



City of Inglewood

*Proposed (Typ)*

Well No. 8

# Preliminary Design Report



*May, 2018*

# Well No. 8 Preliminary Design Report

April 2018

*May*

## PREPARED FOR

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## INTRODUCTION

There are current considerations to develop the area around the City of Inglewood Well No. 6 which would require destruction of that well and construction of a replacement well. The City refers to this potential replacement well as Well No. 8.

This Preliminary Design report assesses the feasibility and requirements for the destruction of Well No. 6, and the construction of Well No. 8 at a City lot located approximately 500' from Well No. 6 and near the intersection of 102<sup>nd</sup> St. and Doty Ave. Specifically, this report includes a preliminary assessment of the well drilling, well equipping, and site improvements including an estimate of construction costs.

## EXISTING WELL NO. 6 CONDITIONS

The City of Inglewood's Well-6 was constructed in 2003 and has experienced declining pumping capacity and specific capacity over the years.

The well consists of a Flowserv constant speed 200 HP vertical turbine pump set approximately 400-feet below grade. The well includes approximately 180-feet of screen and 550 feet of 20-inch blank casing. Initial pumping tests were at flows of 1,500 to 4,400 gpm and the original recommended flow rate for Well-6 was 2,800 gpm. The pump was replaced in 2011 with a reduced flow of 1,400 gpm. However, water quality issues have reduced the average day use to approximately 1,200 gpm.

Well-6 had been scheduled for rehabilitation to increase its capacity to 1,500 gpm in 2017. The proposed rehabilitation work is designed to seal off perforations in the casing located in the upper aquifer (345 – 386 feet below grade), which has been contributing elevated levels of problematic manganese to the discharged water. Also, the rehabilitation work will provide additional perforations in the well casing located in the lower aquifer (440 – 510 feet below grade), which has better water quality, with the goal to increase the overall flow capacity from Well-6. However, this work has not been initiated by the City of Inglewood as of the writing of this report.

## PROPOSED WELL NO. 8 SITE

### Well Location

The City of Inglewood has identified Lot 35, located near the intersection of Doty Ave and 102<sup>nd</sup> Street, as the proposed location for Well No. 8. This lot is divided into two sublots (both owned by the City) and we have assumed that both lots can be utilized for Well No. 8 facilities. Refer to Appendix Figure-1 "Well No. 8 Site Plan" and Figure-2 "Well No. 8 Mechanical Plan and Sections" for illustrations of the proposed site location and well equipment. Piping and pump sizes illustrated are based on the hydrogeologist recommendations (discussed later this PDR) and may change dependent on the final testing results on the drilled well.

The State Water Resource Control Board's Department of Drinking Water (DDW) sets guidelines for well separation distances to certain utilities.

The following table shows the DDW guidelines and the actual distances from the proposed well location in the PDR to the utilities:

**Table-1: Potable Well Distance Guidelines**

<b>DDW GUIDELINES FOR SEPARATION FROM POTABLE PIPING</b>		
<b>Utility</b>	<b>DDW Guideline</b>	<b>Actual Distance</b>
Any sewer line (sanitary, industrial, or storm: main or lateral)	50 feet	179 feet (SS) 193 feet (SD) >300 feet (MH)
Watertight septic tank or subsurface leaching field	100 feet	NA
Cesspool or seepage pit	150 feet	NA
Recycled water use area	50 to 100 feet*	NA
Animal or fowl enclosure	100 feet	NA

\* Depending on level of treatment of recycled water

In addition, there is a 50 foot Control Zone requirement. The 50 foot Control Zone refers to an area that is necessary to have some assurance that potentially detrimental land uses will not be introduced in the future. For example, that a third party would not construct a sewer line within 50 feet of the well.

