11N/R35W-11J1		
25518		267	278	CL		brown		T11N/R35W-11J1		
25518		278	288	CL-G		brown		T11N/R35W-11J1		
25518		288	297	GC		gray and brown		T11N/R35W-11J1		
25518		297	308	CL		brown		T11N/R35W-11J1		
25518		308	313	SP-G		white		T11N/R35W-11J1		
25518		313	320	CL-G		gray and brown		T11N/R35W-11J1		
25518		320	340	CL		white	x	T11N/R35W-11J1		
25518		340	350	CL		yellow	x	T11N/R35W-11J1		
182644	182644	0	90	SW		brown		T11N/R35W-11J3	**T11N/R35W-11J3**	
182644		90	135	CL-S		brown		T11N/R35W-11J3		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
182644		135	175	CL-S		brown		T11N/R35W-11J3		
182644		175	203	SPSC		brown		T11N/R35W-11J3		
182644		203	225	CL-S		white		T11N/R35W-11J3		
182644		225	270	CL-S-G		brown		T11N/R35W-11J3		
182644		270	335	GC				T11N/R35W-11J3		
182644		335	360	CL-G		brown		T11N/R35W-11J3		
182644		360	368	CL		brown		T11N/R35W-11J3		
182644		368	372	CL		white		T11N/R35W-11J3		
182644		372	380	CH		brown		T11N/R35W-11J3		
182644		380	410	GP-S		white		T11N/R35W-11J3		
182644		410	440	CL-S		white		T11N/R35W-11J3		
182644		440	445	GP-S				T11N/R35W-11J3		
182644		445	465	CL-S		white		T11N/R35W-11J3		
182644		465	628	CL		black	X	T11N/R35W-11J3		
182644		628	650	SHALE	Hard Rock	green and blue		T11N/R35W-11J3		
43417	43417	0	156	SP				T11N/R35W-13E2	**T11N/R35W-13E2**	
43417		156	174	SC				T11N/R35W-13E2		
43417		174	190	SP				T11N/R35W-13E2		
43417		190	208	CL-S				T11N/R35W-13E2		
43417		208	232	CL-G				T11N/R35W-13E2		
43417		232	280	CL-S		brown		T11N/R35W-13E2		
43417		280	287	GP				T11N/R35W-13E2		
43417		287	306	CL-G				T11N/R35W-13E2		
43417		306	307	GP				T11N/R35W-13E2		
43417		307	315	CL-G				T11N/R35W-13E2		
43417		315	321	CL				T11N/R35W-13E2		
43417		321	346	CL				T11N/R35W-13E2		
43417		346	366	CL-G				T11N/R35W-13E2		
43417		366	370	SP		gray		T11N/R35W-13E2		
43417		370	378	SP-G		gray		T11N/R35W-13E2		
43417		378	380	SC				T11N/R35W-13E2		
43417		380	385	SP-G				T11N/R35W-13E2		
43417		385	388	CL		gray		T11N/R35W-13E2		
43417		388	390	SP		gray		T11N/R35W-13E2		
43417		390	400	CL		blue		T11N/R35W-13E2		
43417		400	401	GP	Rock			T11N/R35W-13E2		
43417		401	404	CL		gray		T11N/R35W-13E2		
43417		404	405	GP	Rock			T11N/R35W-13E2		
43417		405	408	CL-S		gray		T11N/R35W-13E2		
43417		408	422	SP	Hard			T11N/R35W-13E2		
43417		422	426	SP-G	Hard			T11N/R35W-13E2		
43417		426	428	SP	Solid			T11N/R35W-13E2		
43417		428	430	SHALE	Shale	gray		T11N/R35W-13E2		
43552	43552	0	68	SP				T11N/R35W-13E3	**T11N/R35W-13E3**	
43552		68	72	SPSC				T11N/R35W-13E3		
43552		72	80	CL-S				T11N/R35W-13E3		
43552		80	154	SP				T11N/R35W-13E3		
43552		154	160	GC-S				T11N/R35W-13E3		
43552		160	198	SP				T11N/R35W-13E3		
43552		198	240	GC-S		blue		T11N/R35W-13E3		
43552		240	310	GC-S		brown		T11N/R35W-13E3		
43552		310	395	CL-S		brown		T11N/R35W-13E3		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
43552		395	405	SHALE	Shale	green		T11N/R35W-13E3		
158739	158739	0	175	SP		brown		T11N/35W-13G1	**T11N/35W-13G1**	
158739		175	240	SPSC		white		T11N/35W-13G1		
158739		240	265	SPSC		blue and gray		T11N/35W-13G1		
158739		265	300	SP-G		gray		T11N/35W-13G1		
158739		300	318	CL		brown		T11N/35W-13G1		
158739		318	400	SP-G				T11N/35W-13G1		
158739		400	415	CL-S				T11N/35W-13G1		
158739		415	475	SC-G		blue and gray		T11N/35W-13G1		
335762	335762	0	100	SP		red		T11N/R35W-13M2	**T11N/R35W-13M2**	
335762		100	220	SP		brown		T11N/R35W-13M2		
335762		220	260	SPSC		red		T11N/R35W-13M2		
335762		260	270	CL-S		white		T11N/R35W-13M2		
335762		270	300	SC-G		white and blue		T11N/R35W-13M2		
335762		300	322	SP		white		T11N/R35W-13M2		
335762		322	342	CL-S-G		brown		T11N/R35W-13M2		
335762		342	360	CL-S		red		T11N/R35W-13M2		
335762		360	402	SC-G		brown and red		T11N/R35W-13M2		
335762		402	422	CL-S-G		red and brown		T11N/R35W-13M2		
335762		422	442	SC-G		brown		T11N/R35W-13M2		
335762		442	452	CL-S		white		T11N/R35W-13M2		
335762		452	482	CL-S		blue		T11N/R35W-13M2		
335763	335763	0	130	SP		red		T11N/R35W-11	**T11N/R35W-11**	
335763		130	162	CL-S		brown		T11N/R35W-11		
335763		162	240	CL-S		red		T11N/R35W-11		
335763		240	270	SC		brown		T11N/R35W-11		
335763		270	320	SC-G				T11N/R35W-11		
335763		320	342	CL-G		brown		T11N/R35W-11		
335763		342	422	SP-G				T11N/R35W-11		
335763		422	442	CL-G		brown		T11N/R35W-11		
335763		442	462	SP-G		brown		T11N/R35W-11		
335763		462	480	CH-S		brown		T11N/R35W-11		
335763		480	482	CL		blue		T11N/R35W-11		
222813	222813	0	109	SWSC		brown		T11N/R35W-10G4	**T11N/R35W-10G4**	
222813		109	161	CL-S		brown		T11N/R35W-10G4		
222813		161	235	SP		brown		T11N/R35W-10G4		
222813		235	255	GPGC		brown		T11N/R35W-10G4		
222813		255	310	GPGC		brown		T11N/R35W-10G4		
222813		310	335	CL-GPGC		brown		T11N/R35W-10G4		
222813		335	388	GP-S				T11N/R35W-10G4		
222813		388	400	CL-S		brown		T11N/R35W-10G4		
222813		400	430	GP-S				T11N/R35W-10G4		
222813		430	483	CL-S-G		brown		T11N/R35W-10G4		
222813		483	515	GP-S				T11N/R35W-10G4		
222813		515	550	SC-G		brown		T11N/R35W-10G4		
222813		550	600	CL		blue		T11N/R35W-10G4		
222813		600	650	CL-S-G		blue and gray		T11N/R35W-10G4		
222813		650	770	CLML		gray	x	T11N/R35W-10G4		
222813		770	827	SM			x	T11N/R35W-10G4		
39688	39688	0	35	SP				T11N/R34W-18L1	**T11N/R34W-18L1**	
39688		35	45	CL-S				T11N/R34W-18L1		
39688		45	115	SC				T11N/R34W-18L1		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
39688		115	175	CL-S				T11N/R34W-18L1		
39688		175	180	CL		blue		T11N/R34W-18L1		
39688		180	237	CL-S				T11N/R34W-18L1		
39688		237	247	SHALE	Shale	blue		T11N/R34W-18L1		
39688		247	260	CL-S-G				T11N/R34W-18L1		
39688		260	320	CL-S				T11N/R34W-18L1		
39688		320	330	CL-S		blue		T11N/R34W-18L1		
39688		330	370	SHALE	Shale	blue		T11N/R34W-18L1		
39688		370	587	SHALE	Shale	blue	x	T11N/R34W-18L1		
256188	256188	0	12	CL-S		brown		T11N/R34W-20	**T11N/R34W-20**	
256188		12	15	CL		gray		T11N/R34W-20		
256188		15	35	SW		brown		T11N/R34W-20		
256188		35	52	CL-S		tan		T11N/R34W-20		
256188		52	65	CL-G		gray		T11N/R34W-20		
256188		65	95	CH-S		brown		T11N/R34W-20		
256188		95	125	CL		blue and gray		T11N/R34W-20		
256188		125	146	CL-S		brown		T11N/R34W-20		
256188		146	155	SW-G				T11N/R34W-20		
256188		155	170	SW-G	Fine coarse Sand, float rock & thin Sandsotne lens			T11N/R34W-20		
256188		170	187	CL-S		gray and brown		T11N/R34W-20		
256188		187	207	SP		white	x	T11N/R34W-20		
256188		207	225	CL-S		blue	x	T11N/R34W-20		
256188		225	235	SX	Soft Sandstone, Clay	blue	x	T11N/R34W-20		
256188		235	252	SX	Soft Sandstone, Shale, Clay	gray and black		T11N/R34W-20		
256188		252	295	SHALE	Hard Shale, Volcanic rock	black		T11N/R34W-20		
256188		295	307	CL	Clay - Hard Shale lens	gray and black		T11N/R34W-20		
256188		307	350	SX	Broken Rock	green and white		T11N/R34W-20		
256188		350	387	SHALE	Fractured Rock	black and green		T11N/R34W-20		
256188		387	415	SHALE	Hard Shale with Sandstone	black and green		T11N/R34W-20		
256188		415	450	SX	Sandstone Fractured	green and gray		T11N/R34W-20		
256188		450	540	SX	Sandstone	gray		T11N/R34W-20		
256188		540	556	SHALE	Shale	black		T11N/R34W-20		
335755	335755	0	50	SP		red		T11N/R34W-20	**T11N/R34W-20**	
335755		50	62	CL-S		brown		T11N/R34W-20		
335755		62	122	CL-S		tan and gray		T11N/R34W-20		
335755		122	132	CL-S		tan		T11N/R34W-20		
335755		132	162	CL-S		gray		T11N/R34W-20		
335755		162	195	CL-S-G		gray		T11N/R34W-20		
335755		195	210	CL-S-G		brown		T11N/R34W-20		
335755		210	242	CL-S-G		gray		T11N/R34W-20		
335755		242	282	CL-S		gray		T11N/R34W-20		
335755		282	321	CL		gray		T11N/R34W-20		
25505	25505	0	58	SP				T11N/R34W-21N1	**T11N/R34W-21N1**	
25505		58	60	CL		brown		T11N/R34W-21N1		
25505		60	72	CL-G		brown		T11N/R34W-21N1		
25505		72	105	CL-S		yellow		T11N/R34W-21N1		
25505		105	113	SP				T11N/R34W-21N1		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
25505		113	183	CL		blue		T11N/R34W-21N1		
25505		183	193	SC		brown		T11N/R34W-21N1		
25505		193	200	SP-G		gray		T11N/R34W-21N1		
25505		200	210	CL-S		blue		T11N/R34W-21N1		
25505		210	225	SP-G				T11N/R34W-21N1		
25505		225	250	SHALE	Shale	blue	x	T11N/R34W-21N1		
335754	335754	0	3	CL	Top Soil			T11N/R34W-27	**T11N/R34W-27**	
335754		3	58	CL		red		T11N/R34W-27		
335754		58	82	SC-G		brown		T11N/R34W-27		
335754		82	102	CL-S		gray		T11N/R34W-27		
335754		102	122	SC-G		brown and blue		T11N/R34W-27		
335754		122	142	SC-G	Sand and Gravel with Sandstone stringers with silty clay	blue		T11N/R34W-27		
335754		142	155	CLML		blue		T11N/R34W-27		
6400	6400	0	3	CL	Top Soil			T11N/R34W-18	**T11N/R34W-18**	
6400		3	90	SP				T11N/R34W-18		
6400		90	106	SP	Hard			T11N/R34W-18		
6400		106	150	SC				T11N/R34W-18		
6400		150	188	CL		yellow		T11N/R34W-18		
6400		188	190	CL-G		brown		T11N/R34W-18		
6400		190	240	CL-G		blue		T11N/R34W-18		
6400		240	256	CL		blue		T11N/R34W-18		
6400		256	260	GP				T11N/R34W-18		
6400		260	262	SHALE	Shale	blue		T11N/R34W-18		
5388	5388	0	3	CL	Top Soil			T11N/R34W-18H3	**T11N/R34W-18H3**	
5388		3	76	SP				T11N/R34W-18H3		
5388		76	175	SC				T11N/R34W-18H3		
5388		175	198	SP				T11N/R34W-18H3		
5388		198	208	CL				T11N/R34W-18H3		
5388		208	218	CL-G		gray		T11N/R34W-18H3		
5388		218	242	CL		brown		T11N/R34W-18H3		
5388		242	247	GC		gray		T11N/R34W-18H3		
5388		247	261	CL		gray		T11N/R34W-18H3		
5388		261	308	CL		blue	x	T11N/R34W-18H3		
5388		308	325	SHALE	Shale	blue		T11N/R34W-18H3		
96087	96087	0	76	SP				T11N/R34W-18P2	**T11N/R34W-18P2**	
96087		76	195	SPSC				T11N/R34W-18P2		
96087		195	205	CL-S				T11N/R34W-18P2		
96087		205	240	CL-G				T11N/R34W-18P2		
96087		240	300	GP-S		white		T11N/R34W-18P2		
96087		300	315	CL-S		blue		T11N/R34W-18P2		
256012	256012	0	31	SP		brown		T11N/R34W-18P2		
256012		31	158	SC-G		brown		T11N/R34W-18P2		
256012		158	190	CL-G		tan and white		T11N/R34W-18P2		
256012		190	221	CL-S-G	Clay, Shale, Gravel, Sand	gray	x	T11N/R34W-18P2		
256012		221	635	SX	Volcanic Shale Sandstone, Clay and Sand	gray		T11N/R34W-18P2		
161355	161355	0	150	SP				T11N/R35W-13	**T11N/R35W-13**	**GSWC**
161355		150	290	SP				T11N/R35W-13		
161355		290	345	SC		white and brown		T11N/R35W-13		

