Section A-1 – Design Requirements Overview

The following are the design requirements for the project. Pilot Boring logs indicate water quality and production for three zones. Due to local groundwater contamination only the lower zones (zones 1 and 2) will be used for water production.

1.1 Well Field

Three groundwater wells will be included in the Van Ness Well Nos. 12, 13, and 14. The design of the wells and construction details are discussed in the following sections. The design flow from the well field is estimated at 4,500 gpm minimum.

1.1.1 Well No. 12

URS designed and observed the construction. Well construction details are summarized in a report entitled Preliminary Well Design for Pilot Boring #12, 185th Street, west of Van Ness Ave., and Drilling/Testing Results for Pilot Boring #12 (185th St. west of Van Ness Ave.) (Appendix 2). This well has the following characteristics:

- Sustainable well yield = 1800 to 2500 gpm (before omitting Gardena Aquifer)
- 18-inch-diameter casing.
- Screen intervals: 270 to 500 feet, and 640 to 730 feet below ground surface (bgs).
- Well depth = 740 feet bgs.

Discharge from Well No. 12 will be routed to proposed Van Ness Avenue Transmission Main, I-145, to the Border Ave. facility.

1.1.2 Well No. 13

URS designed and observed the construction. Well construction details are summarized in a report titled "Preliminary Well Design for Pilot Boring #13, La Carretera Park (186th Street, east of Van Ness Avenue) and report titled "Drilling /Testing Results for Pilot Boring #13", La Carretera Park (186th Street, east of Van Ness Avenue). {Appendix Z}. This well has the following characteristics:

- Sustainable well yield = 1400 to 1900 gpm (before omitting Gardena Aquifier)
- 18-inch diameter casing
- Screen intervals: 270 to 320, 420 to 640 feet
- Well depth = 650 feet

Discharge from Well No. 13 will be routed to proposed Van Ness Avenue Transmission Main I-145 to the Border Avenue Facility.

1.1.3 Well No. 14

Well No. 14 is proposed to be constructed west side of Delthorne Park, north of the SCE right-of-way within Descanso Park, and is expected to be similar to existing Well No. 12 and 13. The required well yield is 1400

gpm. Water quality and well design for Well No. 14 are predicted to be similar to Well No.s 12 & 13 for Well No. 14 would need approval from Division of Drinking Water.

Discharge from Well No. 14 to proposed Van Ness Avenue Transmisssion Main, I-145 to Border Avenue Facility.

1.1.4 Well Construction Requirements

All work is to be in accordance with the City of Torrance, California Department of Water Resources and California Division of Drinking Water (DDW) standards. Prepare source water assessments for each new well per DDW requirements. Obtain and comply with requirements of a National Pollution Discharge Elimination System (NPDES) Permit. Provide required tanks and means for disposal of test water.

Construction of the new Wells 12, 13 and 14 shall include, at a minimum, the following tasks:

- Erection of temporary sound walls.
- Installation of a grouted conductor casing (task completed for Well 12 and 13).*
- Drill Well No. 14 pilot hole. Take geophysical logs (resistivity, spontaneous potential, gamma ray, guard resistivity, and acoustic with variable density log and porosity). Run caliper, gyroscopic, and video surveys.
- Submit report with recommended screen intervals and filter pack design for City review for Well No. 14.
- Obtain water samples for zone testing and test for water quality.
- Install well casing/screen (Type 316 stainless steel), one 2-inch stainless steel sounding tube, and two 3-inch gravel feed tubes (mild steel). Install filter pack.
- Develop well by airlifting and swabbing.
- Install test pump for final development by pumping and surging. Measure flow rate and groundwater level.
- Conduct step drawdown and constant rates pumping tests.
- At the end of the constant rate test, obtain water samples and test for constituents required by the California Code of Regulations, Title 22 Rule.
- Disinfect well.
- Provide downhole color video of the well casing and screen.
- Prepare and submit the well completion report to the California Department of Water Resources.
- Prepare a report summarizing the well construction. Follow the format of the Well No. 9 report.

1.1.5 Well Buildings

Buildings similar to those for Well No. 9 shall be provided. The buildings for Well Nos. 12, 13, and 14 shall be masonry, grouted solid, and architecturally match Well No. 9.