The highest level of control would be if the 50 foot control zone was entirely within our project property. If this is the case, DDW generally would not take issue with the control zone. Our proposed well location is on the longitude north-south centerline of Lot 35, a City of Inglewood owned property, and provides 50 feet of separation from the both the eastern and western limits of the lot. The proposed well location is 260 feet south of the northern property line of Lot 35, and 50 feet north of the southernmost limit of the lot. Appendix Figure-3 "Well No. 8 DDW Exhibit" illustrates the proposed well location and its approximate distances to vicinity sanitary and storm sewers and 50-ft Control Zone for use in future discussions with DDW, if required.

Currently Lot 35 is unimproved, rough graded level, with native grasses. Properties to the east and south are residential homes, the property immediately to the west (Lot 34) is commercial.

DDW has issued approval on previous similar projects and has sometimes added additional well design requirements, such as a deeper well sanitary seal. Of course, the formal permitting process will need to be completed to obtain DDW approval and identification of any mitigation measures.

The location of the well was also determined based on logistical constraints during well drilling and future well maintenance. The site was evaluated to assure adequate space for drilling equipment during well construction and equipping.

**Site Access and Security**

A 15-ft wide driveway is proposed adjacent to the western side of the proposed well location and wraps around to the south of the electrical control cabinet in order permit maintenance vehicles to turn around. Areas outside the pavement will be furnished with crushed stone, and therefore larger vehicles will be able to access the well, if needed.

A six-foot-tall concrete masonry unit (CMU) security fence is proposed to enclose the project site and includes an automated sliding access gate along its northern fence line. Fencing the entire of perimeter of Lot 35 is assumed to be unnecessary. Anti-climb accessories (spikes/barbed-wire/razor-wire) for the fencing are not proposed, see Appendix Figure-1.

Two security cameras will be provided. One camera will monitor the pumping equipment, and the other camera stationed on the property access gate. Video will be provided to the City of Inglewood via the pump station telemetry system.

**Landscaping**

Currently the site contains no trees or landscaping and consists of level terrain with a turf of native grasses. The project proposes to use 1-inch minus crushed stone on interior fenced areas along the access driveway. The finished grading of the site will direct all rainfall precipitation flow to the project on-site catch basin for the waste line.

No landscaping or irrigation systems are assumed for the interior project site.

Landscaped areas along the sidewalk of 102<sup>nd</sup> Street disturbed by the project work will be restored in kind.

**Curbing and Sidewalk**

Curbing and sidewalk areas disturbed by the project construction will be replaced in kind and is anticipated to be less than 100 feet, see Appendix Figure-1. Curbing in front of the proposed access drive will be modified with a gentle slope to meet the elevation of 102<sup>nd</sup> Street.

**Street Improvements**

Pavement restoration on 102<sup>nd</sup> Street will be required for the trenched installation of the Well-8 discharge piping, waste line, and relocated water main. Table-1 below lists the three restoration areas and approximate lengths of restoration.

**Table-2: Estimated Existing Pavement Restoration Requirements/Proposed Means**

<b>PAVEMENT RESTORATION REQUIREMENTS/PROPOSED MEANS</b>		
<b>LOCATION</b>	<b>ESTIMATED LENGTH</b>	<b>PAVEMENT RESTORATION</b>
Discharge Piping	30 Feet	Tee Patch
Waste Line Piping	115 Feet	Tee Patch
Relocated Water Main	150 Feet	Tee Patch

*Note:  
Any  
LID  
requirements*

Tee patching of the trenched lines is planned for the pavement restoration and no full lane pavement replacements are proposed. Restriping of the pavement will be restored where destroyed.

**Electrical Power**

Power will be provided by Southern California Edison (SCE). An existing utility pole located 50 feet east of the site on south r/w of 102<sup>nd</sup> Street is expected to be the connection location to provide the power for the new Well-8 facility. Because this report is preliminary, the power requirements are unknown and therefore the availability of power from SCE on this utility pole cannot be confirmed at this time. It is recommended to contact SCE early in the design phase that follows this PDR in that coordinating the power hook up can be a long lead time of 6 months or more.

**Noise**

Submersible pumps are proposed to minimize noise impacts to the adjoining residential property owners. Because the pump motor will be inside the well itself (below grade) very little operational noise is expected from Well-8.

