

TECHNICAL SPECIFICATIONS

INTENT AND PURPOSE OF CONTRACT DOCUMENTS

The Carpinteria Valley Water District (District) intends to rehabilitate El Carro Well #2 via chemical and mechanical means to restore lost well performance. The well was drilled by the Bakersfield Well and Pump in 2010 by the reverse-rotary method, and had a baseline 100-minute specific capacity of 10.1 gallons per minute per foot of drawdown (gpm/ft). The 100-minute specific capacity of the well determined through formal testing in September of 2021 was 7.6 gpm/ft, an approximate 25 percent decline from baseline. The District seeks to rehabilitate the well in September 2023 and have the well back online and operational in October 2023.

LOCATION AND SITE CONDITIONS

The well is located at the District's El Carro Well and Treatment Facility, within El Caro Park, at 5300 El Carro Lane, in the City of Carpinteria. The site has an area of approximately 4,500 square feet, however; approximately one-third of the site is occupied by piping, tanks, controls, etc. The entire site is enclosed by a block wall with a locking steel gate at the west-facing entrance. El Carro Well #2 is located in the western portion of the site, and is housed in a skid mounted enclosure. **Figure 1** shows the layout of the site, the location of the well, and the skid mounted well house.

WELL CONSTRUCTION DETAILS

El Carro Well #2 is constructed entirely of stainless steel. The upper blank section from ground surface to a depth of 285 feet is 16-inches in-diameter. The diameter of the casing from 285 feet to the total depth of 1210 feet is 14-inches. The well screen is continuous wire-wrap stainless steel with 0.050-inch openings, and there are three separate screen zones: 285 feet to 350 feet; 850 feet to 915 feet; and 1090 feet to 1190 feet. There is a 20-foot cellar below the lower most screen zone. The borehole diameter for the well is 24 inches, and the annulus outside the well casing is filled with 8 x 16 gradation Premier Silica gravel pack. An as-built schematic of the well is presented on **Figure 2**. Table 1 presents a summary of the as-built construction features and well performance characteristics of the well:

Table 1. As-Built Construction Summary – El Carro Well #2

Well Feature	As-Built
Total Well Depth (ft bgs)	1210
Casing Material	Stainless Steel
Casing Diameter (in, ID)	16" to 285 ft 14" to 1210 ft
Screen Intervals (ft bgs)	285 to 350 850 to 915 1090 to 1190
Screen Diameter (in, ID)	14
Screen Design	Continuous Wire Wrap
Total Screen Length (feet)	230

Well Feature	As-Built
Perforation Aperture	0.050-inch
Gravel Pack (gradation)	8 x 16
Gravel Pack Type	Premier Silica
Cellar Section (ft bgs)	1190 to 1210
Static Water Level, 6/23/23	84 ft
Pump Type	Vertical Turbine, Water Lube, Tube and Shaft
Pump Column	10", 272 ft
Original 100- min Specific Capacity (Oct. 2010)	10.1 gpm/ft
Recent 100-min Specific Capacity (Sept 2021)	7.6 gpm/ft

EXISTING PUMPING EQUIPMENT

The well is currently equipped with vertical turbine, water lubed, tube and shaft assembly. The pump consists of ten stages of 12-inch bowls, coupled to 250 HP Hitachi motor. The pump assembly is set on 10-inch-column pipe with a top of bowl setting of 272 feet. Details of the existing pumping equipment are provided on **Figure 3**.

SCOPE OF WORK

The Contractor shall provide all equipment, labor, chemicals, chemical mixing vessels, and temporary fluid storage and conditioning facilities to complete the work outlined in these specifications, and as directed by the Owner's Technical Representative (OTR). Generally, the work shall consist of:

- Removal of existing pump assembly
- Inspection and formal assessment of pumping equipment
- Pre-rehabilitation video surveying
- Nylon brushing the well screen
- Bailing the well to bottom
- Installation of tanks, piping, and treatment system for discharge water
- Pre-chemical development by airlift/swabbing with dual swab
- Chemical treatment
- Agitation by swabbing
- Post-chemical development by airlift/swabbing with dual swab
- Installation of test pump
- Development via pumping and surging
- Post-rehabilitation pumping tests
- Well disinfection
- Post-rehabilitation video surveying
- Reinstallation of District's pump assembly

PROJECT SCHEDULE

The intent of the District is to commence rehabilitation in late August 2023, perform the bulk of the work in September 2023, and have the well online and back in operation by October 9,

2023. The work period for this project is forty-five (45) working days. The Contractor shall provide with the bid a detailed schedule that meets this deadline.