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161355		345	375	SW				T11N/R35W-13		
161355		375	380	SC		blue and gray		T11N/R35W-13		
161355		380	394	SW				T11N/R35W-13		
161355		394	410	CLML-WS		red and brown		T11N/R35W-13		
161355		410	420	CL		red and brown		T11N/R35W-13		
161355		420	427	SW				T11N/R35W-13		
161355		427	443	CL		blue and gray		T11N/R35W-13		
161355		443	456	CL-S		brown		T11N/R35W-13		
161355		456	475	GP-S				T11N/R35W-13		
161355		475	485	GC-S		brown		T11N/R35W-13		
161355		485	489	GP-S				T11N/R35W-13		
161355		489	518	SWSC		white		T11N/R35W-13		
161355		518	552	CL		white		T11N/R35W-13		
161355		552	562	GP-S				T11N/R35W-13		
161355		562	565	GC-S		white		T11N/R35W-13		
161355		565	573	GP-S				T11N/R35W-13		
161355		573	604	CL-S		blue		T11N/R35W-13		
352734	352734	0	230	SW				T11N/R35W-24	**T11N/R35W-24**	
352734		230	300	SWSC		orange and tan		T11N/R35W-24		
352734		300	320	SP		gray		T11N/R35W-24		
352734		320	375	SPSC		orange and tan		T11N/R35W-24		
352734		375	390	SC-G		orange and tan		T11N/R35W-24		
352734		390	400	CL-S-G		tan		T11N/R35W-24		
352734		400	435	CL-G		black, tan, orange		T11N/R35W-24		
352734		435	450	CL-S		black and tan		T11N/R35W-24		
352734		450	505	SC-G		tan and black		T11N/R35W-24		
352734		505	570	SC-G		gray and tan		T11N/R35W-24		
352734		570	601	CL-S-G		gray and black		T11N/R35W-24		
221031	221031	0	2	CL	Top Soil			T11N/R34W-19	**T11N/R34W-19**	
221031		2	34	SC		yellow		T11N/R34W-19		
221031		34	65	SW				T11N/R34W-19		
221031		65	238	SC		yellow		T11N/R34W-19		
221031		238	241	CL		yellow		T11N/R34W-19		
221031		241	265	CL		yellow and gray		T11N/R34W-19		
221031		265	297	CL-S		gray		T11N/R34W-19		
221031		297	312	CL-S-G		brown		T11N/R34W-19		
221031		312	356	SP-G				T11N/R34W-19		
221031		356	372	CL-G		brown		T11N/R34W-19		
221031		372	394	CL-S	Hard packed	brown		T11N/R34W-19		
221031		394	408	CL-S-G		brown		T11N/R34W-19		
221031		408	410	CL-S	Hard packed	brown		T11N/R34W-19		
221031		410	428	CL-S-G		gray		T11N/R34W-19		
221031		428	435	CL-S	Hard packed	gray		T11N/R34W-19		
221031		435	473	CL-S		gray		T11N/R34W-19		
221031		473	481	SW		gray		T11N/R34W-19		
221031		481	518	CL		gray		T11N/R34W-19		
221031		518	521	SW		gray		T11N/R34W-19		
127249	127249	0	22	SP				T/R/S - ?	**T/R/S - ?**	
127249		22	268	SP				T/R/S - ?		
127249		268	299	CL		gray		T/R/S - ?		
127249		299	318	CL-G		gray		T/R/S - ?		
127249		318	330	CL-S		brown		T/R/S - ?		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
127249		330	358	CL-S-G		brown		T/R/S - ?		
127249		358	375	SP-G				T/R/S - ?		
127249		375	382	GC-S				T/R/S - ?		
127249		382	390	CL-S-G		brown		T/R/S - ?		
127249		390	410	GC-S		brown		T/R/S - ?		
127249		410	428	GP-S		brown		T/R/S - ?		
127249		428	458	CL-G		brown		T/R/S - ?		
127249		458	463	SW-G		brown		T/R/S - ?		
127249		463	467	CL-S-G		brown		T/R/S - ?		
127249		467	474	CL-S-G		brown		T/R/S - ?		
127249		474	486	CL-S-G		blue and brown		T/R/S - ?		
127249		486	494	SW-G		blue and gray		T/R/S - ?		
127249		494	542	CL-S-G		blue and gray		T/R/S - ?		
127249		542	552	SW-G		blue and gray		T/R/S - ?		
127249		552	581	GC				T/R/S - ?		
127249		581	604	GP-S	Broken Rock (sea shell) with gravel, sand	white	x	T/R/S - ?		
127249		604	617	CL-S-G		gray		T/R/S - ?		
103045	103045	0	150	SP		brown		T/R/S - ?	**T/R/S - ?**	
103045		150	160	SP		brown		T/R/S - ?		
103045		160	300	SP		brown		T/R/S - ?		
103045		300	360	SP		white		T/R/S - ?		
103045		360	376	SP		brown		T/R/S - ?		
103045		376	380	CL-S		gray		T/R/S - ?		
103045		380	388	GC-S				T/R/S - ?		
103045		388	390	GP-S	Gravel, Rock, Sand, trace Clay			T/R/S - ?		
103045		390	399	SC-G				T/R/S - ?		
103045		399	410	CL-S		gray		T/R/S - ?		
103045		410	437	CL		brown		T/R/S - ?		
103045		437	442	CL		blue		T/R/S - ?		
103045		442	447	CL		blue		T/R/S - ?		
103045		447	451	SP-G	Sand, Gravel, small Rock			T/R/S - ?		
103045		451	456	CL		brown		T/R/S - ?		
103045		456	459	CL-G	Clay and Rock	blue and brown		T/R/S - ?		
103045		459	469	GC	Gravel, Clay, some Rocks	blue		T/R/S - ?		
103045		469	474	GC		brown and blue		T/R/S - ?		
103045		474	480	GC				T/R/S - ?		
103045		480	489	CL		green		T/R/S - ?		
103045		489	513	CL-S		blue and brown		T/R/S - ?		
103045		513	522	CL		gray		T/R/S - ?		
103045		522	538	CL-S		gray and black		T/R/S - ?		
103045		538	542	CL-S		gray		T/R/S - ?		
103045		542	549	GP-S				T/R/S - ?		
103045		549	557	GP-S				T/R/S - ?		
103045		557	565	CL-G				T/R/S - ?		
103045		565	570	CL		gray and black		T/R/S - ?		
103045		570	589	CL-S-G		gray		T/R/S - ?		
103045		589	620	CL		brown		T/R/S - ?		
763353	763353	0	243	SP		brown		T11N/R34W-19	**T11N/R34W-19**	
763353		243	297	CL-S		blue		T11N/R34W-19		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
763353		297	326	CL-S-G		blue		T11N/R34W-19		
763353		326	359	GC-S		brown		T11N/R34W-19		
763353		359	391	CL-S		brown		T11N/R34W-19		
763353		391	420	GP-S				T11N/R34W-19		
763353		420	479	CL-S		blue		T11N/R34W-19		
763353		479	490	SWSC		blue and green		T11N/R34W-19		
763353		490	523	GP-S		green and gray		T11N/R34W-19		
763353		523	540	GP-S		green		T11N/R34W-19		
763353		540	540	GC-S	Small Gravel, some Shale, Sand	green and white		T11N/R34W-19		
182660	182660	0	19	SP				T11N/R34W-28	**T11N/R34W-28**	
182660		19	22	CL-S		red		T11N/R34W-28		
182660		22	48	SW				T11N/R34W-28		
182660		48	83	SW				T11N/R34W-28		
182660		83	125	SWSC		red and white		T11N/R34W-28		
182660		125	261	SPSC		brown		T11N/R34W-28		
182660		261	273	CL-S		brown		T11N/R34W-28		
182660		273	279	SC-G		green and white		T11N/R34W-28		
182660		279	305	CH		green		T11N/R34W-28		
182660		305	335	CL-S		green		T11N/R34W-28		
182660		335	370	SC-G		red		T11N/R34W-28		
182660		370	430	CL-S		green and white		T11N/R34W-28		
182660		430	451	CH		blue		T11N/R34W-28		
182660		451	471	SC-G		blue		T11N/R34W-28		
182660		471	503	CL-S		blue		T11N/R34W-28		
182660		503	574	GP-S		blue	x	T11N/R34W-28		
182660		574	600	CL		blue		T11N/R34W-28		
90003	90003	0	2	SP				T/R/S - ?	**T/R/S - ?**	
90003		2	8	SCSM				T/R/S - ?		
90003		8	57	SWSC				T/R/S - ?		
90003		57	145	CL-S		brown		T/R/S - ?		
90003		145	208	CL-S		brown and white		T/R/S - ?		
90003		208	238	SC-G				T/R/S - ?		
90003		238	242	SC		brown		T/R/S - ?		
90003		242	285	CL-S		brown		T/R/S - ?		
90003		285	335	SC-G		brown		T/R/S - ?		
90003		335	343	SP-G				T/R/S - ?		
90003		343	361	CL-S		brown and white		T/R/S - ?		
90003		361	422	CL-S		blue		T/R/S - ?		
90003		422	428	SC-G		blue		T/R/S - ?		
90003		428	435	SC		blue		T/R/S - ?		
90003		435	473	SP-G			x	T/R/S - ?		
90003		473	492	SC		blue	x	T/R/S - ?		
90003		492	706	CL		blue	x	T/R/S - ?		
289187	289187	0	9	SP				T11N/R34W-19	**T11N/R34W-19**	
289187		9	70	SW				T11N/R34W-19		
289187		70	110	SP				T11N/R34W-19		
289187		110	144	SW-G		gray		T11N/R34W-19		
289187		144	160	SC-G				T11N/R34W-19		
289187		160	187	SP				T11N/R34W-19		
289187		187	196	CL				T11N/R34W-19		
289187		196	208	SP-G				T11N/R34W-19		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
289187		208	214	CLML				T11N/R34W-19		
289187		214	228	SP-G	Sand and multi-colored Gravel			T11N/R34W-19		
289187		228	282	CLML				T11N/R34W-19		
289187		282	300	SC-G				T11N/R34W-19		
289187		300	311	SP-G	Sand, Gravel, and Cobbles			T11N/R34W-19		
289187		311	314	CL				T11N/R34W-19		
289187		314	322	SP-G				T11N/R34W-19		
289187		322	327	CL				T11N/R34W-19		
289187		327	334	SP-G				T11N/R34W-19		
289187		334	335	CL				T11N/R34W-19		
289187		335	346	SP-G				T11N/R34W-19		
289187		346	352	CL				T11N/R34W-19		
289187		352	354	SP-G				T11N/R34W-19		
289187		354	359	CL		white		T11N/R34W-19		
289187		359	401	CL		green		T11N/R34W-19		
289187		401	452	SP-G	Fine Sand, Gravel, and Cobbles			T11N/R34W-19		
289187		452	474	SP-G			x	T11N/R34W-19		
289187		474	512	CLML-WS			x	T11N/R34W-19		
289187		512	520	CL			x	T11N/R34W-19		
289187		520	521	CH	Rock (harder)			T11N/R34W-19		
289187		521	562	CH				T11N/R34W-19		
90004	90004	0	380	SP				T11N/R35W-22C2	**T11N/R35W-22C2**	**Woodlands**
90004		380	415	CL		brown		T11N/R35W-22C2		
90004		415	426	CL		blue		T11N/R35W-22C2		
90004		426	429	SP				T11N/R35W-22C2		
90004		429	436	CL		blue		T11N/R35W-22C2		
90004		436	440	SP		white		T11N/R35W-22C2		
90004		440	450	SP				T11N/R35W-22C2		
90004		450	455	SP				T11N/R35W-22C2		
90004		455	459	SP				T11N/R35W-22C2		
90004		459	461	SP		white		T11N/R35W-22C2		
90004		461	466	SP				T11N/R35W-22C2		
90004		466	478	CL	Hard	red and brown		T11N/R35W-22C2		
90004		478	492	SP	Hard	white		T11N/R35W-22C2		
90004		492	493	CL-S				T11N/R35W-22C2		
90004		493	498	SW	Hard			T11N/R35W-22C2		
90004		498	504	SP-G				T11N/R35W-22C2		
90004		504	505	CL				T11N/R35W-22C2		
90004		505	506	SP-G				T11N/R35W-22C2		
90004		506	519	CL				T11N/R35W-22C2		
90004		519	521	SP	Hard			T11N/R35W-22C2		
402078	402078	0	2	CL	Soil			T11N/R35W-16	**T11N/R35W-16**	
402078		2	100	SP		red		T11N/R35W-16		
402078		100	150	SPSM		brown and gray		T11N/R35W-16		
402078		150	170	SW		tan and white		T11N/R35W-16		
402078		170	200	SW		tan and brown		T11N/R35W-16		
402078		200	220	SM		white and brown		T11N/R35W-16		
402078		220	230	ML-S		brown		T11N/R35W-16		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
402078		230	280	SPSM		orange, brown, and tan		T11N/R35W-16		
402078		280	310	SPSM		white and gray		T11N/R35W-16		
402078		310	340	SPSM		white and tan		T11N/R35W-16		
402078		340	358	ML-S		tan		T11N/R35W-16		
402078		358	390	CL		gray		T11N/R35W-16		
402078		390	447	SP-G		brown		T11N/R35W-16		
402078		447	478	CL-S		tan and brown		T11N/R35W-16		
402078		478	543	SP-G		tan and brown		T11N/R35W-16		
402078		543	578	SP-G		tan		T11N/R35W-16		
402078		578	595	CL-S		tan and gray		T11N/R35W-16		
402078		595	660	CL-S		gray		T11N/R35W-16		
402078		660	690	SP-GPGC		tan		T11N/R35W-16		
402078		690	700	SP-GPGC		gray, tan, and black		T11N/R35W-16		
402088	402088	0	4	CL	Top Soil			T11N/R35W-16	**T11N/R35W-16**	
402088		4	96	SP		red and brown		T11N/R35W-16		
402088		96	205	SP		brown		T11N/R35W-16		
402088		205	245	SPSC		red and tan		T11N/R35W-16		
402088		245	370	CL-S		tan an white		T11N/R35W-16		
402088		370	390	SC		blue		T11N/R35W-16		
402088		390	450	SP-G				T11N/R35W-16		
402088		450	480	CL-S		brown		T11N/R35W-16		
402088		480	690	SC-G				T11N/R35W-16		
490963	490963	0	135	SP		red and brown		T11N/R35W-15F	**T11N/R35W-15F**	
490963		135	155	CL		white		T11N/R35W-15F		
490963		155	290	SW		tan		T11N/R35W-15F		
490963		290	300	SP-GPGC		orange and brown		T11N/R35W-15F		
490963		300	330	SC-G		orange and brown		T11N/R35W-15F		
490963		330	340	SP-G		orange and brown		T11N/R35W-15F		
490963		340	370	SP-G		orange and brown		T11N/R35W-15F		
490963		370	385	SP-G		orange and brown		T11N/R35W-15F		
490963		385	395	SC-G		orange and brown		T11N/R35W-15F		
490963		395	415	CL-G		brown		T11N/R35W-15F		
490963		415	435	CL-S		brown		T11N/R35W-15F		
490963		435	445	CL-G		brown		T11N/R35W-15F		
490963		445	455	SC-G		brown		T11N/R35W-15F		
490963		455	508	SC-G		brown		T11N/R35W-15F		
490963		508	520	CL-S		brown		T11N/R35W-15F		
490963		520	525	SPSC		brown		T11N/R35W-15F		
490963		525	545	SPSC		brown		T11N/R35W-15F		
490963		545	560	SC-G		brown		T11N/R35W-15F		
490963		560	580	SP-G		orange and brown		T11N/R35W-15F		
490963		580	595	SC-G		orange and brown		T11N/R35W-15F		
490963		595	610	SPSM				T11N/R35W-15F		
490963		610	628	GC		tan and gray		T11N/R35W-15F		
490963		628	645	CL-S-G		tan and gray		T11N/R35W-15F		
490963		645	695	CLML		gray and brown		T11N/R35W-15F		
490919	490919	0	160	SP-G		brown		T11N/R35W-22F	**T11N/R35W-22F**	
490919		160	170	SP		tan		T11N/R35W-22F		
490919		170	220	SPSC		tan		T11N/R35W-22F		
490919		220	245	SP		brown		T11N/R35W-22F		
490919		245	265	SPSC		brown		T11N/R35W-22F		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
490919		265	285	GPGC		black and tan		T11N/R35W-22F		
490919		285	305	SP		brown		T11N/R35W-22F		
490919		305	315	SP-G		brown		T11N/R35W-22F		
490919		315	350	CL-WS		olive and brown		T11N/R35W-22F		
490919		350	360	CL-GPGC		olive and brown		T11N/R35W-22F		
490919		360	370	GPGC		olive and brown		T11N/R35W-22F		
490919		370	405	GPGC		olive and brown		T11N/R35W-22F		
490919		405	420	GPGC		olive and brown		T11N/R35W-22F		
490919		420	430	GP		brown, white, black, and red		T11N/R35W-22F		
490919		430	435	GPGC		brown		T11N/R35W-22F		
490919		435	445	SPSC		brown		T11N/R35W-22F		
490919		445	455	GPGC		tan and brown		T11N/R35W-22F		
490919		455	465	GPGC		red, white, brown		T11N/R35W-22F		
490919		465	475	GPGC		olive and brown		T11N/R35W-22F		
490919		475	485	GPGC		brown, black, white, tan		T11N/R35W-22F		
490919		485	520	GPGC		brown		T11N/R35W-22F		
490919		520	530	SC-G		orange and brown		T11N/R35W-22F		
490919		530	550	GPGC		olive and brown		T11N/R35W-22F		
490919		550	565	GC-S		brown		T11N/R35W-22F		
490919		565	570	GPGC		brown		T11N/R35W-22F		
490919		570	585	CL-G		brown		T11N/R35W-22F		
490919		585	595	CL-G		olive and brown		T11N/R35W-22F		
490919		595	605	CL-S-G		olive and brown		T11N/R35W-22F		
490919		605	635	CL-S-G		brown		T11N/R35W-22F		
490919		635	645	CL-G		olive and brown		T11N/R35W-22F		
490919		645	662	CL-S		olive and brown		T11N/R35W-22F		
490922	490922	0	70	SW		orange and brown		T11N/R35W-22F	**T11N/R35W-22F**	
490922		70	90	SP		tan		T11N/R35W-22F		
490922		90	130	SW		gray, brown, tan		T11N/R35W-22F		
490922		130	220	SW		orange and brown		T11N/R35W-22F		
490922		220	270	SW		white and gray		T11N/R35W-22F		
490922		270	335	SM		white and gray		T11N/R35W-22F		
490922		335	370	SM		yellow and orange		T11N/R35W-22F		
490922		370	390	SM		yellow and orange		T11N/R35W-22F		
490922		390	402	ML-S		yellow and orange		T11N/R35W-22F		
490922		402	430	CL		gray		T11N/R35W-22F		
490922		430	450	SC		gray		T11N/R35W-22F		
490922		450	470	SP		gray		T11N/R35W-22F		
490922		470	495	SP-G		brown		T11N/R35W-22F		
490922		495	550	SM		brown		T11N/R35W-22F		
490922		550	560	SW		orange and brown		T11N/R35W-22F		
490922		560	610	SP-G		tan		T11N/R35W-22F		
490922		610	690	SW		gray and brown		T11N/R35W-22F		
490922		690	740	CL-G		gray		T11N/R35W-22F		
490922		740	810	SC		gray and brown		T11N/R35W-22F		
490922		810	860	SW		gray and blue		T11N/R35W-22F		
490922		860	880	SC		brown and gray		T11N/R35W-22F		
490922		880	900	CL-S		brown and gray		T11N/R35W-22F		
962000	962000	0	400	SP				T11N/R35W-16	**T11N/R35W-16**	
962000		400	420	CL				T11N/R35W-16		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
90005	90005	0	2	SP				T/R/S - ?	**T/R/S - ?**	**RWC**
90005		2	51	SP		brown		T/R/S - ?		
90005		51	174	SW				T/R/S - ?		
90005		174	218	SP		brown and white		T/R/S - ?		
90005		218	290	SP		white and brown		T/R/S - ?		
90005		290	315	CL-S		brown		T/R/S - ?		
90005		315	345	CL-S	Sandy Clay with Shale	gray		T/R/S - ?		
90005		345	378	SHALE	Shale with Clay			T/R/S - ?		
90005		378	390	SHALE	Shale with streaks			T/R/S - ?		
90005		390	415	CL	Clay with Shale	blue		T/R/S - ?		
90005		415	460	CLML	Silt like Clay with hard Shale	blue		T/R/S - ?		
156767	156767	0	80	SP		brown		T11N/R35W-5	**T11N/R35W-5**	
156767		80	160	SP		tan		T11N/R35W-5		
156767		160	170	SW		white		T11N/R35W-5		
156767		170	178	GPGC		white		T11N/R35W-5		
156767		178	180	GPGC		gray		T11N/R35W-5		
156767		180	186	CL-S-G		brown		T11N/R35W-5		
156767		186	198	GPGC				T11N/R35W-5		
156767		198	204	GPGC				T11N/R35W-5		
156767		204	220	GPGC		brown		T11N/R35W-5		
156767		220	250	SW-GPGC		brown		T11N/R35W-5		
156767		250	280	GPGC				T11N/R35W-5		
328762	328762	0	170	SP		brown		T12N/R13E-33	**T12N/R13E-33**	
328762		170	255	SP-G		brown		T12N/R13E-33		
328762		255	263	SP		brown		T12N/R13E-33		
328762		263	275	SP-G		brown and black		T12N/R13E-33		
328762		275	317	CL-GPGC		gray and brown		T12N/R13E-33		
328762		317	325	CL-GPGC		white		T12N/R13E-33		
328762		325	336	CL		tan		T12N/R13E-33		
328762		336	345	CL-GPGC		brown		T12N/R13E-33		
328762		345	355	CL-GPGC		white		T12N/R13E-33		
328762		355	390	CL-GPGC		tan		T12N/R13E-33		
395064	395064	0	139	SP		brown		T11N/R35W-5	**T11N/R35W-5**	
395064		139	141	CL		gray		T11N/R35W-5		
395064		141	165	CL-S		brown		T11N/R35W-5		
395064		165	230	SP		brown		T11N/R35W-5		
395064		230	275	SP		white		T11N/R35W-5		
395064		275	290	GPGC				T11N/R35W-5		
395064		290	294	GPGC		brown		T11N/R35W-5		
395064		294	301	CL		brown		T11N/R35W-5		
395064		301	320	GPGC		brown		T11N/R35W-5		
395064		320	325	CL		gray		T11N/R35W-5		
395064		325	330	CL		tan		T11N/R35W-5		
395064		330	365	GPGC		white		T11N/R35W-5		
395064		365	380	GPGC		brown, white, green		T11N/R35W-5		
906322	906322	0	160	SP		brown		T11N/R35W-5	**T11N/R35W-5**	
906322		160	200	GPGC		tan and white		T11N/R35W-5		
906322		200	230	SPSC	Sand, some Shale	white		T11N/R35W-5		
906322		230	310	SP	Sand, soft	brown		T11N/R35W-5		
906322		310	340	SHALE	Shale, Sand - loose	white and tan		T11N/R35W-5		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
906322		340	380	GP-S		tan and brown		T11N/R35W-5		
906322		380	400	CL	Clay and Shale	brown		T11N/R35W-5		
511077	511077	0	130	SP		brown		T12E/R13E-8	**T12E/R13E-8**	
511077		130	140	SPSC		brown		T12E/R13E-8		
511077		140	180	SP		brown		T12E/R13E-8		
511077		180	184	CL-S		brown		T12E/R13E-8		
511077		184	186	CL-G				T12E/R13E-8		
511077		186	195	SP		brown		T12E/R13E-8		
511077		195	200	SP-G				T12E/R13E-8		
511077		200	280	SP		brown		T12E/R13E-8		
511077		280	322	SP-G				T12E/R13E-8		
511077		322	328	SC-G				T12E/R13E-8		
511077		328	335	SP-GPGC				T12E/R13E-8		
511077		335	340	GPGC		red		T12E/R13E-8		
105391	105391	0	210	CL-S				T/R/S - ?	**T/R/S - ?**	
105391		210	250	SPSC				T/R/S - ?		
105391		250	260	CL				T/R/S - ?		
105391		260	300	SP		white		T/R/S - ?		
105391		300	325	CL-S				T/R/S - ?		
105391		325	335	SP		white		T/R/S - ?		
105391		335	380	CL-S				T/R/S - ?		
90008	90008	0	45	SP				T/R/S - ?	**T/R/S - ?**	**Arroyo Grande**
90008		45	50	CL		blue		T/R/S - ?		
90008		50	92	GP				T/R/S - ?		
90008		92	140	SP-G				T/R/S - ?		
90008		140	160	GP				T/R/S - ?		
90008		160	188	SP-G				T/R/S - ?		
90008		188	190	GC-S				T/R/S - ?		
90008		190	210	GP				T/R/S - ?		
90008		210	215	GP				T/R/S - ?		
90008		215	219	GC				T/R/S - ?		
90009	90009	0	19	SM				T/R/S - ?	**T/R/S - ?**	
90009		19	22	CL-S		yellow		T/R/S - ?		
90009		22	36	SP-G				T/R/S - ?		
90009		36	38	CL		gray		T/R/S - ?		
90009		38	43	CL		brown		T/R/S - ?		
90009		43	45	SP-G				T/R/S - ?		
90009		45	53	CL		brown		T/R/S - ?		
90009		53	118	SP-G				T/R/S - ?		
90009		118	121	SC-G		brown		T/R/S - ?		
90009		121	152	GP				T/R/S - ?		
90009		152	167	SP-G				T/R/S - ?		
90009		167	173	CL		brown		T/R/S - ?		
90009		173	198	SP-G				T/R/S - ?		
90009		198	225	CL-S		brown		T/R/S - ?		
90009		225	232	SC		brown		T/R/S - ?		
90009		232	250	SC		brown		T/R/S - ?		
90010	90010	0	15	SP-G		brown		T/R/S - ?	**T/R/S - ?**	
90010		15	35	SW		yellow		T/R/S - ?		
90010		35	65	CLML-WS		gray and yellow		T/R/S - ?		
90010		65	95	SP-G		yellow		T/R/S - ?		
90010		95	105	SP-G		yellow and brown		T/R/S - ?		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
90010		105	220	GPGC		brown		T/R/S - ?		
90010		220	255	GWGC		brown		T/R/S - ?		
90010		255	280	GPGC		brown		T/R/S - ?		
90010		280	290	CL-S-G		brown		T/R/S - ?		
90010		290	305	GWGC				T/R/S - ?		
90010		305	315	GP-S				T/R/S - ?		
90010		315	330	SW-G				T/R/S - ?		
90010		330	345	GWGC				T/R/S - ?		
90010		345	380	SW-G		brown		T/R/S - ?		
90010		380	435	SC-G		gray to white	x	T/R/S - ?		
90010		435	485	SW-G			x	T/R/S - ?		
90010		485	565	SW		brown and gray	x	T/R/S - ?		
90010		565	575	SWSC		blue and gray		T/R/S - ?		
90010		575	595	SW			x	T/R/S - ?		
90010		595	600	SWSC		blue and gray		T/R/S - ?		
90010		600	610	SW		gray		T/R/S - ?		
339665	339665	0	25	CL-G				T/R/S-?	**T/R/S-?**	
339665		25	40	SC-G				T/R/S-?		
339665		40	115	SP				T/R/S-?		
339665		115	160	GP-S				T/R/S-?		
339665		160	175	GC-S		tan		T/R/S-?		
339665		175	235	GP-S				T/R/S-?		
339665		235	250	CL-G				T/R/S-?		
339665		250	265	CL				T/R/S-?		
339665		265	280	CL-G				T/R/S-?		
339665		280	295	CL-S				T/R/S-?		
78140	78140	0	40	SP				T11N/R34W-27E1	**T11N/R34W-27E1**	**SLO County**
78140		40	85	CL-G		brown		T11N/R34W-27E1		
78140		85	112	CL-S-G		brown		T11N/R34W-27E1		
78140		112	160	CL-S		green		T11N/R34W-27E1		
78140		160	168	CL		blue		T11N/R34W-27E1		
78140		168	205	SP-G		blue and green		T11N/R34W-27E1		
78140		205	215	CL-G		blue	x	T11N/R34W-27E1		
78140		215	242	CLML-S		blue		T11N/R34W-27E1		
78140		242	270	CL-S	Clay and Sand with hard streaks rock	gray		T11N/R34W-27E1		
78140		270	350	SHALE	Shale	gray		T11N/R34W-27E1		
1083178	1083178	0	185	SP		yellow and brown		T11N/R35W-23G1	**T11N/R35W-23G1**	
1083178		185	220	SM				T11N/R35W-23G1		
1083178		220	245	SPSM		brown and yellow		T11N/R35W-23G1		
1083178		245	265	SM				T11N/R35W-23G1		
1083178		265	280	SP		yellow and brown		T11N/R35W-23G1		
1083178		280	342	SPSM				T11N/R35W-23G1		
1083178		342	374	CL-S		gray and brown		T11N/R35W-23G1		
1083178		374	410	CL-S		blue and gray		T11N/R35W-23G1		
1083178		410	435	SP-G		olive and brown		T11N/R35W-23G1		
1083178		435	442	CL		yellow and brown		T11N/R35W-23G1		
1083178		442	444	SP-G		olive and brown		T11N/R35W-23G1		
1083178		444	448	SC		yellow and brown		T11N/R35W-23G1		
1083178		448	460	SP-G		olive and brown		T11N/R35W-23G1		
961625	961625	0	20	SP				T12N/R35W-32C3	**T12N/R35W-32C3**	
961625		20	48	SP				T12N/R35W-32C3		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
961625		48	60	SC-G				T12N/R35W-32C3		
961625		60	80	SC-G				T12N/R35W-32C3		
961625		80	85	SC				T12N/R35W-32C3		
961625		85	100	SP-G				T12N/R35W-32C3		
961625		100	115	SP				T12N/R35W-32C3		
961625		115	120	SP-G				T12N/R35W-32C3		
961625		120	145	SP-G				T12N/R35W-32C3		
961625		145	168	SP-G				T12N/R35W-32C3		
961625		168	176	CL				T12N/R35W-32C3		
961625		176	214	SC				T12N/R35W-32C3		
961625		214	220	SP				T12N/R35W-32C3		
961625		220	230	CL-S				T12N/R35W-32C3		
961625		230	236	SC				T12N/R35W-32C3		
961625		236	240	CL-S				T12N/R35W-32C3		
961625		240	248	SX	Sandstone			T12N/R35W-32C3		
536468	536468	0	10	CL-S	Top Soil			T11N/R34W-5	**T11N/R34W-5**	**DWR**
536468		10	40	RX	Chalk Rock	white		T11N/R34W-5		
536468		40	80	RX	Chalk Rock	orange and brown		T11N/R34W-5		
536468		80	180	CL		blue		T11N/R34W-5		
536468		180	240	CL	Dry Clay, Hard Shale Rock streaks	blue		T11N/R34W-5		
209	209	0	8	CL	Top Soil Adobe			T11N/R34W-6	**T11N/R34W-6**	
209		8	30	SWSC		red		T11N/R34W-6		
209		30	65	CL-S		red and brown		T11N/R34W-6		
209		65	93	SHALE	Shale, Clay with some hard strips	brown		T11N/R34W-6		
209		93	104	CL		green		T11N/R34W-6		
209		104	270	SHALE	Fractured to Mushy Shale	black		T11N/R34W-6		
209		270	323	SHALE	Hard Shale	black and brown		T11N/R34W-6		
209		323	368	CL-S		gray and white		T11N/R34W-6		
209		368	372	SHALE	Hard Shale with crystal	black		T11N/R34W-6		
209		372	400	CL-S		gray		T11N/R34W-6		
209		400	418	SHALE	Hard Shale with crystal	black		T11N/R34W-6		
209		418	430	CL-S		gray		T11N/R34W-6		
209		430	590	SHALE	Hard Shale with crystal	gray		T11N/R34W-6		
209		590	623	CL		green		T11N/R34W-6		
209		623	635	SHALE	Mushy Shale	green		T11N/R34W-6		
209		635	850	SHALE	Shale with crystal	blue and brown		T11N/R34W-6		
782416	782416	0	8	GPGC				T11N/R34W-6		
782416		8	16	CL		gray		T11N/R34W-6		
782416		16	32	SP-GPGC		white		T11N/R34W-6		
782416		32	92	SHALE	Shale	brown		T11N/R34W-6		
782416		92	110	SHALE	Hard Shale	black		T11N/R34W-6		
782416		110	185	SX	Sandstone	gray		T11N/R34W-6		
782416		185	195	SHALE	Shale	black		T11N/R34W-6		
782416		195	245	SHALE	Shale	brown		T11N/R34W-6		
782416		245	250	SHALE	Soft Shale	gray		T11N/R34W-6		
782416		250	280	SHALE	Shale	brown		T11N/R34W-6		
782416		280	358	SHALE	Soft Shale	gray		T11N/R34W-6		
782416		358	420	SX	Sandstone			T11N/R34W-6		
782416		420	440	SHALE	Soft Shale	blue		T11N/R34W-6		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
255996	255996	0	50	SW		brown		T11N/R34W-6		
255996		50	114	CL-S		brown		T11N/R34W-6		
255996		114	135	CL-S-G		brown and gray		T11N/R34W-6		
255996		135	165	SC-G				T11N/R34W-6		
255996		165	190	SC-G				T11N/R34W-6		
255996		190	236	SC-G				T11N/R34W-6		
255996		236	265	CL-S-G		brown		T11N/R34W-6		
255996		265	325	SC-G				T11N/R34W-6		
487540	487540	0	3	CL				T11N/R34W-6		
487540		3	17	SX	Soft Sandstone	brown		T11N/R34W-6		
487540		17	41	CL		brown		T11N/R34W-6		
487540		41	76	SHALE	Shale	brown		T11N/R34W-6		
487540		76	191	SHALE	Shale	brown		T11N/R34W-6		
487540		191	194	CL		gray		T11N/R34W-6		
487540		194	428	SHALE	Shale	brown		T11N/R34W-6		
487540		428	474	SHALE	Shale	blue		T11N/R34W-6		
487540		474	500	SHALE	Shale	black		T11N/R34W-6		
1089662	1089662	0	20	SP				T11N/R34W-7	**T11N/R34W-7**	
1089662		20	80	CL-S		brown		T11N/R34W-7		
1089662		80	120	CL-S		tan		T11N/R34W-7		
1089662		120	140	GC				T11N/R34W-7		
1089662		140	160	CL-S		tan		T11N/R34W-7		
1089662		160	180	CL	Clay with hard Shale	green and gray		T11N/R34W-7		
1089662		180	200	SHALE	Shale and Clay	blue		T11N/R34W-7		
1089662		200	260	SHALE	Shale	blue, white, and red		T11N/R34W-7		
1089662		260	300	SHALE	Shale	blue and gray		T11N/R34W-7		
1089662		300	370	SHALE	Shale	gray and blue		T11N/R34W-7		
1089662		370	380	CL		blue		T11N/R34W-7		
1089627	1089627	0	5	SP				T11N/R34W-7		
1089627		5	15	CL-S		brown		T11N/R34W-7		
1089627		15	30	GP				T11N/R34W-7		
1089627		30	50	CL-G		brown		T11N/R34W-7		
1089627		50	78	GPGC		gray		T11N/R34W-7		
1089627		78	110	CL-S		gray		T11N/R34W-7		
1089627		110	210	CL		gray		T11N/R34W-7		
241	241	0	50	SP				T11N/R34W-7		
241		50	80	SW				T11N/R34W-7		
241		80	250	SC-G		brown		T11N/R34W-7		
241		250	265	SP-G				T11N/R34W-7		
241		265	280	CL-S		yellow		T11N/R34W-7		
241		280	290	CL		gray	x	T11N/R34W-7		
241		290	310	CL-S		gray		T11N/R34W-7		
241		310	315	SHALE	Shale with Clay	black and blue		T11N/R34W-7		
241		315	345	CL-S		blue		T11N/R34W-7		
1085543	1085543	0	20	SP				T11N/R34W-8	**T11N/R34W-8**	
1085543		20	80	CL-S				T11N/R34W-8		
1085543		80	100	CL-G				T11N/R34W-8		
1085543		100	120	CL				T11N/R34W-8		
1090800	1090800	0	20	SP	Sand and loose Shale			T11N/R34W-16	**T11N/R34W-16**	
1090800		20	180	CL-G				T11N/R34W-16		
1090800		180	200	CL				T11N/R34W-16		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
1090800		200	240	CL-G				T11N/R34W-16		
1090800		240	260	CL				T11N/R34W-16		
1090800		260	300	CL-G				T11N/R34W-16		
1090800		300	360	CL				T11N/R34W-16		
1090800		360	380	CL				T11N/R34W-16		
1090800		380	400	SHALE	Solid Shale			T11N/R34W-16		
1090800		400	460	CL	Streaks of Clay and solid Shale			T11N/R34W-16		
1090800		460	480	CL-G				T11N/R34W-16		
763332	763332	0	26	SP		brown		T11N/R34W-16		
763332		26	33	SP		red and brown		T11N/R34W-16		
763332		33	41	CL-S-G		brown		T11N/R34W-16		
763332		41	71	GP-S				T11N/R34W-16		
763332		71	87	SP		brown		T11N/R34W-16		
763332		87	93	CL-S-G		brown		T11N/R34W-16		
763332		93	102	GP-S		brown		T11N/R34W-16		
763332		102	136	CL-S-G		brown		T11N/R34W-16		
763332		136	140	CL-S-G		blue		T11N/R34W-16		
351534	351534	0	2	CL	Adobe			T11N/R34W-16		
351534		2	46	RX	Rock	white and red		T11N/R34W-16		
351534		46	135	SHALE	Monterey Shale	brown		T11N/R34W-16		
351534		135	180	SHALE	Shale	gray		T11N/R34W-16		
351534		180	200	SHALE	Monterey Shale	gray and brown		T11N/R34W-16		
351534		200	220	SHALE	Soft Monterey with small hard stringers	brown		T11N/R34W-16		
351534		220	275	SHALE	Volcanic Sandstone Shale with crystal	gray		T11N/R34W-16		
351534		275	283	SHALE	Soft Monterey Shale	brown		T11N/R34W-16		
351534		283	323	SHALE	Hard Volcanic Sandstone Shale			T11N/R34W-16		
222805	222805	0	3	CL	Adobe	black		T11N/R34W-16		
222805		3	20	RX	Rock	red		T11N/R34W-16		
222805		20	25	GP				T11N/R34W-16		
222805		25	65	RX	Rock	red		T11N/R34W-16		
222805		65	145	SHALE	Hard Volcanic and Monterey Shale	brown		T11N/R34W-16		
222805		145	190	RX	Hard Volcanic w/ crystal	blue and gray		T11N/R34W-16		
222805		190	194	SHALE	Soft Monterey Shale	brown		T11N/R34W-16		
222805		194	229	RX	Hard Volcanic Rock with crystal	gray and white		T11N/R34W-16		
222805		229	485	SHALE	Monterey Shale	brown		T11N/R34W-16		
222805		485	490	RX	Hard Brittle Formation	tan		T11N/R34W-16		
222805		490	507	SHALE	Soft Shale	brown		T11N/R34W-16		
182645	182645	0	8	CL		brown		T11N/R34W-16		
182645		8	17	CL		brown		T11N/R34W-16		
182645		17	26	GC				T11N/R34W-16		
182645		26	48	CL		brown		T11N/R34W-16		
182645		48	62	CL-G		orange		T11N/R34W-16		
182645		62	73	CL		gray		T11N/R34W-16		
182645		73	87	GPGC	Rock with Clay	blue and gray		T11N/R34W-16		
182645		87	100	GC-S	Rock with Clay and Sand	brown		T11N/R34W-16		
182645		100	105	CL-G	Clay with Rock	blue		T11N/R34W-16		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
182645		105	108	RX	Fractured Rock	brown		T11N/R34W-16		
182645		108	163	CL-S		blue and gray		T11N/R34W-16		
182645		163	180	RX	Fractured Rock with fine Sand	gray		T11N/R34W-16		
182645		180	231	RX	Fractured Rock	gray		T11N/R34W-16		
182645		231	258	CL-G	Clay with Rock chips	green and gray		T11N/R34W-16		
182645		258	317	RX	Fractured Rock with Chips	black and white		T11N/R34W-16		
182645		317	320	CL		gray		T11N/R34W-16		
182645		320	325	RX	Rock with Clay	black and white		T11N/R34W-16		
182645		325	350	CL		gray and green		T11N/R34W-16		
256006	256006	0	20	CL	Top Soil			T11N/R34W-17	**T11N/R34W-17**	
256006		20	40	SC		red		T11N/R34W-17		
256006		40	60	CL		tan		T11N/R34W-17		
256006		60	80	GC		blue		T11N/R34W-17		
256006		80	120	CL-G		blue		T11N/R34W-17		
256006		120	140	CL-G		blue		T11N/R34W-17		
256006		140	165	CL		blue	x	T11N/R34W-17		
256006		165	170	CL-S-G		brown		T11N/R34W-17		
256006		170	260	SHALE	Hard Shale	gray		T11N/R34W-17		
256006		260	280	SHALE	Very Hard Shale	gray		T11N/R34W-17		
256006		280	331	SHALE	Broken, very hard Shale	gray		T11N/R34W-17		
40-0836	40-0836	0	40	SP				T11N/R34W-17		
40-0836		40	100	CL-S				T11N/R34W-17		
40-0836		100	110	SP				T11N/R34W-17		
40-0836		110	115	CL				T11N/R34W-17		
40-0836		115	160	CL-S				T11N/R34W-17		
40-0836		160	170	SP				T11N/R34W-17		
40-0836		170	175	SP-G				T11N/R34W-17		
40-0836		175	180	CL				T11N/R34W-17		
40-0836		180	195	CL		blue		T11N/R34W-17		
40-0836		195	197	CL-G				T11N/R34W-17		
40-0836		197	198	CL				T11N/R34W-17		
40-0836		198	210	CL-G				T11N/R34W-17		
40-0836		210	215	GP				T11N/R34W-17		
40-0836		215	230	CL-G				T11N/R34W-17		
40-0836		230	235	CL				T11N/R34W-17		
40-0836		235	250	CL	Clay and Sandstone			T11N/R34W-17		
40-0836		250	251	RX	Bedrock			T11N/R34W-17		
222818	222818	0	25		Adobe	black		T11N/R34W-17		
222818		25	49	CH		brown		T11N/R34W-17		
222818		49	65	CH-S-G		white		T11N/R34W-17		
222818		65	90	CH		tan		T11N/R34W-17		
222818		90	300	SHALE	Monterey Shale			T11N/R34W-17		
222818		300	345	CL		gray and brown		T11N/R34W-17		
222818		345	613	SHALE	Shale	gray and brown		T11N/R34W-17		
256011	256011	0	2		brown			T11N/R34W-17		
256011		2	13		brown			T11N/R34W-17		
256011		13	17					T11N/R34W-17		
256011		17	51		black			T11N/R34W-17		
256011		51	57					T11N/R34W-17		
256011		57	61					T11N/R34W-17		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
256011		61	64					T11N/R34W-17		
256011		64	72		brown			T11N/R34W-17		
256011		72	190		gray and black			T11N/R34W-17		
256011		190	260		gray			T11N/R34W-17		
50980	50980	0	202	SW		red and brown		T11N/R34W-18	**T11N/R34W-18**	
50980		202	294	SP-G		white		T11N/R34W-18		
50980		294	400	CLML		gray	x	T11N/R34W-18		
50980		400	435	ML	Silt, hard carbon and oil residue	gray and black	x	T11N/R34W-18		
50980		435	520	CLML		gray	x	T11N/R34W-18		
50980		520	550	SHALE	Flaky Shale with thin Sandstone strips	blue and gray		T11N/R34W-18		
223416	223416	0	2	SC	Sandy Loam			T11N/R34W-18		
223416		2	20	SC				T11N/R34W-18		
223416		20	185	SP				T11N/R34W-18		
223416		185	195	SP		blue		T11N/R34W-18		
223416		195	215	CL-S		blue		T11N/R34W-18		
223416		215	235	CL		blue		T11N/R34W-18		
223416		235	250	SHALE	Fractured Shale			T11N/R34W-18		
223416		250	265	SP				T11N/R34W-18		
223416		265	290	SP	Fine Sand with stringers of Shale			T11N/R34W-18		
223416		290	305	SW				T11N/R34W-18		
223416		305	315	SPSC	Fine Sand with stringers of Clay and Shale	blue		T11N/R34W-18		
223416		315	363	CL		blue	x	T11N/R34W-18		
401545	401545	0	99	SM				T11N/R34W-18		
401545		99	110	SWSC		gray		T11N/R34W-18		
401545		110	190	SC		tan		T11N/R34W-18		
401545		190	210	SC		cream and gray		T11N/R34W-18		
401545		210	270	CLML		gray		T11N/R34W-18		
401545		270	280	SP-G				T11N/R34W-18		
401545		280	295	CL		tan		T11N/R34W-18		
401545		295	355	CLML		white and cream		T11N/R34W-18		
401545		355	372	SP-G				T11N/R34W-18		
401545		372	395	CL-S-G		green		T11N/R34W-18		
401545		395	500	CLML		green	x	T11N/R34W-18		
68829	68829	0	109	SP				T11N/R34W-18		
68829		109	230	SC		gray		T11N/R34W-18		
68829		230	254	GP				T11N/R34W-18		
68829		254	344	SC				T11N/R34W-18		
68829		344	380	CL		blue		T11N/R34W-18		
68829		380	400	GP				T11N/R34W-18		
68829		400	407	CL		blue		T11N/R34W-18		
40-0909	40-0909	0	48	SP		red		T11N/R34W-18		
40-0909		48	54	CL		brown		T11N/R34W-18		
40-0909		54	126	SP		red		T11N/R34W-18		
40-0909		126	154	SP		white		T11N/R34W-18		
40-0909		154	168	CL-G				T11N/R34W-18		
40-0909		168	185	SP-G				T11N/R34W-18		
40-0909		185	265	SP				T11N/R34W-18		
40-0909		265	276	CL				T11N/R34W-18		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
40-0909		276	314	SP-G				T11N/R34W-18		
40-0909		314	325	GP				T11N/R34W-18		
40-0909		325	350	CL-G				T11N/R34W-18		
40-0909		350	365	CL		brown		T11N/R34W-18		
40-0909		365	403	SP-G				T11N/R34W-18		
40-0909		403	415	CL-G				T11N/R34W-18		
40-0826	40-0826	0	5	SM				T11N/R34W-19	**T11N/R34W-19**	
40-0826		5	16	SPSC				T11N/R34W-19		
40-0826		16	165	SP				T11N/R34W-19		
40-0826		165	209	SPSC		white		T11N/R34W-19		
40-0826		209	217	SC-G		white		T11N/R34W-19		
40-0826		217	247	SP-G				T11N/R34W-19		
40-0826		247	269	CL-S				T11N/R34W-19		
40-0826		269	297	CL-S		brown		T11N/R34W-19		
40-0826		297	326	SC-G		brown		T11N/R34W-19		
40-0826		326	335	GC-S				T11N/R34W-19		
40-0826		335	341	CL		red		T11N/R34W-19		
40-0826		341	364	GP-S				T11N/R34W-19		
40-0826		364	378	CL-G				T11N/R34W-19		
40-0826		378	437	SHALE	Shale	blue		T11N/R34W-19		
40-0826		437	463	SP-G	Coarse Sand and Gravel with some Shale	blue		T11N/R34W-19		
40-0826		463	518	SP	Sand and some Shale	blue	x	T11N/R34W-19		
40-0826		518	572	SHALE	Shale			T11N/R34W-19		
172137	172137	0	3	CL	Top Soil			T11N/R34W-19		
172137		3	100	SP		brown		T11N/R34W-19		
172137		100	125	CL-S		brown		T11N/R34W-19		
172137		125	135	GPGC				T11N/R34W-19		
172137		135	160	CL-GPGC		brown		T11N/R34W-19		
172137		160	200	CL		brown		T11N/R34W-19		
172137		200	220	GPGC				T11N/R34W-19		
172137		220	240	CL-S		green		T11N/R34W-19		
172137		240	280	SX	Sandstone	green		T11N/R34W-19		
172137		280	340	GP-S		blue		T11N/R34W-19		
172137		340	360	GP-S	Seashells		x	T11N/R34W-19		
172137		360	365	CL		blue		T11N/R34W-19		
402077	402077	0	3	SP		brown		T11N/R34W-19		
402077		3	10	SP		tan		T11N/R34W-19		
402077		10	16	CL		brown		T11N/R34W-19		
402077		16	21	CL		yellow		T11N/R34W-19		
402077		21	55	CL-S		tan		T11N/R34W-19		
402077		55	80	GPGC				T11N/R34W-19		
402077		80	105	SC-G		tan		T11N/R34W-19		
402077		105	120	SHALE	Monterey Shale	gray		T11N/R34W-19		
402077		120	130	CL		gray		T11N/R34W-19		
727296	727296	0	210	SP		brown		T11N/R34W-19		
727296		210	230	CL		brown		T11N/R34W-19		
727296		230	235	SHALE	Shale			T11N/R34W-19		
727296		235	280	GPGC		brown		T11N/R34W-19		
727296		280	300	CL		gray and white		T11N/R34W-19		
727296		300	325	CL		blue and green		T11N/R34W-19		
727296		325	345	CL		white		T11N/R34W-19		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
727296		345	355	GPGC		white		T11N/R34W-19		
727296		355	360	CL		blue		T11N/R34W-19		
727296		360	385	SP-G				T11N/R34W-19		
727296		385	610	CL-S		green		T11N/R34W-19		
727296		610	620	CH		blue and green		T11N/R34W-19		
1082555	1082555	0	175	SP		brown		T11N/R34W-20	**T11N/R34W-20**	
1082555		175	210	CL		gray		T11N/R34W-20		
1082555		210	225	GP-S		white and gray		T11N/R34W-20		
1082555		225	230	CL		gray		T11N/R34W-20		
1082555		230	240	SP		gray		T11N/R34W-20		
1082555		240	250	GC-S		white and gray		T11N/R34W-20		
1082555		250	280	GP		gray		T11N/R34W-20		
1082555		280	300	CL		white	x	T11N/R34W-20		
1082555		300	340	CL-S		gray		T11N/R34W-20		
1082555		340	350	CL		gray	x	T11N/R34W-20		
505486	505486	0	15	SP				T11N/R34W-20		
505486		15	20	SP-GPGC				T11N/R34W-20		
505486		20	75	SP				T11N/R34W-20		
505486		75	80	SP-GPGC				T11N/R34W-20		
505486		80	110	SP				T11N/R34W-20		
505486		110	115	SP-GPGC		blue		T11N/R34W-20		
505486		115	120	CL-GPGC		blue		T11N/R34W-20		
505486		120	155	CL		blue		T11N/R34W-20		
505486		155	160	CL-GPGC		yellow		T11N/R34W-20		
505486		160	162	CL		blue		T11N/R34W-20		
505486		162	167	GPGC				T11N/R34W-20		
505486		167	175	CL		blue		T11N/R34W-20		
505486		175	185	GPGC		blue		T11N/R34W-20		
505486		185	195	CL		blue		T11N/R34W-20		
505486		195	200	GPGC		blue		T11N/R34W-20		
505486		200	205	CL		blue		T11N/R34W-20		
505486		205	225	GPGC		blue		T11N/R34W-20		
505486		225	235	GPGC		blue	x	T11N/R34W-20		
505486		235	240	CL		blue	x	T11N/R34W-20		
505486		240	245	GP-S	Seashells		x	T11N/R34W-20		
505486		245	260	CL		blue	x	T11N/R34W-20		
505486		260	275	CL		blue	x	T11N/R34W-20		
505486		275	283	SX	Hard Sandstone	blue		T11N/R34W-20		
256186	256186	0	25	SPSC		red		T11N/R34W-20		
256186		25	80	SP		red		T11N/R34W-20		
256186		80	100	CL		brown and blue		T11N/R34W-20		
256186		100	125	CL		brown and blue		T11N/R34W-20		
256186		125	150	CH		blue and white		T11N/R34W-20		
256186		150	180	CL-S		blue		T11N/R34W-20		
256186		180	190	CL-S		blue	x	T11N/R34W-20		
256186		190	225	SHALE	Hard Sandstone Shale	gray		T11N/R34W-20		
256187	256187	0	42	SP		red		T11N/R34W-20		
256187		42	48	CL		brown		T11N/R34W-20		
256187		48	52	SP				T11N/R34W-20		
256187		52	95	CH		brown		T11N/R34W-20		
256187		95	100	SP-G				T11N/R34W-20		
256187		100	125	CH		blue		T11N/R34W-20		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
256187		125	150	CL-G		brown		T11N/R34W-20		
256187		150	218	CL-S-G		blue and white		T11N/R34W-20		
256187		218	222	SHALE	Hard Sandstone Shale	gray		T11N/R34W-20		
256183	256183	0	10	SP		red		T11N/R34W-20		
256183		10	25	CL-S		white and red		T11N/R34W-20		
256183		25	60	SC		red and white		T11N/R34W-20		
256183		60	72	SP-G				T11N/R34W-20		
256183		72	74	CH		red		T11N/R34W-20		
256183		74	99	SC-G		red		T11N/R34W-20		
256183		99	140	CL		blue		T11N/R34W-20		
256183		140	190	CL-G		white		T11N/R34W-20		
256183		190	249	CL-S		white and green	x	T11N/R34W-20		
221029	221029	0	40	SP		brown		T11N/R34W-20		
221029		40	55	CH		brown		T11N/R34W-20		
221029		55	60	SP-G				T11N/R34W-20		
221029		60	85	SC				T11N/R34W-20		
221029		85	219	SC-G		blue		T11N/R34W-20		
221029		219	912	SHALE	Volcanic Shale with Sandstone and thin Chert strips	green		T11N/R34W-20		
38350	38350	0	204	SP				T11N/R34W-20		
38350		204	212	CL-G		blue		T11N/R34W-20		
38350		212	230	CL-S-G		blue		T11N/R34W-20		
38350		230	237	SP				T11N/R34W-20		
38350		237	252	CL-S-G				T11N/R34W-20		
38350		252	257	SP				T11N/R34W-20		
38350		257	290	CL-S		blue		T11N/R34W-20		
38350		290	306	GC-S				T11N/R34W-20		
38244	38244	0	196	SP				T11N/R34W-20		
38244		196	229	SC		yellow		T11N/R34W-20		
38244		229	233	CL		gray		T11N/R34W-20		
38244		233	248	SC		gray		T11N/R34W-20		
38244		248	268	CL		gray		T11N/R34W-20		
38244		268	275	CL-S-G		brown		T11N/R34W-20		
38244		275	288	CL		brown		T11N/R34W-20		
38244		288	302	CL-S-G		gray		T11N/R34W-20		
38244		302	307	CL		brown		T11N/R34W-20		
38244		307	312	CL-S-G		brown		T11N/R34W-20		
38244		312	320	CL		yellow		T11N/R34W-20		
38244		320	328	SP-G				T11N/R34W-20		
538880	538880	0	179	SP		brown		T11N/R34W-21	**T11N/R34W-21**	
538880		179	241	SP		white and brown		T11N/R34W-21		
538880		241	263	GPGC		white		T11N/R34W-21		
538880		263	289	CL-S-G		brown and white		T11N/R34W-21		
538880		289	318	CL-S		green and white	x	T11N/R34W-21		
538880		318	350	SPSC		white and blue		T11N/R34W-21		
538880		350	379	SP		blue	x	T11N/R34W-21		
538880		379	407	CL-S		blue	x	T11N/R34W-21		
474944	474944	0	65	SP		brown		T11N/R34W-21		
474944		65	70	CL		blue		T11N/R34W-21		
474944		70	85	SP				T11N/R34W-21		
474944		85	210	CL		blue		T11N/R34W-21		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
474944		210	238	CL-S	Sandy Clay with small Rocks	white		T11N/R34W-21		
474944		238	268	RX	Rock			T11N/R34W-21		
538355	538355	0	4	SP				T11N/R34W-21		
538355		4	5	CL		brown		T11N/R34W-21		
538355		5	60	SP				T11N/R34W-21		
538355		60	130	SPSC		brown		T11N/R34W-21		
538355		130	140	SHALE	Soft Shale	gray		T11N/R34W-21		
538355		140	160	CL		blue		T11N/R34W-21		
538355		160	175	SP-G				T11N/R34W-21		
538355		175	185	CL-S		blue		T11N/R34W-21		
538355		185	195	GPGC				T11N/R34W-21		
538355		195	210	SHALE	Sandy Shale	brown		T11N/R34W-21		
538355		210	220	GPGC				T11N/R34W-21		
538355		220	235	SHALE	Sandy Shale	brown		T11N/R34W-21		
538355		235	250	CL-S		blue		T11N/R34W-21		
538355		250	270	CL-S		blue		T11N/R34W-21		
538355		270	290	SP		blue		T11N/R34W-21		
538355		290	337	GPGC		blue		T11N/R34W-21		
538355		337	339	SX	Hard Sandstone	blue		T11N/R34W-21		
538355		339	355	SP		blue	x	T11N/R34W-21		
538355		355	360	CL		blue		T11N/R34W-21		
763346	763346	0	89	SP				T11N/R34W-21		
763346		89	91	CL		blue		T11N/R34W-21		
763346		91	118	SP-G		blue		T11N/R34W-21		
763346		118	165	CL		blue		T11N/R34W-21		
763346		165	178	CL-G		brown		T11N/R34W-21		
763346		178	251	GC-S		brown and blue		T11N/R34W-21		
763346		251	287	SPSC		blue		T11N/R34W-21		
763346		287	302	CL		blue	x	T11N/R34W-21		
763346		302	310	SW		blue	x	T11N/R34W-21		
1082620	1082620	0	20	CL	Top Soil			T11N/R34W-22	**T11N/R34W-22**	
1082620		20	40	CL-S		brown		T11N/R34W-22		
1082620		40	60	CL		brown		T11N/R34W-22		
1082620		60	80	CL-S		tan		T11N/R34W-22		
1082620		80	100	CL		brown		T11N/R34W-22		
1082620		100	120	CL-S		tan		T11N/R34W-22		
1082620		120	140	GC				T11N/R34W-22		
1082620		140	160	CL-S		tan		T11N/R34W-22		
1082620		160	180	CL	Clay and hard Shale	green and gray		T11N/R34W-22		
1082620		180	200	SHALE	Shale and Clay	blue		T11N/R34W-22		
1082620		200	220	SHALE	Shale	blue, red, and white		T11N/R34W-22		
1082620		220	260	SHALE	Shale	blue, red, and white		T11N/R34W-22		
1082620		260	350	SHALE	Shale	blue and gray		T11N/R34W-22		
1090797	1090797	0	40	SP				T11N/R34W-27	**T11N/R34W-27**	
1090797		40	60	CL		brown		T11N/R34W-27		
1090797		60	80	CL		brown		T11N/R34W-27		
1090797		80	100	CL-S-G		white		T11N/R34W-27		
1090797		100	140	CL-G		white and brown		T11N/R34W-27		
1090797		140	180	CL-G		brown		T11N/R34W-27		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
1090797		180	220	CL	Clay with soft Shale	white		T11N/R34W-27		
1090797		220	260	SHALE	Soft Shale and Clay	gray		T11N/R34W-27		
1090797		260	320	SHALE	Hard Shale	gray and brown		T11N/R34W-27		
1090797		320	360	SHALE	Hard Shale and Clay	gray		T11N/R34W-27		
1090797		360	380	SHALE	Hard Shale	black and gray		T11N/R34W-27		
1090797		380	400	SHALE	Shale and Clay	gray		T11N/R34W-27		
5762	5762	0	40	SP				T11N/R34W-27		
5762		40	60	GP-S				T11N/R34W-27		
5762		60	90	CL-S		brown		T11N/R34W-27		
5762		90	100	CL-G		brown		T11N/R34W-27		
5762		100	150	CL-G		blue and green		T11N/R34W-27		
5762		150	170	CL-G		blue and green		T11N/R34W-27		
5762		170	190	GP-S				T11N/R34W-27		
5762		190	210	GP-S				T11N/R34W-27		
5762		210	220	CL		blue	x	T11N/R34W-27		
5762		220	240	CL		blue	x	T11N/R34W-27		
5762		240	250	CL-S		blue		T11N/R34W-27		
5762		250	280	CL-S		blue		T11N/R34W-27		
5762		280	290	SHALE	Shale and Clay	blue and black		T11N/R34W-27		
5762		290	300	SHALE	Shale	blue and black		T11N/R34W-27		
5762		300	320	SHALE	Shale	blue and black		T11N/R34W-27		
158733	158733	0	25	SP		red		T11N/R34W-27		
158733		25	51	SP		red		T11N/R34W-27		
158733		51	70	CH		gray		T11N/R34W-27		
158733		70	74	SP-G				T11N/R34W-27		
158733		74	98	CLML-G		gray		T11N/R34W-27		
158733		98	115	GPGC		brown		T11N/R34W-27		
158733		115	125	SP-G				T11N/R34W-27		
158733		125	160	SC-G		green and yellow		T11N/R34W-27		
158733		160	200	SHALE	Broken Monterey Shale			T11N/R34W-27		
1098046	1098046	0	8	SP		brown		T11N/R34W-29	**T11N/R34W-29**	
1098046		8	85	CL-S				T11N/R34W-29		
1098046		85	140	SP		brown		T11N/R34W-29		
1098046		140	170	GP-S				T11N/R34W-29		
1098046		170	205	CL-G				T11N/R34W-29		
1098046		205	225	GP				T11N/R34W-29		
1098046		225	243	CL		brown		T11N/R34W-29		
1098046		243	263	GP				T11N/R34W-29		
1098046		263	267	CL		brown		T11N/R34W-29		
1098046		267	288	GP				T11N/R34W-29		
1098046		288	302	CL		blue		T11N/R34W-29		
1098046		302	308	GP				T11N/R34W-29		
1098046		308	315	CL		blue		T11N/R34W-29		
1098046		315	328	SP		blue		T11N/R34W-29		
1098046		328	400	SP		blue		T11N/R34W-29		
1082554	1082554	0	60	SP-G				T11N/R34W-29		
1082554		60	70	SP				T11N/R34W-29		
1082554		70	100	GP				T11N/R34W-29		
1082554		100	120	SP				T11N/R34W-29		
1082554		120	150	CL-G		brown		T11N/R34W-29		
1082554		150	190	GP				T11N/R34W-29		
1082554		190	195	CL				T11N/R34W-29		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
1082554		195	220	GP				T11N/R34W-29		
1082554		220	237	CL				T11N/R34W-29		
1082554		237	268	GP				T11N/R34W-29		
1082554		268	300	SP				T11N/R34W-29		
1082554		300	330	CL				T11N/R34W-29		
1082554		330	360	SP-G		blue		T11N/R34W-29		
1082554		360	410	CL-S			x	T11N/R34W-29		
1082553	1082553	0	180	SP		brown		T11N/R34W-29		
1082553		180	214	CL		gray		T11N/R34W-29		
1082553		214	220	CL-G		brown		T11N/R34W-29		
1082553		220	250	GP				T11N/R34W-29		
1082553		250	267	CL		brown		T11N/R34W-29		
1082553		267	280	GP-S		brown		T11N/R34W-29		
1082553		280	295	CL		gray		T11N/R34W-29		
1082553		295	345	GC-S		gray		T11N/R34W-29		
1082553		345	400	CL-S		gray		T11N/R34W-29		
1082553		400	420	CL		gray	x	T11N/R34W-29		
1098071	1098071	0	3	CL-S				T11N/R34W-29		
1098071		3	18	SP				T11N/R34W-29		
1098071		18	31	GP				T11N/R34W-29		
1098071		31	33	CL		brown		T11N/R34W-29		
1098071		33	46	GP				T11N/R34W-29		
1098071		46	110	SP				T11N/R34W-29		
1098071		110	118	CL-G				T11N/R34W-29		
1098071		118	128	GP-S				T11N/R34W-29		
1098071		128	140	CL		brown		T11N/R34W-29		
1098071		140	162	SC-G				T11N/R34W-29		
1098071		162	185	GP-S				T11N/R34W-29		
1098071		185	202	CL				T11N/R34W-29		
1098071		202	212	GP-S				T11N/R34W-29		
1098071		212	225	CL				T11N/R34W-29		
1098071		225	234	GP-S				T11N/R34W-29		
1098071		234	240	CL				T11N/R34W-29		
1098071		240	267	GP-S				T11N/R34W-29		
1098071		267	290	CL		blue		T11N/R34W-29		
1098071		290	323	GP-S		blue		T11N/R34W-29		
1098071		323	360	SP		blue		T11N/R34W-29		
38116	38116	0	6	SP				T11N/R34W-29		
38116		6	24	SP		brown		T11N/R34W-29		
38116		24	57	CL		blue		T11N/R34W-29		
38116		57	84	SP		gray		T11N/R34W-29		
38116		84	90	CL		brown		T11N/R34W-29		
38116		90	95	CL		blue		T11N/R34W-29		
38116		95	128	CL-S		brown		T11N/R34W-29		
38116		128	137	SP	Hard Sand	brown		T11N/R34W-29		
38116		137	158	CL-S		brown		T11N/R34W-29		
38116		158	166	SP	Hard Sand	brown		T11N/R34W-29		
38116		166	187	CL		blue		T11N/R34W-29		
38116		187	192	SP	Hard Sand			T11N/R34W-29		
38116		192	204	CL		brown		T11N/R34W-29		
38116		204	210	CL		blue		T11N/R34W-29		
38116		210	245	CL-S		brown		T11N/R34W-29		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
38116		245	248	CL		blue		T11N/R34W-29		
38116		248	252	CL		brown		T11N/R34W-29		
38116		252	261	SP				T11N/R34W-29		
38116		261	278	SP	Hard Sand	brown		T11N/R34W-29		
38116		278	293	CL	Hard Clay	gray		T11N/R34W-29		
38116		293	319	CL-S		brown		T11N/R34W-29		
38116		319	350	SP	Hard Sand	brown		T11N/R34W-29		
38116		350	390	GP				T11N/R34W-29		
38116		390	402	SP				T11N/R34W-29		
222860	222860	0	55	SP-G				T11N/R34W-30	**T11N/R34W-30**	
222860		55	75	CL-G		brown		T11N/R34W-30		
222860		75	100	CH-S		brown		T11N/R34W-30		
222860		100	125	SC-G		brown		T11N/R34W-30		
222860		125	175	SP-G				T11N/R34W-30		
222860		175	195	CL-G		brown		T11N/R34W-30		
222860		195	200	SP-G				T11N/R34W-30		
222860		200	215	CL		brown		T11N/R34W-30		
222860		215	225	CL-G		red		T11N/R34W-30		
222860		225	260	CL-S		red and blue		T11N/R34W-30		
222860		260	290	SP-G				T11N/R34W-30		
222860		290	300	CL-G				T11N/R34W-30		
222860		300	340	SM		blue		T11N/R34W-30		
222860		340	350	SM-G		blue	x	T11N/R34W-30		
352765	352765	0	40	SPSC				T11N/R34W-30		
352765		40	95	SW-G				T11N/R34W-30		
352765		95	122	SP-G				T11N/R34W-30		
352765		122	132	CL		gray		T11N/R34W-30		
352765		132	158	SC		red and brown		T11N/R34W-30		
352765		158	200	CL-S				T11N/R34W-30		
352765		200	210	CL		gray		T11N/R34W-30		
352765		210	221	SP				T11N/R34W-30		
352765		221	248	GP-S				T11N/R34W-30		
352765		248	254	CL		brown		T11N/R34W-30		
352765		254	280	SP-G				T11N/R34W-30		
352765		280	345	CH-S		tan		T11N/R34W-30		
352765		345	377	CLML		white		T11N/R34W-30		
351548	351548	0	5	CL	Top Soil			T11N/R34-33	**T11N/R34-33**	
351548		5	65	SP-G		brown		T11N/R34-33		
351548		65	108	SC		brown		T11N/R34-33		
351548		108	119	CL		brown		T11N/R34-33		
351548		119	128	SW				T11N/R34-33		
351548		128	138	CL		brown		T11N/R34-33		
351548		138	171	GP-S				T11N/R34-33		
351548		171	191	CL-S-G		brown		T11N/R34-33		
351548		191	203	CL-S-G		brown		T11N/R34-33		
351548		203	223	CL-S		brown		T11N/R34-33		
351548		223	234	CL		brown		T11N/R34-33		
351548		234	241	CL		blue and brown		T11N/R34-33		
351548		241	275	SPSC		blue		T11N/R34-33		
351548		275	285	CL-S		blue		T11N/R34-33		
351548		285	329	CL-S-G		blue		T11N/R34-33		
351548		329	349	SW		blue	x	T11N/R34-33		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
351548		349	380	SW		black and blue	x	T11N/R34-33		
351548		380	400	CL-S		blue	x	T11N/R34-33		
351548		400	445	CL-S		blue	x	T11N/R34-33		
25853	25853	0	3	ML-S				T11N/R34-34	**T11N/R34-34**	
25853		3	47	SP				T11N/R34-34		
25853		47	50	GP				T11N/R34-34		
25853		50	74	SP				T11N/R34-34		
25853		74	78	GP				T11N/R34-34		
25853		78	103	SP				T11N/R34-34		
25853		103	125	GP				T11N/R34-34		
25853		125	135	SP		white		T11N/R34-34		
25853		135	162	CL-S		blue		T11N/R34-34		
25853		162	171	SP-G		blue		T11N/R34-34		
25853		171	178	SP-G	Hard Sand and Gravel	blue		T11N/R34-34		
25853		178	190	CL-S	Soft Sandy Clay			T11N/R34-34		
25853		190	200	SP-G				T11N/R34-34		
25853		200	208	SP		blue		T11N/R34-34		
25853		208	213	GP	Some Gravel and Shale			T11N/R34-34		
25853		213	214	RX	Hard Rock			T11N/R34-34		
559228	559228	0	12	SP				T11N/R34-34		
559228		12	63	CL				T11N/R34-34		
559228		63	102	CL-G				T11N/R34-34		
559228		102	115	GP				T11N/R34-34		
559228		115	136	CL				T11N/R34-34		
559228		136	150	CL	Clay with Shale streaks			T11N/R34-34		
559228		150	181	CL				T11N/R34-34		
559228		181	190	SHALE	Shale with Clay streaks			T11N/R34-34		
559228		190	200	SHALE	Hard Shale			T11N/R34-34		
748810	748810	0	106	SP-G		brown		T11N/R34W-35	**T11N/R34W-35**	
748810		106	110	CL		blue		T11N/R34W-35		
748810		110	197	SPSC		blue		T11N/R34W-35		
748810		197	201	CL		blue		T11N/R34W-35		
748810		201	221	SHALE	Shale	black		T11N/R34W-35		
05889	05889	0	80	SP				T11N/R35W-1	**T11N/R35W-1**	
05889		80	90	CL		yellow		T11N/R35W-1		
05889		90	95	CL		blue		T11N/R35W-1		
05889		95	110	GPGC		blue		T11N/R35W-1		
05889		110	122	CL		yellow		T11N/R35W-1		
05889		122	140	GPGC				T11N/R35W-1		
05889		140	163	CL-G		yellow		T11N/R35W-1		
05889		163	180	GPGC				T11N/R35W-1		
05889		180	189	CL		yellow		T11N/R35W-1		
05889		189	215	GPGC				T11N/R35W-1		
05889		215	230	CL		yellow		T11N/R35W-1		
05889		230	255	GPGC				T11N/R35W-1		
05889		255	265	SHALE	Shale	blue		T11N/R35W-1		
256012	256012	0	31	SP		brown		T11N/R35W-1		
256012		31	158	SC-G		brown		T11N/R35W-1		
256012		158	190	CL-G		tan and white		T11N/R35W-1		
256012		190	221	CL-S-G		gray	x	T11N/R35W-1		
256012		221	635	SX	Sandstone	gray		T11N/R35W-1		
269651	269651	0	20	SP				T11N/R35W-1		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
269651		20	60	SP				T11N/R35W-1		
269651		60	140	GPGC				T11N/R35W-1		
269651		140	180	GPGC				T11N/R35W-1		
269651		180	200	GPGC				T11N/R35W-1		
269651		200	220	SHALE	Shale	blue		T11N/R35W-1		
294059	294059	0	92	SP		brown		T11N/R35W-1		
294059		92	107	CL-GPGC		gray		T11N/R35W-1		
294059		107	264	GPGC		brown		T11N/R35W-1		
294059		264	272	CL		blue		T11N/R35W-1		
294059		272	284	GPGC				T11N/R35W-1		
294059		284	300	SHALE	Shale	green		T11N/R35W-1		
106368	106368	0	5	SP				T11N/R35W-1		
106368		5	65	SP				T11N/R35W-1		
106368		65	92	SP				T11N/R35W-1		
106368		92	128	SP				T11N/R35W-1		
106368		128	131	GP				T11N/R35W-1		
106368		131	153	CL		gray		T11N/R35W-1		
106368		153	177	SP				T11N/R35W-1		
106368		177	186	CL		brown		T11N/R35W-1		
106368		186	211	GC				T11N/R35W-1		
106368		211	223	CL		brown		T11N/R35W-1		
106368		223	240	GP				T11N/R35W-1		
106368		240	253	SP				T11N/R35W-1		
106368		253	266	GP				T11N/R35W-1		
106368		266	320	CL		blue		T11N/R35W-1		
069694	069694	0	17	SP				T11N/R35W-1		
069694		17	22	GPGC				T11N/R35W-1		
069694		22	54	SP				T11N/R35W-1		
069694		54	196	GPGC				T11N/R35W-1		
069694		196	203	SHALE	Shale	blue		T11N/R35W-1		
069694		203	215	CL		blue		T11N/R35W-1		
069694		215	223	SHALE	Shale	blue		T11N/R35W-1		
069694		223	234	CL		blue		T11N/R35W-1		
069694		234	280	SHALE	Shale	blue		T11N/R35W-1		
171357	171357	0	65	SP				T11N/R35W-1		
171357		65	100	SPSC		red		T11N/R35W-1		
171357		100	150	CL-G		brown and gray		T11N/R35W-1		
171357		150	225	SC-G		gray		T11N/R35W-1		
171357		225	245	SC-G		red		T11N/R35W-1		
171357		245	275	CL-G		gray		T11N/R35W-1		
171357		275	315	SC-G		white		T11N/R35W-1		
171357		315	350	CL		gray	x	T11N/R35W-1		
171357		350	400	CL-S		gray	x	T11N/R35W-1		
171357		400	491	SHALE	Shale	gray and blue		T11N/R35W-1		
171356	171356	0	150	SPSC		red		T11N/R35W-1		
171356		150	200	SC-G		brown		T11N/R35W-1		
171356		200	235	CL-G		blue		T11N/R35W-1		
171356		235	265	SP-G				T11N/R35W-1		
171356		265	310	CL-G		tan and blue		T11N/R35W-1		
171356		310	325	SC-G		white		T11N/R35W-1		
171356		325	350	SC-G		gray		T11N/R35W-1		
171356		350	455	CL		gray	x	T11N/R35W-1		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
82394	82394	0	86	SP				T11N/R35W-1		
82394		86	98	SP				T11N/R35W-1		
82394		98	100	CL		gray		T11N/R35W-1		
82394		100	106	CL-S-G				T11N/R35W-1		
82394		106	132	CL-G		brown		T11N/R35W-1		
82394		132	148	CL-G		yellow		T11N/R35W-1		
82394		148	179	CL-G		brown		T11N/R35W-1		
82394		179	200	CL		brown		T11N/R35W-1		
82394		200	209	CL-G		brown		T11N/R35W-1		
82394		209	212	CL		brown		T11N/R35W-1		
82394		212	218	CL-G		gray		T11N/R35W-1		
82394		218	224	CL		gray		T11N/R35W-1		
82394		224	248	CL		gray		T11N/R35W-1		
82394		248	250	SHALE	Shale	blue		T11N/R35W-1		
64910	64910	0	74	SP				T11N/R35W-1		
64910		74	79	CL		gray		T11N/R35W-1		
64910		79	88	CL-G		brown		T11N/R35W-1		
64910		88	94	CL		brown		T11N/R35W-1		
64910		94	100	CL-G		brown		T11N/R35W-1		
64910		100	111	CL-S		brown		T11N/R35W-1		
64910		111	116	CL-G		brown		T11N/R35W-1		
64910		116	143	CL		brown		T11N/R35W-1		
64910		143	148	CL-G		brown		T11N/R35W-1		
64910		148	178	CL		brown		T11N/R35W-1		
64910		178	184	CL-G		brown		T11N/R35W-1		
64910		184	190	CL		brown		T11N/R35W-1		
64910		190	199	CL		brown		T11N/R35W-1		
64910		199	204	CL-G		brown		T11N/R35W-1		
64910		204	214	CL-G		gray		T11N/R35W-1		
64910		214	219	CL-G		gray		T11N/R35W-1		
64910		219	227	SHALE	Shale	gray		T11N/R35W-1		
64910		227	240	SHALE	Shale	blue		T11N/R35W-1		
172132	172132	0	3	CL	Soil			T11N/R35W-1		
172132		3	85	SP				T11N/R35W-1		
172132		85	90	GPGC				T11N/R35W-1		
172132		90	130	CL-S		green		T11N/R35W-1		
172132		130	160	CL-GPGC		brown		T11N/R35W-1		
172132		160	170	GPGC				T11N/R35W-1		
172132		170	215	CL		brown		T11N/R35W-1		
172132		215	235	GPGC				T11N/R35W-1		
172132		235	245	CL		brown		T11N/R35W-1		
172132		245	255	GPGC				T11N/R35W-1		
172132		255	270	CL		brown		T11N/R35W-1		
172132		270	285	GPGC				T11N/R35W-1		
172132		285	310	CL-GPGC		green		T11N/R35W-1		
172132		310	330	GP				T11N/R35W-1		
172132		330	340	SHALE	Shale	blue		T11N/R35W-1		
171940	171940	0	3	Soil	Soil			T11N/R35W-1		
171940		3	115	SP				T11N/R35W-1		
171940		115	170	CL-G		brown		T11N/R35W-1		
171940		170	182	GPGC				T11N/R35W-1		
171940		182	220	CL-GPGC		brown		T11N/R35W-1		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
171940		220	230	GPGC				T11N/R35W-1		
171940		230	265	CL-GPGC		brown		T11N/R35W-1		
171940		265	283	SP-GPGC				T11N/R35W-1		
171940		283	290	CL-GPGC		brown		T11N/R35W-1		
171940		290	330	GPGC				T11N/R35W-1		
171940		330	370	SX	Sandstone	green		T11N/R35W-1		
15206	15206	0	20	SP				T11N/R35W-1		
15206		20	40	SC-G				T11N/R35W-1		
15206		40	60	CL-S				T11N/R35W-1		
15206		60	100	CL-S-G				T11N/R35W-1		
15206		100	140	GPGC				T11N/R35W-1		
15206		140	160	CL-G				T11N/R35W-1		
15206		160	200	SHALE	Shale			T11N/R35W-1		
288033	288033	0	18	CL				T11N/R35W-1		
288033		18	121	SHALE	Shale			T11N/R35W-1		
288033		121	260	SHALE	Shale	green		T11N/R35W-1		
288033		260	300	SHALE	Shale			T11N/R35W-1		
160826	160826	0	38	CL-G	Fill			T11N/R35W-1		
160826		38	240	SHALE	Shale			T11N/R35W-1		
151389	151389	0	58	SP				T11N/R35W-1		
151389		58	90	SC				T11N/R35W-1		
151389		90	98	CL-G		blue		T11N/R35W-1		
151389		98	101	SP-GPGC		yellow		T11N/R35W-1		
151389		101	110	CL		yellow		T11N/R35W-1		
151389		110	120	SP-G				T11N/R35W-1		
151389		120	160	SP-GPGC				T11N/R35W-1		
151389		160	193	SC				T11N/R35W-1		
151389		193	220	GPGC				T11N/R35W-1		
151389		220	240	SP-GPGC				T11N/R35W-1		
151389		240	247	CL		brown		T11N/R35W-1		
151389		247	250	GPGC				T11N/R35W-1		
151389		250	280	SHALE	Shale	brown		T11N/R35W-1		
40-3730	40-3730	0	2	CL	Soil			T11N/R35W-1		
40-3730		2	60	SP		yellow		T11N/R35W-1		
40-3730		60	77	SPSC		gray		T11N/R35W-1		
40-3730		77	85	CL	Clay and Shale	gray		T11N/R35W-1		
40-3730		85	94	SHALE	Shale with Sand			T11N/R35W-1		
40-3730		94	100	SHALE	Shale with Clay			T11N/R35W-1		
40-3730		100	140	CL	Clay large Shale	brown		T11N/R35W-1		
40-3730		140	145	CL		brown		T11N/R35W-1		
40-3730		145	152	SHALE				T11N/R35W-1		
40-3730		152	167	CL	Clay and Shale			T11N/R35W-1		
40-3730		167	173	CL				T11N/R35W-1		
40-3730		173	188	SHALE	Shale with Sand			T11N/R35W-1		
40-3730		188	195	CL	Clay Shale	gray		T11N/R35W-1		
40-3730		195	210	CL	Clay and Shale	gray		T11N/R35W-1		
40-3730		210	232	GP-S				T11N/R35W-1		
40-3730		232	240	SC		gray		T11N/R35W-1		
352457	352457	0	6	SP				T11N/R35W-2	**T11N/R35W-2**	
352457		6	98	SP				T11N/R35W-2		
352457		98	105	SX	Sandstone			T11N/R35W-2		
352457		105	108	GP		white and red		T11N/R35W-2		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
352457		108	155	GC		brown		T11N/R35W-2		
352457		155	185	GC				T11N/R35W-2		
352457		185	190	GP				T11N/R35W-2		
352457		190	195	GC				T11N/R35W-2		
352457		195	200	GC	Rock	white		T11N/R35W-2		
352457		200	238	GC				T11N/R35W-2		
352457		238	247	GP				T11N/R35W-2		
352457		247	250	GP-S				T11N/R35W-2		
352457		250	263	GC		brown		T11N/R35W-2		
352457		263	270	CL		blue		T11N/R35W-2		
218576	218576	0	100	SP				T11N/R35W-2		
218576		100	120	SP-G				T11N/R35W-2		
218576		120	140	GC				T11N/R35W-2		
218576		140	210	CL				T11N/R35W-2		
218576		210	270	CL-G				T11N/R35W-2		
218576		270	280	SHALE	Shale	blue		T11N/R35W-2		
222443	222443	0	3	CL	Soil			T11N/R35W-2		
222443		3	115	SP		brown		T11N/R35W-2		
222443		115	205	CL-S		brown		T11N/R35W-2		
222443		205	310	GPGC				T11N/R35W-2		
222443		310	325	CL		brown		T11N/R35W-2		
222443		325	330	GPGC				T11N/R35W-2		
222443		330	350	CL		brown		T11N/R35W-2		
222443		350	375	GPGC				T11N/R35W-2		
222443		375	390	GPGC				T11N/R35W-2		
222443		390	400	GPGC				T11N/R35W-2		
222443		400	410	GPGC				T11N/R35W-2		
222443		410	440	GPGC				T11N/R35W-2		
222443		440	450	CL-S		green		T11N/R35W-2		
222443		450	455	CL-S	Seashells	x		T11N/R35W-2		
222443		455	460	SHALE		green		T11N/R35W-2		
69517	69517	0	100	SP				T11N/R35W-2		
69517		100	255	GPGC				T11N/R35W-2		
69517		255	265	CL-GPGC		brown		T11N/R35W-2		
69517		265	330	GPGC				T11N/R35W-2		
69517		330	350	SHALE	Shale and Clay	white		T11N/R35W-2		
69517		350	403	GPGC				T11N/R35W-2		
50963	50963	0	50	SC		red and brown		T11N/R35W-2		
50963		50	90	CL-S		brown		T11N/R35W-2		
50963		90	110	SP		brown		T11N/R35W-2		
50963		110	125	CL-G		gray		T11N/R35W-2		
50963		125	255	SP-G				T11N/R35W-2		
50963		255	265	CL		gray		T11N/R35W-2		
50963		265	285	SP-G				T11N/R35W-2		
50963		285	295	CL		white		T11N/R35W-2		
50963		295	301	CL		gray		T11N/R35W-2		
159144	159144	0	4	SP	Sandy Top			T11N/R35W-2		
159144		4	93	SP		brown		T11N/R35W-2		
159144		93	96	SP		white		T11N/R35W-2		
159144		96	103	SHALE	Shale Soft	gray		T11N/R35W-2		
159144		103	135	GC		brown		T11N/R35W-2		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
159144		135	205	GPGC	Loose Shale Conglomerate			T11N/R35W-2		
159144		205	235	GC		gray		T11N/R35W-2		
159144		235	270	GW				T11N/R35W-2		
159144		270	280	CL	Hard Rock			T11N/R35W-2		
159144		280	287	CL		blue		T11N/R35W-2		
38844	38844	0	92	SP				T11N/R35W-2		
38844		92	198	CL-G				T11N/R35W-2		
38844		198	202	GP				T11N/R35W-2		
38844		202	250	CL-G				T11N/R35W-2		
38844		250	254	GP				T11N/R35W-2		
82381	82381	0	1	SP				T11N/R35W-2		
82381		1	66	SP		brown		T11N/R35W-2		
82381		66	78	CL		gray		T11N/R35W-2		
82381		78	80	SP				T11N/R35W-2		
82381		80	87	SP		gray		T11N/R35W-2		
82381		87	96	CL-G		gray		T11N/R35W-2		
82381		96	151	CL-G		brown		T11N/R35W-2		
82381		151	193	CL		brown		T11N/R35W-2		
82381		193	208	CL-G		brown		T11N/R35W-2		
82381		208	215	CL-G		yellow		T11N/R35W-2		
82381		215	236	CL-G		brown		T11N/R35W-2		
82381		236	242	CL		brown		T11N/R35W-2		
82381		242	246	GP				T11N/R35W-2		
82381		246	249	CL		brown		T11N/R35W-2		
82381		249	250	GP				T11N/R35W-2		
82381		250	251	CL		brown		T11N/R35W-2		
82381		251	254	GP-S				T11N/R35W-2		
82381		254	279	GP				T11N/R35W-2		
82381		279	283	CL		gray		T11N/R35W-2		
159145	159145	0	3	SP	Top Sandy Soil			T11N/R35W-2		
159145		3	67	SP		brown		T11N/R35W-2		
159145		67	70	GP	Coarse Gravel Conglomerate			T11N/R35W-2		
159145		70	100	SP		brown		T11N/R35W-2		
159145		100	110	GP				T11N/R35W-2		
159145		110	136	CL		brown		T11N/R35W-2		
159145		136	153	GC				T11N/R35W-2		
159145		153	175	CL		brown		T11N/R35W-2		
159145		175	220	CL		brown		T11N/R35W-2		
159145		220	230	SHALE	Soft Shale			T11N/R35W-2		
159145		230	252	CL-G		brown		T11N/R35W-2		
159145		252	264	SP-G				T11N/R35W-2		
159145		264	268	GP-S				T11N/R35W-2		
159145		268	276	CL		blue		T11N/R35W-2		
478859	478859	0	20	SP		brown		T11N/R35W-2		
478859		20	100	SX	Sandstone - soft	brown		T11N/R35W-2		
478859		100	115	GPGC				T11N/R35W-2		
478859		115	130	CL-S				T11N/R35W-2		
478859		130	160	GPGC				T11N/R35W-2		
478859		160	260	SC-G				T11N/R35W-2		
478859		260	300	SHALE	Hard Shale	gray		T11N/R35W-2		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
478860	478860	0	60	SP		brown		T11N/R35W-2		
478860		60	180	CL-G		brown		T11N/R35W-2		
478860		180	270	SC-G				T11N/R35W-2		
478860		270	280	SHALE	Hard Shale			T11N/R35W-2		
338463	338463	0	90	SP				T11N/R35W-2		
338463		90	95	CL		brown		T11N/R35W-2		
338463		95	105	SP				T11N/R35W-2		
338463		105	110	CL		brown		T11N/R35W-2		
338463		110	158	SP				T11N/R35W-2		
338463		158	188	CL		brown		T11N/R35W-2		
338463		188	210	SHALE	Shale, Sand			T11N/R35W-2		
338463		210	230	CL		brown		T11N/R35W-2		
338463		230	232	SC	Shaly Sand			T11N/R35W-2		
338463		232	254	CL		brown		T11N/R35W-2		
338463		254	256	SC	Shaley Sand			T11N/R35W-2		
338463		256	270	CL		brown		T11N/R35W-2		
338463		270	272	SP				T11N/R35W-2		
338463		272	290	CL		brown		T11N/R35W-2		
338463		290	295	SP		green		T11N/R35W-2		
338463		295	312	CL		brown		T11N/R35W-2		
338463		312	314	SP		green		T11N/R35W-2		
338463		314	340	CL		brown		T11N/R35W-2		
338463		340	342	SC	Shaly Sand			T11N/R35W-2		
338463		342	390	CL		brown		T11N/R35W-2		
338463		390	395	SC	Shaly Sand			T11N/R35W-2		
338463		395	420	CL		blue		T11N/R35W-2		
159146	159146	0	4	SP	Sandy Soil			T11N/R35W-2		
159146		4	95	SP		brown		T11N/R35W-2		
159146		95	108	SP-G				T11N/R35W-2		
159146		108	130	SX	Hard Sandstone			T11N/R35W-2		
159146		130	157	SP		brown		T11N/R35W-2		
159146		157	168	GC		blue		T11N/R35W-2		
159146		168	175	SX	Sandstone	brown		T11N/R35W-2		
159146		175	210	GC				T11N/R35W-2		
159146		210	245	SHALE	Hard Shale Fractured			T11N/R35W-2		
159146		245	297	CL		brown		T11N/R35W-2		
159146		297	315	GP	? Gravel Conglomerate			T11N/R35W-2		
159146		315	320	SHALE	Soft Limestone Formation	White		T11N/R35W-2		
159146		320	350	SHALE	Fractured Shale			T11N/R35W-2		
159146		350	351	GC		gray		T11N/R35W-2		
322379	322379	0	65	SP-G				T11N/R35W-2		
322379		65	70	CL		brown		T11N/R35W-2		
322379		70	175	SP				T11N/R35W-2		
322379		175	178	CL		brown		T11N/R35W-2		
322379		178	182	GPGC				T11N/R35W-2		
322379		182	235	CL		brown		T11N/R35W-2		
322379		235	239	GP				T11N/R35W-2		
322379		239	310	GC		brown		T11N/R35W-2		
322379		310	375	CL		brown		T11N/R35W-2		
322379		375	376	GP				T11N/R35W-2		
322379		376	378	CL		brown		T11N/R35W-2		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
322379		378	385	CL		brown		T11N/R35W-2		
322379		385	390	SP				T11N/R35W-2		
322379		390	408	CL		brown		T11N/R35W-2		
322379		408	412	SP				T11N/R35W-2		
322379		412	422	CL		brown		T11N/R35W-2		
322379		422	424	GPGC				T11N/R35W-2		
322379		424	430	CL		brown		T11N/R35W-2		
322379		430	435	SHALE	Shale and Sand	white		T11N/R35W-2		
322379		435	445	CL		brown		T11N/R35W-2		
322379		445	460	SHALE	Shale	blue		T11N/R35W-2		
159789	159789	0	3	CL	Top Soil			T11N/R35W-2		
159789		3	70	SP		brown		T11N/R35W-2		
159789		70	105	SX	Sandstone			T11N/R35W-2		
159789		105	160	GPGC				T11N/R35W-2		
159789		160	210	GPGC				T11N/R35W-2		
159789		210	230	GPGC		brown		T11N/R35W-2		
159789		230	260	GPGC				T11N/R35W-2		
159789		260	270	CL		blue		T11N/R35W-2		
159797	159797	0	3	CL	Top Soil			T11N/R35W-2		
159797		3	100	SP		brown		T11N/R35W-2		
159797		100	160	SX	Sandstone	brown		T11N/R35W-2		
159797		160	250	CL-GPGC				T11N/R35W-2		
159797		250	280	GPGC				T11N/R35W-2		
159797		280	315	CL-GPGC		brown		T11N/R35W-2		
159797		315	350	GPGC				T11N/R35W-2		
159797		350	365	SP	Cemented Sand			T11N/R35W-2		
159797		365	375	GPGC				T11N/R35W-2		
159797		375	425	SX	Sandstone	green		T11N/R35W-2		
159797		425	440	SHALE	Shale	blue		T11N/R35W-2		
487534	487534	0	3	SP	Sandy Top Soil			T11N/R35W-2		
487534		3	172	SP		brown		T11N/R35W-2		
487534		172	225	GPGC				T11N/R35W-2		
487534		225	238	SP		brown		T11N/R35W-2		
487534		238	265	CL-G		brown		T11N/R35W-2		
487534		265	300	SP		brown		T11N/R35W-2		
487534		300	306	CL-GPGC		brown		T11N/R35W-2		
487534		306	340	GPGC				T11N/R35W-2		
487534		340	375	SP		brown		T11N/R35W-2		
487534		375	390	SP-G				T11N/R35W-2		
487534		390	395	SHALE	Shale	green	x	T11N/R35W-2		
487534		395	420	GPGC		green		T11N/R35W-2		
487534		420	440	SHALE	Shale	blue		T11N/R35W-2		
353241	353241	0	40	SP		brown		T11N/R35W-2		
353241		40	80	SC				T11N/R35W-2		
353241		80	120	SC-G				T11N/R35W-2		
353241		120	160	CL		brown		T11N/R35W-2		
353241		160	180	CL-S-G				T11N/R35W-2		
353241		180	200	SHALE	Shale, gravel and sand			T11N/R35W-2		
353241		200	220	SHALE	Shale, thin clay layers			T11N/R35W-2		
353241		220	320	CL-GPGC		brown		T11N/R35W-2		
353241		320	360	SHALE	Hard Shale, thin clay layers	blue		T11N/R35W-2		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
353242	353242	0	140	SP		brown		T11N/R35W-2		
353242		140	160	SP-G		brown		T11N/R35W-2		
353242		160	220	SC-G				T11N/R35W-2		
353242		220	300	CL		brown		T11N/R35W-2		
353242		300	380	CL-S-G				T11N/R35W-2		
353242		380	400	CL		gray	x	T11N/R35W-2		
353242		400	415	CL		gray		T11N/R35W-2		
40-3741	40-3741	0	80	SP				T11N/R35W-2		
40-3741		80	100	CL-S				T11N/R35W-2		
40-3741		100	110	CL	Clay and Shale			T11N/R35W-2		
40-3741		110	120	SHALE	Shale			T11N/R35W-2		
40-3741		120	180	GPGC				T11N/R35W-2		
40-3741		180	190	CL		brown		T11N/R35W-2		
40-3741		190	195	GPGC				T11N/R35W-2		
40-3741		195	200	CL-GPGC				T11N/R35W-2		
40-3741		200	210	CL				T11N/R35W-2		
40-3741		210	220	GPGC				T11N/R35W-2		
40-3741		220	230	CL				T11N/R35W-2		
40-3741		230	280	GPGC				T11N/R35W-2		
40-3741		280	290	CL				T11N/R35W-2		
40-3741		290	340	GPGC				T11N/R35W-2		
40-3741		340	360	GPGC	Shale and Gravel, Bedrock			T11N/R35W-2		
106382	106382	0	4	SP	Top Soil Sandy			T11N/R35W-2		
106382		4	26	SP		brown		T11N/R35W-2		
106382		26	40	SC		brown		T11N/R35W-2		
106382		40	48	SC		brown		T11N/R35W-2		
106382		48	97	SC		brown		T11N/R35W-2		
106382		97	122	GC		gray		T11N/R35W-2		
106382		122	124	SP-G				T11N/R35W-2		
106382		124	147	SC-G		brown		T11N/R35W-2		
106382		147	154	GP-S				T11N/R35W-2		
106382		154	160	GC		brown		T11N/R35W-2		
106382		160	181	GC		brown		T11N/R35W-2		
106382		181	206	CL-G		brown		T11N/R35W-2		
106382		206	209	GC				T11N/R35W-2		
106382		209	228	GC		brown		T11N/R35W-2		
106382		228	242	GC-S		brown		T11N/R35W-2		
106382		242	260	CL-G		brown and white		T11N/R35W-2		
106382		260	281	CL-G	Water Wash Rock, Loose			T11N/R35W-2		
106382		281	300	CL		white and gray		T11N/R35W-2		
106382		300	323	SHALE	Consolidated Shale Hard	blue		T11N/R35W-2		
157911	157911	0	3	CL	Top Soil			T11N/R35W-2		
157911		3	140	SP				T11N/R35W-2		
157911		140	165	CL-S		brown		T11N/R35W-2		
157911		165	200	GPGC				T11N/R35W-2		
157911		200	230	CL-S		brown		T11N/R35W-2		
157911		230	265	GPGC				T11N/R35W-2		
157911		265	275	CL-S		brown		T11N/R35W-2		
157911		275	295	GPGC				T11N/R35W-2		
157911		295	305	CL		blue		T11N/R35W-2		
353240	353240	0	20	CL	Clay, Shale	brown		T11N/R35W-2		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
353240		20	40	SHALE	Shale	brown		T11N/R35W-2		
353240		40	180	SHALE	Shale	gray		T11N/R35W-2		
353240		180	220	SHALE	Shale	green		T11N/R35W-2		
353240		220	400	SHALE	Shale, hard streaks	green		T11N/R35W-2		
353240		400	460	SHALE	Shale, broken			T11N/R35W-2		
353240		460	500	SHALE	Shale, broken			T11N/R35W-2		
102928	102928	0	100	SP		brown		T11N/R35W-2		
102928		100	125	CL-GPGC		blue		T11N/R35W-2		
102928		125	130	GPGC		blue		T11N/R35W-2		
102928		130	140	GPGC				T11N/R35W-2		
102928		140	145	CL-GPGC		blue		T11N/R35W-2		
102928		145	150	CL-GPGC		yellow		T11N/R35W-2		
102928		150	160	GPGC				T11N/R35W-2		
102928		160	175	GPGC				T11N/R35W-2		
102928		175	180	CL--S		yellow		T11N/R35W-2		
102928		180	215	GPGC				T11N/R35W-2		
102928		215	220	CL-S		yellow		T11N/R35W-2		
102928		220	250	GPGC		yellow		T11N/R35W-2		
102928		250	260	GPGC				T11N/R35W-2		
102928		260	280	GC-S		white		T11N/R35W-2		
102928		280	295	GP-S		white		T11N/R35W-2		
102928		295	315	CL-S		white		T11N/R35W-2		
102928		315	330	CL-S		blue		T11N/R35W-2		
143717	143717	0	75	SP		brown		T11N/R35W-2		
143717		75	105	CL-S		gray		T11N/R35W-2		
143717		105	115	GC		gray		T11N/R35W-2		
143717		115	180	SHALE	Shale, some clay	brown		T11N/R35W-2		
143717		180	220	SHALE	Fractured Shale, Hard Conglomerate			T11N/R35W-2		
143717		220	233	CL		brown		T11N/R35W-2		
143717		233	250	SHALE	Loose Shale, some Sand	gray		T11N/R35W-2		
143717		250	260	SHALE	Hard Fractured Shale			T11N/R35W-2		
143717		260	270	CL		blue		T11N/R35W-2		
40-3731	40-3731	0	60	SP				T11N/R35W-2		
40-3731		60	76	SP				T11N/R35W-2		
40-3731		76	80	CL				T11N/R35W-2		
40-3731		80	160	SP				T11N/R35W-2		
40-3731		160	200	CL		brown		T11N/R35W-2		
40-3731		200	210	CL		blue		T11N/R35W-2		
40-3746	40-3746	0	55	SP		brown		T11N/R35W-2		
40-3746		55	110	CL-S				T11N/R35W-2		
40-3746		110	250	CL-G				T11N/R35W-2		
40-3746		250	270	GP				T11N/R35W-2		
40-3746		270	273	CL		blue		T11N/R35W-2		
906304	906304	0	120	SP		brown		T11N/R35W-2		
906304		120	125	SP-G				T11N/R35W-2		
906304		125	135	CL		brown		T11N/R35W-2		
906304		135	150	CL-G				T11N/R35W-2		
906304		150	175	GP				T11N/R35W-2		
906304		175	180	CL		brown		T11N/R35W-2		
906304		180	185	GP				T11N/R35W-2		
906304		185	190	CL		brown		T11N/R35W-2		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
906304		190	235	GP				T11N/R35W-2		
906304		235	245	CL		brown		T11N/R35W-2		
906304		245	260	CL		brown		T11N/R35W-2		
906304		260	362	CL-G				T11N/R35W-2		
906304		362	370	CL		blue		T11N/R35W-2		
906303	906303	0	140	SP		brown		T11N/R35W-2		
906303		140	165	CL-GPGC		brown		T11N/R35W-2		
906303		165	330	GPGC		brown		T11N/R35W-2		
906303		330	350	GPGC		white		T11N/R35W-2		
906303		350	375	SP		green	x	T11N/R35W-2		
906303		375	410	SW		white		T11N/R35W-2		
906303		410	420	CL		blue		T11N/R35W-2		
1085530	1085530	0	100	SP				T11N/R35W-2		
1085530		100	160	SC		brown		T11N/R35W-2		
1085530		160	340	CL-G		brown		T11N/R35W-2		
1085530		340	420	GC		gray		T11N/R35W-2		
1085530		420	420	CL		blue		T11N/R35W-2		
1085531	1085531	0	100	SP				T11N/R35W-2		
1085531		100	160	SC		brown		T11N/R35W-2		
1085531		160	340	CL-G		brown		T11N/R35W-2		
1085531		340	420	GC		gray		T11N/R35W-2		
1085531		420	460	CL-G	Increasing Clay			T11N/R35W-2		
1085531		460	480	CL		blue		T11N/R35W-2		
1084099	1084099	0	85	SP		brown		T11N/R35W-2		
1084099		85	110	SP		gray		T11N/R35W-2		
1084099		110	150	SP-G		brown		T11N/R35W-2		
1084099		150	180	CL-G		brown		T11N/R35W-2		
1084099		180	230	GP				T11N/R35W-2		
1084099		230	245	CL		brown		T11N/R35W-2		
1084099		245	265	GP				T11N/R35W-2		
1084099		265	275	CL		gray		T11N/R35W-2		
1084099		275	280	GP				T11N/R35W-2		
1084099		280	305	CL-G				T11N/R35W-2		
1084099		305	330	GP				T11N/R35W-2		
1084099		330	350	SP		blue	x	T11N/R35W-2		
1084099		350	355	CL		blue		T11N/R35W-2		
1084099		355	417	SP		blue	x	T11N/R35W-2		
1084099		417	418	CL	Rock	black		T11N/R35W-2		
1084099		418	440	CL		gray and blue		T11N/R35W-2		
1084100	1084100	0	120	SP		brown		T11N/R35W-2		
1084100		120	180	CL-G		brown		T11N/R35W-2		
1084100		180	195	CL		brown		T11N/R35W-2		
1084100		195	220	CL-G				T11N/R35W-2		
1084100		220	255	GP				T11N/R35W-2		
1084100		255	280	CL-G		brown		T11N/R35W-2		
1084100		280	345	GP				T11N/R35W-2		
1084100		345	355	CL-G		blue		T11N/R35W-2		
1084100		355	425	CL		blue	x	T11N/R35W-2		
1084100		425	430	CL-G	Clay, Seashells, and Rock	blue and black	x	T11N/R35W-2		
1084100		430	440	CL		blue and gray		T11N/R35W-2		
E053145	E053145	0	65	SP-G		brown		T11N/R35W-2		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
E053145		65	72	CL-G		gray		T11N/R35W-2		
E053145		72	143	CL-G		brown		T11N/R35W-2		
E053145		143	173	SP-G				T11N/R35W-2		
E053145		173	190	CL-G		brown		T11N/R35W-2		
E053145		190	198	SP		brown		T11N/R35W-2		
E053145		198	230	CL-G		brown		T11N/R35W-2		
E053145		230	260	CL		brown		T11N/R35W-2		
E053145		260	337	SC-G				T11N/R35W-2		
E053145		337	418	CL-S		blue and gray	x	T11N/R35W-2		
E053145		418	425	SP	Cemented Sand	blue		T11N/R35W-2		
E053145		425	430	ML-S		blue	x	T11N/R35W-2		
E053145		430	432	SP	Cemented Sand	blue		T11N/R35W-2		
E053145		432	490	SM		blue	x	T11N/R35W-2		
E053158	E053158	0	72	SP		brown		T11N/R35W-2		
E053158		72	76	SP-G				T11N/R35W-2		
E053158		76	82	SP		brown		T11N/R35W-2		
E053158		82	130	CL-S-G		brown		T11N/R35W-2		
E053158		130	135	SP-G				T11N/R35W-2		
E053158		135	140	CL		brown		T11N/R35W-2		
E053158		140	175	SP-G				T11N/R35W-2		
E053158		175	182	CL		brown		T11N/R35W-2		
E053158		182	300	SC-G				T11N/R35W-2		
E053158		300	315	CL-S		brown		T11N/R35W-2		
E053158		315	325	SP-G				T11N/R35W-2		
E053158		325	360	SC		brown	X	T11N/R35W-2		
E053158		360	415	CL-S		blue and green	X	T11N/R35W-2		
E053158		415	419	SP	Cemented Sands		X	T11N/R35W-2		
E053158		419	435	CLML		green		T11N/R35W-2		
E053158		435	445	SP	Cemented Sands			T11N/R35W-2		
E053158		445	460	CLML		green		T11N/R35W-2		
E053158		460	510	SP	Cemented Sands			T11N/R35W-2		
1097969	1097969	0	60	SP		brown		T11N/R35W-2		
1097969		60	135	GP-S		brown		T11N/R35W-2		
1097969		135	160	CL		brown		T11N/R35W-2		
1097969		160	350	SP		brown		T11N/R35W-2		
1097969		350	410	CL		brown		T11N/R35W-2		
1097969		410	448	SP		blue	x	T11N/R35W-2		
1097969		448	460	SC		blue		T11N/R35W-2		
E041047	E041047	0	3	SP	Sandy Top Soil			T11N/R35W-3	**T11N/R35W-3**	
E041047		3	190	SP		brown		T11N/R35W-3		
E041047		190	210	SP-G				T11N/R35W-3		
E041047		210	282	CL-G		brown		T11N/R35W-3		
E041047		282	295	SP-G				T11N/R35W-3		
E041047		295	350	CL-G				T11N/R35W-3		
E041047		350	370	SP		brown		T11N/R35W-3		
E041047		370	400	CL-S-G		brown		T11N/R35W-3		
E041047		400	415	SP	Cemented Sand			T11N/R35W-3		
E041047		415	428	SP		brown		T11N/R35W-3		
E041047		428	435	SP	Cemented Sand			T11N/R35W-3		
E041047		435	445	CL		blue		T11N/R35W-3		
E041047		445	460	CL	Oily Clay	black		T11N/R35W-3		
E041047		460	465	SP-G				T11N/R35W-3		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
E041047		465	475	CL		gray		T11N/R35W-3		
E041047		475	490	SP-G	Cemented Sand and Gravel			T11N/R35W-3		
E041047		490	600	CL		gray		T11N/R35W-3		
1084195	1084195	0	7	SP				T11N/R35W-3		
1084195		7	116	SCSM		yellow		T11N/R35W-3		
1084195		116	182	CLML-S		yellow		T11N/R35W-3		
1084195		182	191	CL-S		brown		T11N/R35W-3		
1084195		191	216	GP	Gravel, colored			T11N/R35W-3		
1084195		216	230	CL-G		brown		T11N/R35W-3		
1084195		230	261	CL		brown		T11N/R35W-3		
1084195		261	269	CL-S		beige		T11N/R35W-3		
1084195		269	283	GP				T11N/R35W-3		
1084195		283	300	CL-G	White Clay, Colored Gravel	white		T11N/R35W-3		
1084195		300	322	CL-S-G		green		T11N/R35W-3		
1084195		322	374	GC		green		T11N/R35W-3		
1084195		374	403	ML-S		green		T11N/R35W-3		
1084196	1084196	0	2	SP				T11N/R35W-3		
1084196		2	41	ML-S				T11N/R35W-3		
1084196		41	83	SCSM				T11N/R35W-3		
1084196		83	183	SM				T11N/R35W-3		
1084196		183	207	GP				T11N/R35W-3		
1084196		207	251	CL-S-G		brown		T11N/R35W-3		
1084196		251	263	CL-S		red and brown		T11N/R35W-3		
1084196		263	276	GP		green		T11N/R35W-3		
1084196		276	309	CL-S-G		biege		T11N/R35W-3		
1084196		309	381	GC		green		T11N/R35W-3		
1084196		381	479	SCSM				T11N/R35W-3		
1084196		479	505	GP-S	Gravel - round and Sand			T11N/R35W-3		
1084197	1084197	0	5	CLML				T11N/R35W-3		
1084197		5	16	SP		biege		T11N/R35W-3		
1084197		16	63	SCSM		beige		T11N/R35W-3		
1084197		63	81	SW				T11N/R35W-3		
1084197		81	96	CL-S		tan		T11N/R35W-3		
1084197		96	116	CLML-WS		orange and tan		T11N/R35W-3		
1084197		116	150	CL-S		orange and biege		T11N/R35W-3		
1084197		150	159	SCSM		biege and green		T11N/R35W-3		
1084197		159	188	CL-G	Clay and Gravel - Shale	brown		T11N/R35W-3		
1084197		188	206	CL	Clay - Shale	red and brown		T11N/R35W-3		
1084197		206	221	CL-G		brown		T11N/R35W-3		
1084197		221	236	CLML-S		brown		T11N/R35W-3		
1084197		236	246	SHALE	Shale	white and rust		T11N/R35W-3		
1084197		246	277	CL	Clay and Shale	white		T11N/R35W-3		
1084197		277	296	CLML-WS		brown		T11N/R35W-3		
1084197		296	366	CLML-S		green		T11N/R35W-3		
1084197		366	400	GP	Gravel - Colored			T11N/R35W-3		
1084197		400	405	CL		blue		T11N/R35W-3		
1084198	1084198	0	3	SP				T11N/R35W-3		
1084198		3	74	SCSM		biege		T11N/R35W-3		
1084198		74	139	SC				T11N/R35W-3		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
1084198		139	181	CL-S	Sandy Clay and Shale stringers			T11N/R35W-3		
1084198		181	241	CL-S-G		brown		T11N/R35W-3		
1084198		241	305	SHALE	Shale and clay stringers (sandy)			T11N/R35W-3		
1084198		305	423	CLML-S		green		T11N/R35W-3		
1090756	1090756	0	200	SP				T11N/R35W-3		
1090756		200	220	GP				T11N/R35W-3		
1090756		220	240	GC				T11N/R35W-3		
1090756		240	270	CL				T11N/R35W-3		
1090756		270	380	GC				T11N/R35W-3		
1090756		380	400	CL				T11N/R35W-3		
1090756		400	475	GP				T11N/R35W-3		
1090756		475	480	CL				T11N/R35W-3		
153026	153026	0	50	SP		red		T11N/R35W-3		
153026		50	70	SP		brown		T11N/R35W-3		
153026		70	200	SC		brown		T11N/R35W-3		
153026		200	215	SP		white		T11N/R35W-3		
153026		215	250	SP-G		brown		T11N/R35W-3		
153026		250	300	SW-G				T11N/R35W-3		
153026		300	350	SC-G		brown		T11N/R35W-3		
153026		350	435	GC-S		brown		T11N/R35W-3		
153026		435	450	CL		blue		T11N/R35W-3		
539799	539799	0	90	SP		white		T11N/R35W-3		
539799		90	120	SP		brown		T11N/R35W-3		
539799		120	185	SP-G				T11N/R35W-3		
539799		185	200	CL-S		white		T11N/R35W-3		
539799		200	240	SP		white		T11N/R35W-3		
539799		240	310	SP-G				T11N/R35W-3		
539799		310	320	CL-S		brown		T11N/R35W-3		
539799		320	365	SP-G				T11N/R35W-3		
539799		365	420	CL-S		blue		T11N/R35W-3		
576082	576082	0	280	SP		brown		T11N/R35W-3		
576082		280	287	SP		gray		T11N/R35W-3		
576082		287	304	SP		brown		T11N/R35W-3		
576082		304	310	CL-S		brown		T11N/R35W-3		
576082		310	322	SP		brown		T11N/R35W-3		
576082		322	330	GPGC				T11N/R35W-3		
576082		330	342	CL-GPGC		brown		T11N/R35W-3		
576082		342	397	GPGC				T11N/R35W-3		
576082		397	408	CL-S		brown		T11N/R35W-3		
576082		408	411	GPGC				T11N/R35W-3		
576082		411	416	CL-G		brown		T11N/R35W-3		
576082		416	421	CL-S		brown		T11N/R35W-3		
576082		421	430	GPGC				T11N/R35W-3		
576082		430	433	CL-S		brown		T11N/R35W-3		
576082		433	437	GPGC				T11N/R35W-3		
576082		437	452	CL-G		brown		T11N/R35W-3		
576082		452	455	CL		brown		T11N/R35W-3		
576082		455	473	GPGC				T11N/R35W-3		
576082		473	478	CL-G		brown		T11N/R35W-3		
576082		478	508	GPGC				T11N/R35W-3		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
576082		508	514	CL		brown		T11N/R35W-3		
576082		514	520	GPGC				T11N/R35W-3		
576083	576083	0	295	SP		brown		T11N/R35W-3		
576083		295	302	SP		gray		T11N/R35W-3		
576083		302	308	SP-GPGC		brown		T11N/R35W-3		
576083		308	310	CL-G		brown		T11N/R35W-3		
576083		310	318	GPGC		brown		T11N/R35W-3		
576083		318	335	CL-G		brown		T11N/R35W-3		
576083		335	340	SP-G				T11N/R35W-3		
576083		340	354	GPGC				T11N/R35W-3		
576083		354	357	CL		brown		T11N/R35W-3		
576083		357	368	GPGC				T11N/R35W-3		
576083		368	390	CL-S		brown		T11N/R35W-3		
576083		390	398	GPGC				T11N/R35W-3		
576083		398	408	CL-S		brown		T11N/R35W-3		
576083		408	428	GPGC				T11N/R35W-3		
576083		428	434	CL-S		brown		T11N/R35W-3		
576083		434	468	SP-G				T11N/R35W-3		
576083		468	476	CL-S		brown		T11N/R35W-3		
576083		476	520	GPGC				T11N/R35W-3		
441264	441264	0	281	SP		brown		T11N/R35W-3		
441264		281	285	SP		gray		T11N/R35W-3		
441264		285	288	CL-S		brown		T11N/R35W-3		
441264		288	328	SP		brown		T11N/R35W-3		
441264		328	330	GPGC				T11N/R35W-3		
441264		330	334	CL		brown		T11N/R35W-3		
441264		334	340	GPGC				T11N/R35W-3		
441264		340	352	CL		brown		T11N/R35W-3		
441264		352	372	GPGC				T11N/R35W-3		
441264		372	375	CL-S		brown		T11N/R35W-3		
441264		375	391	GPGC				T11N/R35W-3		
441264		391	396	CL		brown		T11N/R35W-3		
441264		396	408	GPGC				T11N/R35W-3		
441264		408	410	SP		brown		T11N/R35W-3		
441264		410	415	GPGC				T11N/R35W-3		
441264		415	427	CL		brown		T11N/R35W-3		
441264		427	435	GPGC				T11N/R35W-3		
441264		435	440	CL		brown		T11N/R35W-3		
441264		440	446	GPGC				T11N/R35W-3		
441264		446	463	CL		brown		T11N/R35W-3		
441264		463	485	GPGC				T11N/R35W-3		
441264		485	513	GPGC				T11N/R35W-3		
441264		513	516	SP-G				T11N/R35W-3		
441264		516	538	CL-S		green		T11N/R35W-3		
441264		538	553	GPGC				T11N/R35W-3		
441264		553	558	CL-S		green		T11N/R35W-3		
441264		558	573	GPGC				T11N/R35W-3		
441264		573	580	CL-S		green		T11N/R35W-3		
441286	441286	0	319	SP		brown		T11N/R35W-3		
441286		319	327	CL		brown		T11N/R35W-3		
441286		327	350	CL-G		brown		T11N/R35W-3		
441286		350	437	GPGC				T11N/R35W-3		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
441286		437	442	CL		brown		T11N/R35W-3		
441286		442	445	GPGC				T11N/R35W-3		
441286		445	462	CL		gray		T11N/R35W-3		
441286		462	489	GP-S				T11N/R35W-3		
441286		489	494	CL		gray		T11N/R35W-3		
441286		494	522	SP-G				T11N/R35W-3		
441286		522	528	CL		gray		T11N/R35W-3		
441286		528	580	SP				T11N/R35W-3		
441285	441285	0	275	SP		brown		T11N/R35W-3		
441285		275	290	CL-G		brown		T11N/R35W-3		
441285		290	315	GPGC				T11N/R35W-3		
441285		315	335	CL-G		brown		T11N/R35W-3		
441285		335	350	GPGC				T11N/R35W-3		
441285		350	360	CL		brown		T11N/R35W-3		
441285		360	364	GPGC				T11N/R35W-3		
441285		364	386	CL-G		brown		T11N/R35W-3		
441285		386	392	GPGC				T11N/R35W-3		
441285		392	397	CL-G		brown		T11N/R35W-3		
441285		397	410	GPGC				T11N/R35W-3		
441285		410	414	CL		brown		T11N/R35W-3		
441285		414	424	GPGC				T11N/R35W-3		
441285		424	450	CL-G		brown		T11N/R35W-3		
441285		450	458	GPGC				T11N/R35W-3		
441285		458	463	CL		brown		T11N/R35W-3		
441285		463	473	GPGC				T11N/R35W-3		
441285		473	482	CL-G		brown		T11N/R35W-3		
441285		482	488	GPGC				T11N/R35W-3		
441285		488	492	CL-G		brown		T11N/R35W-3		
441285		492	497	GPGC				T11N/R35W-3		
441285		497	502	CL-G		brown		T11N/R35W-3		
441285		502	514	GPGC				T11N/R35W-3		
441285		514	520	CL-G		brown		T11N/R35W-3		
441284	441284	0	253	SP		brown		T11N/R35W-3		
441284		253	262	CL-G		brown		T11N/R35W-3		
441284		262	275	SP		brown		T11N/R35W-3		
441284		275	277	GPGC				T11N/R35W-3		
441284		277	335	CL-GPGC		brown		T11N/R35W-3		
441284		335	362	GPGC				T11N/R35W-3		
441284		362	372	CL		brown		T11N/R35W-3		
441284		372	378	GPGC				T11N/R35W-3		
441284		378	382	CL		brown		T11N/R35W-3		
441284		382	395	GPGC				T11N/R35W-3		
441284		395	405	CL		brown		T11N/R35W-3		
441284		405	409	GPGC				T11N/R35W-3		
441284		409	425	CL		brown		T11N/R35W-3		
441284		425	435	GPGC				T11N/R35W-3		
441284		435	441	CL		brown		T11N/R35W-3		
441284		441	450	GPGC				T11N/R35W-3		
441284		450	454	CL		brown		T11N/R35W-3		
441284		454	462	GPGC				T11N/R35W-3		
441284		462	475	CL-G		brown		T11N/R35W-3		
441284		475	483	CL		brown		T11N/R35W-3		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
441284		483	512	GPGC				T11N/R35W-3		
441284		512	520	CL		brown		T11N/R35W-3		
441280	441280	0	273	SP		brown		T11N/R35W-3		
441280		273	306	GPGC				T11N/R35W-3		
441280		306	315	CL		brown		T11N/R35W-3		
441280		315	336	GPGC				T11N/R35W-3		
441280		336	339	CL-G		brown		T11N/R35W-3		
441280		339	352	CL		gray		T11N/R35W-3		
441280		352	402	GPGC				T11N/R35W-3		
441280		402	408	CL		brown		T11N/R35W-3		
441280		408	412	GPGC				T11N/R35W-3		
441280		412	420	CL		brown		T11N/R35W-3		
441280		420	438	GPGC				T11N/R35W-3		
441280		438	450	CL-G	Rocky Clay			T11N/R35W-3		
441280		450	486	GPGC				T11N/R35W-3		
441280		486	493	CL		brown		T11N/R35W-3		
441280		493	520	GPGC				T11N/R35W-3		
441315	441315	0	263	SP		brown		T11N/R35W-3		
441315		263	270	CL-GPGC				T11N/R35W-3		
441315		270	318	SP-GPGC				T11N/R35W-3		
441315		318	324	CL		brown		T11N/R35W-3		
441315		324	332	GPGC				T11N/R35W-3		
441315		332	350	CL		brown		T11N/R35W-3		
441315		350	362	SP-G				T11N/R35W-3		
441315		362	410	GPGC				T11N/R35W-3		
441315		410	415	CL		brown		T11N/R35W-3		
441315		415	428	GPGC				T11N/R35W-3		
441315		428	434	CL		brown		T11N/R35W-3		
441315		434	442	GPGC				T11N/R35W-3		
441315		442	448	CL		white		T11N/R35W-3		
441315		448	520	GPGC				T11N/R35W-3		
441314	441314	0	256	SP		brown		T11N/R35W-3		
441314		256	264	CL		brown		T11N/R35W-3		
441314		264	277	SP-G				T11N/R35W-3		
441314		277	282	CL		brown		T11N/R35W-3		
441314		282	319	SP-G				T11N/R35W-3		
441314		319	322	CL		brown		T11N/R35W-3		
441314		322	333	SP-G				T11N/R35W-3		
441314		333	352	CL		brown		T11N/R35W-3		
441314		352	364	SP-G				T11N/R35W-3		
441314		364	370	CL		brown		T11N/R35W-3		
441314		370	392	SP-G				T11N/R35W-3		
441314		392	404	CL		gray		T11N/R35W-3		
441314		404	428	SP-G				T11N/R35W-3		
441314		428	447	CL		gray		T11N/R35W-3		
441314		447	468	SP-G				T11N/R35W-3		
441314		468	474	CL		gray		T11N/R35W-3		
441314		474	520	SP		brown		T11N/R35W-3		
441281	441281	0	250	SP		brown		T11N/R35W-3		
441281		250	263	CL		brown		T11N/R35W-3		
441281		263	275	GPGC				T11N/R35W-3		
441281		275	280	CL-G		brown		T11N/R35W-3		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
441281		280	322	GPGC				T11N/R35W-3		
441281		322	338	CL-S		brown		T11N/R35W-3		
441281		338	345	GPGC				T11N/R35W-3		
441281		345	355	CL-G		brown		T11N/R35W-3		
441281		355	375	CL		brown		T11N/R35W-3		
441281		375	386	GPGC				T11N/R35W-3		
441281		386	390	CL		brown		T11N/R35W-3		
441281		390	393	SP-G				T11N/R35W-3		
441281		393	400	CL		brown		T11N/R35W-3		
441281		400	405	GPGC				T11N/R35W-3		
441281		405	415	SP		brown		T11N/R35W-3		
441281		415	423	GPGC				T11N/R35W-3		
441281		423	438	CL-S		brown		T11N/R35W-3		
441281		438	445	SP-GPGC				T11N/R35W-3		
441281		445	457	CL		brown		T11N/R35W-3		
441281		457	465	GPGC				T11N/R35W-3		
441281		465	479	CL		brown		T11N/R35W-3		
441281		479	490	GPGC				T11N/R35W-3		
441281		490	494	CL		brown		T11N/R35W-3		
441281		494	520	GPGC				T11N/R35W-3		
441292	441292	0	274	SP		brown		T11N/R35W-3		
441292		274	278	CL-S		gray		T11N/R35W-3		
441292		278	307	SP		brown		T11N/R35W-3		
441292		307	328	CL-G		brown		T11N/R35W-3		
441292		328	329	GPGC				T11N/R35W-3		
441292		329	342	GC		brown		T11N/R35W-3		
441292		342	348	CL		brown		T11N/R35W-3		
441292		348	360	SP-GPGC				T11N/R35W-3		
441292		360	368	CL-S		brown		T11N/R35W-3		
441292		368	377	SP-G				T11N/R35W-3		
441292		377	392	CL		brown		T11N/R35W-3		
441292		392	409	SP-GPGC				T11N/R35W-3		
441292		409	413	CL		brown		T11N/R35W-3		
441292		413	416	GPGC				T11N/R35W-3		
441292		416	437	CL		brown		T11N/R35W-3		
441292		437	461	GPGC				T11N/R35W-3		
441292		461	472	CL-S		brown		T11N/R35W-3		
441292		472	488	CL-G				T11N/R35W-3		
441292		488	493	CL-S		brown		T11N/R35W-3		
441292		493	498	GPGC				T11N/R35W-3		
441292		498	500	CL-S		brown		T11N/R35W-3		
441292		500	520	GPGC				T11N/R35W-3		
441313	441313	0	3	SP	Sandy Top Soil			T11N/R35W-3		
441313		3	295	SP		brown		T11N/R35W-3		
441313		295	330	GPGC		brown		T11N/R35W-3		
441313		330	336	SP-G				T11N/R35W-3		
441313		336	340	CL-S		brown		T11N/R35W-3		
441313		340	362	SP-GPGC				T11N/R35W-3		
441313		362	374	CL-S-G		brown		T11N/R35W-3		
441313		374	396	SP-G				T11N/R35W-3		
441313		396	406	CL-S		brown		T11N/R35W-3		
441313		406	417	GP-S				T11N/R35W-3		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
441313		417	419	CL-S		brown		T11N/R35W-3		
441313		419	428	SP-G				T11N/R35W-3		
441313		428	432	CL-S		brown		T11N/R35W-3		
441313		432	435	SP-G				T11N/R35W-3		
441313		435	442	CL-S-G		brown		T11N/R35W-3		
441313		442	486	SP-GPGC				T11N/R35W-3		
441313		486	490	CL				T11N/R35W-3		
441313		490	500	SP-GPGC				T11N/R35W-3		
441293	441293	0	315	SP		brown		T11N/R35W-3		
441293		315	320	GPGC				T11N/R35W-3		
441293		320	354	CL-S-G		brown		T11N/R35W-3		
441293		354	374	GPGC				T11N/R35W-3		
441293		374	377	CL-S		brown		T11N/R35W-3		
441293		377	381	GPGC				T11N/R35W-3		
441293		381	387	CL-G		brown		T11N/R35W-3		
441293		387	402	CL-G		brown		T11N/R35W-3		
441293		402	418	CL-G		brown		T11N/R35W-3		
441293		418	451	GPGC				T11N/R35W-3		
441293		451	460	CL		brown		T11N/R35W-3		
441293		460	486	GPGC				T11N/R35W-3		
441293		486	496	CL-S		brown		T11N/R35W-3		
441293		496	498	SP-GPGC				T11N/R35W-3		
441293		498	503	CL		brown		T11N/R35W-3		
441293		503	516	GPGC				T11N/R35W-3		
441293		516	520	CL		brown		T11N/R35W-3		
441294	441294	0	234	SP		brown		T11N/R35W-3		
441294		234	242	CL-G				T11N/R35W-3		
441294		242	266	SP-G				T11N/R35W-3		
441294		266	284	CL		brown		T11N/R35W-3		
441294		284	307	SP-G				T11N/R35W-3		
441294		307	321	CL		brown		T11N/R35W-3		
441294		321	326	SP-G				T11N/R35W-3		
441294		326	332	CL		brown		T11N/R35W-3		
441294		332	378	SP-G				T11N/R35W-3		
441294		378	396	CL		gray		T11N/R35W-3		
441294		396	428	SP-G				T11N/R35W-3		
441294		428	446	CL		gray		T11N/R35W-3		
441294		446	453	SP-G				T11N/R35W-3		
441294		453	460	CL		gray		T11N/R35W-3		
441294		460	509	SP		brown		T11N/R35W-3		
441294		509	512	CL		gray		T11N/R35W-3		
441294		512	520	CL-S		blue		T11N/R35W-3		
441282	441282	0	238	SP		brown		T11N/R35W-3		
441282		238	255	CL		brown		T11N/R35W-3		
441282		255	293	SP-G				T11N/R35W-3		
441282		293	296	CL		brown		T11N/R35W-3		
441282		296	307	SP-G				T11N/R35W-3		
441282		307	312	CL		brown		T11N/R35W-3		
441282		312	318	SP-G				T11N/R35W-3		
441282		318	354	CL		brown		T11N/R35W-3		
441282		354	386	SP-G				T11N/R35W-3		
441282		386	394	CL		brown		T11N/R35W-3		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
441282		394	399	SP-G				T11N/R35W-3		
441282		399	411	CL		brown		T11N/R35W-3		
441282		411	446	SP-G				T11N/R35W-3		
441282		446	458	CL		gray		T11N/R35W-3		
441282		458	518	SP		brown		T11N/R35W-3		
441282		518	520	CL-S		blue		T11N/R35W-3		
441283	441283	0	232	SP		brown		T11N/R35W-3		
441283		232	261	SP-G				T11N/R35W-3		
441283		261	265	SP		brown		T11N/R35W-3		
441283		265	285	SP-G				T11N/R35W-3		
441283		285	287	SP		brown		T11N/R35W-3		
441283		287	294	SP-G				T11N/R35W-3		
441283		294	300	SP		brown		T11N/R35W-3		
441283		300	317	SP-G				T11N/R35W-3		
441283		317	336	SP		brown		T11N/R35W-3		
441283		336	348	SP-G				T11N/R35W-3		
441283		348	354	SP		brown		T11N/R35W-3		
441283		354	387	SP-G				T11N/R35W-3		
441283		387	394	SP		brown		T11N/R35W-3		
441283		394	400	SP-G				T11N/R35W-3		
441283		400	412	CL		gray		T11N/R35W-3		
441283		412	445	SP-G				T11N/R35W-3		
441283		445	456	CL		gray		T11N/R35W-3		
441283		456	519	SP		brown		T11N/R35W-3		
441283		519	520	CL-S		blue		T11N/R35W-3		
276929	276929	0	31	SP		red		T11N/R35W-3		
276929		31	127	SP		red		T11N/R35W-3		
276929		127	140	SPSC		red and brown		T11N/R35W-3		
276929		140	159	SP		red		T11N/R35W-3		
276929		159	191	SC		brown and red		T11N/R35W-3		
276929		191	222	SP-G		brown and red		T11N/R35W-3		
276929		222	254	SP-G				T11N/R35W-3		
276929		254	285	SC-G		brown		T11N/R35W-3		
276929		285	317	CL-S-G		brown		T11N/R35W-3		
276929		317	380	SC-G		brown		T11N/R35W-3		
276929		380	411	SC-G		blue		T11N/R35W-3		
276929		411	443	CL-S		blue and brown		T11N/R35W-3		
276929		443	474	CL-G		blue and brown		T11N/R35W-3		
276929		474	506	CL-G		blue and tan		T11N/R35W-3		
276929		506	537	CL-G		gray and blue		T11N/R35W-3		
276929		537	569	CL		gray		T11N/R35W-3		
256003	256003	0	15	SP		brown		T11N/R35W-3		
256003		15	63	SW		brown		T11N/R35W-3		
256003		63	94	SP		brown		T11N/R35W-3		
256003		94	190	SC		brown		T11N/R35W-3		
256003		190	221	GP-S		brown		T11N/R35W-3		
256003		221	409	GC-S		brown		T11N/R35W-3		
256003		409	536	CL-S-G		brown		T11N/R35W-3		
256003		536	567	SC		white		T11N/R35W-3		
256003		567	600	CL		blue		T11N/R35W-3		
727307	727307	0	130	SP		brown		T11N/R35W-3		
727307		130	150	CL-S	Sandy Clay and Shale	gray		T11N/R35W-3		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
727307		150	160	CL-G		brown		T11N/R35W-3		
727307		160	175	GPGC				T11N/R35W-3		
727307		175	190	CL-GPGC	Clay, Streaks of Shale	brown		T11N/R35W-3		
727307		190	250	GPGC	Shale/Gravel - streak Clay			T11N/R35W-3		
727307		250	290	CL	Clay and Shale	brown		T11N/R35W-3		
727307		290	310	CL		brown		T11N/R35W-3		
727307		310	330	SP	Firm Sand, little Shale	white		T11N/R35W-3		
727307		330	350	CL-S	Sandy Clay and Shale	green		T11N/R35W-3		
727307		350	375	SP	Fine Sand and Shale	white		T11N/R35W-3		
727307		375	430	SP	Sand and Shale	green		T11N/R35W-3		
727307		430	431	CL		blue		T11N/R35W-3		
580630	580630	0	91	SP		brown		T11N/R35W-4	**T11N/R35W-4**	
580630		91	94	CL		brown		T11N/R35W-4		
580630		94	192	SP		brown		T11N/R35W-4		
580630		192	194	CL		brown		T11N/R35W-4		
580630		194	227	SP-G				T11N/R35W-4		
580630		227	265	SP		brown		T11N/R35W-4		
580630		265	272	CL		brown		T11N/R35W-4		
580630		272	280	SP		brown		T11N/R35W-4		
580630		280	284	CL		brown		T11N/R35W-4		
580630		284	302	SP		brown		T11N/R35W-4		
580630		302	370	SP-G				T11N/R35W-4		
580630		370	373	CL		blue		T11N/R35W-4		
580630		373	396	SP-G		blue		T11N/R35W-4		
580630		396	399	CL		blue		T11N/R35W-4		
580630		399	408	SP-G		blue		T11N/R35W-4		
580630		408	410	CL		blue		T11N/R35W-4		
580630		410	443	SP		blue		T11N/R35W-4		
580630		443	447	SX	Sandstone			T11N/R35W-4		
580630		447	458	SP		blue	x	T11N/R35W-4		
580630		458	480	CL		blue		T11N/R35W-4		
580629	580629	0	174	SP		brown		T11N/R35W-4		
580629		174	218	SP-G				T11N/R35W-4		
580629		218	226	CL		brown		T11N/R35W-4		
580629		226	272	SP-G				T11N/R35W-4		
580629		272	316	SP-G				T11N/R35W-4		
580629		316	331	CL-S		gray		T11N/R35W-4		
580629		331	339	SP				T11N/R35W-4		
580629		339	357	CL		gray		T11N/R35W-4		
580629		357	373	SP-G				T11N/R35W-4		
580629		373	380	CL		blue		T11N/R35W-4		
580629		380	387	SP-G				T11N/R35W-4		
580629		387	392	CL		blue		T11N/R35W-4		
580629		392	397	SP-G				T11N/R35W-4		
580629		397	400	CL		blue		T11N/R35W-4		
580629		400	408	SP-G				T11N/R35W-4		
580629		408	411	CL		blue		T11N/R35W-4		
580629		411	416	SP-G				T11N/R35W-4		
580629		416	422	CL		blue		T11N/R35W-4		
580629		422	468	SP		blue		T11N/R35W-4		
580629		468	480	CL		blue	x	T11N/R35W-4		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
576117	576117	0	116	SP		brown		T11N/R35W-4		
576117		116	120	CL-S		gray		T11N/R35W-4		
576117		120	124	CL-G				T11N/R35W-4		
576117		124	131	CL		brown		T11N/R35W-4		
576117		131	140	SP-G				T11N/R35W-4		
576117		140	147	CL		brown		T11N/R35W-4		
576117		147	160	SP-G				T11N/R35W-4		
576117		160	177	SP		brown		T11N/R35W-4		
576117		177	207	CL		blue		T11N/R35W-4		
576117		207	238	SP-G				T11N/R35W-4		
576117		238	242	CL		brown		T11N/R35W-4		
576117		242	246	SP-G				T11N/R35W-4		
576117		246	253	CL		brown		T11N/R35W-4		
576117		253	277	SP-G				T11N/R35W-4		
576117		277	291	CL		brown		T11N/R35W-4		
576117		291	344	SP				T11N/R35W-4		
576117		344	360	CL		brown		T11N/R35W-4		
576117		360	424	SP-G				T11N/R35W-4		
576117		424	438	CL		blue		T11N/R35W-4		
576117		438	463	SP-G				T11N/R35W-4		
576117		463	471	CL		blue		T11N/R35W-4		
576117		471	518	SP		blue		T11N/R35W-4		
576117		518	530	CL		blue		T11N/R35W-4		
1090783	1090783	0	160	SP				T11N/R35W-4		
1090783		160	180	GC				T11N/R35W-4		
1090783		180	230	SP-G				T11N/R35W-4		
1090783		230	260	CL				T11N/R35W-4		
1085599	1085599	0	80	SP				T11N/R35W-4		
1085599		80	160	SC				T11N/R35W-4		
1085599		160	200	CL-S				T11N/R35W-4		
1085599		200	220	CL				T11N/R35W-4		
1085599		220	280	SC				T11N/R35W-4		
1085599		280	320	CL-G				T11N/R35W-4		
1085599		320	340	GP				T11N/R35W-4		
1085599		340	380	CL-G				T11N/R35W-4		
1085599		380	400	GC				T11N/R35W-4		
1085600	1085600	0	80	SP				T11N/R35W-4		
1085600		80	160	SC				T11N/R35W-4		
1085600		160	200	CL-S				T11N/R35W-4		
1085600		200	220	CL				T11N/R35W-4		
1085600		220	280	SC				T11N/R35W-4		
1085600		280	320	CL-G				T11N/R35W-4		
1085600		320	340	GP				T11N/R35W-4		
1085600		340	380	CL-G				T11N/R35W-4		
1085600		380	400	GC				T11N/R35W-4		
491800	491800	0	3	SP	Sandy Top Soil			T11N/R35W-4		
491800		3	250	SP		brown		T11N/R35W-4		
491800		250	258	SP-G		brown		T11N/R35W-4		
491800		258	305	SP		brown		T11N/R35W-4		
491800		305	326	SP-G				T11N/R35W-4		
491800		326	341	SP		brown		T11N/R35W-4		
491800		341	345	SP-G				T11N/R35W-4		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
491800		345	380	CL-S		brown		T11N/R35W-4		
491800		380	415	SP-G				T11N/R35W-4		
491800		415	440	CL-G		brown		T11N/R35W-4		
491800		440	452	SP-G				T11N/R35W-4		
491800		452	475	CL-S-G		green		T11N/R35W-4		
491800		475	495	SP-G				T11N/R35W-4		
491800		495	505	CL-S		green		T11N/R35W-4		
491800		505	510	SP-G				T11N/R35W-4		
491800		510	520	CL-S		green		T11N/R35W-4		
139094	139094	0	195	SW		brown		T11N/R35W-4		
139094		195	245	GC-S				T11N/R35W-4		
139094		245	280	CL-G				T11N/R35W-4		
139094		280	305	SC				T11N/R35W-4		
139094		305	360	CL-G				T11N/R35W-4		
139094		360	385	SC				T11N/R35W-4		
139094		385	410	GP				T11N/R35W-4		
139094		410	430	GW				T11N/R35W-4		
139094		430	438	CL				T11N/R35W-4		
182202	182202	0	3	CL	Top Soil			T11N/R35W-4		
182202		3	120	SP		brown		T11N/R35W-4		
182202		120	200	GPGC				T11N/R35W-4		
182202		200	250	SP		brown		T11N/R35W-4		
182202		250	260	CL		brown		T11N/R35W-4		
100999	100999	0	180	SC		brown		T11N/R35W-4		
100999		180	290	GPGC				T11N/R35W-4		
100999		290	300	CL				T11N/R35W-4		
100999		300	310	GPGC				T11N/R35W-4		
100999		310	315	CL				T11N/R35W-4		
100999		315	320	GPGC				T11N/R35W-4		
100999		320	335	CL				T11N/R35W-4		
100999		335	345	GPGC				T11N/R35W-4		
100999		345	365	CL-GPGC				T11N/R35W-4		
100999		365	380	CL				T11N/R35W-4		
100999		380	390	GPGC				T11N/R35W-4		
100999		390	400	SP				T11N/R35W-4		
100999		400	410	GPGC				T11N/R35W-4		
100999		410	430	SP		white		T11N/R35W-4		
100999		430	435	CL-S				T11N/R35W-4		
100999		435	450	SP		white		T11N/R35W-4		
100999		450	480	SP	hard sand	white		T11N/R35W-4		
68811	68811	0	176	SP				T11N/R35W-4		
68811		176	206	SP		white		T11N/R35W-4		
68811		206	236	SP-G		brown		T11N/R35W-4		
68811		236	266	GC				T11N/R35W-4		
68811		266	281	CL-S-G				T11N/R35W-4		
68811		281	309	CL		brown		T11N/R35W-4		
68811		309	400	CL-G		brown		T11N/R35W-4		
32188	32188	0	2	SP				T11N/R35W-5	**T11N/R35W-5**	
32188		2	20	SP		brown		T11N/R35W-5		
32188		20	120	SP		yellow		T11N/R35W-5		
32188		120	168	SP		gray		T11N/R35W-5		
32188		168	170	CL		gray		T11N/R35W-5		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
32188		170	183	SP		gray		T11N/R35W-5		
32188		183	192	CL-S-G		gray		T11N/R35W-5		
32188		192	195	CL		gray		T11N/R35W-5		
32188		195	204	CL		brown		T11N/R35W-5		
32188		204	210	GP				T11N/R35W-5		
32188		210	220	SP		gray		T11N/R35W-5		
39452	39452	0	2	SP				T11N/R35W-5		
39452		2	20	SP		brown		T11N/R35W-5		
39452		20	120	SP		yellow		T11N/R35W-5		
39452		120	168	SP		gray		T11N/R35W-5		
39452		168	170	CL		gray		T11N/R35W-5		
39452		170	183	SP		gray		T11N/R35W-5		
39452		183	192	CL-S-G		gray		T11N/R35W-5		
39452		192	195	CL		gray		T11N/R35W-5		
39452		195	204	CL		brown		T11N/R35W-5		
39452		204	210	GP				T11N/R35W-5		
39452		210	220	SP		gray		T11N/R35W-5		
536446	536446	0	160	SP		brown		T11N/R35W-5		
536446		160	280	GPGC	Shale, Gravel, Clay	brown		T11N/R35W-5		
536446		280	290	CL		brown		T11N/R35W-5		
536446		290	330	GPGC	Shale, Gravel, Clay	brown		T11N/R35W-5		
536446		330	340	CL		tan		T11N/R35W-5		
536446		340	375	SC-G	Sand, Gravle, Shale	white		T11N/R35W-5		
536446		375	380	CL		green		T11N/R35W-5		
224157	224157	0	195	SP				T11N/R35W-5		
224157		195	210	GPGC				T11N/R35W-5		
224157		210	220	CL-S				T11N/R35W-5		
224157		220	225	SHALE	Shale small			T11N/R35W-5		
224157		225	255	SP				T11N/R35W-5		
224157		255	310	SP-GPGC				T11N/R35W-5		
224157		310	345	GPGC				T11N/R35W-5		
1097940	1097940	0	60	SW		brown		T11N/R35W-5		
1097940		60	80	CL		gray and blue		T11N/R35W-5		
1097940		80	94	CL-S		brown		T11N/R35W-5		
1097940		94	125	SP		brown		T11N/R35W-5		
1097940		125	200	SP-G				T11N/R35W-5		
1097940		200	300	SW				T11N/R35W-5		
1097968	1097968	0	105	SP		brown		T11N/R35W-5		
1097968		105	120	GP-S				T11N/R35W-5		
1097968		120	140	CH		green		T11N/R35W-5		
1097968		140	220	GW				T11N/R35W-5		
1097968		220	240	SP		brown		T11N/R35W-5		
1085593	1085593	0	100	SP				T11N/R35W-5		
1085593		100	200	CL-S				T11N/R35W-5		
1085593		200	240	GC				T11N/R35W-5		
1085593		240	320	GC				T11N/R35W-5		
1085593		320	380	GC				T11N/R35W-5		
1085593		380	400	CL-G				T11N/R35W-5		
739486	739486	0	20	SP		brown		T11N/R35W-5		
739486		20	140	SP		brown		T11N/R35W-5		
739486		140	160	SP		brown		T11N/R35W-5		
739486		160	190	GPGC		brown		T11N/R35W-5		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
739486		190	195	CL		gray		T11N/R35W-5		
739486		195	200	GPGC				T11N/R35W-5		
739486		200	220	CL-GPGC		brown		T11N/R35W-5		
536591	536591	0	200	SP		brown		T11N/R35W-5		
536591		200	240	SP-GPGC		white		T11N/R35W-5		
536591		240	250	CL		brown		T11N/R35W-5		
536591		250	275	GPGC		brown		T11N/R35W-5		
536591		275	310	CL-S		brown		T11N/R35W-5		
536591		310	330	GP-GPGC		white		T11N/R35W-5		
536591		330	340	CL-S		brown		T11N/R35W-5		
727337	727337	0	180	SP		brown		T11N/R35W-6	**T11N/R35W-6**	
727337		180	190	CL-S	Sandy Clay, some Shale	gray		T11N/R35W-6		
727337		190	250	SP		brown		T11N/R35W-6		
727337		250	300	CL-S	Sandy Clay - Shale	brown		T11N/R35W-6		
727337		300	380	GPGC				T11N/R35W-6		
727337		380	420	SP-GPGC				T11N/R35W-6		
90001	90001	0	8	ML-S				T11N/R35W-7A1	**T11N/R35W-7A1**	
90001		8	62	SC		yellow		T11N/R35W-7A1		
90001		62	72	SP	hard	gray		T11N/R35W-7A1		
90001		72	84	SP	soft	yellow		T11N/R35W-7A1		
90001		84	96	SP	hard	yellow		T11N/R35W-7A1		
90001		96	102	CL-S		brown		T11N/R35W-7A1		
90001		102	184	SC				T11N/R35W-7A1		
90001		184	190	SC		gray		T11N/R35W-7A1		
90001		190	215	SP	hard	gray		T11N/R35W-7A1		
90001		215	219	CL	hard	gray		T11N/R35W-7A1		
90001		219	222	SP-G		gray		T11N/R35W-7A1		
90001		222	237	SP-G	hard	gray		T11N/R35W-7A1		
90001		237	239	SP-G	soft			T11N/R35W-7A1		
90001		239	240	CL		gray		T11N/R35W-7A1		
90001		240	262	SP		gray		T11N/R35W-7A1		
90001		262	282	SP		yellow		T11N/R35W-7A1		
90001		282	290	SP-G	hard			T11N/R35W-7A1		
90001		290	358	SP-G	hard	yellow		T11N/R35W-7A1		
90001		358	362	GP-S				T11N/R35W-7A1		
90001		362	372	SP-G				T11N/R35W-7A1		
90001		372	415	SP		gray		T11N/R35W-7A1		
90001		415	420	SP-G		gray		T11N/R35W-7A1		
90001		420	428	SP	hard	gray		T11N/R35W-7A1		
90001		428	440	GP-S				T11N/R35W-7A1		
90001		440	450	SC-G	hard	gray		T11N/R35W-7A1		
90001		450	460	CL-S	hard	brown		T11N/R35W-7A1		
90001		460	475	GC		brown		T11N/R35W-7A1		
90001		475	480	CL-S	hard	brown		T11N/R35W-7A1		
90001		480	484	CL-S	soft			T11N/R35W-7A1		
90001		484	488	CL	hard	gray		T11N/R35W-7A1		
90001		488	494	CL-S	soft			T11N/R35W-7A1		
90001		494	496	GC				T11N/R35W-7A1		
90001		496	502	SC	hard	gray		T11N/R35W-7A1		
90001		502	544	SP	hard	gray		T11N/R35W-7A1		
90001		544	550	CL-S	hard			T11N/R35W-7A1		
90001		550	578	SP	hard	gray		T11N/R35W-7A1		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
90001		578	581	CL-S	hard	gray		T11N/R35W-7A1		
90001		581	610	SP	hard	gray		T11N/R35W-7A1		
90001		610	611	GP				T11N/R35W-7A1		
90001		611	698	SP	hard	gray		T11N/R35W-7A1		
90001		698	704	GP-S	hard			T11N/R35W-7A1		
90001		704	710	GP	hard			T11N/R35W-7A1		
90001		710	722	SP	hard			T11N/R35W-7A1		
5946	5946	0	46	SP				T11N/R35W-7A1		
5946		46	58	SP		gray		T11N/R35W-7R1	**T11N/R35W-7R1**	
5946		58	96	SC		yellow		T11N/R35W-7R1		
5946		96	102	CL-S		brown and blue		T11N/R35W-7R1		
5946		102	130	SP		brown		T11N/R35W-7R1		
5946		130	192	SP		gray		T11N/R35W-7R1		
5946		192	198	CL		gray and brown		T11N/R35W-7R1		
5946		198	210	SC		brown		T11N/R35W-7R1		
5946		210	236	SP	solid	brown		T11N/R35W-7R1		
5946		236	240	SP-G		gray		T11N/R35W-7R1		
5946		240	250	SP-G	solid	gray		T11N/R35W-7R1		
5946		250	252	SP-G		gray		T11N/R35W-7R1		
5946		252	280	CL-S		gray and brown		T11N/R35W-7R1		
5946		280	290	GP-S				T11N/R35W-7R1		
5946		290	300	SP-G		gray		T11N/R35W-7R1		
5946		300	314	SP		gray		T11N/R35W-7R1		
5946		314	330	SP		brown		T11N/R35W-7R1		
5946		330	372	SP	solid	brown		T11N/R35W-7R1		
5946		372	388	SP-G	hard			T11N/R35W-7R1		
5946		388	400	SP-G		gray		T11N/R35W-7R1		
5946		400	420	GP-S				T11N/R35W-7R1		
5946		420	424	SP-G		brown		T11N/R35W-7R1		
5946		424	426	CL-G		brown		T11N/R35W-7R1		
5946		426	438	GC-S				T11N/R35W-7R1		
5946		438	450	SP-G		gray		T11N/R35W-7R1		
5946		450	478	SP	hard	gray		T11N/R35W-7R1		
5946		478	490	CL-G		brown		T11N/R35W-7R1		
5946		490	510	SP-G				T11N/R35W-7R1		
5946		510	570	CL-G	soft	gray		T11N/R35W-7R1		
5946		570	584	SP	solid	gray		T11N/R35W-7R1		
5946		584	694	SP	hard	gray		T11N/R35W-7R1		
5946		694	774	SP-G	hard	blue		T11N/R35W-7R1		
5946		774	800	SC-G		blue		T11N/R35W-7R1		
5946		800	805	CL-G	hard	blue		T11N/R35W-7R1		
5946		805	810	SC		blue		T11N/R35W-7R1		
40-3705	40-3705	0	12	SP		brown		T11N/R35W-7R1		
40-3705		12	20	SP				T11N/R35W-7R1		
40-3705		20	87	SP		brown		T11N/R35W-7R1		
40-3705		87	127	SC				T11N/R35W-7R1		
40-3705		127	176	CL-S		gray		T11N/R35W-7R1		
40-3705		176	184	SHALE	Shale and sand	gray		T11N/R35W-7R1		
40-3705		184	190	CL		gray		T11N/R35W-7R1		
40-3705		190	196	SHALE	Shale and sand			T11N/R35W-7R1		
40-3705		196	214	SHALE	Shale, sand, some clay	brown		T11N/R35W-7R1		
40-3705		214	230	SC				T11N/R35W-7R1		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
40-3705		230	250	CL		gray		T11N/R35W-7R1		
40-3705		250	266	GPGC	Coarse Shale and sand, clean			T11N/R35W-7R1		
40-3705		266	275	GPGC	Coarse Shale and sand, clean			T11N/R35W-7R1		
907653	907653	0	40	SW-G				T11N/R35W-8	**T11N/R35W-8**	
907653		40	103	SW				T11N/R35W-8		
907653		103	230	CL-S	Clay, fine and course sand, some shale	tan		T11N/R35W-8		
907653		230	260	CL-S		tan		T11N/R35W-8		
907653		260	280	CL-S-G		tan		T11N/R35W-8		
907653		280	301	SC		gray		T11N/R35W-8		
907653		301	344	GPGC	Monterey shale, fine and coarse sand			T11N/R35W-8		
907653		344	360	GPGC				T11N/R35W-8		
907653		360	400	CL-S-G		tan		T11N/R35W-8		
907653		400	530	GP-S				T11N/R35W-8		
1090802	1090802	0	200	SP				T11N/R35W-8		
1090802		200	220	GP				T11N/R35W-8		
1090802		220	240	CL		gray		T11N/R35W-8		
1090802		240	270	CL		brown		T11N/R35W-8		
1090802		270	380	GC				T11N/R35W-8		
1090802		380	400	CL				T11N/R35W-8		
1090802		400	480	GC				T11N/R35W-8		
352479	352479	0	6	SP	Sandy Top Soil			T11N/R35W-8		
352479		6	120	SP				T11N/R35W-8		
352479		120	128	GP-S				T11N/R35W-8		
352479		128	195	SP				T11N/R35W-8		
352479		195	220	SC		gray		T11N/R35W-8		
352479		220	244	SC				T11N/R35W-8		
352479		244	280	GP	Small broken rock (white)	white		T11N/R35W-8		
352479		280	315	SP-G	Fine Sand and Rock	white		T11N/R35W-8		
40-3677	40-3677	0	30	SP				T11N/R35W-8		
40-3677		30	80	CL-S				T11N/R35W-8		
40-3677		80	160	SP		white		T11N/R35W-8		
40-3677		160	170	SP		yellow		T11N/R35W-8		
40-3677		170	250	SP				T11N/R35W-8		
40-3677		250	350	SP				T11N/R35W-8		
40-3677		350	375	GP-S				T11N/R35W-8		
223663	223663	0	6	SP	Sandy Top Soil			T11N/R35W-8		
223663		6	120	SP				T11N/R35W-8		
223663		120	128	GP-S				T11N/R35W-8		
223663		128	194	SC		gray		T11N/R35W-8		
223663		194	220	SP				T11N/R35W-8		
223663		220	244	SC				T11N/R35W-8		
223663		244	260	GP	Small broken rock			T11N/R35W-8		
223663		260	288	GP	Light textured rock			T11N/R35W-8		
223663		288	294	SC		blue		T11N/R35W-8		
223663		294	320	GP-S	Small broken rock, sand			T11N/R35W-8		
40-3685	40-3685	0	20	SP		brown		T11N/R35W-8		
40-3685		20	35	SP-G		white		T11N/R35W-8		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
40-3685		35	75	SW		brown		T11N/R35W-8		
40-3685		75	100	SP		brown		T11N/R35W-8		
40-3685		100	130	SP		white		T11N/R35W-8		
40-3685		130	160	SP		brown		T11N/R35W-8		
40-3685		160	175	SP		white		T11N/R35W-8		
40-3685		175	185	SP-G	Fine Sand and broken Shale	white		T11N/R35W-8		
40-3685		185	195	GP	Large broken Shale			T11N/R35W-8		
40-3685		195	205	GP	Large coarse Shale			T11N/R35W-8		
40-3685		205	220	GP	Large Shale			T11N/R35W-8		
40-3685		220	230	GC	Broken Shale and Clay	brown		T11N/R35W-8		
715654	715654	0	340	SP				T11N/R35W-8		
715654		340	440	GP				T11N/R35W-8		
715654		440	460	GC	Streaks			T11N/R35W-8		
715654		460	500	CL-G	Clay and Gravel streaks			T11N/R35W-8		
715655	715655	0	320	SP				T11N/R35W-8		
715655		320	440	GP				T11N/R35W-8		
715655		440	460	GC	Gravel and Clay streaks			T11N/R35W-8		
715655		460	500	CL-G	More Clay Streaks			T11N/R35W-8		
715663	715663	0	330	SP				T11N/R35W-8		
715663		330	420	GP				T11N/R35W-8		
715663		420	480	GC	Gravel streaks			T11N/R35W-8		
715663		480	520	CL-G	More Clay Streaks			T11N/R35W-8		
5695	5695	0	32	SP			**T11N/R35W-8M**	T11N/R35W-8		
5695		32	56	SP		brown		T11N/R35W-8		
5695		56	96	SC				T11N/R35W-8		
5695		96	99	CH				T11N/R35W-8		
5695		99	188	SP				T11N/R35W-8		
5695		188	197	CL				T11N/R35W-8		
5695		197	236	SP				T11N/R35W-8		
5695		236	248	SP-G				T11N/R35W-8		
5695		248	308	CL		gray		T11N/R35W-8		
5695		308	370	SP-G				T11N/R35W-8		
5695		370	382	GP-S				T11N/R35W-8		
5695		382	384	CL		gray		T11N/R35W-8		
5695		384	393	GP-S				T11N/R35W-8		
5695		393	400	CL-G				T11N/R35W-8		
5695		400	410	GP-S				T11N/R35W-8		
5695		410	426	GP-S				T11N/R35W-8		
5695		426	428	CL				T11N/R35W-8		
5695		428	435	GP-S				T11N/R35W-8		
5695		435	442	CL	Hard			T11N/R35W-8		
5695		442	466	GC				T11N/R35W-8		
5695		466	480	SC		brown		T11N/R35W-8		
5695		480	500	SC-G				T11N/R35W-8		
5695		500	520	SP		brown		T11N/R35W-8		
5695		520	532	SP		gray		T11N/R35W-8		
5695		532	544	SP-G		gray		T11N/R35W-8		
5695		544	545	CL				T11N/R35W-8		
5695		545	548	SP		gray		T11N/R35W-8		
5695		548	562	CL		gray		T11N/R35W-8		
5695		562	590	SP-G		gray		T11N/R35W-8		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
5695		590	600	CL		gray		T11N/R35W-8		
40-3712	40-3712	0	2	SP	Sandy Soil			T11N/R35W-9	**T11N/R35W-9**	
40-3712		2	8	SP		brown		T11N/R35W-9		
40-3712		8	10	SX				T11N/R35W-9		
40-3712		10	18	SW		red and brown		T11N/R35W-9		
40-3712		18	27	SP		brown		T11N/R35W-9		
40-3712		27	88	SP		red and brown		T11N/R35W-9		
40-3712		88	142	SW		brown		T11N/R35W-9		
40-3712		142	175	SC		black and brown		T11N/R35W-9		
40-3712		175	187	SP		white		T11N/R35W-9		
40-3712		187	200	SC		white		T11N/R35W-9		
40-3712		200	230	SHALE	Shale and Sand	white		T11N/R35W-9		
E034591	E034591	0	110	SW		brown		T11N/R35W-9		
E034591		110	210	SW		brown		T11N/R35W-9		
E034591		210	220	SP-G				T11N/R35W-9		
E034593	E034593	0	220	SW		brown		T11N/R35W-9		
E034593		220	240	SW		brown		T11N/R35W-9		
E034593		240	262	SP-G		brown		T11N/R35W-9		
297356	297356	0	3		Top Soil	brown		T11N/R35W-9		
297356		3	120	SP				T11N/R35W-9		
297356		120	220	SP				T11N/R35W-9		
297356		220	240	SP-GPGC				T11N/R35W-9		
297356		240	255	CL-S		brown		T11N/R35W-9		
297356		255	290	SP-GPGC				T11N/R35W-9		
297356		290	294	CL		brown		T11N/R35W-9		
297356		294	310	SP-GPGC				T11N/R35W-9		
297356		310	315	CL		brown		T11N/R35W-9		
297356		315	321	SP-GPGC				T11N/R35W-9		
297356		321	355	CL		brown		T11N/R35W-9		
297356		355	365	SP-GPGC				T11N/R35W-9		
297356		365	390	CL		brown		T11N/R35W-9		
297356		390	400	SP-GPGC				T11N/R35W-9		
560974	560974	0	10	SP				T11N/R35W-9		
560974		10	18	SP-G	Sand and Rock Streaks			T11N/R35W-9		
560974		18	32	SP				T11N/R35W-9		
560974		32	45	SP-G				T11N/R35W-9		
560974		45	76	SP				T11N/R35W-9		
560974		76	80	SP-G				T11N/R35W-9		
560974		80	186	SX	Sandstone with Sand	white		T11N/R35W-9		
560974		186	300	SX	Sandstone with Sand			T11N/R35W-9		
529395	529395	0	80	SP		brown		T11N/R35W-9		
529395		80	160	SP		gray		T11N/R35W-9		
529395		160	200	SP	Sand - little Shale	white		T11N/R35W-9		
529395		200	220	SW	Fine to coarse Sand - Shale	white		T11N/R35W-9		
529395		220	240	SHALE	Shale	white		T11N/R35W-9		
529395		240	300	SW		white		T11N/R35W-9		
82383	82383	0	195	SP		brown		T11N/R35W-9		
82383		195	216	SP		white		T11N/R35W-9		
82383		216	220	SP		brown		T11N/R35W-9		
82383		220	264	SP		brown		T11N/R35W-9		
82383		264	278	CL		gray		T11N/R35W-9		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
82383		278	281	CL		brown		T11N/R35W-9		
82383		281	293	SC		brown		T11N/R35W-9		
82383		293	312	CL		brown		T11N/R35W-9		
82383		312	314	GP				T11N/R35W-9		
82383		314	315	CL		brown		T11N/R35W-9		
82383		315	317	GP				T11N/R35W-9		
82383		317	318	CL		brown		T11N/R35W-9		
82383		318	330	GP				T11N/R35W-9		
82383		330	337	SP		brown		T11N/R35W-9		
5239	5239	0	120	SW		brown		T11N/R35W-9		
5239		120	220	SP				T11N/R35W-9		
5239		220	260	SP-G				T11N/R35W-9		
5239		260	275	SP		brown		T11N/R35W-9		
5239		275	305	CLML		gray		T11N/R35W-9		
5239		305	374	SP-G				T11N/R35W-9		
5239		374	475	GC		brown		T11N/R35W-9		
5239		475	490	CL-G		brown		T11N/R35W-9		
5239		490	515	GP-S				T11N/R35W-9		
5239		515	535	CL-S		brown		T11N/R35W-9		
5239		535	585	SM				T11N/R35W-9		
5239		585	601	CL		brown		T11N/R35W-9		
763499	763499	0	80	SP				T11N/R35W-9		
763499		80	120	SP				T11N/R35W-9		
763499		120	200	SC				T11N/R35W-9		
763499		200	220	CL-S-G		white		T11N/R35W-9		
763499		220	260	GP				T11N/R35W-9		
763499		260	280	GPGC				T11N/R35W-9		
763499		280	300	GP				T11N/R35W-9		
763499		300	400	GC				T11N/R35W-9		
763500	763500	0	80	SP				T11N/R35W-9		
763500		80	120	SP				T11N/R35W-9		
763500		120	200	SC				T11N/R35W-9		
763500		200	220	CL-S-G		white		T11N/R35W-9		
763500		220	260	GP				T11N/R35W-9		
763500		260	280	GPGC				T11N/R35W-9		
763500		280	300	GP				T11N/R35W-9		
763500		300	400	GC				T11N/R35W-9		
1085525	1085525	0	80	SP				T11N/R35W-9		
1085525		80	280	SP				T11N/R35W-9		
1085525		280	310	GP				T11N/R35W-9		
1085525		310	320	CL				T11N/R35W-9		
1085525		320	340	CL-G				T11N/R35W-9		
1085525		340	365	GP				T11N/R35W-9		
1085525		365	388	CL				T11N/R35W-9		
1085525		388	400	CL		brown		T11N/R35W-9		
1085525		400	460	GPGC				T11N/R35W-9		
1085525		460	540	GP				T11N/R35W-9		
1090810	1090810	0	200	SP		brown		T11N/R35W-9		
1090810		200	220	SC				T11N/R35W-9		
1090810		220	360	SW		white		T11N/R35W-9		
1090810		360	380	CL		gray		T11N/R35W-9		
1090810		380	400	SP-G				T11N/R35W-9		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
1090810		400	420	GP				T11N/R35W-9		
1090810		420	440	GP-S				T11N/R35W-9		
1090810		440	485	CL		brown		T11N/R35W-9		
1090810		485	540	GP				T11N/R35W-9		
1090811	1090811	0	300	SP		brown		T11N/R35W-9		
1090811		300	365	SW		white		T11N/R35W-9		
1090811		365	372	CL		gray		T11N/R35W-9		
1090811		372	418	GP	Fragmented Gravel			T11N/R35W-9		
1090811		418	422	CL		brown		T11N/R35W-9		
1090811		422	560	GP				T11N/R35W-9		
1090226	1090226	0	220	SP				T11N/R35W-9		
1090226		220	260	CL-G				T11N/R35W-9		
1090226		260	300	CL				T11N/R35W-9		
1090226		300	350	GP				T11N/R35W-9		
1090226		350	400	CL-G				T11N/R35W-9		
1090226		400	450	CL				T11N/R35W-9		
1090226		450	520	CL-G				T11N/R35W-9		
E063612	E063612	0	180	SP		brown		T11N/R35W-9		
E063612		180	230	SP		brown		T11N/R35W-9		
E063612		230	245	SP-GPGC				T11N/R35W-9		
E063612		245	250	CL-S-G				T11N/R35W-9		
E063612		250	295	SP-GPGC				T11N/R35W-9		
E063612		295	303	CL-S				T11N/R35W-9		
E063612		303	326	SP-GPGC				T11N/R35W-9		
E063612		326	331	CL-S		brown		T11N/R35W-9		
E063612		331	357	SP-GPGC		brown		T11N/R35W-9		
E063612		357	370	SC-G				T11N/R35W-9		
E063612		370	380	SP-G				T11N/R35W-9		
E063612		380	400	CH				T11N/R35W-9		
E063613	E063613	0	145	SP		brown		T11N/R35W-9		
E063613		145	210	SP		brown		T11N/R35W-9		
E063613		210	235	SP		yellow		T11N/R35W-9		
E063613		235	310	SP-GPGC				T11N/R35W-9		
E063613		310	320	CL-S				T11N/R35W-9		
E063613		320	335	SP-GPGC				T11N/R35W-9		
E063613		335	342	CL-S				T11N/R35W-9		
E063613		342	355	SP-GPGC				T11N/R35W-9		
E063613		355	362	CL-S				T11N/R35W-9		
E063613		362	389	SP-G				T11N/R35W-9		
E063613		389	400	CL-S		brown		T11N/R35W-9		
E063615	E063615	0	190	SP		brown		T11N/R35W-9		
E063615		190	253	SP		yellow		T11N/R35W-9		
E063615		253	290	SP-GPGC				T11N/R35W-9		
E063615		290	295	CL-S		brown		T11N/R35W-9		
E063615		295	320	SP-GPGC				T11N/R35W-9		
E063615		320	335	CL-S				T11N/R35W-9		
E063615		335	400	SP-GPGC				T11N/R35W-9		
40-3701	40-3701	0	25	SP		brown		T11N/R35W-9		
40-3701		25	47	SPSC		brown		T11N/R35W-9		
40-3701		47	55	SPSC		white		T11N/R35W-9		
40-3701		55	140	SPSC		brown		T11N/R35W-9		
40-3701		140	192	SWSC		brown		T11N/R35W-9		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
40-3701		192	198	SWSC		white		T11N/R35W-9		
40-3701		198	203	SWSC	Fine to coarse sand, some Shale, some clay	white		T11N/R35W-9		
40-3701		203	236	SWSC		white		T11N/R35W-9		
40-3701		236	293	SHALE	Shale and sand, some clay	white		T11N/R35W-9		
40-3701		293	298	CL	Clay, some Shale	brown		T11N/R35W-9		
40-3701		298	300	SHALE	Shale and fine sand, some clay			T11N/R35W-9		
40-3701		300	347	SP	Sand and Shale	brown		T11N/R35W-9		
40-3701		347	360	SPSC	Fine Sand, some Shale and Clay	brown		T11N/R35W-9		
40-3702	40-3702	0	62	SPSC		brown		T11N/R35W-9		
40-3702		62	102	SPSC		brown		T11N/R35W-9		
40-3702		102	110	SC		brown		T11N/R35W-9		
40-3702		110	142	SPSC		brown		T11N/R35W-9		
40-3702		142	158	SPSC		white		T11N/R35W-9		
40-3702		158	163	SPSC		brown		T11N/R35W-9		
40-3702		163	174	SPSC		brown		T11N/R35W-9		
40-3702		174	197	SPSC		white		T11N/R35W-9		
40-3702		197	199	CL-S		gray		T11N/R35W-9		
40-3702		199	202	CL-S		brown		T11N/R35W-9		
40-3702		202	210	CL-S		gray		T11N/R35W-9		
40-3702		210	213	SHALE	Shale and fine sand, some clay	white		T11N/R35W-9		
40-3702		213	215	SHALE	Shale, fine sand, and clay	brown		T11N/R35W-9		
40-3702		215	222	SC	Fine sand and clay and shale	brown		T11N/R35W-9		
40-3702		222	280	SHALE	Shale and fine sand	brown		T11N/R35W-9		
40-3703	40-3703	0	15	SP	Top Soil, Sand			T11N/R35W-9		
40-3703		15	138	SW				T11N/R35W-9		
40-3703		138	165	SC		brown		T11N/R35W-9		
40-3703		165	245	CL-S		yellow		T11N/R35W-9		
40-3703		245	256	SP-G				T11N/R35W-9		
40-3703		256	298	GC		orange and brown		T11N/R35W-9		
40-3703		298	307	CL-G		blue		T11N/R35W-9		
82351	82351	0	2	SP	Sandy Soil			T11N/R35W-10	**T11N/R35W-10**	**NCSD Well**
82351		2	96	SP				T11N/R35W-10		
82351		96	187	SP	Hard Sand			T11N/R35W-10		
82351		187	221	SPSC		yellow		T11N/R35W-10		
82351		221	252	CL-S		brown		T11N/R35W-10		
82351		252	269	CL-G		brown		T11N/R35W-10		
82351		269	297	CL		brown		T11N/R35W-10		
82351		297	312	CL-G		brown		T11N/R35W-10		
82351		312	328	CL		brown		T11N/R35W-10		
82351		328	341	CL-G		brown		T11N/R35W-10		
82351		341	346	GC-S				T11N/R35W-10		
82351		346	356	CL-G		brown		T11N/R35W-10		
82351		356	372	GP				T11N/R35W-10		
82351		372	387	CL-G				T11N/R35W-10		
82351		387	420	CL		brown		T11N/R35W-10		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
82351		420	425	GP-S				T11N/R35W-10		
82351		425	428	GC				T11N/R35W-10		
82351		428	435	SP-G				T11N/R35W-10		
82351		435	441	SP		gray		T11N/R35W-10		
82351		441	445	CL		gray		T11N/R35W-10		
82351		445	448	CL		gray		T11N/R35W-10		
82351		448	459	SP		gray		T11N/R35W-10		
82351		459	460	CL		gray		T11N/R35W-10		
82351		460	462	SP				T11N/R35W-10		
82351		462	470	CL				T11N/R35W-10		
82351		470	475	SC		gray		T11N/R35W-10		
82351		475	476	SP-G		gray		T11N/R35W-10		
82351		476	483	CL		brown		T11N/R35W-10		
82351		483	489	SC		gray		T11N/R35W-10		
82351		489	501	SHALE	Shale	blue		T11N/R35W-10		
82351		501	510	SHALE	Shale	gray		T11N/R35W-10		
222463	222463	0	100	SP		brown		T11N/R35W-10		
222463		100	160	CL-G		brown		T11N/R35W-10		
222463		160	180	GPGC				T11N/R35W-10		
222463		180	235	CL		brown		T11N/R35W-10		
222463		235	250	GPGC				T11N/R35W-10		
222463		250	255	CL		brown		T11N/R35W-10		
222463		255	265	GPGC				T11N/R35W-10		
222463		265	275	CL		green		T11N/R35W-10		
222463		275	288	GPGC				T11N/R35W-10		
222463		288	295	CL		green		T11N/R35W-10		
222463		295	305	GPGC				T11N/R35W-10		
222463		305	310	CL		blue		T11N/R35W-10		
580760	580760	0	3	SP				T11N/R35W-10		
580760		3	95	SP		brown		T11N/R35W-10		
580760		95	97	CL		gray		T11N/R35W-10		
580760		97	102	CL-G		brown		T11N/R35W-10		
580760		102	118	SP-G		brown		T11N/R35W-10		
580760		118	135	CL-G		brown		T11N/R35W-10		
580760		135	143	GPGC				T11N/R35W-10		
580760		143	147	CL-S		brown		T11N/R35W-10		
580760		147	153	GPGC				T11N/R35W-10		
580760		153	160	CL		brown		T11N/R35W-10		
580760		160	210	GPGC				T11N/R35W-10		
580760		210	250	CL-S		brown		T11N/R35W-10		
580760		250	278	GPGC				T11N/R35W-10		
580760		278	280	CL		brown		T11N/R35W-10		
580760		280	287	GPGC				T11N/R35W-10		
580760		287	291	CL		brown		T11N/R35W-10		
580760		291	296	GPGC				T11N/R35W-10		
580760		296	360	SP		brown		T11N/R35W-10		
580760		360	365	SP		blue		T11N/R35W-10		
580760		365	380	CL		blue	x	T11N/R35W-10		
580760		380	390	SP		blue		T11N/R35W-10		
580760		390	400	SM		blue		T11N/R35W-10		
580760		400	430	SP		blue		T11N/R35W-10		
580760		430	433	SP	Cemented	blue		T11N/R35W-10		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
580760		433	440	ML-S		blue	x	T11N/R35W-10		
40-0743	40-0743	0	78	SPSC		brown		T11N/R35W-10		
40-0743		78	94	SP		brown		T11N/R35W-10		
40-0743		94	109	SP		brown		T11N/R35W-10		
40-0743		109	123	CL-S		brown		T11N/R35W-10		
40-0743		123	136	SPSC		white		T11N/R35W-10		
40-0743		136	198	SPSC		brown		T11N/R35W-10		
40-0743		198	224	SPSC		white		T11N/R35W-10		
40-0743		224	288	SPSC		brown		T11N/R35W-10		
40-0743		288	294	CL		brown		T11N/R35W-10		
40-0743		294	323	SHALE	Shale, some fine sand and clay	brown		T11N/R35W-10		
40-0743		323	352	SHALE	Shale and fine sand, some clay			T11N/R35W-10		
40-0743		352	355	CL		brown		T11N/R35W-10		
40-0743		355	360	SHALE	Shale and Clay	brown		T11N/R35W-10		
40-0743		360	400	SHALE	Shale, fine sand, some Clay			T11N/R35W-10		
40-0746	40-0746	0	9	SP		brown		T11N/R35W-10		
40-0746		9	65	SPSC		brown		T11N/R35W-10		
40-0746		65	82	SPSC		brown		T11N/R35W-10		
40-0746		82	167	SPSC		brown		T11N/R35W-10		
40-0746		167	182	SPSC		white		T11N/R35W-10		
40-0746		182	202	SPSC		white		T11N/R35W-10		
40-0746		202	212	SP		white		T11N/R35W-10		
40-0746		212	217	SC		white		T11N/R35W-10		
40-0746		217	240	SHALE	Shale and fine sand, some clay	brown		T11N/R35W-10		
40-0746		240	268	SC		brown		T11N/R35W-10		
40-0746		268	280	SHALE	Shale and some clay and sand	brown		T11N/R35W-10		
40-0746		280	294	CL-S		brown		T11N/R35W-10		
40-0746		294	302	SHALE				T11N/R35W-10		
40-0746		302	307	CL		brown		T11N/R35W-10		
40-0746		307	320	CL-S		gray		T11N/R35W-10		
40-0746		320	325	CL	Clay and some Shale	gray		T11N/R35W-10		
40-0746		325	339	SHALE	Shale and clay and some fine sand	brown		T11N/R35W-10		
40-0746		339	350	CL		brown		T11N/R35W-10		
40-0746		350	371	SHALE	Shale and some clay and fine sand	brown		T11N/R35W-10		
40-0746		371	385	SHALE	Shale and clay and fine sand	brown		T11N/R35W-10		
40-0746		385	395	SHALE	Shale and some clay and fine sand			T11N/R35W-10		
40-0746		395	400	CL		brown		T11N/R35W-10		
40-0716	40-0716	0	62	SPSC		brown		T11N/R35W-10		
40-0716		62	71	SC		brown		T11N/R35W-10		
40-0716		71	102	SPSC		brown		T11N/R35W-10		
40-0716		102	206	SC		brown		T11N/R35W-10		
40-0716		206	218	SPSC		white		T11N/R35W-10		
40-0716		218	234	SPSC		brown		T11N/R35W-10		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
40-0716		234	250	SHALE	Shale Sand and Clay	brown		T11N/R35W-10		
40-0716		250	262	SC	Sand and some Shale and Clay	brown		T11N/R35W-10		
40-0716		262	290	SC		brown		T11N/R35W-10		
40-0716		290	300	SHALE	Shale and sand, some clay	brown		T11N/R35W-10		
40-0716		300	305	CL-S		brown		T11N/R35W-10		
40-0716		305	320	SHALE	Shale and sand, some clay	brown		T11N/R35W-10		
40-0716		320	323	SC		brown		T11N/R35W-10		
40-0716		323	360	SHALE	Shale and sand, some clay	brown		T11N/R35W-10		
1085512	1085512	0	220	SP				T11N/R35W-10		
1085512		220	280	CL-S-G				T11N/R35W-10		
1085512		280	360	GC				T11N/R35W-10		
1085512		360	460	CL-G				T11N/R35W-10		
1085512		460	520	SP-G				T11N/R35W-10		
1090760	1090760	0	185	SP				T11N/R35W-10		
1090760		185	235	GP				T11N/R35W-10		
1090760		235	240	CL		brown		T11N/R35W-10		
1090761	1090761	0	180	SP				T11N/R35W-10		
1090761		180	200	GP				T11N/R35W-10		
1090761		200	245	GP				T11N/R35W-10		
1090761		245	260	CL		brown		T11N/R35W-10		
1090761		260	320	GC		brown		T11N/R35W-10		
1090761		320	400	CL-G		brown		T11N/R35W-10		
1090761		400	420	CL		blue		T11N/R35W-10		
1090761		420	430	CL-S		brown		T11N/R35W-10		
1090761		430	450	CL		blue		T11N/R35W-10		
1090761		450	520	GP				T11N/R35W-10		
1090761		520	620	CL		blue		T11N/R35W-10		
E063608	E063608	0	195	SP		brown		T11N/R35W-10		
E063608		195	210	SP		yellow and brown		T11N/R35W-10		
E063608		210	230	SP-GPGC				T11N/R35W-10		
E063608		230	235	CL-S		brown		T11N/R35W-10		
E063608		235	250	SP-GPGC				T11N/R35W-10		
E063608		250	255	CL-S		brown		T11N/R35W-10		
E063608		255	285	GP-GPGC				T11N/R35W-10		
E063608		285	297	SP		yellow		T11N/R35W-10		
E063608		297	305	SC				T11N/R35W-10		
E063608		305	350	SP-GPGC				T11N/R35W-10		
E063608		350	363	CL-S-G				T11N/R35W-10		
E063608		363	375	SP-G				T11N/R35W-10		
E063608		375	400	CL-S				T11N/R35W-10		
E063609	E063609	0	205					T11N/R35W-10		
E063609		205	235	SP		brown		T11N/R35W-10		
E063609		235	250	SP-GPGC				T11N/R35W-10		
E063609		250	258	SP		brown and yellow		T11N/R35W-10		
E063609		258	320	SP-GPGC				T11N/R35W-10		
E063609		320	330	CL-S		brown		T11N/R35W-10		
E063609		330	350	SP-GPGC				T11N/R35W-10		
E063609		350	354	CL-S		brown		T11N/R35W-10		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
E063609		354	400	SP-GPGC				T11N/R35W-10		
E063606	E063606	0	150	SP		brown		T11N/R35W-10		
E063606		150	215	SP		yellow and brown		T11N/R35W-10		
E063606		215	240	SP-GPGC				T11N/R35W-10		
E063606		240	250	CL-S		brown		T11N/R35W-10		
E063606		250	315	SP-GPGC				T11N/R35W-10		
E063606		315	325	CL-S				T11N/R35W-10		
E063606		325	335	SP-GPGC				T11N/R35W-10		
E063606		335	350	CL-S		brown		T11N/R35W-10		
E063606		350	364	SP-GPGC				T11N/R35W-10		
E063606		364	371	CL-S				T11N/R35W-10		
E063606		371	395	SP-GPGC				T11N/R35W-10		
E063606		395	400	SC				T11N/R35W-10		
E90275	E90275	0	2	SP	Sandy Top Soil			T11N/R35W-10		
E90275		2	75	SP		brown		T11N/R35W-10		
E90275		75	190	SP		brown		T11N/R35W-10		
E90275		190	215	SP-G				T11N/R35W-10		
E90275		215	226	CL-G		brown		T11N/R35W-10		
E90275		226	233	CL		brown		T11N/R35W-10		
E90275		233	325	SC-G		brown		T11N/R35W-10		
E90275		325	335	CL		gray		T11N/R35W-10		
E90275		335	353	SP-G				T11N/R35W-10		
E90275		353	360	CL		gray		T11N/R35W-10		
E90275		360	373	SP-G				T11N/R35W-10		
E90275		373	383	CL		gray		T11N/R35W-10		
E90275		383	397	SP		brown		T11N/R35W-10		
E90275		397	421	CL		gray		T11N/R35W-10		
E90275		421	470	SP-G				T11N/R35W-10		
E90275		470	520	CLML-WS		blue		T11N/R35W-10		
E0090851	E0090851	0	2	CL	Top Soil			T11N/R35W-10		
E0090851		2	200	SP		brown		T11N/R35W-10		
E0090851		200	220	GPGC		yellow		T11N/R35W-10		
222812	222812	0	95	SPSC		brown		T11N/R35W-10		
222812		95	103	SP		white		T11N/R35W-10		
222812		103	104	SC		white		T11N/R35W-10		
222812		104	140	SP		white		T11N/R35W-10		
222812		140	155	SWSC		brown		T11N/R35W-10		
222812		155	175	CL-S		brown		T11N/R35W-10		
222812		175	205	SPSC				T11N/R35W-10		
222812		205	235	GPGC		gray		T11N/R35W-10		
222812		235	310	CL-S		brown		T11N/R35W-10		
222812		310	357	CL-S		brown and white		T11N/R35W-10		
222812		357	377	CL-GPGC		gray and white		T11N/R35W-10		
222812		377	382	CL-S		white		T11N/R35W-10		
222812		382	386	CH		white and gray		T11N/R35W-10		
222812		386	445	CL-S		white		T11N/R35W-10		
222812		445	488	GC-S		white and gray		T11N/R35W-10		
222812		488	583	CL-S		blue and gray		T11N/R35W-10		
222812		583	625	CL		blue and green		T11N/R35W-10		
222812		625	650	CL		green and blue		T11N/R35W-10		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
222812		650	683	CL-S	Clay, fine silty Sand, cemented Sandstone lens	green		T11N/R35W-10		
222812		683	694	SX	Sandstone lens with some Clay and fine Sand			T11N/R35W-10		
222812		694	705	CL		gray		T11N/R35W-10		
222812		705	730	CL	Clay (Serpentine)	green and gray		T11N/R35W-10		
71937	71937	0	183	SP				T11N/R35W-10		
71937		183	187	SP				T11N/R35W-10		
71937		187	247	SP				T11N/R35W-10		
71937		247	286	SPSC				T11N/R35W-10		
71937		286	305	CL		brown		T11N/R35W-10		
71937		305	309	GP				T11N/R35W-10		
71937		309	316	CL-S-G				T11N/R35W-10		
71937		316	323	GPGC				T11N/R35W-10		
71937		323	336	CL		brown		T11N/R35W-10		
71937		336	341	GP				T11N/R35W-10		
71937		341	346	CL		brown		T11N/R35W-10		
71937		346	357	CL-G				T11N/R35W-10		
71937		357	373	GP-S				T11N/R35W-10		
71937		373	376	CL		brown		T11N/R35W-10		
907667	907667	0	87	SP		brown		T11N/R35W-10		
907667		87	186	SPSC		brown		T11N/R35W-10		
907667		186	200	SPSC		brown and white		T11N/R35W-10		
907667		200	260	SC-G		brown		T11N/R35W-10		
907667		260	270	CL-G		brown		T11N/R35W-10		
907667		270	300	GP-S		brown		T11N/R35W-10		
907667		300	311	GPGC		brown		T11N/R35W-10		
907667		311	320	GP-S		brown		T11N/R35W-10		
907667		320	437	GPGC		brown		T11N/R35W-10		
907667		437	500	GP				T11N/R35W-10		
907667		500	600	CL-G		brown		T11N/R35W-11	**T11N/R35W-11**	
460281	460281	0	20	SP		brown		T11N/R35W-11		
460281		20	25	CL-S		black		T11N/R35W-11		
460281		25	52	SP		brown		T11N/R35W-11		
460281		52	82	SPSC		brown		T11N/R35W-11		
460281		82	152	SPSC		brown		T11N/R35W-11		
460281		152	255	CL-S		blue		T11N/R35W-11		
460281		255	335	SPSC		blue		T11N/R35W-11		
460281		335	420	SWSC		blue		T11N/R35W-11		
460281		420	450	CL	Clay and Shale	blue		T11N/R35W-11		
446205	446205	0	10	SP	Sandy Top Soil			T11N/R35W-11		
446205		10	40	SP		red		T11N/R35W-11		
446205		40	60	CL-S		white		T11N/R35W-11		
446205		60	90	CL-S		red		T11N/R35W-11		
446205		90	120	CL-S-G		red		T11N/R35W-11		
446205		120	140	SP-G				T11N/R35W-11		
446205		140	160	SPSC				T11N/R35W-11		
446205		160	200	CL-G		red		T11N/R35W-11		
446205		200	220	CL-G		tan		T11N/R35W-11		
446205		220	260	GC-S				T11N/R35W-11		
446205		260	300	GC-S		blue and brown		T11N/R35W-11		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
446205		300	320	GC-S		tan		T11N/R35W-11		
446205		320	340	GC-S		blue		T11N/R35W-11		
446205		340	460	CLML		gray	x	T11N/R35W-11		
446205		460	480	SX	Volcanic Shale Sandstone (very hard)			T11N/R35W-11		
51626	51626	0	50	SP		brown		T11N/R35W-11		
51626		50	62	CL		blue		T11N/R35W-11		
51626		62	72	CL-S-G		brown		T11N/R35W-11		
51626		72	160	GC				T11N/R35W-11		
51626		160	190	CL-S-G				T11N/R35W-11		
51626		190	210	CL		brown		T11N/R35W-11		
51626		210	265	GP-S				T11N/R35W-11		
51626		265	270	CL-S		brown		T11N/R35W-11		
51626		270	285	GP-S				T11N/R35W-11		
51626		285	290	CL		white		T11N/R35W-11		
51626		290	307	SP		white		T11N/R35W-11		
460192	460192	0	8	SP	Sandy Top Soil			T11N/R35W-11		
460192		8	55	SP		red and brown		T11N/R35W-11		
460192		55	65	CL-S		red		T11N/R35W-11		
460192		65	100	CL-S-G		red		T11N/R35W-11		
460192		100	160	SP-G		red		T11N/R35W-11		
460192		160	200	SC-G		red		T11N/R35W-11		
460192		200	260	SC-G		brown		T11N/R35W-11		
460192		260	300	GC		tan		T11N/R35W-11		
460192		300	320	SP-G		blue		T11N/R35W-11		
460192		320	360	SP		gray	x	T11N/R35W-11		
460192		360	400	CLML	Hard stringers of silty Clay and Sandstone	gray		T11N/R35W-11		
460192		400	420	CL		gray	x	T11N/R35W-11		
460192		420	440	CL		gray		T11N/R35W-11		
336363	336363	0	210	SP				T11N/R35W-11		
336363		210	320	CL-G				T11N/R35W-11		
763495	763495	0	20	SP				T11N/R35W-11		
763495		20	120	SP				T11N/R35W-11		
763495		120	180	SC				T11N/R35W-11		
763495		180	200	SP				T11N/R35W-11		
763495		200	240	SC				T11N/R35W-11		
763495		240	340	GP				T11N/R35W-11		
763495		340	360	CL-G				T11N/R35W-11		
763495		360	420	CL-G				T11N/R35W-11		
763495		420	445	CL-G	Clay/Boulders	blue		T11N/R35W-11		
906313	906313	0	200	SP		brown		T11N/R35W-11		
906313		200	220	GP-S		brown		T11N/R35W-11		
906313		220	245	SP-G				T11N/R35W-11		
906313		245	280	SP		brown		T11N/R35W-11		
906313		280	290	GP				T11N/R35W-11		
906313		290	305	CL		brown		T11N/R35W-11		
906313		305	385	GP				T11N/R35W-11		
906313		385	395	CL		brown		T11N/R35W-11		
906313		395	420	GP				T11N/R35W-11		
906313		420	435	CL		brown		T11N/R35W-11		
906313		435	500	GP				T11N/R35W-11		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
1084140	1084140	0	200	SP		brown		T11N/R35W-11		
1084140		200	220	GP-S		brown		T11N/R35W-11		
1084140		220	245	SP-G				T11N/R35W-11		
1084140		245	280	SP		brown		T11N/R35W-11		
1084140		280	290	GP				T11N/R35W-11		
1084140		290	305	CL		brown		T11N/R35W-11		
1084140		305	385	GP				T11N/R35W-11		
1084140		385	395	CL		brown		T11N/R35W-11		
1084140		395	420	GP				T11N/R35W-11		
1084140		420	435	CL		brown		T11N/R35W-11		
1084140		435	500	GP				T11N/R35W-11		
906312	906312	0	200	SP		brown		T11N/R35W-11		
906312		200	220	GP-S		brown		T11N/R35W-11		
906312		220	245	SP-G				T11N/R35W-11		
906312		245	280	SP		brown		T11N/R35W-11		
906312		280	290	GP				T11N/R35W-11		
906312		290	305	CL		brown		T11N/R35W-11		
906312		305	385	GP				T11N/R35W-11		
906312		385	395	CL		brown		T11N/R35W-11		
906312		395	420	GP				T11N/R35W-11		
906312		420	435	CL		brown		T11N/R35W-11		
906312		435	500	GP				T11N/R35W-11		
1084139	1084139	0	200	SP		brown		T11N/R35W-11		
1084139		200	220	GP-S		brown		T11N/R35W-11		
1084139		220	245	SP-G				T11N/R35W-11		
1084139		245	280	SP		brown		T11N/R35W-11		
1084139		280	290	GP				T11N/R35W-11		
1084139		290	305	CL		brown		T11N/R35W-11		
1084139		305	385	GP				T11N/R35W-11		
1084139		385	395	CL		brown		T11N/R35W-11		
1084139		395	420	GP				T11N/R35W-11		
1084139		420	435	CL		brown		T11N/R35W-11		
1084139		435	500	GP				T11N/R35W-11		
1084066	1084066	0	200	SP		brown		T11N/R35W-11		
1084066		200	220	GP-S		brown		T11N/R35W-11		
1084066		220	245	SP-G				T11N/R35W-11		
1084066		245	280	SP		brown		T11N/R35W-11		
1084066		280	290	GP				T11N/R35W-11		
1084066		290	305	CL		brown		T11N/R35W-11		
1084066		305	385	GP				T11N/R35W-11		
1084066		385	395	CL		brown		T11N/R35W-11		
1084066		395	420	GP				T11N/R35W-11		
1084066		420	435	CL		brown		T11N/R35W-11		
1084066		435	500	GP				T11N/R35W-11		
905287	905287	0	20	SP		brown		T11N/R35W-12	**T11N/R35W-12**	
905287		20	34	CL-S		brown		T11N/R35W-12		
905287		34	125	SP	Hard	brown		T11N/R35W-12		
905287		125	165	CL		gray		T11N/R35W-12		
905287		165	198	CL-S-G		brown		T11N/R35W-12		
905287		198	204	CL		gray		T11N/R35W-12		
905287		204	215	SHALE	Shale and Clay	black and gray		T11N/R35W-12		
905287		215	328	SHALE	Franciscan	gray		T11N/R35W-12		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
905287		328	329	SHALE	Fractured Franciscan			T11N/R35W-12		
905287		329	375	SHALE	Franciscan Volcanic	gray		T11N/R35W-12		
256197	256197	0	130	SW		brown		T11N/R35W-12		
256197		130	150	SW		brown		T11N/R35W-12		
256197		150	205	SPSC				T11N/R35W-12		
256197		205	210	SP-G				T11N/R35W-12		
256197		210	215	SC-G				T11N/R35W-12		
256197		215	260	SC-G				T11N/R35W-12		
256197		260	272	SC				T11N/R35W-12		
256197		272	286	SC-G				T11N/R35W-12		
256197		286	296	CL-G				T11N/R35W-12		
256197		296	317	SC-G				T11N/R35W-12		
256197		317	322	CL-S				T11N/R35W-12		
256197		322	352	SC-G				T11N/R35W-12		
256197		352	370	SC-G				T11N/R35W-12		
256197		370	450	SC-G				T11N/R35W-12		
365145	365145	0	60	SP		tan		T11N/R35W-12		
365145		60	120	SP		gray		T11N/R35W-12		
365145		120	140	SP		gray and tan		T11N/R35W-12		
365145		140	160	CL-S-G		brown, black, tan		T11N/R35W-12		
365145		160	180	CL-S-G		brown, black, tan		T11N/R35W-12		
365145		180	200	GP-S		tan		T11N/R35W-12		
365145		200	300	CL-G		red		T11N/R35W-12		
365145		300	360	GPGC		tan		T11N/R35W-12		
365145		360	380	CL-G		green and black		T11N/R35W-12		
365145		380	510	CL	Clay and Shale	blue and green		T11N/R35W-12		
365147	365147	0	60	SX		tan		T11N/R35W-12		
365147		60	80	SP		tan		T11N/R35W-12		
365147		80	120	CL-S		tan		T11N/R35W-12		
365147		120	130	GP-S		tan		T11N/R35W-12		
365147		130	140	GC-S		tan		T11N/R35W-12		
365147		140	160	GP-S				T11N/R35W-12		
365147		160	180	GP-S	River Gravel and Sand			T11N/R35W-12		
365147		180	200	GP-S	River Gravel and Sand			T11N/R35W-12		
365147		200	220	CL		red and brown		T11N/R35W-12		
365147		220	240	CL-G		red and brown		T11N/R35W-12		
365147		240	280	CL-G		red and brown		T11N/R35W-12		
365147		280	300	CL-G				T11N/R35W-12		
365147		300	320	GC				T11N/R35W-12		
365147		320	340	GP	River Gravel			T11N/R35W-12		
365147		340	360	CL-G	Clay with Shales, some Gravels	blue		T11N/R35W-12		
365147		360	380	CL-G	Clay with Shales, some Gravels			T11N/R35W-12		
241071	241071	0	100	SP		tan		T11N/R35W-12		
241071		100	120	SP	Sand and Sandstone	tan		T11N/R35W-12		
241071		120	160	SX	Sandstone and Clay	tan		T11N/R35W-12		
241071		160	180	SX	Sandstone and River Gravel	tan		T11N/R35W-12		
241071		180	240	CL-G	Clays, Sandstone with Gravel	tan		T11N/R35W-12		
241071		240	320	CL-G	Clays with some Rock			T11N/R35W-12		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
241071		320	400	CL		blue	x	T11N/R35W-12		
521856	521856	0	72	SP		brown		T11N/R35W-12		
521856		72	132	SP		brown		T11N/R35W-12		
521856		132	141	SP		brown		T11N/R35W-12		
521856		141	175	SP		brown and red		T11N/R35W-12		
521856		175	183	SC-G		white and brown		T11N/R35W-12		
521856		183	290	GP-S	Medium Gravel, Fine Sand, some Shale	white		T11N/R35W-12		
521856		290	365	GC-S	Medium Gravel, Fine Sand, some Shale, Streaks of Clay	brown		T11N/R35W-12		
521856		365	384	GC-S		brown		T11N/R35W-12		
521856		384	415	SC-G		white		T11N/R35W-12		
521856		415	420	CL-S-G	Clay, Shale, Fine Sand, some Gravel	gray		T11N/R35W-12		
139247	139247	0	60	SP				T11N/R35W-12		
139247		60	90	CL		brown		T11N/R35W-12		
139247		90	180	CL-S				T11N/R35W-12		
139247		180	205	CL		brown		T11N/R35W-12		
139247		205	215	CL-G		brown		T11N/R35W-12		
139247		215	250	CL-S		brown		T11N/R35W-12		
139247		250	295	CL		gray		T11N/R35W-12		
351557	351557	0	60	SP		red		T11N/R35W-12		
351557		60	95	SP		red		T11N/R35W-12		
351557		95	190	CL-S		red and brown		T11N/R35W-12		
351557		190	220	CL-S		white		T11N/R35W-12		
351557		220	260	SC-G		brown		T11N/R35W-12		
351557		260	320	CL-S-G		red		T11N/R35W-12		
351557		320	350	CL		brown		T11N/R35W-12		
351557		350	410	GP-S		brown		T11N/R35W-12		
351557		410	424	CL		brown		T11N/R35W-12		
276962	276962	0	234	SW		brown		T11N/R35W-12		
276962		234	314	GP-S				T11N/R35W-12		
276962		314	352	SC-G				T11N/R35W-12		
276962		352	410	SW				T11N/R35W-12		
276962		410	503	SW-G				T11N/R35W-12		
565586	565586	0	12	CL	Top Soil			T11N/R35W-12		
565586		12	99	SP				T11N/R35W-12		
565586		99	105	CL		red and brown		T11N/R35W-12		
565586		105	135	SP				T11N/R35W-12		
565586		135	150	CL		brown		T11N/R35W-12		
565586		150	180	SP				T11N/R35W-12		
565586		180	184	CL-S		gray		T11N/R35W-12		
565586		184	195	SP-G				T11N/R35W-12		
565586		195	205	CL		brown		T11N/R35W-12		
565586		205	215	SP				T11N/R35W-12		
565586		215	235	GP				T11N/R35W-12		
565586		235	237	CL		brown		T11N/R35W-12		
565586		237	257	GP				T11N/R35W-12		
565586		257	261	CL		brown		T11N/R35W-12		
565586		261	268	GP				T11N/R35W-12		
565586		268	270	CL		brown		T11N/R35W-12		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
565586		270	277	GP				T11N/R35W-12		
565586		277	285	CL-G		brown		T11N/R35W-12		
565586		285	300	CL		brown		T11N/R35W-12		
565586		300	328	GP				T11N/R35W-12		
565586		328	368	CL		gray		T11N/R35W-12		
565586		368	380	GP				T11N/R35W-12		
335777	335777	0	240	SC				T11N/R35W-12		
335777		240	300	SC-G		brown		T11N/R35W-12		
335777		300	340	CL-G		white		T11N/R35W-12		
335777		340	480	SX	Volcanic Sandstone (fractured 420-440)	gray and blue		T11N/R35W-12		
335777		480	620	SX	Volcanic Shale Sandstone (fractured 550-560)	gray		T11N/R35W-12		
335777		620	660	SP		gray		T11N/R35W-12		
335777		660	736	SHALE	Cemented Shale	gray		T11N/R35W-12		
256175	256175	0	45	SP		red		T11N/R35W-12		
256175		45	80	CL-S		red		T11N/R35W-12		
256175		80	185	CL-S-G		brown		T11N/R35W-12		
256175		185	217	CH-G		brown and blue		T11N/R35W-12		
90007	90007	0	255	SP				T11N/R35W-13	**T11N/R35W-13**	
90007		255	265	CL		blue		T11N/R35W-13		
90007		265	285	SP-G		gray		T11N/R35W-13		
90007		285	320	CL-G		brown		T11N/R35W-13		
90007		320	335	CL-G		blue and gray		T11N/R35W-13		
90007		335	350	CH		brown		T11N/R35W-13		
90007		350	363	CL		brown		T11N/R35W-13		
90007		363	385	GC-S				T11N/R35W-13		
90007		385	395	CL		white		T11N/R35W-13		
90007		395	400	CL		blue		T11N/R35W-13		
90007		400	408	SP		blue		T11N/R35W-13		
90007		408	425	CL-S		blue		T11N/R35W-13		
90007		425	430	CL		brown		T11N/R35W-13		
224274	224274	0	3		Top Soil			T11N/R35W-13		
224274		3	120	SP				T11N/R35W-13		
224274		120	360	SX	Sandstone	brown		T11N/R35W-13		
224274		360	415	SX	Sandstone	green		T11N/R35W-13		
224274		415	420	CL		brown		T11N/R35W-13		
1090807	1090807	0	210	SP				T11N/R35W-13		
1090807		210	360	CL-G				T11N/R35W-13		
1090807		360	380	CL		blue		T11N/R35W-13		
1090807		380	410	GP				T11N/R35W-13		
1090807		410	440	CL		blue		T11N/R35W-13		
1089651	1089651	0	275	SP		brown		T11N/R35W-13		
1089651		275	295	GPGC		gray		T11N/R35W-13		
1089651		295	300	CL		gray		T11N/R35W-13		
1089651		300	380	GPGC		gray		T11N/R35W-13		
1089651		380	420	SP-G				T11N/R35W-13		
1089651		420	475	CL-G		brown		T11N/R35W-13		
1089651		475	585	CL-G		gray		T11N/R35W-13		
1089647	1089647	0	275	SP				T11N/R35W-13		
1089647		275	460	GC				T11N/R35W-13		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
194034	194034	0	75	SP		brown		T11N/R35W-13		
194034		75	100	SW				T11N/R35W-13		
194034		100	150	SWSC				T11N/R35W-13		
194034		150	250	SP				T11N/R35W-13		
194034		250	290	SP-G				T11N/R35W-13		
194034		290	350	CH-G		gray		T11N/R35W-13		
194034		350	360	CH		gray		T11N/R35W-13		
194034		360	375	SP				T11N/R35W-13		
194034		375	440	SP-G				T11N/R35W-13		
194034		440	500	SC-G				T11N/R35W-13		
256007	256007	0	40	SP		brown		T11N/R35W-13		
256007		40	80	SP		red		T11N/R35W-13		
256007		80	120	SP		red and yellow		T11N/R35W-13		
256007		120	200	SP		brown		T11N/R35W-13		
256007		200	220	SC-G		red		T11N/R35W-13		
256007		220	240	CL-S-G				T11N/R35W-13		
256007		240	280	GC-S		brown		T11N/R35W-13		
256007		280	320	CH		brown		T11N/R35W-13		
256007		320	350	CL-G		tan		T11N/R35W-13		
256007		350	360	CL		blue		T11N/R35W-13		
256007		360	380	SP-G		blue		T11N/R35W-13		
256007		380	400	CL-S	Clay with hard Sandstone stringers	white and blue		T11N/R35W-13		
256007		400	410	SP-G		blue		T11N/R35W-13		
256007		410	420	CL		blue	x	T11N/R35W-13		
256007		420	460	SHALE		gray		T11N/R35W-13		
256007		460	495	CL		gray		T11N/R35W-13		
50981	50981	0	85	SP		red		T11N/R35W-13		
50981		85	164	SW		red and brown		T11N/R35W-13		
50981		164	190	CL-S		red		T11N/R35W-13		
50981		190	258	SWSC		white		T11N/R35W-13		
50981		258	320	SC-G		gray		T11N/R35W-13		
50981		320	328	CL		brown		T11N/R35W-13		
50981		328	351	CL-S		gray		T11N/R35W-13		
50981		351	380	CL-S-G		yellow		T11N/R35W-13		
50981		380	390	CL-S		blue and white		T11N/R35W-13		
50981		390	440	SP-G				T11N/R35W-13		
50981		440	452	CL-S	Clay, coarse sand, some sandstone strips	blue		T11N/R35W-13		
50981		452	564	CLML		gray	x	T11N/R35W-13		
221030	221030	0	140	SP		red		T11N/R35W-13		
221030		140	187	SP		white		T11N/R35W-13		
221030		187	230	SPSC		white		T11N/R35W-13		
221030		230	312	SP-G				T11N/R35W-13		
221030		312	413	CL-S		brown		T11N/R35W-13		
221030		413	481	CL-S	Clay with Sandstone Strips	blue	x	T11N/R35W-13		
221030		481	540	CLML		blue	x	T11N/R35W-13		
221030		540	570	CLML		gray	x	T11N/R35W-13		
786263	786263	0	120	SP				T11N/R35W-14	**T11N/R35W-14**	
786263		120	200	SP-G				T11N/R35W-14		
786263		200	280	SC-G				T11N/R35W-14		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
786263		280	320	GP				T11N/R35W-14		
786263		320	345	CL-G		brown		T11N/R35W-14		
786263		345	420	GP				T11N/R35W-14		
786263		420	440	CL-G				T11N/R35W-14		
40-0776	40-0776	0	138	SP	Top Soil and Sand			T11N/R35W-14		
40-0776		138	235	SW		brown		T11N/R35W-14		
40-0776		235	255	SW		white		T11N/R35W-14		
40-0776		255	330	SWSC		white and brown		T11N/R35W-14		
40-0776		330	380	CL	Hard Clay	blue and brown		T11N/R35W-14		
40-0776		380	418	GP-S	Clean broken Shale and some fine Sand			T11N/R35W-14		
40-0776		418	460	CL		brown		T11N/R35W-14		
40-0777	40-0777	0	100	SW				T11N/R35W-14		
40-0777		100	160	SC				T11N/R35W-14		
40-0777		160	280	CL-S		white		T11N/R35W-14		
40-0777		280	336	SC		white and brown		T11N/R35W-14		
40-0777		336	360	SC				T11N/R35W-14		
40-0777		360	400	SHALE	Clean Shale and Clay	brown		T11N/R35W-14		
82393	82393	0	194	SP				T11N/R35W-14		
82393		194	207	CL		brown		T11N/R35W-14		
82393		207	253	CL-G		brown		T11N/R35W-14		
82393		253	278	CL		brown		T11N/R35W-14		
82393		278	316	CL-G		brown		T11N/R35W-14		
82393		316	321	CL		brown		T11N/R35W-14		
82393		321	325	CL		gray		T11N/R35W-14		
82393		325	347	CL		brown		T11N/R35W-14		
82393		347	358	CL-S		gray		T11N/R35W-14		
82393		358	363	CL		brown		T11N/R35W-14		
82393		363	377	CL		gray		T11N/R35W-14		
82393		377	385	CL		blue		T11N/R35W-14		
82393		385	404	CL-S		gray		T11N/R35W-14		
82393		404	418	SHALE		blue		T11N/R35W-14		
256173	256173	0	30	SW		brown		T11N/R35W-14		
256173		30	41	SP		brown		T11N/R35W-14		
256173		41	83	SW		brown		T11N/R35W-14		
256173		83	105	SP		brown		T11N/R35W-14		
256173		105	115	SW		brown		T11N/R35W-14		
256173		115	177	SP		brown		T11N/R35W-14		
256173		177	304	SP		tan		T11N/R35W-14		
256173		304	405	CL-S		gray		T11N/R35W-14		
256177	256177	0	90	SPSC		brown		T11N/R35W-14		
256177		90	128	CL-S		brown		T11N/R35W-14		
256177		128	139	SWSC				T11N/R35W-14		
256177		139	292	SWSC		white		T11N/R35W-14		
256177		292	350	CL-S		gray		T11N/R35W-14		
256177		350	461	SC-G		brown		T11N/R35W-14		
256177		461	490	CL-S-G		gray		T11N/R35W-14		
40-0786	40-0786	0	6	SP		brown		T11N/R35W-14		
40-0786		6	19	SW		brown		T11N/R35W-14		
40-0786		19	31	SP		brown		T11N/R35W-14		
40-0786		31	64	SP		brown		T11N/R35W-14		
40-0786		64	97	SP		brown		T11N/R35W-14		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
40-0786		97	174	SP		brown and white		T11N/R35W-14		
40-0786		174	237	SP		gray and white		T11N/R35W-14		
40-0786		237	270	SP		brown and white		T11N/R35W-14		
40-0786		270	281	SC		gray		T11N/R35W-14		
40-0786		281	300	SPSC		gray and white		T11N/R35W-14		
40-0786		300	315	SPSC	Sand, some clay shale streaks	gray		T11N/R35W-14		
40-0786		315	328	SP-GPGC	Fine Sand, small and medium Shale	gray		T11N/R35W-14		
40-0786		328	375	SHALE	Shale and fine gray Sand	gray		T11N/R35W-14		
40-0786		375	385	SHALE	Shale and Clay and Rock			T11N/R35W-14		
1098083	1098083	0	3	CL				T11N/R35W-14		
1098083		3	135	SP-G				T11N/R35W-14		
1098083		135	168	CL				T11N/R35W-14		
1098083		168	185	GP				T11N/R35W-14		
1098083		185	200	CL				T11N/R35W-14		
1098083		200	212	SP				T11N/R35W-14		
1098083		212	216	CL		blue		T11N/R35W-14		
1098083		216	235	SP-G				T11N/R35W-14		
1098083		235	253	GP		blue		T11N/R35W-14		
1098083		253	260	GP				T11N/R35W-14		
1098083		260	270	CL				T11N/R35W-14		
1098083		270	285	GP				T11N/R35W-14		
1098083		285	290	CL				T11N/R35W-14		
1098083		290	300	CL-S				T11N/R35W-14		
1098083		300	322	CL				T11N/R35W-14		
1098083		322	335	CL-S				T11N/R35W-14		
1098083		335	385	SP				T11N/R35W-14		
1098083		385	387	CL				T11N/R35W-14		
1098083		387	477	SP-G				T11N/R35W-14		
1085548	1085548	0	340	SC				T11N/R35W-14		
1085548		340	380	GC				T11N/R35W-14		
1085548		380	490	GC				T11N/R35W-14		
1085548		490	500	CL-G		blue		T11N/R35W-14		
1085549	1085549	0	340	SC				T11N/R35W-14		
1085549		340	380	GC				T11N/R35W-14		
1085549		380	490	GC				T11N/R35W-14		
1085549		490	500	CL-G		blue		T11N/R35W-14		
38141	38141	0	274	SP				T11N/R35W-14		
38141		274	287	SP		gray		T11N/R35W-14		
38141		287	304	CL-S		gray		T11N/R35W-14		
38141		304	342	SP		gray		T11N/R35W-14		
38141		342	344	SP-G		gray		T11N/R35W-14		
38141		344	349	CL		brown		T11N/R35W-14		
38141		349	356	SP-G				T11N/R35W-14		
38141		356	368	CL-G		brown		T11N/R35W-14		
38141		368	375	GP				T11N/R35W-14		
38141		375	384	CL		brown		T11N/R35W-14		
38141		384	390	GP-S				T11N/R35W-14		
38141		390	391	CL		brown		T11N/R35W-14		
38141		391	401	GP				T11N/R35W-14		
38141		401	403	CL		brown		T11N/R35W-14		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
38141		403	404	GP				T11N/R35W-14		
38141		404	409	CL		brown		T11N/R35W-14		
218523	218523	0	20	SP				T11N/R35W-14		
218523		20	60	SP				T11N/R35W-14		
218523		60	140	SP	Coarse Sand (hard)			T11N/R35W-14		
218523		140	160	GPGC				T11N/R35W-14		
218523		160	180	CL-S		brown		T11N/R35W-14		
218523		180	200	SPSC				T11N/R35W-14		
218523		200	240	SPSC				T11N/R35W-14		
218523		240	260	CL-S		gray		T11N/R35W-14		
218523		260	280	SP-G				T11N/R35W-14		
218523		280	300	CL-G		brown		T11N/R35W-14		
218523		300	320	CL-G		brown		T11N/R35W-14		
218523		320	340	SP-G				T11N/R35W-14		
218523		340	360	SHALE	Shale	blue		T11N/R35W-14		
439779	439779	0	12	SP		brown		T11N/R35W-14		
439779		12	160	SP		brwn		T11N/R35W-14		
439779		160	200	SPSC		brown		T11N/R35W-14		
439779		200	260	SPSC		brown		T11N/R35W-14		
439779		260	280	SP-GPGC				T11N/R35W-14		
439779		280	300	CL-S		brown		T11N/R35W-14		
439779		300	335	CL-S		brown		T11N/R35W-14		
439779		335	360	GPGC				T11N/R35W-14		
439779		360	370	CH		brown		T11N/R35W-14		
439779		370	380	GPGC				T11N/R35W-14		
439779		380	390	CL		brown		T11N/R35W-14		
439779		390	400	SP-GPGC				T11N/R35W-14		
439779		400	420	CL-GPGC		brown		T11N/R35W-14		
158738	158738	0	100	SP		red and yellow		T11N/R35W-14		
158738		100	125	SPSC		red and brown		T11N/R35W-14		
158738		125	225	SP				T11N/R35W-14		
158738		225	350	SC-G		brown		T11N/R35W-14		
158738		350	395	GC-S		blue		T11N/R35W-14		
158738		395	410	SP-G		blue		T11N/R35W-14		
158738		410	465	SC-G		gray		T11N/R35W-14		
158738		465	479	SC		gray	x	T11N/R35W-14		
158739	158739	0	175	SP		brown		T11N/R35W-14		
158739		175	240	SPSC		white		T11N/R35W-14		
158739		240	265	SPSC		blue and gray		T11N/R35W-14		
158739		265	300	SP-G		gray		T11N/R35W-14		
158739		300	318	CL		brown		T11N/R35W-14		
158739		318	400	SP-G				T11N/R35W-14		
158739		400	415	CL-S				T11N/R35W-14		
158739		415	475	SC-G		blue and gray		T11N/R35W-14		
352786	352786	0	150	SW				T11N/R35W-14		
352786		150	160	CL		tan		T11N/R35W-14		
352786		160	180	SPSC				T11N/R35W-14		
352786		180	279	CL-S-G				T11N/R35W-14		
352786		279	330	GC-S				T11N/R35W-14		
352786		330	339	CL-S-G		brown		T11N/R35W-14		
352786		339	355	SC-G				T11N/R35W-14		
352786		355	357	SC-G				T11N/R35W-14		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
352786		357	415	GP-S				T11N/R35W-14		
352786		415	422	CL-S-G				T11N/R35W-14		
352786		422	475	CL-S				T11N/R35W-14		
352786		475	490	SC-G				T11N/R35W-14		
352786		490	563	CL-S-G		blue		T11N/R35W-14		
5225	5225	0	98	SP		brown		T11N/R35W-15	**T11N/R35W-15**	
5225		98	140	CL-S		brown		T11N/R35W-15		
5225		140	214	SC-G				T11N/R35W-15		
5225		214	259	SW				T11N/R35W-15		
5225		259	305	SP-G				T11N/R35W-15		
5225		305	450	SC-G				T11N/R35W-15		
5225		450	465	CLML		blue		T11N/R35W-15		
5225		465	480	CL		gray		T11N/R35W-15		
5225		480	484	CL		gray	x	T11N/R35W-15		
68808	68808	0	190	SP				T11N/R35W-15		
68808		190	250	CL-S				T11N/R35W-15		
68808		250	350	CL-G				T11N/R35W-15		
68808		350	375	GP				T11N/R35W-15		
68808		375	460	SC-G				T11N/R35W-15		
352772	352772	0	62	SP				T11N/R35W-15		
352772		62	82	SWSC				T11N/R35W-15		
352772		82	142	SWSC		red		T11N/R35W-15		
352772		142	180	SP				T11N/R35W-15		
352772		180	322	SC-G				T11N/R35W-15		
352772		322	362	SP-G				T11N/R35W-15		
352772		362	400	SC-G				T11N/R35W-15		
352772		400	420	SC		white		T11N/R35W-15		
352772		420	530	SC-G		brown		T11N/R35W-15		
352772		530	560	CLML		gray	x	T11N/R35W-15		
294236	294236	0	208	SP		brown		T11N/R35W-15		
294236		208	372	SP-GPGC				T11N/R35W-15		
294236		372	380	CL		brown		T11N/R35W-15		
294235	294235	0	232	SP		brown		T11N/R35W-15		
294235		232	380	SP-GPGC				T11N/R35W-15		
294234	294234	0	230	SP		brown		T11N/R35W-15		
294234		230	389	SP-GPGC				T11N/R35W-15		
294234		389	400	CL		brown		T11N/R35W-15		
294233	294233	0	210	SP		brown		T11N/R35W-15		
294233		210	410	SP-GPGC				T11N/R35W-15		
1097950	1097950	0	200	SP		brown		T11N/R35W-15		
1097950		200	280	SP-G				T11N/R35W-15		
1097950		280	293	CL		brown		T11N/R35W-15		
1097950		293	400	SP-G				T11N/R35W-15		
1097950		400	420	CL-G		brown		T11N/R35W-15		
1097949	1097949	0	220	SP		brown		T11N/R35W-15		
1097949		220	300	SP-G				T11N/R35W-15		
1097949		300	315	CL		brown		T11N/R35W-15		
1097949		315	420	SP-G				T11N/R35W-15		
1097949		420	440	CL		brown		T11N/R35W-15		
786260	786260	0	140	SP				T11N/R35W-15		
786260		140	240	SC				T11N/R35W-15		
786260		240	320	CL-G				T11N/R35W-15		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
786260		320	420	GP				T11N/R35W-15		
786260		420	560	CL-G				T11N/R35W-15		
490963	490963	0	130	SP		red and brown		T11N/R35W-15		
490963		130	140	GP-S				T11N/R35W-15		
490963		140	284	SP		tan and brown		T11N/R35W-15		
490963		284	400	GPGC	Shale with course Sand and Clay	brown and olive brown		T11N/R35W-15		
490963		400	427	CL-GPGC		gray		T11N/R35W-15		
490963		427	432	GPGC		brown		T11N/R35W-15		
490963		432	499	GPGC	Shale with small 1/4-inch Gravel			T11N/R35W-15		
490963		499	547	CL-GPGC	Clay and Shale with small Gravel	gray		T11N/R35W-15		
490963		547	610	SHALE	Shale with Clay	brown and olive		T11N/R35W-15		
490963		610	630	SHALE	Shale and Clay	brown		T11N/R35W-15		
490963		630	652	CL		gray		T11N/R35W-15		
490963		652	695	CL		olive and brown		T11N/R35W-15		
40-0779	40-0779	0	15	SP		brown		T11N/R35W-15		
40-0779		15	28	SPSC		brown		T11N/R35W-15		
40-0779		28	43	SP		brown		T11N/R35W-15		
40-0779		43	49	SPSC		brown		T11N/R35W-15		
40-0779		49	83	SP		brown		T11N/R35W-15		
40-0779		83	125	SP		brown		T11N/R35W-15		
40-0779		125	132	SP		white		T11N/R35W-15		
40-0779		132	175	SPSC		brown		T11N/R35W-15		
40-0779		175	243	SP		white		T11N/R35W-15		
40-0779		243	302	SP		brown		T11N/R35W-15		
40-0779		302	304	CL		black		T11N/R35W-15		
40-0779		304	360	SPSC	Fine Sand and Shale, some Clay	white		T11N/R35W-15		
40-0779		360	380	SPSC		brown		T11N/R35W-15		
E34590	E34590	0	15	SW		brown		T11N/R35-16	**T11N/R35-16**	
E34590		15	250	SW		brown		T11N/R35-16		
E34589	E34589	0	60	SP		brown		T11N/R35-16		
E34589		60	90	SW		brown		T11N/R35-16		
E34589		90	108	SW		brown		T11N/R35-16		
E34589		108	215	SP		brown		T11N/R35-16		
E34589		215	285	SP		brown		T11N/R35-16		
34272	34272	0	15	SP		brown		T11N/R35W-17	**T11N/R35W-17**	
34272		15	28	SPSC		gray		T11N/R35W-17		
34272		28	75	SP-G				T11N/R35W-17		
34272		75	95	CL-S				T11N/R35W-17		
34272		95	110	SC				T11N/R35W-17		
34272		110	121	CL		tan		T11N/R35W-17		
34272		121	126	SP				T11N/R35W-17		
34272		126	170	SPSC				T11N/R35W-17		
34272		170	175	CL		gray		T11N/R35W-17		
34272		175	180	SP				T11N/R35W-17		
34272		180	220	SC-G				T11N/R35W-17		
34272		220	233	CL		blue		T11N/R35W-17		
34272		233	239	SC-G				T11N/R35W-17		
34272		239	257	SP-G				T11N/R35W-17		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
34272		257	266	SPSC		gray		T11N/R35W-17		
34272		266	280	SP-G				T11N/R35W-17		
34272		280	285	SP-G				T11N/R35W-17		
34272		285	300	SC		gray		T11N/R35W-17		
34272		300	310	SP-G				T11N/R35W-17		
34272		310	330	SP-G				T11N/R35W-17		
34272		330	335	CL-S		brown		T11N/R35W-17		
34272		335	340	SP		brown		T11N/R35W-17		
34272		340	355	SP-G				T11N/R35W-17		
34272		355	362	SP-G				T11N/R35W-17		
34272		362	370	SW				T11N/R35W-17		
34272		370	380	SPSC		red		T11N/R35W-17		
34272		380	385	CL-S		gray		T11N/R35W-17		
34272		385	388	CL-S		black		T11N/R35W-17		
34272		388	400	CL-S		gray		T11N/R35W-17		
34272		400	415	SP-G				T11N/R35W-17		
34272		415	430	GP-S				T11N/R35W-17		
34272		430	448	SC				T11N/R35W-17		
34272		448	545	SC-G		white		T11N/R35W-17		
34272		545	575	SP-G				T11N/R35W-17		
34272		575	605	SP				T11N/R35W-17		
34272		605	612	SP-G				T11N/R35W-17		
34272		612	670	SP		tan		T11N/R35W-17		
34272		670	705	SP		white		T11N/R35W-17		
139244	139244	0	170	SP		brown		T11N/R35W-17		
139244		170	265	SPSC		brown and gray		T11N/R35W-17		
139244		265	400	GP				T11N/R35W-17		
139244		400	415	CL		brown		T11N/R35W-17		
139244		415	425	CL-G		brown		T11N/R35W-17		
139244		425	550	GC-S				T11N/R35W-17		
139244		550	595	CL-S-G		brown		T11N/R35W-17		
139244		595	610	GP				T11N/R35W-17		
25928	25928	0	32	SP				T11N/R35W-17		
25928		32	56	SP		brown		T11N/R35W-17		
25928		56	96	SC				T11N/R35W-17		
25928		96	99	CH				T11N/R35W-17		
25928		99	188	SP				T11N/R35W-17		
25928		188	197	CL				T11N/R35W-17		
25928		197	236	SP				T11N/R35W-17		
25928		236	248	SP-G				T11N/R35W-17		
25928		248	308	CL		gray		T11N/R35W-17		
25928		308	370	SP-G				T11N/R35W-17		
25928		370	382	GP-S				T11N/R35W-17		
25928		382	384	CL				T11N/R35W-17		
25928		384	393	GP-S				T11N/R35W-17		
25928		393	400	CL-G				T11N/R35W-17		
25928		400	410	GP-S				T11N/R35W-17		
25928		410	426	GP-S				T11N/R35W-17		
25928		426	428	CL				T11N/R35W-17		
25928		428	435	GP-S				T11N/R35W-17		
25928		435	442	CL	Hard Clay			T11N/R35W-17		
25928		442	466	GC				T11N/R35W-17		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
25928		466	480	SC				T11N/R35W-17		
25928		480	500	SC-G				T11N/R35W-17		
25928		500	520	SP		brown		T11N/R35W-17		
25928		520	532	SP		gray		T11N/R35W-17		
25928		532	544	SP-G		gray		T11N/R35W-17		
25928		544	545	CL				T11N/R35W-17		
25928		545	548	SP		gray		T11N/R35W-17		
25928		548	562	CL		gray		T11N/R35W-17		
25928		562	590	SP-G		gray		T11N/R35W-17		
25928		590	600	CL		gray		T11N/R35W-17		
39337	39337	0	5	CL				T11N/R35W-21	**T11N/R35W-21**	
39337		5	9	SP				T11N/R35W-21		
39337		9	12	SP	Hard Sand			T11N/R35W-21		
39337		12	63	SC				T11N/R35W-21		
39337		63	186	CL	Hard Clay			T11N/R35W-21		
39337		186	210	SP		brown		T11N/R35W-21		
39337		210	244	CL	Tough Clay			T11N/R35W-21		
39337		244	340	SP				T11N/R35W-21		
39337		340	358	CL-G				T11N/R35W-21		
39337		358	410	SP		brown		T11N/R35W-21		
39337		410	414	SP-G				T11N/R35W-21		
39337		414	424	SP-G				T11N/R35W-21		
39337		424	433	SP				T11N/R35W-21		
39337		433	434	CL				T11N/R35W-21		
39337		434	486	SP				T11N/R35W-21		
39337		486	496	SC-G				T11N/R35W-21		
39337		496	503	SC				T11N/R35W-21		
39337		503	510	SC	Hard Sand and Clay			T11N/R35W-21		
39337		510	538	SP				T11N/R35W-21		
39609	39609	0	5	CL				T11N/R35W-21		
39609		5	15	CL				T11N/R35W-21		
39609		15	35	CL		blue		T11N/R35W-21		
39609		35	60	SP		brown		T11N/R35W-21		
39609		60	80	CL-S		brown		T11N/R35W-21		
39609		80	150	CL		brown		T11N/R35W-21		
39609		150	190	CL		blue		T11N/R35W-21		
39609		190	200	SP		blue		T11N/R35W-21		
39609		200	212	SP		brown		T11N/R35W-21		
39609		212	250	SP		white		T11N/R35W-21		
39609		250	310	CL-S		yellow		T11N/R35W-21		
39609		310	360	CL-G				T11N/R35W-21		
39609		360	376	CL	Hard Clay	blue		T11N/R35W-21		
39609		376	397	CL-G		brown		T11N/R35W-21		
39609		397	410	CL	Hard Clay	brown		T11N/R35W-21		
39609		410	419	SP-G		brown		T11N/R35W-21		
39609		419	425	CL-G		brown		T11N/R35W-21		
39609		425	428	CL		brown		T11N/R35W-21		
39609		428	433	SP		white		T11N/R35W-21		
39609		433	460	CL-G		gray		T11N/R35W-21		
39609		460	475	SP		white		T11N/R35W-21		
39609		475	481	CL	Hard Clay	brown		T11N/R35W-21		
39609		481	492	SP-G				T11N/R35W-21		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
39609		492	505	CL		brown		T11N/R35W-21		
39609		505	640	SP		white		T11N/R35W-21		
39609		640	645	CL		gray		T11N/R35W-21		
39609		645	657	CL-G		brown		T11N/R35W-21		
39609		657	664	SP		white		T11N/R35W-21		
39609		664	669	SHALE	Shale	blue		T11N/R35W-21		
39609		669	675	CL-S-G	Hard Sandy Clay and Gravel			T11N/R35W-21		
39609		675	689	SC-G				T11N/R35W-21		
39609		689	692	CL-S	Hard Sandy Clay			T11N/R35W-21		
39609		692	710	SC-G				T11N/R35W-21		
39609		710	720	SP-G				T11N/R35W-21		
39609		720	749	SPSC				T11N/R35W-21		
39609		749	761	GP				T11N/R35W-21		
39609		761	772	CL-S-G				T11N/R35W-21		
39609		772	798	GP				T11N/R35W-21		
39609		798	808	SP		blue		T11N/R35W-21		
39609		808	811	CL-S		blue		T11N/R35W-21		
39609		811	816	SP-G				T11N/R35W-21		
39609		816	823	GP-S				T11N/R35W-21		
39609		823	832	CL-S		blue		T11N/R35W-21		
34273	34273	0	30	CL-S				T11N/R35W-21		
34273		30	90	SP				T11N/R35W-21		
34273		90	200	SP				T11N/R35W-21		
34273		200	208	SP-G				T11N/R35W-21		
34273		208	218	SPSC		red		T11N/R35W-21		
34273		218	255	CL-S		gray		T11N/R35W-21		
34273		255	275	SC-G				T11N/R35W-21		
34273		275	305	CL-S	Hard Clay with strips fine Sand	gray		T11N/R35W-21		
34273		305	315	SC-G				T11N/R35W-21		
34273		315	325	CL-S	Hard Clay with strips fine Sand			T11N/R35W-21		
34273		325	345	SC-G				T11N/R35W-21		
34273		345	355	SPSC				T11N/R35W-21		
34273		355	358	CL	Hard Clay			T11N/R35W-21		
34273		358	385	SP-G				T11N/R35W-21		
34273		385	392	SC-G				T11N/R35W-21		
34273		392	399	CL	Hard Clay	red		T11N/R35W-21		
34273		399	415	SC-G				T11N/R35W-21		
34273		415	460	CL-S				T11N/R35W-21		
34273		460	470	SP-G				T11N/R35W-21		
34273		470	490	SC-G				T11N/R35W-21		
34273		490	560	SP		tan		T11N/R35W-21		
34273		560	600	SP		white		T11N/R35W-21		
34273		600	613	SP-G				T11N/R35W-21		
34273		613	619	CL-S		tan		T11N/R35W-21		
34273		619	630	SC	Hard Sand and Clay	brown		T11N/R35W-21		
34273		630	635	SP-G				T11N/R35W-21		
34273		635	655	SP		brown and white		T11N/R35W-21		
34273		655	660	SP-G				T11N/R35W-21		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
34273		660	665	SP-G	Sand, small amount Gravel, Hard	brown		T11N/R35W-21		
34273		665	685	SP		brown and white		T11N/R35W-21		
104151	104151	0	2	SP	Sandy Top Soil			T11N/R35W-22	**T11N/R35W-22**	
104151		2	8	CL-S		brown		T11N/R35W-22		
104151		8	19	CL		brown		T11N/R35W-22		
104151		19	25	SP-G				T11N/R35W-22		
104151		25	112	SW				T11N/R35W-22		
104151		112	116	CL-S		brown		T11N/R35W-22		
104151		116	128	SW				T11N/R35W-22		
104151		128	186	SC		brown		T11N/R35W-22		
104151		186	205	SW				T11N/R35W-22		
104151		205	222	SC		brown		T11N/R35W-22		
104151		222	228	SP-G				T11N/R35W-22		
104151		228	234	SC		brown		T11N/R35W-22		
104151		234	244	SP-G				T11N/R35W-22		
104151		244	253	SC		brown		T11N/R35W-22		
104151		253	276	CL-S		brown		T11N/R35W-22		
104151		276	283	SP-G				T11N/R35W-22		
104151		283	303	SP-G				T11N/R35W-22		
104151		303	315	CL-S		brown		T11N/R35W-22		
104151		315	321	SP-G				T11N/R35W-22		
104151		321	343	CL-S		brown		T11N/R35W-22		
104151		343	355	SP-G				T11N/R35W-22		
104151		355	407	SP-G				T11N/R35W-22		
104151		407	413	SP-G				T11N/R35W-22		
104151		413	447	SW				T11N/R35W-22		
104151		447	475	SP-G				T11N/R35W-22		
104151		475	533	SP				T11N/R35W-22		
104151		533	585	SC		brown		T11N/R35W-22		
104151		585	600	SC-G				T11N/R35W-22		
101600	101600	0	3	CL	Top Soil Adobe			T11N/R35W-22		
101600		3	14	SP-G				T11N/R35W-22		
101600		14	17	CL-S		blue		T11N/R35W-22		
101600		17	25	SP-G				T11N/R35W-22		
101600		25	76	SC-G				T11N/R35W-22		
101600		76	119	CL-S		yellow		T11N/R35W-22		
101600		119	142	CL-S		brown		T11N/R35W-22		
101600		142	155	SC		brown		T11N/R35W-22		
101600		155	166	CL-S		brown		T11N/R35W-22		
101600		166	185	SC		brown		T11N/R35W-22		
101600		185	212	SP-G				T11N/R35W-22		
101600		212	234	CL-S		brown		T11N/R35W-22		
101600		234	284	SP-G				T11N/R35W-22		
101600		284	306	CL		blue		T11N/R35W-22		
101600		306	335	GC				T11N/R35W-22		
101600		335	337	SC				T11N/R35W-22		
101600		337	394	SC		brown		T11N/R35W-22		
101600		394	419	CL-S-G		brown		T11N/R35W-22		
101600		419	435	SP-G				T11N/R35W-22		
101600		435	443	SC-G				T11N/R35W-22		
101600		443	447	SC				T11N/R35W-22		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
101600		447	506	CL-S-G				T11N/R35W-22		
101600		506	556	SC				T11N/R35W-22		
101600		556	608	SC-G		brown		T11N/R35W-22		
101600		608	670	SC				T11N/R35W-22		
763498	763498	0	120	SP				T11N/R35W-22		
763498		120	140	SC				T11N/R35W-22		
763498		140	280	CL				T11N/R35W-22		
763498		280	340	CL-S				T11N/R35W-22		
763498		340	360	CL				T11N/R35W-22		
763498		360	380	CL-S		white		T11N/R35W-22		
763498		380	400	CL-S		white and brown		T11N/R35W-22		
763498		400	420	CL-S		white and brown		T11N/R35W-22		
763498		420	440	CL		brown		T11N/R35W-22		
763498		440	460	CL		gray		T11N/R35W-22		
763498		460	500	GPGC				T11N/R35W-22		
E033253	E033253	0	180	SP		brown		T11N/R35W-22		
E033253		180	340	SP		brown		T11N/R35W-22		
E033253		340	395	SW-G				T11N/R35W-22		
E033253		395	400	CL		brown		T11N/R35W-22		
E036600	E036600	0	180	SP		yellow		T11N/R35W-22		
E036600		180	400	SW				T11N/R35W-22		
E036601	E036601	0	170	SP		brown		T11N/R35W-22		
E036601		170	400	SW		brown		T11N/R35W-22		
E034607	E034607	0	250	SW		brown		T11N/R35W-22		
E034607		250	360	SP		brown		T11N/R35W-22		
E034607		360	395	SW-G				T11N/R35W-22		
E034607		395	400	CL		gray and brown		T11N/R35W-22		
40-3707	40-3707	0	12	SP		brown		T11N/R35W-22		
40-3707		12	197	SW		brown		T11N/R35W-22		
40-3707		197	248	SP		white		T11N/R35W-22		
40-3707		248	321	SW		tan		T11N/R35W-22		
40-3707		321	370	SP		white		T11N/R35W-22		
1097647	1097647	0	160	SP				T11N/R35W-23	**T11N/R35W-23**	
1097647		160	360	SC				T11N/R35W-23		
1097647		360	380	CL-G				T11N/R35W-23		
1097647		380	460	CL-G				T11N/R35W-23		
1097647		460	520	GP				T11N/R35W-23		
1097647		520	540	CL-G				T11N/R35W-23		
1098051	1098051	0	300	SP		brown		T11N/R35W-23		
1098051		300	380	CL		gray		T11N/R35W-23		
1098051		380	395	SP		gray		T11N/R35W-23		
1098051		395	420	CL		blue		T11N/R35W-23		
1098051		420	447	SP				T11N/R35W-23		
1098051		447	470	CL-S		blue		T11N/R35W-23		
1098051		470	550	SP				T11N/R35W-23		
1098051		550	565	CL		brown		T11N/R35W-23		
1098051		565	575	SP				T11N/R35W-23		
1098051		575	590	CL		brown		T11N/R35W-23		
1098051		590	610	SP				T11N/R35W-23		
1097672	1097672	0	310	SP				T11N/R35W-23		
1097672		310	330	CL		brown		T11N/R35W-23		
1097672		330	390	SP-G				T11N/R35W-23		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
1097672		390	430	CL		brown		T11N/R35W-23		
1097672		430	460	CL		gray		T11N/R35W-23		
1097672		460	480	CL-G		gray		T11N/R35W-23		
1097672		480	495	CL-S		gray		T11N/R35W-23		
1097672		495	535	GP				T11N/R35W-23		
1090806	1090806	0	300	SP				T11N/R35W-23		
1090806		300	380	SC		white		T11N/R35W-23		
1090806		380	440	CL				T11N/R35W-23		
1090806		440	510	CL-G				T11N/R35W-23		
1090806		510	520	CL		brown		T11N/R35W-23		
1090769	1090769	0	260	SP				T11N/R35W-24	**T11N/R35W-24**	
1090769		260	280	SC				T11N/R35W-24		
1090769		280	300	SP				T11N/R35W-24		
1090769		300	360	SP		white		T11N/R35W-24		
1090769		360	380	SHALE	Decomposed Shale			T11N/R35W-24		
1090769		380	400	SC-G				T11N/R35W-24		
1090769		400	420	CL-S				T11N/R35W-24		
1090769		420	450	CL		black		T11N/R35W-24		
1090769		450	455	GP				T11N/R35W-24		
1090769		455	460	CL		tan		T11N/R35W-24		
1090769		460	470	CL		gray and tan		T11N/R35W-24		
1090769		470	475	GP				T11N/R35W-24		
1090769		475	480	GC-S				T11N/R35W-24		
1090769		480	500	GC-S				T11N/R35W-24		
1090769		500	520	SP		white		T11N/R35W-24		
1090769		520	540	CL		tan and gray		T11N/R35W-24		
1090769		540	550	CL				T11N/R35W-24		
1090769		550	555	GP				T11N/R35W-24		
1090769		555	560	CL-G				T11N/R35W-24		
1085546	1085546	0	180	SP				T11N/R35W-24		
1085546		180	350	CL-S				T11N/R35W-24		
1085546		350	380	CL-G				T11N/R35W-24		
1085546		380	480	GP				T11N/R35W-24		
1085546		480	500	CL				T11N/R35W-24		
1089631	1089631	0	300	SP				T11N/R35W-24		
1089631		300	425	SP		white		T11N/R35W-24		
1089631		425	475	CL		brown		T11N/R35W-24		
1089631		475	480	GC		brown		T11N/R35W-24		
1089631		480	495	CL		gray		T11N/R35W-24		
1089631		495	560	CL-G		brown		T11N/R35W-24		
1089632	1089632	0	320	SP				T11N/R35W-24		
1089632		320	400	SP		white		T11N/R35W-24		
1089632		400	510	CL-S-G		brown		T11N/R35W-24		
1089632		510	545	CL		gray		T11N/R35W-24		
1089632		545	550	GP				T11N/R35W-24		
1089632		550	560	CL-S		brown		T11N/R35W-24		
782690	782690	0	294	SP		brown		T11N/R35W-24		
782690		294	317	CL		blue		T11N/R35W-24		
782690		317	328	SP-G				T11N/R35W-24		
782690		328	355	CL		brown		T11N/R35W-24		
782690		355	372	SP-G				T11N/R35W-24		
782690		372	386	CL-S		brown		T11N/R35W-24		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
782690		386	471	SP-G				T11N/R35W-24		
782690		471	500	CL		brown		T11N/R35W-24		
1097661	1097661	0	380	SP				T11N/R35W-24		
1097661		380	420	CL		brown		T11N/R35W-24		
1097661		420	440	CL-G		brown		T11N/R35W-24		
1097661		440	460	GPGC		brown		T11N/R35W-24		
1097661		460	510	GP				T11N/R35W-24		
1097661		510	515	CL				T11N/R35W-24		
25942	25942	0	3	CL	Soil			T11N/R35W-25	**T11N/R35W-25**	
25942		3	26	SP				T11N/R35W-25		
25942		26	36	SP-G				T11N/R35W-25		
25942		36	68	SP				T11N/R35W-25		
25942		68	70	CL		brown		T11N/R35W-25		
25942		70	84	SP-G				T11N/R35W-25		
25942		84	85	CL		brown		T11N/R35W-25		
25942		85	87	SP-G				T11N/R35W-25		
25942		87	94	CL-S-G		brown		T11N/R35W-25		
25942		94	104	GP				T11N/R35W-25		
25942		104	128	CL		yellow		T11N/R35W-25		
25942		128	132	CL		blue		T11N/R35W-25		
25942		132	162	CL		yellow		T11N/R35W-25		
25942		162	188	CL		blue		T11N/R35W-25		
25942		188	200	SP		brown		T11N/R35W-25		
25942		200	218	SP-G		brown		T11N/R35W-25		
25942		218	230	CL		blue		T11N/R35W-25		
25942		230	235	GP				T11N/R35W-25		
25942		235	237	CL		yellow		T11N/R35W-25		
25942		237	245	CL-G		blue		T11N/R35W-25		
25942		245	255	CL		blue		T11N/R35W-25		
25942		255	267	CL-S-G				T11N/R35W-25		
25942		267	271	GP				T11N/R35W-25		
25942		271	272	CL		yellow		T11N/R35W-25		
25942		272	292	SP-G		brown		T11N/R35W-25		
25942		292	307	CL		yellow		T11N/R35W-25		
25942		307	313	SC		yellow		T11N/R35W-25		
25942		313	316	GP-S				T11N/R35W-25		
25942		316	340	SP		white		T11N/R35W-25		
1098062	1098062	0	35	SP-G				T11N/R35W-25		
1098062		35	40	CL		brown		T11N/R35W-25		
1098062		40	60	SP-G				T11N/R35W-25		
1098062		60	105	CL-S				T11N/R35W-25		
1098062		105	135	SP-G				T11N/R35W-25		
1098062		135	150	CL		brown		T11N/R35W-25		
1098062		150	235	GP-S				T11N/R35W-25		
1098062		235	255	CL		brown		T11N/R35W-25		
1098062		255	395	GP-S				T11N/R35W-25		
1098062		395	405	CL		blue		T11N/R35W-25		
802734	802734	0	24	GP-S		brown		T11N/R35W-26	**T11N/R35W-26**	
802734		24	45	SW-G				T11N/R35W-26		
802734		45	75	GP-S				T11N/R35W-26		
802734		75	95	GP-S				T11N/R35W-26		
802734		95	134	CL-S-G		brown		T11N/R35W-26		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
802734		134	142	CL-S-G		brown		T11N/R35W-26		
802734		142	145	CL		brown		T11N/R35W-26		
802734		145	163	CL-G		brown		T11N/R35W-26		
802734		163	168	CL-G		brown and blue		T11N/R35W-26		
802734		168	188	SW				T11N/R35W-26		
802734		188	215	GP-S				T11N/R35W-26		
802734		215	223	SW				T11N/R35W-26		
802734		223	231	CL-S-G		blue		T11N/R35W-26		
802734		231	238	CL-S-G		blue		T11N/R35W-26		
802734		238	249	CL-S-G		blue		T11N/R35W-26		
802734		249	269	CL-S		blue		T11N/R35W-26		
802734		269	290	GP-S				T11N/R35W-26		
802734		290	298	CL-S-G		brown		T11N/R35W-26		
802734		298	353	GP-S				T11N/R35W-26		
802734		353	381	GP-S				T11N/R35W-26		
802734		381	400	GP-S				T11N/R35W-26		
E151642	E151642	0	160	SW		brown		T11N/R35W-23F	**T11N/R35W-23F**	**Unprocessed**
E151642		160	280	SP		brown		T11N/R35W-23F		
E151642		280	370	SP		white		T11N/R35W-23F		
E151642		370	380	CL-S		brown		T11N/R35W-23F		
E151642		380	395	SP		brown		T11N/R35W-23F		
E151642		395	400	CL-S		brown		T11N/R35W-23F		
E151642		400	415	SP		brown		T11N/R35W-23F		
E151642		415	427	CL		gray		T11N/R35W-23F		
E151642		427	445	SP-G		brown		T11N/R35W-23F		
E151642		445	451	CL		brown		T11N/R35W-23F		
E151642		451	455	SP-G		brown		T11N/R35W-23F		
E151642		455	460	CL		brown		T11N/R35W-23F		
E151642		460	480	SP-G		brown		T11N/R35W-23F		
E151642		480	493	CL		brown		T11N/R35W-23F		
E151642		493	523	SP-G		brown		T11N/R35W-23F		
961609	961609	0	200	SP		brown		11N/R35W-3C	**11N/R35W-3C**	
961609		200	223	CL-S		blue		11N/R35W-3C		
961609		223	320	GP-S				11N/R35W-3C		
961609		320	340	GP				11N/R35W-3C		
961609		340	375	CL		brown		11N/R35W-3C		
961608	961608	0	140	SP		brown		T11N/R35W-6H	**T11N/R35W-6H**	
961608		140	148	CL-S				T11N/R35W-6H		
961608		148	180	SP		brown		T11N/R35W-6H		
961608		180	220	CL-S				T11N/R35W-6H		
961608		220	280	GP				T11N/R35W-6H		
961608		280	300	SP				T11N/R35W-6H		
962102	962102	0	120	SP				T12N/R35W-33C	**T12N/R35W-33C**	
962102		120	130	SP				T12N/R35W-33C		
962102		130	190	SP-G				T12N/R35W-33C		
962102		190	200	CL		blue		T12N/R35W-33C		
962102		200	270	CL-G		brown		T12N/R35W-33C		
962102		270	275	CL		blue		T12N/R35W-33C		
962102		275	280	SP		blue		T12N/R35W-33C		
962102		280	290	CL		blue		T12N/R35W-33C		
907311	907311	0	7		Top Soil			T32S/R13E-34	**T32S/R13E-34**	
907311		7	203	GPGC				T32S/R13E-34		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
907311		203	348	CL-S		gray		T32S/R13E-34		
907311		348	508	SHALE	Shale, Clay	gray		T32S/R13E-34		
1083181	1083181	0	135	SP				T12N/R35W-34	**T12N/R35W-34**	
1083181		135	155	CL-G		gray		T12N/R35W-34		
1083181		155	230	GPGC		white		T12N/R35W-34		
1083181		230	240	GP		brown		T12N/R35W-34		
1083181		240	265	CL-G		brown		T12N/R35W-34		
1083181		265	360	CL		brown		T12N/R35W-34		
1083181		360	375	CL		blue		T12N/R35W-34		
1083181		375	420	CL		blue		T12N/R35W-34		
1083194	1083194	0	200	SP		brown		T11N/R35W-3A	**T11N/R35W-3A**	
1083194		200	240	CL-S-G				T11N/R35W-3A		
1083194		240	260	GC				T11N/R35W-3A		
1083194		260	300	CL-S		brown		T11N/R35W-3A		
1083194		300	320	CL		brown and white		T11N/R35W-3A		
E160886	E160886	0	3	CL				T11N/R35W-18	**T11N/R35W-18**	
E160886		3	10	CL				T11N/R35W-18		
E160886		10	48	SP				T11N/R35W-18		
E160886		48	76	CL				T11N/R35W-18		
E160886		76	165	SP				T11N/R35W-18		
E160886		165	177	CL				T11N/R35W-18		
E160886		177	225	SP				T11N/R35W-18		
E160886		225	228	GP-S				T11N/R35W-18		
E160886		228	261	SP				T11N/R35W-18		
E160886		261	272	CL-S				T11N/R35W-18		
E160886		272	350	SP				T11N/R35W-18		
E160886		350	384	GP				T11N/R35W-18		
E160886		384	403	CL				T11N/R35W-18		
E160886		403	411	SP-G				T11N/R35W-18		
E160886		411	428	CL				T11N/R35W-18		
E160886		428	460	SP-G				T11N/R35W-18		
E160886		460	481	CL				T11N/R35W-18		
E160886		481	494	SP-G				T11N/R35W-18		
E160886		494	498	CL				T11N/R35W-18		
E160886		498	530	SP-G				T11N/R35W-18		
E160886		530	540	CL				T11N/R35W-18		
738228	738228	0	150	SP		brown		T12N/R35W-32	**T12N/R35W-32**	
738228		150	170	CL-S		blue		T12N/R35W-32		
738228		170	200	SP-GPGC				T12N/R35W-32		
738228		200	330	SP				T12N/R35W-32		
738228		330	340	CL-S		blue		T12N/R35W-32		
738228		340	360	GPGC		blue		T12N/R35W-32		
738228		360	375	SP				T12N/R35W-32		
738228		375	378	SHALE	Hard Shale	white		T12N/R35W-32		
738228		378	400	GPGC				T12N/R35W-32		
738228		400	440	SHALE	Sandy Shale			T12N/R35W-32		
961832	961832	0	130	SP		brown		T11N/R35W-2N	**T11N/R35W-2N**	
961832		130	160	CL-S		brown		T11N/R35W-2N		
961832		160	195	SP-G		brown		T11N/R35W-2N		
961832		195	210	CL-G		blue and white		T11N/R35W-2N		
961832		210	245	SP-G		white		T11N/R35W-2N		
961832		245	330	CL-S		white		T11N/R35W-2N		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
961832		330	365	SP-G				T11N/R35W-2N		
961832		365	410	CL-S		white		T11N/R35W-2N		
961832		410	420	CL		blue and gray		T11N/R35W-2N		
961854	961854	0	120	SP				T11N/R35W-5J	**T11N/R35W-5J**	
961854		120	160	SP-G				T11N/R35W-5J		
961854		160	170	CL		brown		T11N/R35W-5J		
961854		170	215	SP-G				T11N/R35W-5J		
961854		215	230	CL-S				T11N/R35W-5J		
961854		230	265	SP-G				T11N/R35W-5J		
961854		265	305	CL-S				T11N/R35W-5J		
961854		305	313	CL		brown		T11N/R35W-5J		
961854		313	355	SP-G		brown		T11N/R35W-5J		
961854		355	360	CL		brown		T11N/R35W-5J		
961854		360	375	SP-G				T11N/R35W-5J		
961854		375	390	CL-S				T11N/R35W-5J		
961854		390	421	SP-G		white		T11N/R35W-5J		
961855	961855	0	45	SP-G				T11N/R35W-25P	**T11N/R35W-25P**	
961855		45	50	CL		brown		T11N/R35W-25P		
961855		50	60	SP-G				T11N/R35W-25P		
961855		60	70	CL		green		T11N/R35W-25P		
961855		70	120	SP-G				T11N/R35W-25P		
961855		120	135	CL		brown		T11N/R35W-25P		
961855		135	170	SP-G				T11N/R35W-25P		
961855		170	190	CL		brown		T11N/R35W-25P		
961855		190	235	SP-G				T11N/R35W-25P		
961855		235	260	CL-S		brown		T11N/R35W-25P		
961855		260	420	SP-G		brown		T11N/R35W-25P		
961855		420	425	CL		brown		T11N/R35W-25P		
961855		425	460	SP-G				T11N/R35W-25P		
961855		460	520	CL-S		brown		T11N/R35W-25P		
961855		520	565	SP-G		brown		T11N/R35W-25P		
961855		565	590	CL		brown		T11N/R35W-25P		
961855		590	605	SP		brown		T11N/R35W-25P		
961855		605	620	CL-G		brown		T11N/R35W-25P		
961853	961853	0	70	CL-S				T11N/R35W-34	**T11N/R35W-34**	
961853		70	260	SP-G				T11N/R35W-34		
961853		260	285	CL		brown		T11N/R35W-34		
961853		285	340	SP-G				T11N/R35W-34		
961853		340	350	CL		brown		T11N/R35W-34		
961853		350	405	SP-G				T11N/R35W-34		
961853		405	415	CL-S				T11N/R35W-34		
961853		415	470	SC-G				T11N/R35W-34		
961853		470	480	CL				T11N/R35W-34		
961853		480	490	SP-G				T11N/R35W-34		
961853		490	520	CL		brown		T11N/R35W-34		
961853		520	580	SP-G				T11N/R35W-34		
961853		580	590	CL				T11N/R35W-34		
961853		590	640	SP-G				T11N/R35W-34		
907308	907308	0	78	SP		brown		T11N/R34W-28	**T11N/R34W-28**	
907308		78	236	SC-G		brown		T11N/R34W-28		
907308		236	245	CL-S		green	x	T11N/R34W-28		
907308		245	362	SP		green and white		T11N/R34W-28		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
907308		362	412	SHALE		blue and white		T11N/R34W-28		
5239	5239	0	120	SW		brown		No T/R/S	**No T/R/S**	
5239		120	220	SP				No T/R/S		
5239		220	260	SP-G				No T/R/S		
5239		260	275	SP		brown		No T/R/S		
5239		275	305	CLML		gray		No T/R/S		
5239		305	374	SP-G				No T/R/S		
5239		374	475	GPGC				No T/R/S		
5239		475	490	CL-G		brown		No T/R/S		
5239		490	515	GP-S				No T/R/S		
5239		515	535	CL-S		brown		No T/R/S		
5239		535	585	SM				No T/R/S		
5239		585	601	CL		brown		No T/R/S		
5220	5220	0	240	SPSC		brown		No T/R/S		
5220		240	340	SP-G				No T/R/S		
5220		340	420	GC-S		brown		No T/R/S		
5220		420	430	CL-S-G		blue		No T/R/S		
5220		430	455	CL		blue		No T/R/S		
5220		455	465	CL		blue and white		No T/R/S		
5220		465	511	SP-G				No T/R/S		
5220		511	535	CH		gray	x	No T/R/S		
77809	77809	0	20	SP		brown		No T/R/S		
77809		20	37	SPSC		brown		No T/R/S		
77809		37	40	CL-S		brown		No T/R/S		
77809		40	160	SW		brown		No T/R/S		
77809		160	180	SP		brown and black		No T/R/S		
77809		180	218	SP		brown		No T/R/S		
77809		218	225	CL-S		gray		No T/R/S		
77809		225	235	CL-S-G		gray and brown		No T/R/S		
77809		235	248	CL-S-G		brown		No T/R/S		
77809		248	258	SW-G				No T/R/S		
77809		258	320	SC-G		brown		No T/R/S		
77809		320	340	SP-G				No T/R/S		
77809		340	360	SPSC		brown and white		No T/R/S		
77809		360	375	SP		brown		No T/R/S		
77809		375	383	CL-S		gray and brown		No T/R/S		
77809		383	387	CL-S-G		brown		No T/R/S		
77809		387	391	CL-S		brown		No T/R/S		
77809		391	400	SC-G				No T/R/S		
77809		400	419	CL-S-G		brown		No T/R/S		
77809		419	430	CL-S-G		gray		No T/R/S		
77809		430	432	CL		blue		No T/R/S		
77809		432	435	SP-G		blue		No T/R/S		
77809		435	440	SHALE	Shale	blue		No T/R/S		
77809		440	442	SP-G		blue		No T/R/S		
77809		442	460	SHALE	Shale	blue		No T/R/S		
77808	77808	0	5	SP		brown		No T/R/S		
77808		5	7	SP		yellow		No T/R/S		
77808		7	130	SPSC		brown		No T/R/S		
77808		130	220	SPSC		brown		No T/R/S		
77808		220	250	CL-S		yellow		No T/R/S		
77808		250	270	SP	Hard Sand	white		No T/R/S		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
77808		270	278	SP		brown		No T/R/S		
77808		278	300	SW-G				No T/R/S		
77808		300	307	SP-G				No T/R/S		
77808		307	343	CL-S-G		brown		No T/R/S		
77808		343	368	SP-G				No T/R/S		
77808		368	382	CL-S		brown		No T/R/S		
77808		382	435	SP-G				No T/R/S		
77808		435	445	SHALE	Shale	blue		No T/R/S		
319035	319035	0	40	SP		brown		T12N/R34W-31	**T12N/R34W-31**	
319035		40	60	SP	brown sand, soft sandstone	brown		T12N/R34W-31		
319035		60	80	SP		brown		T12N/R34W-31		
319035		80	100	SP-GPGC		brown		T12N/R34W-31		
319035		100	120	SP-GPGC				T12N/R34W-31		
319035		120	160	CL-GPGC		brown		T12N/R34W-31		
319035		160	180	CL-GPGC				T12N/R34W-31		
319035		180	260	SP-G				T12N/R34W-31		
319035		260	280	SHALE	Shale - sticky	blue		T12N/R34W-31		
469912	469912	0	31	SP		brown		T12N/R35W-27	**T12N/R35W-27**	
469912		31	33	CL-S		brown		T12N/R35W-27		
469912		33	88	SP		brown		T12N/R35W-27		
469912		88	93	CL-S		brown		T12N/R35W-27		
469912		93	112	SP		brown		T12N/R35W-27		
469912		112	158	SP-G				T12N/R35W-27		
469912		158	161	CL		brown		T12N/R35W-27		
469912		161	200	SP-G				T12N/R35W-27		
469901	469901	0	138	SP		brown		T12N/R35W-28	**T12N/R35W-28**	
469901		138	147	CL		gray		T12N/R35W-28		
469901		147	257	SP		brown		T12N/R35W-28		
469901		257	262	CL		gray		T12N/R35W-28		
469901		262	278	SP-G				T12N/R35W-28		
469901		278	315	SP		brown		T12N/R35W-28		
469901		315	322	CL		brown		T12N/R35W-28		
469901		322	334	CL-G		brown		T12N/R35W-28		
469901		334	356	SP-G				T12N/R35W-28		
469901		356	359	CL		brown		T12N/R35W-28		
469901		359	395	SP-G				T12N/R35W-28		
469901		395	400	GPGC		blue		T12N/R35W-28		
E030078	E030078	0	1					T12N/R35W-28		
E030078		1	5	SP				T12N/R35W-28		
E030078		5	7	CL-S		brown		T12N/R35W-28		
E030078		7	100	SP				T12N/R35W-28		
E030078		100	135	CL-S-G		brown		T12N/R35W-28		
E030078		135	150	SP				T12N/R35W-28		
E030078		150	160	CL-S-G		gray		T12N/R35W-28		
E030078		160	180	GPGC				T12N/R35W-28		
E030078		180	210	CL-S		brown		T12N/R35W-28		
E030078		210	230	GP-S				T12N/R35W-28		
E030078		230	290	GC-S		gray		T12N/R35W-28		
E030078		290	300	CL		gray and brown		T12N/R35W-28		
1090816	1090816	0	180	SP				T12N/R35W-28		
1090816		180	260	SC-G		brown		T12N/R35W-28		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
1090816		260	280	CL-G				T12N/R35W-28		
1090816		280	420	CL-G				T12N/R35W-28		
782420	782420	0	86	SP		brown		T12N/R35W-29	**T12N/R35W-29**	
782420		86	140	SC-G				T12N/R35W-29		
782420		140	260	SP-GPGC				T12N/R35W-29		
782420		260	290	SW				T12N/R35W-29		
782420		290	300	CL		blue		T12N/R35W-29		
E024533	E024533	0	80	SP		brown		T12N/R35W-29		
E024533		80	90	CL-S		gray		T12N/R35W-29		
E024533		90	100	GPGC		gray and blue		T12N/R35W-29		
E024533		100	120	SPSC		brown		T12N/R35W-29		
E024533		120	130	GPGC				T12N/R35W-29		
E024533		130	135	SPSC		brown		T12N/R35W-29		
E024533		135	255	SP-G				T12N/R35W-29		
E024533		255	275	CL-S		blue		T12N/R35W-29		
E024533		275	285	SPSC		brown		T12N/R35W-29		
E024533		285	292	CL-S		blue		T12N/R35W-29		
E024533		292	305	SP-GPGC		blue		T12N/R35W-29		
E024533		305	310	SPSC		brown		T12N/R35W-29		
E024533		310	560	CL-S		blue		T12N/R35W-29		
727313	727313	0	65	SP		brown		T12N/R35W-31	**T12N/R35W-31**	
727313		65	110	SP		yellow tan		T12N/R35W-31		
727313		110	140	SP		tan		T12N/R35W-31		
727313		140	185	SP		tan and blue		T12N/R35W-31		
727313		185	205	GPGC		white		T12N/R35W-31		
727313		205	230	SP		tan		T12N/R35W-31		
727313		230	285	SP				T12N/R35W-31		
727313		285	345	SP				T12N/R35W-31		
727313		345	380	GPGC				T12N/R35W-31		
727299	727299	0	5	SP		white		T12N/R35W-32	**T12N/R35W-32**	
727299		5	80	SP				T12N/R35W-32		
727299		80	140	SP				T12N/R35W-32		
727299		140	170	GPGC		tan		T12N/R35W-32		
727299		170	195	GPGC		white		T12N/R35W-32		
727299		195	235	SP-GPGC		white		T12N/R35W-32		
727299		235	240	SP		tan		T12N/R35W-32		
221036	221036	0	10	SP				T12N/R35W-32		
221036		10	18	CL-S				T12N/R35W-32		
221036		18	27	SW				T12N/R35W-32		
221036		27	40	GPGC				T12N/R35W-32		
221036		40	43	CLML-S		blue		T12N/R35W-32		
221036		43	48	GPGC		brown		T12N/R35W-32		
221036		48	74	CL-S		blue and green		T12N/R35W-32		
221036		74	77	SP		blue		T12N/R35W-32		
221036		77	80	CL		green		T12N/R35W-32		
221036		80	93	CL-S-G		blue		T12N/R35W-32		
221036		93	103	CL		blue and green		T12N/R35W-32		
221036		103	125	GPGC				T12N/R35W-32		
221036		125	160	GC-S				T12N/R35W-32		
221036		160	181	CL		yellow		T12N/R35W-32		
221036		181	212	GP-S				T12N/R35W-32		
221036		212	220	CL		yellow		T12N/R35W-32		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
221036		220	275	GP-S		yellow and white		T12N/R35W-32		
221036		275	276	SX	Hard Lens Sandstone	gray		T12N/R35W-32		
221036		276	281	CL-S		blue		T12N/R35W-32		
221036		281	357	SX	Sandstone	gray		T12N/R35W-32		
221036		357	383	CL-S		yellow		T12N/R35W-32		
221036		383	397	SX	Sandstone	gray and white		T12N/R35W-32		
221036		397	403	SX	Broken Sandstone with Clay	white		T12N/R35W-32		
221036		403	408	SX	Hard Sandstone	gray		T12N/R35W-32		
221036		408	414	CL	Clay broken, Sandstone strips, hard Sandstone	white		T12N/R35W-32		
221036		414	432	SX	Hard Sandstone			T12N/R35W-32		
221036		432	480	SWSC		white and yellow	x	T12N/R35W-32		
221036		480	484	SX	Hard Sandstone			T12N/R35W-32		
221036		484	491	SX	Broken Sandstone and Clay	white		T12N/R35W-32		
221036		491	550	SWSC	Cemented Sand coarse fine with Clay	yellow and white		T12N/R35W-32		
221036		550	568	CL-S	Cemented Sand coarse and fine	yellow and white		T12N/R35W-32		
221036		568	570	SX	Hard Sandstone lens			T12N/R35W-32		
221036		570	595	CL-S		white and yellow		T12N/R35W-32		
221036		595	620	CL-S	Clay fine cemented Sand	white and yellow		T12N/R35W-32		
221036		620	628	SP	Coarse cemented Sand	yellow		T12N/R35W-32		
221036		628	639	SX	Broken Sandstone		x	T12N/R35W-32		
221036		639	650	CL-S		blue		T12N/R35W-32		
221036		650	750	CLML		blue	x	T12N/R35W-32		
153023	153023	0	60	SP				T12N/R35W-32		
153023		60	75	SW				T12N/R35W-32		
153023		75	100	SP				T12N/R35W-32		
153023		100	125	SPSC				T12N/R35W-32		
153023		125	175	SPSC		brown		T12N/R35W-32		
153023		175	200	SPSC		white		T12N/R35W-32		
153023		200	225	SP-G				T12N/R35W-32		
153023		225	250	SC-G		brown		T12N/R35W-32		
153023		250	315	CL-S-G		brown		T12N/R35W-32		
153023		315	330	SP-G				T12N/R35W-32		
153023		330	340	CL		brown		T12N/R35W-32		
153023		340	350	SP-G				T12N/R35W-32		
153023		350	365	CL		brown		T12N/R35W-32		
153023		365	406	SP-G				T12N/R35W-32		
153023		406	425	CL		blue		T12N/R35W-32		
763496	763496	0	100	SP-GPGC				T12N/R35W-32		
763496		100	160	SP				T12N/R35W-32		
763496		160	240	SP				T12N/R35W-32		
763496		240	260	SP				T12N/R35W-32		
763496		260	360	GP				T12N/R35W-32		
763496		360	420	CL-G				T12N/R35W-32		
1090224	1090224	0	269	SP				T12N/R35W-32		
1090224		269	310	CL-G				T12N/R35W-32		
1090224		310	380	GP				T12N/R35W-32		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
1090224		380	395	SHALE	Hard Shale	blue		T12N/R35W-32		
1097658	1097658	0	200	SP				T12N/R35W-32		
1097658		200	240	SP-G				T12N/R35W-32		
1097658		240	280	GPGC				T12N/R35W-32		
1097658		280	320	GPGC				T12N/R35W-32		
1097658		320	415	GP				T12N/R35W-32		
40564	40564	0	145	SP				T12N/R35W-32		
40564		145	250	SP				T12N/R35W-32		
40564		250	260	GP				T12N/R35W-32		
40564		260	270	CL				T12N/R35W-32		
40564		270	276	SP-G				T12N/R35W-32		
40564		276	280	GP				T12N/R35W-32		
40564		280	283	CL				T12N/R35W-32		
40564		283	290	GP				T12N/R35W-32		
40564		290	300	CL				T12N/R35W-32		
905311	905311	0	245	SP		brown		T12N/R35W-33	**T12N/R35W-33**	
905311		245	282	GP		brown		T12N/R35W-33		
905311		282	301	GPGC				T12N/R35W-33		
905311		301	338	GP		brown		T12N/R35W-33		
905311		338	430	CL-S		white		T12N/R35W-33		
1097642	1097642	0	140	SP				T12N/R35W-33		
1097642		140	240	CL-S				T12N/R35W-33		
1097642		240	260	GP				T12N/R35W-33		
1097642		260	285	SC-G				T12N/R35W-33		
1097642		285	310	CL		brown		T12N/R35W-33		
1097642		310	330	SC				T12N/R35W-33		
1097642		330	340	CL		brown		T12N/R35W-33		
1097642		340	350	CL		brown		T12N/R35W-33		
1097642		350	360	SC		brown		T12N/R35W-33		
1097642		360	380	SP				T12N/R35W-33		
1097642		380	400	CL		brown		T12N/R35W-33		
1097642		400	450	CL	Soft wet clay			T12N/R35W-33		
1097642		450	460	CL	Hard dry Clay			T12N/R35W-33		
782553	782553	0	162	SP		brown		T12N/R35W-33		
782553		162	181	SP-G		brown		T12N/R35W-33		
782553		181	193	CL		gray		T12N/R35W-33		
782553		193	212	SP-G				T12N/R35W-33		
782553		212	215	CL		gray		T12N/R35W-33		
782553		215	229	CL		brown		T12N/R35W-33		
782553		229	251	SP-G				T12N/R35W-33		
782553		251	273	CL		brown		T12N/R35W-33		
782553		273	295	SP-G				T12N/R35W-33		
782553		295	314	CL		brown		T12N/R35W-33		
782553		314	353	SP-G				T12N/R35W-33		
782553		353	361	CL		brown		T12N/R35W-33		
782553		361	392	SP		brown		T12N/R35W-33		
782553		392	400	CL		gray		T12N/R35W-33		
738191	738191	0	120	SP		tan		T12N/R35W-33		
738191		120	160	SP		brown		T12N/R35W-33		
738191		160	170	SPSC		brown		T12N/R35W-33		
738191		170	185	SPSC		white		T12N/R35W-33		
738191		185	210	SP		brown		T12N/R35W-33		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
738191		210	300	CL-GPGC		brown		T12N/R35W-33		
738191		300	315	GPGC		white and tan		T12N/R35W-33		
738191		315	340	GPGC		white and tan		T12N/R35W-33		
738191		340	365	CL-GPGC		white and tan		T12N/R35W-33		
738191		365	380	SX	Sandstone	white		T12N/R35W-33		
738191		380	415	SP		white		T12N/R35W-33		
738191		415	420	CL-S		green		T12N/R35W-33		
738227	738227	0	85	SP		brown		T12N/R35W-33		
738227		85	190	SP		tan		T12N/R35W-33		
738227		190	240	SP		rust		T12N/R35W-33		
738227		240	265	CL-S		gray		T12N/R35W-33		
738227		265	270	SP		tan and white		T12N/R35W-33		
738227		270	295	SP-GPGC		gray		T12N/R35W-33		
738227		295	300	GPGC		white		T12N/R35W-33		
738227		300	340	GPGC		brown		T12N/R35W-33		
738227		340	390	CH-S		brown		T12N/R35W-33		
738227		390	420	CL-S		white and gray		T12N/R35W-33		
738227		420	430	CH		brown		T12N/R35W-33		
738227		430	510	GPGC				T12N/R35W-33		
738227		510	520	CL-S		green	x	T12N/R35W-33		
906239	906239	0	120	SP		brown		T12N/R35W-33		
906239		120	180	SP-GPGC		brown		T12N/R35W-33		
906239		180	215	CH		brown		T12N/R35W-33		
906239		215	290	GPGC		gray and white		T12N/R35W-33		
906239		290	305	CL		blue		T12N/R35W-33		
906239		305	390	SP-GPGC		white		T12N/R35W-33		
906239		390	400	CL		blue		T12N/R35W-33		
906240	906240	0	125	SP		brown		T12N/R35W-33		
906240		125	165	SP-GPGC		brown		T12N/R35W-33		
906240		165	180	CH		blue		T12N/R35W-33		
906240		180	220	CL-GPGC		blue		T12N/R35W-33		
906240		220	280	SP-GPGC		white		T12N/R35W-33		
906240		280	310	CL		blue		T12N/R35W-33		
E053138	E053138	0	46	SP		red and brown		T12N/R35W-33		
E053138		46	240	SP		brown		T12N/R35W-33		
E053138		240	263	SP-GPGC				T12N/R35W-33		
E053138		263	270	CL-S		brown		T12N/R35W-33		
E053138		270	288	SP-G				T12N/R35W-33		
E053138		288	295	CL		brown		T12N/R35W-33		
E053138		295	305	SP-G				T12N/R35W-33		
E053138		305	320	CL-S		brown		T12N/R35W-33		
E053138		320	335	SP		brown		T12N/R35W-33		
E053138		335	366	CL-S		brown		T12N/R35W-33		
E053138		366	375	SP-G				T12N/R35W-33		
E053138		375	380	CL		brown		T12N/R35W-33		
E053138		380	387	CL-S		brown		T12N/R35W-33		
E053138		387	408	SP-G				T12N/R35W-33		
E053138		408	412	CL-S		brown		T12N/R35W-33		
E053138		412	415	SP-G				T12N/R35W-33		
E053138		415	432	CL-S		brown		T12N/R35W-33		
E053138		432	457	SP-G		brown		T12N/R35W-33		
E053138		457	460	CL-S		brown		T12N/R35W-33		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
E053138		460	483	SP-G			x	T12N/R35W-33		
E053138		483	486	CL		brown		T12N/R35W-33		
E053138		486	495	SP-G				T12N/R35W-33		
E053138		495	501	CL-S		brown		T12N/R35W-33		
E053138		501	510	SP-G				T12N/R35W-33		
E053138		510	600	SP-G		brown		T12N/R35W-33		
529407	529407	0	180	SP				T12N/R35W-33		
529407		180	220	CL		brown		T12N/R35W-33		
529407		220	230	CL-S		gray		T12N/R35W-33		
529407		230	238	CL-S		gray		T12N/R35W-33		
529407		238	250	CL		brown		T12N/R35W-33		
529407		250	260	CL		brown		T12N/R35W-33		
529407		260	270	CL		brown		T12N/R35W-33		
529407		270	275	GPGC				T12N/R35W-33		
529407		275	290	CL-S		white		T12N/R35W-33		
529407		290	300	GPGC				T12N/R35W-33		
529407		300	320	GPGC		white		T12N/R35W-33		
529407		320	345	GPGC		white		T12N/R35W-33		
529407		345	350	CL-GPGC		white		T12N/R35W-33		
536474	536474	0	225	SP		brown		T12N/R35W-33		
536474		225	290	SP		tan		T12N/R35W-33		
536474		290	345	GPGC		brown		T12N/R35W-33		
536474		345	360	CL		brown		T12N/R35W-33		
536474		360	380	GPGC		brown		T12N/R35W-33		
536474		380	400	CL		brown		T12N/R35W-33		
536474		400	425	SHALE	Shale, Sand	white		T12N/R35W-33		
536474		425	440	CL		gray		T12N/R35W-33		
536474		440	460	SW		white		T12N/R35W-33		
536474		460	480	GPGC		white		T12N/R35W-33		
536474		480	550	SP	Sand, Shale	white		T12N/R35W-33		
536474		550	560	CL-S		green	x	T12N/R35W-33		
710472	710472	0	65	SP		tan		T12N/R35W-33		
710472		65	75	GPGC				T12N/R35W-33		
710472		75	110	SP		tan		T12N/R35W-33		
710472		110	120	GPGC				T12N/R35W-33		
710472		120	145	CL-S		white		T12N/R35W-33		
710472		145	155	SP		blue		T12N/R35W-33		
710472		155	160	SP		brown		T12N/R35W-33		
710472		160	185	GPGC				T12N/R35W-33		
710472		185	200	GPGC				T12N/R35W-33		
710472		200	235	SHALE	Shale and Sand	brown		T12N/R35W-33		
710472		235	240	GPGC				T12N/R35W-33		
710472		240	260	SP		blue		T12N/R35W-33		
710472		260	270	CL		brown		T12N/R35W-33		
710472		270	285	SP		white		T12N/R35W-33		
710472		285	370	SP-G				T12N/R35W-33		
710472		370	380	CL		blue		T12N/R35W-33		
736687	736687	0	130	SP		brown		T12N/R35W-33		
736687		130	170	CL-GPGC		brown		T12N/R35W-33		
736687		170	200	CH				T12N/R35W-33		
736687		200	235	GPGC		brown and tan		T12N/R35W-33		
736687		235	260	CL-GPGC		white		T12N/R35W-33		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
736687		260	280	CL-S		white		T12N/R35W-33		
736687		280	305	CL-S		white		T12N/R35W-33		
736687		305	320	CL-S		white		T12N/R35W-33		
736687		320	370	SP-G		white		T12N/R35W-33		
736687		370	380	CL		blue		T12N/R35W-33		
782415	782415	0	230	SP		brown		T12N/R35W-33		
782415		230	245	SP-GPGC				T12N/R35W-33		
782415		245	255	SP		brown		T12N/R35W-33		
782415		255	260	CL-S-G		white		T12N/R35W-33		
782415		260	312	SP-GPGC				T12N/R35W-33		
782415		312	320	SP		brown		T12N/R35W-33		
782415		320	332	CL-S-G		white		T12N/R35W-33		
782415		332	337	SP		brown		T12N/R35W-33		
782415		337	375	SP-G		brown		T12N/R35W-33		
782415		375	400	SPSC		brown and white		T12N/R35W-33		
782415		400	433	SW				T12N/R35W-33		
782415		433	440	CL		blue		T12N/R35W-33		
536571	536571	0	180	SP		brown		T12N/R35W-33		
536571		180	300	CL-GPGC		brown		T12N/R35W-33		
536571		300	420	SP-GPGC		white		T12N/R35W-33		
529390	529390	0	100	SP				T12N/R35W-33		
529390		100	110	SP		brown		T12N/R35W-33		
529390		110	140	SP				T12N/R35W-33		
529390		140	210	SP		white and rust		T12N/R35W-33		
529390		210	220	SHALE	Shale	black		T12N/R35W-33		
529390		220	235	CL		brown		T12N/R35W-33		
529390		235	240	SHALE	Shale			T12N/R35W-33		
529390		240	250	CL	Clay, little Shale	white		T12N/R35W-33		
529390		250	270	SHALE	Shale, streak of Clay	white		T12N/R35W-33		
529390		270	290	CL		white		T12N/R35W-33		
529390		290	320	SHALE	Shale, little Sand	white		T12N/R35W-33		
529390		320	340	SP		white		T12N/R35W-33		
529390		340	360	SP				T12N/R35W-33		
529390		360	380	SP				T12N/R35W-33		
529390		380	425	SP				T12N/R35W-33		
529390		425	430	CL		green		T12N/R35W-33		
529390		430	440	SP				T12N/R35W-33		
710461	710461	0	85	SP		brown		T12N/R35W-33		
710461		85	125	SP		white		T12N/R35W-33		
710461		125	140	GPGC				T12N/R35W-33		
710461		140	185	GPGC		brown		T12N/R35W-33		
710461		185	195	SHALE	Shale	white		T12N/R35W-33		
710461		195	255	GPGC		gray		T12N/R35W-33		
710461		255	285	CL-S		white		T12N/R35W-33		
710461		285	325	GPGC				T12N/R35W-33		
1098081	1098081	0	70	SP		brown		T12N/R35W-34	**T12N/R35W-34**	
1098081		70	120	SP		brown		T12N/R35W-34		
1098081		120	165	SP		brown		T12N/R35W-34		
1098081		165	190	GP-S				T12N/R35W-34		
1098081		190	232	GP				T12N/R35W-34		
1098081		232	240	CL		brown		T12N/R35W-34		
1098081		240	305	GP-S				T12N/R35W-34		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
1098081		305	312	CL-S		white		T12N/R35W-34		
1098081		312	327	SP-G				T12N/R35W-34		
1098081		327	345	CL-G				T12N/R35W-34		
1098081		345	354	CL-S				T12N/R35W-34		
1098081		354	409	SPSC				T12N/R35W-34		
1098081		409	415	CL		blue		T12N/R35W-34		
1098081		415	416	SHALE	Monterey Shale			T12N/R35W-34		
E036604	E036604	0	120	SP		brown		T12N/R35W-34		
E036604		120	152	SC		brown		T12N/R35W-34		
E036604		152	158	SP-G				T12N/R35W-34		
E036604		158	164	SP		brown		T12N/R35W-34		
E036604		164	174	SP-G				T12N/R35W-34		
E036604		174	180	CL-S-G		brown		T12N/R35W-34		
E036604		180	254	GPGC				T12N/R35W-34		
E036604		254	270	CL		brown		T12N/R35W-34		
E036604		270	275	SP-G				T12N/R35W-34		
E036604		275	300	CL-G		brown		T12N/R35W-34		
580718	580718	0	3	SP	Sandy Top Soil			T12N/R35W-34		
580718		3	212	SP		brown		T12N/R35W-34		
580718		212	216	GPGC				T12N/R35W-34		
580718		216	222	CL-GPGC		brown		T12N/R35W-34		
580718		222	230	SP-GPGC		brown		T12N/R35W-34		
580718		230	234	CL		brown		T12N/R35W-34		
580718		234	252	GPGC				T12N/R35W-34		
580718		252	263	CL		brown		T12N/R35W-34		
580718		263	273	GPGC		gray		T12N/R35W-34		
580718		273	288	CL		brown		T12N/R35W-34		
580718		288	296	GPGC		gray		T12N/R35W-34		
580718		296	300	CL-G		brown		T12N/R35W-34		
580718		300	315	GP-S		gray		T12N/R35W-34		
580718		315	320	SHALE	Shale	gray		T12N/R35W-34		
580733	580733	0	42	SP		brown		T12N/R35W-34		
580733		42	47	CL-S		brown		T12N/R35W-34		
580733		47	75	CL		brown		T12N/R35W-34		
580733		75	98	SP-G				T12N/R35W-34		
580733		98	101	CL		brown		T12N/R35W-34		
580733		101	128	SP		brown		T12N/R35W-34		
580733		128	132	CL		gray		T12N/R35W-34		
580733		132	139	SP-G				T12N/R35W-34		
580733		139	158	CL		brown		T12N/R35W-34		
580733		158	175	SP-G				T12N/R35W-34		
580733		175	185	CL		brown		T12N/R35W-34		
580733		185	194	SP-G				T12N/R35W-34		
580733		194	206	CL		brown		T12N/R35W-34		
580733		206	231	SP-G				T12N/R35W-34		
580733		231	240	SHALE	Shale	blue		T12N/R35W-34		
782446	782446	0	3		Top Soil			T12N/R35W-36	**T12N/R35W-36**	
782446		3	95	CL-GPGC		brown		T12N/R35W-36		
782446		95	100	CL		white		T12N/R35W-36		
782446		100	185	SHALE	Shale	brown		T12N/R35W-36		
782446		185	234	SHALE	Shale (Sandstone)	gray		T12N/R35W-36		
782446		234	255	SHALE	Shale	blue		T12N/R35W-36		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
782446		255	370	SHALE	Shale (Sandstone)	gray		T12N/R35W-36		
782446		370	390	CL		blue		T12N/R35W-36		
107004	107004	0	2		Top Soil - Adobe			T12N/R35W-36		
107004		2	94	SX	Sandstone and Shale			T12N/R35W-36		
107004		94	111	SX	Sandstone and Conglomerate			T12N/R35W-36		
107004		111	148	SX	Sandstone and Shale			T12N/R35W-36		
107004		148	203	CL-S		gray		T12N/R35W-36		
107004		203	389	SHALE	Shale and Conglomerate	black		T12N/R35W-36		
107004		389	410	SX	Sandstone	gray		T12N/R35W-36		
107004		410	454	SX	Sandstone with Shale lenses	gray		T12N/R35W-36		
107004		454	502	SHALE	Sandstone Shale and Clay			T12N/R35W-36		
1097982	1097982	0	40	SHALE	Chunky Shale	yellow		T12N/R35W-36		
1097982		40	62	SX	Sandstone (soft)	brown		T12N/R35W-36		
1097982		62	80	CL		brown		T12N/R35W-36		
1097982		80	220	SX	Sandstone	brown		T12N/R35W-36		
1097982		220	245	SHALE	Sandy Shale	gray and white		T12N/R35W-36		
1097982		245	260	GP-S				T12N/R35W-36		
1097982		260	265	CL-S		gray		T12N/R35W-36		
1097982		265	340	SX	Sandstone	blue		T12N/R35W-36		
1097982		340	360	SP-G				T12N/R35W-36		
1097982		360	525	SX	Sandstone Frack Outs	blue		T12N/R35W-36		
1097982		525	545	SHALE	Soft Shale	gray		T12N/R35W-36		
90019	90019	0	44	SP				T12N/R36W-36	**T12N/R36W-36**	**PSBO-1**
90019		44	78	GP-S			x	T12N/R36W-36		
90019		78	105	CLML				T12N/R36W-36		
90019		105	125	SCSM			x	T12N/R36W-36		
90019		125	140	CLML				T12N/R36W-36		
90019		140	240	SC-G		brown		T12N/R36W-36		
90019		240	260	SC-G		brown		T12N/R36W-36		
90019		260	310	CLML		black		T12N/R36W-36		
90019		310	370	SC-G		white and black		T12N/R36W-36		
90019		370	380	SP-G		white		T12N/R36W-36		
90019		380	400	CL-G		tan and white		T12N/R36W-36		
90019		400	460	SP-G		white		T12N/R36W-36		
90019		460	490	SP		green		T12N/R36W-36		
90019		490	550	SC-G		blue, gray, olive, brown		T12N/R36W-36		
90019		550	630	SP-G		blue		T12N/R36W-36		
90019		630	755	CLML		olive		T12N/R36W-36		
90019		755	830	CLML		olive	x	T12N/R36W-36		
90019		830	847	CL-S		olive	x	T12N/R36W-36		
90020	90020	0	98	SP		red and brown		T12N/R36W-36		**PSBO-2**
90020		98	102	CLML		gray		T12N/R36W-36		
90020		102	168	SWSC		red and brown		T12N/R36W-36		
90020		168	170	SC-G		buff and red		T12N/R36W-36		
90020		170	190	CL-G		buff, brown, blue, green		T12N/R36W-36		
90020		190	225	SW		red, brown, white		T12N/R36W-36		
90020		225	275	SPSC		white and yellow		T12N/R36W-36		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
90020		275	310	SC-G		yellow		T12N/R36W-36		
90020		310	330	SC-G		olive and white		T12N/R36W-36		
90020		330	375	CL-S		olive and white		T12N/R36W-36		
90020		375	395	CL-S-G		yellow and white		T12N/R36W-36		
90020		395	455	GP-S		white and gray		T12N/R36W-36		
90020		455	470	GP-S		white and gray		T12N/R36W-36		
90020		470	480	SPSC		gray		T12N/R36W-36		
90020		480	530	CL-S-G		olive and black	x	T12N/R36W-36		
90020		530	600	CH		olive	x	T12N/R36W-36		
90020		600	620	GC		blue and green		T12N/R36W-36		
90020		620	660	SP-G		blue	x	T12N/R36W-36		
90020		660	670	SP		blue	x	T12N/R36W-36		
90020		670	700	CL		olive	x	T12N/R36W-36		
90020		700	720	CL-S		olive and green		T12N/R36W-36		
90020		720	750	CL-S-G		olive, blue, green		T12N/R36W-36		
90020		750	760	GP-S		blue	x	T12N/R36W-36		
90020		760	1000	CLML		olive		T12N/R36W-36		
322939	322939	0	3		Top Soil			T32S/R12E-13	**T32S/R12E-13**	
322939		3	10	CL-S		brown		T32S/R12E-13		
322939		10	30	SP-G				T32S/R12E-13		
322939		30	40	SP		yellow		T32S/R12E-13		
322939		40	60	SP-G				T32S/R12E-13		
322939		60	97	SP		black		T32S/R12E-13		
322939		97	100	SC		black		T32S/R12E-13		
322939		100	302	SP		black		T32S/R12E-13		
322939		302	400	CL-S				T32S/R12E-13		
90021	90021	0	2	SP				T32S/R12E-24	**T32S/R12E-24**	**POO-1**
90021		2	11	CH		gray		T32S/R12E-24		
90021		11	35	SP		gray	x	T32S/R12E-24		
90021		35	47	CL-S-G		blue and brown		T32S/R12E-24		
90021		47	65	SC-G			x	T32S/R12E-24		
90021		65	96	SC				T32S/R12E-24		
90021		96	190	SC-G			x	T32S/R12E-24		
90021		190	192	CL-S		blue		T32S/R12E-24		
90021		192	208	SPSC		tan	x	T32S/R12E-24		
90021		208	210	CL		blue		T32S/R12E-24		
90021		210	311	SPSC		blue and tan		T32S/R12E-24		
90021		311	420	SW			x	T32S/R12E-24		
90021		420	432	GC-S		gray	x	T32S/R12E-24		
90021		432	434	SP-G		green	x	T32S/R12E-24		
90021		434	474	SC				T32S/R12E-24		
90021		474	482	CL-S				T32S/R12E-24		
90021		482	577	SC-G		blue and gray		T32S/R12E-24		
90021		577	600	CL-S-G		gray		T32S/R12E-24		
90021		600	623	CL-S		green		T32S/R12E-24		
90021		623	669	SWSC				T32S/R12E-24		
90021		669	690	SC-G		gray	x	T32S/R12E-24		
90021		690	858	SW				T32S/R12E-24		
90021		858	921	CL-S		gray		T32S/R12E-24		
90022	90022	0	4	SP				T32S/R12E-24		**POO-2**
90022		4	10	CLML-S		brown		T32S/R12E-24		
90022		10	12	SP		gray		T32S/R12E-24		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
90022		12	17	CLML-S		tan		T32S/R12E-24		
90022		17	18					T32S/R12E-24		
90022		18	29	CL-S				T32S/R12E-24		
90022		29	34	SPSC		green		T32S/R12E-24		
90022		34	42	SP-G		brown		T32S/R12E-24		
90022		42	61	GC-S				T32S/R12E-24		
90022		61	74	SC-G				T32S/R12E-24		
90022		74	91	SC-G				T32S/R12E-24		
90022		91	105	SC				T32S/R12E-24		
90022		105	133	CL-S		blue	x	T32S/R12E-24		
90022		133	145	SWSM		green and blue		T32S/R12E-24		
90022		145	177	SW		green		T32S/R12E-24		
90022		177	201	SP		green	x	T32S/R12E-24		
90022		201	295	SM				T32S/R12E-24		
90022		295	315	SX				T32S/R12E-24		
90022		315	334	SP		green		T32S/R12E-24		
90022		334	356	SP		green	x	T32S/R12E-24		
90022		356	401	SPSC		green		T32S/R12E-24		
90022		401	418	SC				T32S/R12E-24		
90022		418	444	SW		green		T32S/R12E-24		
90022		444	466	SC		green and brown		T32S/R12E-24		
90022		466	556	SC		green and buff		T32S/R12E-24		
90022		556	649	SPSC		green and buff		T32S/R12E-24		
90022		649	662	SP		green	x	T32S/R12E-24		
90022		662	749	SC		green, black, blue		T32S/R12E-24		
90022		749	829	CLML-S		green and black	x	T32S/R12E-24		
90022		829	839	SPSC		green and black		T32S/R12E-24		
90022		839	848	CL				T32S/R12E-24		
1085551	1085551	0	30		Missing			T32S/R12E-36	**T32S/R12E-36**	
1085551		30	50	CL-S-G		yellow and brown		T32S/R12E-36		
1085551		50	60		Missing			T32S/R12E-36		
1085551		60	80	CX	Claystone	gray		T32S/R12E-36		
1085551		80	90	CX	Claystone and Shale	gray		T32S/R12E-36		
1085551		90	100	MX	Siltstone	green and gray		T32S/R12E-36		
1085551		100	130	CX	Claystone	green and gray		T32S/R12E-36		
1085551		130	160	CX	Silty Claystone	green and gray		T32S/R12E-36		
1085551		160	170	CX	Tuff and Silty Claystone	white and gray		T32S/R12E-36		
1085551		170	190	TUFF	Tuff	blue and gray		T32S/R12E-36		
1085551		190	210	TUFF	Tuff	blue, gray, white		T32S/R12E-36		
1085551		210	240	SHALE	Shale and Claystone	gray		T32S/R12E-36		
1085551		240	280	TUFF	Tuff	gray		T32S/R12E-36		
1085551		280	290	CX	Silty Claystone	gray		T32S/R12E-36		
1085551		290	300	SHALE	Shale	gray		T32S/R12E-36		
173313	173313	0	2					T32S/R13E-17	**T32S/R13E-17**	
173313		2	12	SP				T32S/R13E-17		
173313		12	21	CL		black		T32S/R13E-17		
173313		21	24	SP				T32S/R13E-17		
173313		24	47	CL-S				T32S/R13E-17		
173313		47	58	CL-S		green		T32S/R13E-17		
173313		58	77	SW				T32S/R13E-17		
173313		77	99	CL-S		green		T32S/R13E-17		
173313		99	107	SP				T32S/R13E-17		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
173313		107	136	CL-S		green		T32S/R13E-17		
173313		136	152	SW				T32S/R13E-17		
173313		152	188	CL-S		green		T32S/R13E-17		
173313		188	212	SW				T32S/R13E-17		
173313		212	218	CL-S		green		T32S/R13E-17		
173313		218	227	SW				T32S/R13E-17		
173313		227	234	CL-S		green		T32S/R13E-17		
173313		234	310	SP				T32S/R13E-17		
165110	165110	0	18	CL	Top Soil			T32S/R13E-19	**T32S/R13E-19**	
165110		18	30	SP				T32S/R13E-19		
165110		30	47	CL-S		brown		T32S/R13E-19		
165110		47	65	SP-G				T32S/R13E-19		
165110		65	73	CL-S-G		brown		T32S/R13E-19		
165110		73	75	CL		brown		T32S/R13E-19		
165110		75	77	CL-S-G		brown		T32S/R13E-19		
165110		77	102	SP-G				T32S/R13E-19		
165110		102	106	CL-S		gray		T32S/R13E-19		
165110		106	121	CL-G		gray		T32S/R13E-19		
165110		121	124	SP				T32S/R13E-19		
165110		124	139	SP-G				T32S/R13E-19		
165110		139	157	CL		brown		T32S/R13E-19		
165110		157	165	CL-G				T32S/R13E-19		
351556	351556	0	30	SPSC				T32S/R13E-19		
351556		30	60	GP				T32S/R13E-19		
351556		60	74	SP-G				T32S/R13E-19		
351556		74	110	CLML		gray		T32S/R13E-19		
351556		110	130	CLML		gray	x	T32S/R13E-19		
351556		130	170	SC-G		tan		T32S/R13E-19		
351556		170	180	CLML		gray	x	T32S/R13E-19		
351556		180	200	CL		gray		T32S/R13E-19		
40-1823	40-1823	0	20	SP				T32S/R13E-20	**T32S/R13E-20**	
40-1823		20	23	CL		yellow		T32S/R13E-20		
40-1823		23	30	SP-G				T32S/R13E-20		
40-1823		30	48	CL-G	Hard dry Clay and Rock	yellow		T32S/R13E-20		
40-1823		48	61	GP				T32S/R13E-20		
40-1823		61	80	CL-G	Clay and Rock			T32S/R13E-20		
40-1823		80	85	GP-S				T32S/R13E-20		
40-1823		85	96	CL		blue		T32S/R13E-20		
40-1823		96	100	GP				T32S/R13E-20		
40-1823		100	105	CL		blue		T32S/R13E-20		
40-1823		105	113	GP				T32S/R13E-20		
40-1823		113	115	CL		blue		T32S/R13E-20		
5856	5856	0	6	SP				T32S/R13E-20		
5856		6	35	SP		yellow		T32S/R13E-20		
5856		35	40	SP				T32S/R13E-20		
5856		40	55	CL-S		yellow		T32S/R13E-20		
5856		55	65	CL		blue		T32S/R13E-20		
5856		65	75	CL		brown		T32S/R13E-20		
5856		75	80	SP				T32S/R13E-20		
5856		80	90	CL-G		yellow		T32S/R13E-20		
5856		90	100	CL-S		blue		T32S/R13E-20		
5856		100	106	SP				T32S/R13E-20		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
5856		106	121	CL		blue		T32S/R13E-20		
5856		121	132	GP-S				T32S/R13E-20		
39392	39392	0	2	ML				T32S/R13E-20		
39392		2	9	SP				T32S/R13E-20		
39392		9	23	CL-G		brown		T32S/R13E-20		
39392		23	46	CL-S		brown		T32S/R13E-20		
39392		46	51	SP	Wood and Sand			T32S/R13E-20		
39392		51	58	CL-S		brown		T32S/R13E-20		
39392		58	161	CL-S		brown		T32S/R13E-20		
39392		161	162	CL	Hard streaks of Clay			T32S/R13E-20		
39392		162	300	CL-S	Clay and fine Sand with hard streaks	brown		T32S/R13E-20		
39394	39394	0	10	SP		brown		T32S/R13E-20		
39394		10	80	SPSC		brown and red		T32S/R13E-20		
39394		80	87	SPSC		brown		T32S/R13E-20		
39394		87	95	CL		blue		T32S/R13E-20		
39394		95	99	CL		red		T32S/R13E-20		
39394		99	103	CL		blue		T32S/R13E-20		
39394		103	112	SW				T32S/R13E-20		
39394		112	140	GC-S				T32S/R13E-20		
39394		140	160	SP		brown		T32S/R13E-20		
39394		160	178	SP-G		brown		T32S/R13E-20		
39394		178	185	SPSC		gray		T32S/R13E-20		
39394		185	193	CL		yellow		T32S/R13E-20		
39394		193	204	SP		black		T32S/R13E-20		
39394		204	212	SPSC		black		T32S/R13E-20		
39394		212	404	CL-S		gray and black		T32S/R13E-20		
536469	536469	0	6	CL				T32S/R13E-26	**T32S/R13E-26**	
536469		6	30	RX	Chalk Rock (broken)	orange		T32S/R13E-26		
536469		30	50	RX	Chalk Rock (broken)	gray		T32S/R13E-26		
536469		50	60	RX	Rock	blue and gray		T32S/R13E-26		
536469		60	95	RX	Chalk Rock (broken)	gray		T32S/R13E-26		
536469		95	115	RX	Chalk Rock (broken)	orange		T32S/R13E-26		
536469		115	170	RX	Chalk Rock (broken)	gray		T32S/R13E-26		
536469		170	180	SHALE	Shale - broken	black		T32S/R13E-26		
536469		180	240	SHALE	Shale - firm	tan		T32S/R13E-26		
536469		240	260	SHALE	Shale - hard, some broken zones	black		T32S/R13E-26		
536469		260	295	SX	Sandstone, little Clay	blue and gray		T32S/R13E-26		
536469		295	310	SHALE	Hard Shale	black		T32S/R13E-26		
536469		310	320	SHALE	Shale - broken	black		T32S/R13E-26		
536469		320	345	SX	Sandstone, little Clay	blue and gray		T32S/R13E-26		
792457	792457	0	5	CL-G	Top Soil			T32S/R13E-27	**T32S/R13E-27**	
792457		5	36	CL-S-G		brown		T32S/R13E-27		
792457		36	49	GP-S				T32S/R13E-27		
792457		49	64	GPGC				T32S/R13E-27		
792457		64	109	CL-S-G		blue		T32S/R13E-27		
792457		109	196	CL-G		blue		T32S/R13E-27		
792457		196	251	CL-S-G		gray and black		T32S/R13E-27		
792458	792458	0	5	CL-G	Top Soil			T32S/R13E-27		
792458		5	36	CL-S-G		brown		T32S/R13E-27		
792458		36	49	GP-S				T32S/R13E-27		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
792458		49	64	GPGC				T32S/R13E-27		
792458		64	109	CL-S-G				T32S/R13E-27		
792458		109	196	CL-G		blue		T32S/R13E-27		
792458		196	251	CL-S-G		gray and black		T32S/R13E-27		
339664	339664	0	115	SX	Sandstone	white		T32S/R13E-27		
339664		115	130	SX	Sillty Sandstone	white		T32S/R13E-27		
339664		130	400	SX	Sillty Sandstone	gray		T32S/R13E-27		
25984	25984	0	16	CL	Adobe			T32S/R13E-28	**T32S/R13E-28**	
25984		16	20	CL-G				T32S/R13E-28		
25984		20	34	CL		brown		T32S/R13E-28		
25984		34	38	CL-G		black		T32S/R13E-28		
25984		38	56	CL		black		T32S/R13E-28		
25984		56	60	GC		gray		T32S/R13E-28		
25984		60	65	CL-G		gray		T32S/R13E-28		
25984		65	68	CL		gray		T32S/R13E-28		
25984		68	71	CL		brown		T32S/R13E-28		
25984		71	80	SP-G				T32S/R13E-28		
25984		80	90	GP-S				T32S/R13E-28		
25984		90	94	CL		blue		T32S/R13E-28		
25984		94	105	SHALE	Hard Shale	blue		T32S/R13E-28		
5774	5774	0	26	SP				T32S/R13E-28		
5774		26	29	CL				T32S/R13E-28		
5774		29	32	CL-G	Clay and Gravel Conglomerate			T32S/R13E-28		
5774		32	55	CL				T32S/R13E-28		
5774		55	90	GC	Gravel and Clay Conglomerate			T32S/R13E-28		
5774		90	133	GP				T32S/R13E-28		
5931	5931	0	4	SP	Sandy Soil			T32S/R13E-28		
5931		4	16	SP		yellow		T32S/R13E-28		
5931		16	40	SC-G				T32S/R13E-28		
5931		40	90	GC				T32S/R13E-28		
5931		90	100	GP-S				T32S/R13E-28		
5931		100	105	CL	Soft Clay			T32S/R13E-28		
5931		105	120	GP-S				T32S/R13E-28		
5775	5775	0	19	SP		brown		T32S/R13E-28		
5775		19	21	CL		yellow		T32S/R13E-28		
5775		21	23	GP				T32S/R13E-28		
5775		23	34	CL	Soft Clay	yellow		T32S/R13E-28		
5775		34	41	CL-G				T32S/R13E-28		
5775		41	46	GPGC				T32S/R13E-28		
5775		46	140	CL-G		yellow		T32S/R13E-28		
5775		140	155	CL-G	Soft Clay with Gravel breaks			T32S/R13E-28		
5775		155	170	GP				T32S/R13E-28		
5775		170	190	CL-G	Hard Clay and Gravel Conglomerate			T32S/R13E-28		
5775		190	252	SX	Hard Sandstone	gray		T32S/R13E-28		
54182	54182	0	4	SP		brown		T32S/R13E-28		
54182		4	20	SP		yellow		T32S/R13E-28		
54182		20	40	SP-G				T32S/R13E-28		
54182		40	50	CL		blue		T32S/R13E-28		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
54182		50	75	CL-S		brown		T32S/R13E-28		
54182		75	135	SP-G				T32S/R13E-28		
54182		135	147	GP				T32S/R13E-28		
54182		147	150	CL-S		white		T32S/R13E-28		
E1900	E1900	0	3	CL	Top Soil			T32S/R13E-28		
E1900		3	22	CL-S		brown		T32S/R13E-28		
E1900		22	28	CLML		black		T32S/R13E-28		
E1900		28	35	SP-G				T32S/R13E-28		
E1900		35	37	CL		brown		T32S/R13E-28		
E1900		37	48	GPGC				T32S/R13E-28		
E1900		48	54	CLML		black		T32S/R13E-28		
E1900		54	57	SP-G				T32S/R13E-28		
E1900		57	60	CLML		gray		T32S/R13E-28		
E1900		60	70	SP		gray		T32S/R13E-28		
E1900		70	74	CLML		gray		T32S/R13E-28		
E1900		74	85	SP-G				T32S/R13E-28		
E1900		85	93	CL		brown		T32S/R13E-28		
E1900		93	100	SHALE		gray		T32S/R13E-28		
529383	529383	0	25					T32S/R13E-28		
529383		25	35	GP	Gravel, broken Shale	brown		T32S/R13E-28		
529383		35	40	CL				T32S/R13E-28		
529383		40	55	GC	Gravel and soft Clay			T32S/R13E-28		
529383		55	65	CL	Soft Clay			T32S/R13E-28		
529383		65	100	GP-S				T32S/R13E-28		
529383		100	120	GP		white and blue		T32S/R13E-28		
710468	710468	0	6	CL	Adobe Clay	black		T32S/R13E-28		
710468		6	16	CL-S-G	Sandy Clay - small Shale	tan		T32S/R13E-28		
710468		16	17	CL		black		T32S/R13E-28		
710468		17	25	CL-S-G	Sandy Clay - small Shale	tan		T32S/R13E-28		
710468		25	28	CL		black		T32S/R13E-28		
710468		28	33	CL-S-G	Sandy Clay - small Shale	tan		T32S/R13E-28		
710468		33	36	CL		black		T32S/R13E-28		
710468		36	41	CL-S-G	Sandy Clay - Shale	tan		T32S/R13E-28		
710468		41	55	SHALE	Broken Shale - soft			T32S/R13E-28		
710468		55	58	CL		tan		T32S/R13E-28		
710468		58	88	GW				T32S/R13E-28		
710468		88	100	SX	Sandstone and Clay	blue		T32S/R13E-28		
13474	13474	0	6	CL	Top Soil			T32S/R13E-28		
13474		6	7	GP				T32S/R13E-28		
13474		7	28	CL				T32S/R13E-28		
13474		28	29	SP				T32S/R13E-28		
13474		29	35	CL				T32S/R13E-28		
13474		35	36	SP-G				T32S/R13E-28		
13474		36	42	CL				T32S/R13E-28		
13474		42	104	GP				T32S/R13E-28		
13474		104	120	RX	Serpentine			T32S/R13E-28		
25851	25851	0	25	SP				T32S/R13E-28		
25851		25	76	CL-G				T32S/R13E-28		
25851		76	97	CL		brown		T32S/R13E-28		
25851		97	106	GP				T32S/R13E-28		
25851		106	110	CL				T32S/R13E-28		
25851		110	117	CL				T32S/R13E-28		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
25851		117	125	GP				T32S/R13E-28		
25851		125	141	CL-S-G				T32S/R13E-28		
25851		141	150	GP				T32S/R13E-28		
90011	90011	0	33	SP				T32S/R13E-29	**T32S/R13E-29**	
90011		33	43	SC		brown		T32S/R13E-29		
90011		43	52	CL-G				T32S/R13E-29		
90011		52	60	GP				T32S/R13E-29		
90011		60	68	SC-G				T32S/R13E-29		
90011		68	73	CL				T32S/R13E-29		
90011		73	85	CL-S-G				T32S/R13E-29		
90011		85	98	CL		blue		T32S/R13E-29		
90011		98	106	CL-G				T32S/R13E-29		
90011		106	115	GP				T32S/R13E-29		
90011		115	156	CL		gray		T32S/R13E-29		
90011		156	174	GP				T32S/R13E-29		
90011		174	180	CL-G		gray		T32S/R13E-29		
17801	17801	0	30	SP				T32S/R13E-29		
17801		30	40	CL-S				T32S/R13E-29		
17801		40	55	SP				T32S/R13E-29		
17801		55	90	GP				T32S/R13E-29		
17801		90	100	GC				T32S/R13E-29		
17801		100	139	SHALE	Shale	green		T32S/R13E-29		
17801		139	185	GP				T32S/R13E-29		
17801		185	190	CL-G				T32S/R13E-29		
39474	39474	0	4	ML-S				T32S/R13E-29		
39474		4	18	SP		brown		T32S/R13E-29		
39474		18	29	SC-G				T32S/R13E-29		
39474		29	45	CL		brown		T32S/R13E-29		
39474		45	80	CL-G		brown		T32S/R13E-29		
39474		80	102	GP-S				T32S/R13E-29		
39474		102	111	CL		gray		T32S/R13E-29		
39474		111	120	GP-S				T32S/R13E-29		
39474		120	133	CL		gray		T32S/R13E-29		
39474		133	145	SP-G				T32S/R13E-29		
39474		145	152	GP				T32S/R13E-29		
39474		152	157	CL		brown		T32S/R13E-29		
39474		157	169	GP-S				T32S/R13E-29		
39474		169	177	SP		white		T32S/R13E-29		
25859	25859	0	55	SP				T32S/R13E-29		
25859		55	70	CL				T32S/R13E-29		
25859		70	85	CL		brown		T32S/R13E-29		
25859		85	88	SP				T32S/R13E-29		
25859		88	117	CL		gray		T32S/R13E-29		
25859		117	125	GP				T32S/R13E-29		
25859		125	131	CL		white		T32S/R13E-29		
25859		131	136	GP				T32S/R13E-29		
25859		136	148	CL				T32S/R13E-29		
25859		148	151	GP				T32S/R13E-29		
25859		151	155	CL				T32S/R13E-29		
25859		155	165	CL		gray		T32S/R13E-29		
25859		165	166	GP				T32S/R13E-29		
25859		166	172	CL				T32S/R13E-29		