Building shall be designed to be vandal-resistant with no exterior windows. All doors shall be constructed of steel. Vandal-resistant door shall be used, including heavy-duty locksets with deadbolts and tamper-proof

*Tasks completed for Well No. 10.

door hinges with non-removable pins. Doors and frames shall be primed and painted insulated galvanized steel; 1-3/4-inch thick 16 gage doors and 12 gage frames. Finish hardware shall be Type 316 stainless steel and shall include lever handle heavy-duty mortise locks, heavy-duty mortise hinges, and overhead closers protected by separate heavy-duty stops. Accessories shall be aluminum and shall include continuous replaceable weather stripping and thermal-break thresholds.

Provide removable skylights over each well pump.

Floors shall be constructed of reinforced concrete, 6-inch minimum thickness, with a light broom finish to provide a slip-resistant surface. Floors shall be sloped a minimum of 1 percent to floor drains. Floor slab of new buildings shall have a moisture barrier and be treated with a chemical hardener.

1.2 Booster Pump Station (BPS) Facility

The existing Border Avenue Facility BPS is to store, treat and discharge treated water to the City's distribution system.

Well No. 7 located at the Border Avenue Facility is to be abandoned and building removed, unless building is needed for treatment.

A new chemical storage building is required for proposed water treatment system, proposed at Well No. 7 building location.

The Border Avenue Facility will require a new SCADA system to be tied into SCADA system at the City Yard.

1.3 Drain Lines

Several drain lines are required for disposal of project waste flows. New drain lines (storm drains) are included with the Van Ness Avenue Transmission Main Project for Well No.s 12 & 14. These are to be constructed by others. Well No. 13, at La Carretera Park is located next to an existing storm drain catch basin that can be modified for waste flows. A new storm drain for reservoir waste flows is also included in the Van Ness Avenue Transmission Main Project to be constructed by others.

1.4 Water Treatment

The chemical storage and water treatment system shall be designed for a flow of 6,000 gpm and provide treatment for the bacteriological and virus disinfection as required by DDW.

The water treatment requirements are to be based on water quality analysis from Well No.s 12 & 13. The general chemistry results are summarized in Table 3.1, which show that the water from Well No.s 12 & 13 meets all maximum contaminant levels (MCLs) established by the DPH based upon the initial sampling. The complete analysis is provided Appendix 2 of Volume III of Notice Inviting Bids

If treatment systems for iron and manganese are determined to be required through water quality testing, they would be extra work. A discussion of these constituents and their treatment methodology is provided in the sections below.

1.4.1 Disinfection

The City practices disinfection by chloramination to maintain compatibility with imported water supplies (the Metropolitan Water District chloraminates water treated at its treatment plants).

It is intended to inject both chlorine and ammonia into the water upstream of the existing reservoir to form chloramine prior to storage and minimize the time the water experiences a free chlorine residual. An additional chlorine residual analyzer and hypochlorite metering pumps will monitor reservoir effluent combined chlorine residual and add hypochlorite if necessary to maintain the desired concentration.

To maintain compatibility with imported water, the chloramine concentration should be maintained at about 2.2 milligrams per liter (mg/L) as total chlorine. Because there is some chlorine demand in the water (assumed to be about 1.3 mg/L), this will require addition of about 3.5 mg/L of chlorine and 0.6 mg/L ammonia. Actual chlorine dose to maintain 2.2 mg/L in the reservoir effluent will be determined by bench testing and operating experience. Based upon these doses and assuming a maximum well field production rate of 9,000 gpm, the disinfection system will need to be able to supply about 378 pounds of chlorine and 64 pounds of ammonia per day. Chemical requirements are summarized in Table 3.2.

Chlorine will be added as sodium hypochlorite, which will be purchased as a nominal 12.5 percent solution, containing about 1 pound of effective chlorine per gallon. It will be stored in a proposed 5,000-gallon fiberglass storage tank, which will provide about 14 days of storage plus working volume to allow receipt of a full truckload of hypochlorite.

Ammonia will be purchased as aqueous ammonia at a nominal concentration of 19 percent, containing about 1.54 pounds of ammonia per gallon. Ammonia will be stored in a 500-gallon steel tank, which provides 14 days of storage plus working volume. This volume is less than a full tank load (6,000 gallons). Due to its volatility and pungent odor, ammonia storage systems require installation of a scrubber on the tank vent to capture ammonia fumes. The scrubber will be a small tank, 18 inches in diameter, and filled with water to absorb the ammonia fumes. The tank will occasionally be manually drained and refilled with fresh water.