QUALIFICATIONS OF THE CONTRACTOR

Contractor shall be familiar with all aspects of the work outlined in these specifications and shall possess a valid Class C-57 and/or C-61/D-21 California Contractor's License. Qualified bidders shall also have experience within the past 5 years performing similar mechanical/chemical well rehabilitation. Concurrent with the bid submittal, the contractor shall submit a list of wells he has performed rehabilitation of similar nature and scope as specified herein.

COMPLIANCE WITH APPLICABLE LAWS AND REGULATIONS

Contractor shall perform all work in strict accordance with all Federal, State, and local regulations, including those applying to the handling, transportation, and disposal of chemicals used or produced on the project. Contractor shall also obtain all permits required for the performance of the work outlined in these specifications.

SAFETY

Job site safety, both during and after working hours, is the sole responsibility of the Contractor. The Contractor, his employees and subcontractors shall be familiar with and comply with all applicable safety regulations and guidelines relating to the transportation, handling, and disposal of the chemicals to be utilized for the work as well as other aspects of the work, including electrical and mechanical safety guidelines and regulations. The Contractor shall also provide for and ensure public safety around the site both during and after work hours. The Contractor shall notify local fire department or emergency response agencies of the nature, quantity, and location of chemicals used during the project work.

Contractor shall provide and maintain onsite the necessary equipment and materials for chemical mist and spray migration abatement, spill containment, neutralization, and cleanup of the chemicals utilized or produced during the project work. The Contractor shall be held responsible for any and all damages caused by fugitive chemical releases, including mist, spray, and spills. The Contractor shall address mitigation of chemical mist or spray which may occur during the raising and lowering of tools while the chemical solution is in the well. If the OTR determines that any of the Contractor's mitigation equipment, mitigation methods, safety measures, or safety equipment onsite are inadequate or inappropriate, he shall stop all work until the safety issue is corrected. No payment for standby time or equipment rental shall be made for such delays in the work.

CONTRACTOR'S EQUIPMENT

The Contractor shall provide all necessary equipment, tools, and appurtenances for the timely completion of the work. Contractor's equipment shall be in complete and safe operating condition, and shall be appropriately maintained and operated during the project. Contractor shall provide materials and equipment as required to protect existing facilities from damage by rehabilitation chemicals. The Contractor shall be solely responsible for the condition of his equipment and shall maintain an inventory of necessary spare parts for the timely repair of equipment in the event of a failure or breakdown. No payment shall be made for standby time or equipment rental caused by a breakdown or failure of the Contractor's equipment. Equipment necessary for the work shall include, but not be limited to, the following items:

- Pump rig capable of lifting the bailer or surge block at a minimum velocity of 3 feet/second

- Wire line surge block
- 14-inch-nominal-diameter nylon brush block (weighted)
- 10- to 12-inch-nominal-diameter bailer
- 12-inch-nominal-diameter by 10-foot separation, dual-swab isolation tool with air-lift pumping capability
- Temporary discharge treatment system consisting of a minimum of a *Chitosan* flocculent injection system and two 21,000-gallon ‘Baker’ tanks or three ‘mini-frac’ 8,000 gallon tanks, internally baffled and connected in series for treatment and storage of well discharge water
- Pumps of sufficient capacity for transferring and circulating fluids in tanks
- Temporary containment vessel for bailed fluids and solids removed from the well
- Temporary piping and valves for well pump discharge and storage tank piping
- Chemical pre-mix tank, minimum capacity 1,000 gallons
- Test pump assembly, electric or engine drive, capable of providing up to 1,500 gpm at 300 feet TDH. Pump intake setting shall be approximately 280 feet. The pump shall be equipped with suitable throttling devices to control discharge rates
- One 1-inch-diameter Sch 40 PVC sounding tubes set to approximately 280 feet (i.e., to top of test pump bowls)
- Electric water-level sounder
- Rossum sand testing device

To mitigate noise impact throughout the duration of the project, the Contractor shall provide residential grade mufflers, silencers, and other noise attenuating devices (Universal Silencers type EN4 or equivalent; minimum insertion loss of 15 dB at 63 Hz or equal as approved by the OTR) on all equipment. No internal combustion engine shall be operated on the project without said muffler.