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25859		172	191	GC				T32S/R13E-29		
25859		191	193	CL		white		T32S/R13E-29		
25859		193	196	GP				T32S/R13E-29		
25859		196	200	CL	Hard Clay			T32S/R13E-29		
43435	43435	0	42	SP				T32S/R13E-29		
43435		42	45	SP				T32S/R13E-29		
43435		45	57	CL		brown		T32S/R13E-29		
43435		57	65	CL-S-G		brown		T32S/R13E-29		
43435		65	80	CL		brown		T32S/R13E-29		
43435		80	85	CL-G		gray		T32S/R13E-29		
43435		85	102	CL		brown		T32S/R13E-29		
43435		102	106	CL-G		brown		T32S/R13E-29		
43435		106	116	CL		gray		T32S/R13E-29		
43435		116	124	GP				T32S/R13E-29		
43435		124	130	CL		brown		T32S/R13E-29		
43435		130	135	GP				T32S/R13E-29		
43435		135	138	CL				T32S/R13E-29		
43435		138	185	GP				T32S/R13E-29		
43435		185	195	SP		gray		T32S/R13E-29		
43440	43440	0	41	SP				T32S/R13E-29		
43440		41	55	CL		brown		T32S/R13E-29		
43440		55	72	GC				T32S/R13E-29		
43440		72	125	GP				T32S/R13E-29		
43440		125	128	CL		brown		T32S/R13E-29		
43440		128	135	CL		gray		T32S/R13E-29		
43440		135	146	CL		gray		T32S/R13E-29		
43440		146	158	CL-S		blue		T32S/R13E-29		
43440		158	162	CL-S	Sandy Clay (soft)	black		T32S/R13E-29		
43440		162	168	CL		gray		T32S/R13E-29		
43440		168	178	GP				T32S/R13E-29		
43440		178	190	SP				T32S/R13E-29		
739494	739494	0	20	SP	Sand (soft)	brown		T32S/R13E-29		
739494		20	65	SP		brown		T32S/R13E-29		
739494		65	72	GPGC				T32S/R13E-29		
739494		72	95	CL		blue		T32S/R13E-29		
739494		95	105	SP-GPGC				T32S/R13E-29		
739494		105	125	CLML		green		T32S/R13E-29		
739494		125	135	GPGC				T32S/R13E-29		
739494		135	175	GPGC				T32S/R13E-29		
739494		175	185	SP-G		white		T32S/R13E-29		
739494		185	210	SP				T32S/R13E-29		
739494		210	220	SP		green		T32S/R13E-29		
40-0621	40-0621	0	20	SP				T32S/R13E-29		
40-0621		20	32	CL		yellow		T32S/R13E-29		
40-0621		32	41	SP				T32S/R13E-29		
40-0621		41	52	GP				T32S/R13E-29		
40-0621		52	68	SP				T32S/R13E-29		
40-0621		68	75	GP				T32S/R13E-29		
40-0621		75	85	CL-G				T32S/R13E-29		
40-0621		85	104	GP				T32S/R13E-29		
40-0621		104	115	CL-S		yellow		T32S/R13E-29		
40-0621		115	117	GP				T32S/R13E-29		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
40-0621		117	121	CL		brown		T32S/R13E-29		
40-0621		121	134	GP				T32S/R13E-29		
40-0621		134	143	GPGC				T32S/R13E-29		
40-0621		143	159	GP				T32S/R13E-29		
43997	43997	0	29	SP				T32S/R13E-29		
43997		29	35	SC-G				T32S/R13E-29		
43997		35	55	SP-G				T32S/R13E-29		
43997		55	140	GP-S				T32S/R13E-29		
43997		140	173	GP-S				T32S/R13E-29		
43997		173	176	CL-S		yellow		T32S/R13E-29		
43997		176	199	GP-S				T32S/R13E-29		
43997		199	201	CL		yellow		T32S/R13E-29		
34280	34280	0	38	SP				T32S/R13E-29		
34280		38	52	CL-S				T32S/R13E-29		
34280		52	55	SP		brown		T32S/R13E-29		
34280		55	84	CL		brown		T32S/R13E-29		
34280		84	86	GP				T32S/R13E-29		
34280		86	94	CL		blue		T32S/R13E-29		
34280		94	95	GP				T32S/R13E-29		
34280		95	134	CL-G		blue		T32S/R13E-29		
34280		134	148	GP				T32S/R13E-29		
34280		148	157	CL		brown		T32S/R13E-29		
34280		157	172	GP				T32S/R13E-29		
34280		172	178	CL-S		white		T32S/R13E-29		
710441	710441	0	35	SP		brown		T32S/R13E-29		
710441		35	38	CL		black		T32S/R13E-29		
710441		38	50	CL	Soft Clay	tan		T32S/R13E-29		
710441		50	57	CL		tan		T32S/R13E-29		
710441		57	65	SP		tan		T32S/R13E-29		
710441		65	110	GPGC		brown and tan		T32S/R13E-29		
710441		110	118	GPGC		brown and tan		T32S/R13E-29		
710441		118	145	GPGC		brown		T32S/R13E-29		
710441		145	155	CL-S	Soft Sandy Clay	tan		T32S/R13E-29		
25248	25248	0	10	SP				T32S/R13E-29		
25248		10	54	CL-S				T32S/R13E-29		
25248		54	80	GP-S				T32S/R13E-29		
25248		80	96	CL				T32S/R13E-29		
25248		96	120	GPGC				T32S/R13E-29		
25248		120	130	GP				T32S/R13E-29		
25248		130	140	CL				T32S/R13E-29		
25248		140	150	GP				T32S/R13E-29		
25248		150	164	CL				T32S/R13E-29		
25248		164	180	GP				T32S/R13E-29		
25248		180	182	GP	Boulders			T32S/R13E-29		
25248		182	208	GPGC				T32S/R13E-29		
25248		208	212	CL				T32S/R13E-29		
25248		212	222	GP				T32S/R13E-29		
25248		222	225	CL				T32S/R13E-29		
25248		225	243	GP				T32S/R13E-29		
25248		243	250		Sea Shells			T32S/R13E-29		
90012	90012	0	22	SP				T32S/R13E-29		
90012		22	27	CL-G		brown		T32S/R13E-29		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
90012		27	110	GP				T32S/R13E-29		
90012		110	114	GPGC				T32S/R13E-29		
90012		114	170	GW				T32S/R13E-29		
90012		170	175	GPGC				T32S/R13E-29		
90012		175	182	CL		blue		T32S/R13E-29		
90013	90013	0	20	SP				T32S/R13E-29		
90013		20	27	GC				T32S/R13E-29		
90013		27	77	GP				T32S/R13E-29		
90013		77	110	GP	Coarse Gravel and Rock			T32S/R13E-29		
90013		110	133	GC		yellow		T32S/R13E-29		
90013		133	176	GW				T32S/R13E-29		
90013		176	186	CL		gray		T32S/R13E-29		
90014	90014	0	14	SP				T32S/R13E-29		
90014		14	22	GP-S				T32S/R13E-29		
90014		22	28	CL-S				T32S/R13E-29		
90014		28	90	GP-S				T32S/R13E-29		
90014		90	168	GC-S				T32S/R13E-29		
90014		168	180	SHALE	Hard Shale	white		T32S/R13E-29		
39393	39393	0	10	SP		brown		T32S/R13E-29		
39393		10	20	SP-G		brown		T32S/R13E-29		
39393		20	30	GC-S		brown		T32S/R13E-29		
39393		30	45	CL		brown		T32S/R13E-29		
39393		45	60	GC-S				T32S/R13E-29		
39393		60	70	GP-S				T32S/R13E-29		
39393		70	80	GPGC		brown		T32S/R13E-29		
39393		80	110	GP-S				T32S/R13E-29		
39393		110	120	GPGC				T32S/R13E-29		
39393		120	140	GPGC		gray		T32S/R13E-29		
39393		140	175	CL-G		gray		T32S/R13E-29		
39393		175	180	CL-S		gray		T32S/R13E-29		
39393		180	205	CL-S		gray	x	T32S/R13E-29		
39393		205	240	SHALE	Hard Clay Slate and Clay	gray	x	T32S/R13E-29		
39393		240	260	SC	Coarse Sand streaks in Slate and Clay			T32S/R13E-29		
39393		260	300	SPSC		gray	x	T32S/R13E-29		
39393		300	370	SP		brown	x	T32S/R13E-29		
39393		370	504	SPSC		brown and gray		T32S/R13E-29		
39393		504	507	SHALE		blue		T32S/R13E-29		
39393		507	518	SP	Coarse hard packed Sand		x	T32S/R13E-29		
39393		518	525	CL-S		gray and blue		T32S/R13E-29		
22118	22118	0	30		Top Soil			T32S/R13E-29		
22118		30	121	GPGC		brown		T32S/R13E-29		
22118		121	127	GPGC				T32S/R13E-29		
22118		127	133	CL		brown		T32S/R13E-29		
22118		133	175	GPGC				T32S/R13E-29		
22118		175	196	SHALE		white		T32S/R13E-29		
22118		196	198	CL-S		white		T32S/R13E-29		
22118		198	295	GPGC				T32S/R13E-29		
22118		295	320	SP		white		T32S/R13E-29		
22118		320	333	SX	Sandstone	gray		T32S/R13E-29		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
22118		333	341	SX	Sandstone and some Sand			T32S/R13E-29		
22118		341	374	SP	Sand and some Sandstone			T32S/R13E-29		
22118		374	390	SX	Sandstone and some Sand			T32S/R13E-29		
22118		390	412	SW				T32S/R13E-29		
22118		412	426	CL-S		brown		T32S/R13E-29		
22118		426	433	SP				T32S/R13E-29		
22118		433	451	SP				T32S/R13E-29		
22118		451	460	CLML		white		T32S/R13E-29		
22118		460	474	SPSC		blue and white		T32S/R13E-29		
22118		474	495	SX	Sandstone	blue		T32S/R13E-29		
22118		495	516	SP		blue		T32S/R13E-29		
22118		516	527	SX	Sandstone	blue		T32S/R13E-29		
22118		527	539	SP		blue		T32S/R13E-29		
22118		539	546	SC		blue		T32S/R13E-29		
22118		546	574	CL-S		blue		T32S/R13E-29		
22118		574	582	SP		blue		T32S/R13E-29		
22118		582	610	CL		blue		T32S/R13E-29		
25244	25244	0	12	SP				T32S/R13E-29		
25244		12	16	CL-G		yellow		T32S/R13E-29		
25244		16	46	SHALE	Shale Rock			T32S/R13E-29		
25244		46	62	CL				T32S/R13E-29		
25244		62	70	RX	Rock			T32S/R13E-29		
25244		70	84	CL				T32S/R13E-29		
25244		84	88	RX	Rock			T32S/R13E-29		
25244		88	100	CL				T32S/R13E-29		
25244		100	144	RX	Rock and Gravel			T32S/R13E-29		
25244		144	147	CL				T32S/R13E-29		
25244		147	198	RX	Rock and Gravel, few Clay streaks			T32S/R13E-29		
39684	39684	0	42	SP				T32S/R13E-29		
39684		42	55	CL		brown		T32S/R13E-29		
39684		55	65	SP		brown		T32S/R13E-29		
39684		65	70	GP				T32S/R13E-29		
39684		70	77	CL		brown		T32S/R13E-29		
39684		77	88	SP-G				T32S/R13E-29		
39684		88	95	CL-G		brown		T32S/R13E-29		
39684		95	97	CL-G		gray		T32S/R13E-29		
39684		97	100	GP				T32S/R13E-29		
39684		100	117	CL-G		blue		T32S/R13E-29		
39684		117	128	GP-S				T32S/R13E-29		
39684		128	177	GP-S				T32S/R13E-29		
39684		177	185	CL-S				T32S/R13E-29		
39684		185	190	SP				T32S/R13E-29		
25524	25524	0	33	SP				T32S/R13E-29		
25524		33	42	CL		yellow		T32S/R13E-29		
25524		42	48	GP				T32S/R13E-29		
25524		48	70	CL		gray		T32S/R13E-29		
25524		70	90	CL		blue		T32S/R13E-29		
25524		90	100	CL-S		blue		T32S/R13E-29		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
25524		100	110	GP				T32S/R13E-29		
25524		110	126	CL		blue		T32S/R13E-29		
25524		126	135	GP				T32S/R13E-29		
25524		135	140	CL	Hard Clay	blue		T32S/R13E-29		
25524		140	151	GC				T32S/R13E-29		
25524		151	154	CL		gray		T32S/R13E-29		
25524		154	160	GP				T32S/R13E-29		
25524		160	162	CL-G	Hard Clay and Gravel	blue		T32S/R13E-29		
90015	90015	0	4	SP				T32S/R13E-30	**T32S/R13E-30**	
90015		4	6	SW		brown	x	T32S/R13E-30		
90015		6	16	CLML-S				T32S/R13E-30		
90015		16	28	SW-G				T32S/R13E-30		
90015		28	63	SC-G		tan and brown		T32S/R13E-30		
90015		63	75	CL-S		blue		T32S/R13E-30		
90015		75	103	SW-G				T32S/R13E-30		
90015		103	108	GC-S				T32S/R13E-30		
90015		108	152	CL-S		blue		T32S/R13E-30		
90015		152	218	SC-G		tan		T32S/R13E-30		
90015		218	243	CL-G		blue	x	T32S/R13E-30		
90015		243	283	GPGC		blue		T32S/R13E-30		
90015		283	289	CL-G		tan		T32S/R13E-30		
90015		289	357	SWSC		green		T32S/R13E-30		
90015		357	369	SM			x	T32S/R13E-30		
90015		369	393	CLML-S				T32S/R13E-30		
90015		393	425	SM-G				T32S/R13E-30		
90015		425	590	SWSC				T32S/R13E-30		
90015		590	680	SM		green		T32S/R13E-30		
90015		680	769	ML-S		blue		T32S/R13E-30		
90015		769	778	CL				T32S/R13E-30		
90015		778	803	MUDST	Mudstone	black		T32S/R13E-30		
50900	50900	0	27	SP				T32S/R13E-30		
50900		27	33	CL				T32S/R13E-30		
50900		33	46	GP				T32S/R13E-30		
50900		46	58	CL-S-G		yellow		T32S/R13E-30		
50900		58	65	GP	Gravel and Boulders			T32S/R13E-30		
50900		65	68	CL		yellow		T32S/R13E-30		
50900		68	92	GP				T32S/R13E-30		
50900		92	115	SP-G				T32S/R13E-30		
50900		115	122	CL		gray		T32S/R13E-30		
50900		122	138	GP	Boulders and Gravel, some Shale			T32S/R13E-30		
50900		138	160	GP-S				T32S/R13E-30		
50900		160	164	GP				T32S/R13E-30		
50900		164	182	GC	Gravel and Clay (tight), gas			T32S/R13E-30		
101595	101595	0	4	SP				T32S/R13E-30		
101595		4	26	CL-S		yellow		T32S/R13E-30		
101595		26	28	SP-G				T32S/R13E-30		
101595		28	34	SC-G				T32S/R13E-30		
101595		34	78	GP-S				T32S/R13E-30		
101595		78	98	GC				T32S/R13E-30		
101595		98	106	SP-G				T32S/R13E-30		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
101595		106	115	CL-G				T32S/R13E-30		
101595		115	146	SP-G				T32S/R13E-30		
101595		146	180	CL		blue		T32S/R13E-30		
90016	90016	0	15	SP				T32S/R13E-30		
90016		15	42	GPGC				T32S/R13E-30		
90016		42	60	CLML		buff and green		T32S/R13E-30		
90016		60	138	SP-GPGC				T32S/R13E-30		
90016		138	183	CL-S-G		green		T32S/R13E-30		
90016		183	260	SC-G		buff and green		T32S/R13E-30		
90016		260	271	CLML-S		buff		T32S/R13E-30		
90016		271	290	SWSC		brown		T32S/R13E-30		
90016		290	339	SPSC		blue		T32S/R13E-30		
90016		339	363	CLML-S		green and blue		T32S/R13E-30		
90016		363	377	ML-S				T32S/R13E-30		
90016		377	385	CLML		green and blue		T32S/R13E-30		
90016		385	449	SPSC				T32S/R13E-30		
90016		449	465	SM				T32S/R13E-30		
90016		465	760	SWSC		green and blue		T32S/R13E-30		
90016		760	856	CLML-S		green		T32S/R13E-30		
90016		856	873	CH		black		T32S/R13E-30		
25233	25233	0	4	CL	Surface Soil			T32S/R13E-30		
25233		4	13	SP				T32S/R13E-30		
25233		13	15	GP				T32S/R13E-30		
25233		15	20	SP				T32S/R13E-30		
25233		20	29	CL				T32S/R13E-30		
25233		29	34	GP				T32S/R13E-30		
25233		34	40	SP-G				T32S/R13E-30		
25233		40	59	GP-S				T32S/R13E-30		
25233		59	62	CL		blue		T32S/R13E-30		
25233		62	70	GP-S				T32S/R13E-30		
25233		70	75	CL		blue		T32S/R13E-30		
25233		75	80	GP-S				T32S/R13E-30		
25233		80	96	GP-S				T32S/R13E-30		
25233		96	98	CL		blue		T32S/R13E-30		
25233		98	110	GP-S				T32S/R13E-30		
25233		110	112	GX	Conglomerate			T32S/R13E-30		
25233		112	118	GP-S				T32S/R13E-30		
25233		118	128	CL-G		blue		T32S/R13E-30		
31910	31910	0	6	SP				T32S/R13E-30		
31910		6	28	SW				T32S/R13E-30		
31910		28	42	CL		brown		T32S/R13E-30		
31910		42	53	SP-G				T32S/R13E-30		
31910		53	57	GP		yellow		T32S/R13E-30		
31910		57	65	CL-S		yellow		T32S/R13E-30		
31910		65	75	CL		blue		T32S/R13E-30		
31910		75	103	SP-G				T32S/R13E-30		
31910		103	108	CL		gray		T32S/R13E-30		
31910		108	113	CL		blue		T32S/R13E-30		
31910		113	118	SW-G				T32S/R13E-30		
31910		118	125	CL-S		blue		T32S/R13E-30		
31910		125	129	CL-S		gray		T32S/R13E-30		
31910		129	144	SP-G		blue		T32S/R13E-30		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
31910		144	160	GP				T32S/R13E-30		
31910		160	170	CL		blue		T32S/R13E-30		
5385	5385	0	3					T32S/R13E-30		
5385		3	22	SP				T32S/R13E-30		
5385		22	31	CL		brown		T32S/R13E-30		
5385		31	40	CL-S		yellow		T32S/R13E-30		
5385		40	45	SP				T32S/R13E-30		
5385		45	50	GP				T32S/R13E-30		
5385		50	55	CL-G		yellow		T32S/R13E-30		
5385		55	65	CL		blue		T32S/R13E-30		
5385		65	73	CL-S		blue		T32S/R13E-30		
5385		73	85	CH		blue		T32S/R13E-30		
5385		85	98	GP				T32S/R13E-30		
5385		98	106	CH-G				T32S/R13E-30		
5385		106	128	CL		blue		T32S/R13E-30		
5385		128	141	GPGC		blue		T32S/R13E-30		
5385		141	145	CL		blue		T32S/R13E-30		
90017	90017	0	17		Soil			T32S/R13E-30		
90017		17	35	CL-G				T32S/R13E-30		
90017		35	46	CL	Hard Clay			T32S/R13E-30		
90017		46	80	GP				T32S/R13E-30		
90017		80	83	CL				T32S/R13E-30		
90017		83	93	CL				T32S/R13E-30		
90017		93	97	GP				T32S/R13E-30		
90017		97	103	CL				T32S/R13E-30		
90018	90018	0	8	SP				T32S/R13E-30		
90018		8	14	SP-G				T32S/R13E-30		
90018		14	15	CL		blue		T32S/R13E-30		
90018		15	20	GP				T32S/R13E-30		
90018		20	29	CL		yellow		T32S/R13E-30		
90018		29	30	GP				T32S/R13E-30		
90018		30	54	CL-G		yellow		T32S/R13E-30		
90018		54	55	GP				T32S/R13E-30		
90018		55	62	SC				T32S/R13E-30		
90018		62	80	GC-S				T32S/R13E-30		
90018		80	86	CL	Hard Clay	yellow		T32S/R13E-30		
90018		86	91	CL	Hard Clay	blue		T32S/R13E-30		
90018		91	93	GP				T32S/R13E-30		
90018		93	95	CL-G		blue		T32S/R13E-30		
90018		95	103	GC				T32S/R13E-30		
90018		103	108	CL	Hard Clay			T32S/R13E-30		
90018		108	124	GP				T32S/R13E-30		
90018		124	125	GP				T32S/R13E-30		
90018		125	135	GP				T32S/R13E-30		
90018		135	`136	GP				T32S/R13E-30		
90018		`136	138	GP				T32S/R13E-30		
90018		138	140	GP-S				T32S/R13E-30		
90018		140	155	CL				T32S/R13E-30		
90018		155	160	SC		blue		T32S/R13E-30		
40-1518	40-1518	0	6	SW		tan and green		T32S/R13E-31	**T32S/R13E-31**	**POO-5**
40-1518		6	22	SP-G		tan and green		T32S/R13E-31		
40-1518		22	49	SC		brown		T32S/R13E-31		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
40-1518		49	114	CLML		blue		T32S/R13E-31		
40-1518		114	134	SWSC		green		T32S/R13E-31		
40-1518		134	148	CL-S-G				T32S/R13E-31		
40-1518		148	170	SWSC				T32S/R13E-31		
40-1518		170	208	CL-S		buff		T32S/R13E-31		
40-1518		208	247	SWSC				T32S/R13E-31		
40-1518		247	284	SM		tan		T32S/R13E-31		
40-1518		284	300	CLML-S				T32S/R13E-31		
40-1518		300	348	SC		tan		T32S/R13E-31		
40-1518		348	391	CL-S				T32S/R13E-31		
40-1518		391	452	CL-S		blue		T32S/R13E-31		
40-1518		452	486	CL-S		blue		T32S/R13E-31		
40-1518		486	531	CLML-S				T32S/R13E-31		
40-1518		531	600	SWSC				T32S/R13E-31		
40-1518		600	611	CLML-S				T32S/R13E-31		
40-1518		611	621	SWSC		gray		T32S/R13E-31		
40-1518		621	740	SWSC		blue and tan		T32S/R13E-31		
40-1518		740	800	SWSC		green and gray		T32S/R13E-31		
40-1518		800	891	SM		brown		T32S/R13E-31		
40-1518		891	906	CL				T32S/R13E-31		
219084	219084	0	10	SP				T32S/R13E-31		
219084		10	20	ML		brown and white		T32S/R13E-31		
219084		20	25	ML-G		brown		T32S/R13E-31		
219084		25	29	GC				T32S/R13E-31		
219084		29	30	SP		brown		T32S/R13E-31		
219084		30	42	GC-S				T32S/R13E-31		
219084		42	50	CH		blue		T32S/R13E-31		
219084		50	71	CL		blue		T32S/R13E-31		
219084		71	100	GP				T32S/R13E-31		
219084		100	104	CL		blue		T32S/R13E-31		
219084		104	126	GP-S				T32S/R13E-31		
219084		126	156	SP				T32S/R13E-31		
219084		156	170	SC		tan		T32S/R13E-31		
219080	219080	0	10	SP				T32S/R13E-31		
219080		10	20	ML-S		brown		T32S/R13E-31		
219080		20	23	CH		brown		T32S/R13E-31		
219080		23	27	SP		brown		T32S/R13E-31		
219080		27	40	GW-S	3" to 5" Rock and Sand and Gravel			T32S/R13E-31		
219080		40	80	CH		blue		T32S/R13E-31		
219080		80	83	GP				T32S/R13E-31		
219080		83	89	CL		blue		T32S/R13E-31		
219080		89	94	GP				T32S/R13E-31		
219080		94	103	CL		blue		T32S/R13E-31		
219080		103	126	GW	Medium Gravel and a few Boulders			T32S/R13E-31		
219080		126	161	GP-S				T32S/R13E-31		
219080		161	178	CL		yellow		T32S/R13E-31		
219080		178	210	GP		white		T32S/R13E-31		
219080		210	215	CL				T32S/R13E-31		
219080		215	225	GW	Gravel and few Boulders			T32S/R13E-31		
219080		225	253	SP-G				T32S/R13E-31		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
219080		253	268	SP				T32S/R13E-31		
219080		268	269	GP-S	Hard layer Gravel and Sand			T32S/R13E-31		
219080		269	271	CL-G				T32S/R13E-31		
219080		271	272	GW	Gravel and Boulders			T32S/R13E-31		
219080		272	302	CL		blue		T32S/R13E-31		
219080		302	307	GP-S	Rocks and Sand			T32S/R13E-31		
219080		307	336	SX	Sandstone	gray		T32S/R13E-31		
219080		336	359	SX	Sandstone and Clay layers	tan		T32S/R13E-31		
219080		359	363	CL-S		yellow		T32S/R13E-31		
219080		363	380	SX	Hard Sandstone	gray		T32S/R13E-31		
219080		380	388	GP-S	Hard cemented Gravel and Sand			T32S/R13E-31		
219080		388	396	CL	Clay and trace Sandstone			T32S/R13E-31		
219080		396	403	SX	Hard Sandstone			T32S/R13E-31		
219080		403	408	SX	Broken Sandstone			T32S/R13E-31		
219080		408	409	SP				T32S/R13E-31		
219080		409	414	SX	Broken Sandstone and Sand			T32S/R13E-31		
219080		414	415	SX	Hard layer Sandstone			T32S/R13E-31		
219080		415	420	SP				T32S/R13E-31		
219080		420	423	SX	Broken Sandstone and Clay	white		T32S/R13E-31		
219080		423	427	SX	Hard Sandstone			T32S/R13E-31		
219080		427	461	SWSC				T32S/R13E-31		
219080		461	462	SX	Hard layer Sandstone			T32S/R13E-31		
219080		462	483	SWSC		white		T32S/R13E-31		
219080		483	485	SX	Hard Sandstone			T32S/R13E-31		
219080		485	505	SPSC		white		T32S/R13E-31		
219080		505	513	SP				T32S/R13E-31		
219080		513	514	SX	Layer of Sandstone			T32S/R13E-31		
219080		514	523	SP				T32S/R13E-31		
219080		523	524	SX	Hard Sandstone layer			T32S/R13E-31		
219080		524	540	SC		white		T32S/R13E-31		
1084134	1084134	0	10	CL	Top Soil			T32S/R13E-32	**T32S/R13E-32**	
1084134		10	20	CL		black		T32S/R13E-32		
1084134		20	23	GP		brown		T32S/R13E-32		
1084134		23	28	CL-G		brown		T32S/R13E-32		
1084134		28	50	GP		brown		T32S/R13E-32		
1084134		50	51	CL		black		T32S/R13E-32		
1084134		51	56	GP		brown		T32S/R13E-32		
1084134		56	68	CL	Soft Clay			T32S/R13E-32		
1084134		68	70	GP		brown		T32S/R13E-32		
1084134		70	71	GC				T32S/R13E-32		
1084134		71	81	GPGC		brown		T32S/R13E-32		
1084134		81	90	GP		brown		T32S/R13E-32		
1084134		90	95	CL				T32S/R13E-32		
1084134		95	130	GP		brown		T32S/R13E-32		
1084134		130	160	GP-S		blue		T32S/R13E-32		
198167	198167	0	13	CL	Top Soil			T32S/R13E-32		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
198167		13	40	CL				T32S/R13E-32		
198167		40	60	CL-S-G				T32S/R13E-32		
198167		60	100	SHALE	Shale and Boulders			T32S/R13E-32		
198167		100	120	GW	Boulders and Gravel			T32S/R13E-32		
198167		120	140	CL				T32S/R13E-32		
198167		140	160	GC	Boulders, Shale, and Clay			T32S/R13E-32		
198167		160	180	GP	Boulders and Shale			T32S/R13E-32		
198167		180	200	GW	Boulders and Gravel			T32S/R13E-32		
198167		200	240	GP-S				T32S/R13E-32		
198167		240	250	SHALE	Shale and Clay			T32S/R13E-32		
198167		250	260	CL				T32S/R13E-32		
198167		260	600	SP				T32S/R13E-32		
782540	782540	0	76	SP		brown		T32S/R13E-32		
782540		76	84	SP-G				T32S/R13E-32		
782540		84	92	CL		gray		T32S/R13E-32		
782540		92	96	SP-G				T32S/R13E-32		
782540		96	117	CL		blue		T32S/R13E-32		
782540		117	119	SP-G				T32S/R13E-32		
782540		119	132	CL		blue		T32S/R13E-32		
782540		132	210	GP			x	T32S/R13E-32		
782540		210	300	SP-G				T32S/R13E-32		
455786	455786	0	140	SP				T32S/R13E-32		
455786		140	405	SP	Fine Sand, cemented streaks Shale			T32S/R13E-32		
455786		405	455	GPGC				T32S/R13E-32		
455786		455	450	CL		brown		T32S/R13E-32		
455786		450	460	GPGC				T32S/R13E-32		
455786		460	500	SP	Fine Sand cemented			T32S/R13E-32		
38509	38509	0	2					T32S/R13E-32		
38509		2	40	SP				T32S/R13E-32		
38509		40	44	CL	Soft Clay	brown		T32S/R13E-32		
38509		44	58	SP				T32S/R13E-32		
38509		58	64	GP-S				T32S/R13E-32		
38509		64	68	CL-S		brown		T32S/R13E-32		
38509		68	72	CL		gray		T32S/R13E-32		
38509		72	76	SC		blue		T32S/R13E-32		
38509		76	80	CL		gray		T32S/R13E-32		
38509		80	88	SP		gray		T32S/R13E-32		
38509		88	91	CL		gray		T32S/R13E-32		
38509		91	100	CL		blue		T32S/R13E-32		
38509		100	108	CL		gray		T32S/R13E-32		
38509		108	118	CL		black	x	T32S/R13E-32		
38509		118	123	GP-S				T32S/R13E-32		
38509		123	126	CL		blue		T32S/R13E-32		
38509		126	129	CL-G		gray		T32S/R13E-32		
38509		129	144	GP				T32S/R13E-32		
38509		144	150	GC		gray		T32S/R13E-32		
73920	73920	0	3	CL	Top Soil			T32S/R13E-32		
73920		3	10	SP		brown		T32S/R13E-32		
73920		10	15	CLML				T32S/R13E-32		
73920		15	25	CH				T32S/R13E-32		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
73920		25	35	SP				T32S/R13E-32		
73920		35	40	GPGC				T32S/R13E-32		
73920		40	50	CH		brown		T32S/R13E-32		
73920		50	60	GPGC				T32S/R13E-32		
73920		60	70	CL-S		brown		T32S/R13E-32		
73920		70	85	GPGC				T32S/R13E-32		
73920		85	90	CH				T32S/R13E-32		
73920		90	120	GPGC				T32S/R13E-32		
40-0651	40-0651	0	62	SP		brown		T32S/R13E-32		
40-0651		62	72	CL-S-G		gray		T32S/R13E-32		
40-0651		72	76	CL		blue		T32S/R13E-32		
40-0651		76	82	SP		brown		T32S/R13E-32		
40-0651		82	86	CL-S-G		blue		T32S/R13E-32		
40-0651		86	108	CH-S		blue		T32S/R13E-32		
40-0651		108	112	CL-G		gray		T32S/R13E-32		
40-0651		112	128	GP-S				T32S/R13E-32		
40-0651		128	134	CL		brown		T32S/R13E-32		
40-0651		134	150	CH		blue		T32S/R13E-32		
40-0651		150	160	CL-S		blue		T32S/R13E-32		
40-0651		160	162	CL		gray		T32S/R13E-32		
40-0651		162	166	SP		gray		T32S/R13E-32		
40-0651		166	172	CH		black		T32S/R13E-32		
40-0651		172	176	CL-S-G		gray		T32S/R13E-32		
40-0651		176	186	SP-G				T32S/R13E-32		
40-0651		186	194	SC-G				T32S/R13E-32		
40-0651		194	200	SP				T32S/R13E-32		
43444	43444	0	67	SP				T32S/R13E-32		
43444		67	76	CL		gray		T32S/R13E-32		
43444		76	98	CL-S	Soft Sandy Clay	blue		T32S/R13E-32		
43444		98	110	CL		blue		T32S/R13E-32		
43444		110	117	CL		gray		T32S/R13E-32		
43444		117	122	GP-S				T32S/R13E-32		
43444		122	132	CL	Soft Clay	gray		T32S/R13E-32		
43444		132	143	CL		gray		T32S/R13E-32		
43444		143	148	CL-S	Soft Sandy Clay	blue		T32S/R13E-32		
43444		148	151	SP-G				T32S/R13E-32		
43444		151	153	CL		blue		T32S/R13E-32		
43444		153	158	CL-S-G		gray		T32S/R13E-32		
43444		158	163	SP-G		brown		T32S/R13E-32		
43444		163	172	CL		gray		T32S/R13E-32		
43444		172	183	SP-G				T32S/R13E-32		
43444		183	193	SP				T32S/R13E-32		
43444		193	200	SPSC				T32S/R13E-32		
223346	223346	0	6		Heavy Adobe Top Soil			T32S/R13E-33	**T32S/R13E-33**	
223346		6	19	CL				T32S/R13E-33		
223346		19	26	CL-S				T32S/R13E-33		
223346		26	34	CL-S-G				T32S/R13E-33		
223346		34	40	SP	Sand and Stone			T32S/R13E-33		
223346		40	80	SC	Sand and Clay Stone	white		T32S/R13E-33		
223346		80	113	CL-S		brown		T32S/R13E-33		
736663	736663	0	190	SP		brown		T32S/R13E-33		
736663		190	205	CL		brown		T32S/R13E-33		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
736663		205	210	CL-G		brown		T32S/R13E-33		
736663		210	230	GPGC		brown		T32S/R13E-33		
736663		230	240	CL-GPGC		tan		T32S/R13E-33		
736663		240	255	GPGC		brown, tan, white		T32S/R13E-33		
736663		255	260	CL		white		T32S/R13E-33		
736663		260	275	GP		white and tan		T32S/R13E-33		
736663		275	283	CL		white		T32S/R13E-33		
736663		283	285	CL		black		T32S/R13E-33		
736663		285	300	SP-G		white		T32S/R13E-33		
736663		300	304	CL		black		T32S/R13E-33		
736663		304	315	SP		white		T32S/R13E-33		
736663		315	325	SC		white and black		T32S/R13E-33		
736663		325	335	SP		white		T32S/R13E-33		
736663		335	345	CL		black and white		T32S/R13E-33		
736663		345	400	SP		white		T32S/R13E-33		
736663		400	410	SC		white and black		T32S/R13E-33		
736663		410	470	SP		white		T32S/R13E-33		
736663		470	475	SW		blue		T32S/R13E-33		
736663		475	480	CL		blue	x	T32S/R13E-33		
496698	496698	0	10	CL-S-G		brown		T32S/R13E-33		
496698		10	19	SP				T32S/R13E-33		
496698		19	24	CL		brown and black		T32S/R13E-33		
496698		24	31	SP				T32S/R13E-33		
496698		31	34	CL		brown and black		T32S/R13E-33		
496698		34	37	SP-G				T32S/R13E-33		
496698		37	44	CL		black and brown		T32S/R13E-33		
496698		44	46	GP				T32S/R13E-33		
496698		46	62	CL		brown		T32S/R13E-33		
496698		62	68	SC-G		brown		T32S/R13E-33		
496698		68	224	CL		brown		T32S/R13E-33		
496698		224	232	SP				T32S/R13E-33		
496698		232	245	CL		brown		T32S/R13E-33		
496698		245	250	SP				T32S/R13E-33		
496698		250	264	CL		brown		T32S/R13E-33		
496698		264	267	SP-G				T32S/R13E-33		
496698		267	275	CL		brown		T32S/R13E-33		
496698		275	300	SP-G				T32S/R13E-33		
25723	25723	0	19	CL	Surface Soil			T32S/R13E-33		
25723		19	50	GP-S				T32S/R13E-33		
25723		50	100	SP-G				T32S/R13E-33		
25723		100	130	CL-S		yellow		T32S/R13E-33		
25723		130	145	SPSC				T32S/R13E-33		
25723		145	160	CL-S		blue		T32S/R13E-33		
25723		160	180	CH-S		blue		T32S/R13E-33		
25723		180	195	CL-S		yellow and blue		T32S/R13E-33		
25723		195	258	CH-S		blue		T32S/R13E-33		
25723		258	260	SHALE	Hard Shale			T32S/R13E-33		
77824	77824	0	5	SP		brown		T32S/R13E-33		
77824		5	7	SP		yellow		T32S/R13E-33		
77824		7	130	SPSC		brown		T32S/R13E-33		
77824		130	220	SPSC		brown		T32S/R13E-33		
77824		220	250	CL-S		yellow		T32S/R13E-33		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
77824		250	270	SP	Hard Sand	white		T32S/R13E-33		
77824		270	278	SP		brown		T32S/R13E-33		
77824		278	300	SW-G				T32S/R13E-33		
77824		300	307	SP-G				T32S/R13E-33		
77824		307	343	CL-S-G		brown		T32S/R13E-33		
77824		343	368	SP-G				T32S/R13E-33		
77824		368	382	CL-S		brown		T32S/R13E-33		
77824		382	435	SP-G		gray		T32S/R13E-33		
77824		435	445	SHALE	Shale	blue		T32S/R13E-33		
539794	539794	0	40	SP		brown		T32S/R13E-34	**T32S/R13E-34**	
539794		40	50	SHALE	Shale	brown		T32S/R13E-34		
539794		50	65	GPGC		brown		T32S/R13E-34		
539794		65	70	CL		brown		T32S/R13E-34		
539794		70	80	GPGC		brown		T32S/R13E-34		
539794		80	83	CL		brown		T32S/R13E-34		
539794		83	90	CL		brown		T32S/R13E-34		
539794		90	95	GPGC		brown		T32S/R13E-34		
539794		95	97	CL		brown		T32S/R13E-34		
539794		97	107	GPGC		brown		T32S/R13E-34		
539794		107	115	CL		brown		T32S/R13E-34		
539794		115	125	GPGC		white		T32S/R13E-34		
539794		125	135	CL		green and brown		T32S/R13E-34		
539794		135	140	CL		blue		T32S/R13E-34		
786272	786272	0	20	SP				T32S/R13E-34		
786272		20	30	SC				T32S/R13E-34		
786272		30	110	CL-G				T32S/R13E-34		
786272		110	120	GP				T32S/R13E-34		
786272		120	140	CL				T32S/R13E-34		
539765	539765	0	45	SP				T32S/R13E-34		
539765		45	90	SHALE				T32S/R13E-34		
539765		90	110	GPGC				T32S/R13E-34		
539765		110	135	GPGC				T32S/R13E-34		
539765		135	140	CL		blue		T32S/R13E-34		
1090771	1090771	0	65	SP				T32S/R13E-34		
1090771		65	125	SP-G				T32S/R13E-34		
1090771		125	130	GC		brown		T32S/R13E-34		
1090771		130	140	CL		brown		T32S/R13E-34		
1090771		140	160	SHALE		gray		T32S/R13E-34		
223808	223808	0	12	CL		brown		T32S/R13E-35	**T32S/R13E-35**	
223808		12	190	SX	Broken Sandstone			T32S/R13E-35		
223808		190	200	SX	Broken Sandstone			T32S/R13E-35		
223808		200	220	SX	Broken Sandstone			T32S/R13E-35		
223808		220	240	SX	Broken Sandstone			T32S/R13E-35		
223808		240	278	SX	Broken Sandstone	yellow		T32S/R13E-35		
223808		278	320	SX	Broken Sandstone	yellow		T32S/R13E-35		
223808		320	360	RX	Fault Gouge	blue		T32S/R13E-35		
158730	158730	0	15	GC				T32S/R13E-35		
158730		15	25	CL		red and brown		T32S/R13E-35		
158730		25	70	SHALE	Shale	white		T32S/R13E-35		
158730		70	125	SHALE	Shale with Clay	gray		T32S/R13E-35		
158730		125	135	SHALE	Shale	red		T32S/R13E-35		
158730		135	166	SHALE	Shale with Clay	gray		T32S/R13E-35		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
158730		166	255	SHALE	Shale	black, green, gray		T32S/R13E-35		
158730		255	281	CL	Clay with Shale	gray and green		T32S/R13E-35		
158730		281	305	SHALE	Shale	green		T32S/R13E-35		
158730		305	470	SHALE	Shale Rock	red		T32S/R13E-35		
158730		470	685	SHALE	Shale	green and black		T32S/R13E-35		
158730		685	726	CL	Clay and Rock	gray and green		T32S/R13E-35		
171368	171368	0	52	SHALE	Hard Shale	orange and red		T32S/R13E-35		
171368		52	115	SHALE	Hard Shale	black		T32S/R13E-35		
171368		115	170	SHALE	Hard Shale with some Clay	black and gray		T32S/R13E-35		
171368		170	300	SHALE	Hard Shale	gray		T32S/R13E-35		
171368		300	410	CL	Clay and Shale	black		T32S/R13E-35		
171368		410	420	SHALE	Shale and Clay			T32S/R13E-35		
171368		420	430	CL	Clay with some Shale	black		T32S/R13E-35		
171368		430	450	SHALE	Shale	gray		T32S/R13E-35		
171368		450	510	SHALE	Broken Shale	gray		T32S/R13E-35		
171368		510	520	SHALE	Shale with Clay	gray and white		T32S/R13E-35		
171368		520	530	CL		white and gray		T32S/R13E-35		
153002	153002	0	15	CL-S	Sandy Clay with Rock	brown		T32S/R13E-35		
153002		15	20	RX	Rock	blue and gray		T32S/R13E-35		
153002		20	28	RX	Rock, Clay	brown		T32S/R13E-35		
153002		28	50	SHALE	Shale Rock	brown		T32S/R13E-35		
153002		50	92	SHALE	Hard Shale	black		T32S/R13E-35		
153002		92	108	SX	Hard volcanic Sandstone	gray		T32S/R13E-35		
153002		108	140	SX	Hard fractured volcanic Sandstone	gray		T32S/R13E-35		
153002		140	165	RX	Rock and Clay	black and gray		T32S/R13E-35		
153002		165	200	SHALE	Shale Rock, some Rock	black and red		T32S/R13E-35		
153002		200	230	SHALE	Shale Rock	black		T32S/R13E-35		
153002		230	310	SX	Volcanic Sandstone	gray		T32S/R13E-35		
153002		310	400	RX	Rock	gray and green		T32S/R13E-35		
153002		400	511	RX	Rock with fractured zones	gray		T32S/R13E-35		
153002		511	530	RX	Rock and Clay	white		T32S/R13E-35		
153002		530	706	RX	Broken Rock with Clay lens	white		T32S/R13E-35		
276953	276953	0	10	SHALE	Shale	brown and white		T32S/R13E-35		
276953		10	52	SHALE	Shale with some Clay	brown		T32S/R13E-35		
276953		52	73	SHALE	Shale	brown and black		T32S/R13E-35		
276953		73	83	SHALE	Soft Shale	black		T32S/R13E-35		
276953		83	130	SHALE	Hard Shale	blackk		T32S/R13E-35		
276953		130	143	SX	Hard Sandstone	Hard Sandstone		T32S/R13E-35		
276953		143	148	SX	Sandstone with Shale	black		T32S/R13E-35		
276953		148	188	SX	Hard Sandstone with Shale	black, blue, green		T32S/R13E-35		
276953		188	274	SX	Sandstone and Shale	blue and green		T32S/R13E-35		
276953		274	282	SX	Sandstone			T32S/R13E-35		
276953		282	418	SX	Sandstone with very little Shale	blue and green		T32S/R13E-35		
276953		418	566	SHALE	Shale with some Sandstone	black		T32S/R13E-35		
792436	792436	0	3	CL	Top Soil			T32S/R13E-35		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
792436		3	14	SP-G				T32S/R13E-35		
792436		14	49	CL-G		brown		T32S/R13E-35		
792436		49	77	GC-S		gray		T32S/R13E-35		
792436		77	80	SC		gray		T32S/R13E-35		
792436		80	250	CL-S				T32S/R13E-35		
792463	792463	0	2	GC				T32S/R13E-35		
792463		2	11	CL-S-G		brown		T32S/R13E-35		
792463		11	23	CL-G		brown		T32S/R13E-35		
792463		23	39	CL-G		brown		T32S/R13E-35		
792463		39	57	CL-G		brown		T32S/R13E-35		
792463		57	61	CL-G		blue		T32S/R13E-35		
792463		61	66	CL-G		brown		T32S/R13E-35		
792463		66	68	CL-G		blue		T32S/R13E-35		
792463		68	69	CL-G		brown		T32S/R13E-35		
792463		69	98	CL-G		blue		T32S/R13E-35		
792463		98	134	CL-S-G		brown		T32S/R13E-35		
792463		134	243	CL-G		gray		T32S/R13E-35		
792463		243	277	CL-G		brown		T32S/R13E-35		
792463		277	293	CL		brown		T32S/R13E-35		
792463		293	296	GC		black and brown		T32S/R13E-35		
792463		296	309	CL		brown		T32S/R13E-35		
792463		309	313	CL-G		gray		T32S/R13E-35		
792463		313	322	CL-G		brown		T32S/R13E-35		
792463		322	400	GP		black		T32S/R13E-35		
792463		400	417	GP		brown		T32S/R13E-35		
792463		417	496	GP-S		gray		T32S/R13E-35		
792463		496	503	CL-S-G		gray		T32S/R13E-35		
07900329	07900329	0	500	SC-G				T32S/R13E-31	**T32S/R13E-31**	**Oil Wells**
07900329		500	890	SP-G				T32S/R13E-31		
07900329		890	940	MX	Siltstone, some fine Sand			T32S/R13E-31		
07900329		940	1000	SM				T32S/R13E-31		
07900329		1000	1940	SHALE	Shale	gray		T32S/R13E-31		
07900329		1940	1960	SHALE	Shale, fractured, broken			T32S/R13E-31		
07900329		1960	1970	SX	Sandstone, hard, thin strips Shale	gray and black		T32S/R13E-31		
07900329		1970	2160	SP	Hard Sand and Shale	gray		T32S/R13E-31		
07900329		2160	3000	SHALE	Shale, occasional streaks Sand	gray		T32S/R13E-31		
07900329		3000	4170	SM		gray		T32S/R13E-31		
07900329		4170	4290	SHALE	Shale			T32S/R13E-31		
07900329		4290	5570	SP	Sand with streaks Shale, streaks Chert and Serpentine	gray		T32S/R13E-31		
07900329		5570	6229	SHALE	Shale and Serpentine			T32S/R13E-31		
07900329		6229	6243	RX	Serpentine, fractured	gray and green		T32S/R13E-31		
07900329		6243	6696	RX	Serpentine and Shale	gray		T32S/R13E-31		
07900592	07900592	0	96	SC-G				T12N/R35W-34	**T12N/R35W-34**	
07900592		96	101	SP-G				T12N/R35W-34		
07900592		101	139	SC				T12N/R35W-34		
07900592		139	176	SP-G				T12N/R35W-34		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
07900592		176	205	SP	Soft Sand, Shale, Sandy Shale			T12N/R35W-34		
07900592		205	346	SP-G				T12N/R35W-34		
07900592		346	466	SC-G		buff		T12N/R35W-34		
07900592		466	511	CL	Clay with streaks limey conglomerate	blue		T12N/R35W-34		
07900592		511	706	SPSC	Sand with some Clay and Sandy Shale	buff and blue		T12N/R35W-34		
07900592		706	710	SHALE	Carbonaceous Shale			T12N/R35W-34		
07900592		710	730	SP	Hard Sand with some calcite veins and hard Shale			T12N/R35W-34		
07900592		730	770	SP				T12N/R35W-34		
07900592		770	829	SHALE	Shale with some Sandy Shale			T12N/R35W-34		
07900592		829	861	SHALE	Shale with some Sandy Shale			T12N/R35W-34		
07900592		861	873	SX	Hard Sandstone and Gravel			T12N/R35W-34		
07900592		873	978	SX	Hard Shaly Sandstone	gray		T12N/R35W-34		
07900502	07900502	0	214	SP				T11N/R35W-10	**T11N/R35W-10**	
07900502		214	500	GC		brown		T11N/R35W-10		
07900502		500	708	SP		tan and yellow		T11N/R35W-10		
07900502		708	723	RX	Franciscan			T11N/R35W-10		
07900503	07900503	0	223	SP				T11N/R35W-11	**T11N/R35W-11**	
07900503		223	676	GC		brown		T11N/R35W-11		
07900503		676	743	GPGC				T11N/R35W-11		
07900503		743	965	SP		tan and yellow		T11N/R35W-11		
07900503		965	1277	SX-MX				T11N/R35W-11		
07900503		1277	1286	RX	Franciscan			T11N/R35W-11		
07900501	07900501	0	347	SP				T11N/R35W-15	**T11N/R35W-15**	
07900501		347	811	GC		brown		T11N/R35W-15		
07900501		811	1006	SP		tan and yellow		T11N/R35W-15		
07900501		1006	1550	SX-MX	Silty Sandstone	blue and gray		T11N/R35W-15		
07900501		1550	1688	SX-MX	Shale, silty	gray		T11N/R35W-15		
07900501		1688	1715	SHALE	Shale	gray		T11N/R35W-15		
07900501		1715	1721	RX	Serpentine, Franciscan	black		T11N/R35W-15		
07900131	07900131	0	20					T11N/R35W-15	**T11N/R35W-15**	
07900131		20	70	SP-G				T11N/R35W-15		
07900131		70	105	SP				T11N/R35W-15		
07900131		105	425	SP				T11N/R35W-15		
07900131		425	450	GW	Gravel and Boulders			T11N/R35W-15		
07900131		450	460	SHALE	Sticky Shale			T11N/R35W-15		
07900131		460	514	SP				T11N/R35W-15		
07900131		514	534	SP		red		T11N/R35W-15		
07900131		534	544	SHALE	Shale			T11N/R35W-15		
07900131		544	648	SP				T11N/R35W-15		
07900131		648	700	SP				T11N/R35W-15		
07900131		700	736	SHALE	Sandy Shale			T11N/R35W-15		
07900131		736	793	SP-G	Sand and Boulders			T11N/R35W-15		
07900131		793	800	SP		gray		T11N/R35W-15		
07900131		800	912	SP		black		T11N/R35W-15		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
07900131		912	1042	SHALE	Sandy Shale			T11N/R35W-15		
07900131		1042	1153	SP	Sand and Shale			T11N/R35W-15		
07900131		1153	1194	SHALE	Shale		x	T11N/R35W-15		
07900131		1194	1431	SP		black	x	T11N/R35W-15		
07900131		1431	1441	SP-G	Hard Sand, Shale, and Boulders			T11N/R35W-15		
07900131		1441	1470	SHALE	Hard Shale, sticky Clay		x	T11N/R35W-15		
07900131		1470	1560	SHALE	Shale		x	T11N/R35W-15		
07900131		1560	1690	SP	Hard Sand, streaks of Shale	gray	x	T11N/R35W-15		
07900131		1690	1716	SHALE	Hard Shale	brown, black, blue		T11N/R35W-15		
07900131		1716	1724	GP	Boulders, streaks of Shale			T11N/R35W-15		
07900131		1724	1822	SHALE	Hard Shale	blue		T11N/R35W-15		
07900131		1822	1836	SP	Hard Sand	gray		T11N/R35W-15		
07900131		1836	1840	SHALE	Shale	blue		T11N/R35W-15		
07900131		1840	1855	SP	Hard Sand	gray		T11N/R35W-15		
07900131		1855	1864	SHALE	Shale			T11N/R35W-15		
07900131		1864	1868	SP	Hard Sand			T11N/R35W-15		
07900131		1868	1904	SHALE	Sandy Shale		x	T11N/R35W-15		
07900131		1904	1935	SP	Hard Sand			T11N/R35W-15		
07900568	07900568	0	185	SP				T11N/R35W-22	**T11N/R35W-22**	
07900568		185	852	SC				T11N/R35W-22		
07900568		852	1505	SP	Sand and Shale, shell at 1503		x	T11N/R35W-22		
07900568		1505	2020	SP	Sand and Shale			T11N/R35W-22		
07900568		2020	2085	SHALE	Sticky Shale			T11N/R35W-22		
07900568		2085	2188	SX	Hard Sandstone	gray		T11N/R35W-22		
446253	446253	0	120	SP		red		T11N/R35W-3	**T11N/R35W-3**	
446253		120	140	SC		tan and red		T11N/R35W-3		
446253		140	160	CL-S		tan		T11N/R35W-3		
446253		160	200	CL-S		red		T11N/R35W-3		
446253		200	400	SC-G				T11N/R35W-3		
446253		400	420	CL-S-G		tan		T11N/R35W-3		
446253		420	440	CL-G		tan		T11N/R35W-3		
446253		440	480	GPGC		tan		T11N/R35W-3		
446253		480	500	GC		brown		T11N/R35W-3		
446253		500	515	GP-S				T11N/R35W-3		
446253		515	520	CL		blue	x	T11N/R35W-3		
64915	64915	0	183	SP				T11N/R35W-4	**T11N/R35W-4**	
64915		183	195	CL-S		brown		T11N/R35W-4		
64915		195	219	CL-G		brown		T11N/R35W-4		
64915		219	234	CL-S		brown		T11N/R35W-4		
64915		234	247	SP		brown		T11N/R35W-4		
64915		247	258	CL		brown		T11N/R35W-4		
64915		258	277	CL-G		brown		T11N/R35W-4		
64915		277	293	CL		blue		T11N/R35W-4		
64915		293	318	CL		gray		T11N/R35W-4		
64915		318	337	CL-G		brown		T11N/R35W-4		
64915		337	342	GP				T11N/R35W-4		
64915		342	347	CL-G		brown		T11N/R35W-4		
64915		347	351	GP				T11N/R35W-4		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
64915		351	383	CL		brown		T11N/R35W-4		
64915		383	398	GP				T11N/R35W-4		
64915		398	402	SC		brown		T11N/R35W-4		
64915		402	406	CL		brown		T11N/R35W-4		
290834	290834	0	140	SP		brown		T11N/R35W-5B1	**T11N/R35W-5B1**	
290834		140	210	CL-S	Sandy Clay, some Shale	brown		T11N/R35W-5B1		
290834		210	220	CL-S	Sandy Clay, some Shale	gray		T11N/R35W-5B1		
290834		220	250	SP		white		T11N/R35W-5B1		
290834		250	270	SP		brown		T11N/R35W-5B1		
290834		270	290	GPGC				T11N/R35W-5B1		
290834		290	295	CL		brown		T11N/R35W-5B1		
290834		295	308	CL-GPGC		tan		T11N/R35W-5B1		
290834		308	317	GPGC		brown		T11N/R35W-5B1		
290834		317	325	CL-GPGC		gray		T11N/R35W-5B1		
290834		325	330	CL		gray		T11N/R35W-5B1		
290834		330	365	GPGC		white and brown		T11N/R35W-5B1		
290834		365	380	CL-S		green		T11N/R35W-5B1		
339587	339587	0	20	SC				T32S/R13E-30K	**T32S/R13E-30K**	
339587		20	70	GC				T32S/R13E-30K		
339587		70	115	CL-G		gray		T32S/R13E-30K		
339587		115	130	GC				T32S/R13E-30K		
339587		130	175	GC				T32S/R13E-30K		
339587		175	190	GP-S				T32S/R13E-30K		
339587		190	295	CL-G		gray	x	T32S/R13E-30K		
339587		295	310	CL		gray		T32S/R13E-30K		
339587		310	385	SHALE	Shale			T32S/R13E-30K		
339587		385	400	SHALE	Shale and Sand			T32S/R13E-30K		
339587		400	580	SP				T32S/R13E-30K		
339588	339588	0	20	CL-S				T32S/R13E-30	**T32S/R13E-30**	
339588		20	50	GP-S				T32S/R13E-30		
339588		50	55	CL				T32S/R13E-30		
339588		55	60	GC-S		brown		T32S/R13E-30		
339588		60	65	CL		black		T32S/R13E-30		
339588		65	80	GP				T32S/R13E-30		
339588		80	85	GP-S				T32S/R13E-30		
339588		85	90	CL		blue		T32S/R13E-30		
339588		90	95	GP-S				T32S/R13E-30		
339588		95	105	CL				T32S/R13E-30		
339588		105	118	GP	Cobbles			T32S/R13E-30		
339588		118	142	GW	Gravel and Rocks			T32S/R13E-30		
339588		142	145	CL		brown		T32S/R13E-30		
339588		145	150	CL		blue		T32S/R13E-30		
339588		150	165	GP-S				T32S/R13E-30		
339588		165	180	CL				T32S/R13E-30		
339588		180	195	SP				T32S/R13E-30		
339588		195	210	SP			x	T32S/R13E-30		
339588		210	215	SP				T32S/R13E-30		
339588		215	225	GW	Gravel and Rock			T32S/R13E-30		
339588		225	255	SC		blue	x	T32S/R13E-30		
339588		255	280	SP				T32S/R13E-30		
339588		280	300	SP	Fine Sand and Sandstone			T32S/R13E-30		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
339588		300	395	SX	Hard Sandstone			T32S/R13E-30		
1089670	1089670	0	190	SP				T11N/R35W-4	**T11N/R35W-4**	
1089670		190	200	CL-S				T11N/R35W-4		
1089670		200	220	SP				T11N/R35W-4		
1089670		220	230	SP				T11N/R35W-4		
1089670		230	250	SHALE				T11N/R35W-4		
1089670		250	260	GPGC				T11N/R35W-4		
1089670		260	280	GP-S				T11N/R35W-4		
1089670		280	300	CL-G		brown		T11N/R35W-4		
1089670		300	340	SP				T11N/R35W-4		
1089670		340	360	CL				T11N/R35W-4		
1089670		360	380	SC				T11N/R35W-4		
1089670		380	430	GP				T11N/R35W-4		
1089670		430	440	CL-S		blue		T11N/R35W-4		
68824	68824	0	176	SP				T11N/R35W-4	**T11N/R35W-4**	
68824		176	206	SP		white		T11N/R35W-4		
68824		206	236	SP-G		brown		T11N/R35W-4		
68824		236	400	CL-G				T11N/R35W-4		
07920051	07920051	0	400		No Data			T11N/R35W-19	**T11N/R35W-19**	
07920051		400	420	SP				T11N/R35W-19		
07920051		420	430	CL				T11N/R35W-19		
07920051		430	460	GPGC				T11N/R35W-19		
07920051		460	470	CL	Lithology			T11N/R35W-19		
07920051		470	515	GPGC	is			T11N/R35W-19		
07920051		515	585	CL	estimated			T11N/R35W-19		
07920051		585	620	SP-G	based			T11N/R35W-19		
07920051		620	640	CL-S	upon			T11N/R35W-19		
07920051		640	685	SP-G	interpretation			T11N/R35W-19		
07920051		685	710	SP	of			T11N/R35W-19		
07920051		710	740	SP-G	oil			T11N/R35W-19		
07920051		740	770	CL	well			T11N/R35W-19		
07920051		770	820	SP-G	geophysical			T11N/R35W-19		
07920051		820	850	CL-S	log			T11N/R35W-19		
07920051		850	865	SP-G				T11N/R35W-19		
07920051		865	900	CL-S				T11N/R35W-19		
07920051		900	960	SC				T11N/R35W-19		
07920051		960	990	SP-G				T11N/R35W-19		
07920051		990	1010	SC				T11N/R35W-19		
07920051		1010	1040	CL				T11N/R35W-19		
07920051		1040	1070	SP-G				T11N/R35W-19		
07920051		1070	1080	CL				T11N/R35W-19		
07920051		1080	1110	SC				T11N/R35W-19		
07920051		1110	1125	SP-G				T11N/R35W-19		
07920051		1125	1155	CL				T11N/R35W-19		
511080	511080	0	215	SP		brown		T11N/R35W-4	**T11N/R35W-4**	**Cypress Ridge**
511080		215	220	CL-S		brown		T11N/R35W-4		
511080		220	270	CL-G		gray		T11N/R35W-4		
511080		270	288	CL-G		gray		T11N/R35W-4		
511080		288	295	SP-G				T11N/R35W-4		
511080		295	300	CL-G		brown		T11N/R35W-4		
511080		300	310	GPGC				T11N/R35W-4		
511080		310	315	CL-G		brown		T11N/R35W-4		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
511080		315	321	SP-G				T11N/R35W-4		
511080		321	332	CL-S		gray		T11N/R35W-4		
511080		332	347	SP-G				T11N/R35W-4		
511080		347	362	SP		brown		T11N/R35W-4		
511080		362	365	CL-S		brown		T11N/R35W-4		
511080		365	391	SP-G		brown		T11N/R35W-4		
511080		391	403	CL		gray		T11N/R35W-4		
511080		403	475	SP-G				T11N/R35W-4		
511080		475	478	GP	Hard Gravel			T11N/R35W-4		
511080		478	490	SP		blue		T11N/R35W-4		
511080		490	520	ML-S		blue		T11N/R35W-4		
511078	511078	0	212	SP		brown		T11N/R35W-4	**T11N/R35W-4**	
511078		212	247	SP-G				T11N/R35W-4		
511078		247	254	SP		brown		T11N/R35W-4		
511078		254	256	CL		gray		T11N/R35W-4		
511078		256	284	SP-G				T11N/R35W-4		
511078		284	289	CL		gray		T11N/R35W-4		
511078		289	328	SP-G				T11N/R35W-4		
511078		328	369	SP		gray		T11N/R35W-4		
511078		369	377	CL		gray		T11N/R35W-4		
511078		377	394	SP-G				T11N/R35W-4		
511078		394	403	CL		gray		T11N/R35W-4		
511078		403	407	SP		gray		T11N/R35W-4		
511078		407	411	CL		blue		T11N/R35W-4		
511078		411	420	SP-G		blue		T11N/R35W-4		
511086	511086	0	232	SP		brown		T11N/R35W-4	**T11N/R35W-4**	
511086		232	246	CL		brown		T11N/R35W-4		
511086		246	279	SP-G				T11N/R35W-4		
511086		279	294	CL		brown		T11N/R35W-4		
511086		294	328	SP-G				T11N/R35W-4		
511086		328	336	CL		brown		T11N/R35W-4		
511086		336	409	SP		gray		T11N/R35W-4		
511086		409	422	SP-G				T11N/R35W-4		
511086		422	443	CL		gray		T11N/R35W-4		
511086		443	460	SP-G		blue		T11N/R35W-4		
511087	511087	0	247	SP		brown		T11N/R35W-4	**T11N/R35W-4**	
511087		247	274	SP		gray		T11N/R35W-4		
511087		274	306	SP-G				T11N/R35W-4		
511087		306	316	CL		brown		T11N/R35W-4		
511087		316	328	SP-G				T11N/R35W-4		
511087		328	347	SP-G		gray		T11N/R35W-4		
511087		347	360	CL		gray	x	T11N/R35W-4		
511087		360	374	CL		gray		T11N/R35W-4		
511087		374	399	SP-G				T11N/R35W-4		
511087		399	405	CL		blue		T11N/R35W-4		
511087		405	427	SP-G		blue		T11N/R35W-4		
511087		427	440	CL		blue		T11N/R35W-4		
511107	511107	0	255	SP		brown		T11N/R35W-4	**T11N/R35W-4**	
511107		255	265	CL-S-G		gray		T11N/R35W-4		
511107		265	275	SP-G				T11N/R35W-4		
511107		275	286	CL-G		brown		T11N/R35W-4		
511107		286	295	SP-G				T11N/R35W-4		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
511107		295	300	CL-S-G		brown		T11N/R35W-4		
511107		300	310	SP-G		gray		T11N/R35W-4		
511107		310	330	SC		gray		T11N/R35W-4		
511107		330	335	CL-G		gray		T11N/R35W-4		
511107		335	350	SP-G				T11N/R35W-4		
511107		350	369	CL-S		brown		T11N/R35W-4		
511107		369	380	SP-G				T11N/R35W-4		
511107		380	390	CL	Chattering Clay	white		T11N/R35W-4		
511107		390	410	GP		blue		T11N/R35W-4		
511107		410	420	CL		blue		T11N/R35W-4		
90023	90023	0	6	SP		brown		T/R/S-??	**T/R/S-??**	**Pismo Beach**
90023		6	11	CL-S		brown		T/R/S-??		
90023		11	15	CL		brown		T/R/S-??		
90023		15	28	CL-S		brown		T/R/S-??		
90023		28	35	SP		brown		T/R/S-??		
90023		35	40	CL-S		brown		T/R/S-??		
90023		40	60	GC-S				T/R/S-??		
90023		60	100	SP-G				T/R/S-??		
90023		100	110	CL-S-G		brown		T/R/S-??		
90023		110	125	CL-S		brown		T/R/S-??		
90023		125	135	CL-S		brown		T/R/S-??		
90023		135	150	CL-S		brown		T/R/S-??		
90023		150	155	CL-S		brown		T/R/S-??		
90023		155	175	SW		brown		T/R/S-??		
90023		175	180	SP		brown		T/R/S-??		
90023		180	185	GC-S				T/R/S-??		
90023		185	195	SP				T/R/S-??		
90023		195	200	SP-G				T/R/S-??		
90023		200	225	SW		brown		T/R/S-??		
90023		225	250	SC-G		brown		T/R/S-??		
90023		250	255	SW				T/R/S-??		
90023		255	268	SC				T/R/S-??		
90023		268	273	SP-G				T/R/S-??		
90023		273	276	CL-S-G				T/R/S-??		
90023		276	285	SPSC		brown and blue		T/R/S-??		
90023		285	310	SPSC		brown and blue		T/R/S-??		
90023		310	320	CL-S		blue		T/R/S-??		
90023		320	325	SPSC		brown and blue		T/R/S-??		
90023		325	350	SC-G		brown and blue		T/R/S-??		
90023		350	370	CL-S		blue and brown		T/R/S-??		
90023		370	400	SC		brown and blue		T/R/S-??		
90023		400	435	CL-S		blue		T/R/S-??		
90023		435	455	SP		blue and gray	X	T/R/S-??		
90023		455	460	SC		brown		T/R/S-??		
90023		460	485	SP		blue and gray	X	T/R/S-??		
90023		485	500	SC		gray	X	T/R/S-??		
90023		500	505	CL	Clay and Sandstone	gray		T/R/S-??		
90023		505	525	CL		gray		T/R/S-??		
90023		525	540	CL-WS		gray		T/R/S-??		
90023		540	574	CL-WS		blue		T/R/S-??		
174229	174229	0	3	CL	Fill			T32S/R13E-19B	**T32S/R13E-19B**	
174229		3	9	CL	Top Soil			T32S/R13E-19B		