Portions of the drilling operations of the well will operate on a 24-hour basis at times. To reduce the impacts on the adjacent residential properties the drilling contractor will be required to install temporary sound attenuating walls.

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### Water Quality

The water quality of the proposed well will be evaluated with laboratory testing during the drilling operations phase of the project. The hydrogeological report concludes the proposed Well-8 site is hydrogeologically feasible. However, it should be noted that water quality issues regarding elevated TDS, Fe, Mn or other problematic constituents could be present in the final wellblend sample from the well.

Because groundwater at the proposed well site may have elevated concentrations of Fe and/or Mn and potentially TDS, isolated aquifer zone testing will be conducted to aid to check for the presence of these constituents. Zone testing will include analysis for other parameters including VOCs and perchlorate, which have been documented to occur in prior, shallow, monitoring wells at the former Hollywood Park Racetrack.

Water from the proposed Well-8 is intended for use at the City of Inglewood's Sanford Water Treatment Plant, which has some capacity to accept and treat some levels of the water quality constituents discussed. Also, onsite treatment systems may be capable of pretreating the proposed Well-8 water prior to its discharge into the city's 27-inch water main on 102<sup>nd</sup> Street, but is dependent the specific constituent and concentration level. It should be noted that development of a well presents many variables in respect to water quality constituents that cannot be known until field work is performed and provides laboratory samples for testing. The suitability of the proposed site for Well-8 will require verification by the laboratory analysis of the water samples collected from the site.

However, the hydrogeological report indicates the water quality at the proposed Well-8 site will likely to be similar to the nearby existing Well-6, which does not require onsite treatment systems and is in current use by the city's water treatment facility. Therefore, options and costs presented in this report assume that onsite treatment systems at the proposed Well-8 site to reduce/remove water quality constituents will not be required.

### Existing Raw Water Main Connection

The Well-8 discharge piping will connect to the existing City of Inglewood raw water main, located immediately in front of the proposed site on 102<sup>nd</sup> Street. The preliminary design will assume a connection point pressure in the existing raw water main of 40 psi.

## **HYDROGEOLOGIST REPORT**

A final hydrogeological report was prepared by Richard C. Slade on March 2018, see Appendix-D. The report estimates the potential well capacity to be up to 2,500 gpm. A conservative flowrate of 2,000 gpm will used for the preliminary design and will be updated (if necessary) when testing results provide more refined data on the Well-8 capacity.

Additional Well-8 preliminary development design parameters are summarized in Table-3 on the next page.

**Table-3: Preliminary Well-8 Development Design Parameters**

<b>PELIMINARY WELL-8 DESIGN PARAMETERS</b>	
Pilot Borehole Depth	750 ft bgs*
Preliminary Cased Depth	720 ft bds*
Casing Diameter	20-inches*
Casing Material	Type 304L Stainless Steel*
Casing Size	20-inches*
Current Static Water Level	130 ft bgs*
Specific Capacities	30 to 40 gpm/ft ddn*
Potential Water Quality Constituents of Concern	TDS, Fe, Mn, and perchlorate**
Preliminary Drilling, Development, Testing, of New Well Costs Estimate	\$1.0M to \$1.3M*
*Final depth, design, costs to be determined (see Appendix: RC Slade Report)	
**Water quality to be evaluated during pilot bore hole operations.	

*equipping*

*Also include site development cost, electrical/SCADA costs and cost of destruction of well #6*

## EQUIPPING

Preliminary equipment selection and sizing is described below.

### Submersible Pump

A submersible pump is recommended for Well-8 to reduce noise to nearby residences. The pump bowl diameter should be sized to perform within the 20-inch inside diameter casing. The pump bowl diameter should be sized to provide maximum velocity of 10 ft./sec across the motor in order to prevent excessive wear on pump, motor, and casing. This translates to a maximum pump bowl diameter of approximately 17.5 inches.