In no case shall noise levels produced by the Contractor exceed 85 decibels (dBA) as measured at a distance of 75 feet from the project site.

DISCHARGE WATER

The Contractor shall comply with all requirements of the Statewide General NPDES Permit for Drinking Water System Discharges (SWRCB Order WQ 2014-0194-DWQ, General Order No. CAG 140001). The District will file a Notice-of-Intent (NOI) to discharge under the General NPDES Permit. The primary constituents of concern for this project are turbidity, pH, settleable solids, and total chlorine. Appropriate discharge Best Management Practices (BMPs) shall be employed in accordance with the General NPDES Permit, as specified herein, and as approved by the OTR.

Minimum discharge BMPs shall include the routing of development fluids from the well to temporary holding tanks (e.g., Baker, Rain-for-Rent, or Adler tanks) to allow acid neutralization, dechlorination, and settlement of solids prior to discharge of decanted water to the designated discharge location. A minimum of a Chitosan flocculent injection system and two internally baffled approximate 21,000 gallon tanks, or three 8000 gallon tanks shall be connected in series to maximize the settling of solids prior to discharge. The plumbing configuration of the tanks shall be to the satisfaction of the OTR.

During airlift swabbing and pumping and surging development, and during testing, the Contractor shall reconfigure the discharge system to convey water from the tanks to a storm drain inlet located at the immediate well site. Water may be discharged to the storm drain when the following water quality conditions are met:

- Turbidity** – less than 100 NTUs
- pH** – greater than 6.5, less than 8.5
- Total Chlorine Residual** – less than 0.019 mg/L

It is the Contractor's responsibility to configure and maintain the settling tank treatment system so that water quality conditions stated above are met. Standby time will not be paid for failure to achieve discharge standards.

WATER SUPPLY

Water supply for well drilling and construction water for construction may be obtained from a temporary connection to the District's potable distribution system at the site

PROCEDURES AND MATERIALS

The following schedule of work describes the procedures to be employed and adhered to for the rehabilitation of the well, and provides descriptions of the materials required. The following tasks also serve as a basis for Contractor costs, and are included and enumerated on the Contractor Bid Sheet.

Task 1 – Mobilization/Demobilization. Mobilization shall consist of all preparatory work and materials necessary for project field operations, including, but not limited to, those necessary for the movement of personnel, equipment, supplies, and incidentals to the project site; control of water; and all other facilities necessary for work on the project. This task also included doing all work and furnishing all materials necessary to maintaining the well site in a professional manner during the project, restoring the site grade to pre-work conditions after work is completed, and demobilizing equipment and materials from the site upon project completion.

Task 2 – Pump Removal, Inspection, Replacement. The Contractor shall remove the existing pump assembly from well, inspect all components of the assembly, and provide a written description of their assessment of the pump and recommendations for repair or replacement of any of the components. The pump components to be assessed include the following: bowls, bearings, wear rings, bushings, shaft wear, stuffing box, packing glands, lube water passages, column pipe condition, and tube and shaft condition.. A written report containing the assessment and recommendations shall be provided to the District within fourteen (14) days following pump removal

Prior to demobilizing from the site, the Contractor shall reinstall the pump to the same depth setting that was in place prior to the rehabilitation project.

Task 3 – Pre-rehabilitation Video Survey. The video survey shall include downhole and sidescan views of the well screen, and shall be performed as directed by the OTR. The video survey shall include a written report of the survey to be completed by the video survey technician, and the report shall include still photos of the various elements of the well casing. Hard copies and pdf copies of the report shall be provided to the OTR, along with a flash drive or link to the entire survey.

Task 4 – Wire Brushing. The entire well screen shall be cleaned using a weighted, appropriately sized (14-inch minimum) Nylon brush. Each 20-foot section of well screen shall be brushed for 30 minutes. At the completion of the brushing, the depth of the well shall be sounded and recorded.

Task 5 – Bailing. All material accumulated in the bottom of the well shall be removed by bailing. Bailed solids and fluids shall be placed in a temporary containment vessel and legally disposed of prior to completion of the work.