PointID	PointID1	Depth	Layer Bottom	Material Graphic	Material Description	Color	Seashells	TRS	TRS1	Log Source
174229		9	13	CL	Rock			T32S/R13E-19B		
174229		13	58	CL-S		brown		T32S/R13E-19B		
174229		58	86	CL		blue		T32S/R13E-19B		
174229		86	97	SP				T32S/R13E-19B		
174229		97	102	CL		blue		T32S/R13E-19B		
174229		102	131	SPSC				T32S/R13E-19B		
174229		131	156	CL-S		blue		T32S/R13E-19B		
174229		156	163	SC				T32S/R13E-19B		
174229		163	172	CL-S		blue		T32S/R13E-19B		
174229		172	184	CL		blue		T32S/R13E-19B		
174229		184	218	CL-S		blue		T32S/R13E-19B		
174229		218	233	SP				T32S/R13E-19B		
174229		233	257	CL-S		blue		T32S/R13E-19B		
174229		257	263	SP				T32S/R13E-19B		
174229		263	285	CL-S		blue		T32S/R13E-19B		
174229		285	286	SX	Sandstone			T32S/R13E-19B		
174229		286	320	CL-S		blue		T32S/R13E-19B		
174235	174235	0	3	CL	Top Soil			T32S/R13E-18Q	**T32S/R13E-18Q**	
174235		3	7	CL	Hard Pan			T32S/R13E-18Q		
174235		7	18	CL		brown		T32S/R13E-18Q		
174235		18	23	CL-G				T32S/R13E-18Q		
174235		23	24	SC				T32S/R13E-18Q		
174235		24	33	GC				T32S/R13E-18Q		
174235		33	44	SC				T32S/R13E-18Q		
174235		44	49	CL-G				T32S/R13E-18Q		
174235		49	64	CL				T32S/R13E-18Q		
174235		64	113	CL		blue		T32S/R13E-18Q		
174235		113	155	SC				T32S/R13E-18Q		
174235		155	159	CL				T32S/R13E-18Q		
174235		159	162	SC				T32S/R13E-18Q		
174235		162	166	SP				T32S/R13E-18Q		
174235		166	173	SP				T32S/R13E-18Q		
174235		173	260	SC				T32S/R13E-18Q		
174235		260	373	SC				T32S/R13E-18Q		
174235		373	412	CL-G		blue		T32S/R13E-18Q		
174235		412	429	SP				T32S/R13E-18Q		
174235		429	436	CL-G		blue		T32S/R13E-18Q		
174235		436	451	SC				T32S/R13E-18Q		
174235		451	455	CL-G				T32S/R13E-18Q		
174235		455	460	CL-G				T32S/R13E-18Q		
90024	90024	0	27	SP				T/R/S-??	**T/R/S-??**	**NCSD WWTF**
90024		27	31	CL				T/R/S-??		
90024		31	78	SP				T/R/S-??		
90024		78	80	CL				T/R/S-??		
90025	90025	0	134	SP				T/R/S-??	**T/R/S-??**	
90025		135	135	CL				T/R/S-??		

APPENDIX D
WATER WELL LOGS (CONFIDENTIAL – PROVIDED ON CD)

APPENDIX E
WATER WELL GEOPHYSICAL LOGS (CONFIDENTIAL – PROVIDED ON CD)

APPENDIX F
OIL WELL LITHOLOGIC AND GEOPHYSICAL LOGS (CONFIDENTIAL – PROVIDED ON CD)

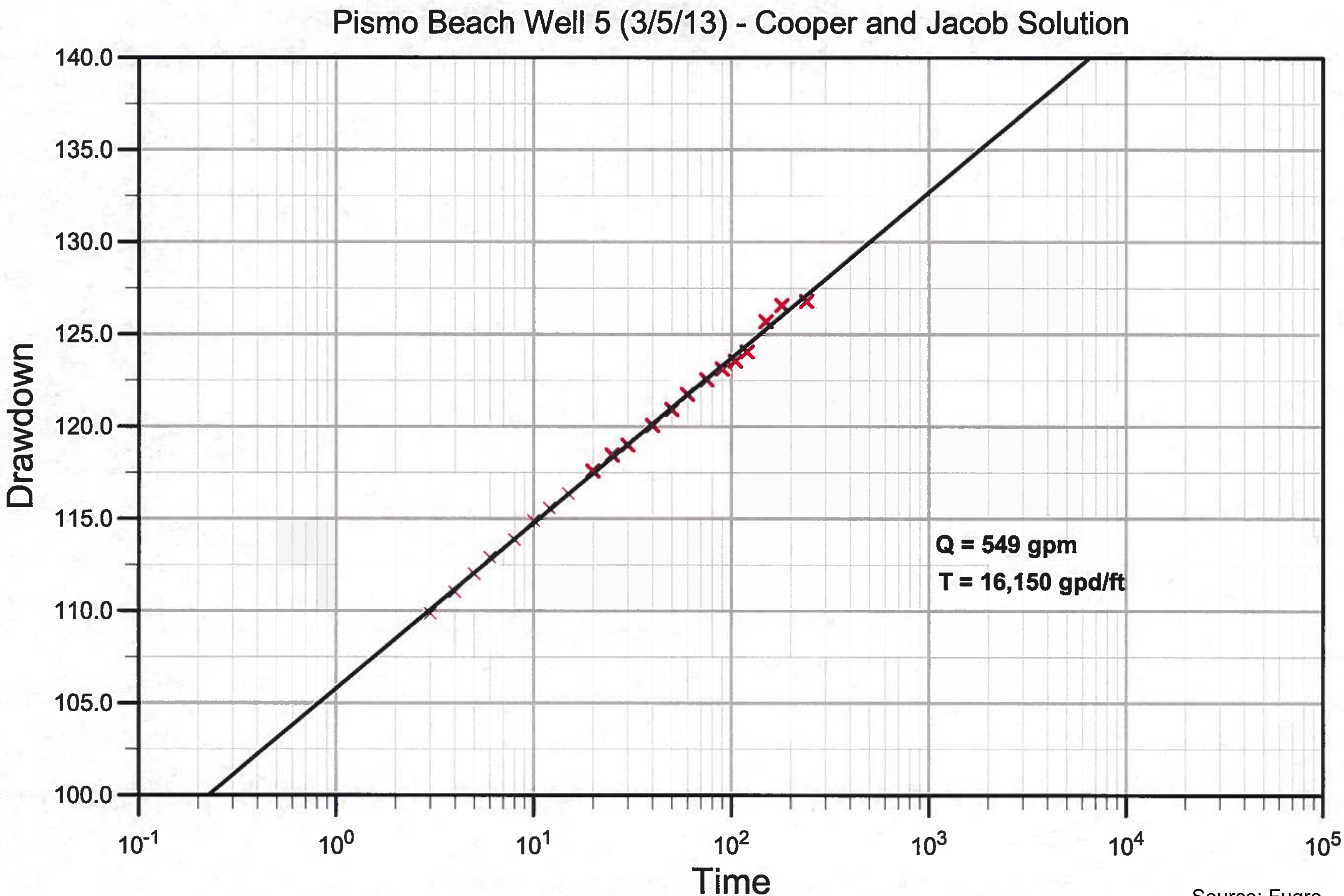
APPENDIX G
SUMMARY OF EXISTING PUMPING TEST DATA AND DATA PLOTS

Table G-1. Summary of Existing Pumping Test Data.

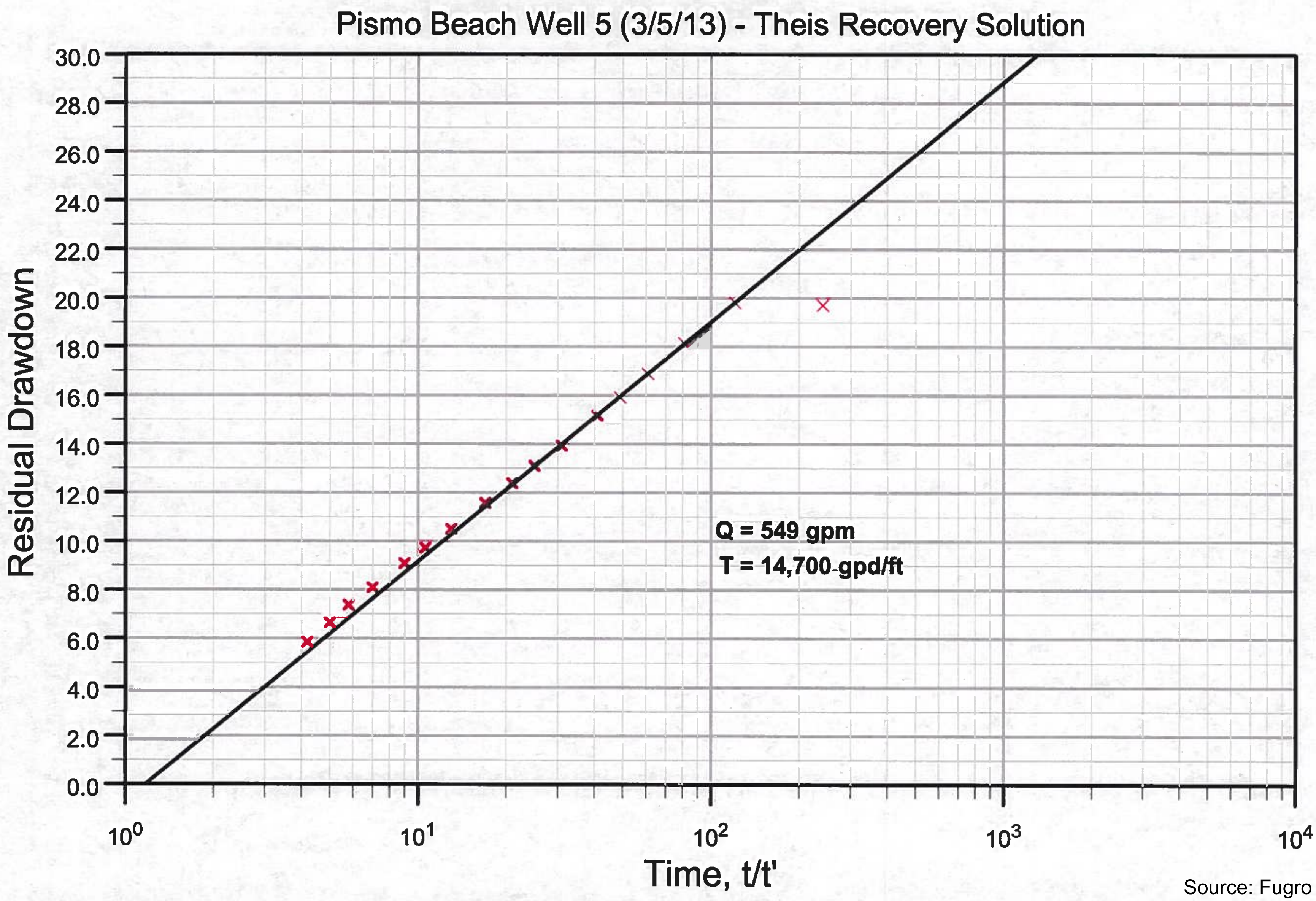
Owner	Well	Well Type	Well Log No.	T/R/S	Management Area	Test Date	Distance from Pumping Well (feet)	Total Depth (feet bgs)	Static Water Level (feet bgs)	Screen Interval (feet bgs)	Screen Length (feet)	Formation Screened	Pumping Rate (gpm)	Drawdown at End of Test (feet)	Pumping Water Level (feet bgs)	Maximum Drawdown (feet)	Specific Capacity (gpm/ft)	Aquifer Thickness (feet)	T (gpd/ft)	Solution	K (feet/day)	S
Pismo Beach	Well 5	Pumping	90023/78836	32S/13E-19Q2	NCMA	3/5/2013	0	500	50.19	150-500/159-454	295	QTpr/Tca	549	126.79	176.98	126.79	4.3	400	16,150	Cooper-Jacob	5	N/A
																		400	14,700	Theis Recovery	5	N/A
Pismo Beach	Well 23	Pumping	N/A	32S/13E-30K19	NCMA	7/12/1990	0	395	29.83	180-220,240-285, 315-375	145	Tca	1,000	81.42	111.25	81.42	12.3	350	34,900	Cooper-Jacob	13	N/A
						3/4/2013	0	395	14.42	202-220,240-285, 315-372	120	Tca	854	79.74	94.16	79.74	10.7	350	32,200	Cooper-Jacob	12	N/A
																		350	25,100	Theis Recovery	10	N/A
	Well 22	Observation	N/A	N/A	NCMA	3/4/2013	10	202	13.2	N/A	N/A	?	854	15.4	28.62	15.4		Unknown	30,400	Hantush	N/A	N/A
Pismo Beach	Well 9	Pumping	174229	32S/13E-19B	NCMA	12/30/1985	0	310	14.1	100-170, 180-300	190	Tpps	177	49.3	63.4	49.3	3.6	200	6,300	Cooper-Jacob	4	N/A
						7/13/2005	0	310	10.96	100-170, 180-300	190	Tpps	167	39.6	50.58	39.6	4.2	200	8,700	Cooper-Jacob	6	N/A
																		200	7,900	Theis Recovery	5	N/A
Pismo Beach	Well 10	Pumping	174325	32S/13E-18Q	NCMA	1/21/1986	0	440	50.4	140-195, 215-345, 355-430	260	Tpps	250	43.2	93.6	43.2	5.8	315	10,600	Cooper-Jacob	4	N/A
					NCMA	1/21/1986	0	440	50.4	140-195, 215-345, 355-430	260	Tpps	250	43.2	93.6	43.2	5.8	315	11,450	Theis Recovery	5	N/A
	Well 4	Observation	N/A	N/A	NCMA	1/21/1986	700	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Unknown	7,200	Theis	N/A	0.002
					NCMA	1/21/1986	700	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Unknown	10,200	Cooper-Jacob	N/A	0.002
	Well 9	Observation	N/A	N/A	NCMA	1/21/1986	1,400	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Unknown	11,800	Theis	N/A	0.0015
					NCMA	1/21/1986	1,400	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Unknown	18,700	Cooper-Jacob	N/A	0.001
	Wells 4, 9, 11	Observation	--	--	NCMA	1/21/1986	700-1,400	--	--	--	--	--	--	--	--	--	--	Unknown	15,900	Distance-Drawdown	N/A	0.001
	Well 10	Pumping	174325	32S/13E-18Q	NCMA	7/26/2005	0	440	47.68	140-195, 215-345, 355-430	260	Tpps	253	72.7	120.38	72.7	3.5	315	8,100	Cooper-Jacob	3	N/A
																		315	9,550	Theis Recovery	4	N/A
Grover Beach	Well 4	Pumping	22118	32S/13E-29E7	NCMA	10/31/1978	0	549	47	205-325, 343-363, 381-451, 469-529	270	Tca	1,600	127	174	127	12.6	340	28,000	Theis Recovery	11	N/A
	Test Well	Observation	N/A	N/A	NCMA	10/31/1978	15	N/A	N/A	N/A	N/A	Tca	1,025	N/A	N/A	N/A	N/A	N/A	40,000	Cooper-Jacob	16	N/A
Woodlands	Well 1 (Highway 1)	Pumping	402088	11S/35W-16J	NMMA	12/15/1993	0	690	246	389-680	291	QTpr	1,000	40	286	40	25.0	300	70,000	Cooper-Jacob	31	N/A
Woodlands	Dawn Rd.	Pumping	490963	11S/35W-15D	NMMA	7/7/1994	0	632	244	340-632	292	QTpr	1,200	51	295	51	23.5	310	85,600	Cooper-Jacob	37	N/A
Woodlands	Mesa Rd.	Pumping	490919	11N/35W-15R	NMMA	7/21/1994	0	582	237	360-572	212	QTpr	1,400	58	295	58	24.1	215	76,000	Cooper-Jacob	47	N/A
Woodlands	Homestead	Pumping	490922	11N/35W-22M	NMMA	8/4/1994	0	690	171	430-680	250	QTpr	1,400	80	251	80	17.5	260	27,300	Cooper-Jacob	14	N/A
Cypress Ridge	Well 4	Pumping	511080	11N/35W-4	NMMA	12/18/1997	0	400	273	340-390	50	QTpr	60	26.1	299.1	26.1	2.3	60	5,100	Cooper-Jacob	11	N/A
																		60	4,500	Theis Recovery	10	N/A
Cypress Ridge	Well 5	Pumping	511078	11N/35W-4	NMMA	1/5/1998	0	378	212.3	318-368	50	QTpr	55	73	285.3	73	0.8	80	5,825	Cooper-Jacob	10	N/A
Cypress Ridge	Well 6	Pumping	511086	11N/35W-4	NMMA	1/9/1998	0	430	254	340-420	80	QTpr	100	46.6	300.6	46.6	2.1	85	5,500	Cooper-Jacob	9	N/A
																		85	7,000	Theis Recovery	11	N/A
Cypress Ridge	Well 7	Pumping	511087	11N/35W-4	NMMA	1/12/1998	0	372	228.2	316-362	46	QTpr	55	69.2	297.4	69.2	0.8	45	1,470	Cooper-Jacob	4	N/A
																		45	750	Theis Recovery	2	N/A
Nipomo CSD	Black Lake 4	Pumping	276929	11N/35W-10G5	NMMA	6/27/1989	0	530	297	310-330; 350-410; 460-520	140	QTpr	350	69	366	69	5.1	220	6,800	Cooper-Jacob	4	N/A
																		200	15,200	Theis Recovery	10	N/A
Nipomo CSD	Bevington 2	Pumping	171358	11N/35W-11	NMMA	8/27/1985	0	590	300	330-570	240	QTpr/Tca	400	84	384	84	4.8	260	17,800	Cooper-Jacob	9	N/A
Nipomo CSD	WWTP MW-1	Pumping	90024	11N/34W-20	NMMA	10/17/2007	0	80	39.4	35-75	40	Qds	33	16.5	55.9	16.5	2.0	?	?	Cooper-Jacob	22 (*)	N/A
Nipomo CSD	WWTP MW-3	Pumping	90025	11N/34W-20	NMMA	10/19/2007	0	135	44.4	50-130	80	Qds	92	39.8	84.3	39.8	2.3	?	?	Cooper-Jacob	13 (*)	N/A
																				Theis Recovery	27 (*)	N/A

Notes:
? = unknown
N/A = not available
-- = see table for specific data for each well; drawdown data from each well plotted on distance-drawdown curve shown within Appendix
(*) = data from Fugro, 2008, Task 2 Memorandum, Assessment of the Potential for Extracting Discharge Water from Beneath the Southland Wastewater Treatment Facility, prepared for Nipomo Community Services District

Footnote: Refer to Section 8.2.3 of the report for a discussion of T and K values

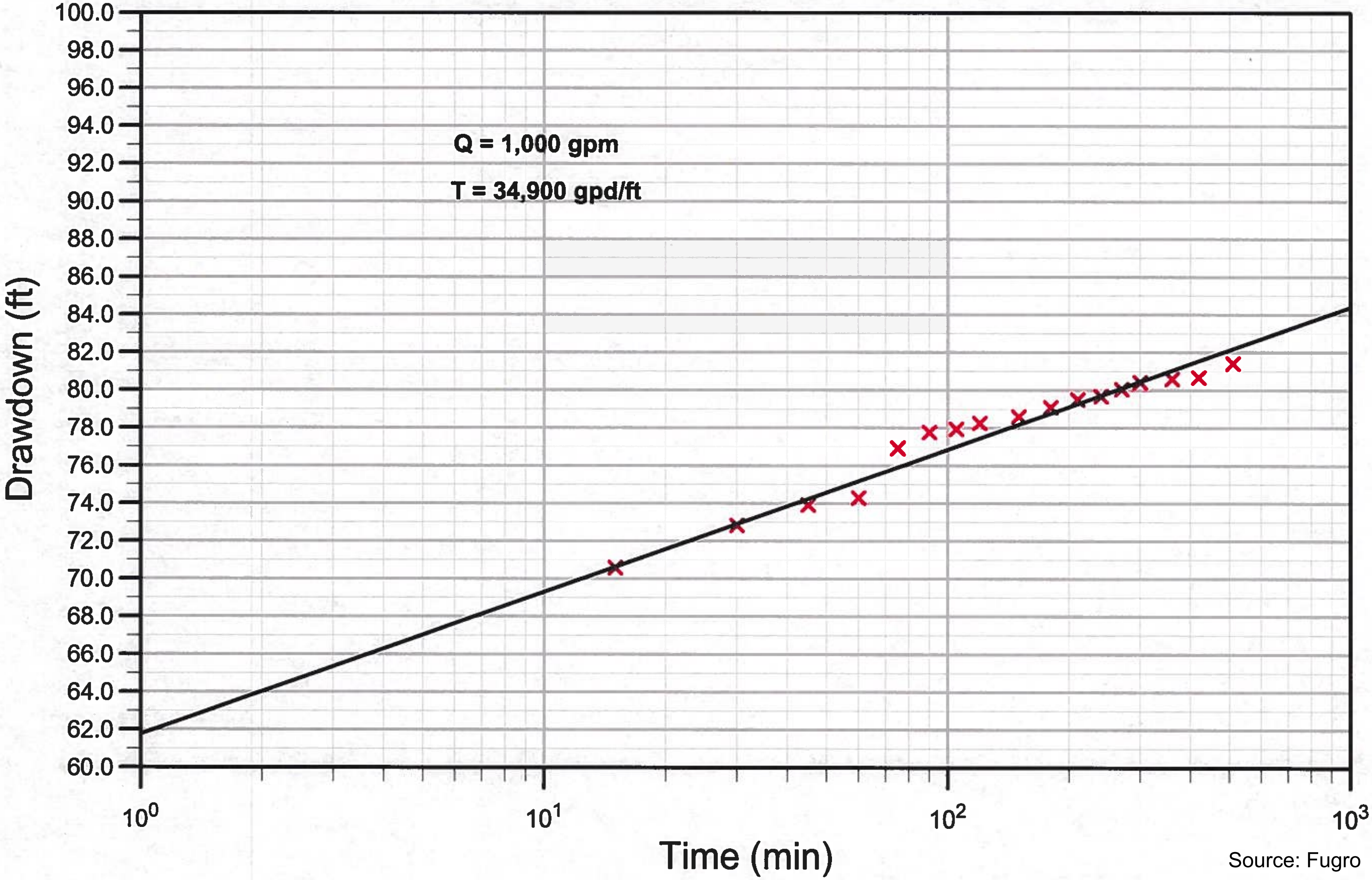


Source: Fugro



Source: Fugro

Pismo Beach Well 23 Pumping Test (7/12/90): Well 10 Cooper and Jacob Solution



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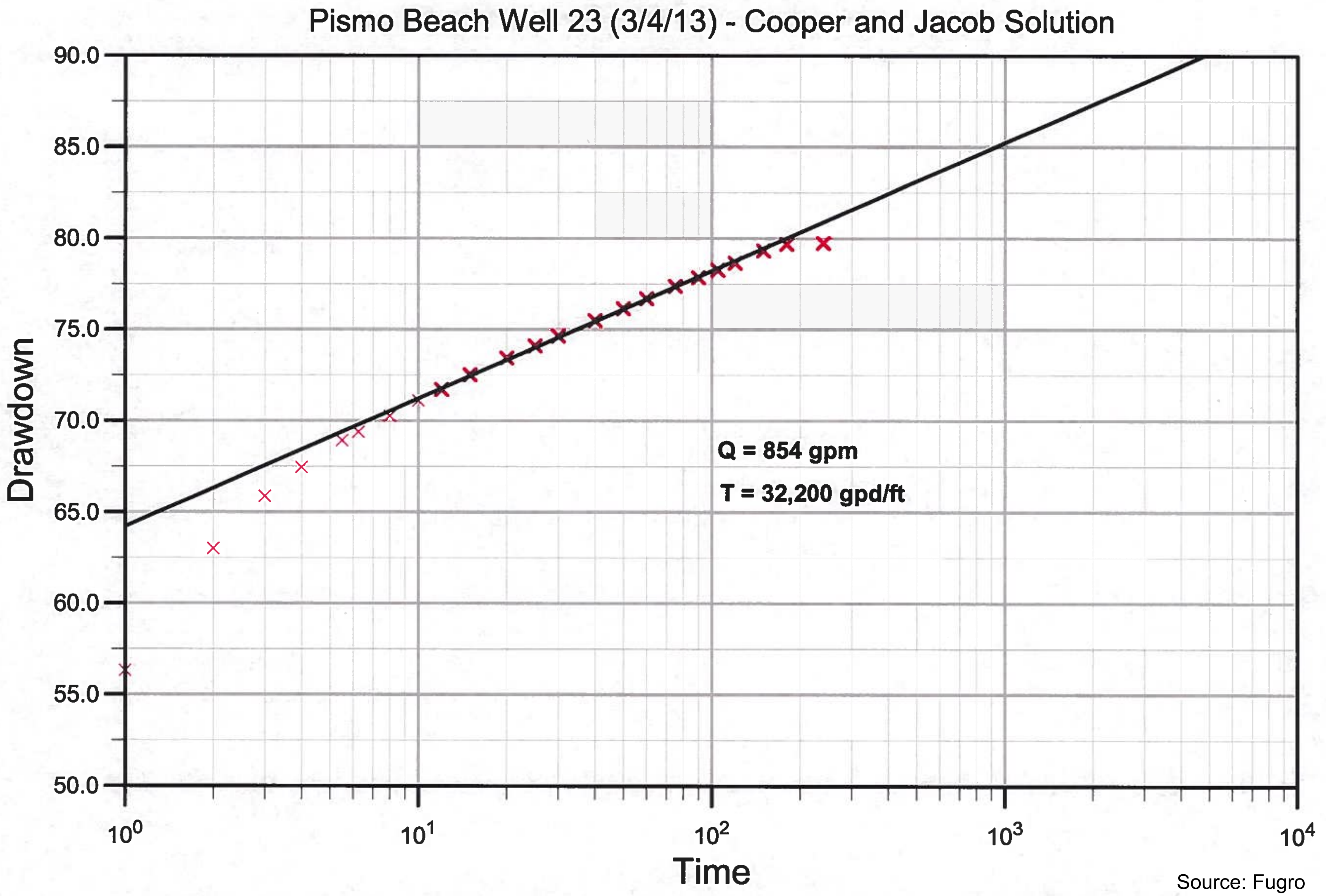

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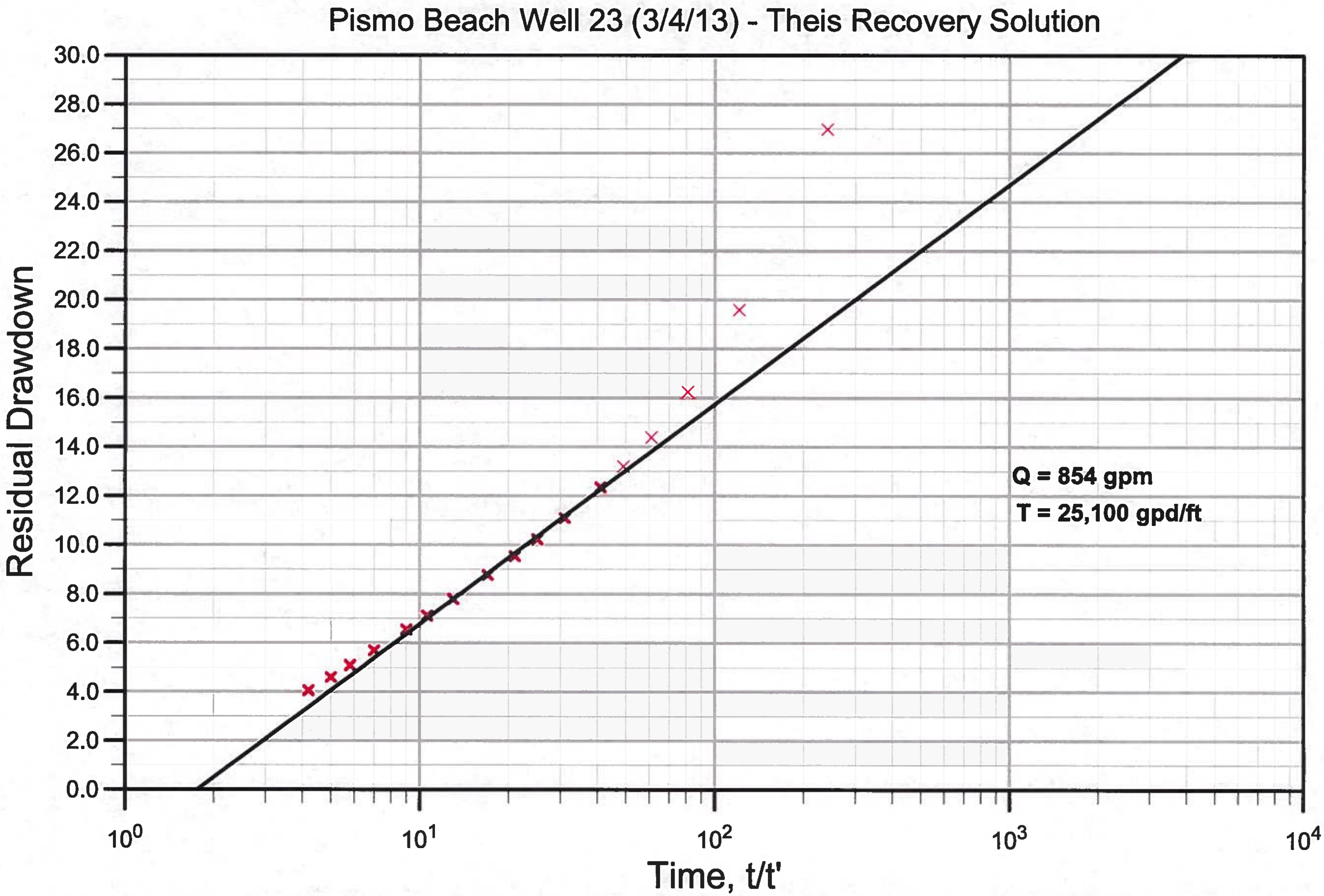

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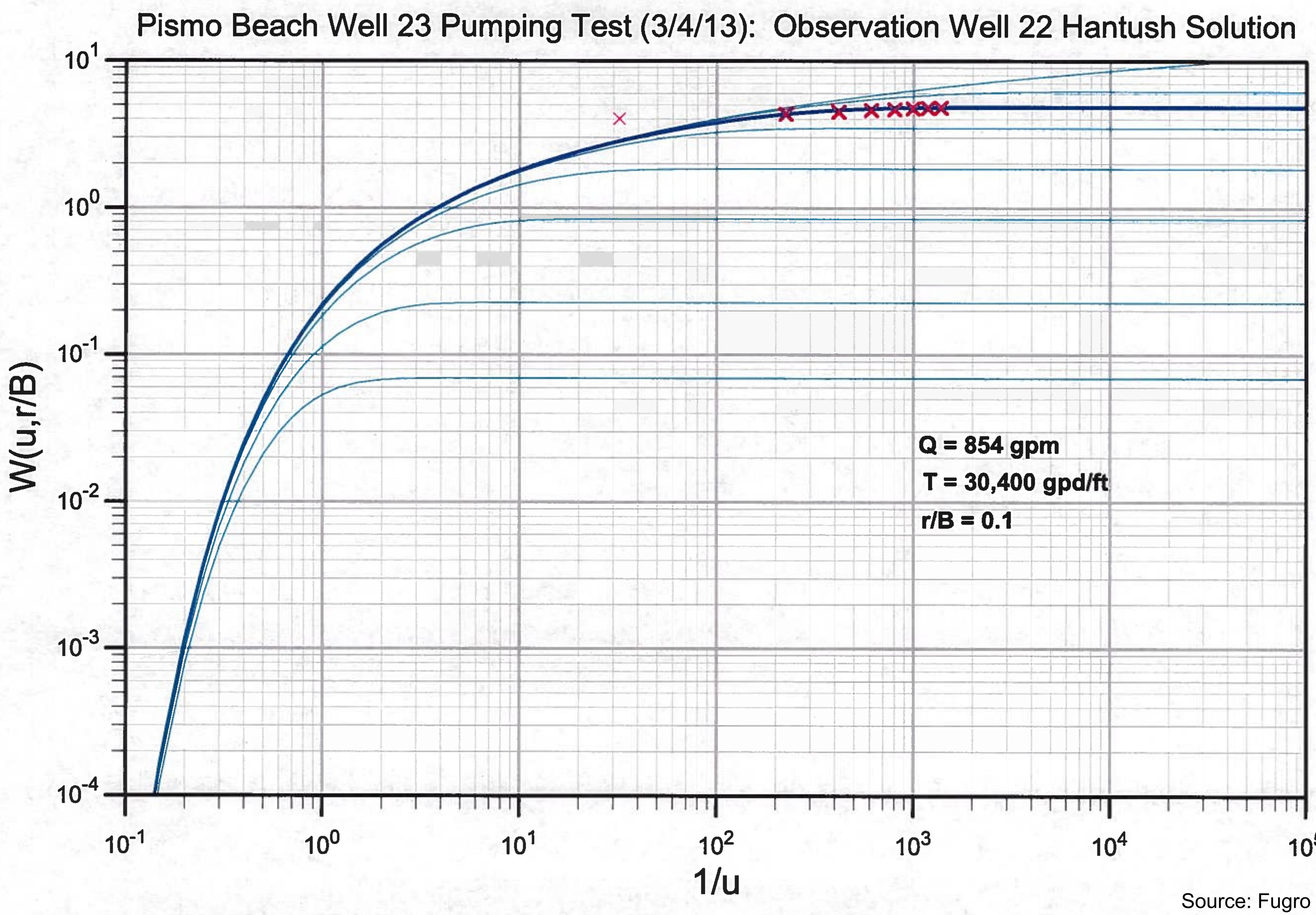
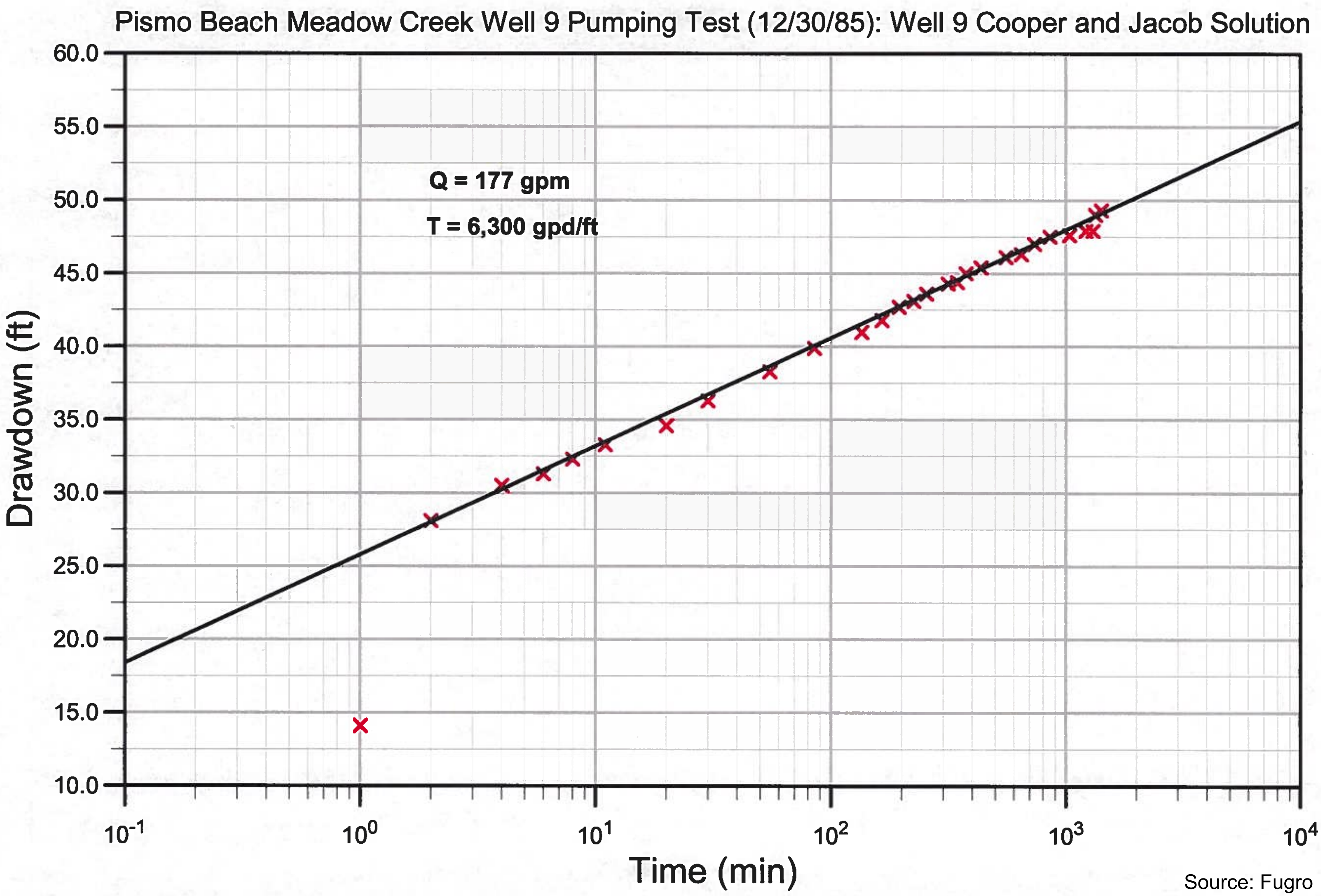