A minimum velocity should also be considered to provide adequate circulating water across the submersible motor for cooling. The pump bowl diameter should be sized to provide a minimum velocity of 0.5 ft./sec across the motor for cooling. A low velocity scenario should be considered when pumping at low capacity of 200 gpm over an extended period. Under this scenario, the minimum pump bowl diameter should be 15 inches.

### Discharge Piping and Control

The Well 8 piping configuration will be the similar as the City of Inglewood's plans for Well 7. This includes a Pump Control Valve with Check feature on the discharge line and a solenoid controlled valve on the waste line.

Well start-up will follow the procedure below:

1. Both the pump control valve and the solenoid valve will be closed when the well pump is off.
2. When an 'on' signal is received, the solenoid valve will begin to open and then the pump will begin to ramp up with a variable frequency drive (VFD) increasing the pump speed. This allows 'first flush' of the well water to be sent to waste.
3. The solenoid valve will then begin to slowly close and the pump control valve will begin to open. The closing/opening of the two valves will be synchronized via a pressure sensing line connecting the two valves.



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4. The solenoid valve will completely close and the pump control valve will completely open, and the pump VFD will then run at the set speed.

A surge analysis was not performed as part of this report and no surge protection system is included in this proposed preliminary design.

### **Pump Control**

A variable frequency drive will be included to allow well discharge adjustments in response to water demands, to aquifer changes, and to provide long term power savings. For example, a VFD will allow less water to be pumped to the conveyance piping system when water demands are lower. Changes in water quality may also benefit by adjusting the flow as this will give some control of the combined water quality in the raw water transmission mission main, which is a blended composition of water from multiple well sources. Due to the length of power cable required between the VFD and the submersible pump, a filter will be required to limit high frequency noise.

### **Buildings/Shelters**

The City of Inglewood well facilities typically do not include buildings/shelters for the pumping equipment. No buildings or shelters are proposed for the Well 8 design.

### **VFD Cooling**

Typically, a VFD drive is rated to operate under 40 degree Celsius, or about 104 degree Fahrenheit. Sources of heat impacting the VFD include heat generated from the VFD itself, ambient temperature, and solar heating from sunlight.

Based on NOAA data at the nearby Torrance and Hawthorne airports, ambient temperatures near the City of Inglewood can reach around 100 degrees, and occasionally may peak above 100 degrees Fahrenheit for short periods during the summer. Therefore, some cooling of the VFD will be required.

There are several methods that are sometimes used separately or in combination to cool VFD's, including:

1. Using a "De-rated" VFD that is larger than required. For example, using a 350 HP VFD instead of a 300 HP. A 350 HP would generate less heat when running a pump that only requires 300 HP.
2. Add air vented heat sinks to the VFD.
3. Put the VFD cabinet in another cabinet, and then supply air conditioning to cool the space between the two cabinets.
4. Put a shade structure or enclosure around the VFD cabinet to shield it from sunlight.

After considering cost and future maintenance required for the different VFD cooling options, we recommend using a larger cabinet with air conditioning system to keep the VFD running under the rated temperature. Based on our research from various manufacturers, a 300 HP VFD with the air conditioning unit will cost about \$75,000 (material only). In addition, a small shade structure should be added to the cabinet to shade the cabinet during the hottest parts of the day. Due to the high ambient temperatures, it is difficult to maintain low enough temperatures through methods other than air conditioning.

### **Emergency Power**

No permanent on-site back-up power source (generator) will be provided for the Well 8 pumping system. The electrical design will include the required connections to use a trailer mounted portable generator at Well 8.

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### Lighting

No lighting of the project site is proposed.

## OTHER

### Waste Line Discharge

The nearest storm drain system to the well site is a LA County Flood Control District catch basin (located at the southwest corner of 102<sup>nd</sup> Street and Doty Ave) that is connected to an 84" storm drain (located in the eastern r/w of Doty Ave). A gravity well drain line will need to be constructed from the site east to the LACFCD storm catch basin. Record information obtained during the detail design phase will confirm that a sufficient gradient exists between the air-gap catch basin and the proposed discharge point at the LACFCD catch basin. Because the receiving storm drain from the LACFCD catch basin is a large diameter, gravity flow is not expected to be an issue.