Task 6 – Tanks, Piping, and Treatment System. Temporary piping shall be installed to route well discharge into the temporary storage tanks and treatment system. The discharge piping shall contain valves, fittings, and ports to allow for acid neutralization and flocculation of the discharge water, and routing of produced water from the temporary storage tanks to the designated discharge points. The temporary storage tanks shall be connected in series, internally baffled or otherwise configured to allow and facilitate the settlement of solids from the produced water. Water from the

tanks/treatment system shall be conveyed to and discharged to the on-site storm drain catch basin immediately adjacent to the well. A plan showing the proposed layout of the pipeline and locations of the various valves, ports, and other fittings shall be submitted prior to mobilization, and is subject to the approval of the OTR.

Task 7 – Pre-Chemical Airlift/Swab Development. Using the dual-swab assembly fitted with air-line, the well shall be developed by airlifting while simultaneously swabbing. Each 20-foot section of horizontal-slot screen (refer to **Figure 2**) shall be airlifted/swabbed for 30 minutes, starting from the top of the perforations and working down to the bottom of the well screen. This procedure shall be repeated starting from the bottom of the well screen and working upward to the top of the well screen. Water produced during the airlift pumping shall be routed through the temporary treatment system for solids settling prior to discharge of the decanted water to the designated discharge point.

Task 8 – Chemicals. The following materials shall be utilized in the chemical treatment of the well. The quantities of the chemicals listed are estimated based on existing water levels and well dimensions. No substitutions of chemical type shall be allowed without the prior written approval of the OTR.

**Table 2. Chemical Volume Requirements
EI Carro Well #2 2023 Rehabilitation Project**

Chemical	Purpose	Quantity
70% wt. Glycolic Acid*	Chelant / Biocide	165 gallons
28% wt. Hydrochloric Acid**	Mineral Acid	1050 gallons
12.5% Sodium Hypochlorite	Disinfectant	16 gallons
Sodium Thiosulfate	De-chlorinator	As needed
Lime or Sodium Hydroxide	Neutralizer	As needed

* With surfactant and dispersant additives

** With corrosion inhibitor

Prior to mobilization, the Contractor shall provide to the OTR for approval, a list of the types and quantities of chemicals to be used for the redevelopment work. The Contractor shall provide suitable mixing tanks, transfer pumps, and agitators as necessary to accurately prepare, dilute, and inject the chemicals. The Contractor shall, at the completion of the work, legally dispose of all empty chemical containers or return them to the manufacturer. The Contractor shall obtain OSHA Material Safety Data Sheets (MSDS) for all chemicals. Copies of MSDS sheets shall be provided to the OTR prior to mobilization, and the Contractor shall retain copies of MSDS sheets onsite at all times.

Task 9 – Application of Chemicals. The hydrochloric and glycolic acids shall be mixed proportionately in the 1,000 gallon (minimum) chemical pre-mix tank. The mixture shall be introduced into the well through the double surge block at each 20-foot section of horizontal-slot screen (refer to **Figure 2**) in an amount proportional to the total screened interval. Chemicals shall be worked into the formation through vigorous swabbing of each 20-foot section for 15 minutes before proceeding to the next section. The introduction of chemicals and swabbing while chemicals are placed shall be performed in a continuous operation of not less than 12 hours. Once the chemicals are introduced, the Contractor shall allow the well to stand idle overnight.

Task 10 – Swabbing of Chemical Solution. Following introduction of the chemicals and the initial overnight idle period, each 20-foot section of horizontal-slot screen shall be swabbed for 20 minutes using the dual-swab assembly. This procedure shall be repeated once.

Task 11 –Chemical Purging and Airlift/Swab Development. Using the dual-swab assembly fitted with air-line, each 20-foot horizontal-slot screen section shall be airlifted while simultaneously swabbed for 40 minutes, starting from the top of the perforations and working down to the bottom of the well screen. This procedure shall be repeated starting from the bottom of the well screen and working upward to the top of the well screen. The OTR may shorten or extend the amount of simultaneous airlifting and swabbing performed on each section based on the OTR’s determination that airlift/swabbing of each section is complete. Flushing will be deemed complete when the pH of the water produced from the well reaches 6 and the discharge is clear. Water produced during the airlift pumping shall be routed through the temporary treatment system for solids settling and neutralization prior to discharge of the decanted water to the designated discharge point.

During the flushing of the acid solution from the well, Contractor shall neutralize the cleaning solution by placing lime or other base neutralizer in the storage tanks under the direction of the OTR. Discharge water may be routed to the designated discharge point when the OTR has determined that the solution has been sufficiently neutralized and discharge limitations of the NPDES permit have been met.

Upon removal of the airlift swab assembly and piping, the Contractor shall tag and record the depth of the well, and remove any accumulated fill by bailing.