Pismo Beach Well 23 Pumping Test (3/4/13): Observation Well 22 Hantush Solution
W(u,r/B)
1/u
Q = 854 gpm
T = 30,400 gpd/ft
r/B = 0.1
Source: Fugro



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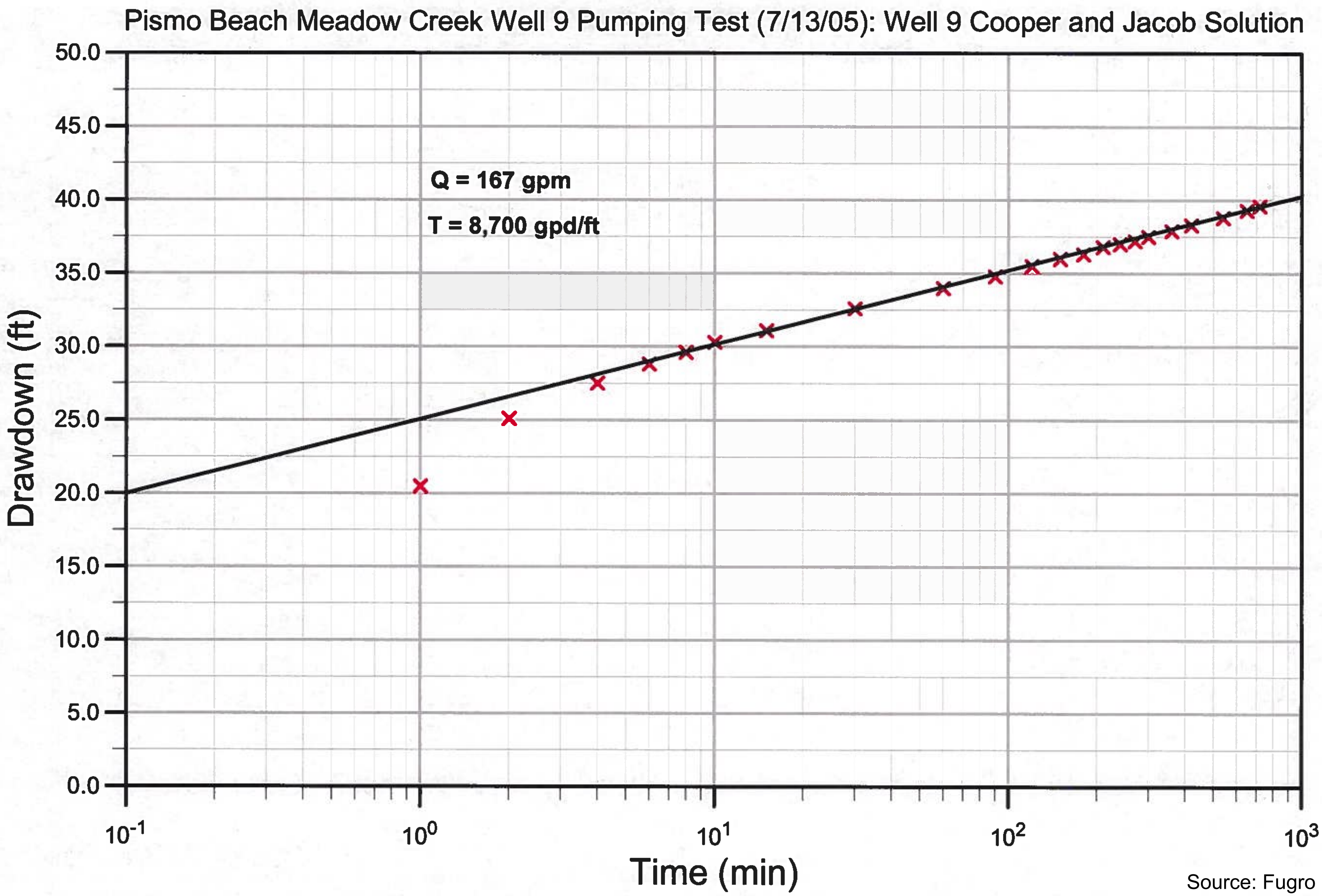

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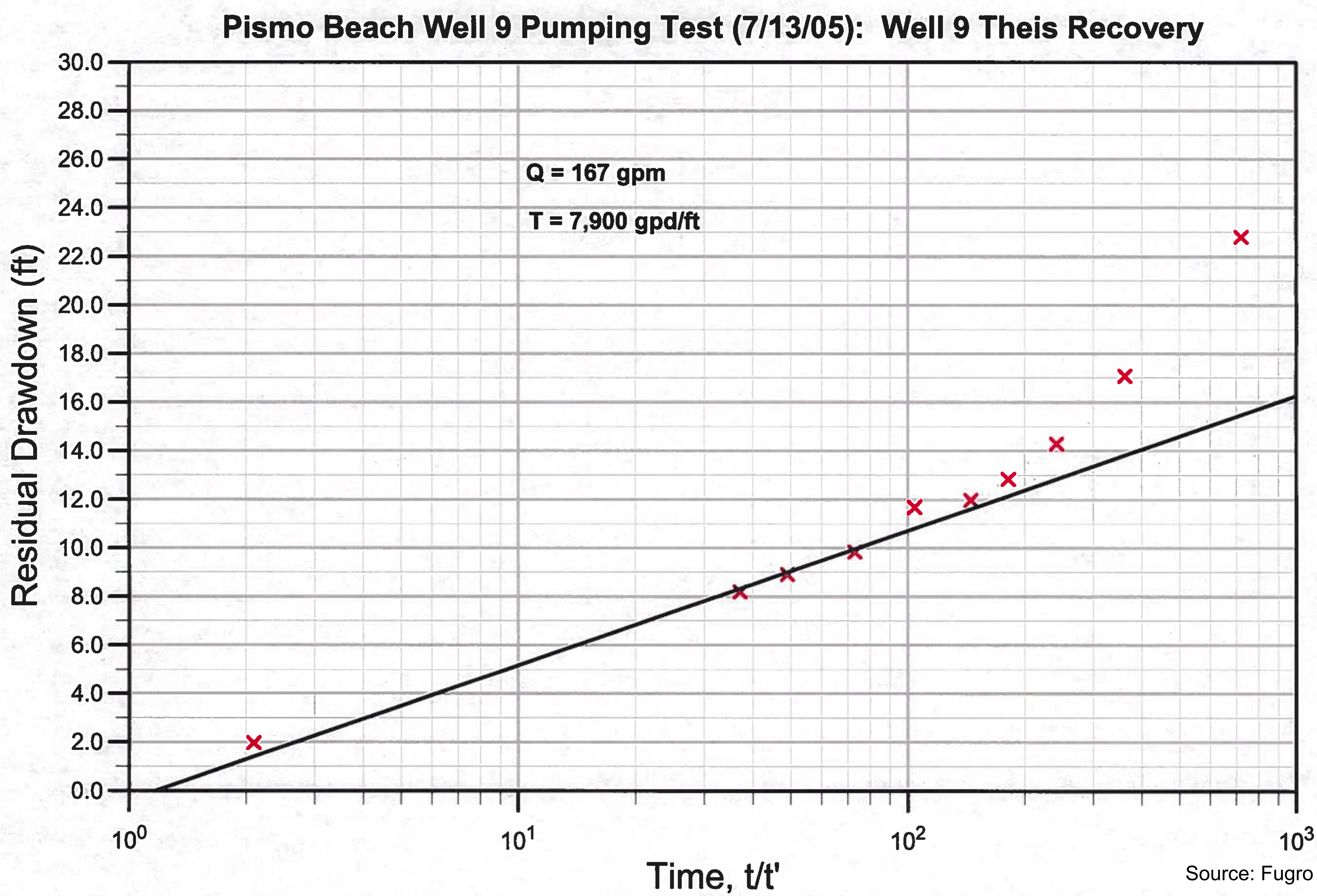
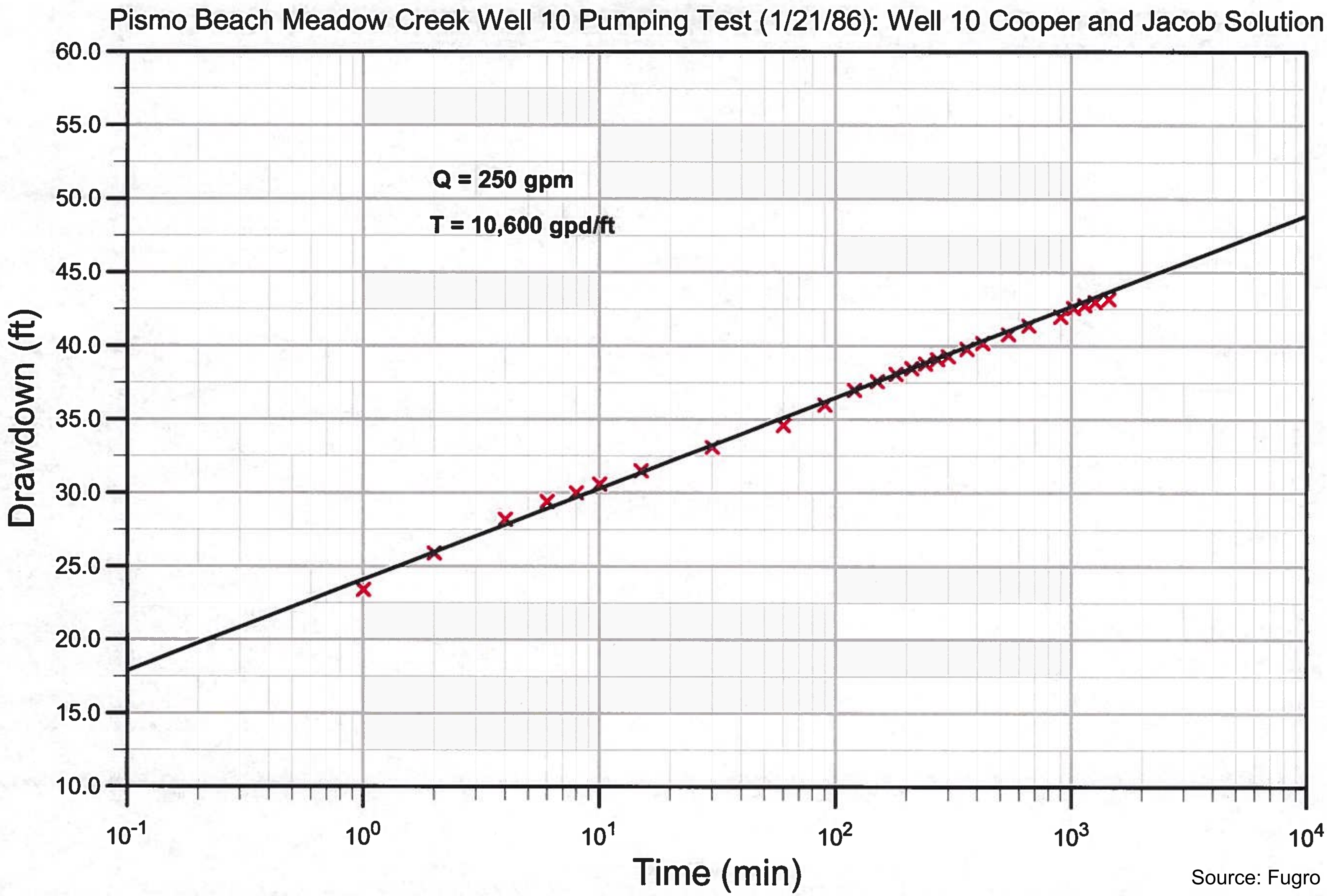


Source: Fugro



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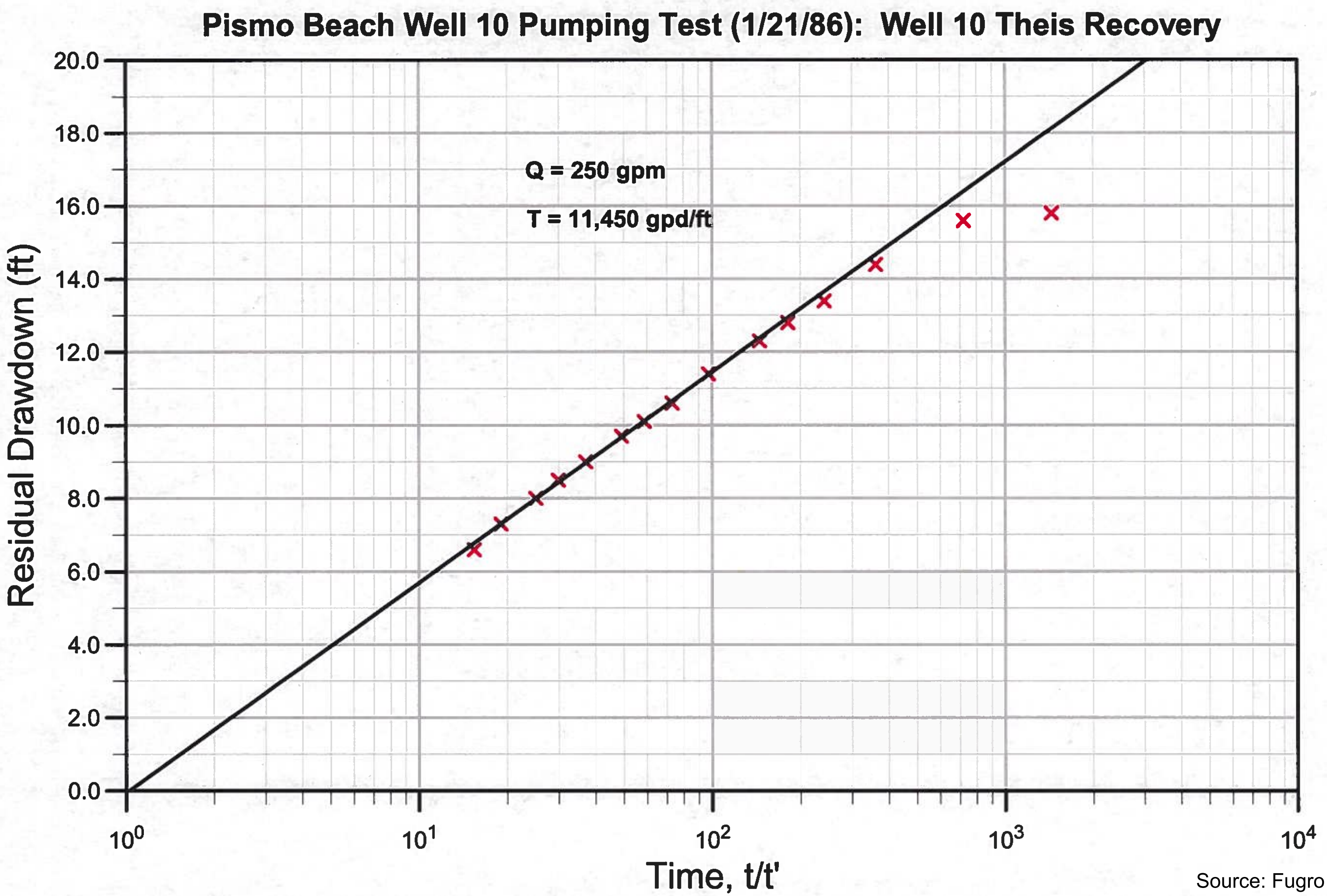
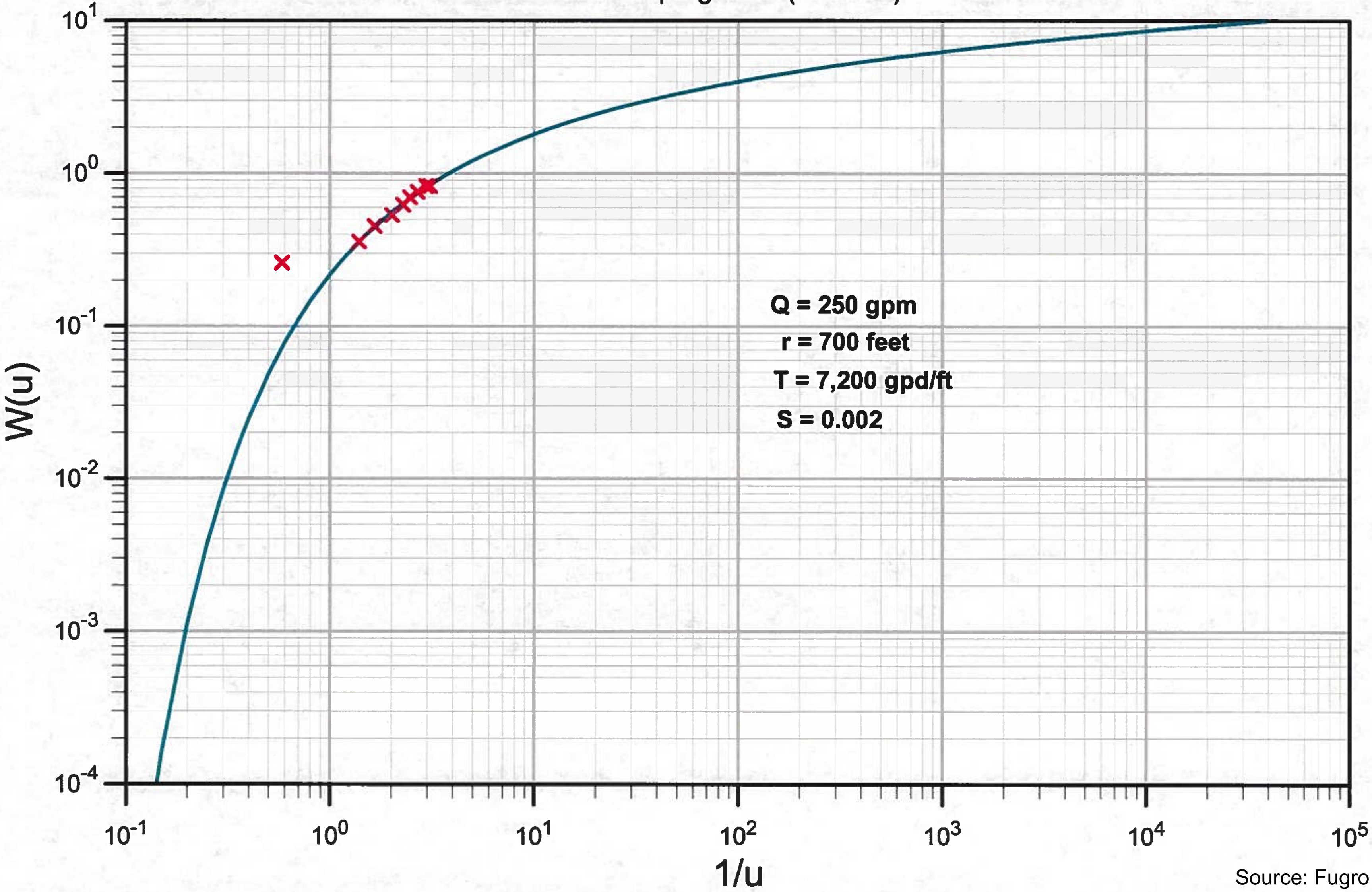


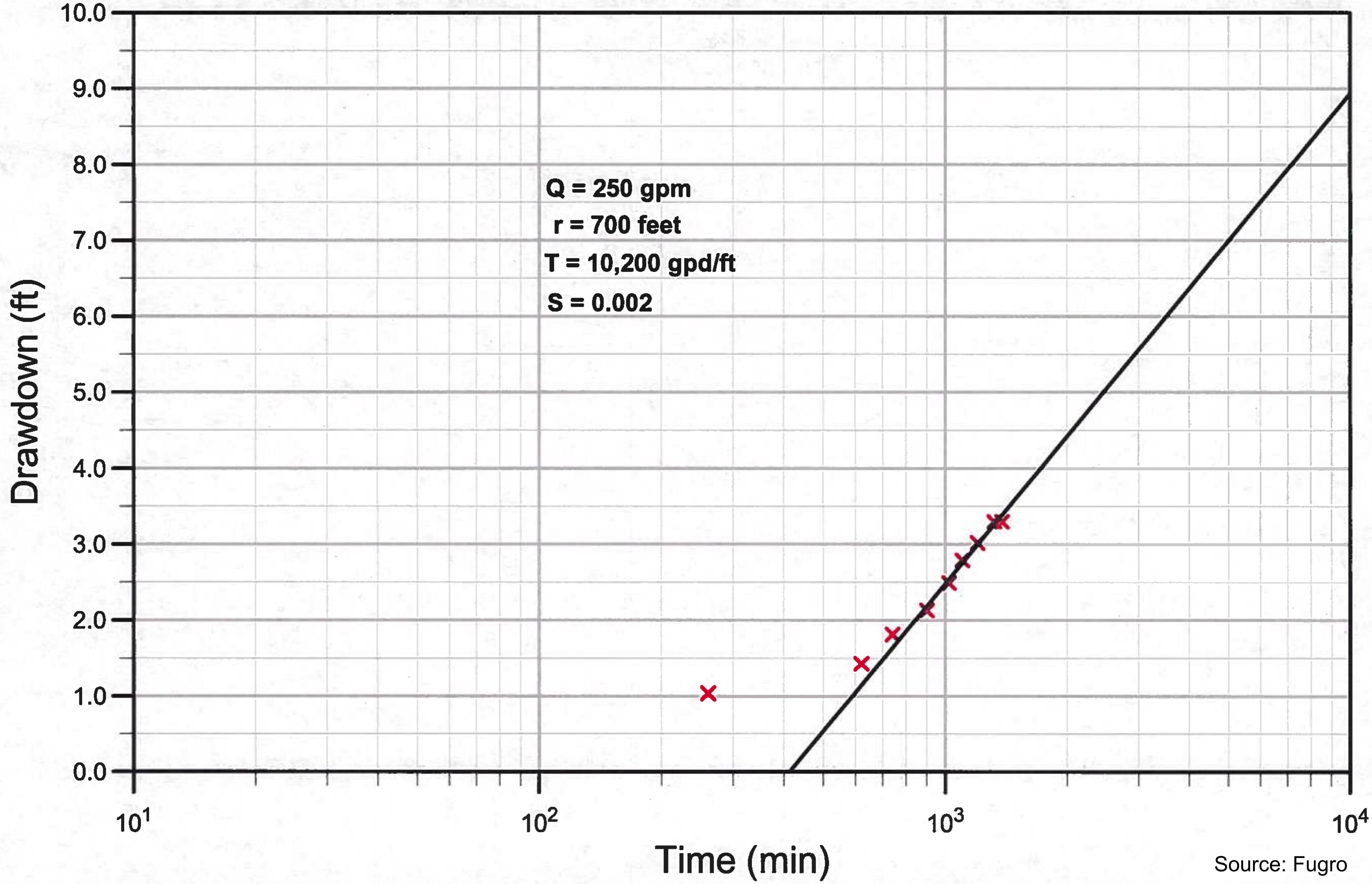
Source: Fugro

Pismo Beach Meadow Creek Well 10 Pumping Test (1/21/86): Observation Well 4 Theis Solution



Source: Fugro

Pismo Beach Meadow Creek Well 10 Pumping Test (1/21/86): Observation Well 4 Cooper-Jacob Solution



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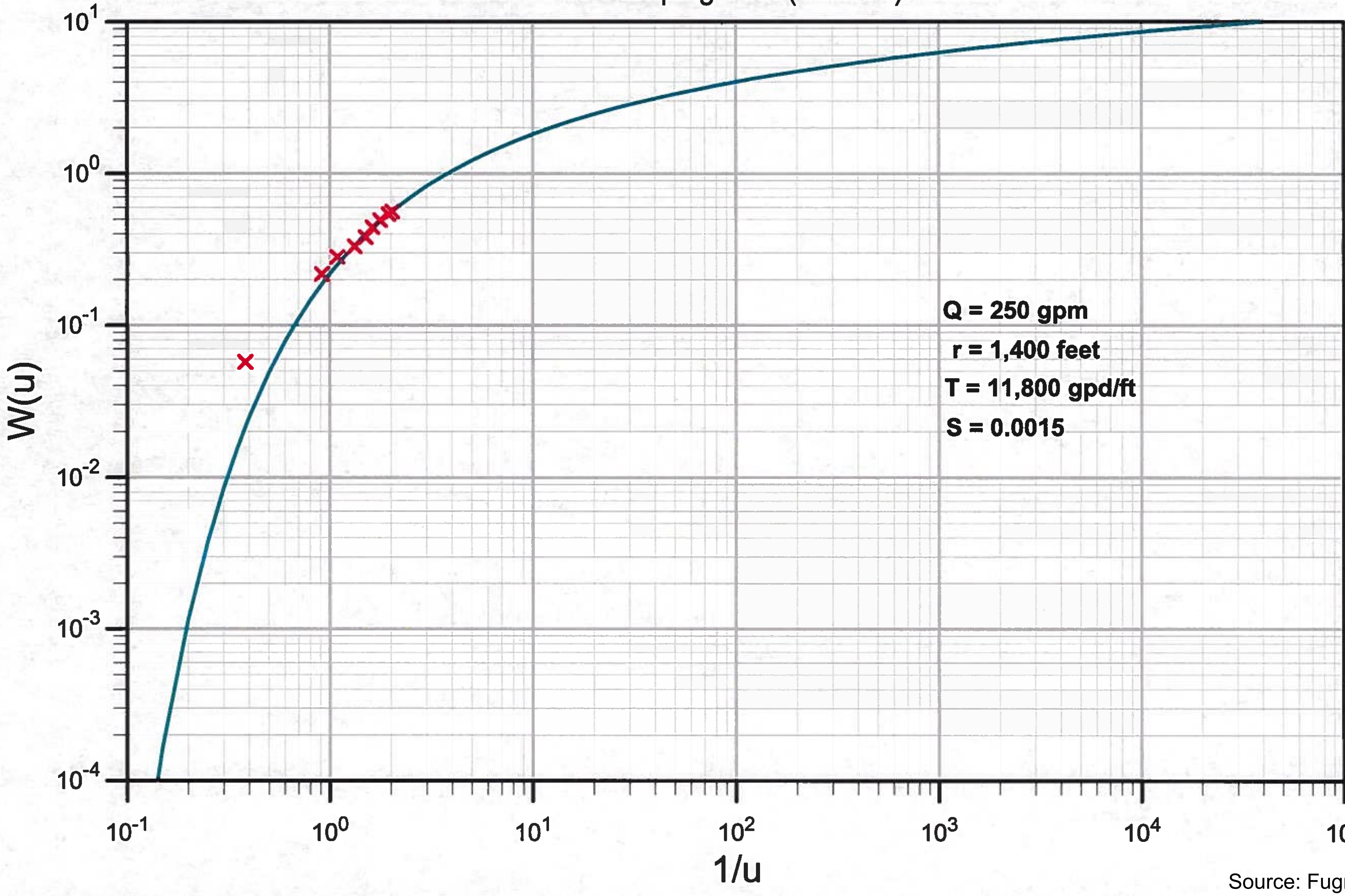
Pismo Beach Meadow Creek Well 10 Pumping Test (1/21/86): Observation Well 9 Theis Solution



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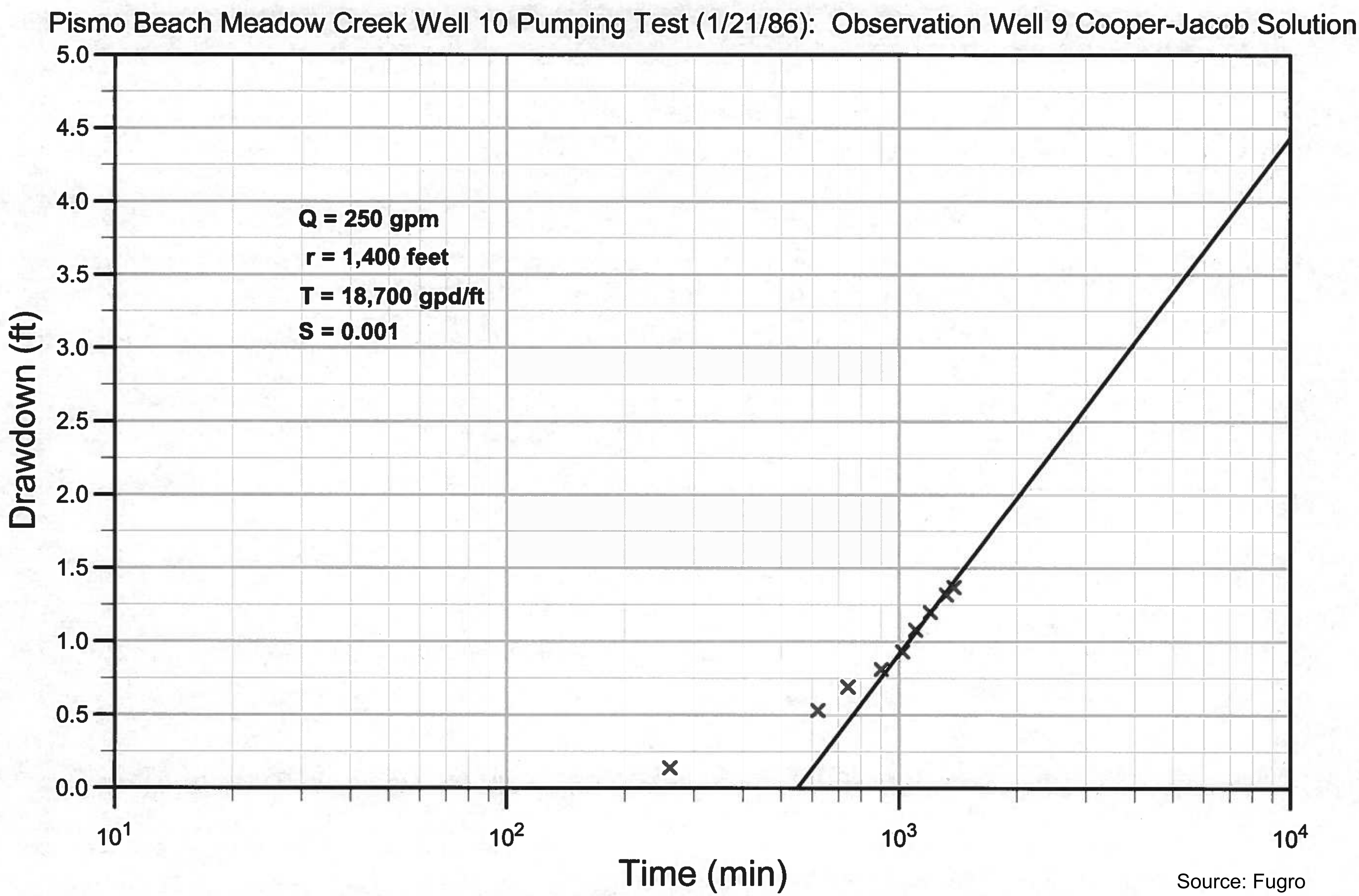

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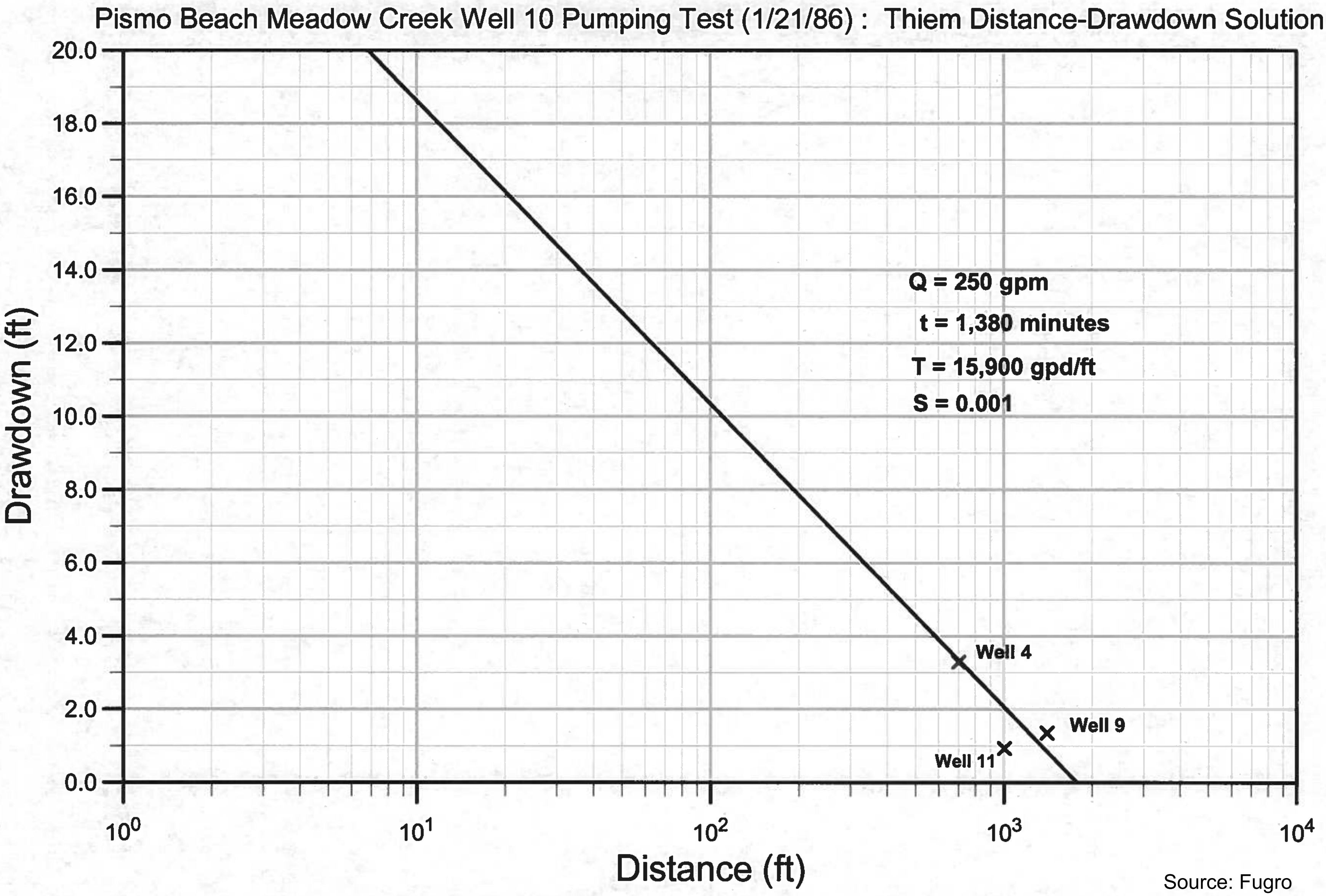
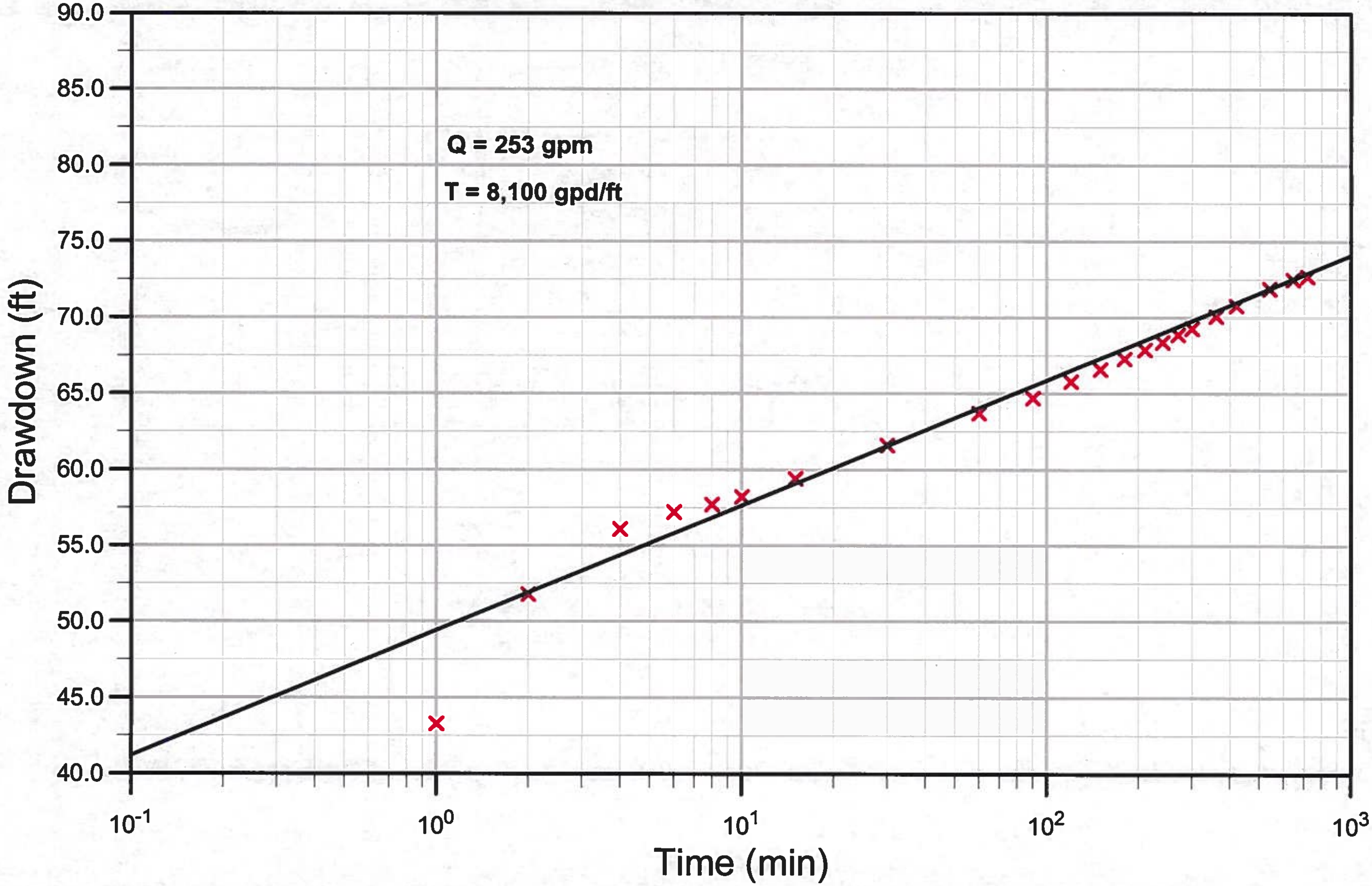
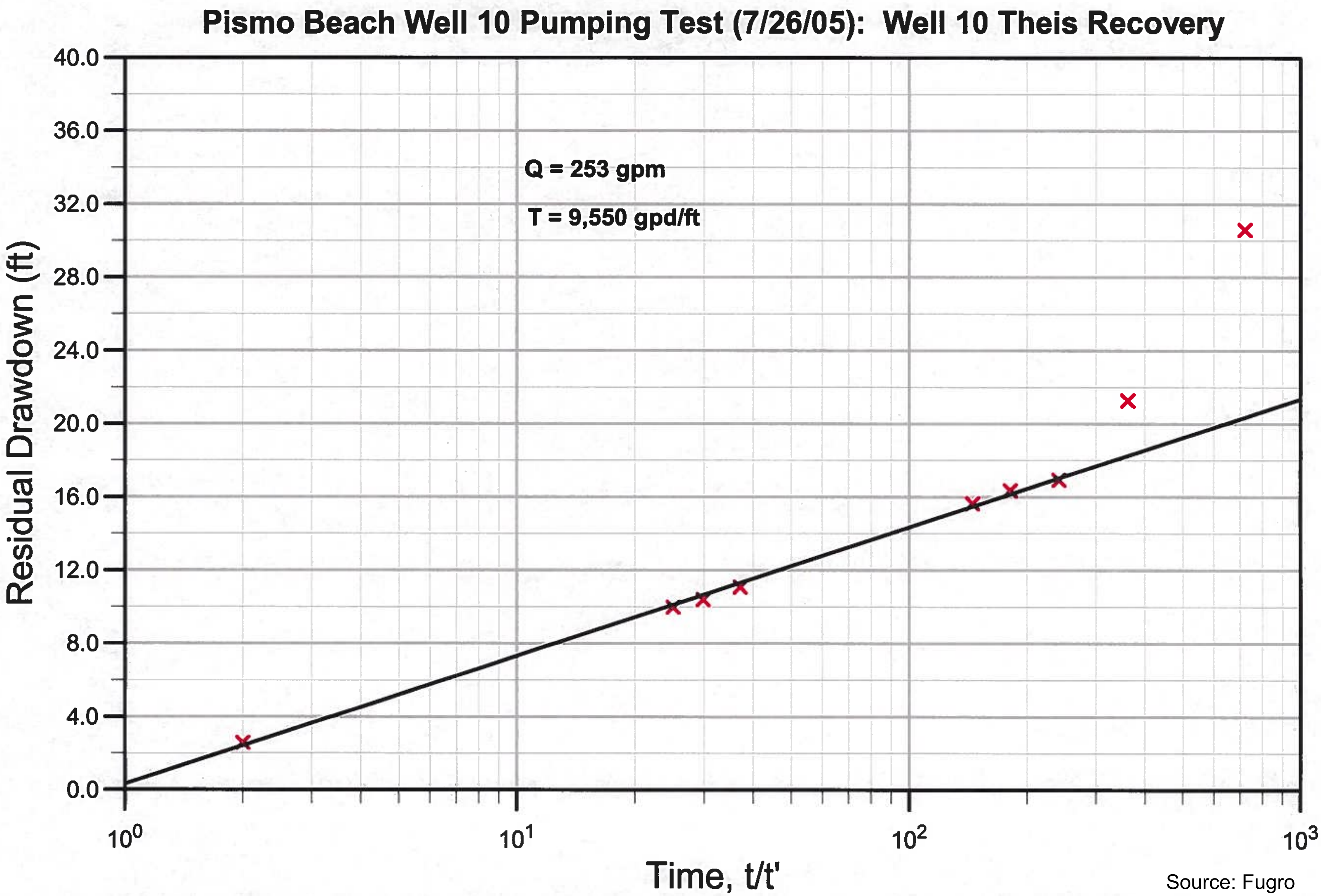


Source: Fugro

Pismo Beach Meadow Creek Well 10 Pumping Test (7/26/05): Well 10 Cooper and Jacob Solution

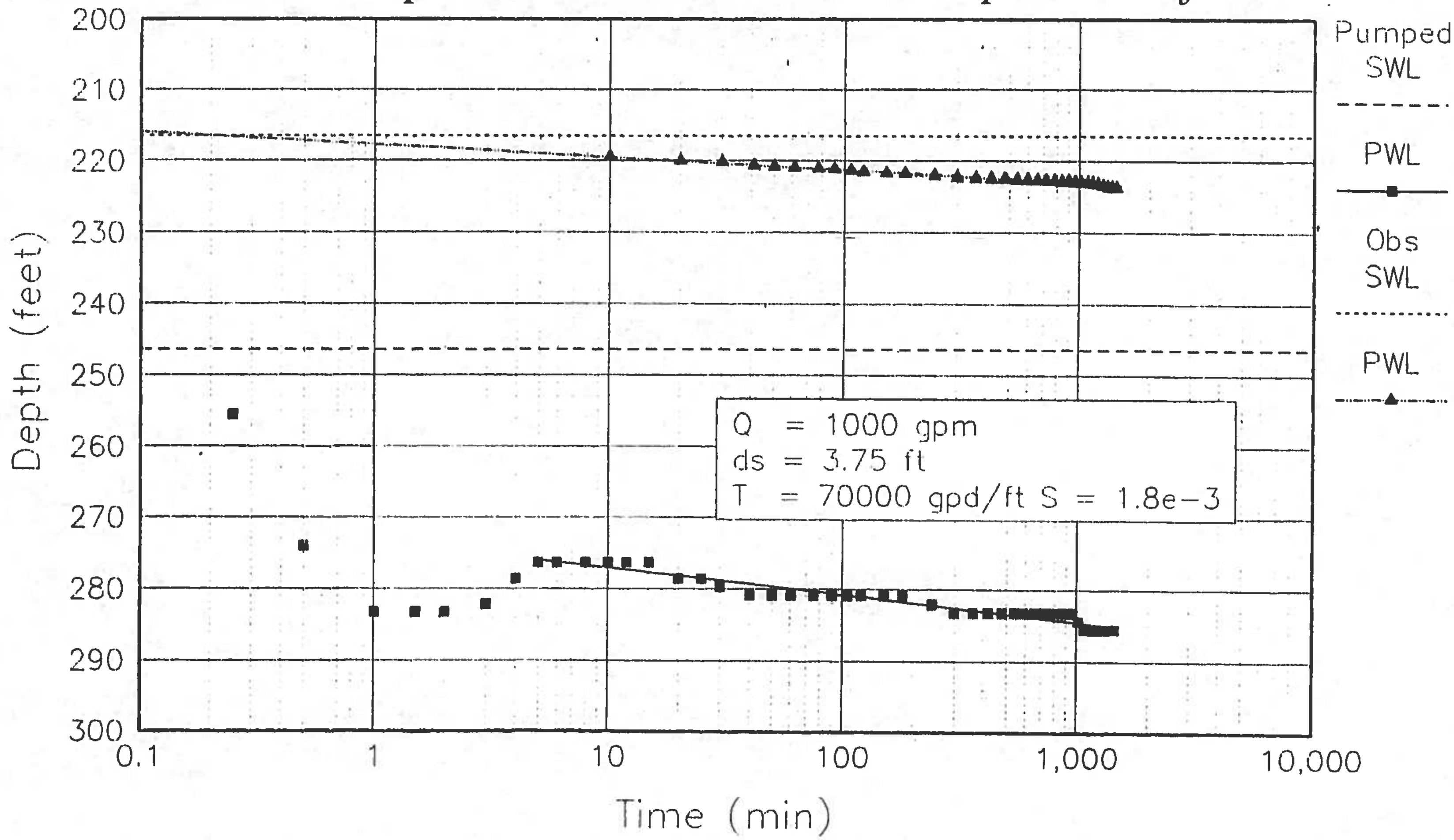


Source: Fugro



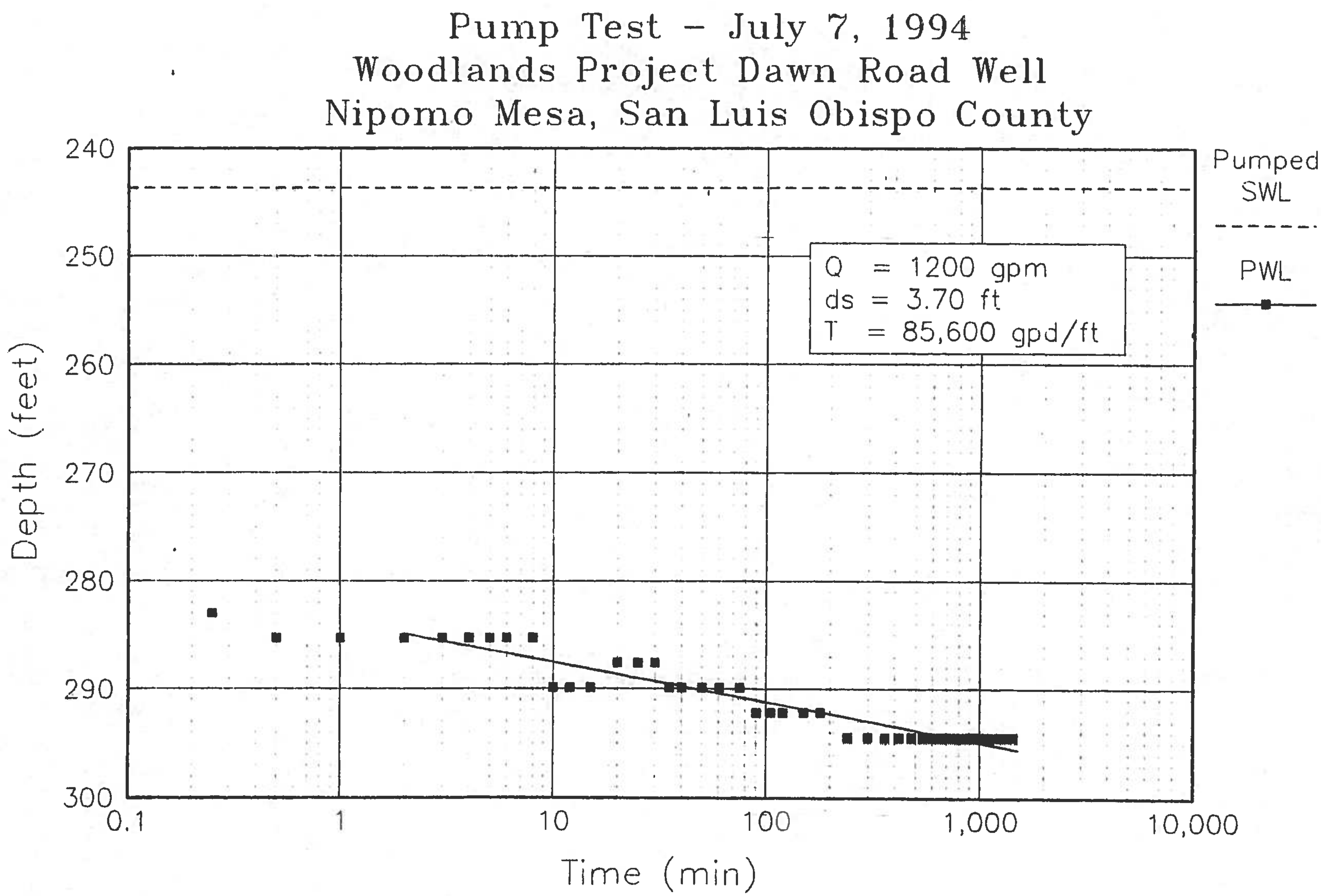
Source: Fugro

Pump Test - December 15, 1993
Woodlands Project Production Well 1
Nipomo Mesa, San Luis Obispo County



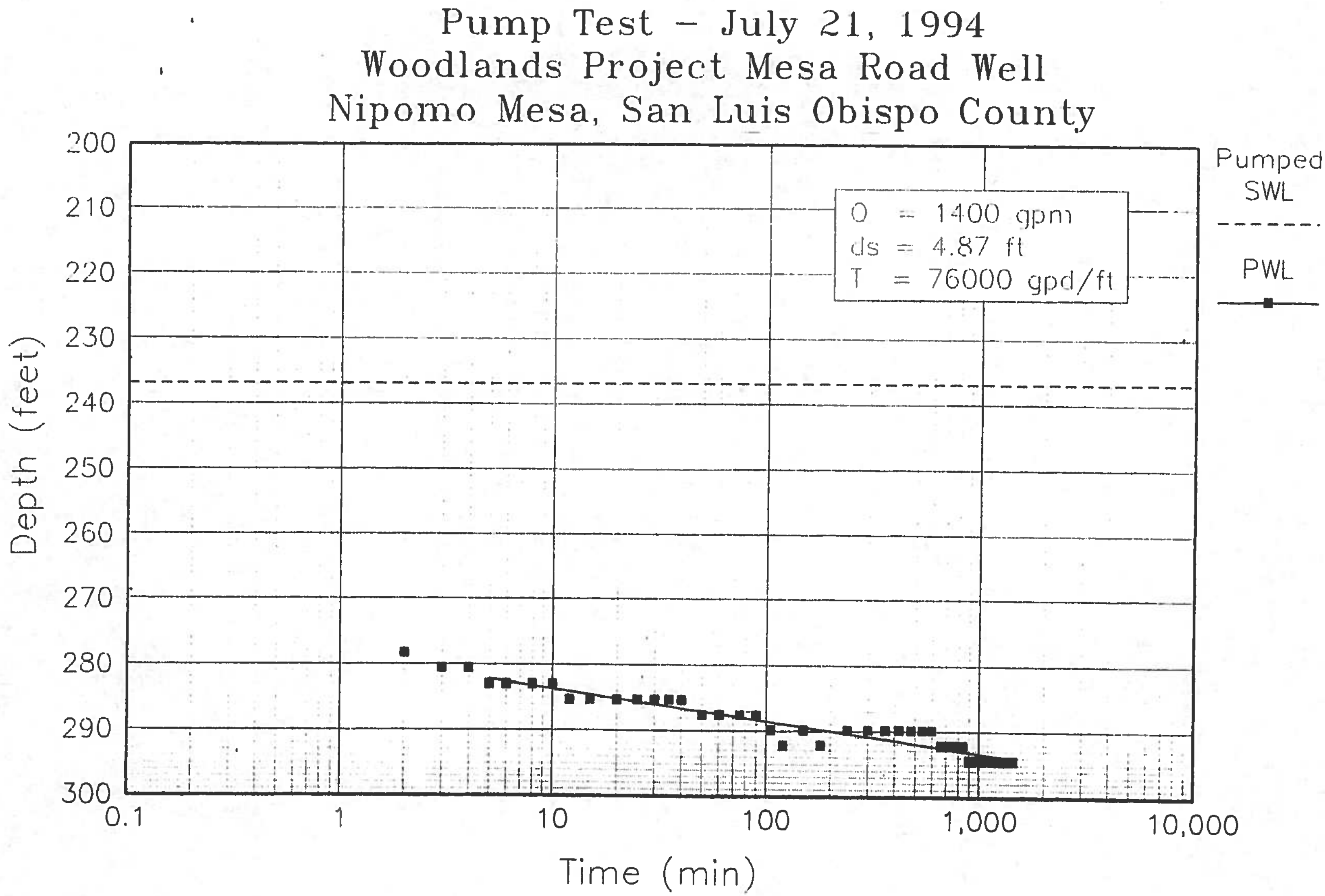
Total Depth Completed 690 feet
Perforated Zone 390 - 680 feet
Pump Set at 505 feet

Source: Cleath



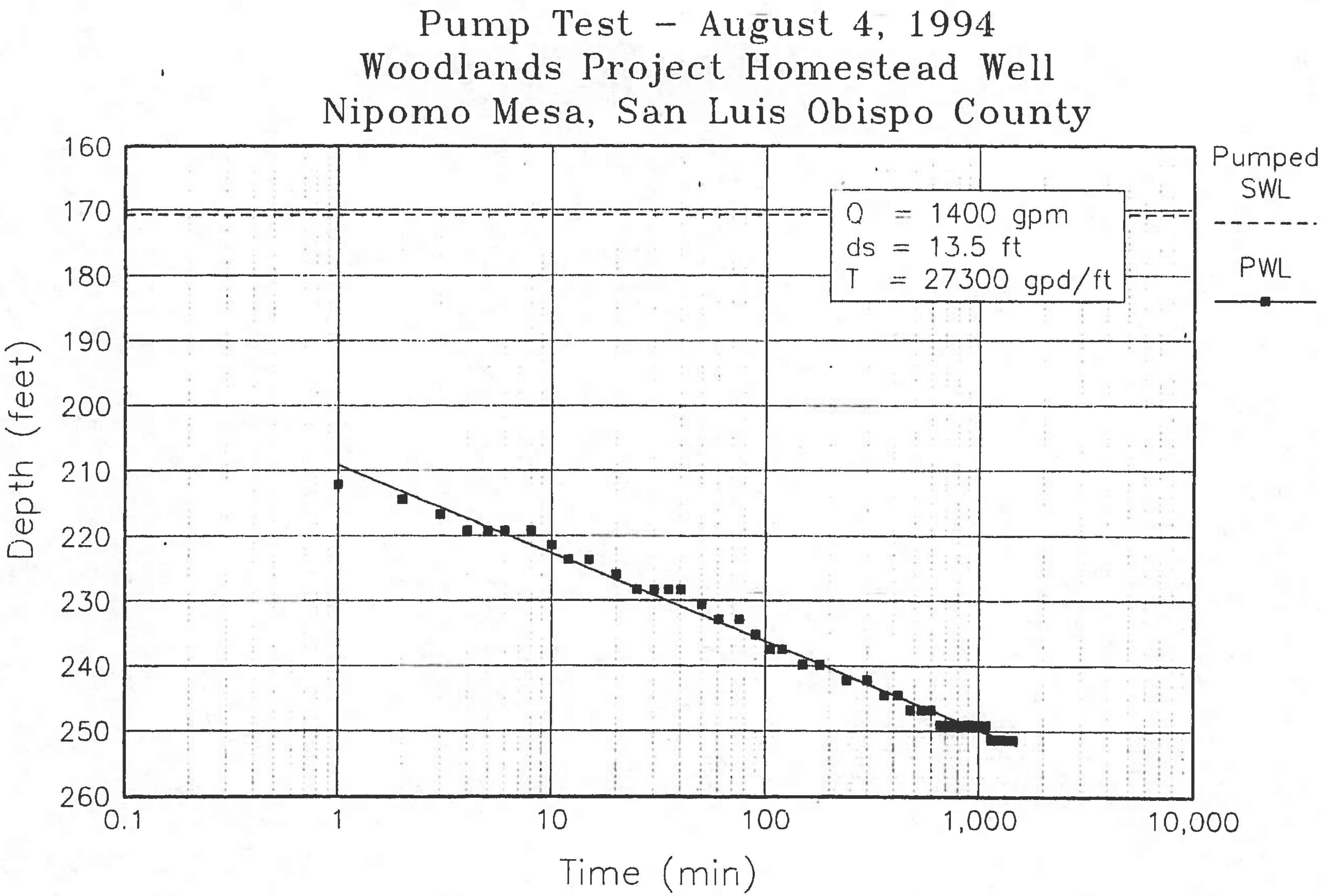
Total Depth Completed 690 feet
Perforated Zone 390 - 680 feet
Pump Set at 505 feet

Source: Cleath



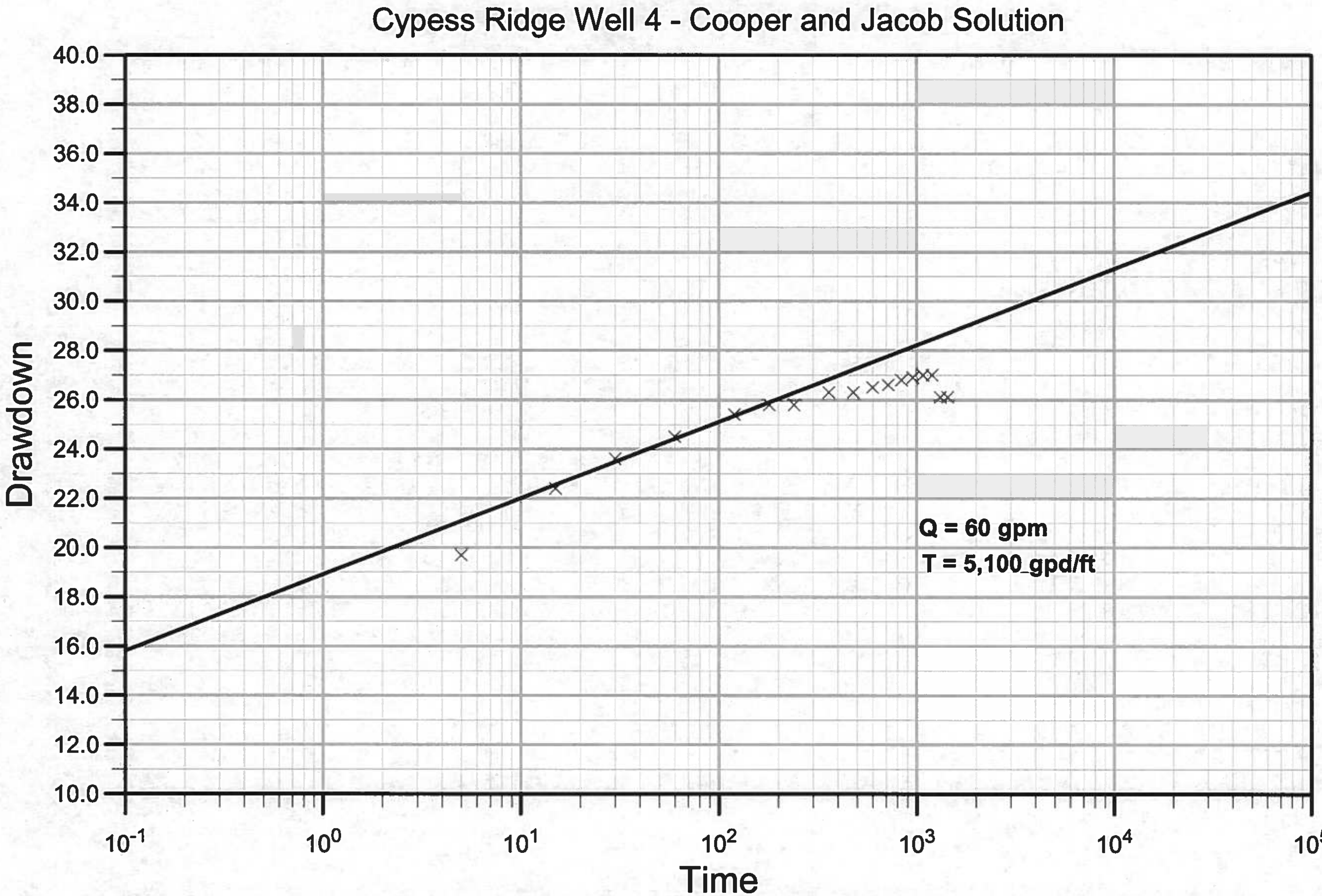
Total Depth Completed 580 feet
Perforated Zone 360 – 570 feet
Pump Set at 410 feet

Source: Cleath

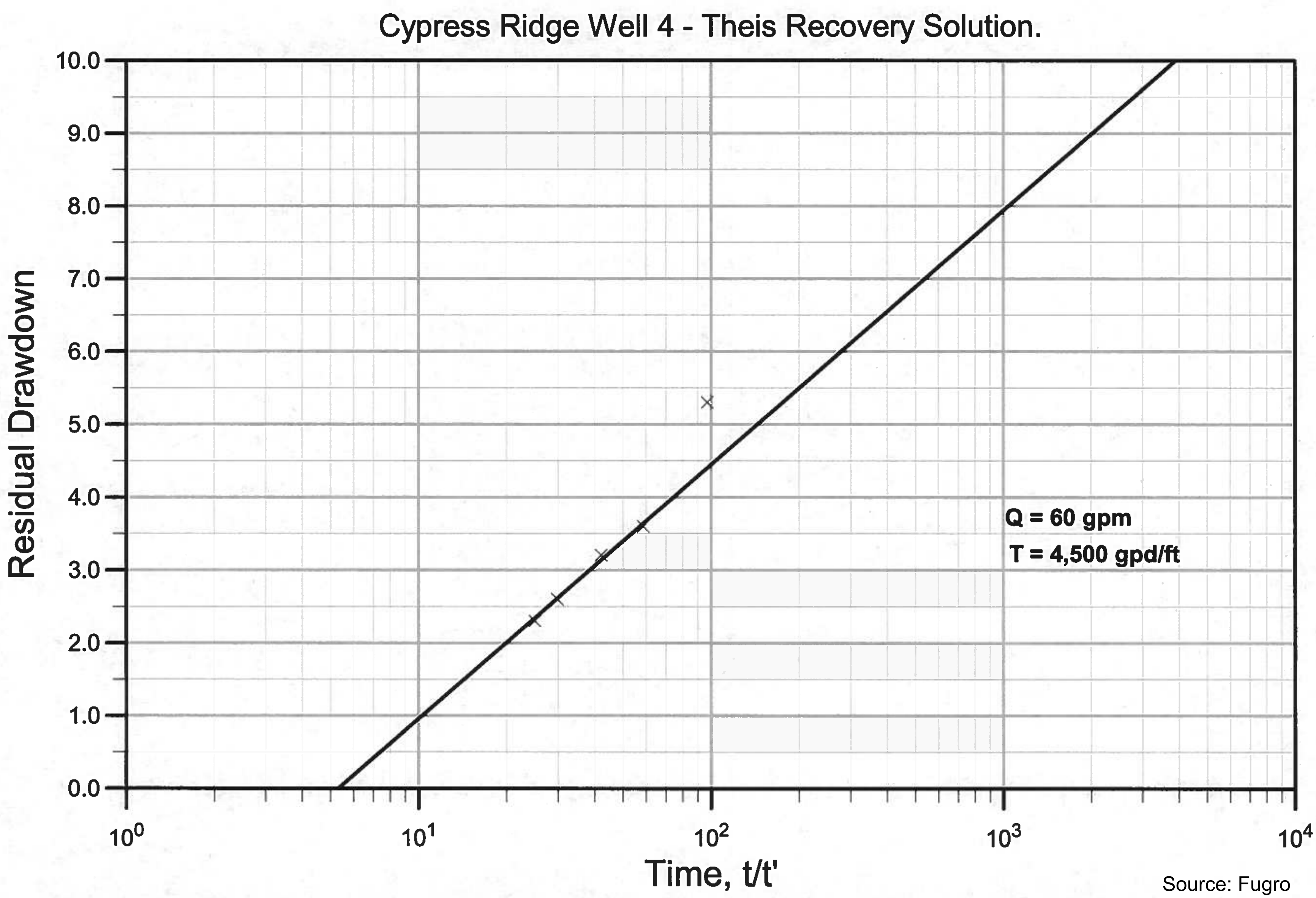


Total Depth Completed 690 feet
Perforated Zone 430 – 680 feet
Pump Set at 390 feet

Source: Cleath



Source: Fugro



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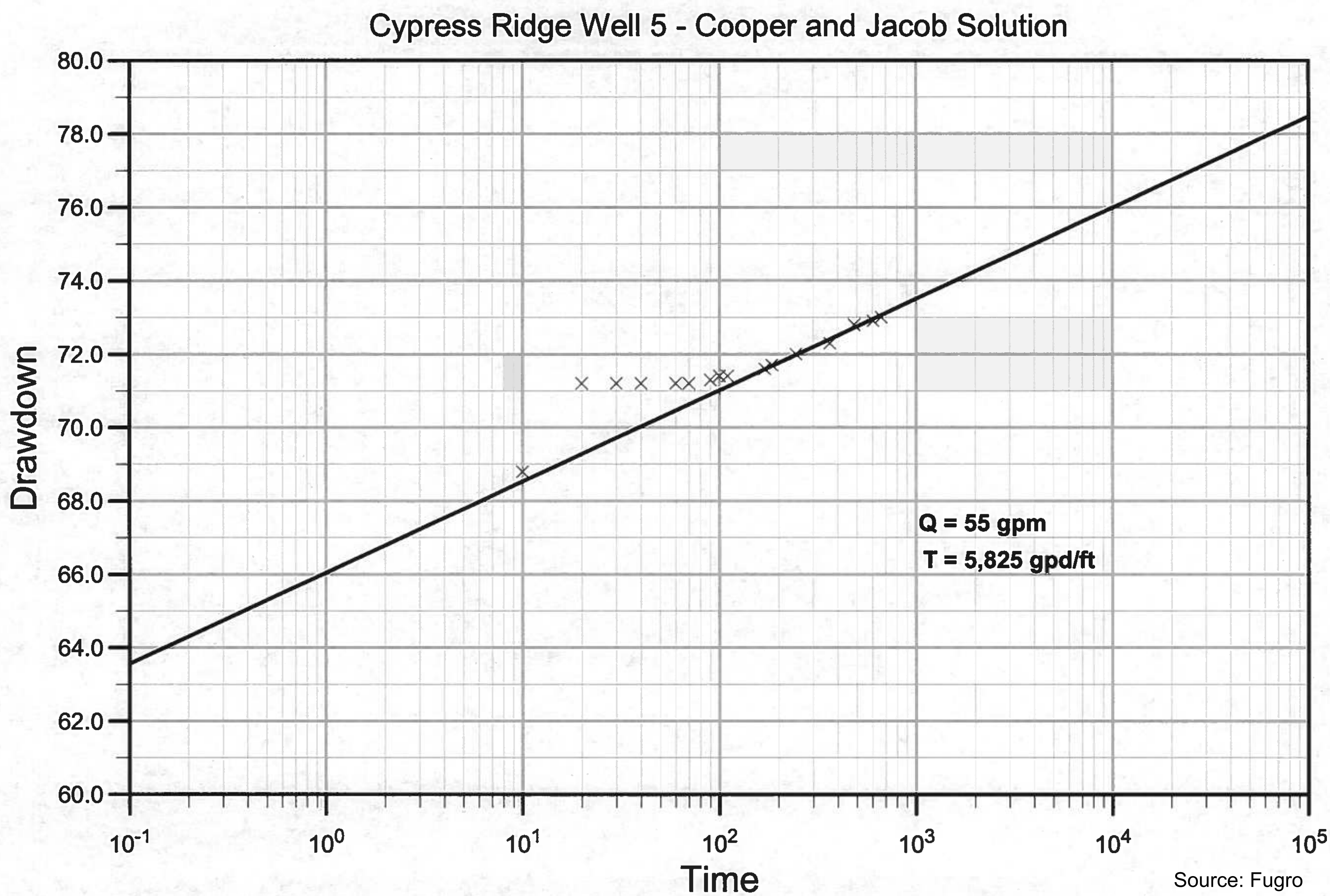
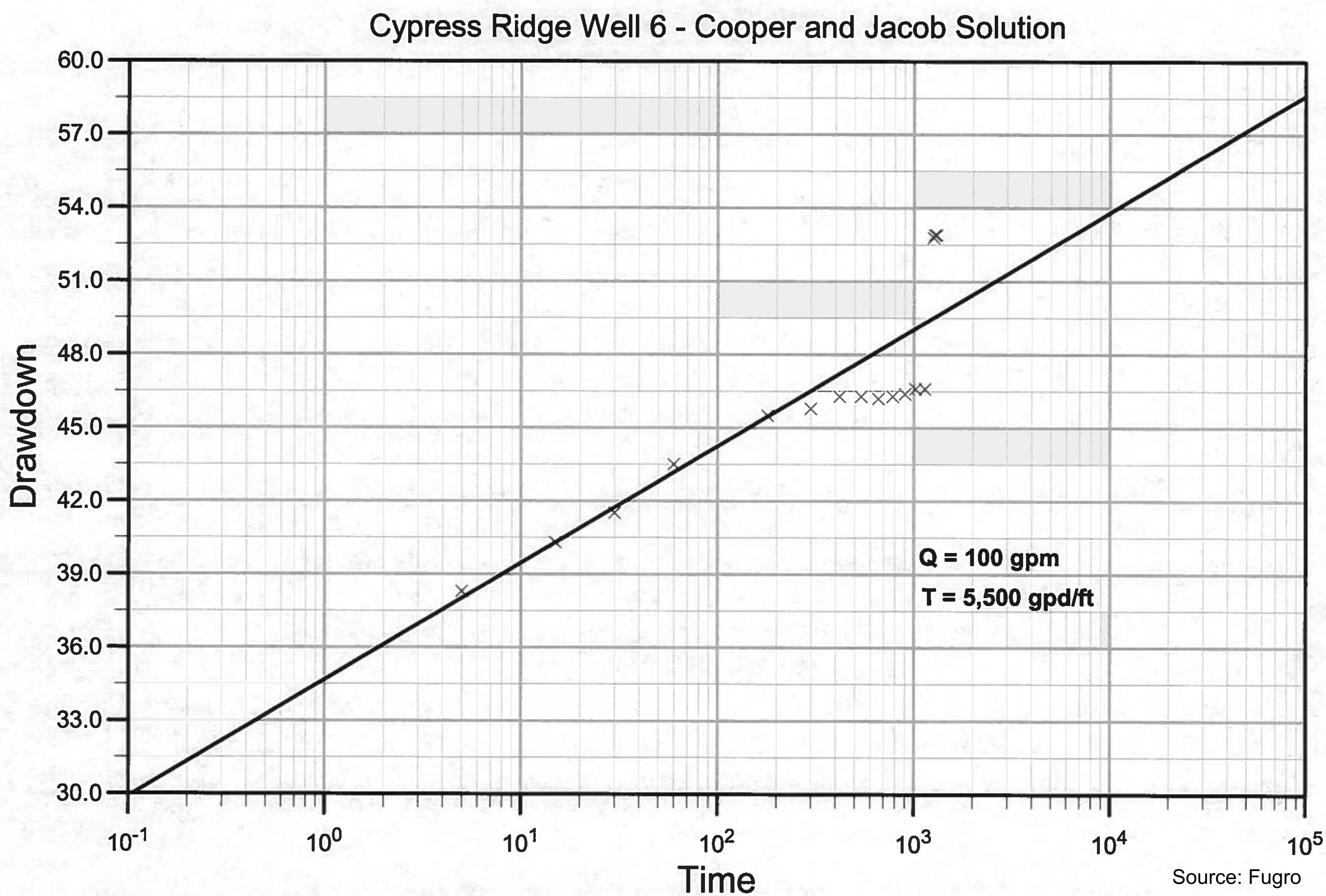

Cypress Ridge Well 5 - Cooper and Jacob Solution
Drawdown
80.0
78.0
76.0
74.0
72.0
70.0
68.0
66.0
64.0
62.0
60.0
Q = 55 gpm
T = 5,825 gpd/ft
10^-1
10^0
10^1
10^2
10^3
10^4
10^5
Time
Source: Fugro



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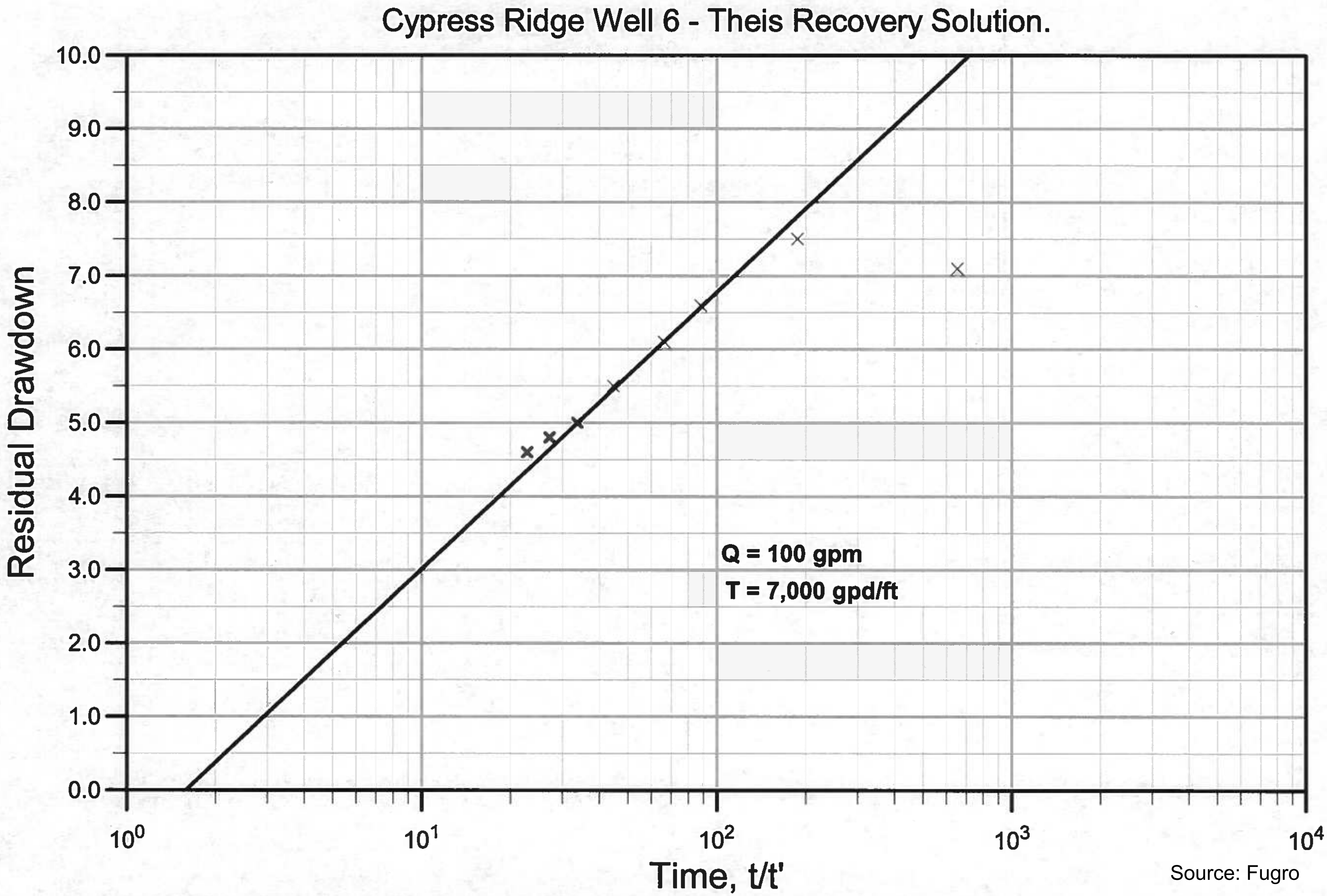

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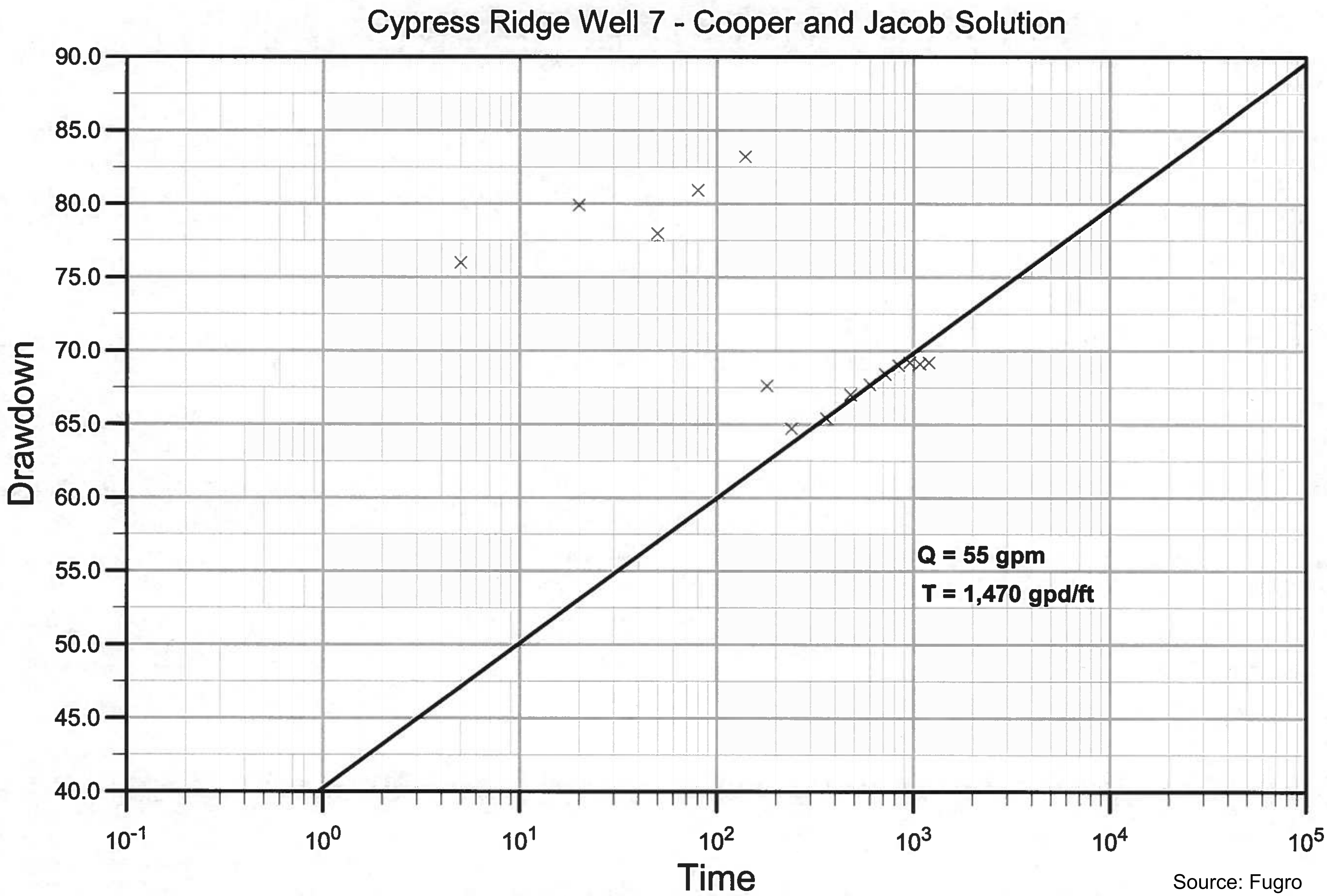

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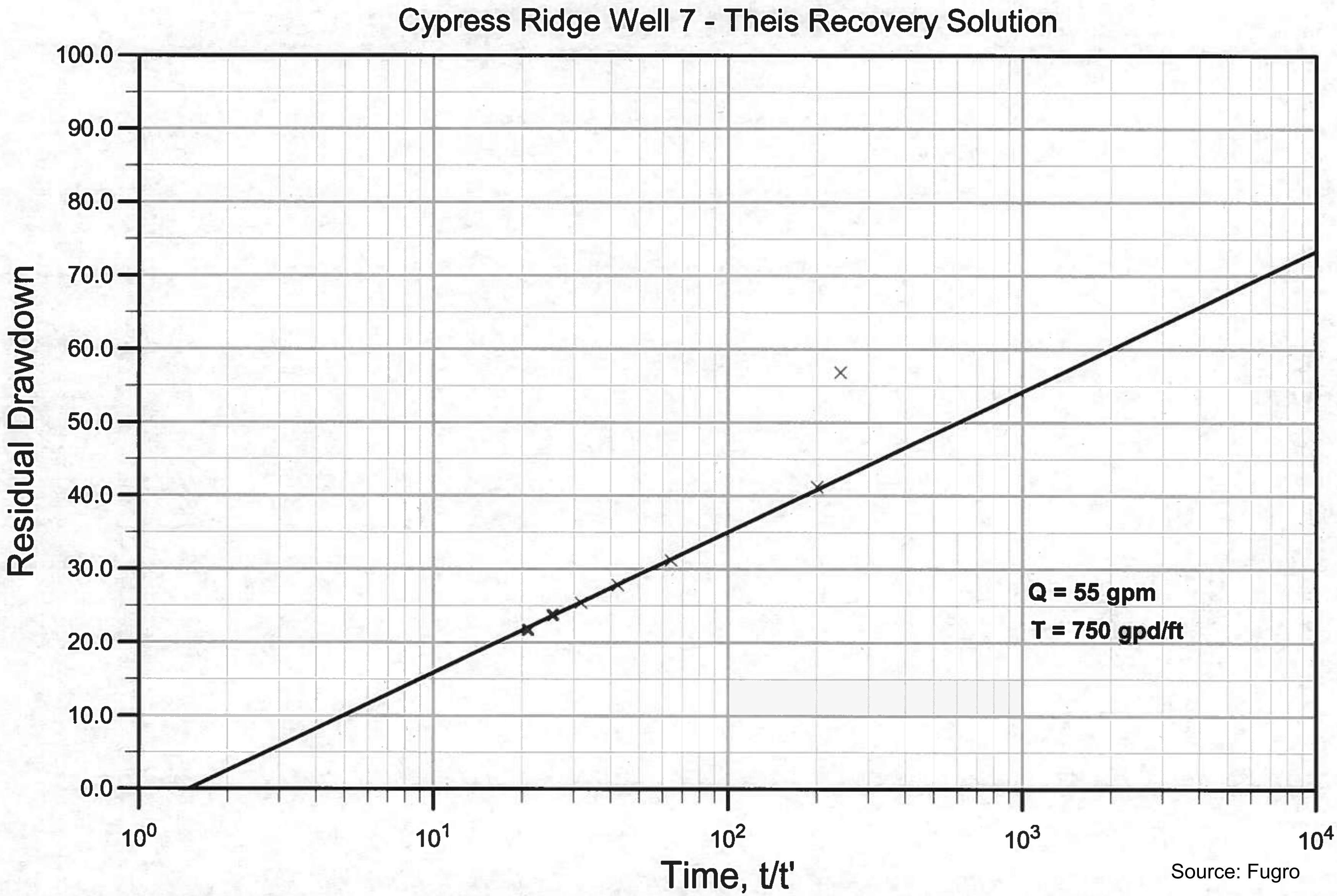

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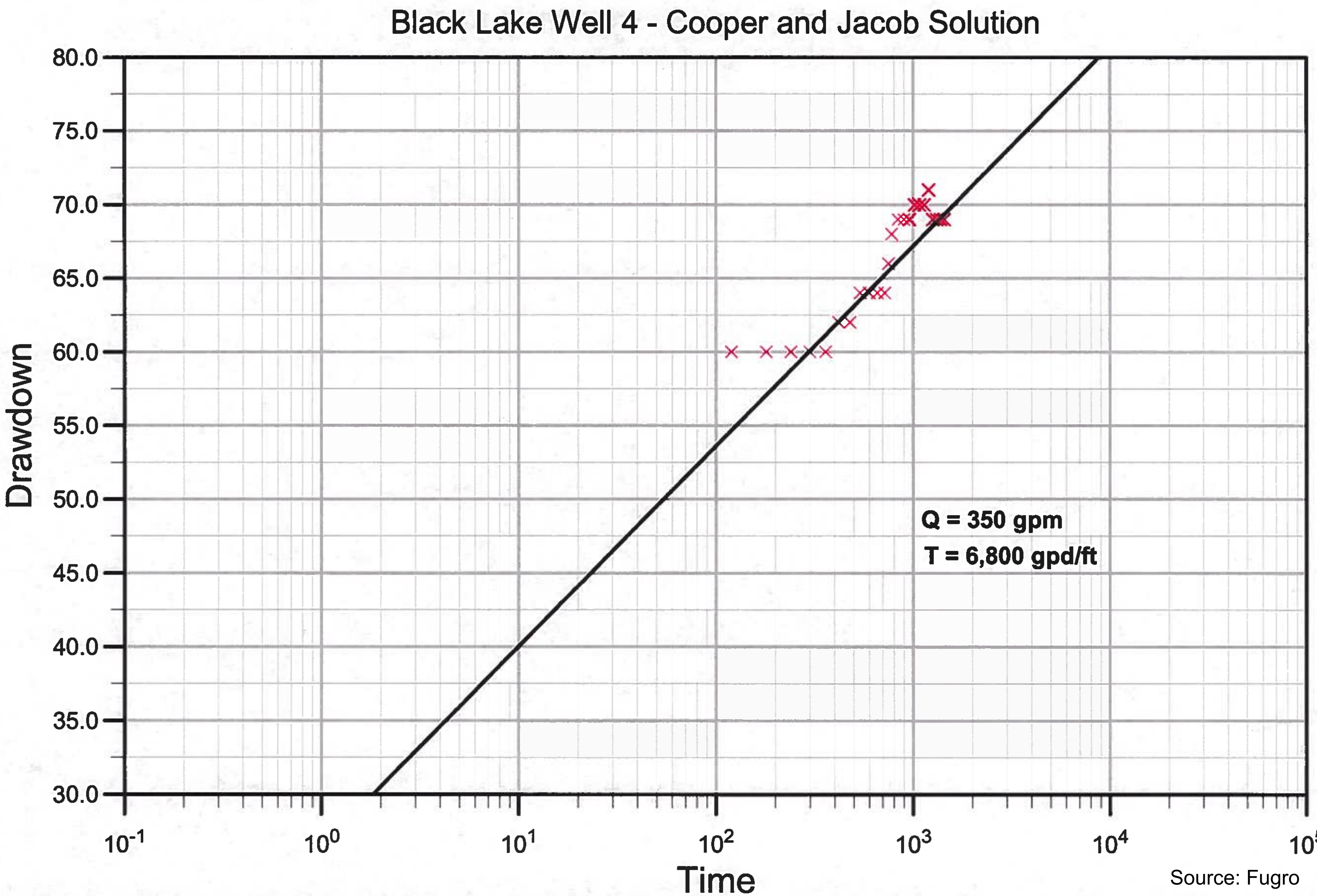

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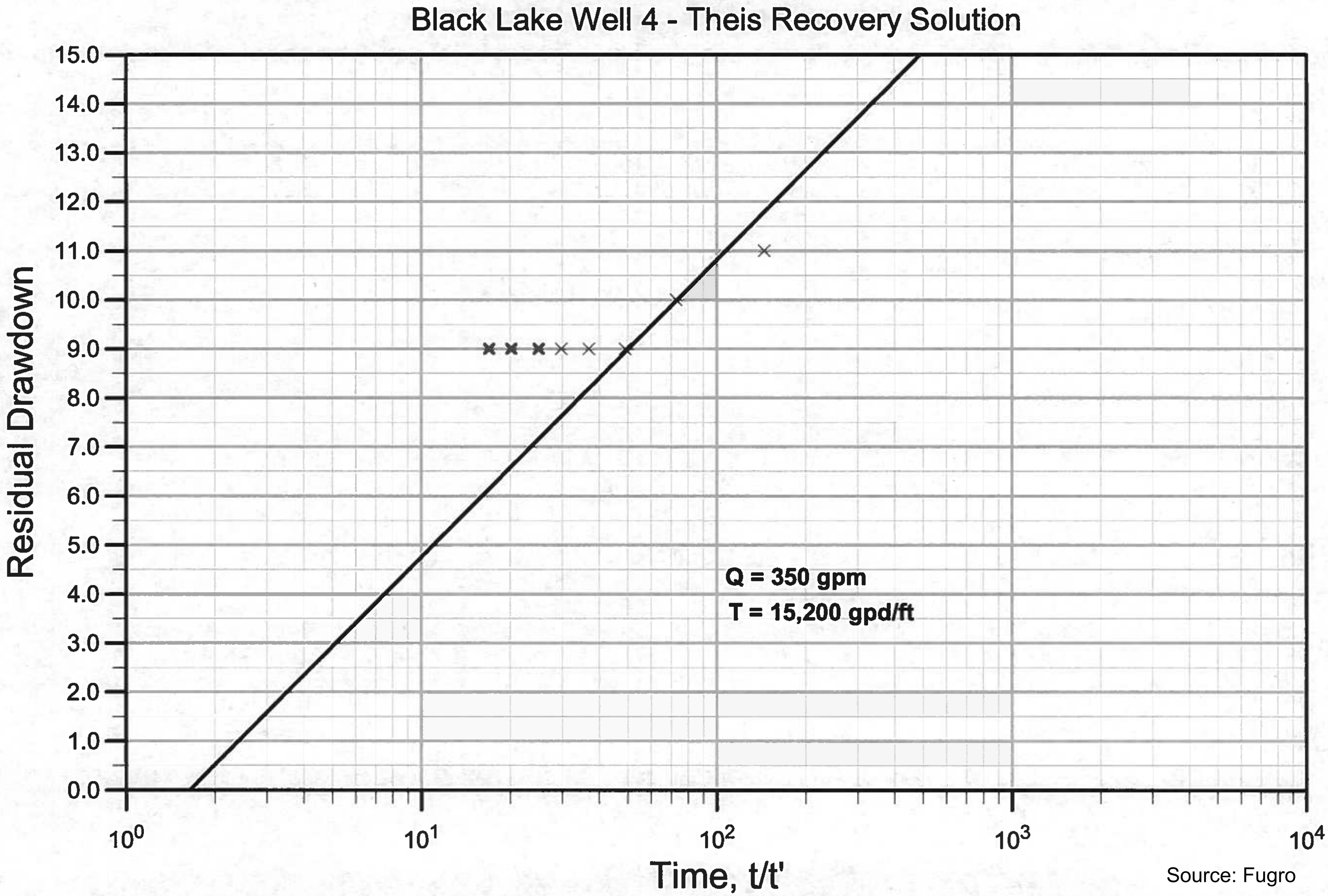
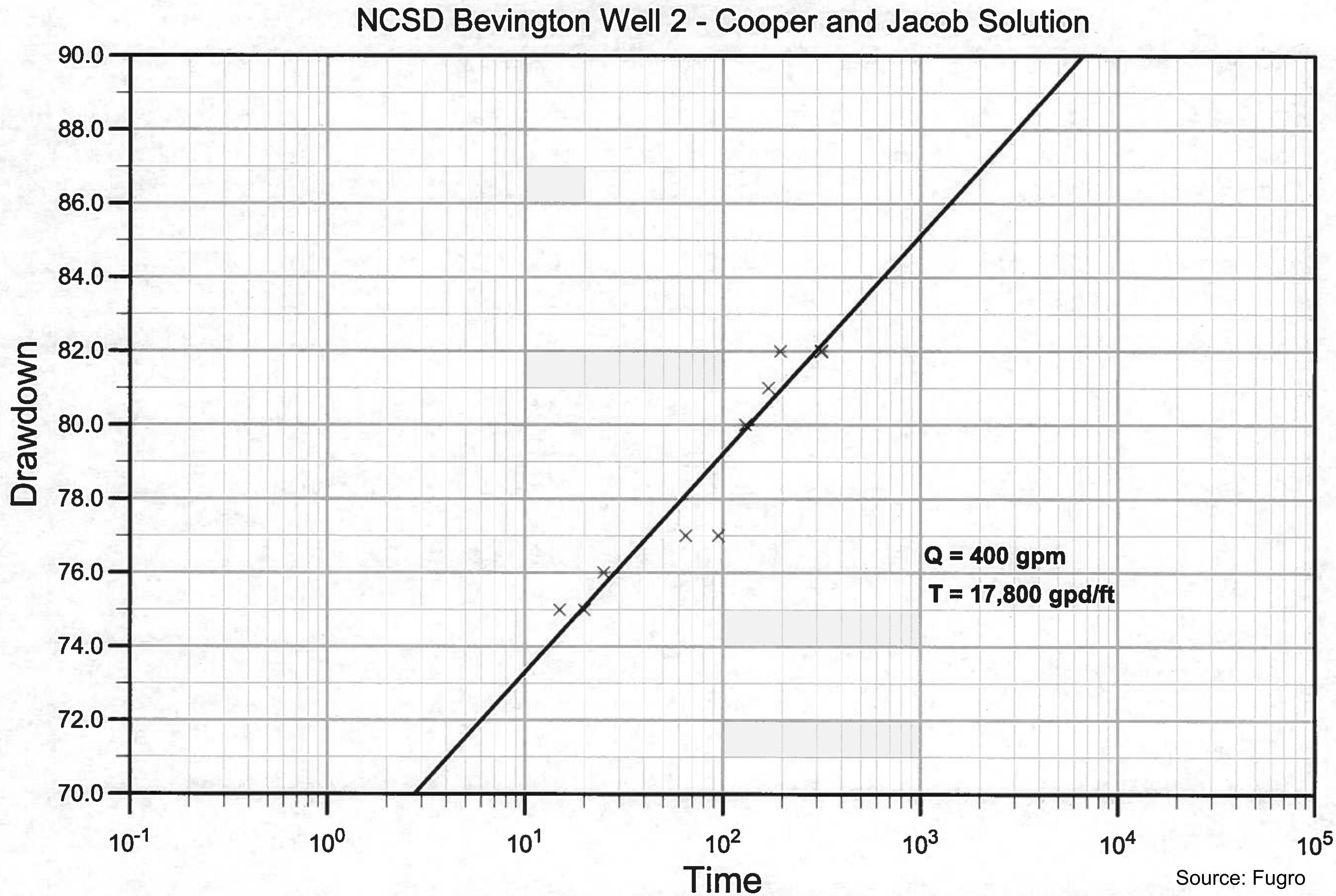
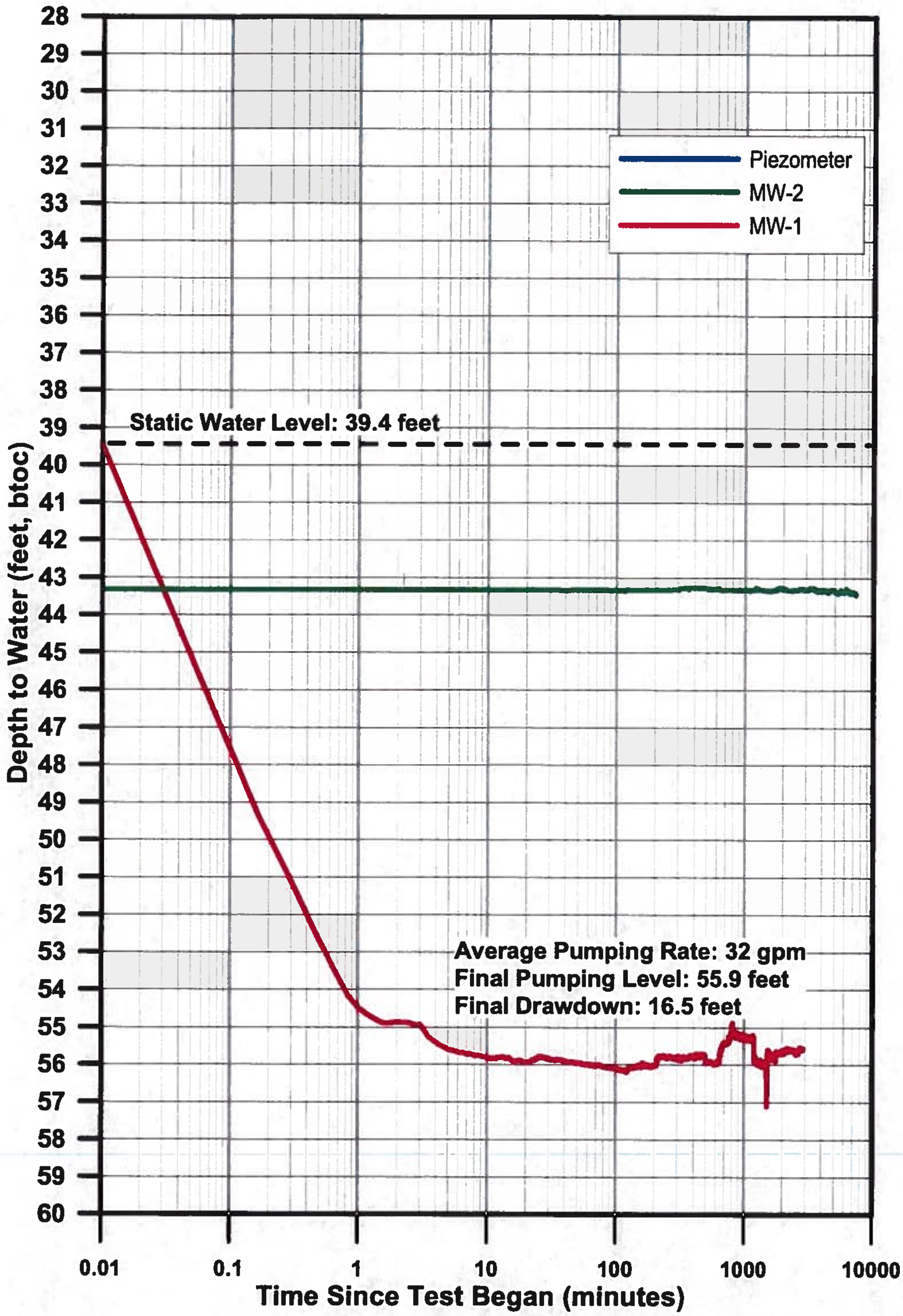


Source: Fugro

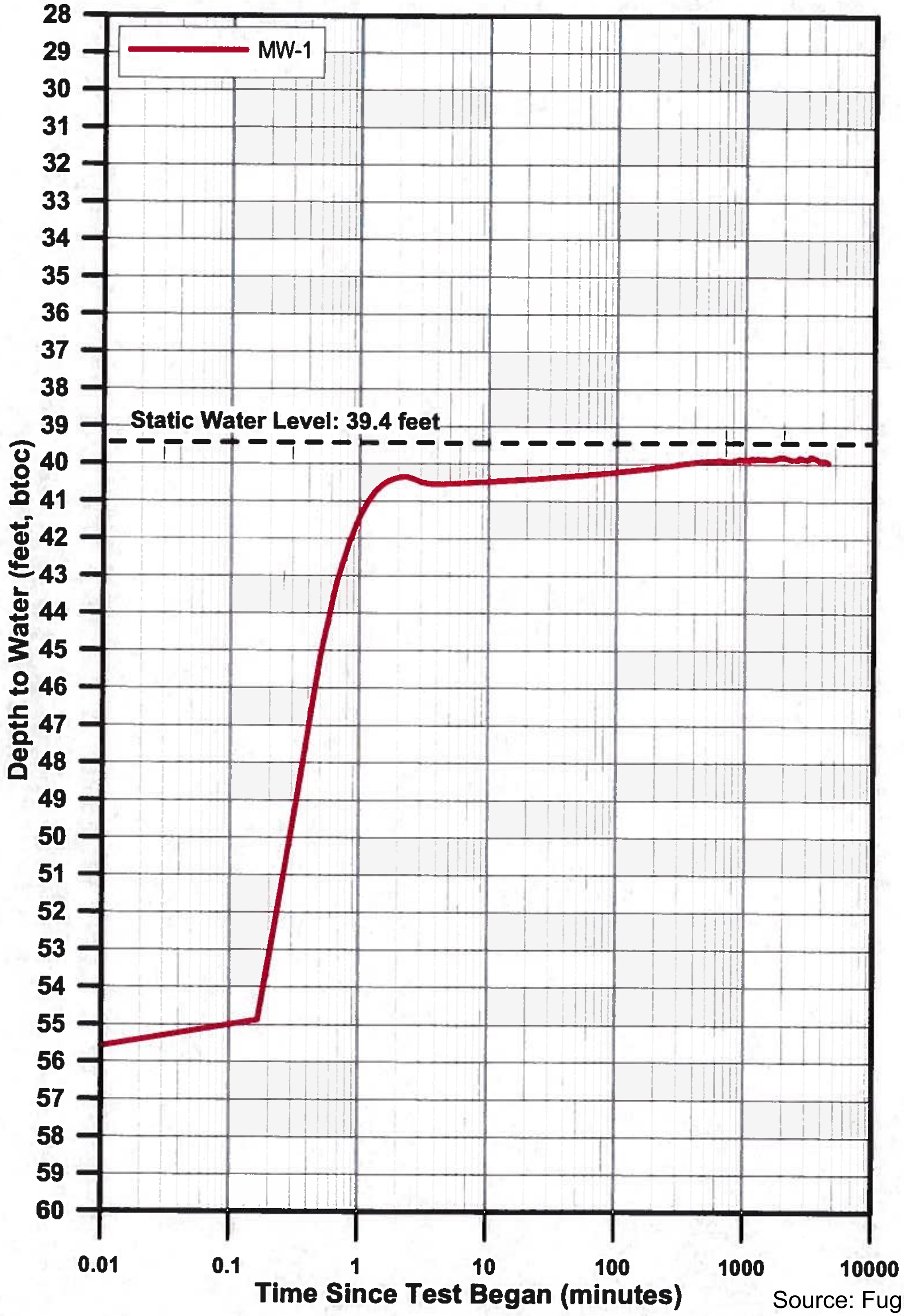


Source: Fugro



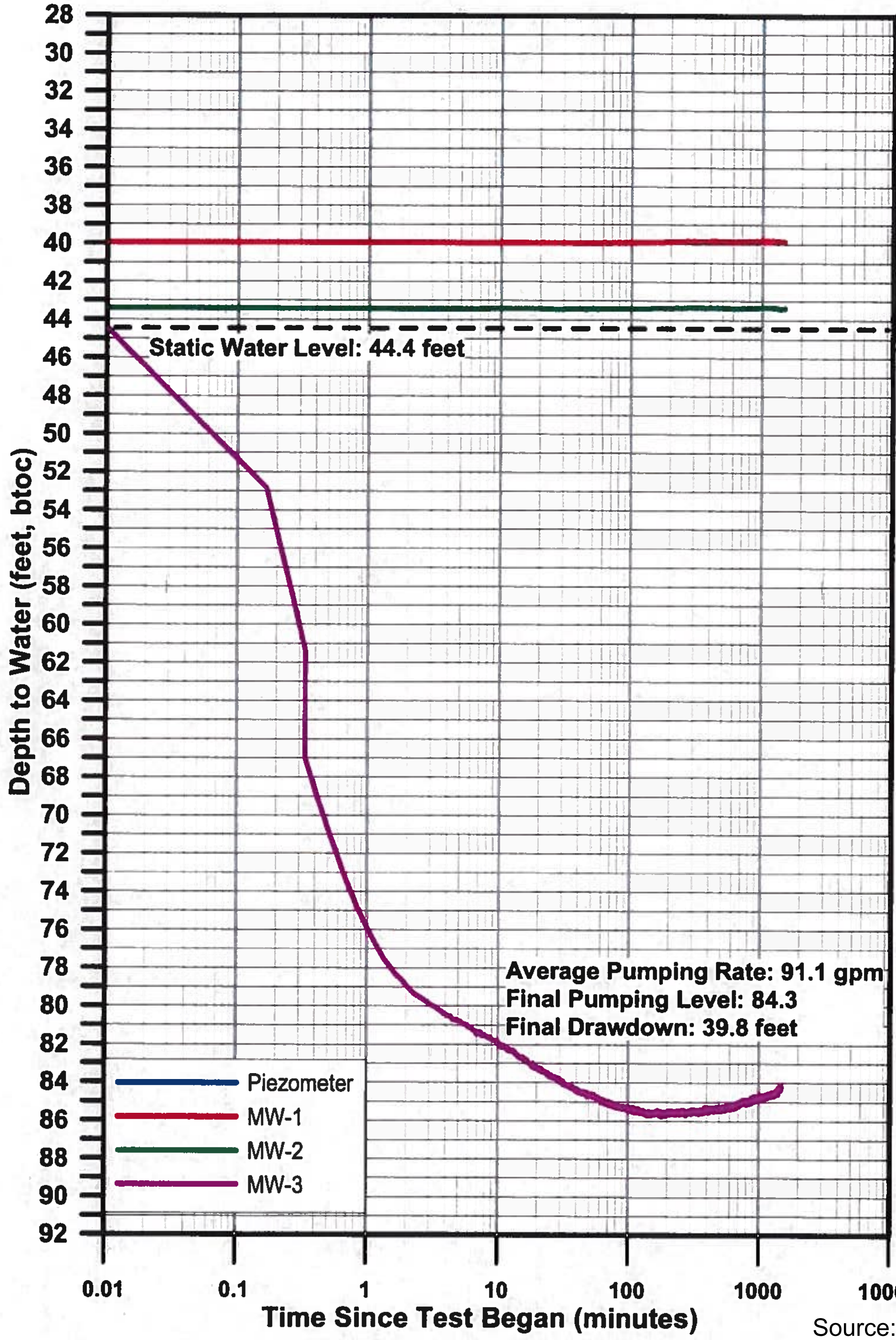
Source: Fugro

MW-1 CONSTANT-RATE TEST HYDROGRAPH
October 17 to 19, 2007
Southland Wastewater Treatment Facility



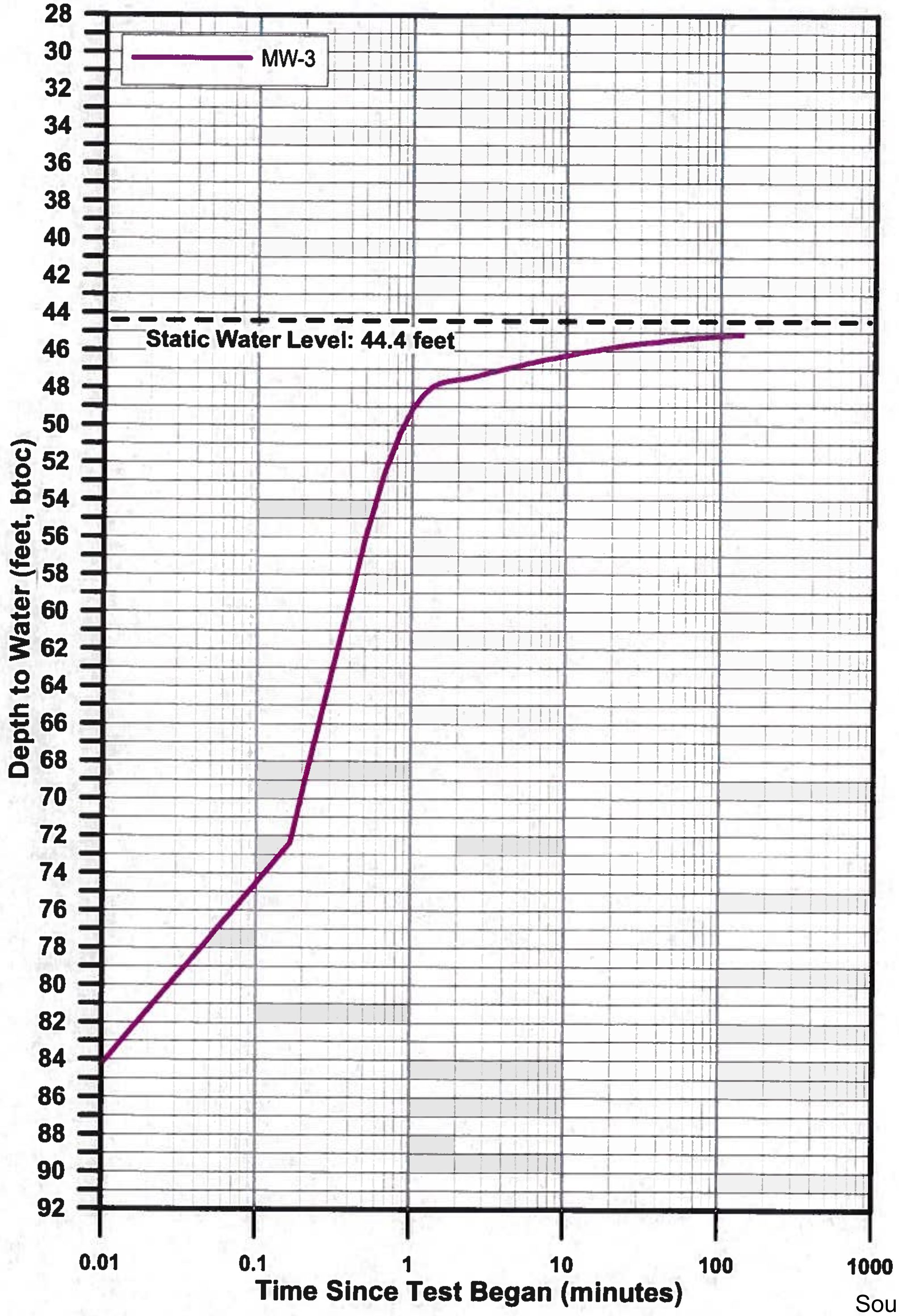
Source: Fugro

MW-1 CONSTANT-RATE TEST RECOVERY HYDROGRAPH
October 19 to 22, 2007
Southland Wastewater Treatment Facility



Source: Fugro

MW-3 CONSTANT-RATE TEST HYDROGRAPH
October 22 to 23, 2007
Southland Wastewater Treatment Facility



Source: Fugro

MW-3 CONSTANT-RATE TEST RECOVERY HYDROGRAPH
October 23, 2007
Southland Wastewater Treatment Facility

APPENDIX H
PROPOSED PUMPING TESTS TM

FUGRO CONSULTANTS, INC.