Because the waste discharge line will require gravity flow, we are including the relocation of a short section of the existing 6-inch water main (see Figure-1) to ensure there are no conflicts with its existing elevation. The proposed alignment of the gravity waste line will parallel the relocated 6-inch potable line by more than 5 feet. This alignment maintains adequate clearance from existing utilities and meets DDW separation requirements from potable water lines.

## PERMITTING AND APPROVALS

The project will require permitting and/or approvals from various agencies in order to be constructed and operated. The following listing identifies the key agencies to be coordinated with during the subsequent design phase of the project.

- Division of Drinking Water (DDW) *Public Works*
- City of Inglewood ~~Utilities~~ Department
- City of Inglewood Encroachment Permit
- State of California (Application For Well Permit)
- Los Angeles County (Application For Well Permit)
- Los Angeles County Flood Control District
- Los Angle County Department of Environmental Health (Well-6 destruction)

## EXISTING WELL-6 DESTRUCTION

The purpose of the existing Well-6 destruction is to ensure it will no longer act as a conduit for surface water contamination, cross-contamination of water of differing quality into multiple aquifers, and the pressure head in the aquifer is preserved. If vertical movement of water within the well bore, including the annular space, is prevented, then the objective for destruction of the well has been achieved.

Because there is a strong likelihood of future development on the existing Well-6 site after its destruction, the proposed destruction will remove all materials to an elevation of 10 feet below the existing grade to help avoid conflicts. This proposed clearance elevation will require the approval of the DDW, Los Angeles County, and the City of Inglewood.

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### Predestruciton Activities

- Obtain record information on existing Well-6 construction, static water levels/well depths, and maintenance logs, if available.
- Inspect and remove any obstructions from the existing bore (old pumps or debris).
- Perform a video survey of the well to determined casing conditions.
- Remove sediment from bottom of casing.

### Well Casing Destruction

Well-6 destruction will involve pulling any existing casing out of the ground as applicable and/or feasible, or perforating or otherwise causing openings to be made in the casing. Openings in casing may be made with a gun-perforator per oilfield practice, an air-percussion perforator, ripped with a mechanical knife or similar device if casing condition allows, or destroyed using explosive devices. In some situations, detonator cord or shaped charges may be placed in the well at selected intervals, and after placement of neat cement sealing material, exploded, thus simultaneously opening the casing and driving the sealing material into the annulus and borehole wall.

Because Well-6 has known casing repair patches there is the potential for a mechanical knife to become irretrievably lodged in the casing and impede the sealing material from reaching the full extents of the casing, therefore the second method of explosive charges is proposed. Shot charges will be placed along the entire length of the existing casing to an elevation of 10 feet below grade.

The purpose of these operations is to facilitate entry of sealing material into the annulus and achieve penetration into the native formation or any existing gravel pack to the maximum extent possible.

### Sealing Materials

Neat cement grout will be used for the sealing of Inglewood Well-6. Neat cement grout generally involves using a ratio of one 94-lb bag of Portland cement to no more than 6-1/2 gallons of water (which is equal to a 17-sack cement/water mix as available from a "ready-mix" source). A small amount of bentonite (up to 6 percent) may be added to make the mixture more "fluid" and reduce shrinkage.

### Sealing Materials Placement

The sealing materials will be placed from the bottom of the well up, using a tremie pipe which is kept submerged in the mixture and is periodically raised as the well bore is filled in one continuous operation. The sealing method will also determine the volume of the hole to be filled, and compare to the volume of sealing materials used, to be sure that the volume of materials emplaced is at least equal to the hole volume.

Once the sealing materials have been placed the shot charges will be detonated. It should be noted that the nearest residences to the site are approximately 250 ft to the northeast. The hydrogeological report indicates the shockwaves generated by the detonation of the charges will likely undergo significant attenuation and thus are not likely to impact those residences.