Task 12 – Installation, Rental, and Removal of Test Pump. The Contractor shall install test pump and related appurtenances for further development via pumping and surging and pumping test operations. The test pump intake shall be installed to a depth of 180 feet, and the pump shall be capable of providing up to 1,500 gpm at 300 feet TDH. The column pipe and the discharge piping shall be sufficiently sized to not restrict the discharge rate. The discharge piping shall include suitable throttling devices to control discharge rates. A 1-inch-diameter Sch 40 PVC sounding tubes shall be installed to approximately 180 feet (i.e., to top of test pump bowls), and the discharge piping shall include a sampling port and a Rossum sand testing device. This Task shall include rental of the pump for the entire duration of pump development and testing, and removal of the pump and temporary piping upon completion of the testing.

Task 13 – Development by Pumping and Surging. The well shall be developed by intermittent pumping and surging, which shall start at an initial rate of approximately 300 gpm and proceed at 300 gpm increments up to a pumping rate of 1500 gpm. Surging shall allow water to flow back through the bowls. During each increment, the pump shall then be started and stopped several times and then pumped until the water is clear, or as directed by the OTR. The Contractor shall keep records of water levels, pumping rate, sand content, and specific capacity. Daily discharge volumes shall also be monitored and recorded by the Contractor.

Task 14 – Testing. Following a period of at least 12 hours of idle conditions following development pumping, a 5-hour step test shall be performed at rates to be determined by the OTR. It is anticipated that three steps, each consisting of 100 minutes of pumping, will be performed. The discharge shall be controlled and maintained at the designated rate for each step with an accuracy of plus or minus 5 percent. During the step test, the Contractor shall keep records of water levels, pumping rate, sand content, and specific capacity. The Contractor shall also measure and keep records of water level recovery for the first hour after step test pumping is terminated. Daily discharge volumes shall also be monitored and recorded by the Contractor. Sand content measurements shall be recorded by the Contractor as directed by the OTR.

After a 12-hour recovery period from the step test, an 5-hour constant rate pumping test shall be performed. The discharge shall be controlled and maintained at the designated rate with an accuracy of plus or minus 5 percent. During the constant rate pumping test, the Contractor shall keep records of water levels, pumping rate, sand content, and specific capacity. Daily discharge volumes shall also be monitored and recorded by the Contractor. A recovery period of not less than 8 hours shall follow termination of the constant rate pumping test. The Contractor shall measure and keep records of water level recovery for the first hour after constant rate test pumping is terminated.

Task 15 – Disinfection. Following well testing the well shall be disinfected by introducing sodium hypochlorite solution in sufficient quantity to achieve a concentration of approximately 200 ppm available chlorine when mixed with the total volume of water in the well and gravel pack. All accessible portions of the well above the water level shall be maintained in a damp condition with water containing the required concentration of chlorine for a period of not less than 20 minutes. The chlorine solution shall be left in the well for a period of at least 12 hours.

After the 12-hour contact period, water shall be flush from the well into the onsite holding tanks until the produced water is free of chlorine. Complete flushing shall be evidenced by a free chlorine residual of less than 0.019 ppm chlorine. After disinfection and flushing, the OTR shall sample the well water for coliform bacteria in accordance with Standard Method 908C. The Contractor shall neutralize the water in the tanks until the chlorine residual is below 0.019. Once the residual chlorine is less than 0.019 ppm the water in the tanks may be discharge provided that all other water quality discharge limitations are met.

Task 16 – Post-rehabilitation Video Survey. The video survey shall include downhole and sidescan views of the well screen, and shall be performed as directed by the OTR. The video survey shall include a written report of the survey to be completed by the video survey technician, and the report shall include still photos of the various elements of the well casing. Hard copies and pdf copies of the report shall be provided to the OTR, along with a flash drive or link to the entire survey.

SECTION 112 – MEASUREMENT AND PAYMENT

Payment will be made according to the unit price schedule in the contract based on the actual unit quantities expended as determined by the OTR. Payment for lump sum items shall be made only upon satisfactory completion of the entire task.

Payment for hourly work completed as part of Tasks 7, 11, 13, and 14 will be made only for time spent performing “active” development and/or test pumping. Active development is defined as the actual time spent bailing, swabbing, airlifting/pumping, or pumping and surging. Compensation will not be made for down time or time spent installing or removing pipe or tools, or for making connections.