1000 Broadway, Suite 440
Oakland, California 94607
Tel: (510) 268-0461
Fax: (510) 268-0137

March 18, 2014
Project No. 04.62130111

TECHNICAL MEMORANDUM

To: Mr. Raymond Dienzo, P.E.
San Luis Obispo County Public Works

From: Peter Leffler, C.Hg.
Paul Sorensen, C.Hg.

Subject: Santa Maria Groundwater Basin Characterization and Planning Activities – Task 3: Proposed Pumping Test Sites

INTRODUCTION

This Technical Memorandum (TM) was prepared to document work performed by the Fugro/GEI Team as part a contract with the County of San Luis Obispo Flood Control and Water Conservation District (SLOFCWCD; District) for the Santa Maria Groundwater Basin Characterization and Planning Activities project (study). This TM provides a summary of available pumping test data, and provides a list and location map of potential sites proposed for field pumping tests as part of Task 3 of the study. The TM is provide for review by the County, Technical Groups, and stakeholders to provide input to which sites are most preferred for conducting pumping tests.

EXISTING PUMPING TEST DATA

The available pumping test are summarized in Table 1, and locations of wells with existing pumping test data (i.e., time vs. drawdown data) are shown on Plate 1. These data were obtained from existing documents and data that were compiled during the course of Task 2. It is possible that other pumping test data exists, but has not yet been provided to us during this study. We would ask any parties reviewing this TM provide us with copies of pumping test data not referenced in Table 1.

PROPOSED PUMPING TEST SITES

The extensive well database compiled and documented in TM No. 1 was reviewed with respect to potential sites for conducting pumping tests. The scope of work for Task 3 includes conducting pumping tests at eight locations. A preliminary list of potential sites from which to select some or all of the eight locations is provided in Table 2, and locations of proposed pumping test sites are depicted in Plate 1. Several criteria were used in selecting the proposed sites in Table 2 including: geographic distribution, sites both near and away from known or suspected fault traces, preference given to potential pumping well locations that would have potential observation wells within about 1,000 feet, preference given to Community Service District/Water Company wells and wells serving developments and golf courses (due to the need for sufficient installed pump capacity to stress aquifer during pumping test), and the locations of wells with existing pumping test data. The performance of a pumping test to satisfy the requirements of the project will involve pumping the well at a controlled (to the extent feasible) constant discharge rate for a period of 8 to 12 hours, with constant monitoring of water levels in the pumping well and observation wells, if available.

COUNTY AND AGENCY REVIEW AND INPUT

The intent of this TM is for the County and project stakeholders to review the attached information, and provide input on selection of preferred sites for conducting pumping tests. It should be noted that the well owners for the listed potential pumping and observation wells have not yet been contacted to obtain approval for use of their wells in this study. Thus, we would recommend that more than eight sites be selected as potential pumping test sites, and priorities be assigned to each site. The highest ranked potential pumping test site well owners would be contacted first to try to obtain approval and make arrangements for testing. If one or more of the highest ranked sites cannot be utilized in this study, we would then attempt to contact well owners for secondary site wells.

In terms of schedule, our goal is to begin conducting the pumping tests as soon as possible, and to be finished with testing by the end of April. If possible, we appreciate the quick review of interested parties, and look forward to receiving your input on site selection.

LIST OF TABLES

LIST OF PLATES

TABLES

Table 1. Summary of Existing Pumping Test Data.

Log No.	Well T/R/S	Date Drilled	Test Date	RE	Q	SWL	PWL	DD	Q/s	Duration (Min)	Est. T	Screen Length	Est. K	Time-DD data?	Formation Screened/Zone	Source	T from time-DD data		K from time-DD data	
																	DD data	recovery	DD data	recovery
276929	11N/35W-10G5	7/27/1988	6/27/1989	301	350	297	366	69	5.1	1440 (?)	10,145	140	10	Partial	Paso Robles/2	NCSD	**6,800**	**15,225**	**6.5**	**15**
171358	11N/35W-10J2	8/20/1985	8/27/1985	317	400	300	382	82	4.9	350	9,756	240	5	Limited	Paso Robles/Careaga/2	NCSD	**17,800**	**NA**	**10**	**NA**
90024	11N/34W-20	1/24/2000	10/17/2007	300	33	39.4	55.9	16.5	2.0	2880	4,000	40	13	Yes	NMMA	Fugro, 2008 Report		**22**		**NA**
90025	11N/34W-20	1/27/2000	10/22/2007	300	92	44.4	84.3	39.9	2.3	1440	4,612	80	8	Yes	NMMA	Fugro, 2008 Report		**13**		**27**
402088	11N/35W-16J	12/3/1993	12/15/1993	279	1000	246	286	40	25.0	1440	50,000	300	22	Yes	Paso Robles/3	Cleath 1996 Report/Woodlands	**70,000**	**NA**	**31**	**NA**
490963	11N/35W-15D	6/13/1994	7/7/1994	246	1200	244	295	51	23.5	1440	47,059	240	26	Yes	Paso Robles/3	Cleath 1996 Report/Woodlands	**85,600**	**NA**	**48**	**NA**
490919	11N/35W-15R	7/1/1994	7/21/1994	242	1400	237	295	58	24.1	1440	48,276	210	31	Yes	Paso Robles/3	Cleath 1996 Report/Woodlands	**76,000**	**NA**	**48**	**NA**
490922	11N/35W-22M	7/13/1994	8/4/1994	184	1400	171	251	80	17.5	1440	35,000	250	19	Yes	Paso Robles/3	Cleath 1996 Report/Woodlands	**27,300**	**NA**	**15**	**NA**
90023	Not listed	3/29/1973	3/5/2013	65	549	50.19	177	126.81	4.3	240	8,659	295	4	Yes	NCMA	Cleath 2013 Report/Pismo Beach	**16,100**	**14,500**	**7.3**	**6.6**
174229	32S/13E-19B	12/18/1985	12/30/1985	31	177	14.1	63.4	49.3	3.6	1413	7,181	190	5	Yes	NCMA	Fugro-Cleath 2005 Report/Pismo Beach	**5,850**			
174325	32S/13E-18Q	1/10/1986	1/10/1986	64	250	50.4	93.6	43.2	5.8	1440	11,574	260	6	Yes	NCMA	Fugro-Cleath 2005 Report/Pismo Beach	**6,950**	**12,450**		
N/A	No Well Log	1990	3/4/2013	Location?	854	14.42	94.5	80.08	10.7	240	21,329	170	17	Yes	NCMA	Cleath 2013 Report/Pismo Beach	**32,200**	**25,050**	**25**	**20**
511080	11N/35W-4	12/1/1997	12/18/1997		60	273	299.1	26.1	2.3	1440	4,598	50	12	Yes		DWR/Cypress Ridge	**5,100**	**4,500**	**14**	**12**
511078	11N/35W-4	12/19/1997	1/5/1998		55	212.3	285.3	73	0.8	665	1,507	50	4	Yes		DWR/Cypress Ridge	**5,825**	**4,000**	**16**	**11**
511086	11N/35W-4		1/9/1998		100	254	300.6	46.6	2.1	1140	4,292	80	7	Yes		DWR/Cypress Ridge	**5,500**	**6,950**	**12**	**12**
511087	11N/35W-4	12/31/1997	1/12/1998		55	228.2	297.4	69.2	0.8	1200	1,590	46	5	Yes		DWR/Cypress Ridge	**1,470**	**750**	**4**	**2**

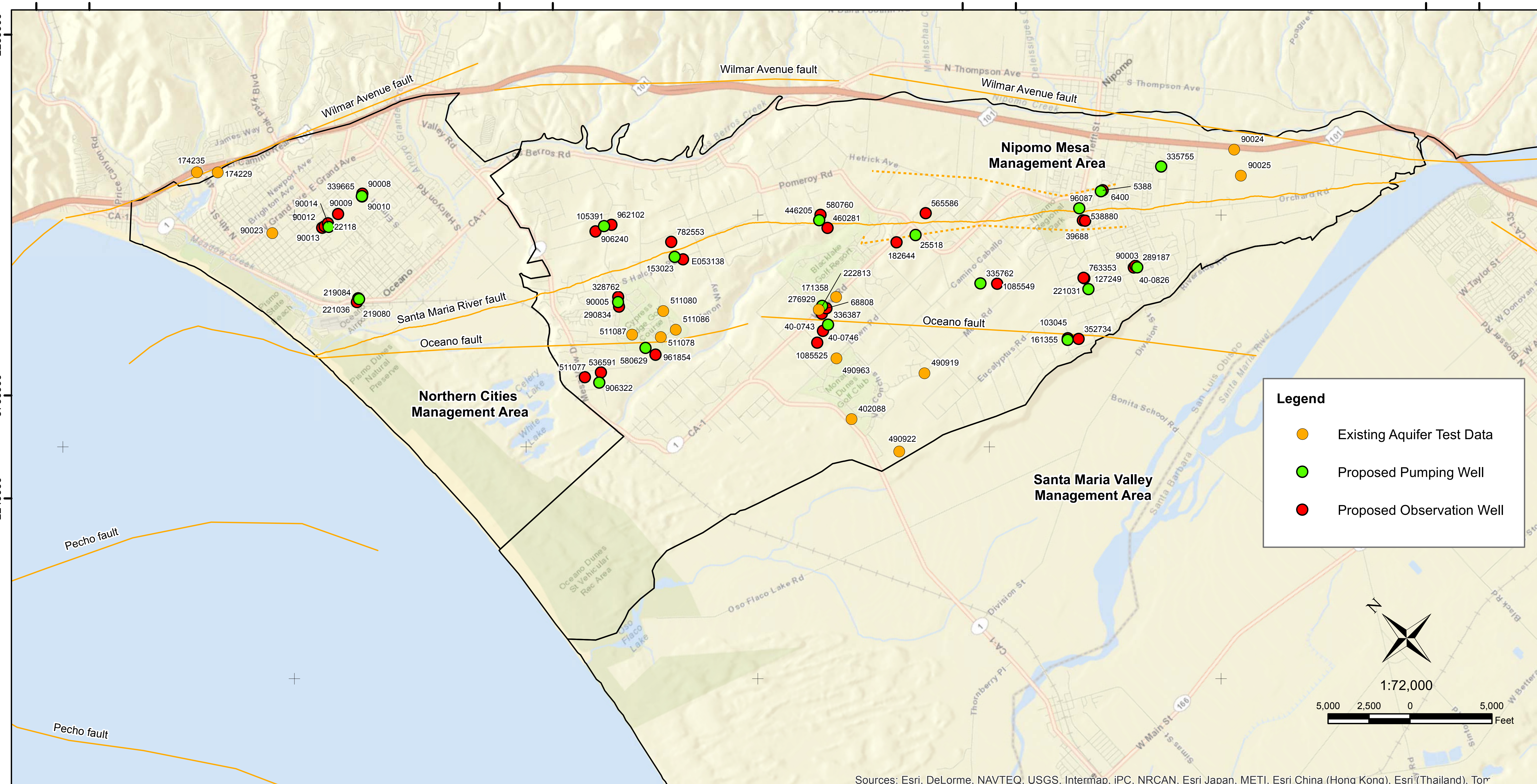
Table 2. Summary of Proposed Pumping Test Sites.

Well ID	Well Name	Screen	Formation	Zone	Source	Type	Distance	Comment
96087	**Nipomo Co. Park**	**260-300**	**Tca**	**1**	**NCSD**	**Pumping**	**0**	**NMMA Area**
39688	Nipomo School	Unknown; TD = 587 ft.	Unknown	2	NCSD	Observation	770	Across SMR Fault
538880	Lucia Mar School District	300-380	Tca	2	DWR	Observation	830	Across SMR Fault
25518	**Camacho Mesa**	**257-267; 287-297; 303-313**	**QTpr/Tca**	**2**	**NCSD**	**Pumping**	**0**	**NMMA Area**
182644	Omiya #2	390-465	Tca	2	NCSD	Observation	1,250	
565586	Knotts	280-372	QTpr	1	DWR	Observation	1,465	Across SMR Fault
446205	**Erwin Farms**	**220-450**	**QTpr/Tca**	**1**	**DWR**	**Pumping**	**0**	**NMMA Area**
580760	Fratello	250-430	QTpr/Tca	1	DWR	Observation	340	
460281	Erwin Farms	260-420	QTpr/Tca	2	DWR	Observation	700	Across SMR Fault
153023	**Chancey**	**220-280; 320-330; 340-350; 360-400**	**QTpr**	**2**	**DWR**	**Pumping**	**0**	**NMMA Area**
E053138	Biddle	300-600	QTpr/Tca	2	DWR	Observation	540	
782553	Rodriquez	200-400	QTpr/Tca	1	DWR	Observation	925	Across SMR Fault
161355	**Alta Mesa 2**	**385-435; 485-570**	**QTpr**	**3**	**GSWC**	**Pumping**	**0**	**NMMA Area**
103045	Vista 4	80-600	QTpr	3	GSWC	Observation	100	
352734	Casa Real 1	440-520	QTpr	3	GSWC	Observation	670	
336387	**Via Concha Well**	**390-690**	**QTpr**	**3**	**NCSD**	**Pumping**	**0**	**NMMA Area**
40-0746	Sackett	200-300	Qds/QTpr	3	DWR	Observation	500	
1085525	Avila	420-540	QTpr	3	DWR	Observation	1,300	
40-0743	McGann	300-400	QTpr	2	DWR	Observation	770	Across Oceano Fault
276929	Black Lake Golf #4	310-330; 350-410; 460-520	QTpr	2	NCSD	Observation	1,050	Across Oceano Fault
68808	Maloney	340-460	QTpr	2	DWR	Observation	1,000	Across Oceano Fault
222813	Black Lake Golf #3	330-550	QTpr	2	NCSD	Observation	1,200	Across Oceano Fault
580629	**Cypress Ridge FT#2**	**280-320; 332-342; 360-410; 430-450**	**QTpr/Tca**	**3**	**Cypress Ridge**	**Observation**	**0**	**NMMA Area**
511078	Cypress Ridge Well 5	318-368	QTpr/Tca	2	Cypress Ridge	Pumping	1,150	Across Oceano Fault
511086	Cypress Ridge Well 6	340-420	Tca	2	Cypress Ridge	Observation	2,150	Across Oceano Fault
961854	Hein	180-350	QTpr	3	DWR	Observation	750	
906322	**RWC Well 9**	**320-380**	**QTpr**	**3**	**RWC**	**Pumping**	**0**	**NMMA Area**
511077	RWC Well 8	240-320	QTpr	3	RWC	Observation	930	
536591	Apodaca	260-340	QTpr	3	DWR	Observation	625	
289187	**GSWC Vista 5**	**290-490**	**QTpr/Tca**	**2**	**GSWC**	**Pumping**	**0**	**Not near fault**
90003	GSWC Vista 3	248-519	QTpr/Tca	2	GSWC	Observation	150	
40-0826	Vista Water Co. 2	256-531	QTpr/Tca/Tms	2	DWR	Observation	215	
221031	**GSWC Eucalyptus 1**	**310-430**	**QTpr**	**2**	**GSWC**	**Observation**	**0**	**Not near fault**
763353	GSWC Eucalyptus 2	310-405; 445-530	QTpr/Tca	2	GSWC	Observation	60	
127249	GSWC La Serena 1	370-605	QTpr/Tca	2	GSWC	Pumping	700	

Table 2. Summary of Proposed Pumping Test Sites.

Well ID	Well Name	Screen	Formation	Zone	Source	Type	Distance	Comment
335755	**NCSD Pender 1**	**185-245**	**QTpr/Tca (?)**	**1**	**NCSD**	**Pumping**	**0**	**Not near fault**
6400	**NCSD Sanders**	**228-262**	**QTpr**	**1**	**NCSD**	**Pumping**	**0**	**Adjacent to fault trace**
5388	**NCSD Crawford**	**305-312**	**Tca/Tms (?)**	**1**	**NCSD**	**Observation**	**125**	
335762	**NCSD Dana 1**	**300-400; 420-460**	**QTpr**	**2**	**NCSD**	**Pumping**	**0**	**Not near fault**
335763	NCSD Dana 2	298-408; 428-468	QTpr	2	NCSD	Observation	700	
1085549	Steve McNeil	320-340; 360-400; 420-460	Qds/QTpr	2	DWR	Observation	1,000	
222813	**NCSD Black Lake 3**	**330-550**	**QTpr**	**2**	**NCSD**	**Pumping**	**0**	**850 feet NE Oceano Fault**
276929	NCSD Black Lake 4	310-330; 350-410; 460-520	QTpr	2	NCSD	Observation	300	
171358	NCSD Bevington	330-570	QTpr/Tca	2	NCSD	Observation	1,000	
336387	NCSD Via Concha	390-690	QTpr	3	NCSD	Observation	1,225	Across Oceano Fault
90005	**RWC Well 2**	**360-390**	**QTpr**	**2**	**RWC**	**Pumping**	**0**	**Not near fault**
290834	RWC Well 4	310-370	QTpr	2	RWC	Observation	290	
328762	RWC 6	250-390	QTpr	2	RWC	Observation	300	
No Log	Cypress Ridge Well 9	?	?	2	Cypress Ridge	Observation	580	
105391	**RWC 5**	**200-340**	**Qds**	**1**	**RWC**	**Pumping**	**0**	**Not near fault**
962102	David Fross	120-287	Qds/QTpr	1	DWR	Observation	460	
906240	Bravo Developments Lot 2	210-310	QTpr	1	DWR	Observation	610	
Well ID	**Well Name**	**Screen**	**Formation**	**Zone**	**Source**	**Type**	**Distance**	**Comment**
22118	**Grover Beach Well**	**205-325; 343-363; 381-451; 469-529**			**Grover Beach**	**Pumping**	**0**	**NCMA Area**
90014	Grover Beach Well 3	58-178			Grover Beach	Observation	220	
90013	Grover Beach Well 2	39-180			Grover Beach	Observation	250	
90012	Grover Beach Well 1	34-178			Grover Beach	Observation	390	
90009	Arroyo Grande Well 5	75-200			Grover Beach	Observation	975	
219080	**Oceano Well 8**	**380-520**			**Oceano**	**Pumping**	**0**	**NCMA Area**
219084	Oceano Well 7	90-140			Oceano	Observation	75	
221036	Oceano Nested Well				Oceano	Observation	230	
339665	**Arroyo Grande Well 7A**	**136-230**			**Arroyo Grande**	**Pumping**	**0**	**NCMA Area**
90008	Arroyo Grande Well 3	100-219			Arroyo Grande	Observation	130	
90010	Arroyo Grande Well 7	290-460; 475-490; 500-515; 525-545; 555-570			Arroyo Grande	Observation	50	

PLATE



PROPOSED TEST PUMPING LOCATIONS
Santa Maria Groundwater Basin Characterization and Planning Activities Study
San Luis Obispo County

PLATE 1

APPENDIX I
2014 PUMPING TEST DATA PLOTS (INCLUDED ON CD)

Table I-1. Summary of 2014 Pumping Test Data.

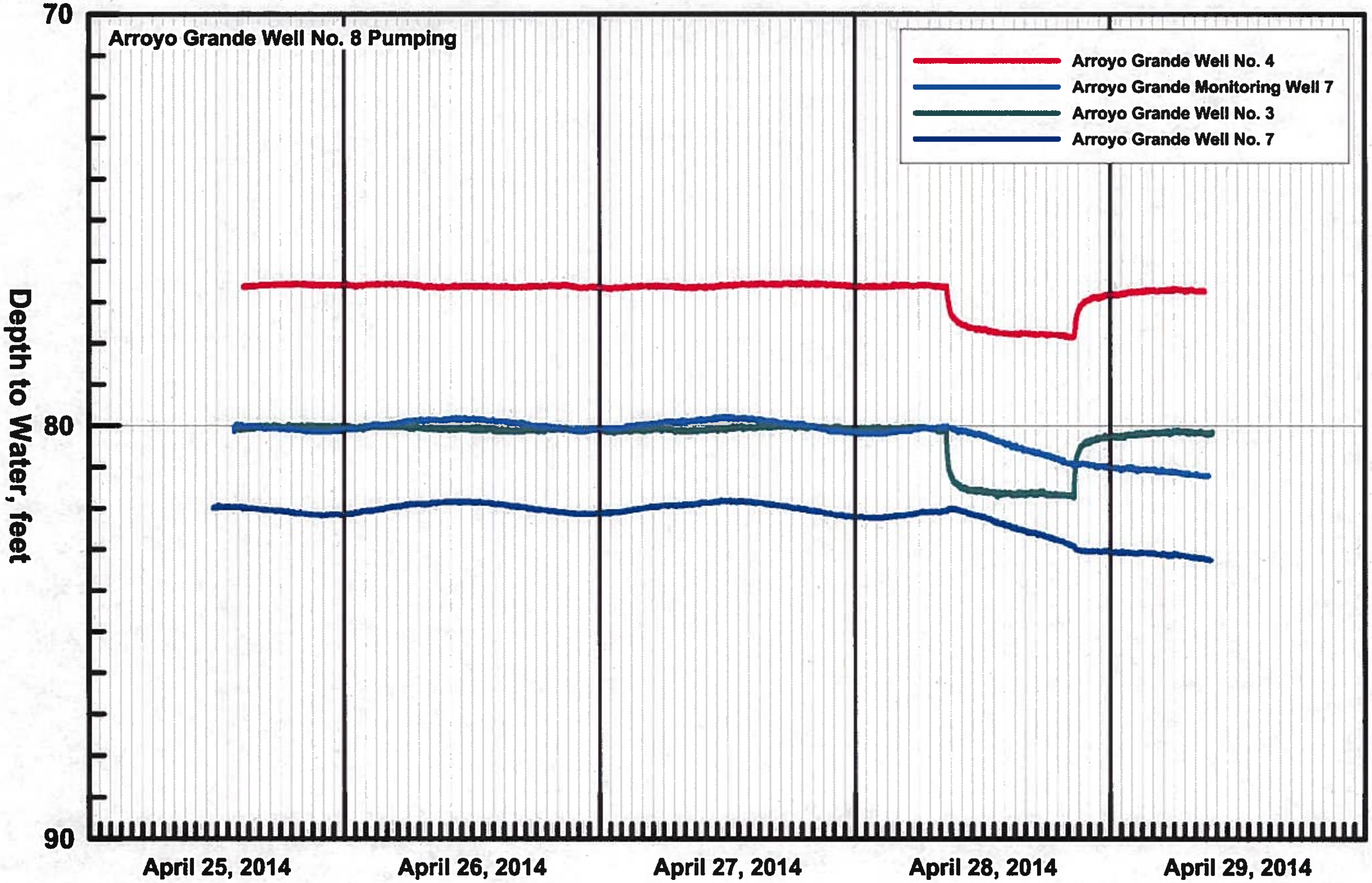
Owner	Well	Well Type	Well Log No.	T/R/S	Management Area	Test Date	Distance from Pumping Well (feet)	Total Depth (feet bgs)	Static Water Level (feet bgs)	Screen Interval (feet bgs)	Screen Length (feeet)	Formation Screened	Pumping Rate (gpm)	Drawdown at 720 Minutes (feet)	Pumping Water Level (feet bgs)	Maximum Drawdown (feet)	Specific Capacity (gpm/ft)	Aquifer Thickness (feet)	T (gpd/ft)	Solution	K (feet/day)	S
Arroyo Grande	Well 8	Pumping	339665	32S/13E-29G	NCMA	4/28/2014	0	250	77	136-230	94	QTpr	475	45	122	45	10.4	140	30,400	Cooper-Jacob	29	N/A
																		140	28,700	Theis Recovery	27	N/A
	Well 1	Observation	No Log	?	NCMA		450	175	74.41	Unknown	Unknown	QTpr	470	0.33	74.74	?	N/A	140	148,200	Hantush	142	0.007
	Well 3	Observation	90008	?	NCMA		165	219	80.02	100-219	119	QTpr	470	1.63	82.72	1.63	N/A	140	122,800	Hantush	117	0.002
																		140	171,400	Theis Recovery	164	N/A
	Well 4	Observation	Not assigned	?	NCMA		390	232	76.62	92-232	140	QTpr	470	1.26	77.85	1.26	N/A	140	151,000	Hantush	144	0.0008
																		140	174,000	Theis Recovery	166	N/A
	Well 7	Observation	90010	?	NCMA		30	580	82.07	290-460; 475-490; 500-515; 525-545; 555-570	235	Tca	470	0.84	82.9	1.2	N/A	N/A	N/A	N/A	N/A	N/A
	Well 7 MW	Observation	No Log	?	NCMA		55	Unknown	80.00	Unknown	Unknown	Tca	470	0.92	80.88	1.19	N/A	N/A	N/A	N/A	N/A	N/A
	Wells 1, 3, and 4	Observation	--	--	NCMA		165-450	--	--	--	--	QTpr	470	--	--	--	--	140	117,000	Distance-Drawdown	112	0.02
Oceano CSD	Well 8	Pumping	219080	32S/13E-31A	NCMA	5/3/2014	0	525	33.47	380-520	140	Tca	800	105.3	132.95	105.3	7.6	270	31,500	Cooper-Jacob	16	N/A
																		270	25,700	Theis Recovery	13	N/A
	Well 7	Observation	219084	32S/13E-31A	NCMA		105	162	36.36	90-140	50	QTpr	800	N/A	36.43	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	MW Green	Observation	221036	12N/35W-32	NCMA		210	130	30.07	110-130	20	QTpr	800	N/A	30.41	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	MW Blue	Observation	221036	12N/35W-32	NCMA		210	265	29.33	190-210; 245-265	40	QTpr	800	0.05	30.69	0.53	N/A	N/A	N/A	N/A	N/A	N/A
	MW Silver	Observation	221036	12N/35W-32	NCMA		210	510	30.64	395-435; 470-510	80	Tca	800	14.8	47.28	14.8	N/A	270	12,900	Hantush	6	0.004
																		270	14,600	Theis	7	0.004
																		270	17,500	Cooper-Jacob	9	0.003
																		270	16,800	Theis Recovery	8	N/A
	MW Yellow	Observation	221036	12N/35W-32	NCMA		210	645	30.8	625-645	20	Tca	800	11.5	44.12	11.5	N/A		N/A	N/A	N/A	N/A
Nipomo CSD	Black Lake Well 4	Pumping	276929	11N/35W-10G5	NMMA	5/8/2014	0	530	315.11	310-330; 350-410; 460-520	140	QTpr	360	57.4	372.51	57.4	6.3	220	25,200	Cooper-Jacob	15	N/A
																		220	17,600	Theis Recovery	11	N/A
	Black Lake Well 3	Observation	222813	11N/35W-10G4	NMMA		240	560	318.53	330-550	220	QTpr	360	1.40	319.93	1.40	N/A	230	70,600	Theis	41	0.02
																		230	70,150	Cooper-Jacob	41	0.01
																		230	85,200	Theis Recovery	50	N/A
Golden State WC	Alta Mesa 2	Pumping	161355	11N/35W-24L2	NMMA	5/12/2014	0	580	296.58	385-435; 485-570	135	QTpr	380	49.9	342.76	49.9	7.6	250	27,200	Cooper-Jacob	15	N/A
																		250	11,200	Theis Recovery	6	N/A
	Vista 4	Observation	103045	11N/35W-24L1	NMMA		105	600	268.02	80-600	520	QTpr	380	11.4	279.47	11.4	N/A	320	15,200	Theis	6	0.002
																		320	19,800	Cooper-Jacob	8	0.002
																		320	19,700	Theis Recovery	8	N/A
Grover Beach	Well 1	Pumping	90012	32S/13E-29E1	NCMA	5/20/2014	0	178	55	34-178	144	QTpr	632	2	57	2	316	120	N/A	N/A	N/A	N/A
	Well 2	Observation	90013	32S/13E-29E2	NCMA		170	180	52.07	39-180	141	QTpr	632	0.58	52.65	0.58	N/A	120	111,800	Hantush	125	0.02
																		120	995,000	Cooper-Jacob	1,109	0.002
																		120	549,000	Theis Recovery	612	N/A
	Well 3	Observation	90014	32S/13E-29E3	NCMA		440	178	54.45	58-178	120	QTpr	632	0.20	54.65	0.20	N/A	120	121,400	Hantush	135	0.02
																		120	1,221,000	Cooper-Jacob	1,360	0.03
																		120	500,000	Theis Recovery	557	N/A
	Well 4	Observation	22118	32S/13E-29E7	NCMA		370	547	59.37	205-325; 343-363; 381-451; 469-529	270	Tca	632	N/A	59.21	N/A	N/A	330	N/A	N/A	N/A	N/A
	Wells 2 and 3	Observation	--	--	NCMA		ec	--	--	--	--	QTpr	632	--	--	--	--	120	360,000	Distance-Drawdown	401	0.10
Grover Beach	Well 4	Pumping	22118	32S/13E-29E7	NCMA	5/16/2014	0	547	60.60	205-325; 343-363; 381-451; 469-529	270	Tca	530	85.85	146.45	85.85	6.2	330	31,800	Cooper-Jacob	13	N/A
																		330	27,200	Theis Recovery	11	N/A

Notes: ? = unknown

N/A = data not available

-- = see table for specific data for each well; drawdown data from each well plotted on distance-drawdown curve shown within Appendix

Footnote: Refer to Section 8.2.3 of the report for a discussion of T and K values

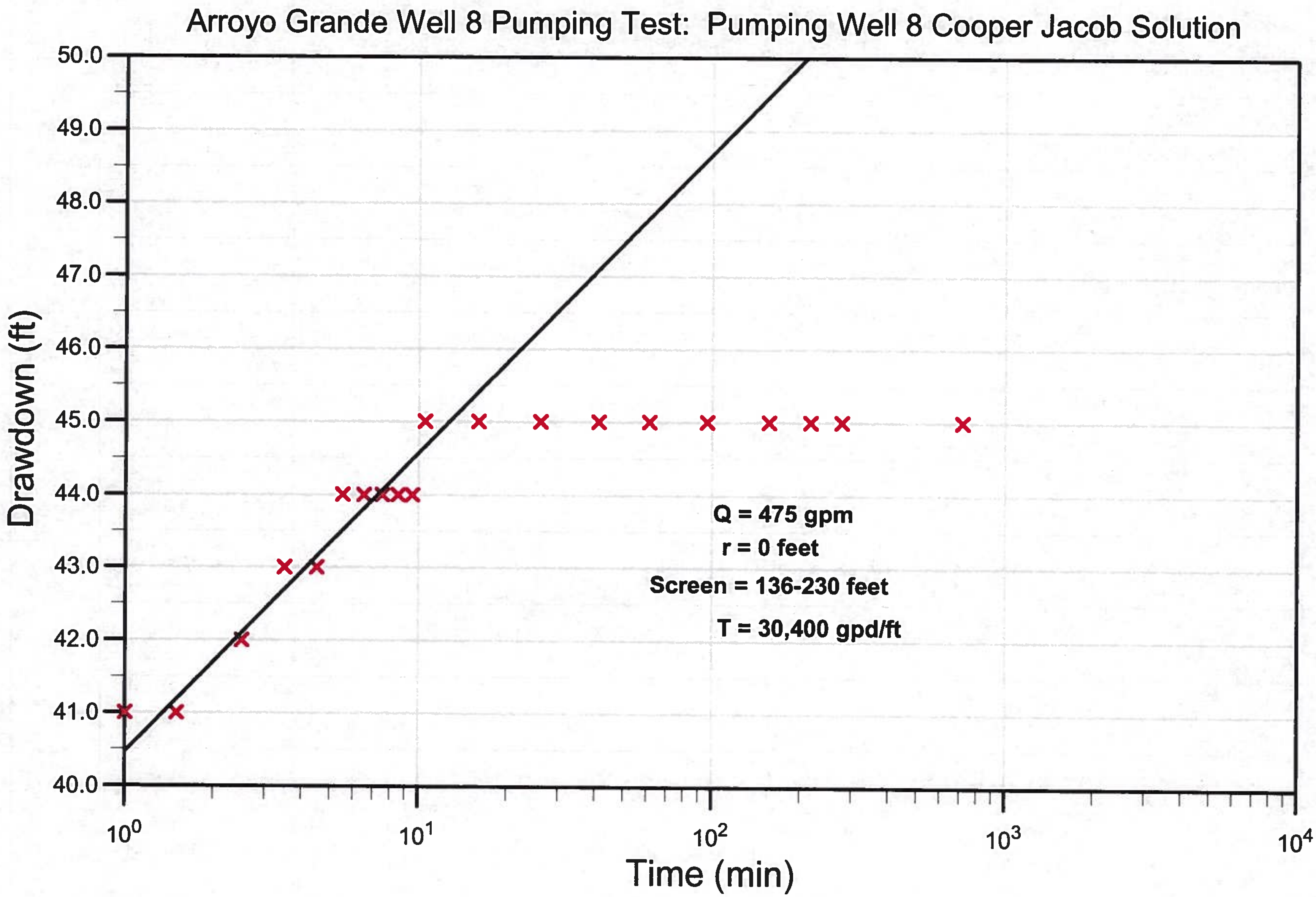


San Luis Obispo County
Project No. 04.62130111

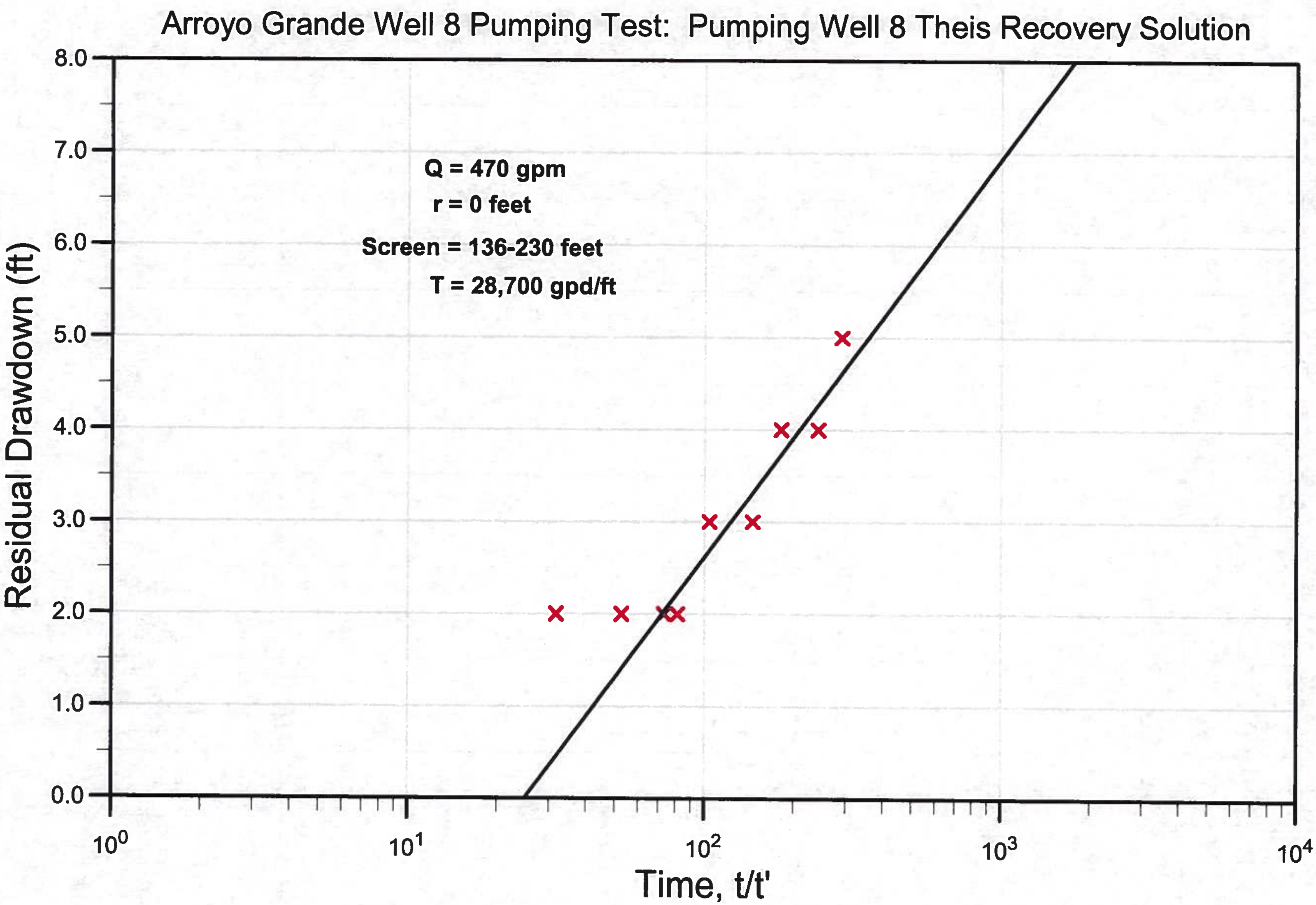
GROUNDWATER LEVEL HYDROGRAPHS, ARROYO GRANDE WELL 8, MONITORING WELLS

Santa Maria Basin Characterization Study

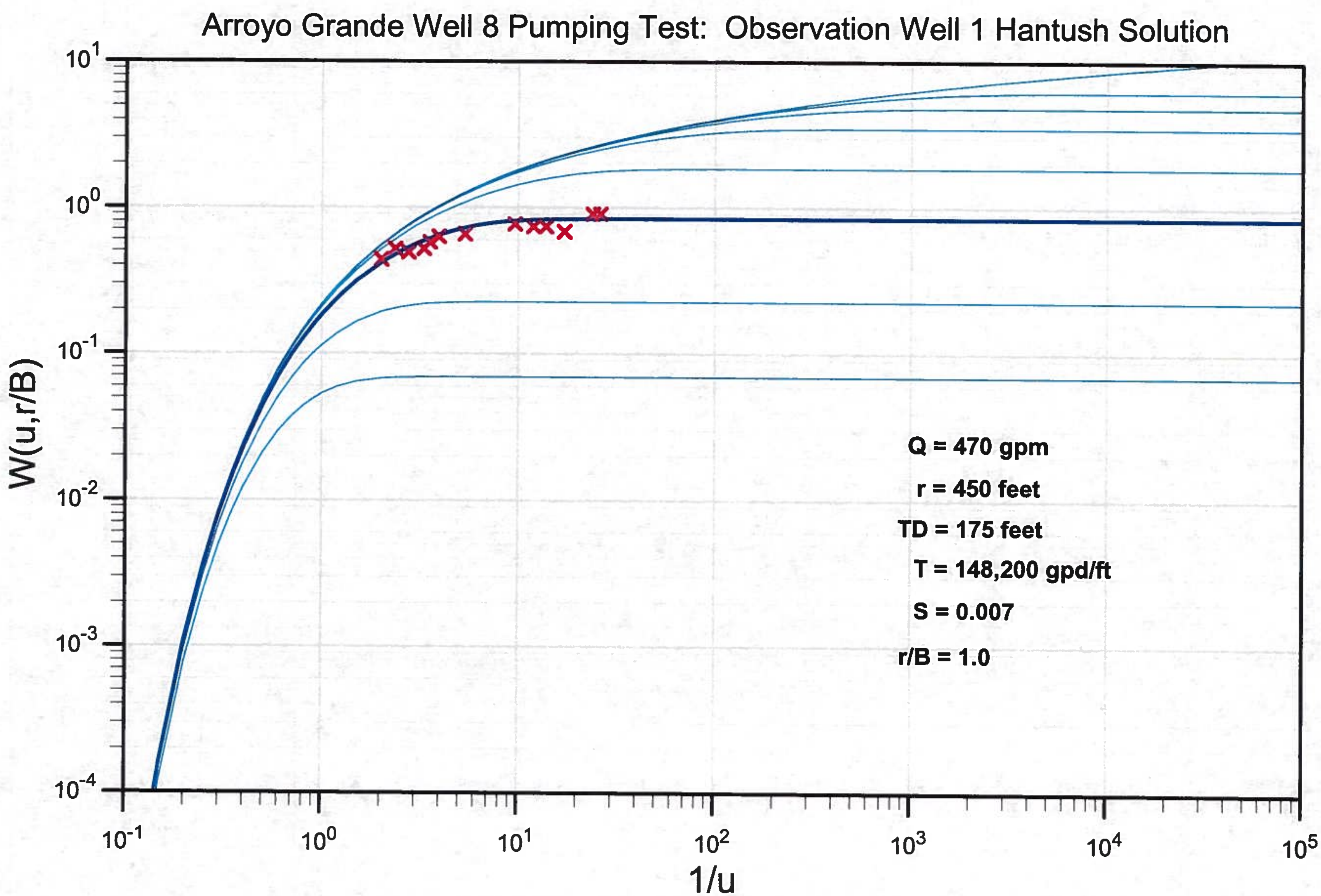
San Luis Obispo County, California



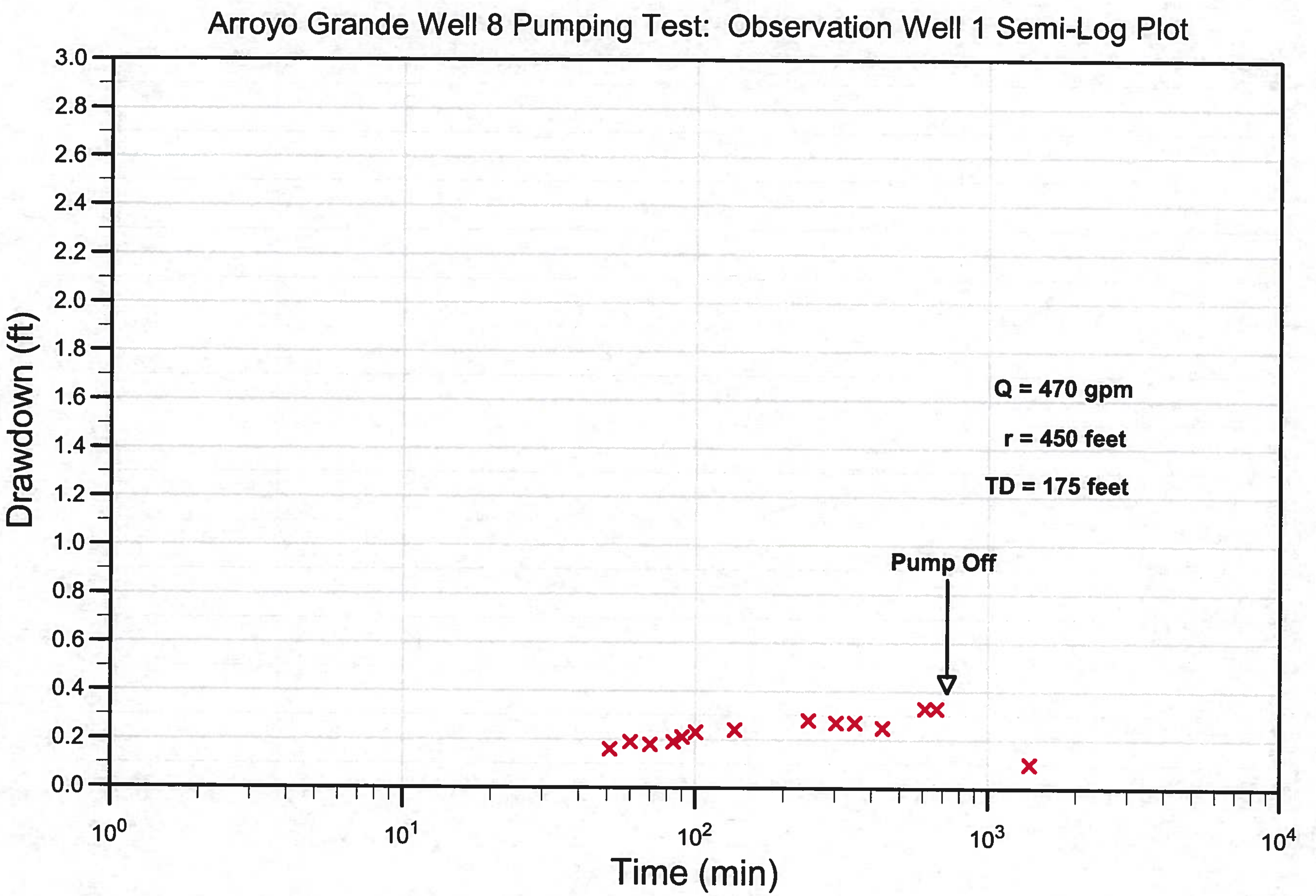
Arroyo Grande Well 8 Pumping Test: Pumping Well 8 Cooper Jacob Solution
50.0
49.0
48.0
47.0
46.0
45.0
44.0
43.0
42.0
41.0
40.0
Drawdown (ft)
Q = 475 gpm
r = 0 feet
Screen = 136-230 feet
T = 30,400 gpd/ft
10^0
10^1
10^2
10^3
10^4
Time (min)

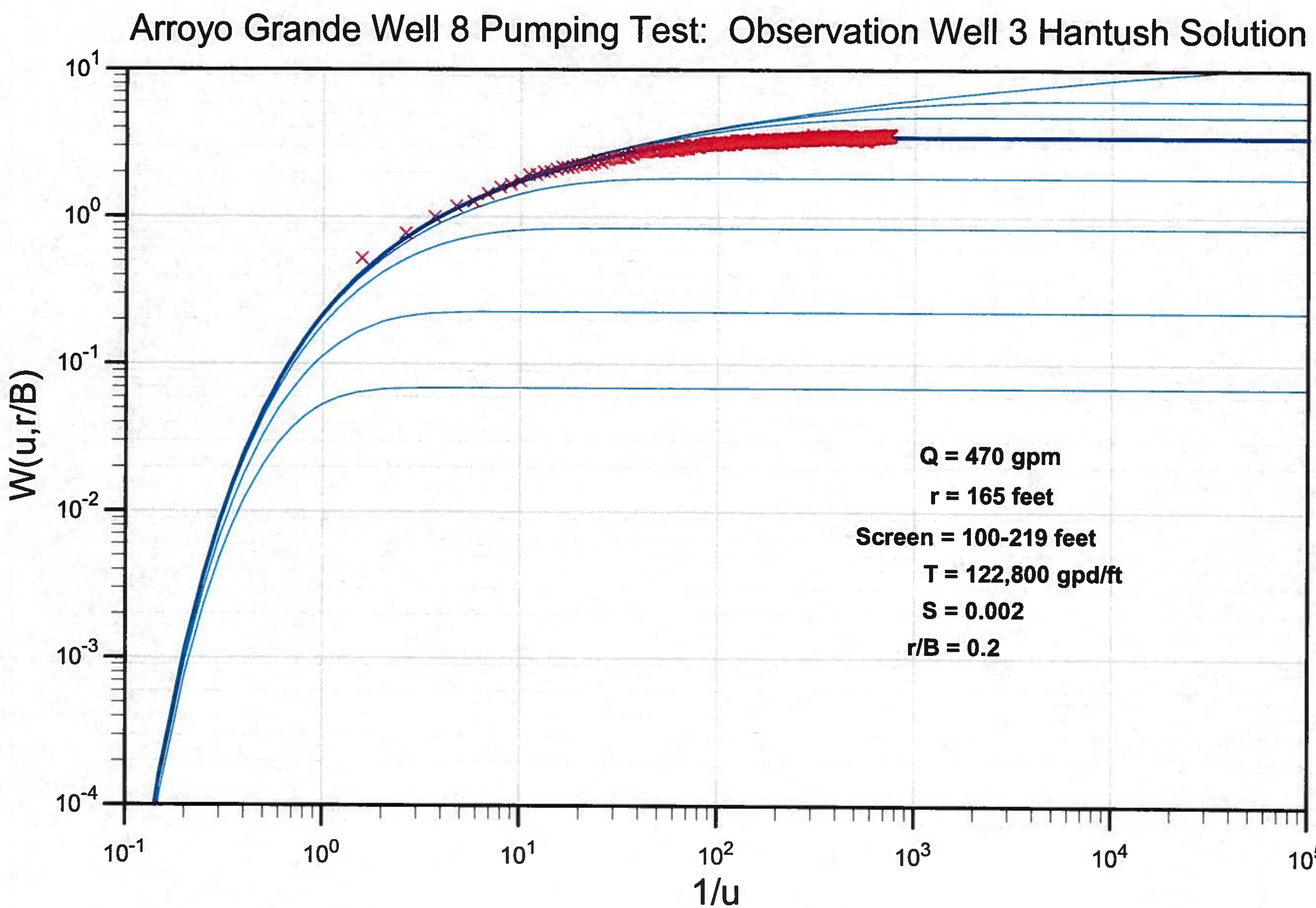


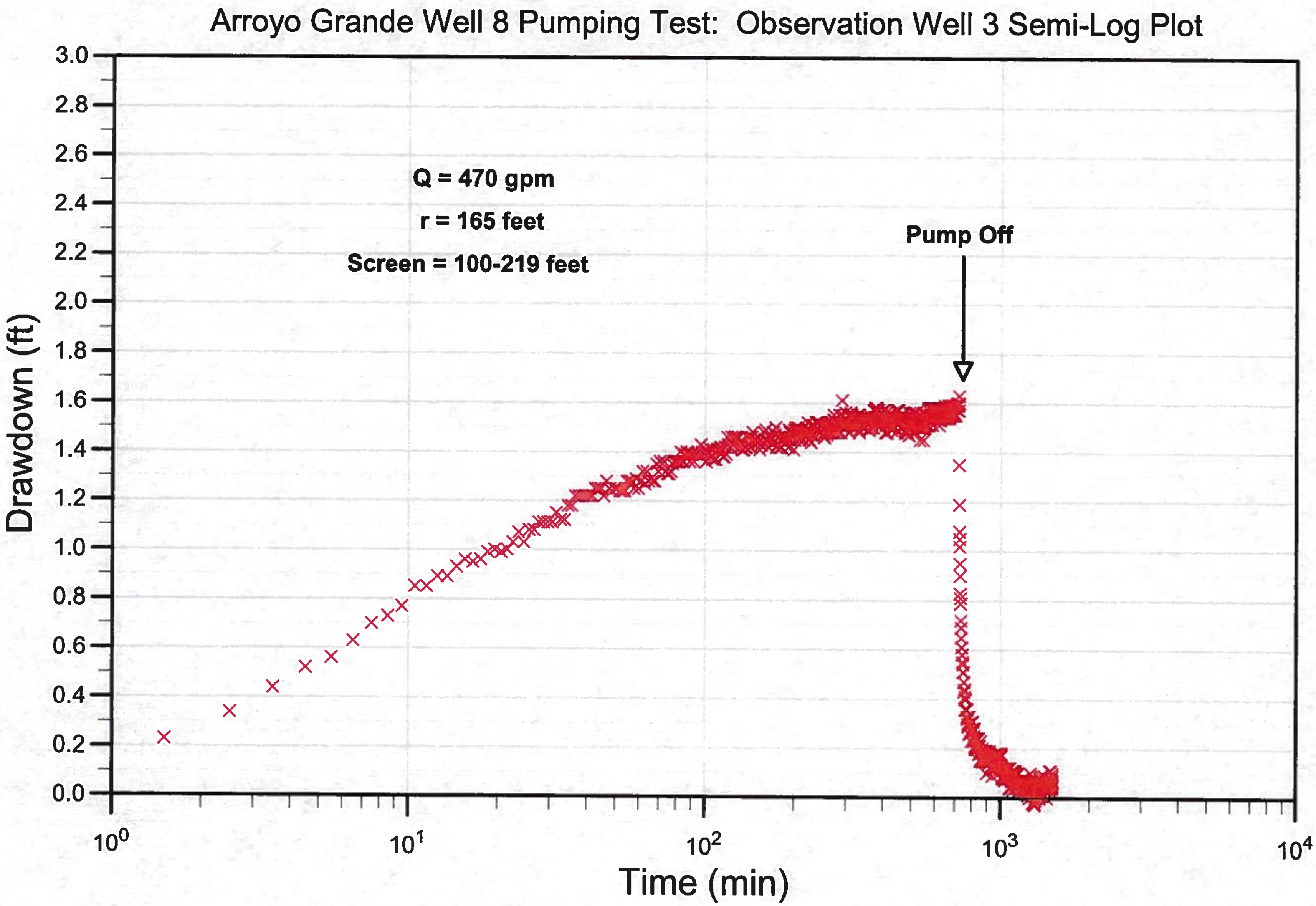
Arroyo Grande Well 8 Pumping Test: Pumping Well 8 Theis Recovery Solution
Q = 470 gpm
r = 0 feet
Screen = 136-230 feet
T = 28,700 gpd/ft
Residual Drawdown (ft)
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
10^0
10^1
10^2
10^3
10^4
Time, t/t'

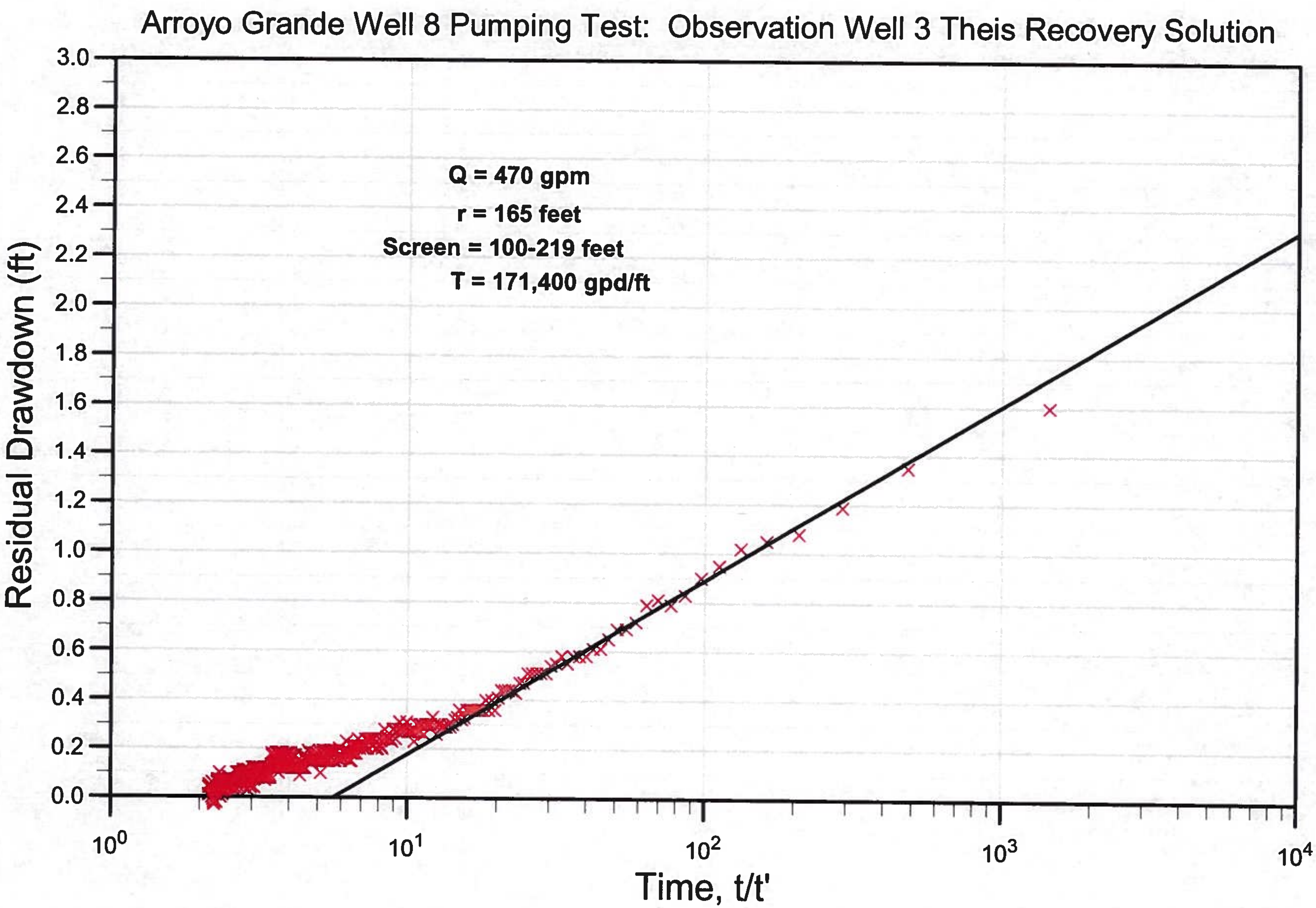


Arroyo Grande Well 8 Pumping Test: Observation Well 1 Hantush Solution
W(u,r/B)
1/u
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{5}
10^{4}
10^{3}
10^{2}
Q = 470 gpm
r = 450 feet
TD = 175 feet
T = 148,200 gpd/ft
S = 0.007
r/B = 1.0

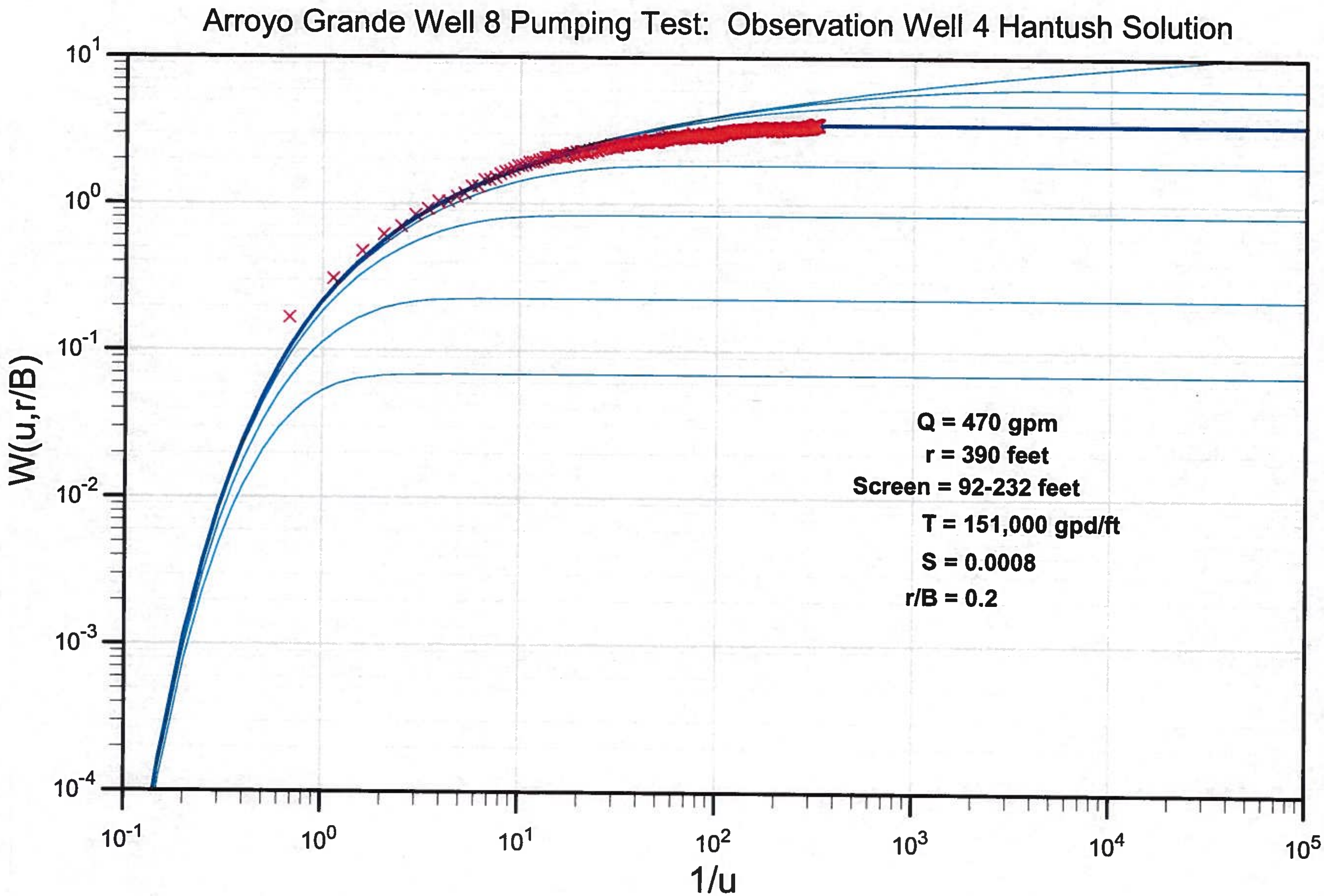

Arroyo Grande Well 8 Pumping Test: Observation Well 1 Semi-Log Plot
Drawdown (ft)
3.0
2.8
2.6
2.4
2.2
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
10^0
10^1
10^2
10^3
10^4
Time (min)
Q = 470 gpm
r = 450 feet
TD = 175 feet
Pump Off


Arroyo Grande Well 8 Pumping Test: Observation Well 3 Hantush Solution
10^1
10^0
10^-1
10^-2
10^-3
10^-4
W(u,r/B)
10^-1
10^0
10^1
10^2
10^3
10^4
10^5
1/u
Q = 470 gpm
r = 165 feet
Screen = 100-219 feet
T = 122,800 gpd/ft
S = 0.002
r/B = 0.2

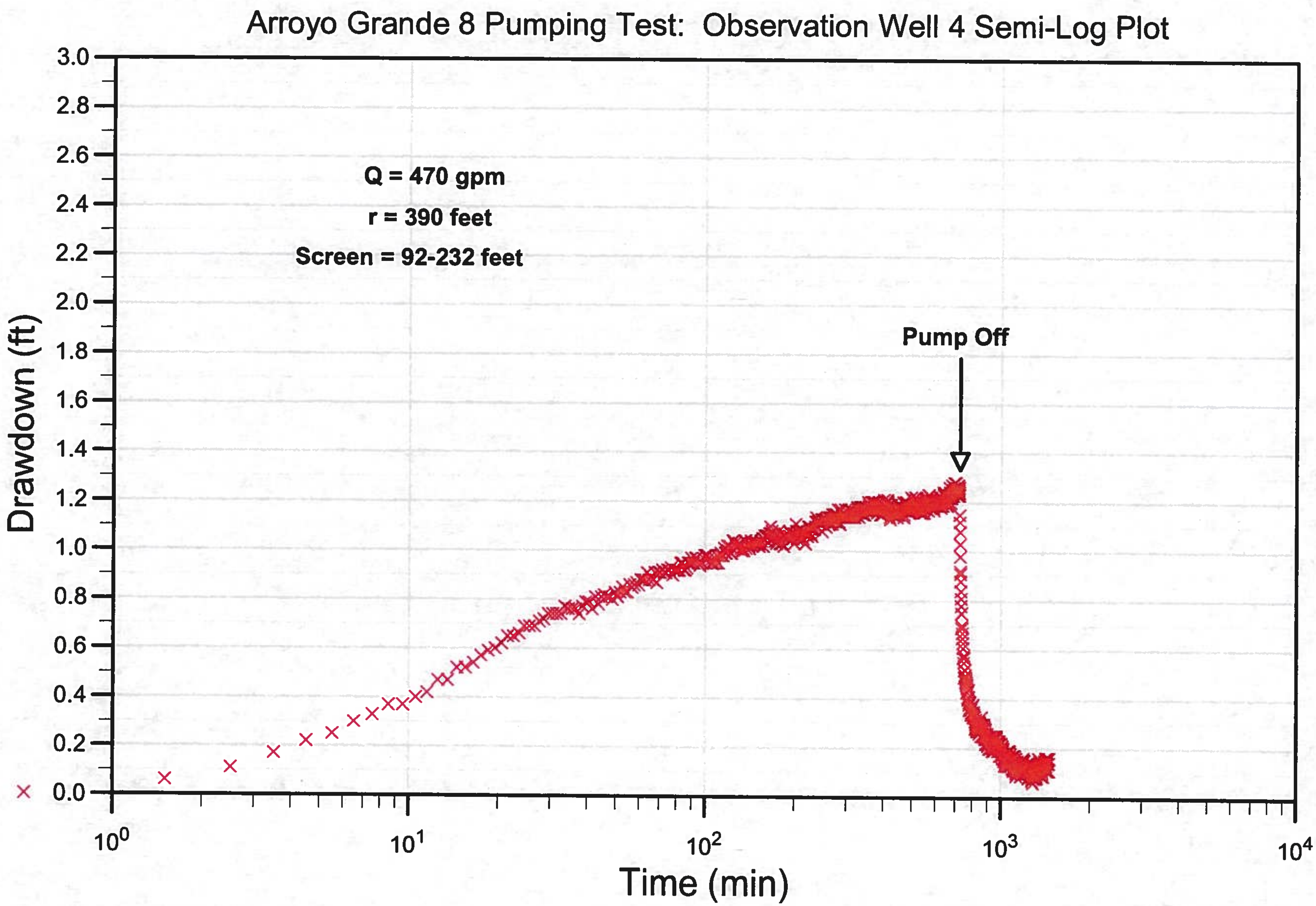

Arroyo Grande Well 8 Pumping Test: Observation Well 3 Semi-Log Plot
Q = 470 gpm
r = 165 feet
Screen = 100-219 feet
Pump Off
Drawdown (ft)
3.0
2.8
2.6
2.4
2.2
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
10^0
10^1
10^2
10^3
10^4
Time (min)

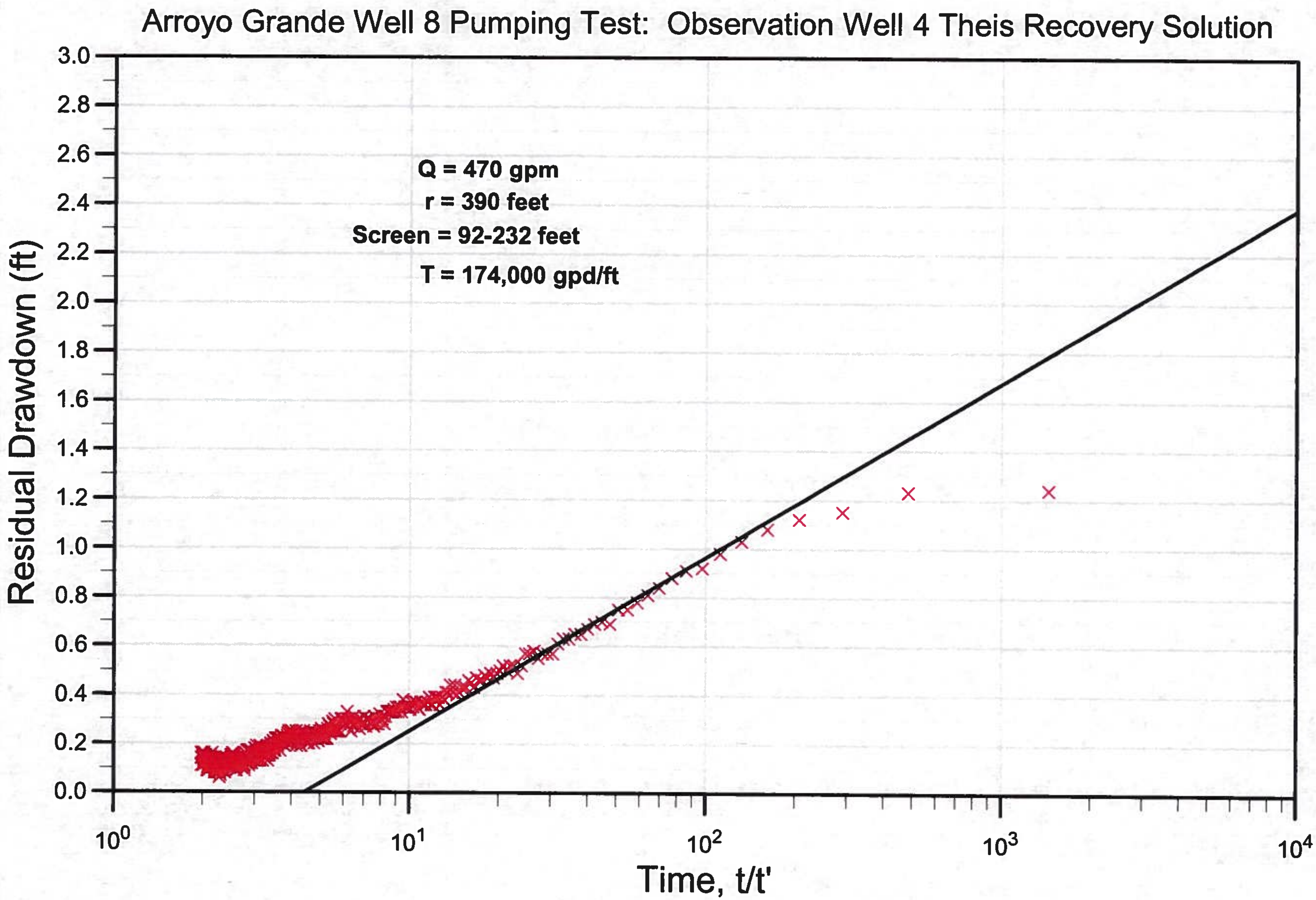


Arroyo Grande Well 8 Pumping Test: Observation Well 3 Theis Recovery Solution
Q = 470 gpm
r = 165 feet
Screen = 100-219 feet
T = 171,400 gpd/ft
Residual Drawdown (ft)
3.0
2.8
2.6
2.4
2.2
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
10^0
10^1
10^2
10^3
10^4
Time, t/t'

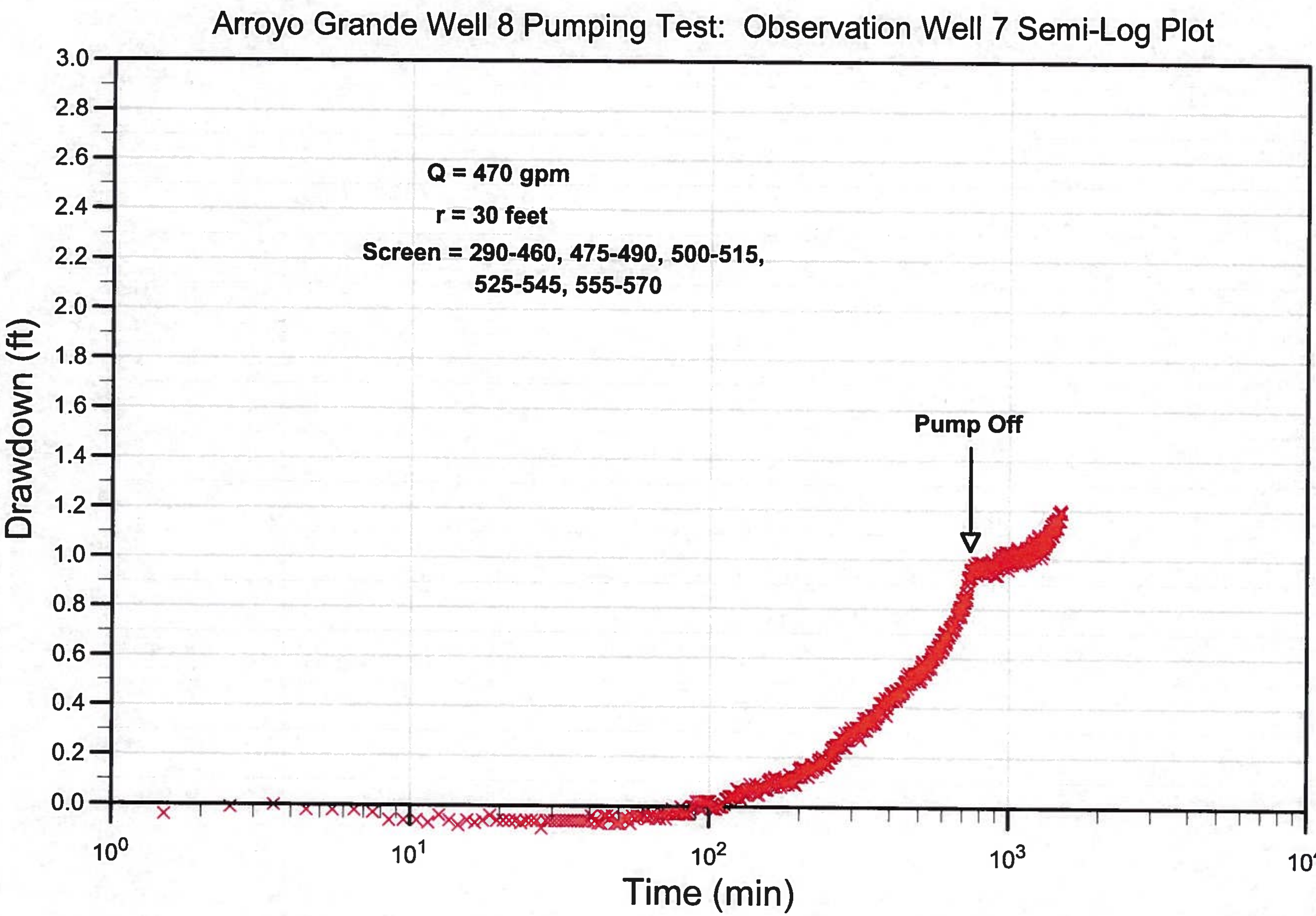


Arroyo Grande Well 8 Pumping Test: Observation Well 4 Hantush Solution
W(u,r/B)
1/u
Q = 470 gpm
r = 390 feet
Screen = 92-232 feet
T = 151,000 gpd/ft
S = 0.0008
r/B = 0.2

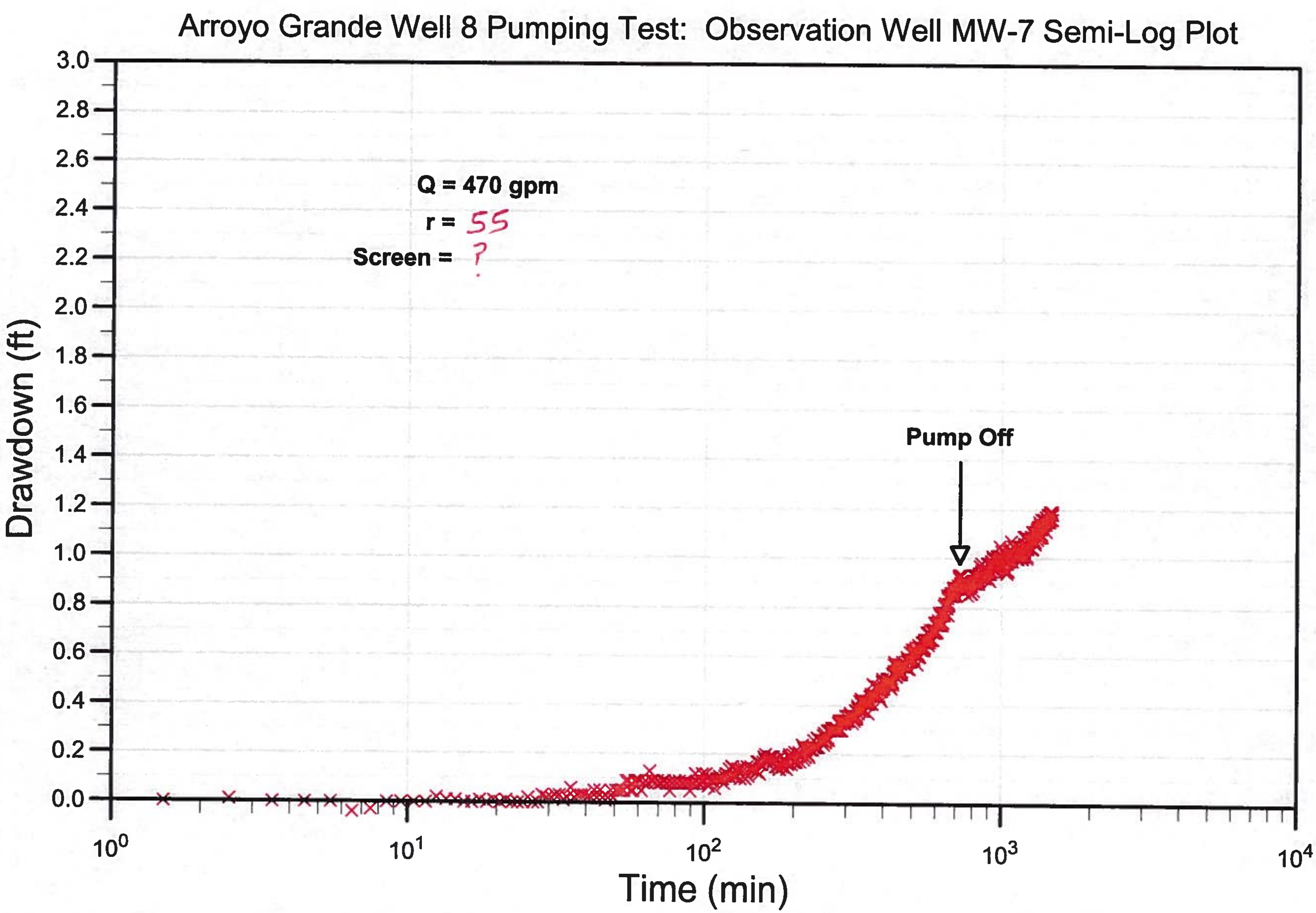

Arroyo Grande 8 Pumping Test: Observation Well 4 Semi-Log Plot
Q = 470 gpm
r = 390 feet
Screen = 92-232 feet
Pump Off
Drawdown (ft)
3.0
2.8
2.6
2.4
2.2
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
10^0
10^1
10^2
10^3
10^4
Time (min)

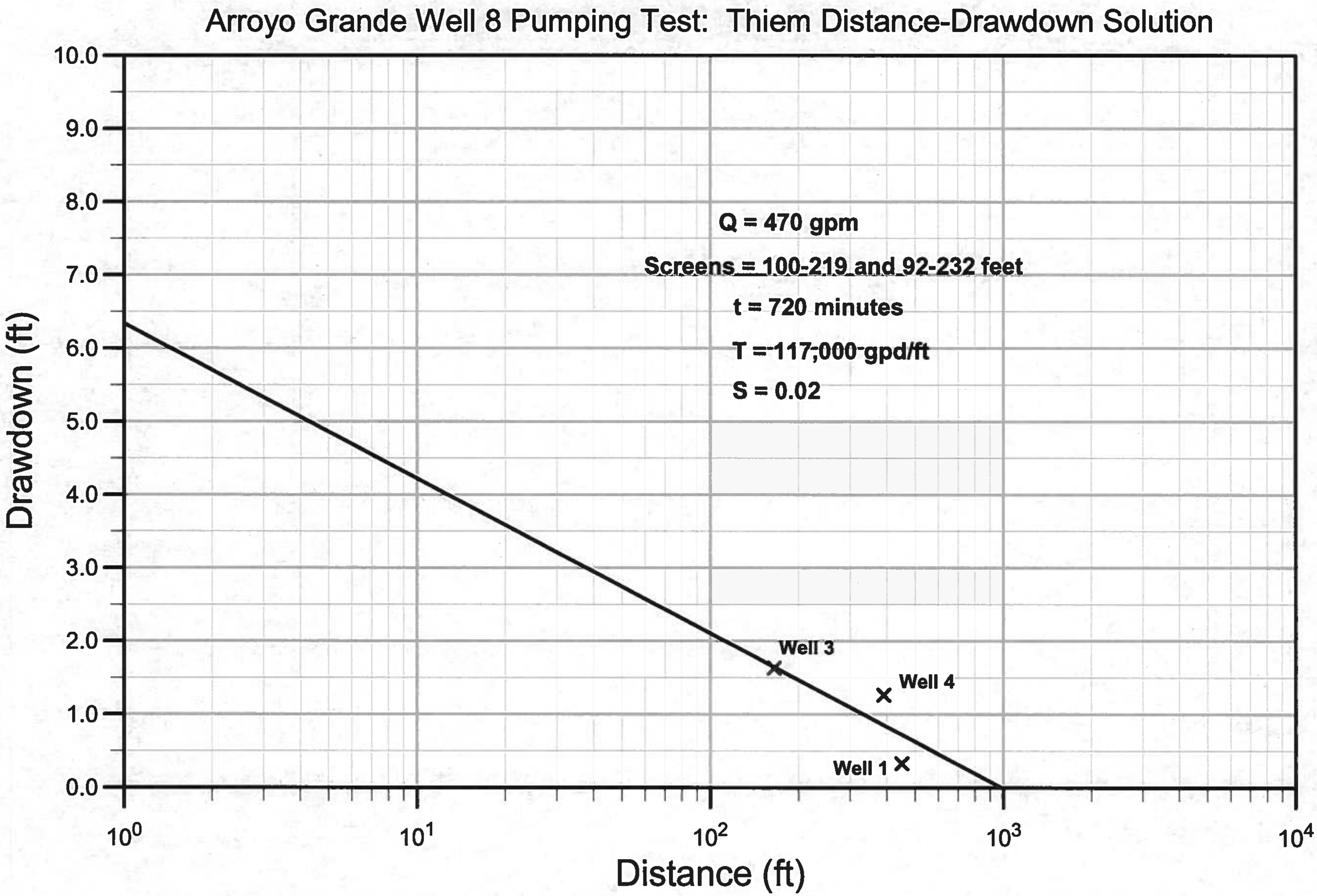


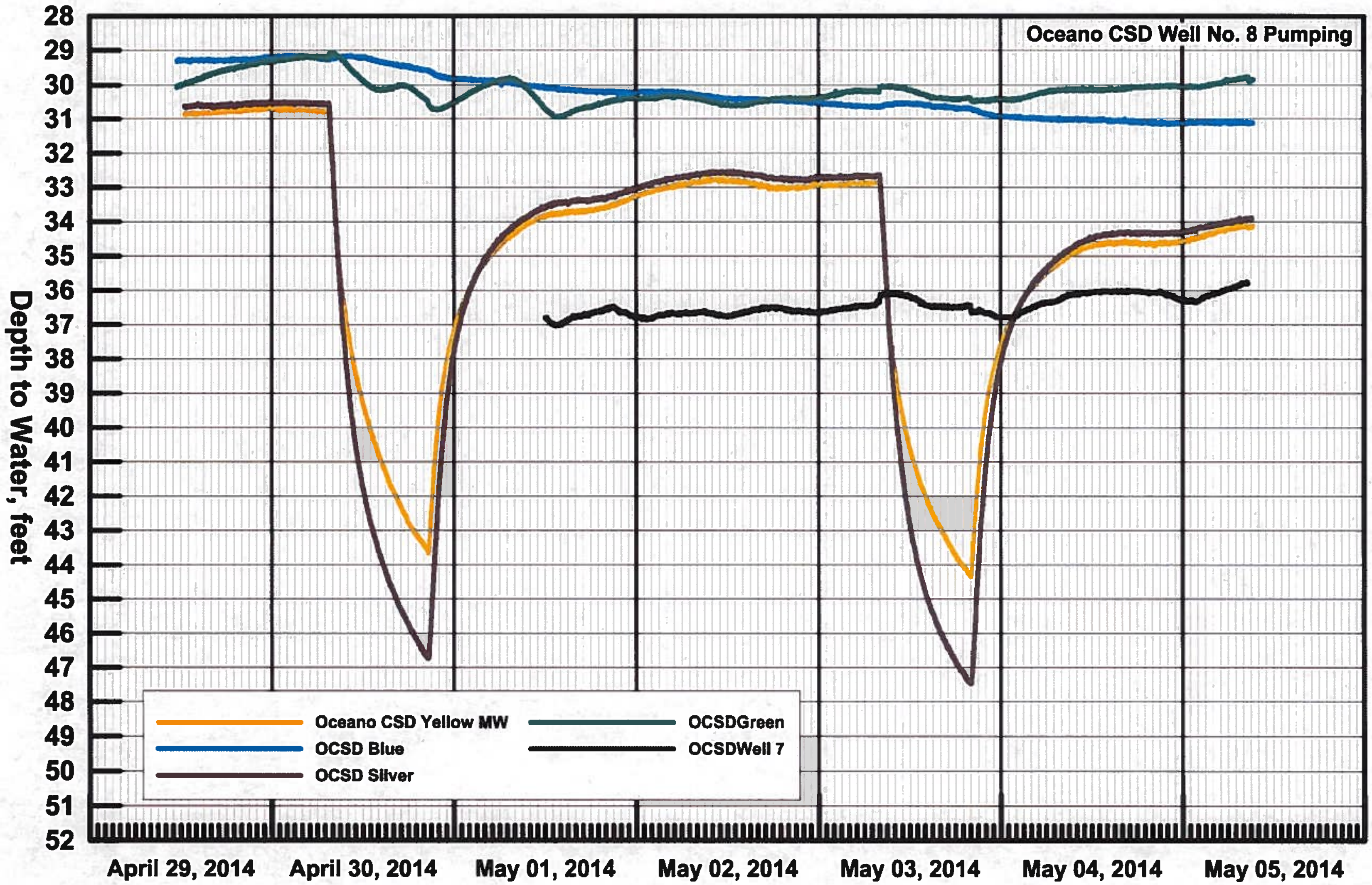
Arroyo Grande Well 8 Pumping Test: Observation Well 4 Theis Recovery Solution
Q = 470 gpm
r = 390 feet
Screen = 92-232 feet
T = 174,000 gpd/ft
Residual Drawdown (ft)
3.0
2.8
2.6
2.4
2.2
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
10^0
10^1
10^2
10^3
10^4
Time, t/t'



Arroyo Grande Well 8 Pumping Test: Observation Well 7 Semi-Log Plot
Q = 470 gpm
r = 30 feet
Screen = 290-460, 475-490, 500-515, 525-545, 555-570
Pump Off
Drawdown (ft)
Time (min)
3.0
2.8
2.6
2.4
2.2
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
10^0
10^1
10^2
10^3
10^4


Arroyo Grande Well 8 Pumping Test: Observation Well MW-7 Semi-Log Plot
Q = 470 gpm
r = 55
Screen = ?
Pump Off
Drawdown (ft)
Time (min)
3.0
2.8
2.6
2.4
2.2
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
10^0
10^1
10^2
10^3
10^4

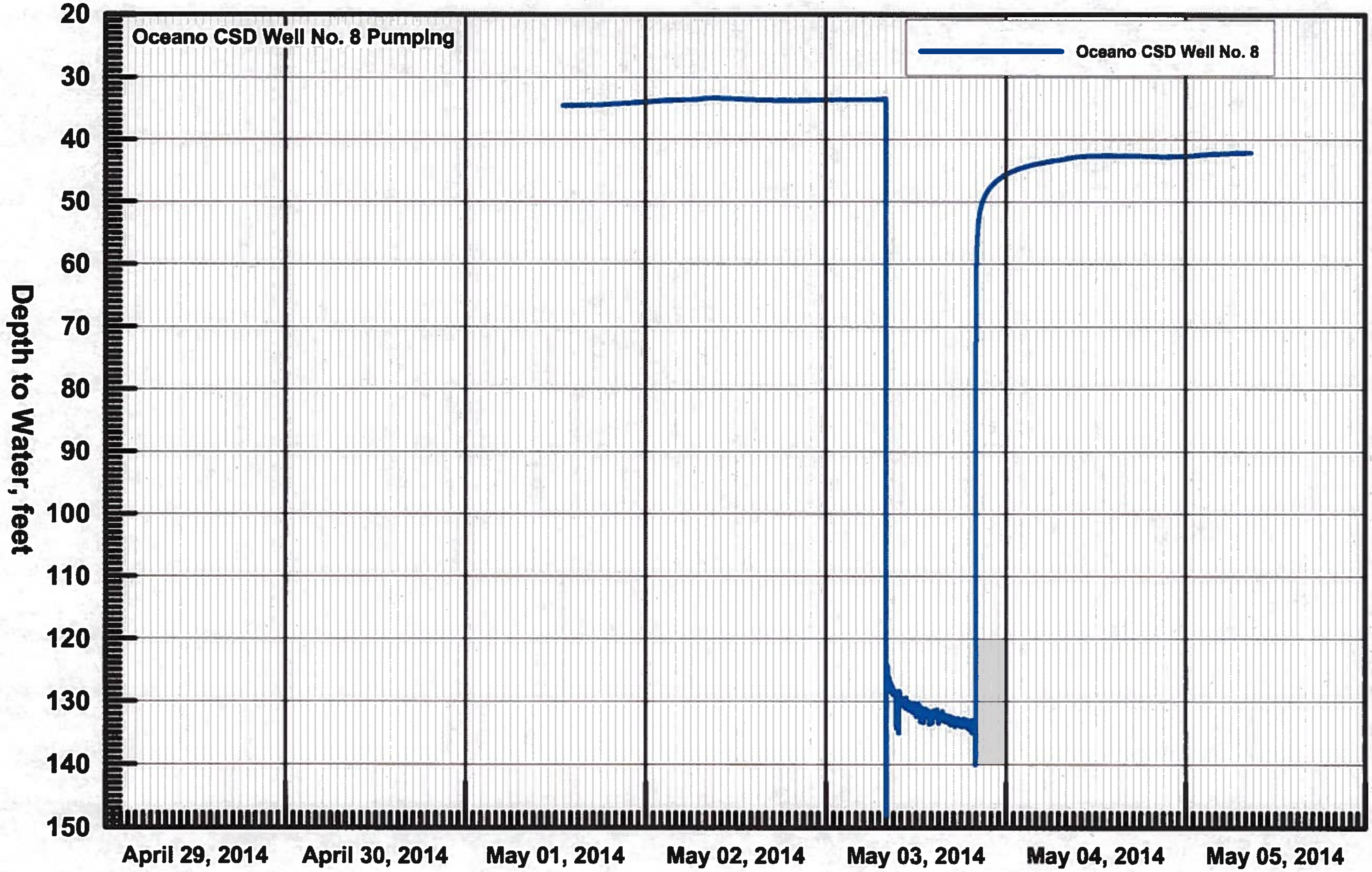

Arroyo Grande Well 8 Pumping Test: Thiem Distance-Drawdown Solution
Q = 470 gpm
Screens = 100-219 and 92-232 feet
t = 720 minutes
T = 117,000 gpd/ft
S = 0.02
Well 3
Well 4
Well 1
Drawdown (ft)
Distance (ft)
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
10^0
10^1
10^2
10^3
10^4



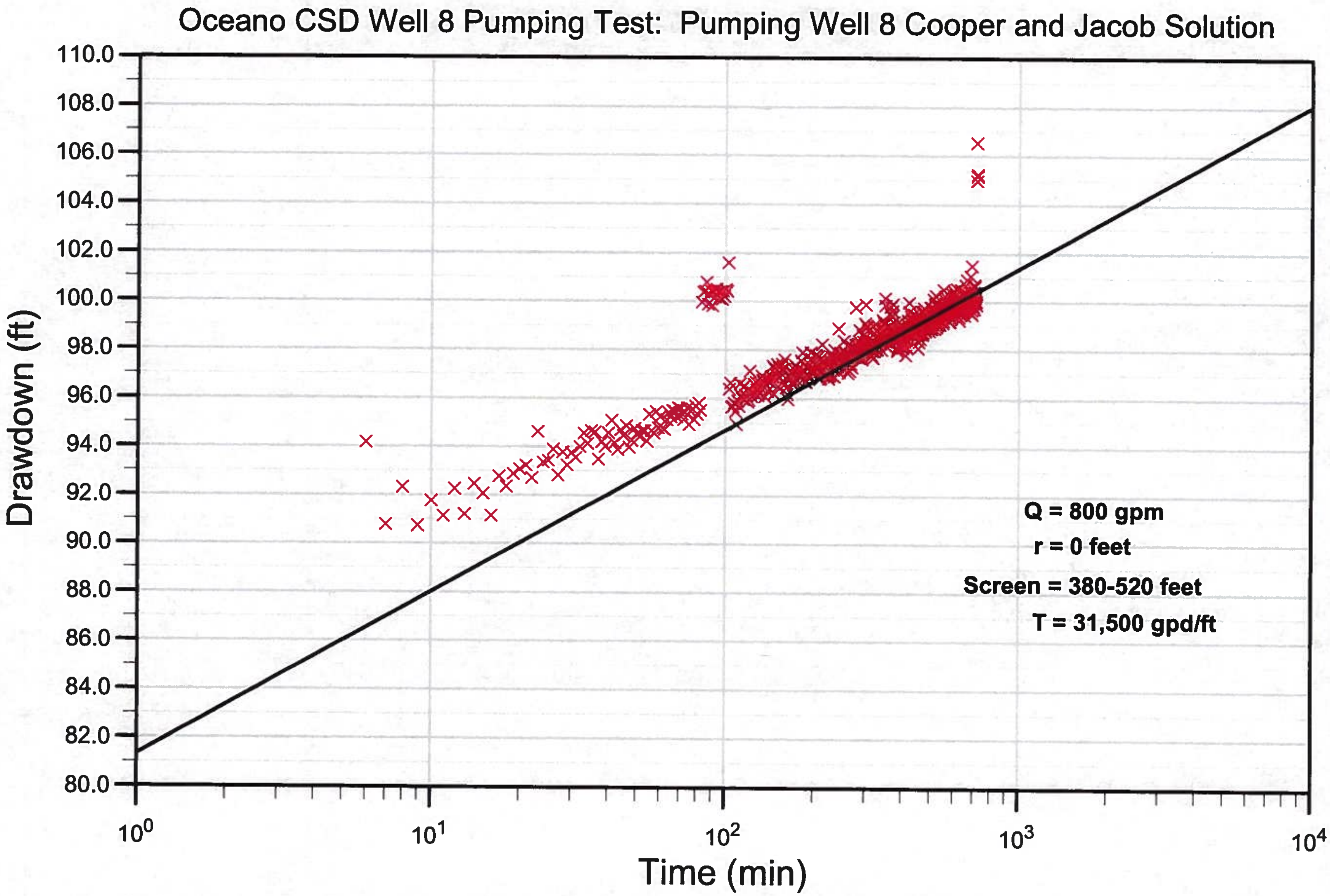
GROUNDWATER LEVEL HYDROGRAPHS, OCEANO CSD MONITORING WELLS

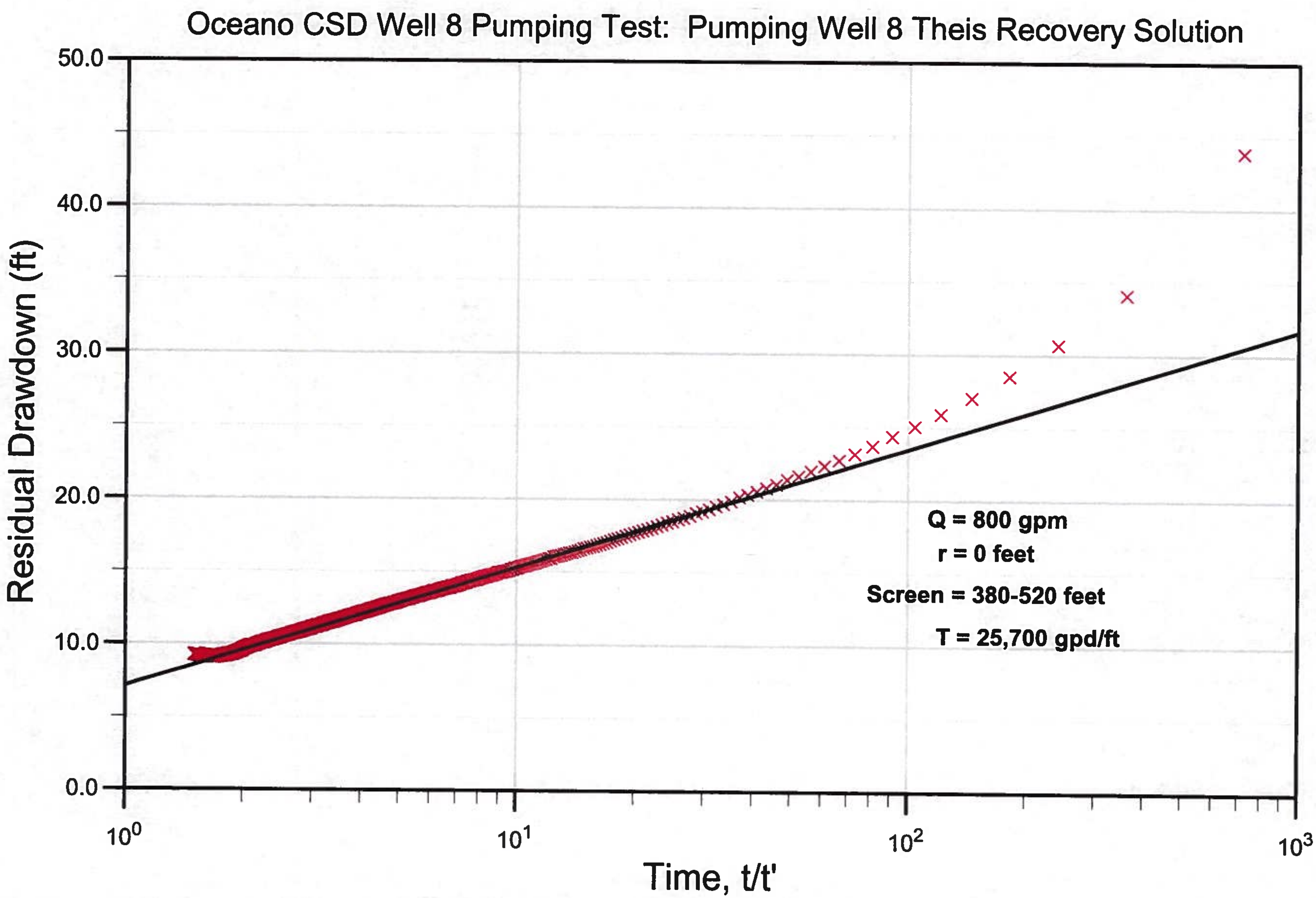
Santa Maria Basin Characterization Study