The bore hole will be sealed to 10-ft below existing grade to aid in reducing conflicts with any future development on the site, pending approvals, as previously discussed. After the cement has cured, the casing will be excavated to remove approximate 6-ft of the casing and the construction of a "mushroom cap" composed of concrete with rebar reinforcement.

The excavations will be back-filled with native soils and compacted to 95%. Two inches of crushed stone (1-inch minus) will be placed over the compacted excavated areas to match the existing grounds cover.

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### Destruction Completion Notifications

The Contractor will complete and file the well destruction forms with the Los Angeles Department of Environmental Health and DWR as notification of completion and to provide final destruction documentation.

### Preliminary Well-6 Borehole Destruction and Sealing Costs:

The preliminary Contractor costs for the destruction of the existing Well-6 is estimated to range from approximately \$60,000 to \$90,000 for destruction and sealing work.

### Destruction/Disconnect of Existing Utilities

Record drawing WS-741 from 2003 illustrates the general layout for Well-6 and is included in the appendix of this report. The extents of existing facilities to be destroyed includes the following items:

- Waste Water Disposal System: The system consists of above and below grade 12-inch piping (approximately 50 LF) which transfers the waste water to a 12-ft diameter HDPE holding tank located on a 16-ft x 16-ft concrete support slab. From the holding tank the waste water flows by gravity through a below grade 6-inch line (approximately 140 LF) connected to an 8-inch gravity sanitary sewer located on the centerline of 102<sup>nd</sup> Street.
  - a. Destruction will include removal of all above and below grade waste water piping, the holding and its concrete support slab, disconnection from the sanitary sewer and concrete encasement of the disconnection point on sewer line.
- Raw Water Discharge Line: The existing Well-6 includes an 18-inch discharge line (approximately 120 LF) connected to a 27-inch raw water transmission main on 102<sup>nd</sup> Street.
  - a. The connection at the 27-inch raw water main will be severed at the gate located connection point. A blind flange will be installed on the gate valve, and entirely concrete encased. All 18-inch discharge piping will be removed from the site.
- Above Grade Piping/Appurtenances:
  - a. All above grade piping, valves, pump motor/mount, and appurtenances will be removed from form the site.
- Electrical/MCC: The facility contains a small MCC (approximately footprint 30-inches x 72-inches) with underground power conductors to an above grade transformer, located at the southwest corner of the site.
  - a. The MCC and underground conductors will be removed from the site. Conductors will be terminated at the SCE transformer. The SCE transformer will be remain in place.
- Miscellaneous:
  - a. The concrete slab (approximately 20 ft x 40 ft) surrounding the above grade piping at the well will be demolished removed from the site.
  - b. Security cameras and telemetry system will be removed from the site.
  - c. The existing concrete access drive will remain in place.
  - d. The site will be level graded and seeded with southern California native grasses.
  - e. The existing security fence will remain in place.

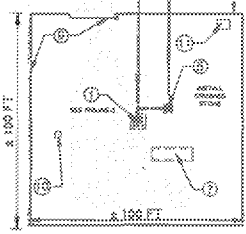
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(Include Engineer's Estimate)



- | NOTES |                             |
|-------|-----------------------------|
| 1     | INSTALL 8" DIA. PIPING      |
| 2     | CONSTRUCT 24" DIAMETER LINE |
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LOT 34  
PRODUCE  
ONE LOT 35



<p>PREPARED FOR MURPHY'S BOWLS, LLC 10400 BELLEVUE, WA 98004</p>	<p><b>TETRA TECH</b> www.tetra-tech.com 500 East 13th North, Ave. Suite 200 Seattle, WA 98101 1.206.296.2227 1.206.296.2292</p>	<p>City of Inglewood, Wash. CITY OF INGLEWOOD WELL NO. 8 SITE PLAN</p>	<p>Project No. 106-000076-10000 Date: 1/26/2016 Scale: 1" = 10' Drawing No. 11 FIGURE 1</p>
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NOT TO SCALE