San Luis Obispo County, California

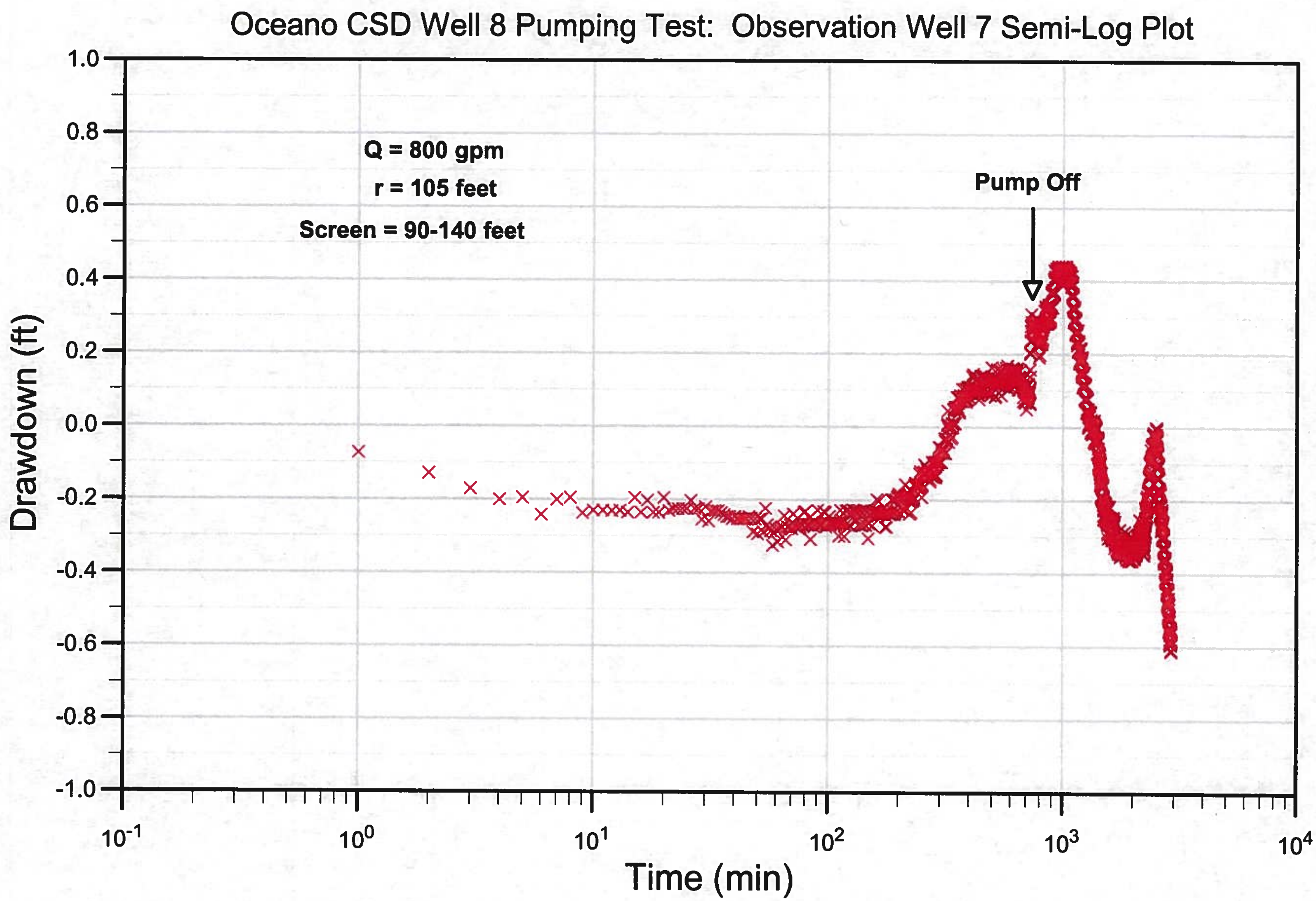


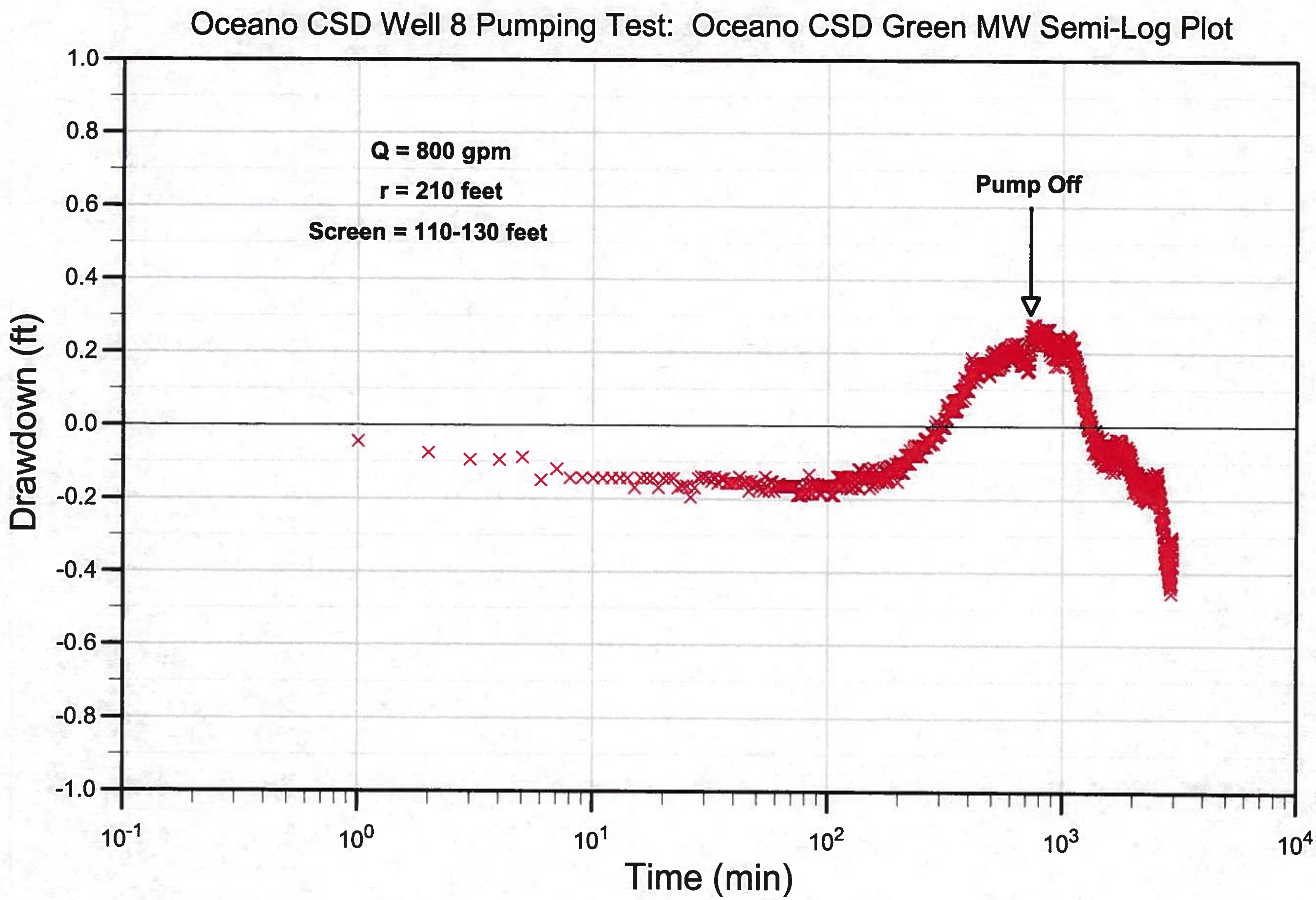
GROUNDWATER LEVEL HYDROGRAPHS, OCEANO CSD WELL NO. 8
Santa Maria Basin Characterization Study
San Luis Obispo County, California


Oceano CSD Well 8 Pumping Test: Pumping Well 8 Cooper and Jacob Solution
Drawdown (ft)
110.0
108.0
106.0
104.0
102.0
100.0
98.0
96.0
94.0
92.0
90.0
88.0
86.0
84.0
82.0
80.0
10^0
10^1
10^2
10^3
10^4
Time (min)
Q = 800 gpm
r = 0 feet
Screen = 380-520 feet
T = 31,500 gpd/ft

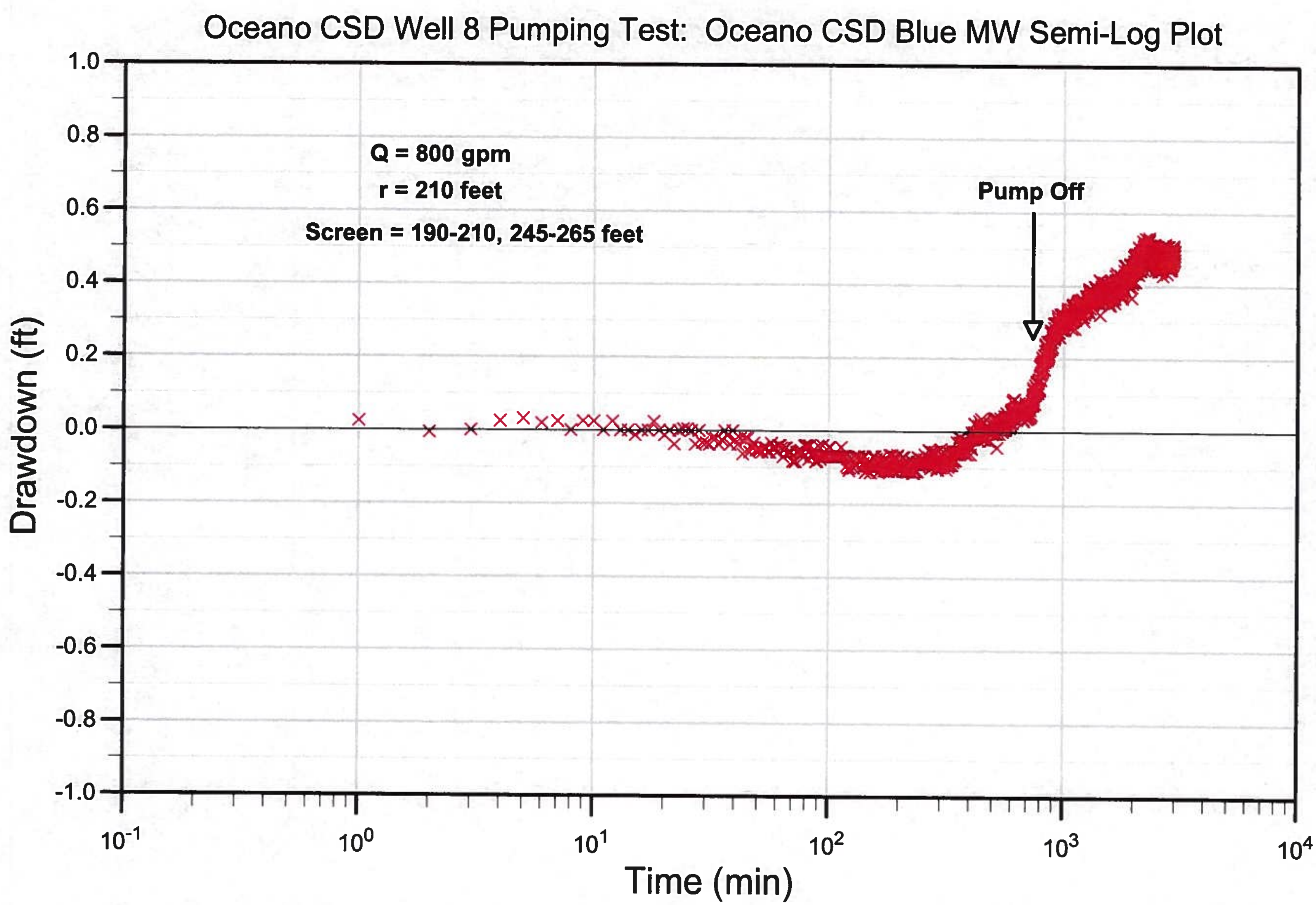


Oceano CSD Well 8 Pumping Test: Pumping Well 8 Theis Recovery Solution
50.0
40.0
30.0
20.0
10.0
0.0
Residual Drawdown (ft)
Q = 800 gpm
r = 0 feet
Screen = 380-520 feet
T = 25,700 gpd/ft
10^0
10^1
10^2
10^3
Time, t/t'

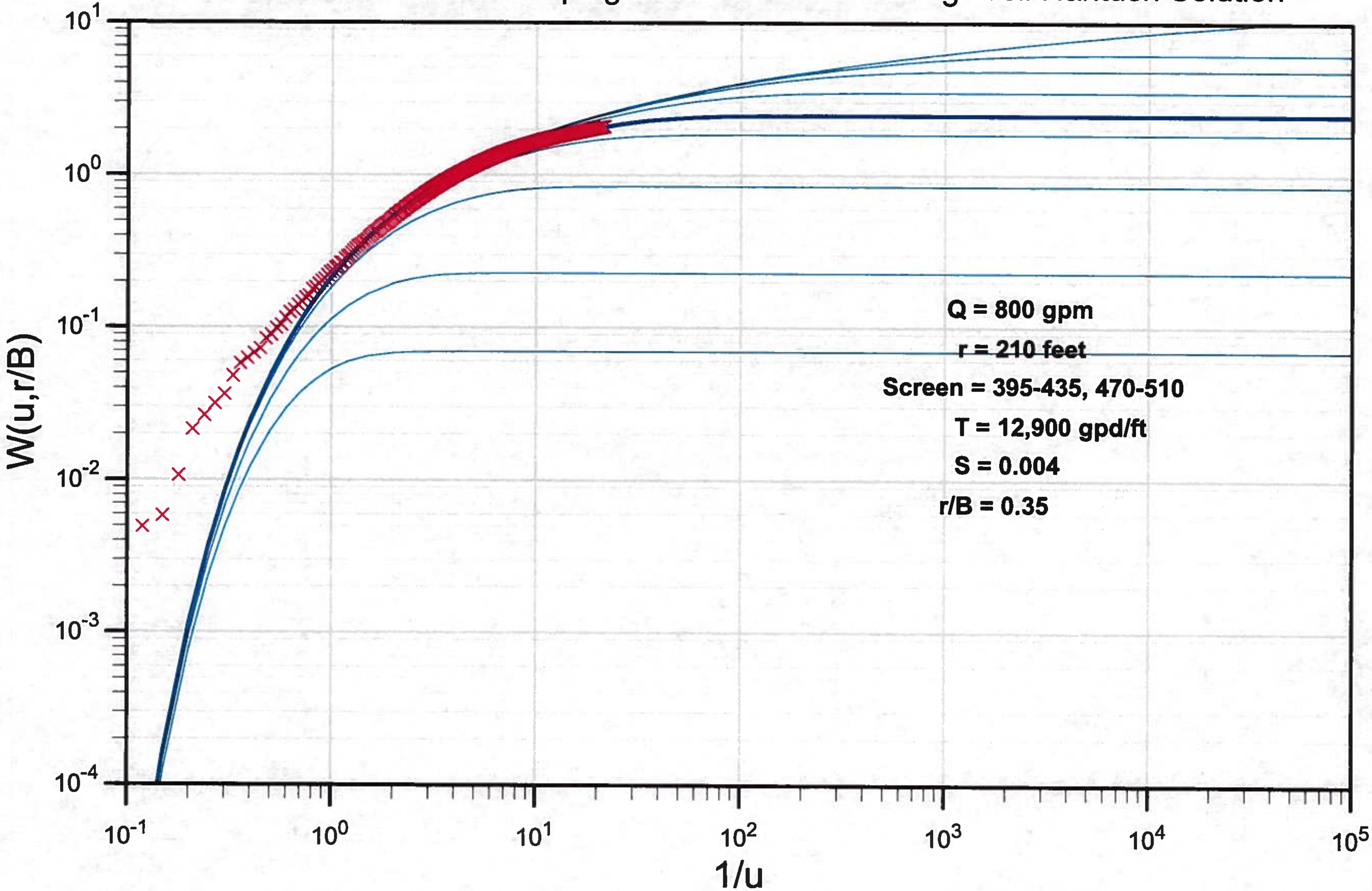

Oceano CSD Well 8 Pumping Test: Observation Well 7 Semi-Log Plot
Q = 800 gpm
r = 105 feet
Screen = 90-140 feet
Pump Off
Drawdown (ft)
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
10-1
100
101
102
103
104
Time (min)

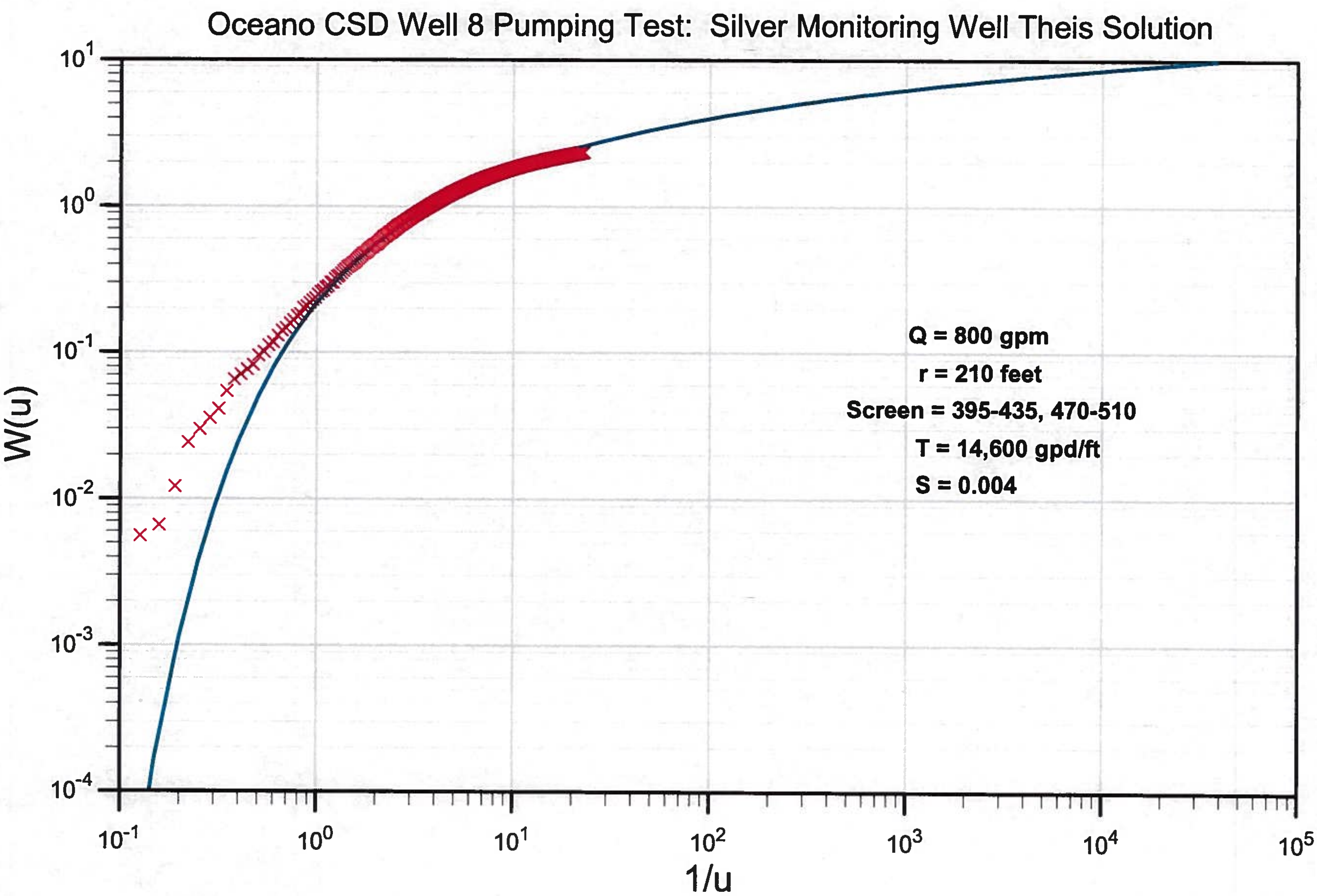


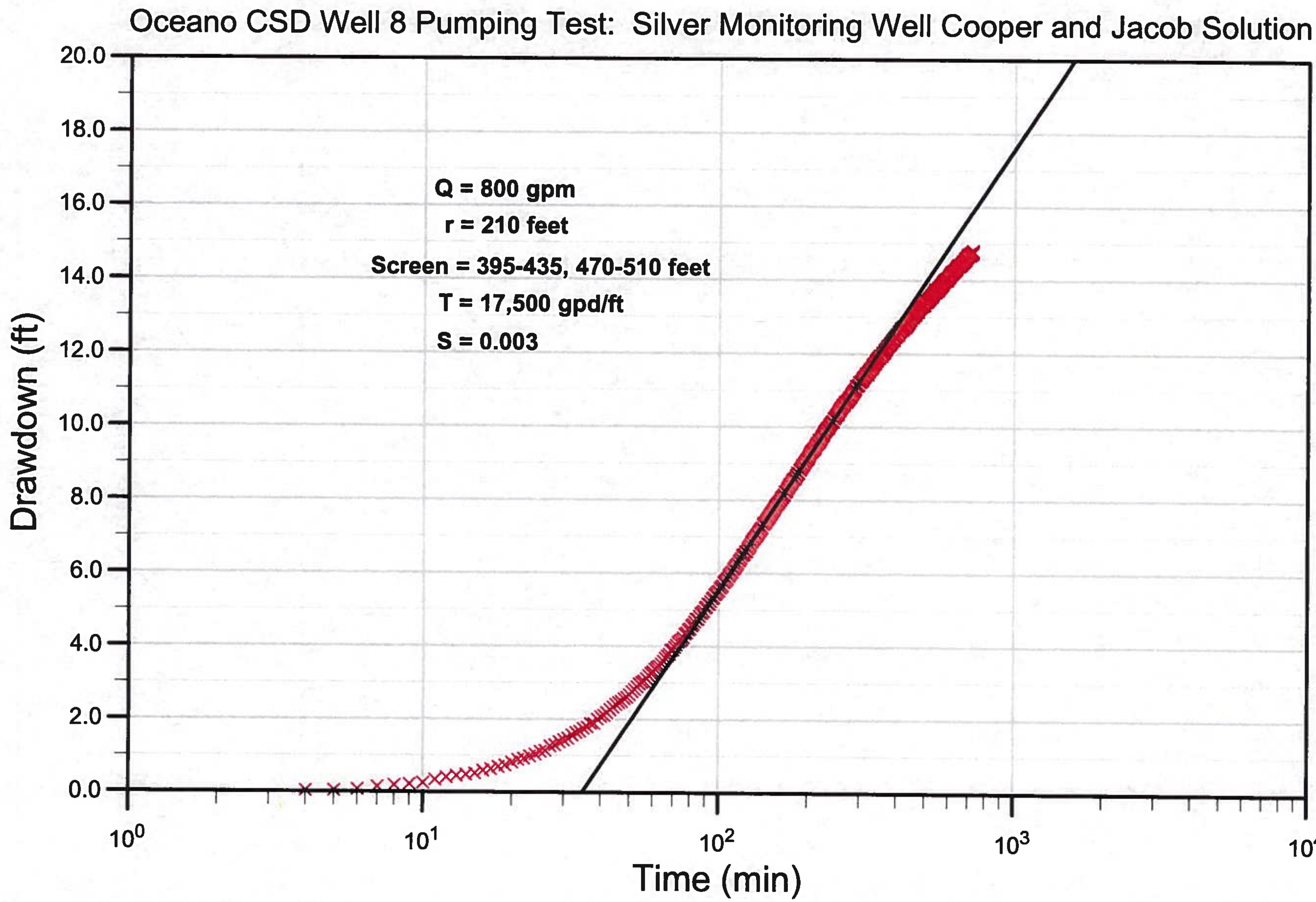
Oceano CSD Well 8 Pumping Test: Oceano CSD Green MW Semi-Log Plot
Q = 800 gpm
r = 210 feet
Screen = 110-130 feet
Pump Off
Drawdown (ft)
Time (min)
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
10-1
100
101
102
103
104


Oceano CSD Well 8 Pumping Test: Oceano CSD Blue MW Semi-Log Plot
Q = 800 gpm
r = 210 feet
Screen = 190-210, 245-265 feet
Pump Off
Drawdown (ft)
Time (min)
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
10^{-1}
10^{0}
10^{1}
10^{2}
10^{3}
10^{4}

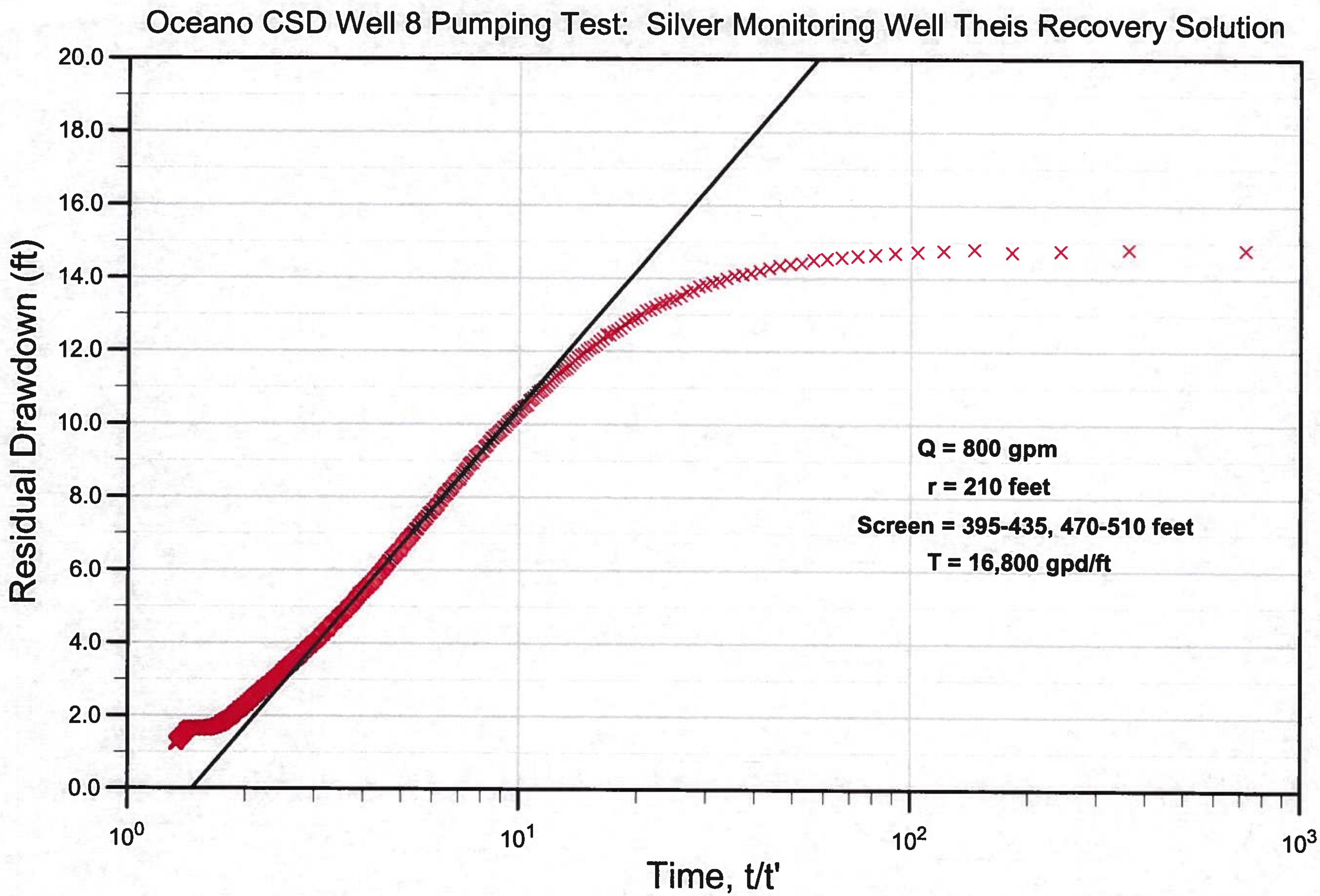
Oceano CSD Well 8 Pumping Test: Silver Monitoring Well Hantush Solution



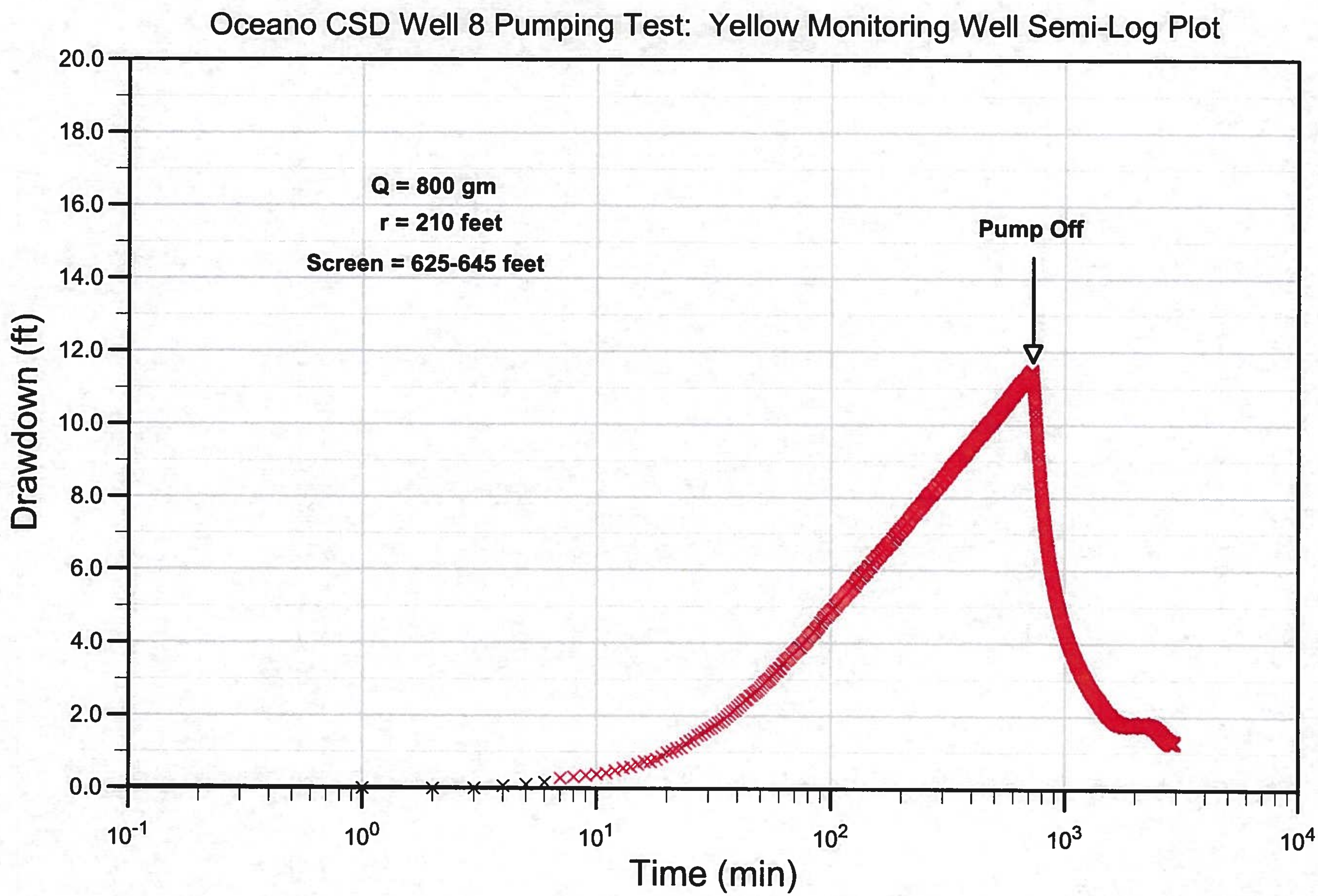

Oceano CSD Well 8 Pumping Test: Silver Monitoring Well Theis Solution
W(u)
1/u
Q = 800 gpm
r = 210 feet
Screen = 395-435, 470-510
T = 14,600 gpd/ft
S = 0.004



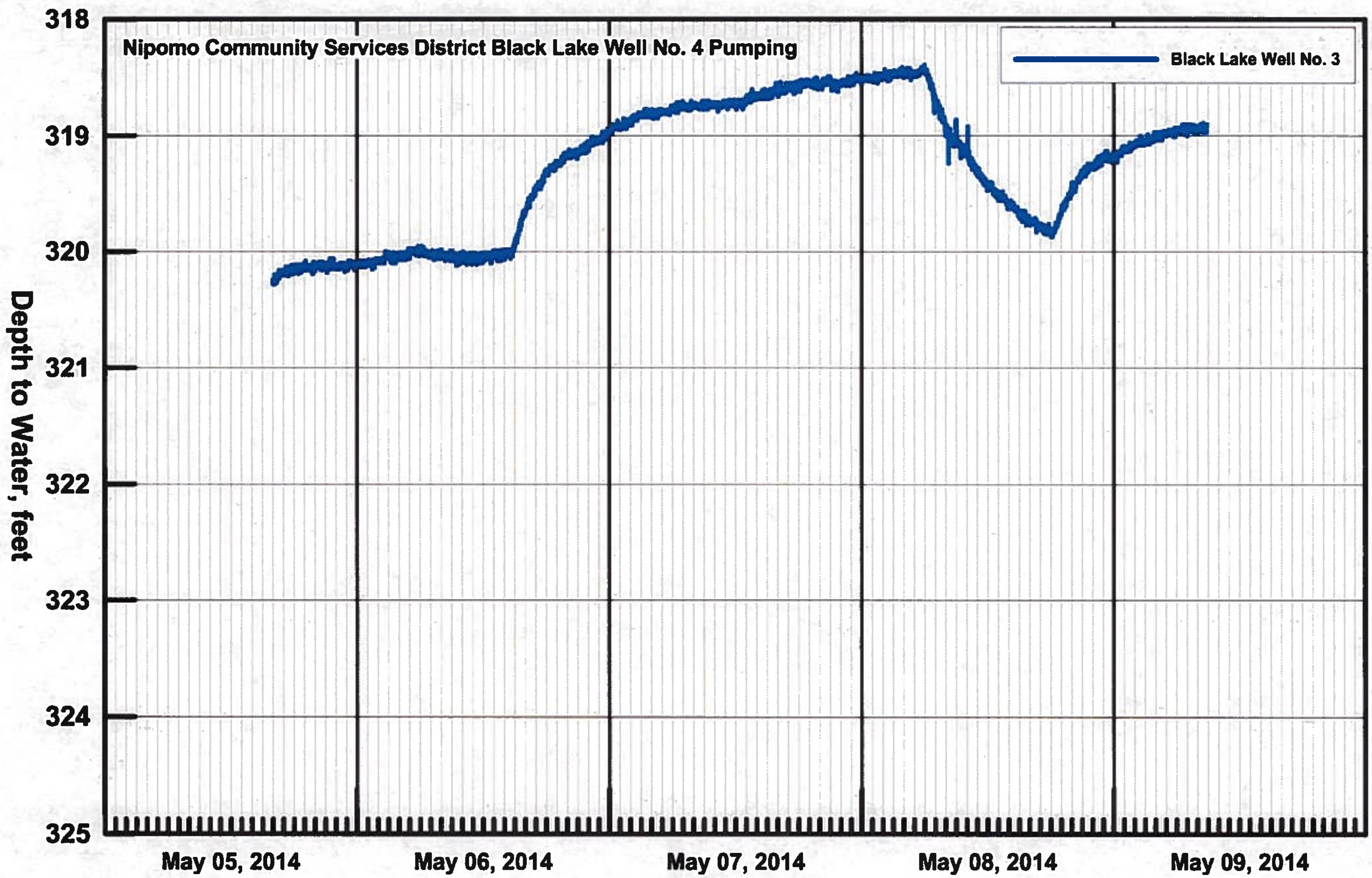
Oceano CSD Well 8 Pumping Test: Silver Monitoring Well Cooper and Jacob Solution
Q = 800 gpm
r = 210 feet
Screen = 395-435, 470-510 feet
T = 17,500 gpd/ft
S = 0.003
Drawdown (ft)
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
10^0
10^1
10^2
10^3
10^4
Time (min)



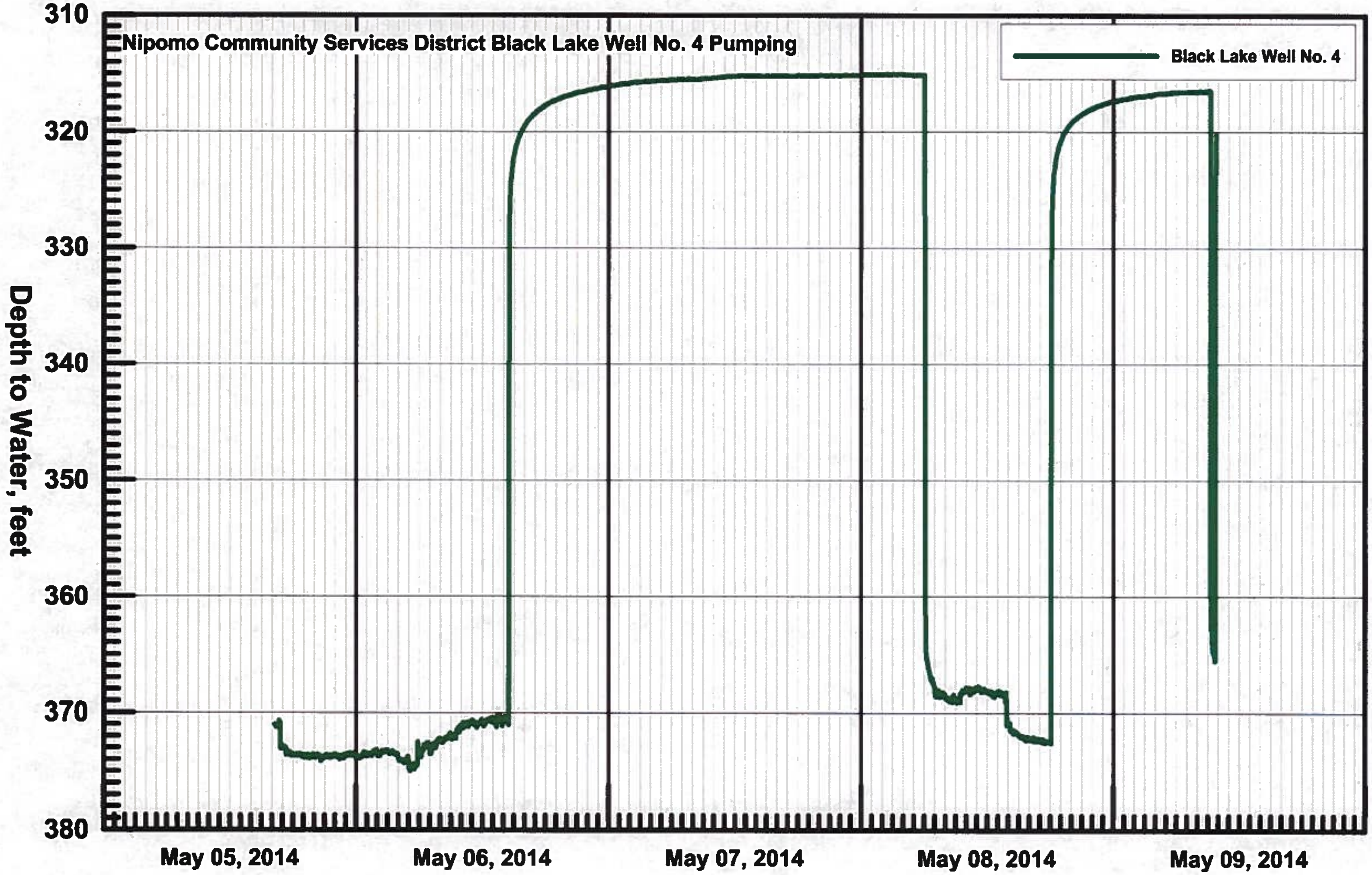
Oceano CSD Well 8 Pumping Test: Silver Monitoring Well Theis Recovery Solution
Residual Drawdown (ft)
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
Q = 800 gpm
r = 210 feet
Screen = 395-435, 470-510 feet
T = 16,800 gpd/ft
10^0
10^1
10^2
10^3
Time, t/t'



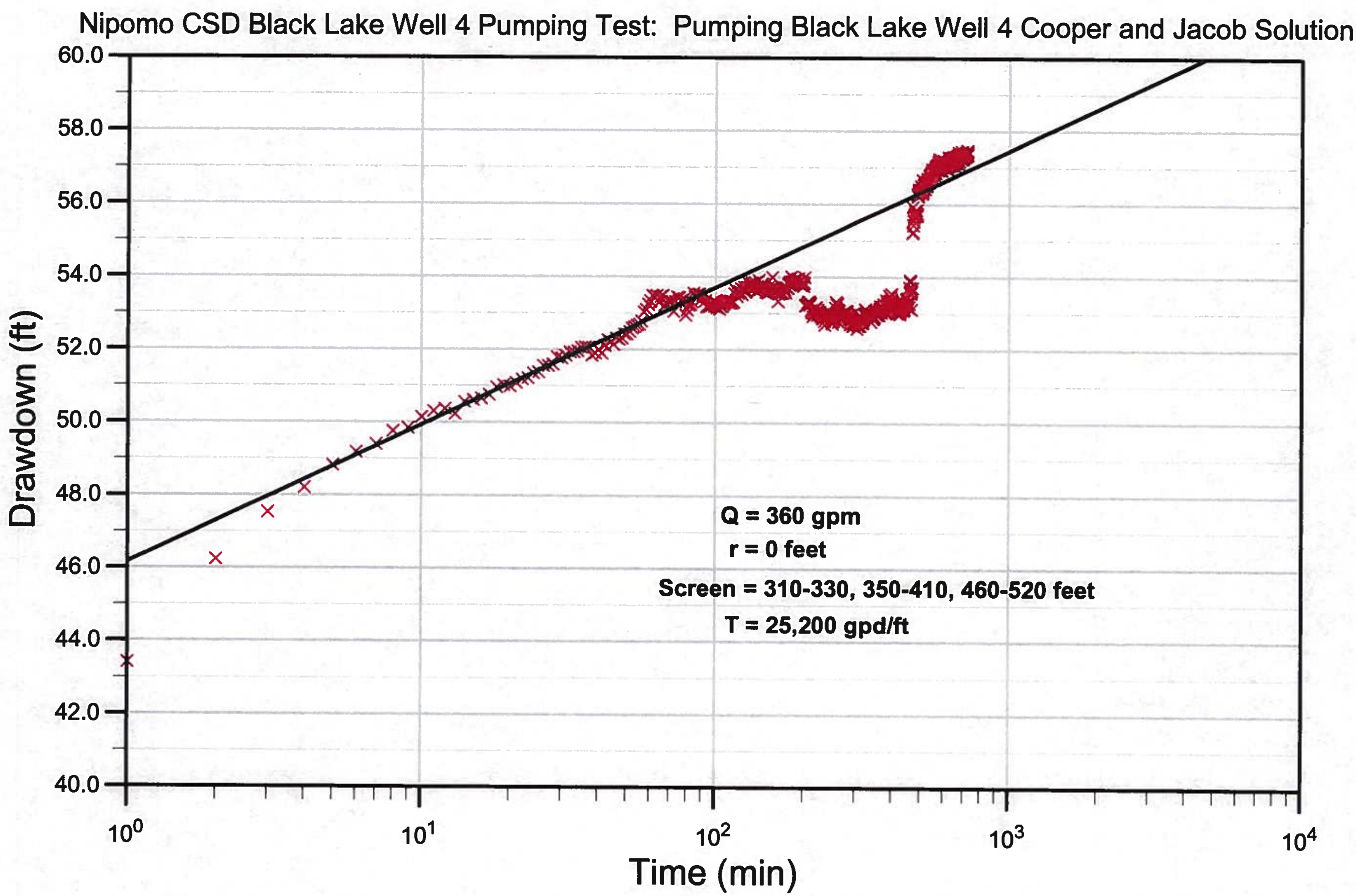
Oceano CSD Well 8 Pumping Test: Yellow Monitoring Well Semi-Log Plot
Q = 800 gm
r = 210 feet
Screen = 625-645 feet
Pump Off
Drawdown (ft)
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
10-1
100
101
102
103
104
Time (min)

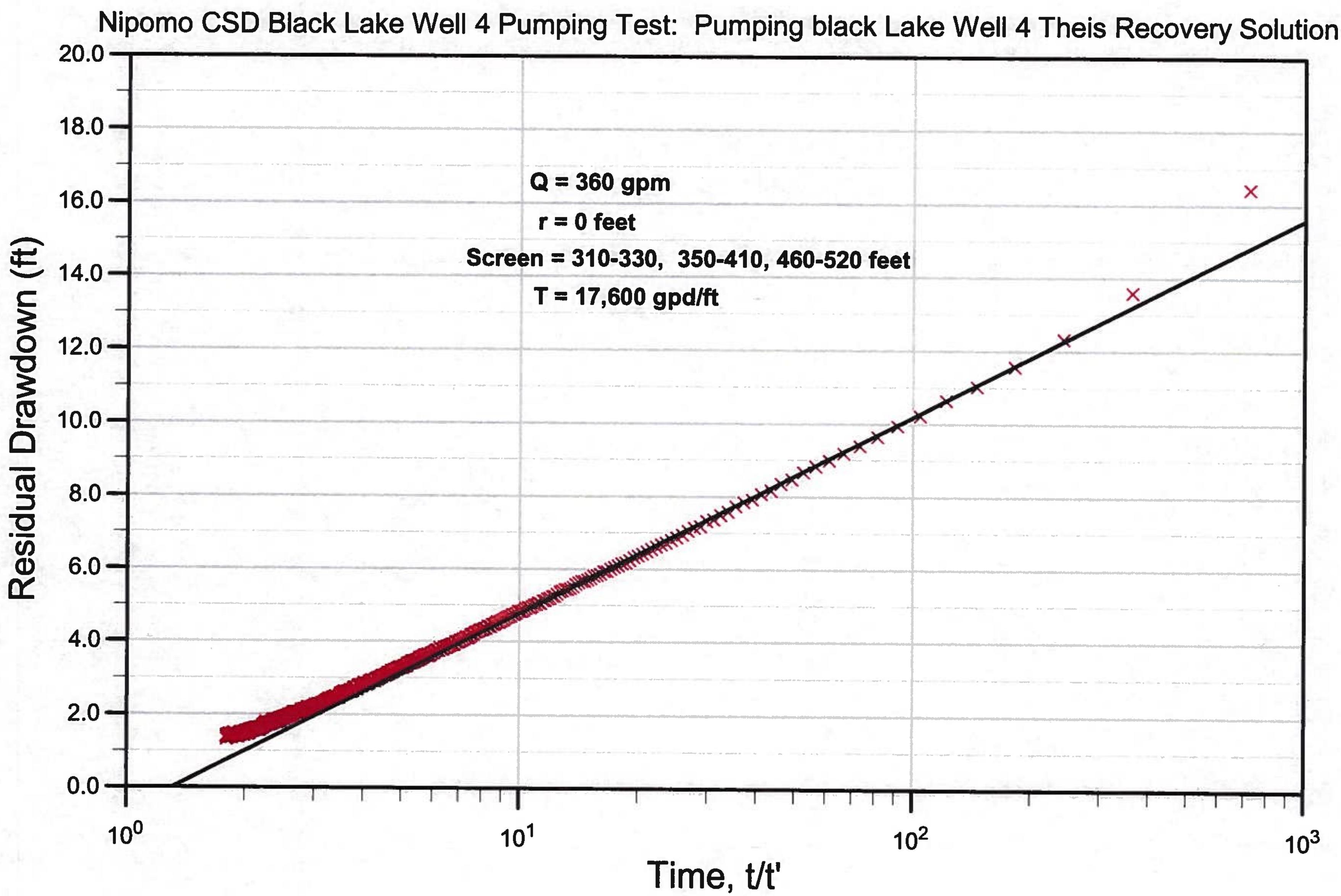


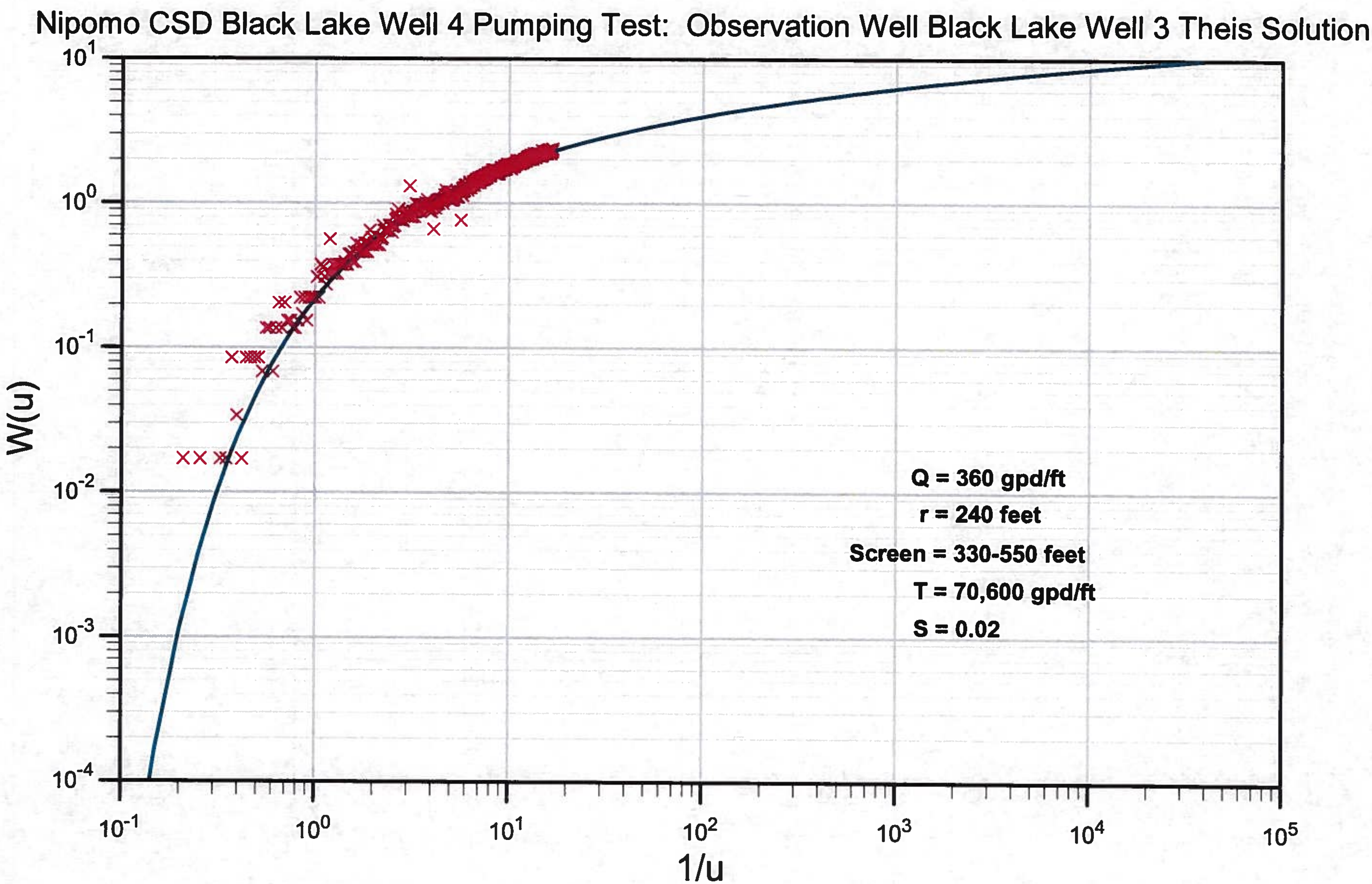
GROUNDWATER LEVEL HYDROGRAPHS, NIPOMO CSD BLACK LAKE WELL NO. 3
Santa Maria Basin Characterization Study
San Luis Obispo County, California



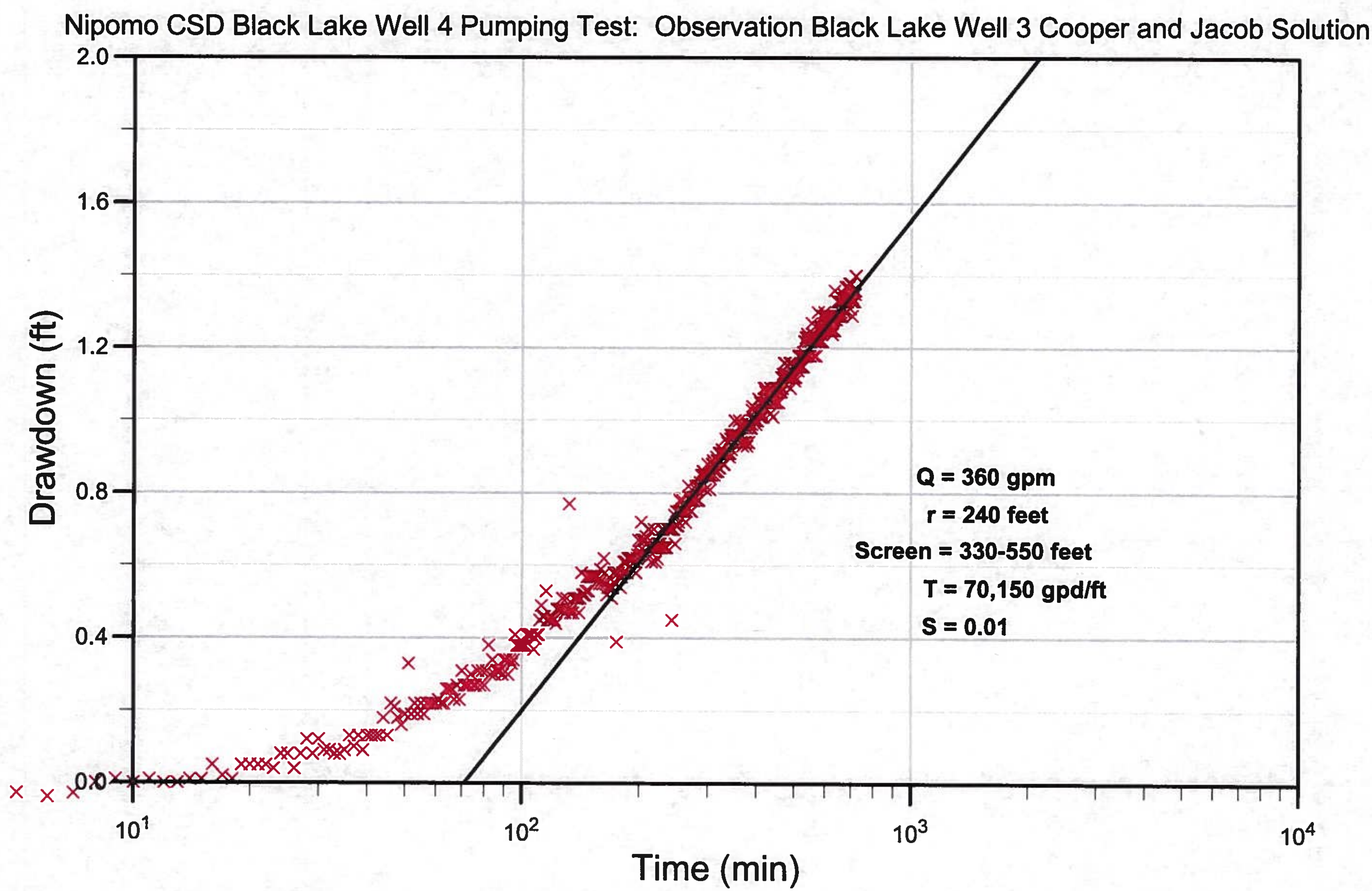
GROUNDWATER LEVEL HYDROGRAPHS, NIPOMO CSD BLACK LAKE WELL NO. 4
Santa Maria Basin Characterization Study
San Luis Obispo County, California

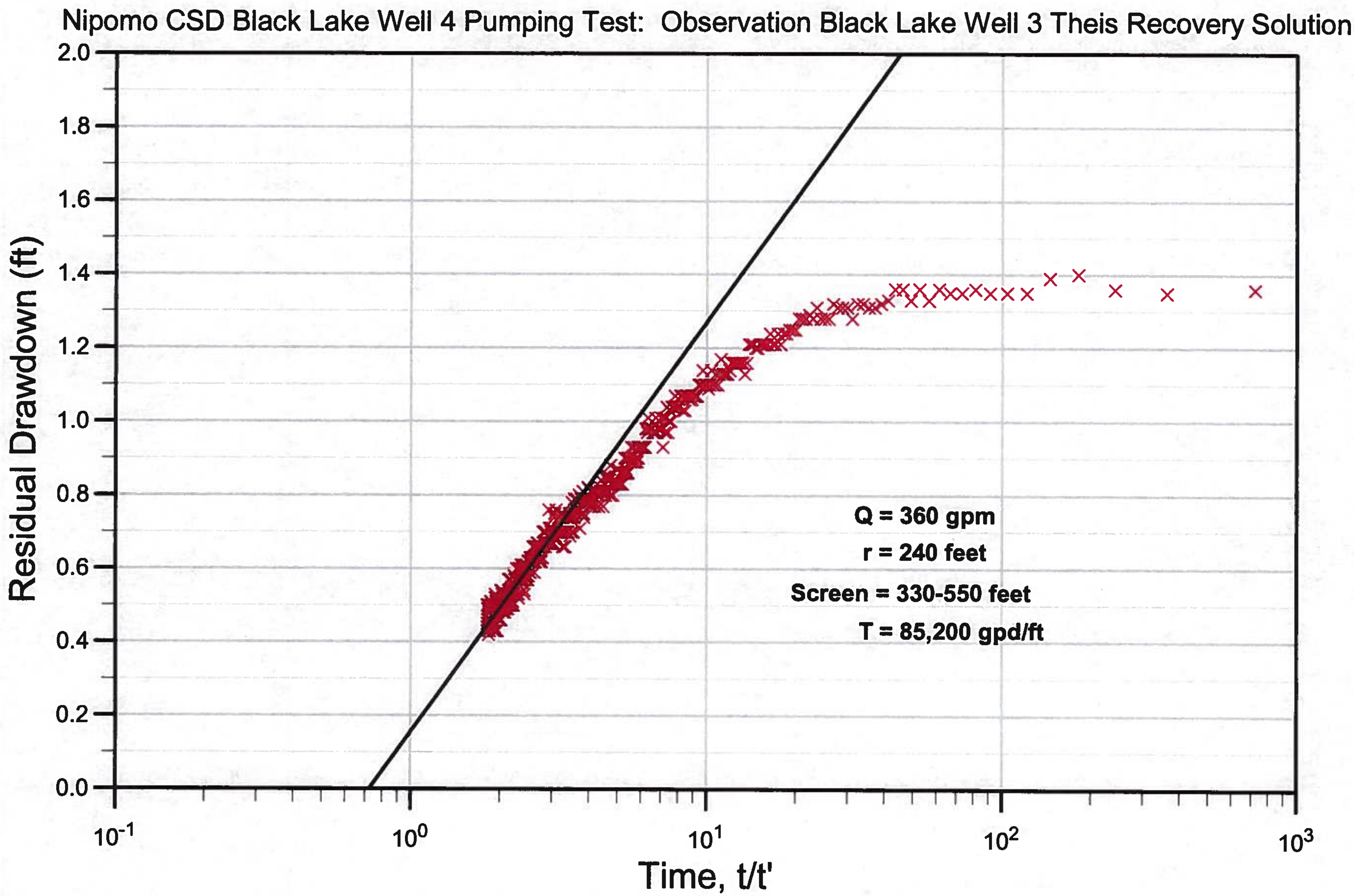

Nipomo CSD Black Lake Well 4 Pumping Test: Pumping Black Lake Well 4 Cooper and Jacob Solution
Drawdown (ft)
60.0
58.0
56.0
54.0
52.0
50.0
48.0
46.0
44.0
42.0
40.0
Time (min)
10^0
10^1
10^2
10^3
10^4
Q = 360 gpm
r = 0 feet
Screen = 310-330, 350-410, 460-520 feet
T = 25,200 gpd/ft

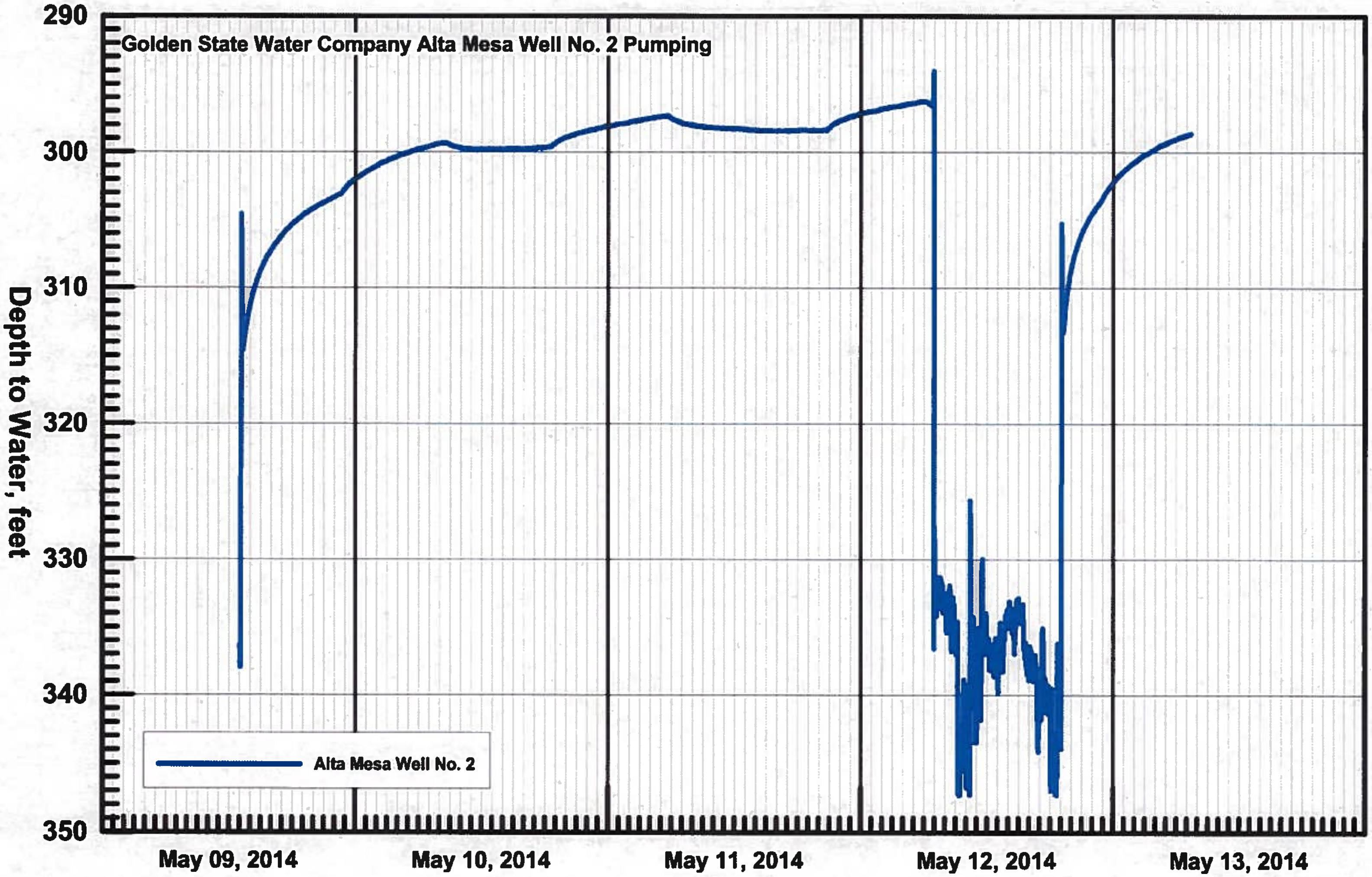

Nipomo CSD Black Lake Well 4 Pumping Test: Pumping black Lake Well 4 Theis Recovery Solution
Q = 360 gpm
r = 0 feet
Screen = 310-330, 350-410, 460-520 feet
T = 17,600 gpd/ft
Residual Drawdown (ft)
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
10^0
10^1
10^2
10^3
Time, t/t'



Nipomo CSD Black Lake Well 4 Pumping Test: Observation Well Black Lake Well 3 Theis Solution
W(u)
1/u
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-1}
10^{0}
10^{1}
10^{2}
10^{3}
10^{4}
10^{5}
Q = 360 gpd/ft
r = 240 feet
Screen = 330-550 feet
T = 70,600 gpd/ft
S = 0.02


Nipomo CSD Black Lake Well 4 Pumping Test: Observation Black Lake Well 3 Cooper and Jacob Solution
Drawdown (ft)
2.0
1.6
1.2
0.8
0.4
0.0
Time (min)
10^1
10^2
10^3
10^4
Q = 360 gpm
r = 240 feet
Screen = 330-550 feet
T = 70,150 gpd/ft
S = 0.01

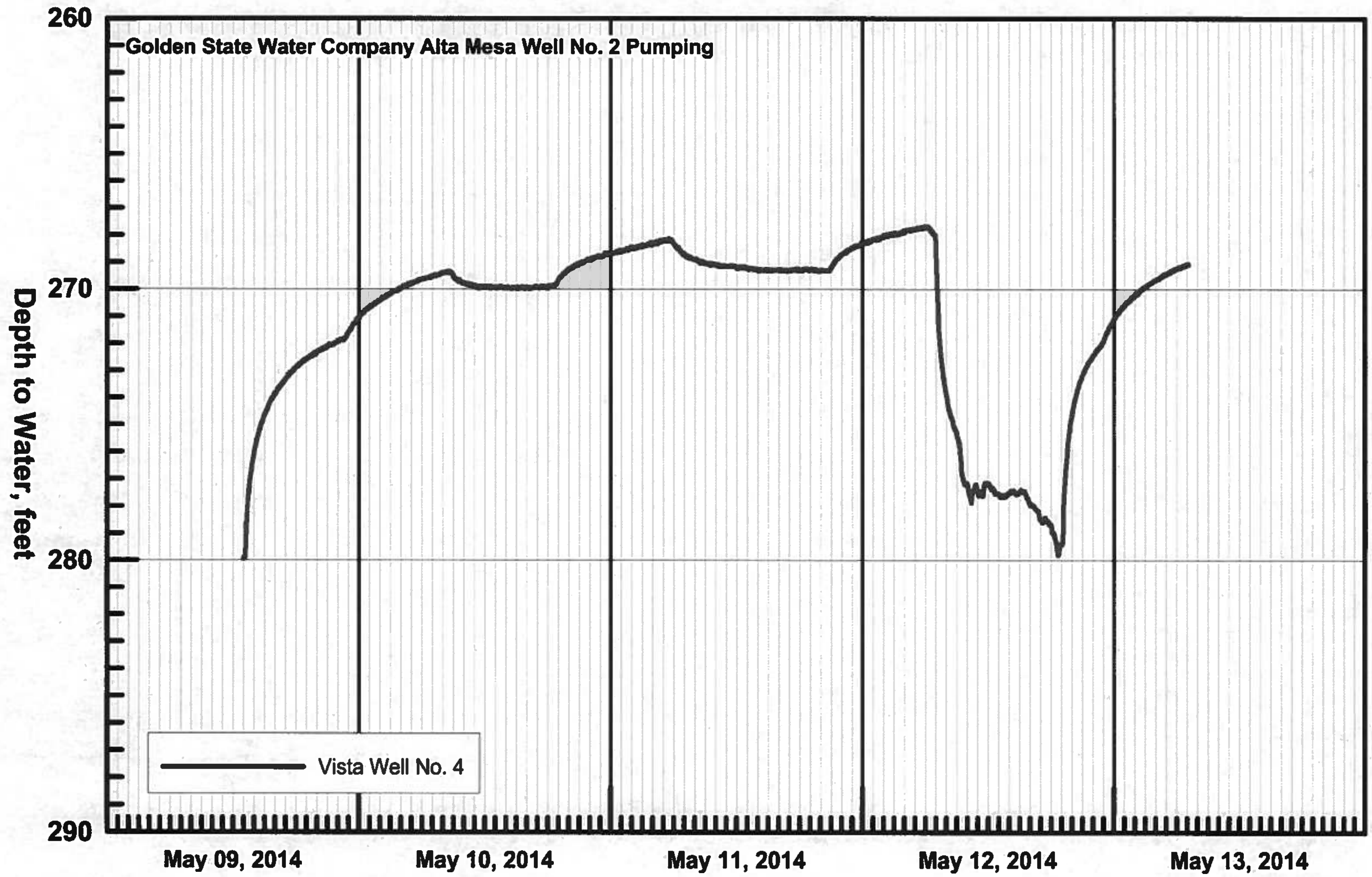

Nipomo CSD Black Lake Well 4 Pumping Test: Observation Black Lake Well 3 Theis Recovery Solution
Residual Drawdown (ft)
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
10-1
100
101
102
103
Time, t/t'
Q = 360 gpm
r = 240 feet
Screen = 330-550 feet
T = 85,200 gpd/ft



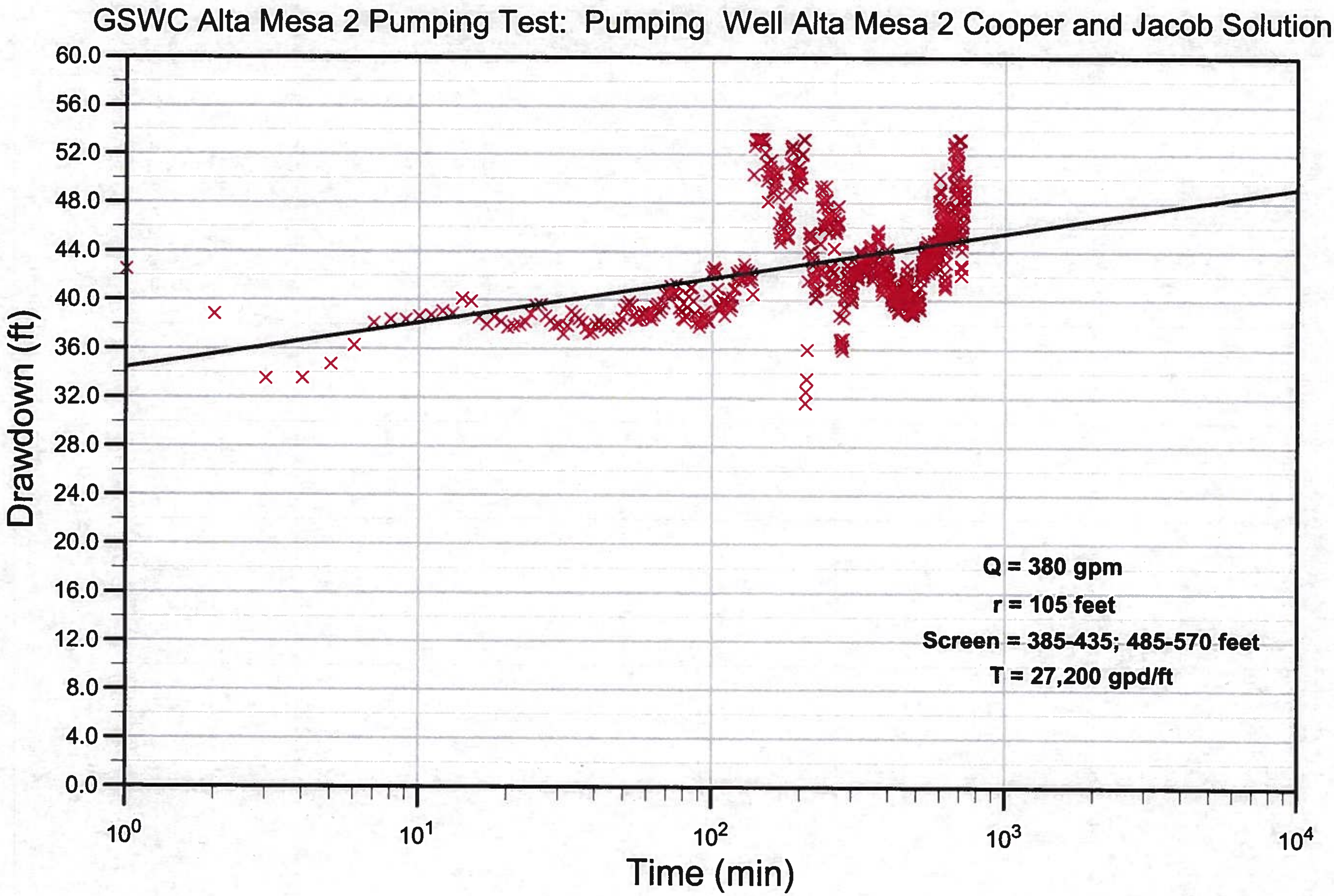
GROUNDWATER LEVEL HYDROGRAPHS, GOLDEN STATE WATER COMPANY, ALTA MESA WELL 2

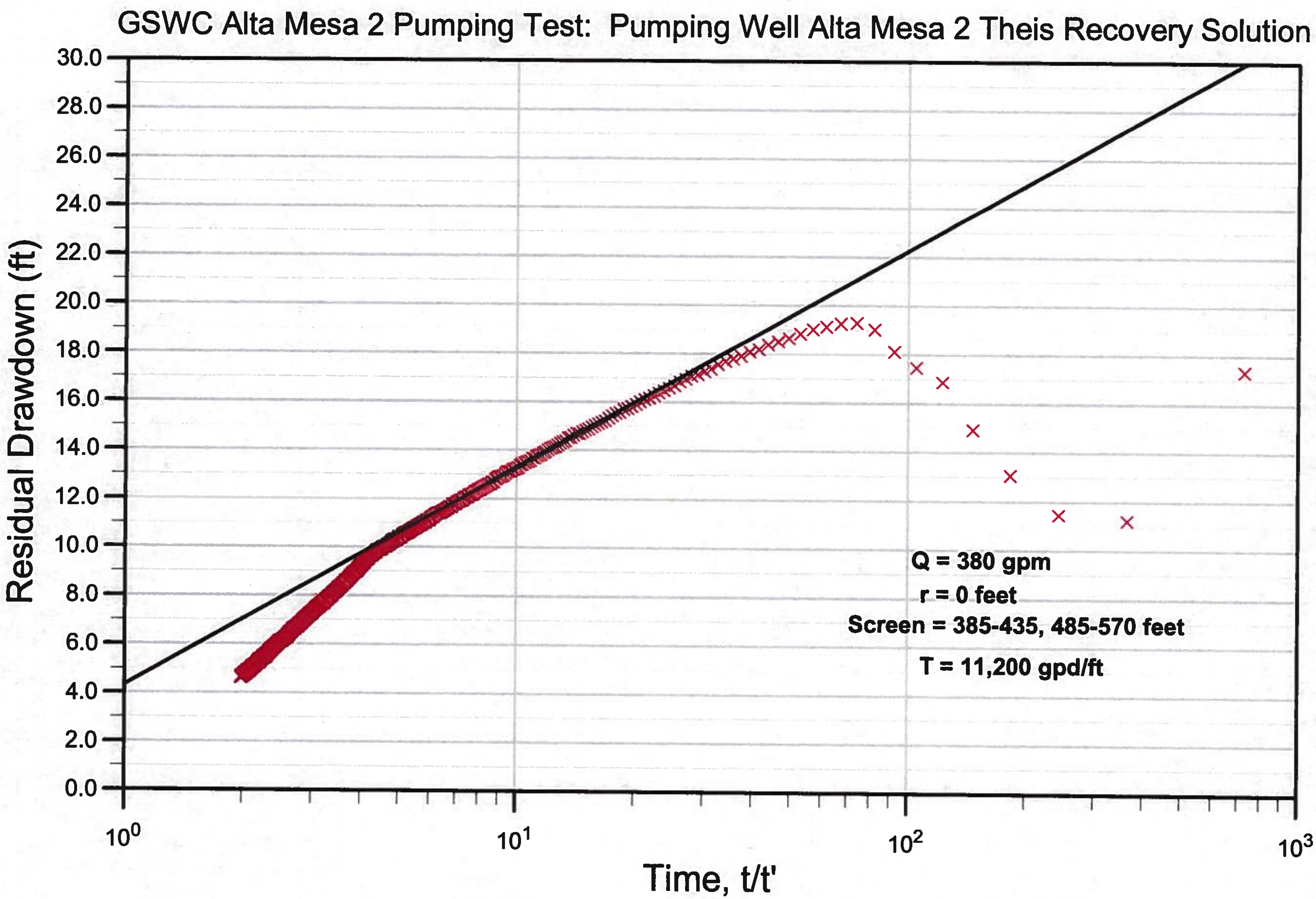
Santa Maria Basin Characterization Study

San Luis Obispo County, California

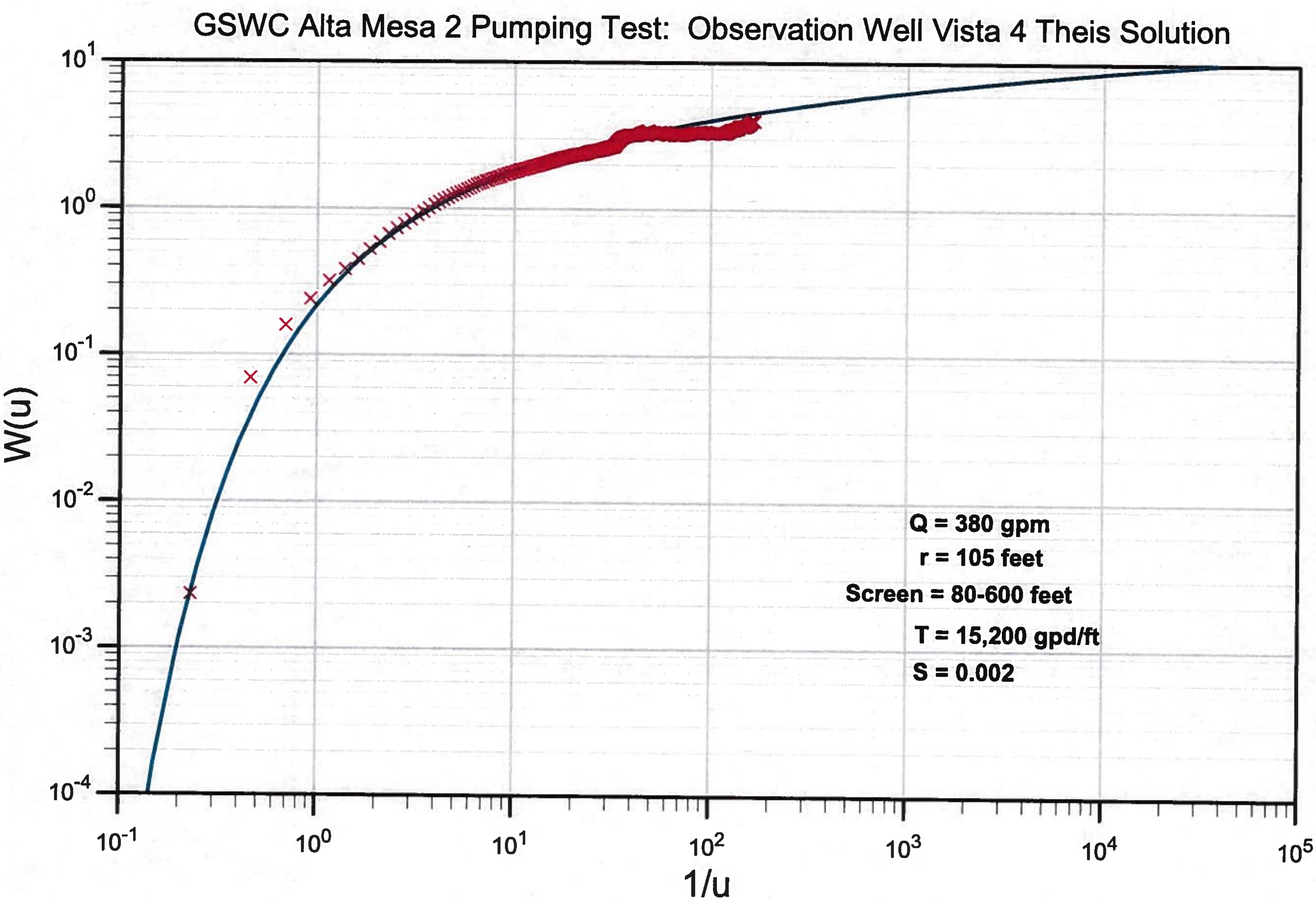


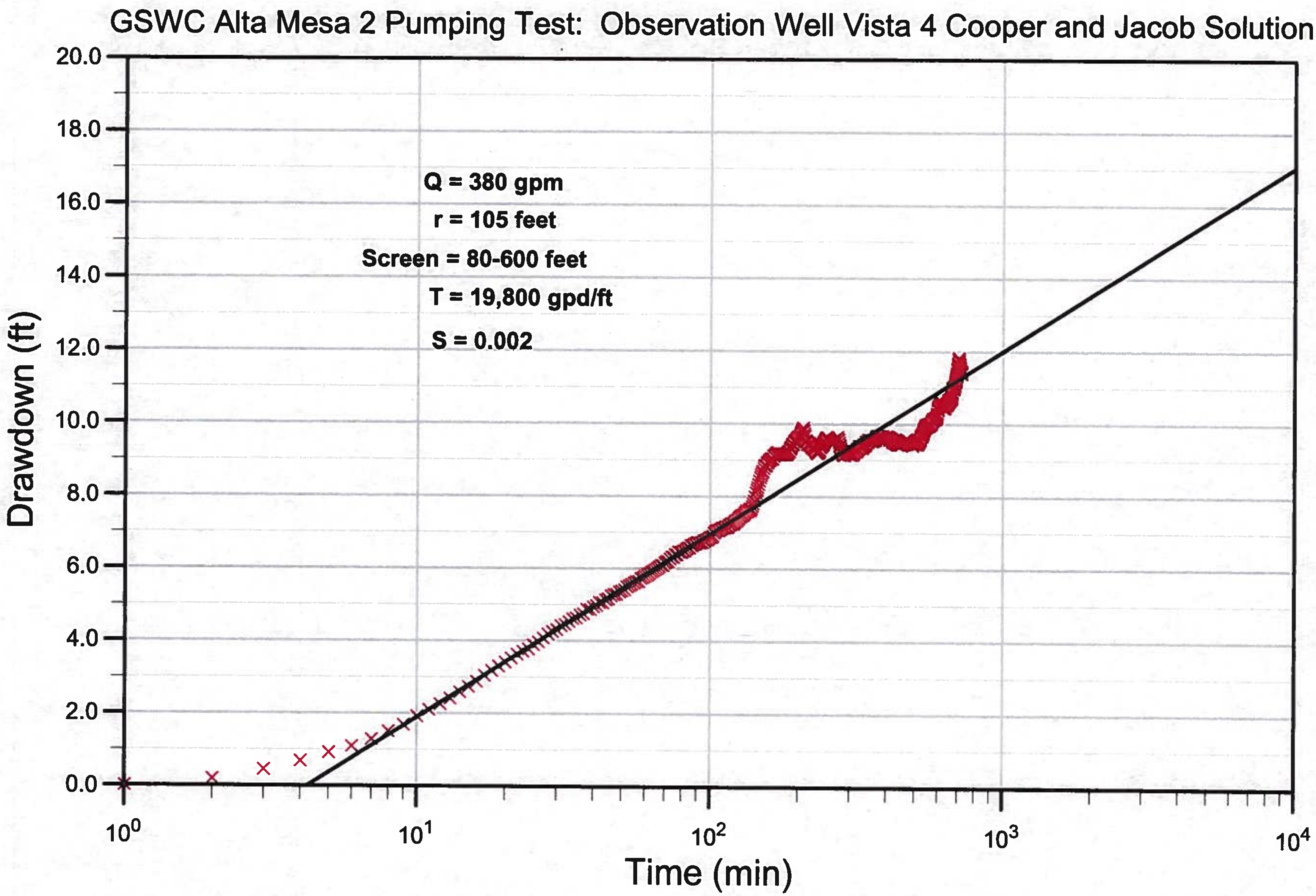
GROUNDWATER LEVEL HYDROGRAPHS, GOLDEN STATE WATER COMPANY, VISTA WELL 4
Santa Maria Basin Characterization Study
San Luis Obispo County, California

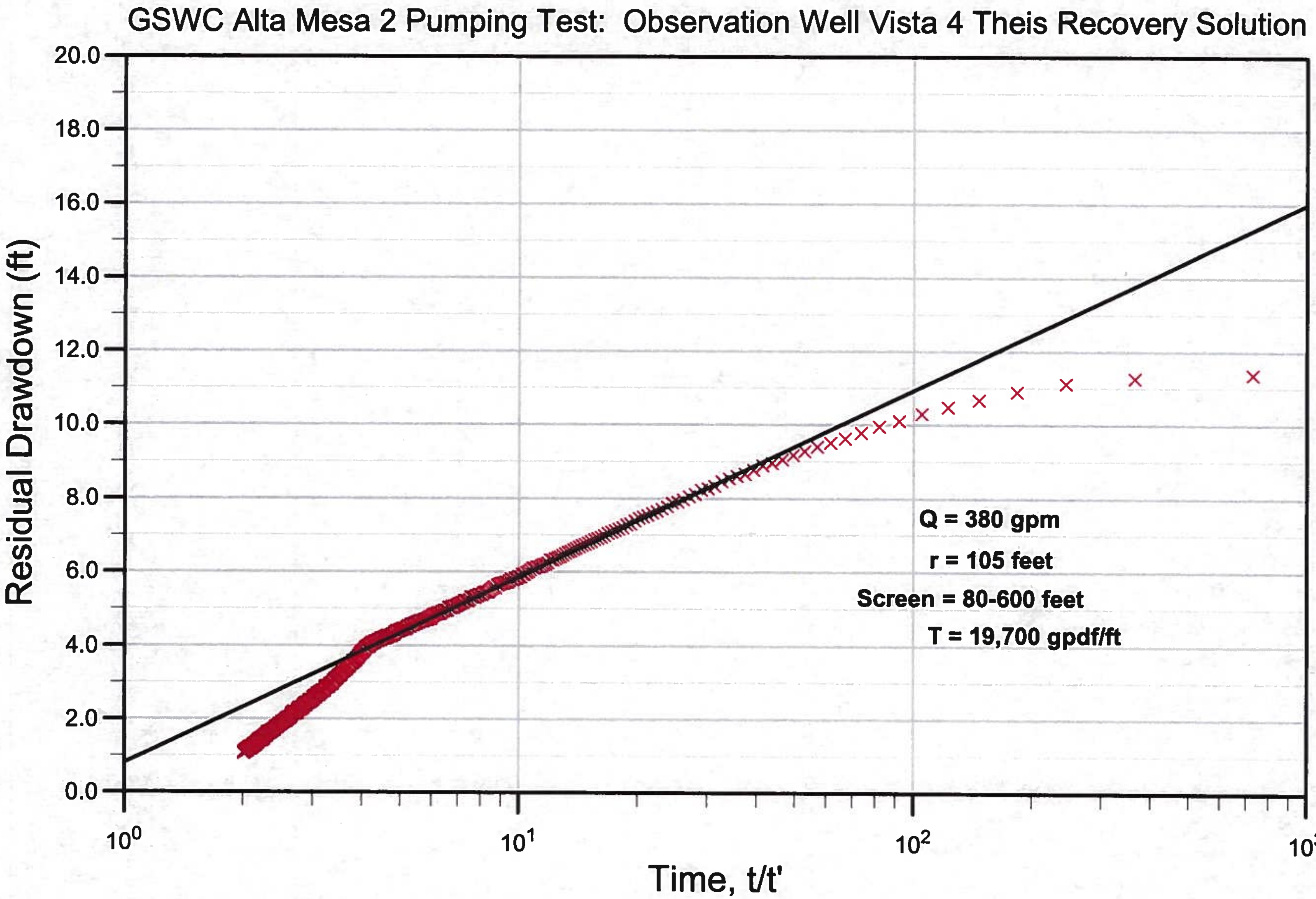

GSWC Alta Mesa 2 Pumping Test: Pumping Well Alta Mesa 2 Cooper and Jacob Solution
Drawdown (ft)
60.0
56.0
52.0
48.0
44.0
40.0
36.0
32.0
28.0
24.0
20.0
16.0
12.0
8.0
4.0
0.0
10^0
10^1
10^2
10^3
10^4
Time (min)
Q = 380 gpm
r = 105 feet
Screen = 385-435; 485-570 feet
T = 27,200 gpd/ft



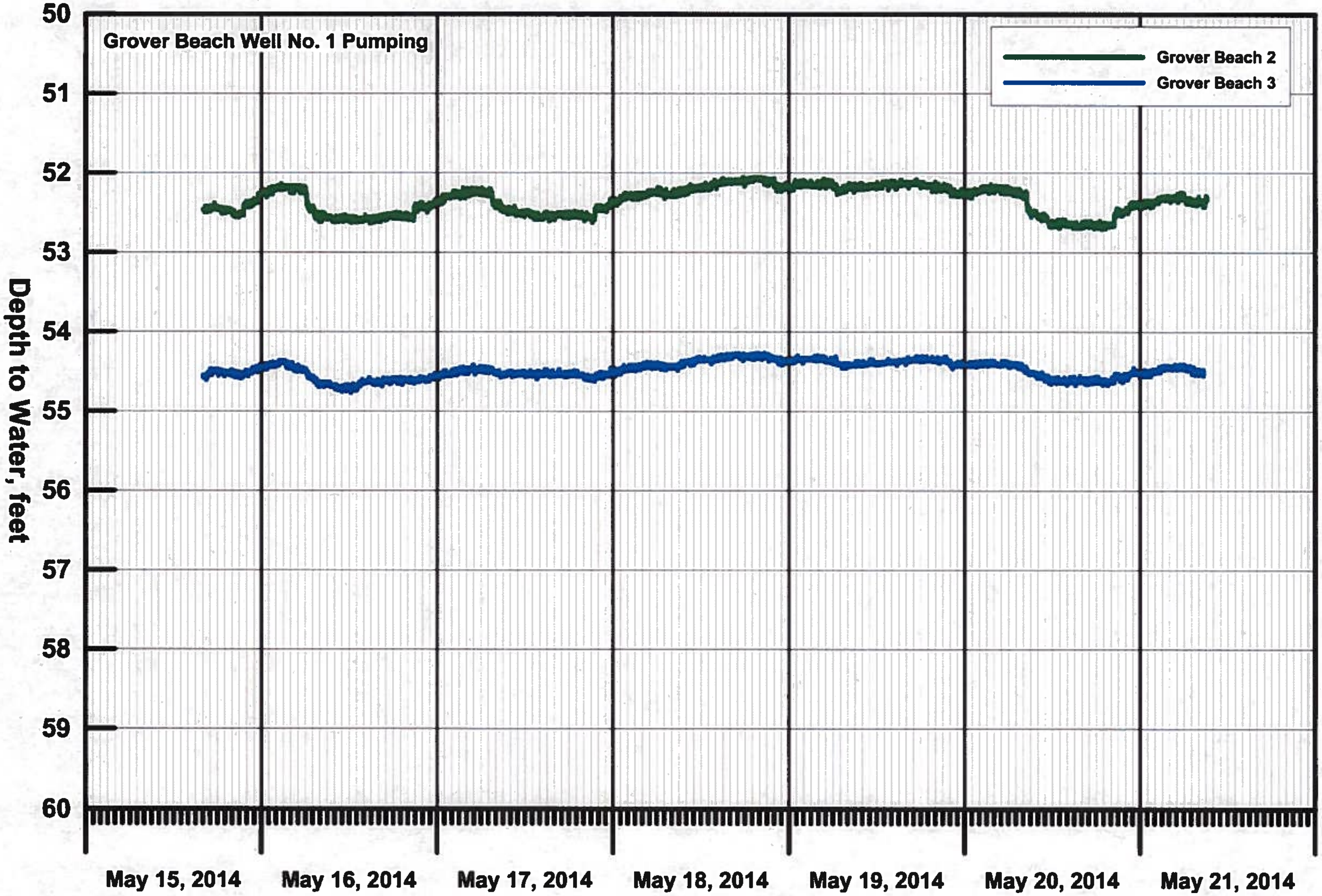
GSWC Alta Mesa 2 Pumping Test: Pumping Well Alta Mesa 2 Theis Recovery Solution
Residual Drawdown (ft)
30.0
28.0
26.0
24.0
22.0
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
10^0
10^1
10^2
10^3
Time, t/t'
Q = 380 gpm
r = 0 feet
Screen = 385-435, 485-570 feet
T = 11,200 gpd/ft


GSWC Alta Mesa 2 Pumping Test: Observation Well Vista 4 Theis Solution
W(u)
1/u
Q = 380 gpm
r = 105 feet
Screen = 80-600 feet
T = 15,200 gpd/ft
S = 0.002

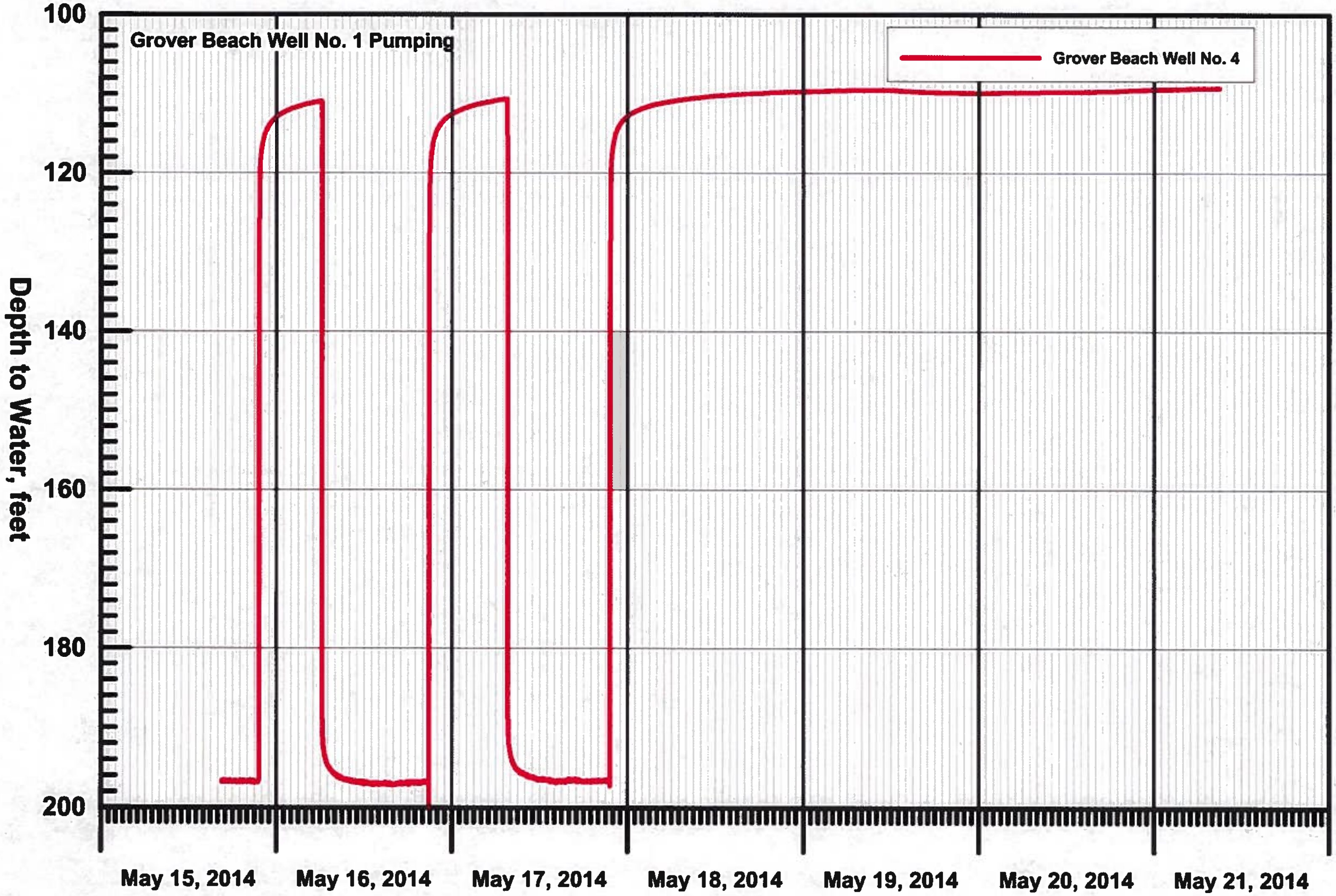

GSWC Alta Mesa 2 Pumping Test: Observation Well Vista 4 Cooper and Jacob Solution
Q = 380 gpm
r = 105 feet
Screen = 80-600 feet
T = 19,800 gpd/ft
S = 0.002
Drawdown (ft)
Time (min)
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
10^0
10^1
10^2
10^3
10^4



GSWC Alta Mesa 2 Pumping Test: Observation Well Vista 4 Theis Recovery Solution
Residual Drawdown (ft)
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
Q = 380 gpm
r = 105 feet
Screen = 80-600 feet
T = 19,700 gpdf/ft
10^0
10^1
10^2
10^3
Time, t/t'

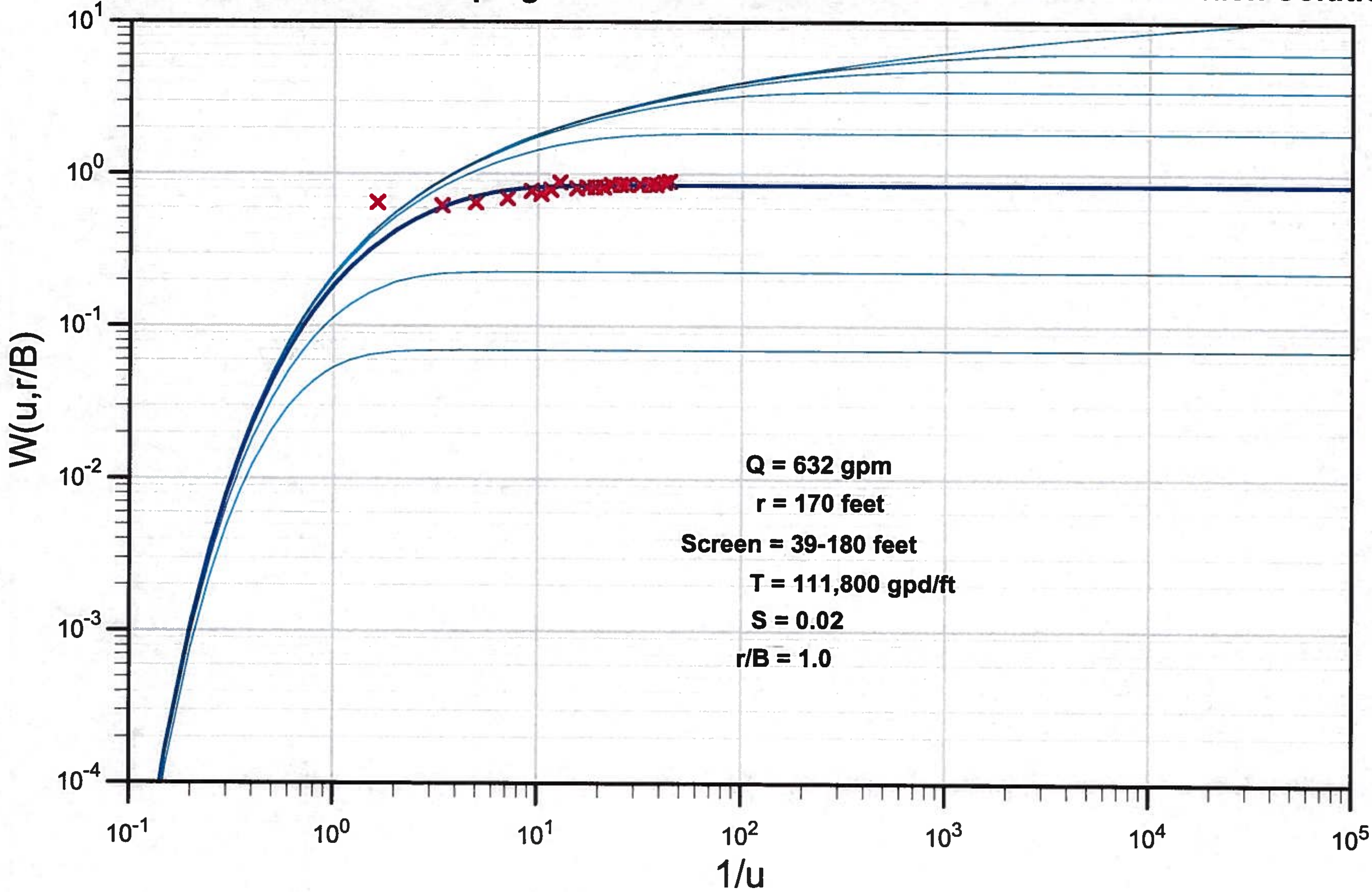


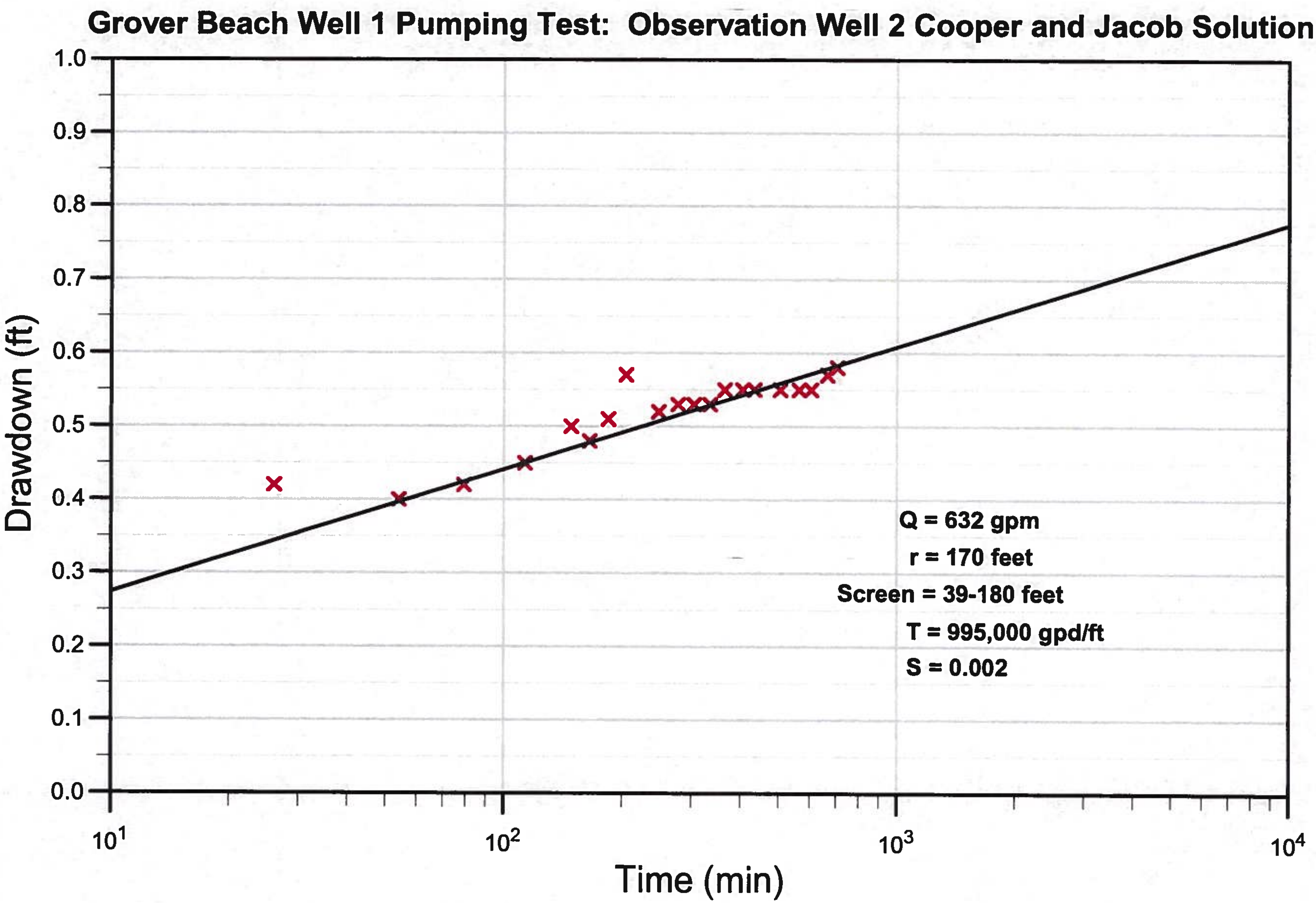
GROUNDWATER LEVEL HYDROGRAPHS, GROVER BEACH WELLS 2 AND 3
Santa Maria Basin Characterization Study
San Luis Obispo County, California

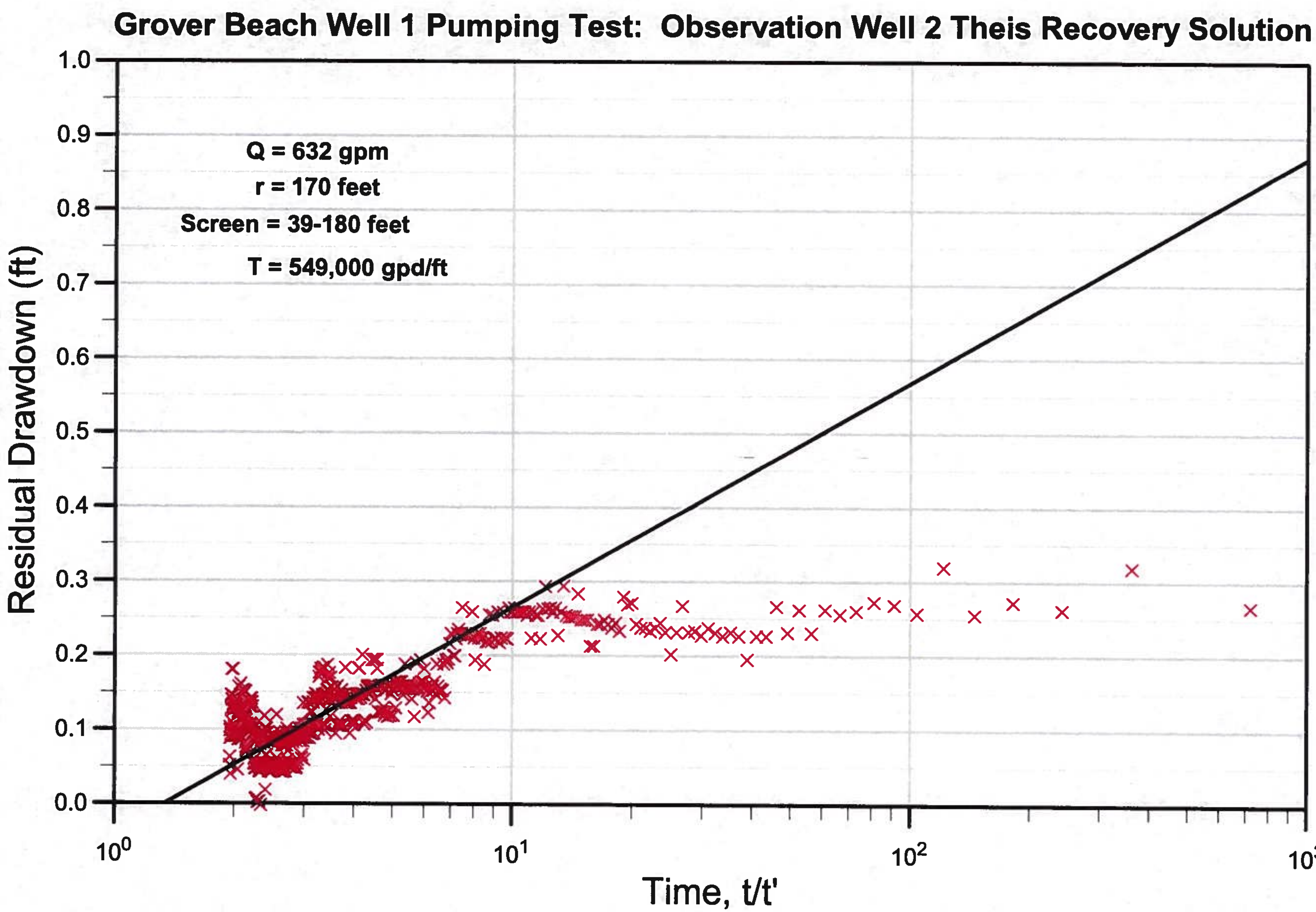


GROUNDWATER LEVEL HYDROGRAPHS, GROVER BEACH WELL 4
Santa Maria Basin Characterization Study
San Luis Obispo County, California

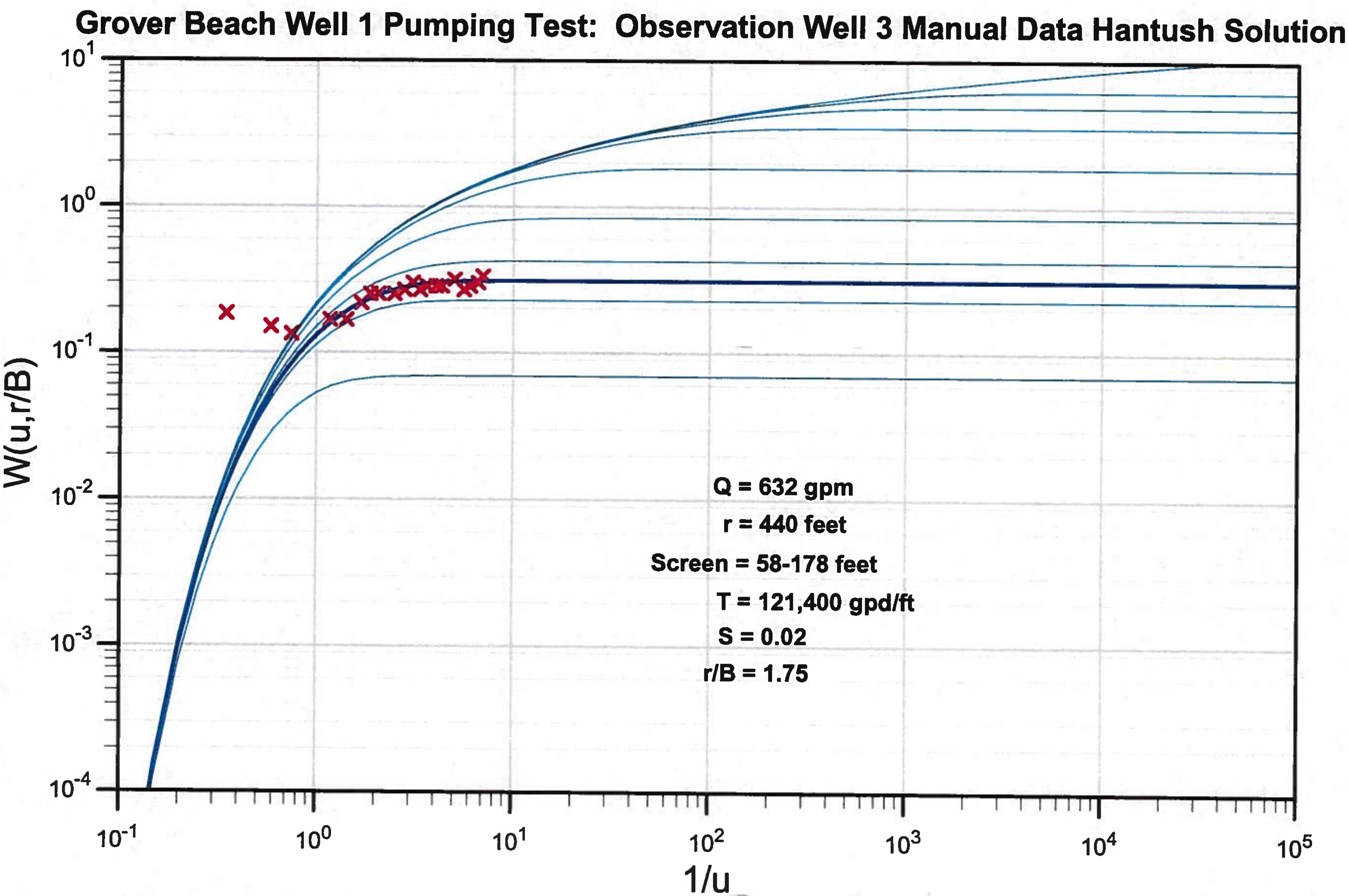
Grover Beach Well 1 Pumping Test: Observation Well 2 Manual Data Hantush Solution



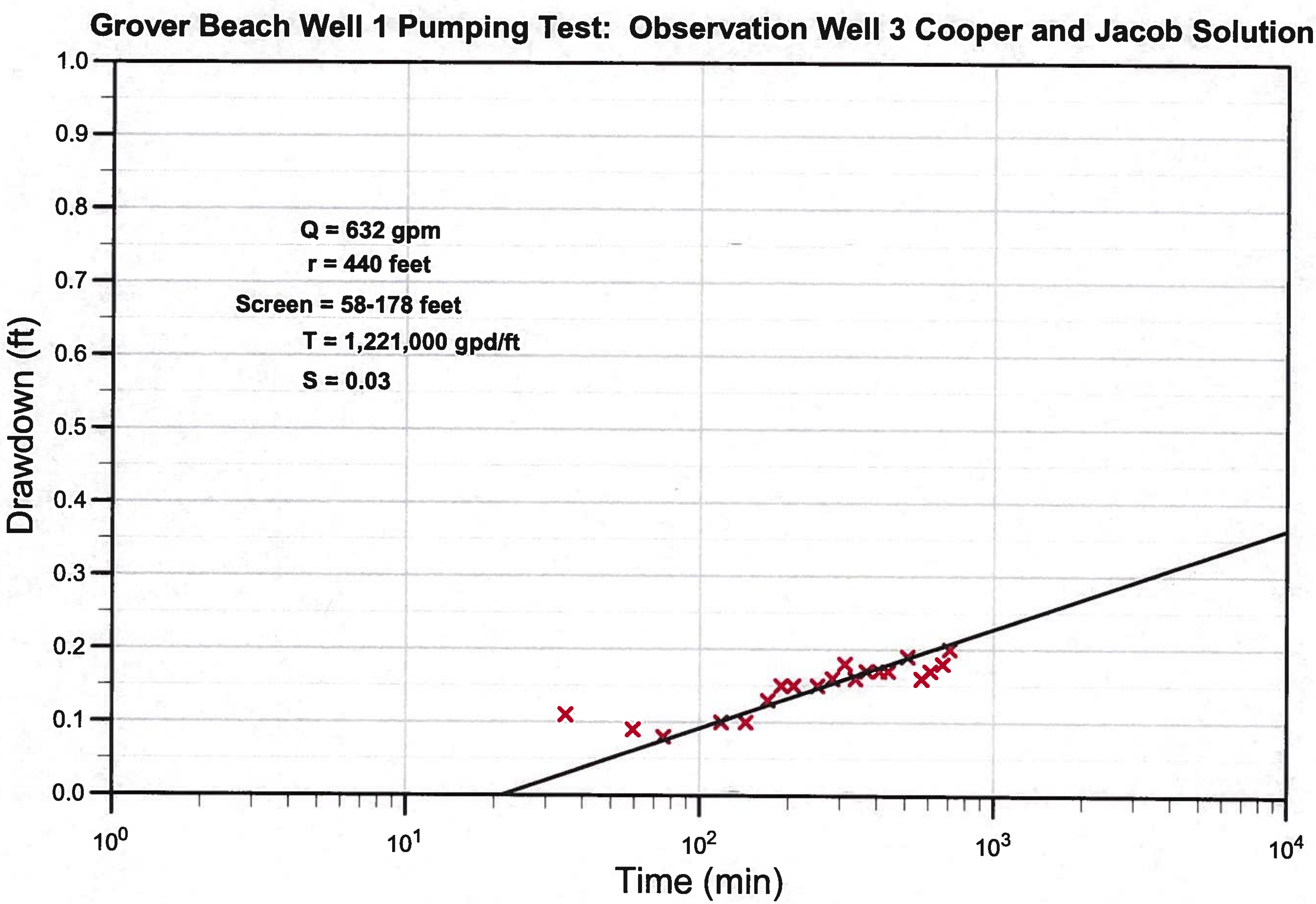

Grover Beach Well 1 Pumping Test: Observation Well 2 Cooper and Jacob Solution
Drawdown (ft)
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
10^1
10^2
10^3
10^4
Time (min)
Q = 632 gpm
r = 170 feet
Screen = 39-180 feet
T = 995,000 gpd/ft
S = 0.002



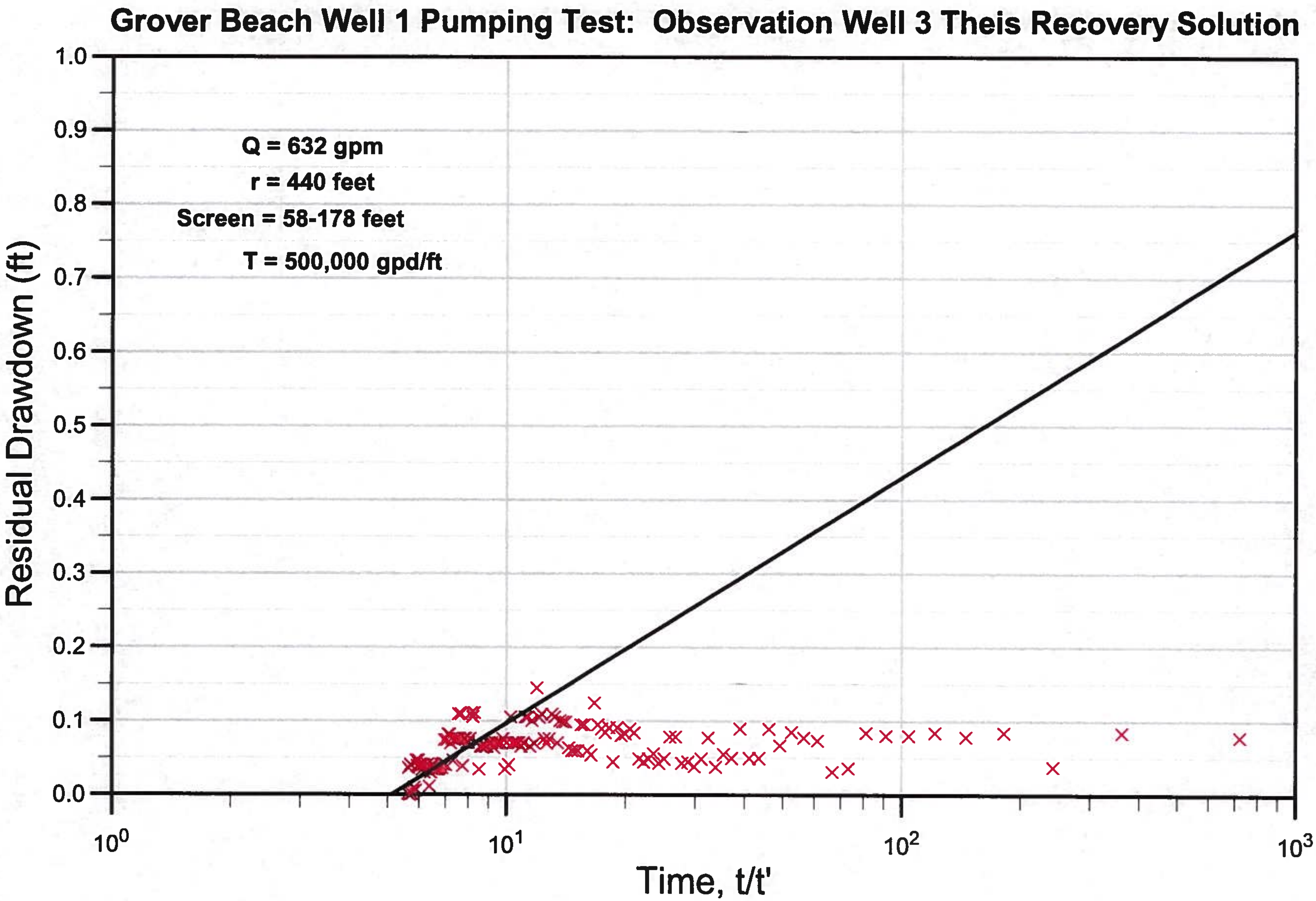
Grover Beach Well 1 Pumping Test: Observation Well 2 Theis Recovery Solution
Q = 632 gpm
r = 170 feet
Screen = 39-180 feet
T = 549,000 gpd/ft
Residual Drawdown (ft)
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
10^0
10^1
10^2
10^3
Time, t/t'



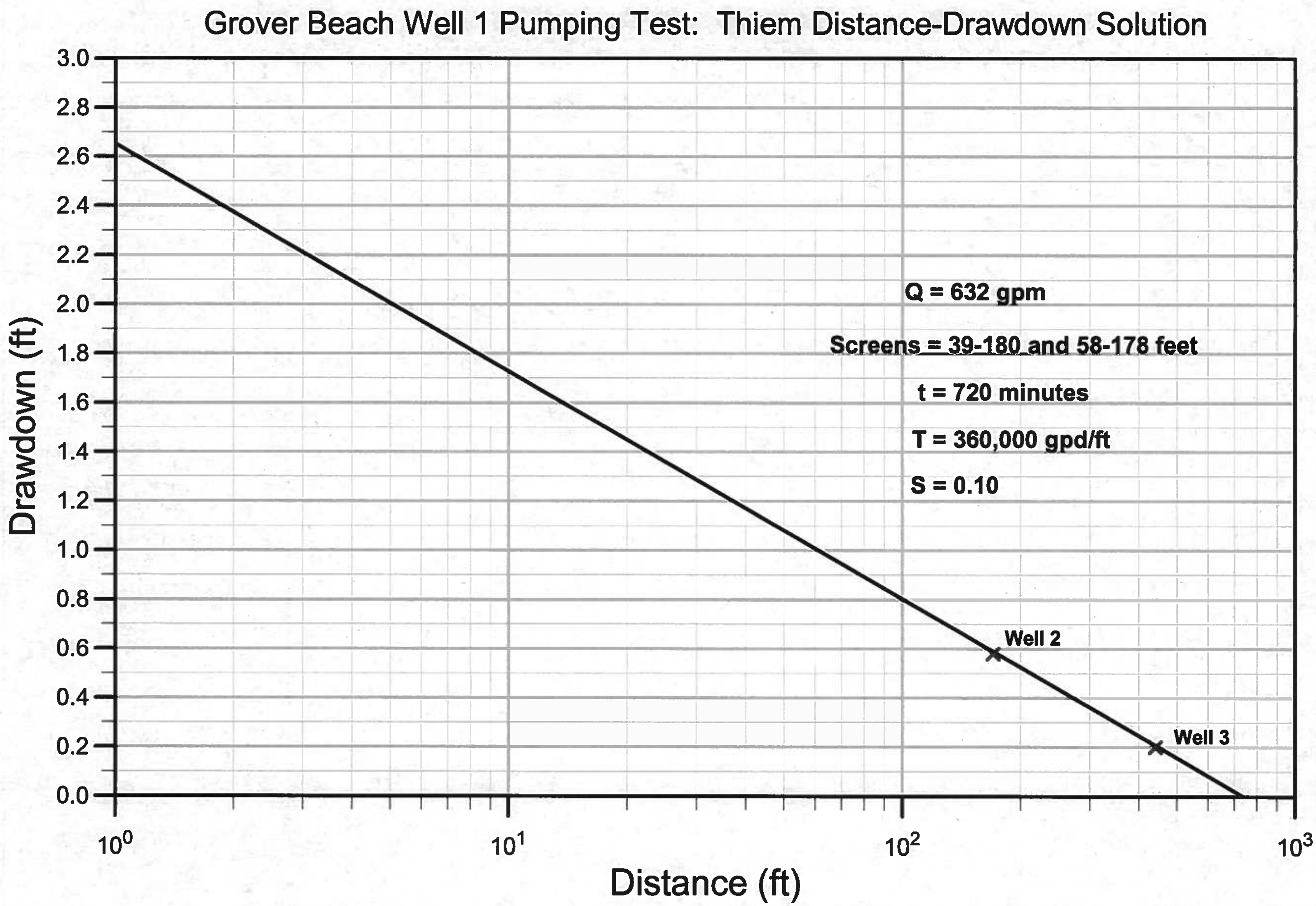
Grover Beach Well 1 Pumping Test: Observation Well 3 Manual Data Hantush Solution
W(u,r/B)
1/u
10^1
10^0
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-1}
10^0
10^1
10^2
10^3
10^4
10^5
Q = 632 gpm
r = 440 feet
Screen = 58-178 feet
T = 121,400 gpd/ft
S = 0.02
r/B = 1.75

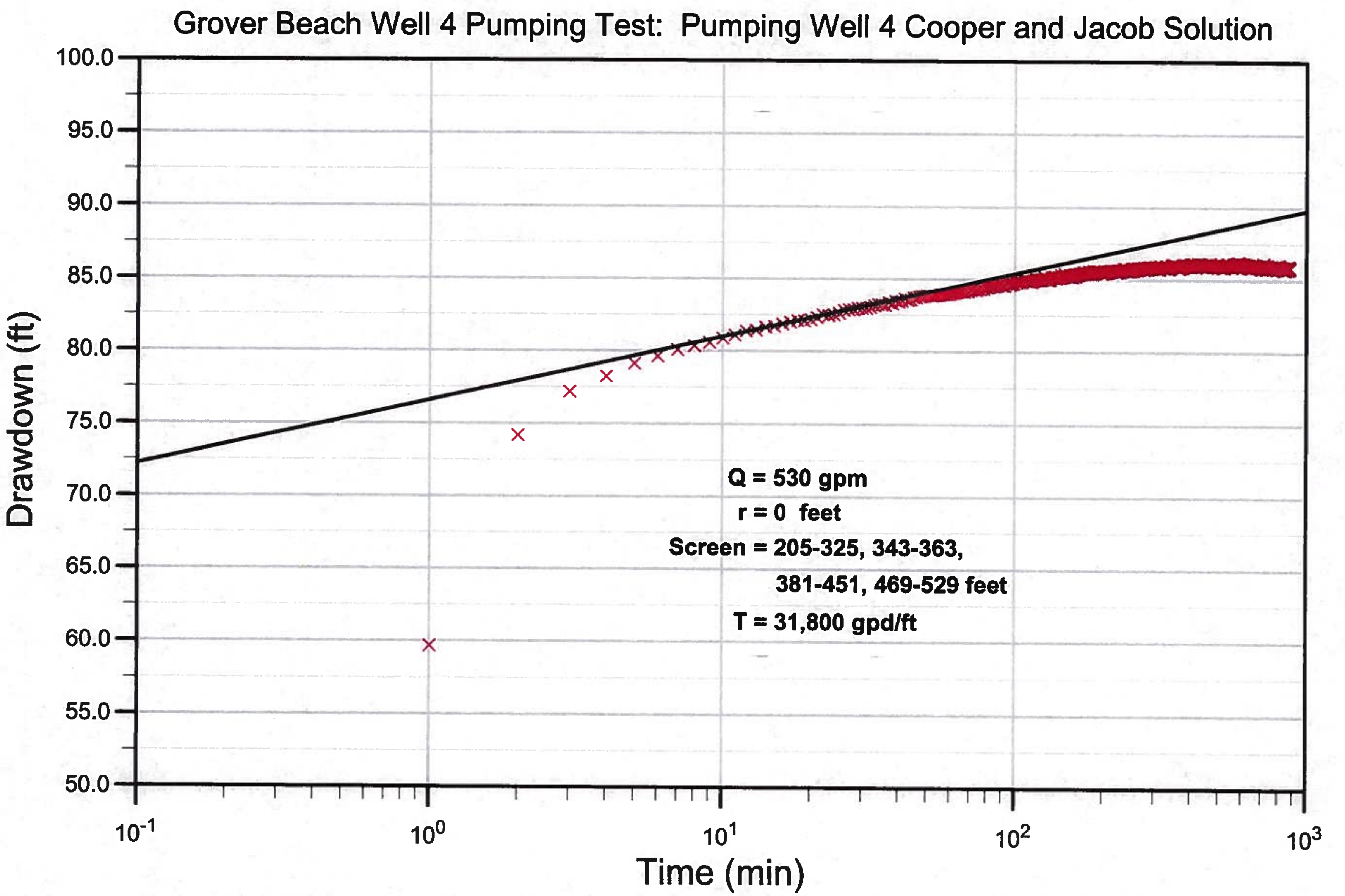


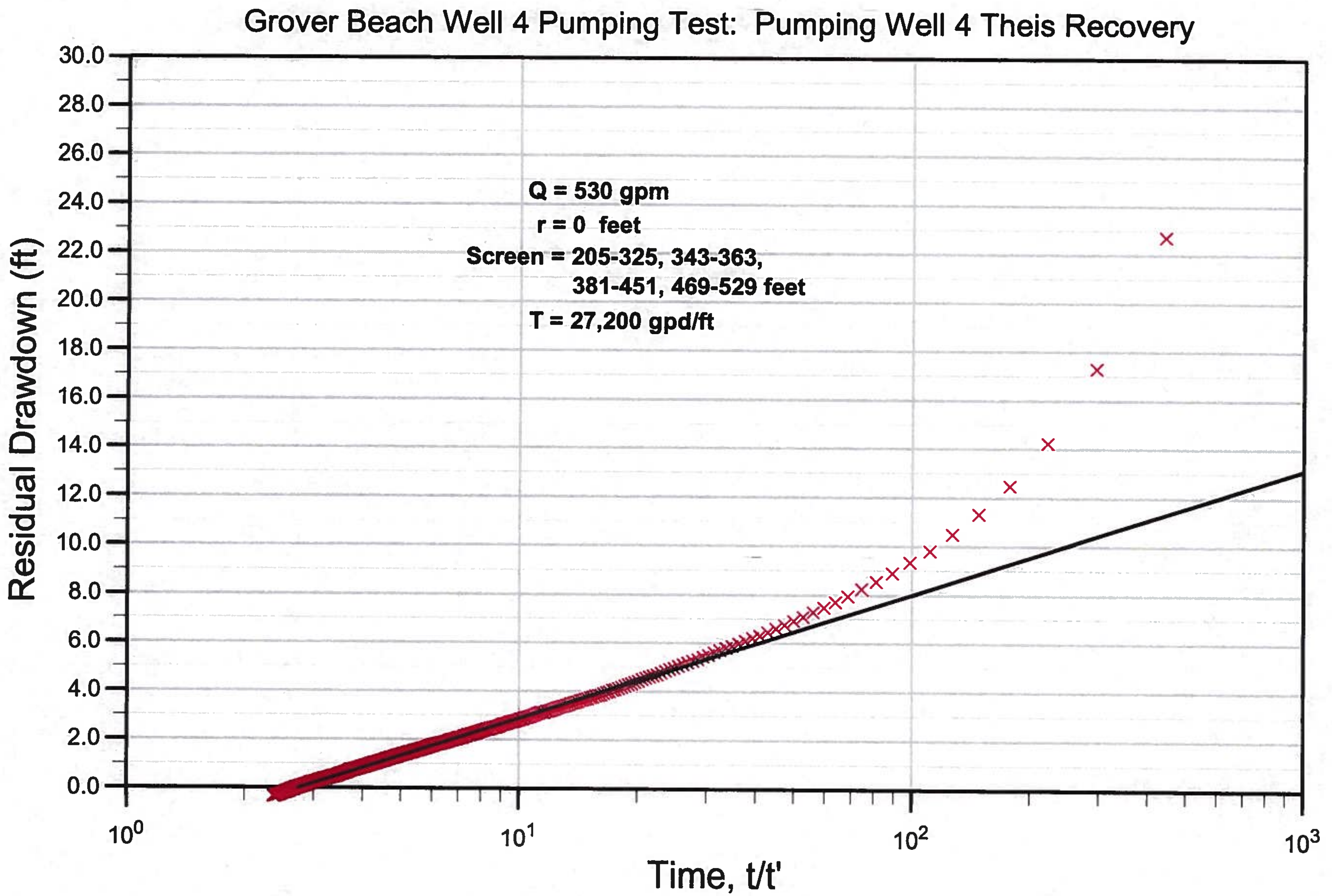
Grover Beach Well 1 Pumping Test: Observation Well 3 Cooper and Jacob Solution
Q = 632 gpm
r = 440 feet
Screen = 58-178 feet
T = 1,221,000 gpd/ft
S = 0.03
Drawdown (ft)
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
10^0
10^1
10^2
10^3
10^4
Time (min)



Grover Beach Well 1 Pumping Test: Observation Well 3 Theis Recovery Solution
Q = 632 gpm
r = 440 feet
Screen = 58-178 feet
T = 500,000 gpd/ft
Residual Drawdown (ft)
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
10^0
10^1
10^2
10^3
Time, t/t'


Grover Beach Well 1 Pumping Test: Thiem Distance-Drawdown Solution
Drawdown (ft)
3.0
2.8
2.6
2.4
2.2
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Q = 632 gpm
Screens = 39-180 and 58-178 feet
t = 720 minutes
T = 360,000 gpd/ft
S = 0.10
Well 2
Well 3
10^0
10^1
10^2
10^3
Distance (ft)


Grover Beach Well 4 Pumping Test: Pumping Well 4 Cooper and Jacob Solution
Drawdown (ft)
100.0
95.0
90.0
85.0
80.0
75.0
70.0
65.0
60.0
55.0
50.0
Q = 530 gpm
r = 0 feet
Screen = 205-325, 343-363,
381-451, 469-529 feet
T = 31,800 gpd/ft
10^{-1}
10^{0}
10^{1}
10^{2}
10^{3}
Time (min)



Grover Beach Well 4 Pumping Test: Pumping Well 4 Theis Recovery
Q = 530 gpm
r = 0 feet
Screen = 205-325, 343-363,
381-451, 469-529 feet
T = 27,200 gpd/ft
Residual Drawdown (ft)
30.0
28.0
26.0
24.0
22.0
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
10^0
10^1
10^2
10^3
Time, t/t'

APPENDIX J
2014 PUMPING TEST DATA (INCLUDED ON CD)

APPENDIX K
STREAMFLOW DATA (INCLUDED ON CD)

APPENDIX L
PROPOSED WELLS FOR TRANSDUCER INSTALLATION TM

FUGRO CONSULTANTS, INC.

1000 Broadway, Suite 440
Oakland, California 94607
Tel: (510) 268-0461
Fax: (510) 268-0137

June 18, 2014
Project No. 04.62130111

TECHNICAL MEMORANDUM

To: Mr. Raymond Dienzo, P.E.
San Luis Obispo County Public Works

From: Peter Leffler, C.Hg.
Paul Sorensen, C.Hg.

Subject: **Santa Maria Groundwater Basin Characterization and Planning Activities – Task 3: Proposed Well Locations for Transducer Installation**

INTRODUCTION

This Technical Memorandum (TM) was prepared to document work performed by the Fugro/GEI Team as part a contract with the County of San Luis Obispo Flood Control and Water Conservation District (SLOFCWCD; District) for the Santa Maria Groundwater Basin Characterization and Planning Activities project (study). This TM provides a list of potential sites proposed for permanent transducer installation as part of Task 3 of the study. The TM is provided for review by the County, Technical Groups, and stakeholders to provide input to which sites are most preferred for installation of the four permanent transducers.

WELLS WITH EXISTING TRANSDUCERS

The monitoring wells with permanent transducers already installed are summarized in Table 1 and locations are shown in Plate 1. All of the monitoring wells with existing transducers listed in Table 1 are located in the NCMA. Data from these NCMA transducers include water levels, temperature, and conductivity, and are summarized in quarterly and annual reports for the NCMA. We understand that transducers are also installed in some production wells in NCMA and NMMA; however, the focus of this particular task is monitoring wells.

PROPOSED WELL SITES FOR TRANSDUCER INSTALLATION

The scope of work for Task 3 includes installation of transducers for measuring water levels, temperature, and conductivity at four locations. The previous reports and well database compiled for this study were reviewed with respect to potential sites for installation of the permanent transducers. In addition, Fugro is retained by NCMA to perform quarterly monitoring, and utilized knowledge gained from that field sampling and reporting program as input to selection of candidate wells for transducer installation. A member of the NMMA was contacted for preliminary input on potential wells for transducer installation in the NMMA. A preliminary list of potential sites from which to select some or all of the four well locations is provided in Table 1, and potential/proposed locations are depicted in Plate 1.

Several criteria were used in selecting the proposed sites in Table 1 including: geographic distribution with preference for coastal locations, well screens located in depth zones most representative of production well screen intervals, and preference given to monitoring wells over pumping wells. It should be noted that Fugro does not have well log or location information for one of the potential well sites recommended by a NMMA Technical Group member (19Q01).

COUNTY AND TECHNICAL GROUP REVIEW AND INPUT

The intent of this TM is for the County and project stakeholders to review the attached information, and provide input on selection of preferred sites for installation of permanent transducers. It should be noted that the well owners for the listed potential wells have not yet been contacted to obtain approval for use of their wells for transducer installation. Although owner approval is expected, we would recommend that one additional site be selected (five wells total) for potential transducer installation, and priorities be assigned to each well. The owners of the highest ranked potential transducer installation well sites would be contacted first to try to obtain approval and make arrangements for installation. If one of the highest ranked well sites cannot be utilized in this study, we would then attempt to contact the well owner for the alternative well.

In terms of schedule, our goal is to begin installation of the transducers as soon as possible, and to be finished with installation by mid-July. If possible, we appreciate the quick review of interested parties, and look forward to receiving your input on site selection.

LIST OF TABLES

LIST OF PLATES

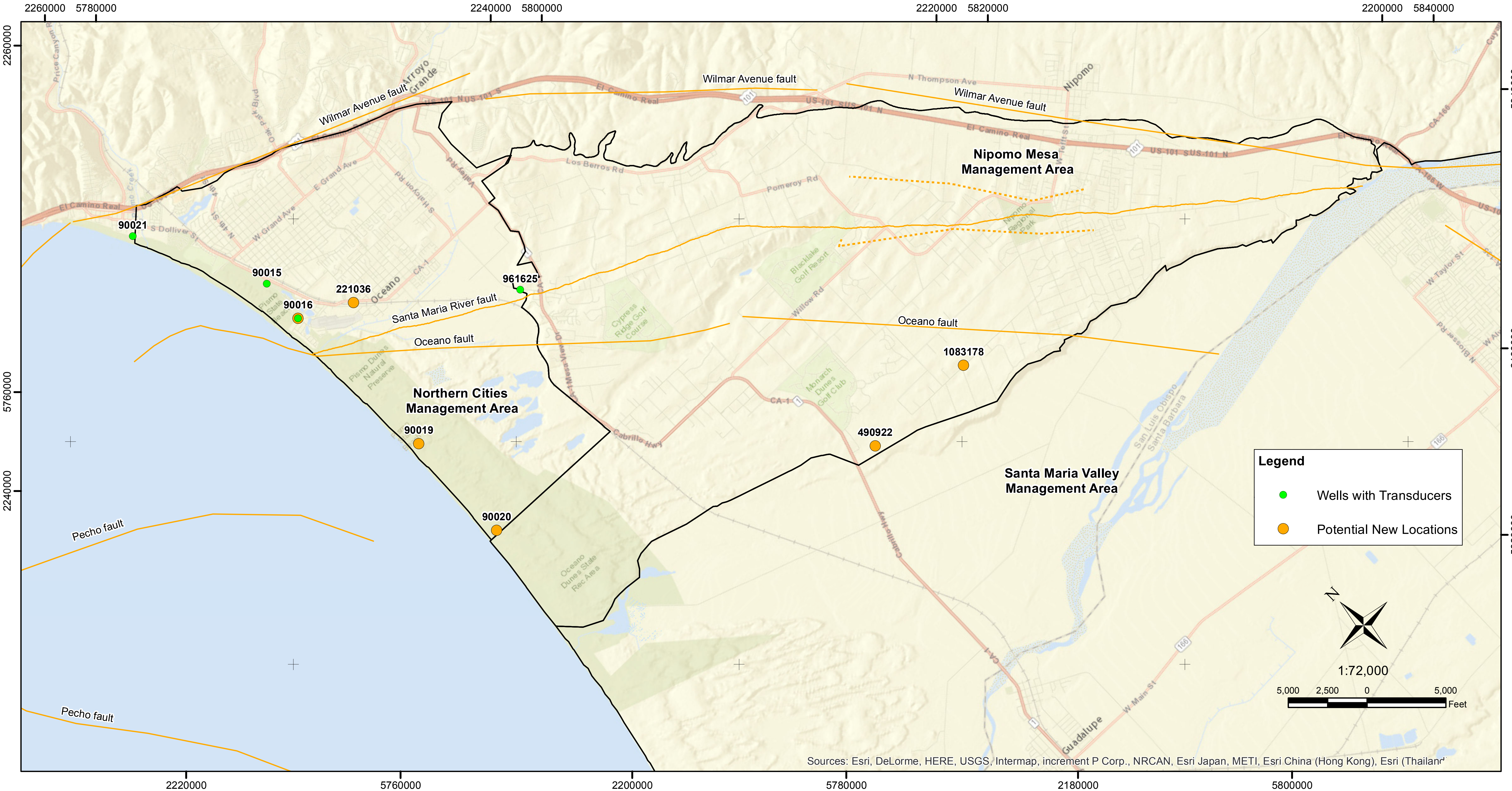
TABLES

Table 1. Summary of Wells With Existing Transducers Installed and Potential New Well Locations for Transducer Installation

Wells with Transducers	Management Area	Well Log No.	Screen (feet bgs)	Other Wells in Cluster/Screen Intervals (feet bgs)
32S/12E-24B01	NCMA	90021 (POO-1)	48-65	B2 = 120-145, B3 = 270-435
32S/12E-24B03	NCMA	90021 (POO-1)	270-435	B1 = 48-65, B2 = 120-145
32S/13E-30F03	NCMA	90015 (POO-3)	305-372	F1 = 15-30, 40-55; F2 = 75-100
32S/13E--30N02	NCMA	90016 (POO-4)	175-255	N1 = 15-40; N3 = 60-135
12N/35W-32C03	NCMA/NMMA	961625 (Co. MW-3)	90-170	None

Potential New Locations	Management Area	Well Log No.	Screen (feet bgs)	Other Wells in Cluster/Screen Intervals (feet bgs)	Surface Elevation (Feet MSL)	Depth to Water (feet bgs)	Transducer Depth (below water level)
32S/13E-30N03	NCMA	90016 (POO-4)	60-135	N1 = 15-40; N2 = 175-255	14	5-10	55-60
11N/34W-19Q01	NMMA	Unknown (Division Rd.)	Unknown	Unknown	?	?	?
11N/35W-22M01	NMMA	490922 (Woodlands Homestead)	430-680	None	184	171 (in 1994)	264
11N/35W-23G01	NMMA	1083178 (Co. MW-5)	400-460	None	261	234 (per well log)	171
11N/36W-12C01	NMMA	90020(PSBO-2)	280-290	C2 = 450-460; C3 = 720-730	50 (21.5 per NMMA?)	0-15	270-285
12N/35W-32	NCMA	221036 (OCSD MW Blue)	190-210, 245-265	Green = 100-133, Silver = 395-510, Yellow = 625-645	32	13-31	164-182
12N/35W-32	NCMA	221036 (OCSD MW Silver)	395-435, 470-510	Green = 110-130, Blue = 190-265, Yellow = 625-645	32	13-31	369-387
12N/36W-36L01	NCMA/NMMA	90019 (PSBO-1)	227-237	L2 = 535-545	29	16-24	208-216

PLATE



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EXISTING AND CANDIDATE WELLS FOR TRANSDUCER INSTALLATION

Santa Maria Groundwater Basin Characterization and Planning Activities Study
San Luis Obispo County

PLATE 1

APPENDIX M
REGIONAL CLIMATE CHANGE ANALYSIS (GEI CONSULTANTS, INC.)

Appendix M
Santa Maria Basin Regional Climate Change Analysis

Appendix M. Climate Change

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M. Climate Change

M.1 Introduction

Consistent with California state guidelines for Integrated Regional Water Management (IRWM) planning, Climate Change Analysis is now considered a critical component in the planning and implementation of water resources management projects and programs. The 2014 IRWM Guidelines require that IRWM Plans address both adaptation to the effects of climate change and mitigation of greenhouse gas (GHG) emissions resulting the potential effect of climate change and GHG on the region to identify and prioritize the Region's vulnerabilities to the effects of climate change.

This section has been developed using a collection of experts from the San Luis Obispo County IRWM Plan and focusing in on the portion of their analysis containing the Santa Maria Groundwater Basin (or Santa Maria Basin Region), a portion of the South County Sub-Region of the IRWM Plan. In the process of evaluating climate change for the Santa Maria Basin Region (Region), a Vulnerability Assessment Checklist has been modified to consider GHG emissions between possible project alternatives occurring specifically in the Santa Maria Basin Region. The checklist of prioritized vulnerabilities assists in the ranking and selection process of project alternatives. As with any climate change analysis, a large component of the Region's implementation of adaption is through data management and monitoring to provide a continuous analysis of climate change as it takes place in the future.

The purpose of this section is to:

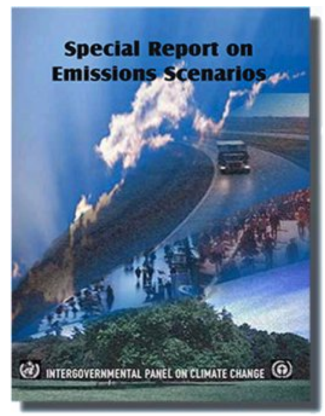
1. **Educate the reader on the contributing factors and measurements of climate change** – a brief introduction to define the terminology used in the section and how each contributes to the understanding of climate change
2. **Describe how Climate Change Analysis is performed** – a discussion of the global models and downscaled data used in the analysis performed in the section's Climate Change Analysis
3. **Summarize the climate change results** – a summary of the Climate Change Analysis results
4. **Present a ranking of vulnerabilities** – a rating and explanation of vulnerabilities stemming from a thorough vulnerability assessment

The scientific study for this section is derived from both the Climate Change Analysis for the **San Luis Obispo County IRWM Region** and for the **Santa Barbara County IRWM Region,** and from various climate change related websites.

M.2 CLIMATE SCIENCE AND MAKING CLIMATE CHANGE PROJECTIONS

Climate change is often described as a significant and lasting change in the weather patterns over extended periods of time ranging from decades to millions of years.

M.2.1 Use of Climate Models



In the early 1990s, the Intergovernmental Panel on Climate Change (IPCC)[1] developed long-term emissions scenarios that have been widely used in the analysis of possible climate change and its impacts, with suggested options to mitigate the impacts. In 1996, the IPCC made the decision to update the emission scenarios to account for the carbon intensity of the world's energy supply, to represent the significance of the income gap between developed and developing countries, and to include sulfur emissions as a climate changing variable. In 2000, the emission scenarios (SRES, 2000) were updated again to identify regions acknowledging agreement in the direction of future climate change as well as regions where projected changes were thought to be more uncertain. Information on the statistical significance of projected changes in relation to modeled natural climate variability was included.

Emission scenarios are alternative "storylines" of how the future might unfold (scenarios) using driving forces such as population growth, land use change, technology, and industry and how they influence future emissions of GHG. The storylines help define future concentrations of GHG in the atmosphere, and how GHG impacts temperature and climate in the oceans and on the land surface. Unfortunately, as with any forecast modeling, the possibility that any single emissions path will occur as described by the scenarios is highly uncertain.

[1] The Intergovernmental Panel on Climate Change (IPCC) is the leading international body for the assessment of climate change. <https://www.ipcc.ch/index.htm>

M.3 Climate Scenarios

The climate scenarios used in this Climate Change Analysis are defined in the Special Report on Emissions Scenarios (SRES, 2000). This report called for the use of multiple models while seeking input from the broadest community of experts and making scenario results available world-wide for review and comment. The SRES developed four storylines (**Figure M-1**) of how the world may move forward with climate change occurring.

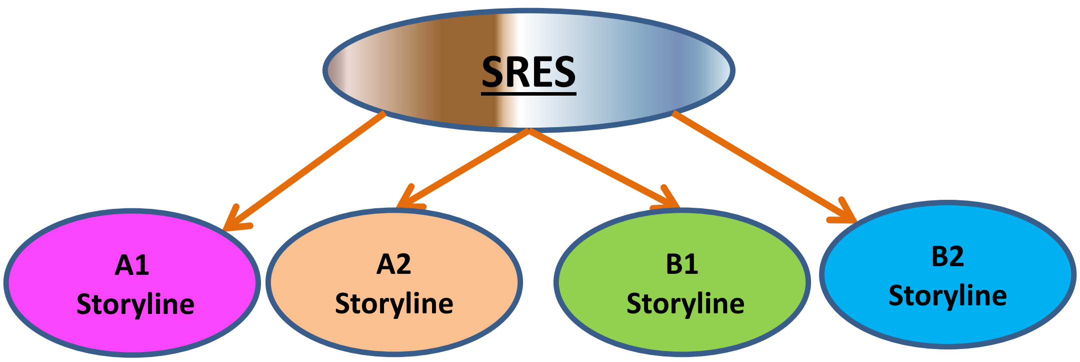


Figure M-1. SRES Storyline Schematic

The following description of the four storylines is taken from the IPCC website, <http://www.ipcc.ch/ipccreports/sres/emission/index.php?idp=3>:

> *The A1 storyline and scenario family describes a future world of very rapid economic growth, global population that peaks in mid-century and declines thereafter, and the rapid introduction of new and more efficient technologies. Major underlying themes are convergence among regions, capacity building, and increased cultural and social interactions, with a substantial reduction in regional differences in per capita income. The A1 scenario family develops into three groups that describe alternative directions of technological change in the energy system. The three A1 groups are distinguished by their technological emphasis: fossil intensive (A1FI), non-fossil energy sources (A1T), or a balance across all sources (A1B).*

> *The A2 storyline and scenario family describes a very heterogeneous world. The underlying theme is self-reliance and preservation of local identities. Fertility patterns across regions converge very slowly, which results in continuously increasing global population. Economic development is primarily regionally oriented and per capita economic growth and technological change are more fragmented and slower than in other storylines.*

> *The B1 storyline and scenario family describes a convergent world with the same global population that peaks in mid-century and declines thereafter, as in the A1 storyline, but with rapid changes in economic structures toward a service and information economy, with reductions in material intensity, and the introduction of clean and resource-efficient technologies. The emphasis is on global solutions to economic, social, and environmental sustainability, including improved equity, but without additional climate initiatives.*

> *The B2 storyline and scenario family describes a world in which the emphasis is on local solutions to economic, social, and environmental sustainability. It is a world with continuously increasing global population at a rate lower than A2, intermediate levels of economic development, and less rapid and more diverse technological change than in the B1 and A1 storylines. While the scenario is also oriented toward environmental protection and social equity, it focuses on local and regional levels.*

M.4 PREFERRED MODEL FOR CLIMATE CHANGE STUDIES

A collaborative effort by the Geos Institute[2] and Local Government Commission[3] resulted in two valuable, regional climate change resources. The two reports were titled *Projected Future Climatic and Ecological Conditions in San Luis Obispo County (April 2010)* and *Integrated Climate Change Adaptation Planning in San Luis Obispo County (November 2010)*.

At the time, the 2010 study relied on three different models to represent one emission scenario. These include the CSIRO, Australian Model; HadCM, United Kingdom (UK) Model; and MIROC, Japan Model. These models are built on slightly different input parameters making them differ in output. The UK Model provides the wettest output and the Japan Model the driest output.

These models were selected for the study because their output facilitated input to the MC1 vegetation model that was run for the study. The study states:

> *The MAPSS team selected CSIRO, MIROC, and HadCM from the suite of available models because their outputs are readily usable for the MC1 vegetation model,*

[2] The Geos Institute is a nonprofit organization that uses science to help people predict, reduce, and prepare for climate change.< http://www.geosinstitute.org/>

[3] The Local Government Commission (LGC) is a California-based nonprofit organization fostering innovation in environmental sustainability, economic prosperity and social equity.<http://www.lgc.org/slo_stakeholder_mtg_052010>

which provided us with projections for such variables as growing conditions for dominant types of vegetation, wildfire, and carbon storage in biomass.

As a result, the study had to sacrifice the ability to make use of daily downscaled data since this data is not available for all three models; instead opting to focus on climate change impacts to growing conditions. For the analysis, lack of daily data limits the computation of indices indicating certain local aspects of energy and agricultural water consumption (part of an adaptation analysis). In this analysis, completed for purposes of addressing both adaptation and mitigation of GHG emissions, the importance of daily downscaled data overrides the consideration to use the MC1 vegetation model. The preferred model, which includes daily downscaled data for all scenarios, is the National Oceanic and Atmospheric Administration's (NOAA) Geophysical Fluid Dynamics Laboratory (GFDL) model (results were released in 2007). The two GEOS 2010 reports; however, do form the basis for updating the climate change conditions and assessing climate change vulnerabilities in the Region(see **Section M.9**).

M.4.1 Selected Model and Storyline for Climate Change Analysis

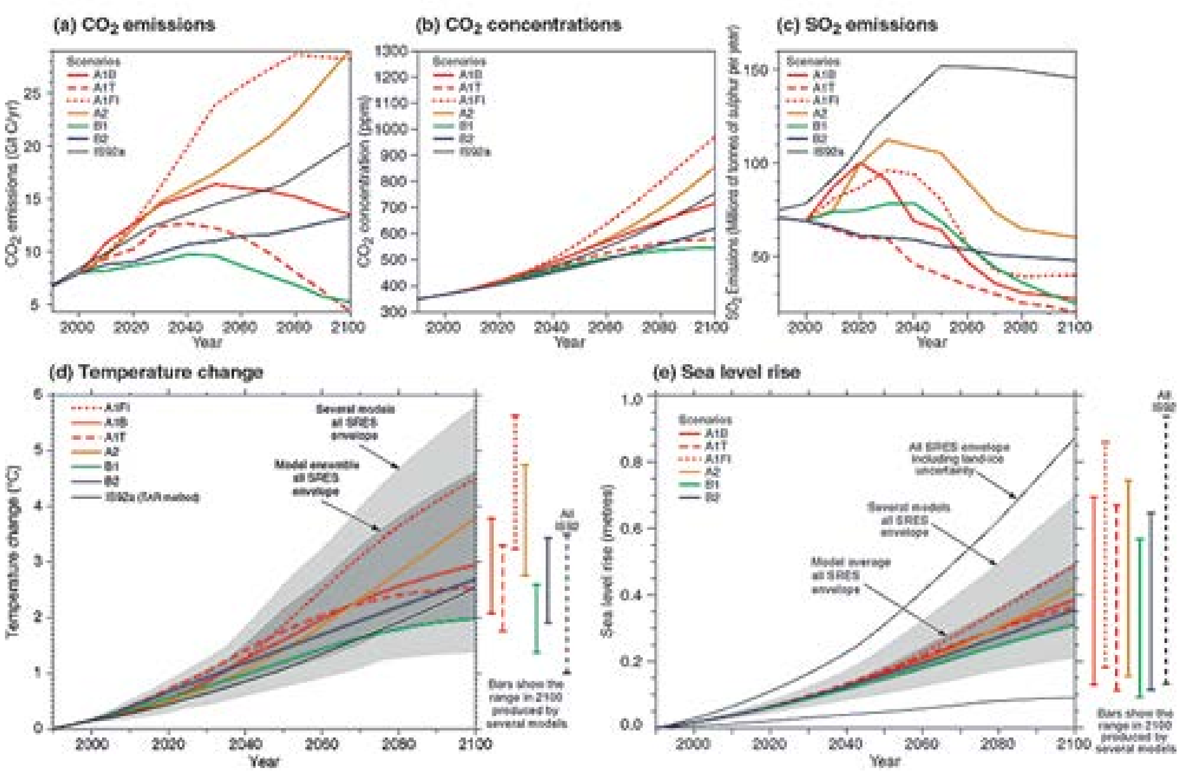
The decision to use NOAA model(s) for the climate change analysis for the IRWM Plan Update is based on the following:

- Downscaled data from the model is available at a resolution to differentiate between the potential impacts in the three Sub-Regions covered in the IRWM Plan
- Daily downscaled data is available for all emission scenarios to facilitate computing change in indices related to energy and water use
- The NOAA model(s) and approach has been utilized in three other region-developed IRWM Plans in the last 2 years (Imperial Region, Gateway Region, San Joaquin Region)

The preferred storyline (see A1 Storyline, **Figure M-1**) and scenario family applied in this section also differs from the 2010 Geos analysis by selecting the A1 storyline rather than the A2 storyline, described in the Geos and Local Government Commission's *Integrated Climate Change Adaptation Planning* report as the "business-as-usual" GHG emission scenario (referred to in past assessments by the IPCC as the IS92a Scenario published in both the 1990 (First Assessment Report [FAR]) and 1995 assessments (Second Assessment Report [SAR]). This change in storyline from the 2010 Geos analysis is a shift to a more optimistic growth scenario for the economy and a world which brings to bear technological solutions to reducing GHG starting mid-Century (2050).

Figure M-2 illustrates the differences in future emissions between the six scenarios (stemming from the four storylines described above by the 2007 IPCC assessment). Plots are briefly described as follows: (a) shows the CO2 emissions of the six SRES scenarios with IS92a for comparison purposes with the SAR; (b) shows projected CO2 concentrations; (c) shows anthropogenic (i.e., caused by man's activities) SO2 emissions; (d) and (e) show the projected temperature and sea-level responses, respectively. The "several models all SRES envelope" in (d) and (e) shows the temperature and sea-level rise, respectively, for a hierarchy of models, that together, are referred to as the simple climate model.

Focusing on the (a) plot and following the A1B line, the trace shows a relatively steep increase in carbon emissions in the first half the century to the mid-century mark (2050) and then a slow gradual decrease to 2100. Intuitively, this reflects the continued use of carbon fuels until green energy technology has evolved and is brought to bear on reducing the rate of emissions. However, the A1B temperature trace shown in the (d) plot is similar to all emission scenarios and continues to rise until the end of the century. As illustrated in **Figure M-3**, the A1B scenario is a balance between the more fossil fuel intensive scenario (A1F) and the non-fossil/green-energy scenario (A1T). The A1B scenario is selected for this analysis to represent the "most-likely" set of conditions for the Region looking out to 2100.



Source: IPCC Third Assessment Report

Figure M-2. Results of SRES Climate Change Scenarios

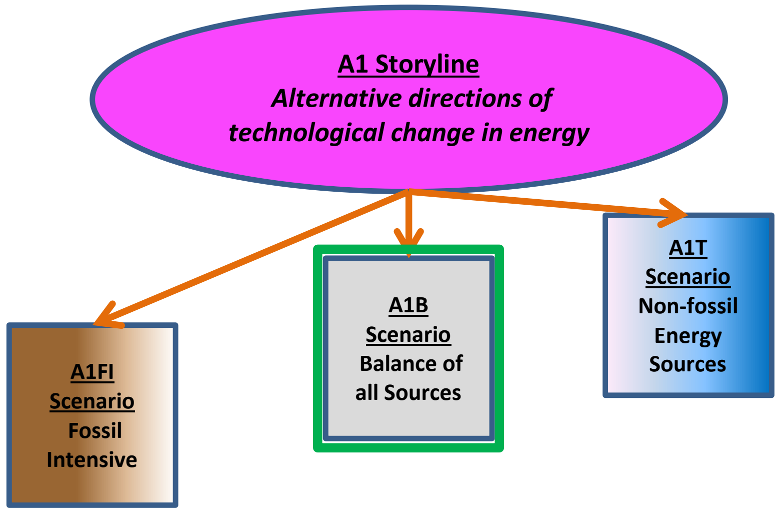


Figure M-3. A1 Storyline Scenarios

M.5 DOWNSCALING GLOBAL MODEL RESULTS

As noted above, downscaling of global data is important to a study looking at adaptation to the effects of climate change and project-specific mitigation for GHG emissions. Downscaling of global model results from the IPCC SRES scenarios refers to a process of taking the global model data on forecasted changes to climate variables (e.g., temperature and precipitation), and translating it to a finer spatial scale that is more meaningful in the context of local and regional impacts. Two general approaches are used in downscaling:

1. Dynamical, where a high resolution regional climate model with a better representation of local terrain simulates climate processes over the region of interest.
2. Statistical downscaling, where large-scale climate features are statistically related to fine-scale climate for the region.

The advantage of using dynamical downscaling is that a regional model can simulate fine-scale processes not anticipated with statistical methods. The disadvantage; however, is that the regional models are far more computationally intensive and that the end performance is highly dependent on the quality of the input data and how well regional climate influences are represented by the downscaling model. Statistical downscaling is less computationally intensive, and it is able to generate data that more closely mimics local climate variations. The main disadvantage is that statistical downscaling assumes that past relationships between regional and global climate results will continue to hold true in the future.

Global Climate simulations of future climate have been developed under the Coupled Model Inter-comparison Project (CMIP) Phase 3 conducted by the World Climate Research Programme (WCRP). The CMIP is an international effort to improve climate models by comparing multiple global model simulations to observations and to each other. The resolution of the global model is 200-300 Km^2 per grid cell (vs. cell size for a regional model is typically 15 Km^2 or finer). In the CMIP archive, simulated climate time series are presented for past (pre-2011), mid-century (2050) and end-century (2100) climate states, assuming various greenhouse gas emission scenarios.

M.5.1 Applying Global Models to the Santa Maria Basin Region

The downscaled global datasets need to be applicable to the Region. The Lawrence Livermore National Labs (LLNL)[4] hosts an archive of the simulations from Global Climate models from the CMIP Phase 3 effort and includes statistically-downscaled data for use in modeling smaller regions. The downscaling includes bias-corrected data to better match the magnitude of modeled precipitation and temperature to observed values in the local region. As described in **Section M.4.1**, simulations from NOAA's GFDL model runs for the A1B emissions scenario were used for the analysis performed.

The analysis below assesses and prioritizes regional vulnerabilities prescribed by California Department of Water Resources (DWR) (**Section M.9**), while also developing a plan for future data gathering and analysis (**Section 3**).

M.6 APPROACH TO CLIMATE CHANGE ANALYSIS FOR THE SANTA MARIA BASIN REGION

Climate Change Analysis for the Region requires sufficient time series data, both in resolution and in temporal span. The analysis requires monthly and daily time series data to characterize climate in the recent past (prior to 2011) and at mid-century (2050), approximately 40 years into the future. The use of mid-century as a future date ensures full coverage of the 20- to 25-year Planning horizon. The analysis takes the following steps:

1. Obtain 40 years of downscaled monthly and daily regional climate model time series for mid-century (future) conditions

[4] See <http://gdo-dcp.ucllnl.org/downscaled_cmip_projections/dcpInterface.html#Welcome> for description and download of data.

2. Obtain 40 years of simulated monthly regional climate model time series for past (1971 to 2010) climate
3. Obtain 20 years of simulated daily regional climate model time series for past (1979 to 1999) climate
4. Analyze monthly time series and present results as seasonal changes in climate variables such as temperature and precipitation
5. Analyze daily time series and present daily results as seasonal changes in accumulated variables such as heating, cooling, and growing degree days

M.6.1 Metrics for Measuring Climate Change

Changes between historical and future global simulation results are summarized in terms of monthly and seasonal differences for precipitation, maximum temperature, minimum temperature, wind speed, evapotranspiration, and runoff. These changes are obtained by analyzing the monthly simulated data. Daily time series data is used to calculate the average seasonal change in growing degree days, heating degree days, cooling degree days, and days with precipitation of more than 1 inch. Both metric categories (i.e., monthly and seasonal) are used to quantitatively express change in the climate parameters and are described below.

M.6.1.1 *Monthly Time Series Metrics*

Precipitation – Average monthly rainfall amounts (inches and mm)

Maximum Temperature – Average monthly maximum daily temperatures °F (°C)

Minimum Temperature – Average monthly minimum daily temperatures °F (°C)

Wind Speed – Average monthly wind speed (m/s)

Evapotranspiration – Average monthly evapotranspiration rates (mm)

Runoff – Estimate average monthly runoff from rainfall (mm/month)

M.6.1.2 *Daily Time Series Metrics*

Growing Degree Days

Growing Degree Days (GDD) are associated with the regional climate and its ability to provide the optimal range in temperature for growing crops (i.e., row crops such as strawberries, vineyards, etc.). While optimal growing conditions differ for each crop, growing conditions for all crops typically range between 46°F (8°C) for low growth and 90°F (32°C) for high growth.

On any given day of the year, if the daily mean temperature falls within this range (see figure below), the day is counted as a growing day and is weighted by how close the temperature falls to the high growth temperature. The weighting is accomplished by the formula: [5]

$GDD = ((T_{Max} + T_{Min})/2 - T_{MinBase})_{Day\ 1} + ((T_{Max} + T_{Min})/2 - T_{MinBase})_{Day\ 2} + \ldots$, where

$T_{Max} = 90°F$ if $T_{Max} >= 90°F$, or

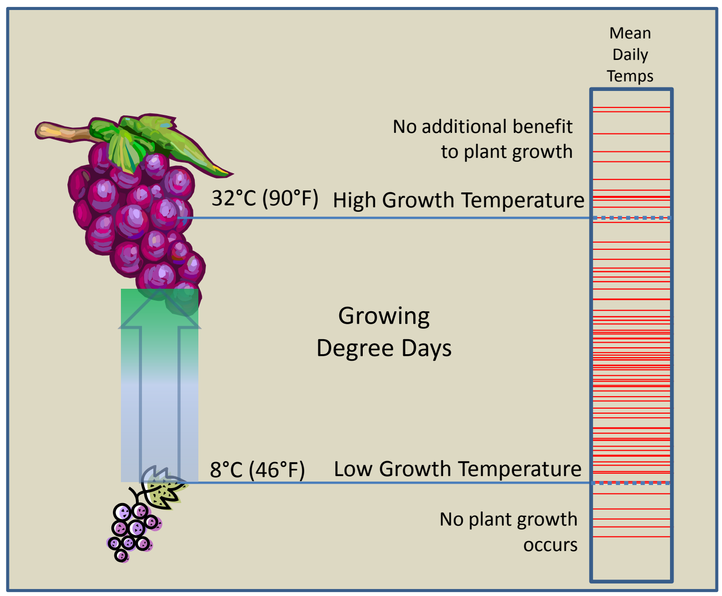
T_{Max} = Max Daily Temp

$T_{Min} = 46°F$ if $T_M =< 46°F$, or

T_{Min} = Min Daily Temp

$T_{MinBase} = 46°F$

In the case of vineyards (mostly grown east of US Highway Route 101) If the daily mean temperature is greater than 90°F, the day is still counted as a growing day, but is only weighted up to the high growth temperature.[6] If the mean temperature falls below 46°F, the minimum base temperature, the day is not counted as a growing day. The sum of the differences in mean daily temperature (after above adjustment) for the period of simulation (20 years) equals the total number of GDDs, with the maximum number being 321,200 (20*365*(90-46) = 321,200 degree-days) GDDs.



As climate change affects temperature, the change in the number of growing degree days between forecasted and what is occurring present day becomes an important identifier (or metric) on the amount and impact of climate change.

[5] Recognizing there are many crop types being grown in the Region, the surrogate crop selected for the region in describing changes in growth patterns is vineyards. Optimum growth temperatures for other crop types (i.e., strawberries) are very similar to those shown.

[6] Note that a >90°F day is still considered a growth day since the heating and cooling temperature cycle falls within the growth range in the morning and early afternoon hours until a maximum temperature above the optimum growth range is reached.

Heating Degree Days

Days with a mean daily temperature below 65°F (18°C), the minimum base temperature, are considered to be Heating Degree Days (HDD) below which buildings need to be heated. The formula is similar to GDDs except the difference is calculated as follows:

$HDD = ((T_{Max} + T_{Min})/2 - T_{MinBase})_{Day\ 1} + ((T_{Max} + T_{Min})/2 - T_{MinBase})_{Day\ 2} + \ldots$, where

T_{Max} = Max Daily Temp

T_{Min} = Min Daily Temp

If $(T_{Max} + T_{Min})/2 > 65°F$ then $(T_{Max} + T_{Min})/2 = 65°F$

$T_{MinBase} = 65°F$

An increase in HDD implies more days where heating energy is expended.

Cooling Degree Days

Cooling Degree Days (CDD) occur when daily mean temperatures are above 75°F (24°C), the maximum base temperature, and buildings require air conditioning to cool temperatures. The formula is calculated as follows:

Cooling Degree Days (CDD) = $((T_{Max} + T_{Min})/2 - T_{MaxBase})_{Day\ 1} + ((T_{Max} + T_{Min})/2 - T_{MaxBase})_{Day\ 2} + \ldots$, where

T_{Max} = Max Daily Temp

T_{Min} = Min Daily Temp

If $(T_{Max} + T_{Min})/2 < 75°F$ then $(T_{Max} + T_{Min})/2 = 75°F$

$T_{MaxBase} = 75°F$

An increase in CDD implies more hot days where cooling energy is expended.

M.6.2 Conceptual Model Setup and Analysis

The analysis flow diagram shown in **Figure M-4** is illustrative of the processes and interactions taking place in the modeling of climate change. As shown in the figure, economic systems are the foundational stressors towards positive and negative changes in climate. The chosen model scenario (A1B) is closely defined by what the world economy may look like and what the human society will do about the changes taking place, and witnessed through temporal and volumetric changes in rainfall and stream/river hydrology, and in sea-level rise. The diagram indicates the feedback between each of the processes, and through each time step, a new equilibrium is reached producing the resultant set of new climate conditions.

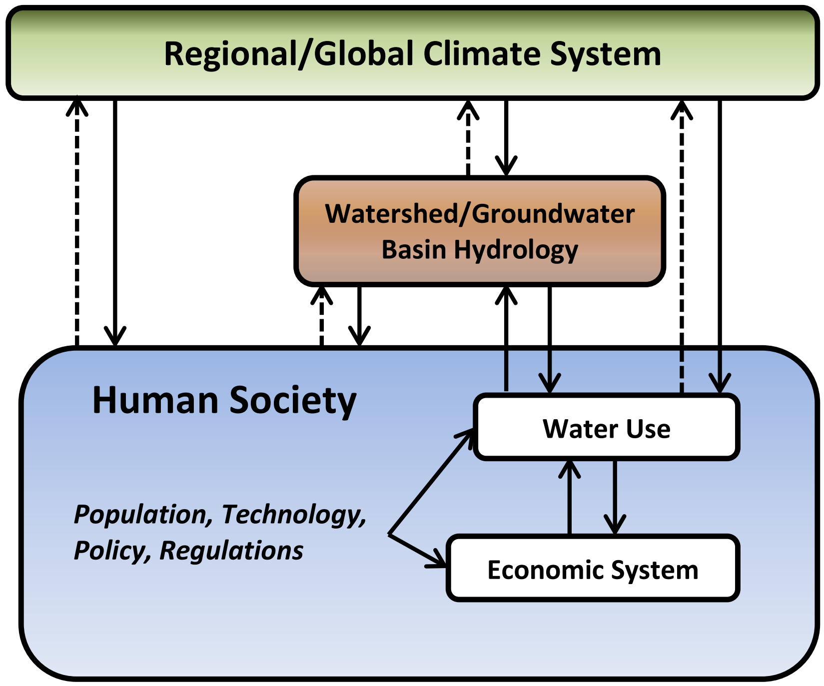


Figure M-4. Analysis Flow Diagram

Since this analysis is scoped to evaluate and prioritize vulnerabilities for the Region shown in **Figure M-5**, the socio-economic and water-related drivers require quantification of what distinguishes the Santa Maria Basin Region before moving forward in the analysis. A general summary of the important distinguishing factors is summarized in **Table M-1.** This table splits the Region into the three subregions (i.e., Coastal, Mid, and Upper) to help differentiate each in terms of potential vulnerabilities. Management agencies most affected are included parenthetically in each region category of **Table M-1**. As discussed above, the climate change analysis tools do not have the resolution to make a concise split amongst agencies.

The biggest drivers in the Santa Maria Basin Region are its geographic proximity of the ocean, economic benefits from tourism, reliance on groundwater as both a drinking water supply and agricultural supply, and the primary natural groundwater recharge occurring from precipitation events where ephemeral streams flow during and after a storm event, but dry up without additional rainfall. The close contact of the Pacific Ocean with the western boundary of the Region generally provides cooler temperatures and higher rainfall amounts; whereas inland portions of the Region to the east, on average, have higher temperatures and less rainfall. The level of human ecosystem interaction is most significant in the amount of agricultural and urban lands across the Mid-Region.

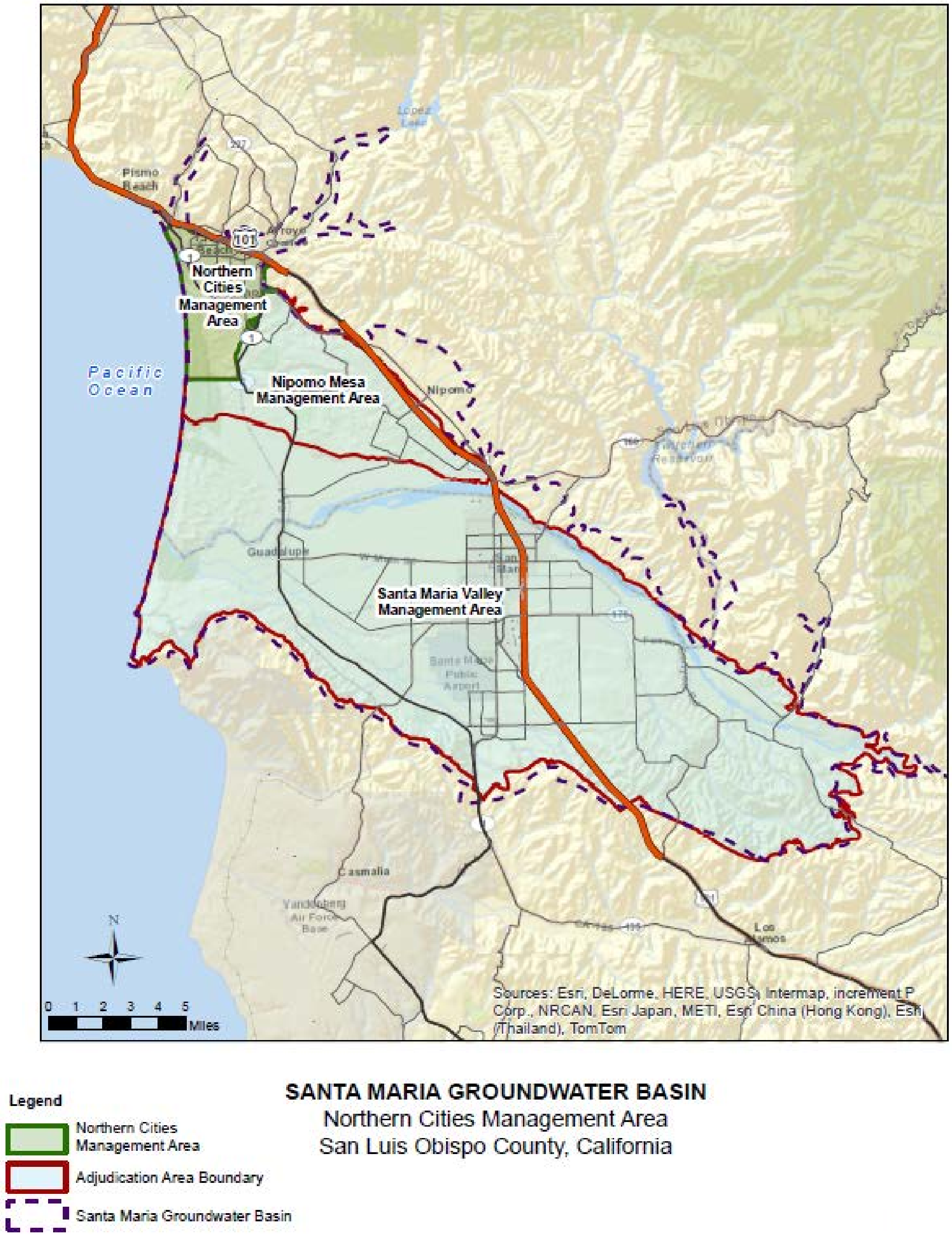


Figure M-5. Santa Maria Basin Region Map

Urbanized land uses in the region exist in various degrees. In describing urban attributes, existing urban densities and projected planned growth occur as part of adopted General Plans, and local agency land use plans. The policies for growth are similar in how population and socio-economic growth and stability requirements are balanced with available water resources. It is widely known that most, if not all, urban areas continuously struggle with water supply, drainage, transportation, and environmental challenges regardless of their relative size, location, and local hydrology. Because of these similarities, the impacting drivers in urban areas resulting from changes in climate are not considered to be significantly different throughout the Region, and are not reflected in **Table M-1**.

Table M-1. Socio-Economic and Water Resources Considerations Across the Santa Maria Valley Basin Region

Western Coastal Region (NCMA, NMMA, SMVMA)	• Sea-level rise along the coastline can significantly impact low-lying areas and groundwater supplies (often the primary source of drinking water) by saltwater intrusion • Timing of rainfall and runoff is critical to recharging the groundwater basin where groundwater is currently constrained by salt water intrusion (i.e., changes in rainfall patterns can cause a possible loss of natural recharge, allowing for further intrusion) • Local economies of communities (e.g., fishery and harbor industries), are reliant on coastal tourism requiring protection of ecosystems and infrastructure • California State Route Highway 1 coastal transportation route from approximately Carmel to the north, to San Simeon is sensitive to changing weather patterns causing slides and long-term road closures, shutting off north-bound and south-bound lanes for weeks, impacting primarily tourism
Mid-Region (NMMA, SMVMA)	• Having the highest amount of agricultural water demands, the water supply needs have the potential to change (up or down) as a result of the need to change cropping patterns or cropping cycles to accommodate rainfall patterns • A larger wine and vineyard-based economy in the Santa Maria Basin Region is sensitive to changing amounts of rainfall, and temperatures governing growing days and sensitive harvest periods • Local economies of communities (such as wine-tasting) are reliant on tourism requiring the ability to sustain the attractions and natural resources • Changes in the flow patterns of the Sisquoc and Santa Maria Rivers dictate the amount of irrigation water and natural recharge to the Santa Maria Basin on an annual basis • State Water Project water is currently made available to increase imported surface water for drinking water supplies in urban areas; however, these supplies are projected to have lower reliability with the potential for stressing local and regional groundwater resources and exacerbating salinity intrusion in the future
Eastern Upper-Region (SMVMA)	• Mostly outside the regional groundwater basin, smaller upstream watersheds contribute to the Region's overall recharge potential • Changes in rainfall patterns to the east reduce the natural catchment volumes of the Region

M.7 Climate Change Analysis Results

The Climate Change Analysis is the execution of the model assuming the mid-century (2050) carbon production conditions of the A1B Scenario shown in **Figure M-2**, and running those conditions through 40 years of monthly hydrology and 20 years of daily hydrology to develop a statistical average of the various climate variables. In this way, the model results are presented so the mid-century results of climate variables are representative of an average over a hydrologic period of record to account for the naturally occurring dry- and wet-period hydrology.

Table M-2 below provides results of the Climate Change Analysis using monthly data aggregated to seasonal time periods for the mid-century (2050) point in time. The table and figures below illustrate the change in average seasonal amounts for each of the key climate variables defined above in **Section M.6.1.1.**

Table M-2. Projected Changes in Monthly Climate Metrics by Mid-Century (2050)

Variable	Change in Variables Projected by GFDL Medium Warming Scenario (A1B)				
	Winter	Spring	Summer	Fall	Annual
Precipitation (see note)	7.0%	-27.5%	-32.5%	0.9%	-5.02%
Maximum Temp	6.6%	4.6%	6.1%	6.0%	5.81%
Minimum Temp	23.2%	14.1%	11.2%	18.8%	15.40%
Wind Speed	0.2%	-1.2%	-0.8%	0.7%	-0.32%
Evapotranspiration	-1.8%	3.8%	7.1%	6.0%	4.90%
Runoff	12.8%	-33.7%	-4.4%	1.7%	-8.78%

Note: Percentage amounts also provide the level of sensitivity of the current average amount to the model change (i.e., current small value amounts of rainfall in spring are more sensitive to change than larger values in winter.)

In the table above, the cells with green backgrounds indicate increases of 3 percent change for current seasonal average or more; red backgrounds indicate decreases of 3 percent or more; and white backgrounds indicate no significant change. The table values provide a sense of the order of magnitude of change projected in 2050 as a result of climate change assuming the A1B Scenario conditions of carbon productions shown in **Figure M-2.** Each of these key climate variables and the effects of climate change are described in this section.

M.7.1 Precipitation Changes

Precipitation is a key indicator of climate change, both when (temporal) and how much (volume) rainfall occurs has a significant impact to the Region's infrastructure and river systems in their capacity to convey flood waters and naturally recharge the Santa Maria Basin freshwater aquifers, respectively. The change in the above table showing rainfall percent changes occurring in winter and spring represent more rainfall in the winter and less rainfall in the spring. As noted in **Table M-2**, the order of magnitude in the change seen in spring stems from the small amount of rainfall that occurs during the spring months of the year.

Precipitation also drives many of the interactions taking place in the analysis flow diagram shown in **Figure M-4.** What is important to quantify from the results is the shift in rainfall from month to month, as shown in **Figure M-6.** The graph clearly shows a shift (overlying transparent green) in the average rainfall pattern where the future projected rainfall is less in the spring months (exposed red) and more in the late fall and winter months.

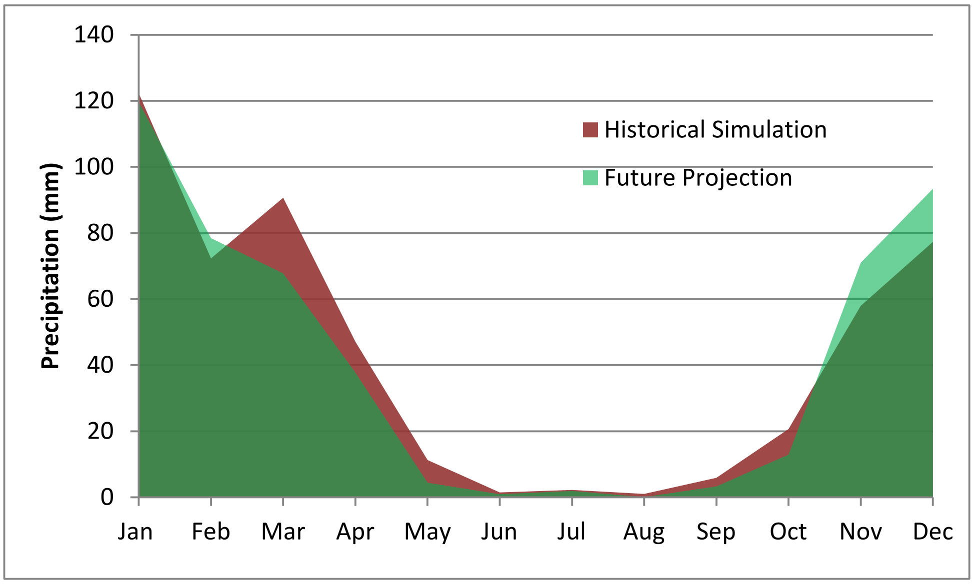


Figure M-6. Historical and Future Precipitation

M.7.2 Temperature Changes

Temperature drives how much water is needed to satisfy both human and natural water demands, and a shift in temperature can reduce or increase this need for water over the months of the year. An increase in temperature raises the amount of evapotranspiration from agricultural production and outdoor landscaping which, in turn, necessitates the application of additional irrigation water. **Figure M-7** illustrates the increased shift in temperatures (transparent green on top of red) over the 12 months of the year with the differences resulting in the percent changes shown in **Table M-2**.

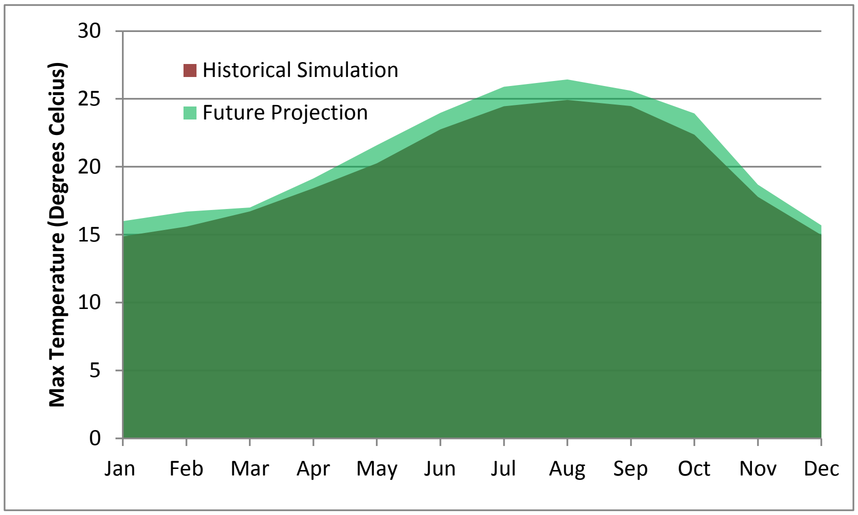


Figure M-7. Historical and Future Maximum Temperature

A rise in maximum temperatures indicates hotter day time temperatures and a rise in minimum temperatures indicate hotter night time temperatures (when compared with existing conditions). **Table M-2** values indicate that the Region will see an increase in temperature year-round.

M.7.3 Wind Speed Changes

Wind speed changes in **Table M-2** show minimal differences in the four seasonal periods. No additional analysis is available for wind speed changes.

M.7.4 Evapotranspiration Changes

Evapotranspiration (ET) is a measure of how the suns radiation affects the amount of water needed by plants to sustain growth. An increase, or positive change in **Table M-2**, represents an increase for water needed by the plant. **Figure M-8** shows the expected increase in the summer months when plants require water the most. The net result is an increased need for irrigation supplies in a region already constrained by available groundwater supplies of the Santa Maria Basin.

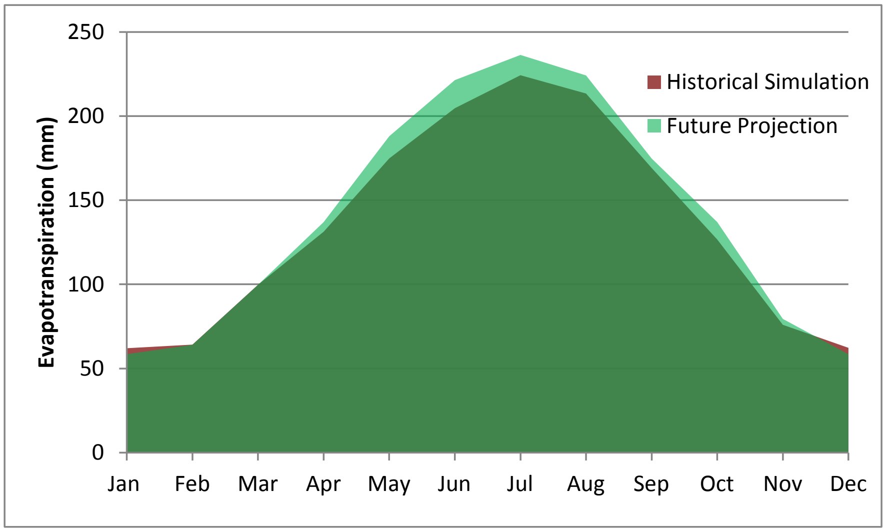


Figure M-8. Historical and Future Evapotranspiration

M.7.5 Runoff Changes

Runoff is an indicator of how much rainfall hits the ground and does not infiltrate or percolate to replenish groundwater supplies. This is an indicator of the intensity of storms, the size of the aquifers, and the soil moisture conditions. When rainfall events are spaced out and of low intensity, the region has an improved chance of capturing the water through deep percolation to groundwater supplies (or possibly to fractured rock in the upper watershed). When soil moisture conditions reject the water, or aquifers become full, runoff occurs and is routed down streams and rivers, with some or all of the water stored in natural or manmade reservoirs. A change in the intensity and frequency of rainfall events resulting in changes in runoff can significantly impact a reservoir's operations resulting in insufficient stored water to meet water demands during the peak irrigation season. **Figure M-9** illustrates the shift in runoff over the 12 months of the year and the percent differences in the seasonal runoff volumes shown in **Table M-2**.

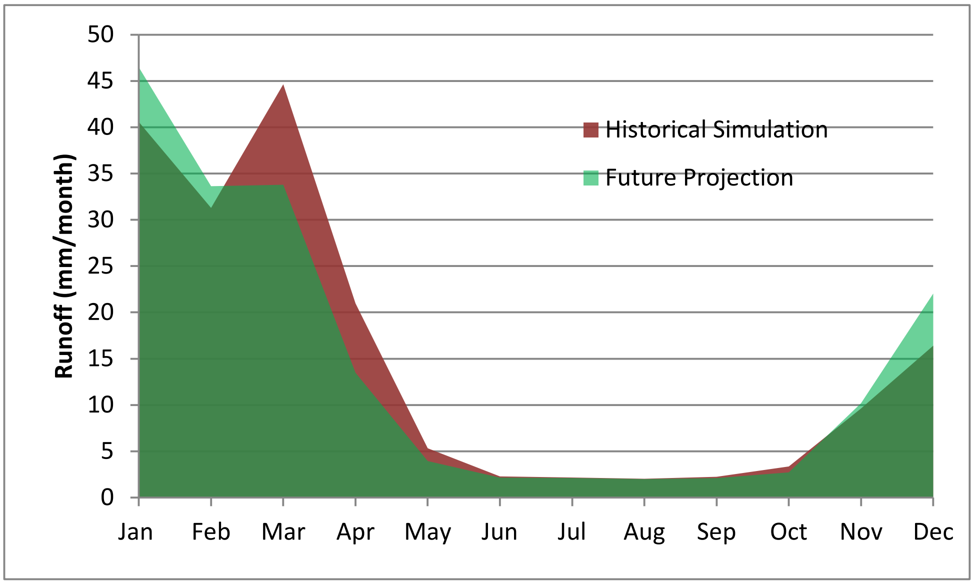


Figure M-9. Historical and Future Runoff

M.7.6 Daily Climate Change Results Expressed as Degree Days and Precipitation

With daily simulation data, the resolution of change significantly increases to the point where more can be said about how climate change affects the economy by considering how much hotter or cooler the temperatures will be, on average, for any given day of the year. **Section M.6.1.2** defines the concept of degree days and its purpose being to provide a metric of change that relates to the use of water and energy both impacting the human economy. **Table M-3** below shows summation of projected daily changes in the climate's daily metrics by mid-century (2050) with increases shown in green background and decreases shown in red backgrounds. Cells with white backgrounds indicate no significant change.

M.7.6.1 *Changes in Growing Degree Days*

Section M.6.1 provides the definition for GDDs using the Region's strawberry and row crops as an example, and can be used as a surrogate for other agricultural crops in the Region, the number of GDDs increases with an increase in temperature.

The difference in the number of summer GDDs for the Region appears to be slightly higher. This is caused by two factors: higher minimum temperatures due to temperate ocean influence along the coastline, and lower current number of GDDs.

Table M-3. Projected Changes in Daily Climate Metrics by Mid-Century (2050)

Variable	**Change in variables projected by GFDL**			
	Medium Emissions (A1B)			
	Winter	**Spring**	**Summer**	**Fall**
Growing Degree Days	150.04	240.46	423.37	283.37
Heating Degree Days	-296.08	-338.93	-190.82	-264.11
Cooling Degree Days	0.00	0.05	1.51	0.41

Notes: Degree Days are represented using degrees Fahrenheit.
Differences are based on the equations provided in **Section M.6.1.2**

Figure M-10 and **Figure M-11** are histogram plots of the maximum and minimum daily temperatures. Both plots indicate a forward shift towards higher temperatures in the future. The mean maximum and minimum difference (i.e., shift in average) in temperatures is approximately 4.3°F (2.5°C) and 4.2°F (2.3°C), respectively. **Figure M-12** illustrates the shift in GDDs by representing the average daily temperature (average of maximum and minimum) and shows that the temperature shift is reducing the total number of days with an average temperature of less than 46°F (8°C) by a total of 33 days (see cross-hatched area representing days no longer less than minimum temperature) thereby increasing the number of growing days throughout the year.

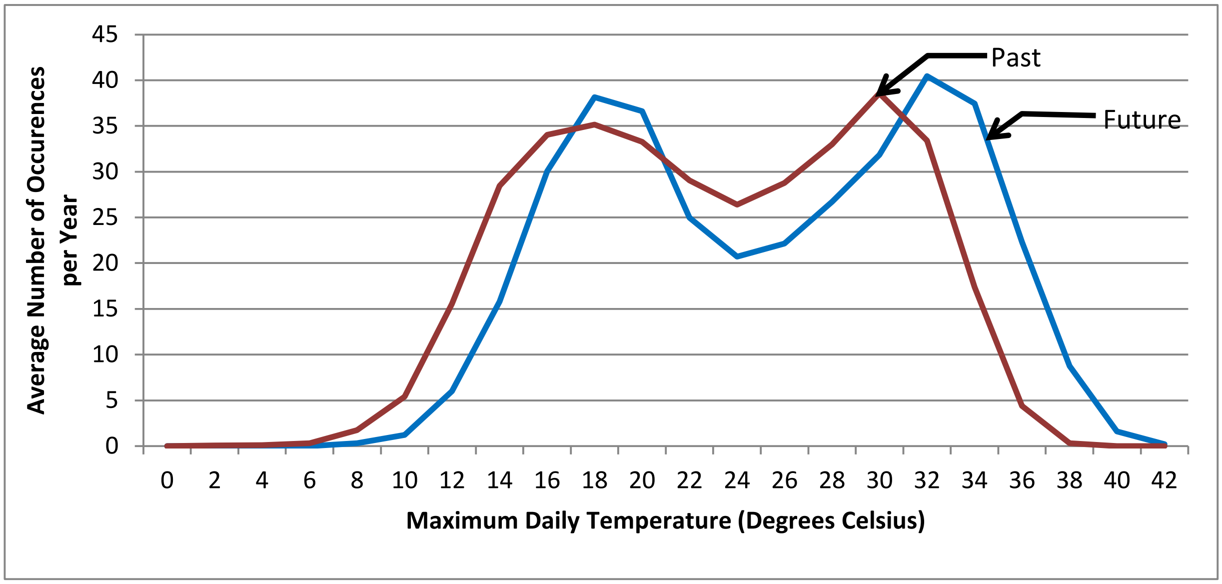


Figure M-10. Histogram Plot of Maximum Daily Temperatures

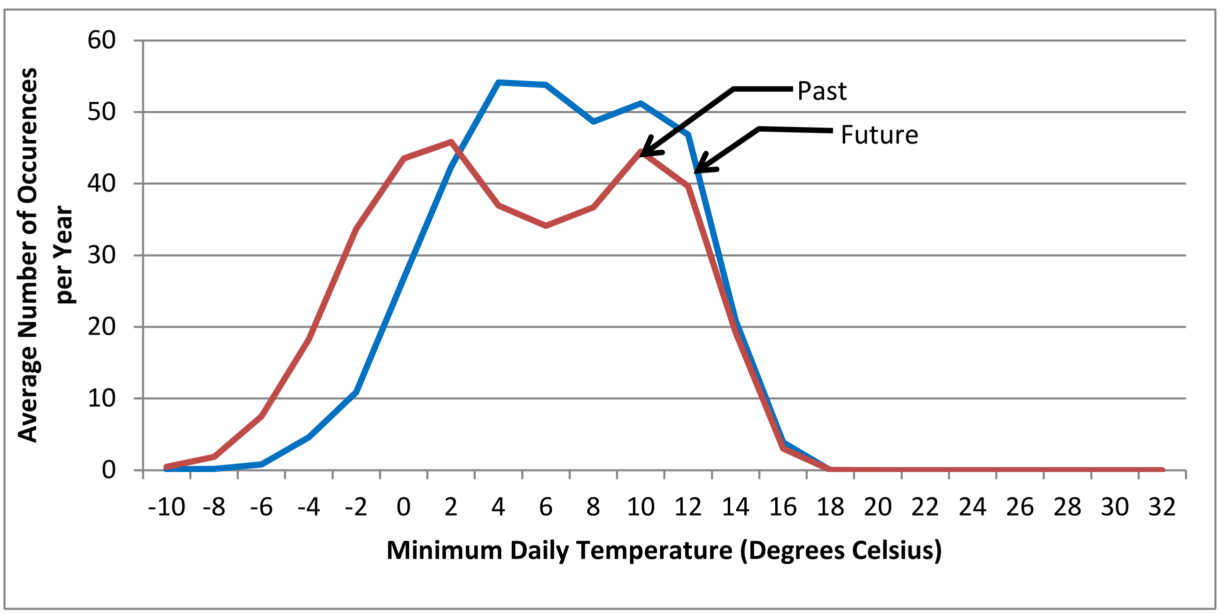


Figure M-11. Histogram Plot of Minimum Daily Temperatures

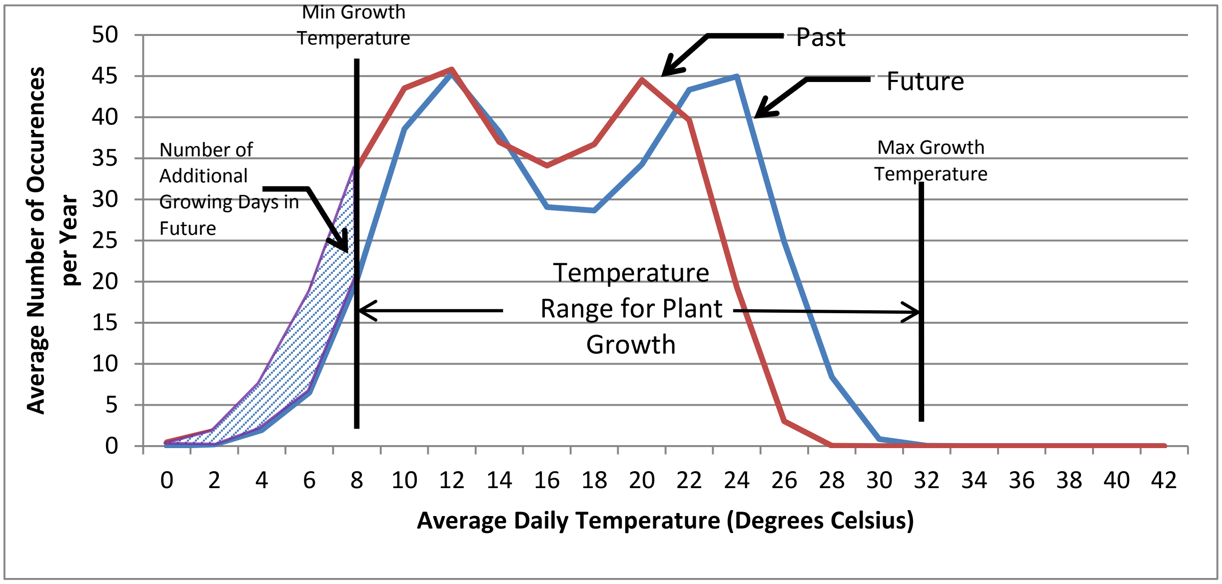


Figure M-12. Histogram Plot of Average Daily Temperatures

M.7.7 Summary of Findings for Climate Change Analysis

Table M-4 provides a summary of the details and general findings substantiating the results presented above.

M.8 Sea-level Rise

In the history of the world, sea levels have been hundreds of feet higher and lower than what they are today due to the natural climate change cycle of ice ages and interglacial periods. Changes in sea level can happen due to many factors, including changes in the amount of ice and snow stored on land in the form of ice sheets and glaciers; the local shoreline moving up or down; or through larger scale processes such as global climate change. The average rate of increase is approximately six tenths of a foot a year with the rate increasing to seven tenths over the past 65 years.

Being adjacent to the Pacific Ocean with approximately 100 miles of coastline, the Region is concerned with SLR and has an interest in quantifying the changes in sea level that may occur in the coming years. While not completely understood, the forecasting of SLR in the modeling community, and hence different numerical and empirical approaches, estimates the rise at different geographic scales. There is no industry-accepted model currently in use.

Table M-4. Summary of Climate Change Findings as Related to Changes in Regional Water Resources

Climate Variables	South County Sub-Region
Rainfall	Increase in winter precipitation up to 7% and decreases in dry season precipitation up to 32% indicate shift in precipitation cycles, with an overall decrease in annual precipitation up to 5%
Maximum Temperature	Increases by 4.6% - 6.6% in maximum temperatures throughout the year (in degree Celsius) indicate an overall increase in warming patterns
Minimum Temperature	Increases by 11.2% - 23.2% in minimum temperatures throughout the year (in degree Celsius) indicate warmer night time temperatures
Wind Speed	Only minor changes in wind speeds ranging from increases of less than 1% and decreases up to 1%
Evapo-transpiration	Increases up to 7% expected in evapotranspiration in all seasons except winter where a decrease up to 2% indicate the need to make a shift in irrigation patterns
Runoff	Increases in runoff in the winter by 12.8% and decreased runoff in the dry seasons up to 33.7% indicate a shift in runoff patterns
Heating/Cooling Degree Days	Significant decreases in heating requirements (heating degree days) through all the seasons due to higher temperatures and minor increases in cooling requirements (cooling degree days) in spring, summer and fall indicate higher energy cost in cooling buildings
Growing Degree Days	Increases in ambient growing temperatures (growing degree days) for plants in all seasons indicates a need to alter crop types and water requirements
Rainfall Events	Slight changes in the number of precipitation events in winter and spring indicate a shift in runoff and irrigation patterns

M.9 VULNERABILITY ASSESSMENT

The Vulnerability Assessment incorporates the effort of the GEOS Institute and Local Government Commission (*Projected Future Climatic and Ecological Conditions in San Luis Obispo County, April 2010*, and *Integrated Climate Change Adaptation Planning in San Luis Obispo County, November 2010*) to evaluate climate change vulnerabilities in the Region as they relate to the Region's water resources. For a complete and thorough listing of possible impacts and climate change vulnerabilities, the reader is encouraged to read the 2010 GEOS report at:

<http://www.geosinstitute.org/images/stories/pdfs/Publications/ClimateWise/sloclimatewisefinal.pdf>.

The purpose of the assessment provided below is to develop a working checklist of prioritized vulnerabilities to compare against in future project selection and ranking. Only those vulnerabilities believed to have the potential for further impact from future project implementation are included in this list. The major categories of water resources-related vulnerabilities and their connection with water include:

Recreation/Tourism

- Fishing – streams and recreational lakes
- Birdwatching – wildlife areas including estuaries and wetlands
- Kayaking – natural streams and lakes
- Wine Country Touring – vineyard irrigation
- Camping – recreational lakes

Natural Water Dependent Activities

- Water Supplies – sufficient groundwater and surface water replenishment and storage
- Protected Fisheries – sufficient minimum in-stream surface water flows
- Food Production – sufficient water and moisture to maintain a healthy and sustainable food chain
- Groundwater Recharge – sufficient recharge water to recover each year
- Sediment Filtration – sufficient natural filtration through streambed and reservoir recharge
- Water Storage – sufficient surface water to fill natural and manmade reservoirs
- Hydroelectricity – sufficient surface water flows to run hydroelectric turbines
- Removal of Pollutants from Waterways – sufficient stream flows to reduce harmful concentrations

Agriculture/Timber

- Cattle Grazing – require irrigation sources
- Timber or firewood – require native woodlands
- Aquaculture – require water source for ponds
- Seasonal/Permanent Crops – require irrigation sources

As part of this analysis the Region is examined using a list of questions intended to better understand the unique vulnerabilities of climate change. A set of categories is provided and a scoring system[7] to assist in prioritizing projects intended to address the vulnerabilities based on

[7] The scoring system used derived from *Section 4. Assessing Regional Vulnerability to Climate Change, of Climate Change Handbook for Regional Water Planning* <http://www.water.ca.gov/climatechange/CCHandbook.cfm> (DWR, 2011).

the level of impact and the ability to mitigate for climate change in whole or in part. Prioritization of the Region's vulnerabilities is as follows:

> **Priority Rating 1** – significant vulnerabilities that have far-reaching impacts, are very likely to occur, have a willingness to pay[8] and can be addressed through well-defined near-term projects[9] where/when feasible.[10]
>
> **Priority Rating 2** – significant vulnerabilities with a high adaptive capacity and can be addressed through specific projects and planning studies and/or monitoring programs where/when feasible.
>
> **Priority Rating 3** – less than significant vulnerabilities for consideration in future long-term projects and planning studies and/or monitoring programs where/when feasible.

Shown in **Table 4-5** are the rating categories and their ranking values. The listing of vulnerabilities begins below the table.

Table M-5. Sub-Region Vulnerability Rating Categories and Ranking

Rating Categories	Rating
Decreased Water Supply	1
Coastal Inundation	1
Water Demand	2
Water Quality	2
Ecosystems and Habitat	2
Flooding	3

M.9.1 Listing of Region's Vulnerabilities and Ranking

Decreased Water Supply: Priority Rating 1

1. Projections of precipitation indicate decreases in the average annual precipitation and a shift in the precipitation patterns with more precipitation occurring in winter and reduced precipitation in spring and summer. These conditions pose water supply challenges.
2. The shift in precipitation patterns towards the winter months coupled with an overall projected annual reduction in precipitation requires that water be stored in the wet months for later use in the drier spring and summer months.

[8] Willingness to pay implies local funding is available to address vulnerability.
[9] Near-term projects are typically smaller projects with a shorter time frame to reach implementation.
[10] Addressing high priority vulnerabilities also alleviates vulnerabilities with lower priority (e.g., maintaining groundwater elevations would also prevent saltwater intrusion and reduce the risk to water quality).

3. The constrained amount of water supplied from the Santa Maria Basin increases the dependence of the Region on surface waters.
4. Water sources in the region include groundwater, the California State Water Project, Lopez Reservoir, Whale Rock Reservoir, Nacimiento Water Project, and the Salinas Reservoir. In addition to groundwater constraints, sources of surface water are expected to become less reliable, especially the California State Water Project which is reliant on snow melt in the Sacramento Valley.
5. The overall reduction in precipitation in the region results in less reliable surface water supplies in the drier months.
6. As a result of intense upper watershed rain storms and/or post wildfire events, reservoir capacities are expected to be impacted by mud flows and sediment depositions; both causing reductions in storage.

Coastal Inundation: Priority Rating 1

1. The Region includes recreational beaches and tourist destinations which are critical to sustaining the local economy. Also included are sensitive coastal ecosystems and habitats. These locations are all vulnerable to coastal inundation through increased flooding, storm surges, and sea-level rise.
2. Although not located in the Region proper, the Diablo Nuclear Power Plant is nearby to the north along the coast and is vulnerable to the effects of coastal inundation on infrastructure and processes (as a result of sea-level rise and storm surges).
3. Highway 1 runs along the coast and is vulnerable to flooding due to sea-level rise especially during coastal storms. Closures have a large impact on local businesses.

Water Demand: Priority Rating 2

1. The Region's agricultural community can expect increases in temperature affecting the number of Growing Degree Days. This affects the crop types, cropping patterns, and crop irrigation requirements. During the summer, creek and stream flows cease to run when increased groundwater extractions occur.
2. Increases in evapotranspiration result in an increased use of water for urban and agricultural irrigation.
3. Projected increases in wildfires due to drier conditions result in the increased need for water required for fighting wildfires. Increased wildfire potential placing urban and rural communities at risk result in the need for increased above-ground water storage to control the fires and to protect life and property.

4. Reduced summer runoff makes it difficult to meet in-stream flow requirements for sustaining ecosystems and habitats.

Water Quality: Priority Rating 2

1. Increases in water temperatures in winter months interfere with mixing cycles of water in large water bodies, such as Twitchell Reservoir, in turn affecting water quality.
2. Projected increased wildfires in the region due to drier conditions and warmer temperatures impact environmental and drinking water. Post-wildfire impacts compromise water quality by the development of mudslides and burnt residue transported through runoff and wind. Both produce undesirable chemical concentrations in rivers, streams, and lakes; affecting water quality of downstream drinking water supplies.
3. Saltwater intrusion in coastal aquifers is a threat to drinking water quality.
4. Lower groundwater elevations in the inland areas of the Santa Maria Groundwater Basin may suffer from increased concentration of nitrates, sulfates, and total dissolved solids in the water.
5. Increases in water temperature reduce dissolved oxygen in water bodies and streams, leading to poor water quality.
6. Increased runoff in winter increases the sediment load in surface waters affecting water quality.
7. Lower base flows in streams and rivers lead to higher concentrations of minerals and lower water quality.

Ecosystems and Habitats: Priority Rating 2

1. Ecosystems already impacted due to urban development face increased impacts with rising sea levels and reduced stream flows.
2. Beach erosion (sand movement) occurs from rising sea levels and tidal effects in the region.
3. Many aquatic and terrestrial species are susceptible to poor water quality and higher water temperatures, and negatively affected by the impacts of climate change.
4. Loss of species such as coastal oak woodlands, riparian habitats, and coniferous forests occurs as temperature and precipitation patterns change.

Flooding: Priority Rating 3

1. The coastline along the western Region and some inland areas are situated in the FEMA 100-year floodplain areas.
2. The shift in the precipitation cycle to winter and increased runoff from higher intensity storms will likely make low-lying communities more susceptible to flooding.
3. Sea-level rise causes inundation of certain areas of coastal communities, which can increase the extent and severity of storm-related flooding events.