Table 3.1 – Well No. 12 Water Quality

Constituent	Unit	MCL	Value
Calcium	mg/L	—	80
Magnesium	mg/L	—	40
Sodium	mg/L	—	590
Potassium	mg/L	—	9
Bicarbonate	mg/L	—	240
Chloride	mg/L	—	26
Sulfate	mg/L	250	1
Nitrate	mg/L	45	ND
Fluoride	mg/L	2	0.29
Hardness	mg/L	—	84
Alkalinity	mg/L	—	240
TDS	mg/L	1,000	350
Specific Conductance	µS/cm	—	500
pH	—	6 to 9	7.88
Odor	TON	—	1.0
Boron	µg/L	1,000	120

Constituent	Unit	MCL	Value
Langelier Index	—	—	0.595
Bromide	µg/L	—	580
Copper	µg/L	1,300	1.9
Lead	µg/L	15	0.47
Iron	µg/L	300	18
Manganese	µg/L	50	41
Sulfide	mg/L	—	ND

1.4.2 Fluoridation

The City of Torrance currently practices fluoridation to be consistent with MWD water.

As seen in Table 3.1, the well water contains about 0.3 mg/L of fluoride. The U.S. Department of Health and Human Services has recently issued a statement advising that water systems target a fluoride concentration of about 0.7 mg/L to minimize dental cavity formation and avoid dental fluorosis. Therefore, the fluoride feed system should be capable of providing about 0.4 mg/L of fluoride, or about 42 pounds per day.

Fluoride will be purchased as hydrofluosilicic acid, with a nominal concentration of 24 percent, containing about 2 pounds of fluoride per gallon. It will be stored in a 500-gallon high-density polyethylene (HDPE) tank, providing 14 days' storage plus working volume

1.4.3 Hydrogen Sulfide

(H2S) is seen in a number of Torrance wells. Spray nozzles were installed at the top of the reservoir similar to other Torrance locations, so that well water is discharged into the reservoir through these nozzles.

To address the possibility that H2S released from the water might lead to odor complaints from populations near the reservoir, means shall be provided to add a scrubber capable of removing H2S from air vented from the reservoir, should it be needed. In the future, a duct should be extended to a blower and scrubber located on the ground adjacent to the reservoir. A 10-foot by 15-foot space shall be required for this blower and scrubber.

1.4.4 Corrosivity

The design shall include corrosion control analysis and facility design and installation to meet DDW requirements and address requirements described in the Corrosion Control Study Report (see Appendix ___)

1.5 Additional Treatment Requirements

While existing water quality information does not indicate the need for treatment beyond disinfection, the City's other wells in the vicinity of Well No. 9 experience a number of water quality issues that require treatment. It is likely that, as the Van Ness Avenue Wells begin to produce significant quantities of water, these water quality issues may begin to appear. It is prudent, therefore, to include design for additional treatment should it be required.

1.5.1 Iron and Manganese

As seen in Table 3.1, iron and manganese are present at concentrations below their secondary MCLs. The manganese concentration of 41 µg/L is close to the MCL of 50 µg/L, and it may therefore be possible that some manganese may accumulate in distribution system piping over time. This could lead to occasional instances of black water if these deposits were disturbed, as might happen during flushing operations. It is important to note that the black water would not be hazardous to health but would be very displeasing aesthetically.

Iron and manganese are present at similar concentrations in other City wells, where they are successfully dealt with by addition of a phosphate sequestrant/corrosion inhibitor (Carus 8500). This sequestrant prevents precipitation and settling of the manganese, thus preventing accumulation of manganese sediment in the distribution system. If manganese concentration should exceed 50 µg/L, additional treatment may be required. This treatment would most likely consist of oxidation using potassium permanganate or ozone and filtration through manganese greensand or other media filtration. The design for these future facilities shall be provided.

The Carus 8500 product is an aqueous solution of phosphates with specific gravity of 1.35 to 1.41. It is typically fed into the well water at a dose of 5 mg/L, which requires about 47 gallons per day. It will be stored in a 1,000-gallon HDPE tank, which provides 14 days of storage plus working volume.

1.6 Electrical Service

The electrical service for each well shall include a new electrical transformer. The utility requirements shall be per Southern California Edison (SCE) standards.

1.6.1 Main Switchboard

The power to each well shall be 480/277 volts, 3 phase, 4 wire. The main switchboard shall consist of an underground pull section and one section with both the utility meter and the main circuit breaker. The main circuit breaker shall have ground fault protection. The main electrical service shall have the capability of powering the pump for each well. The main switchboard shall also include an automatic transfer switch, and one solid-state starter for each well. The main control panel (MCC) will also include a 120/208-volt step-down transformer and panelboard for lighting and auxiliary loads and a circuit breaker for the air-conditioning unit.

1.6.2 Emergency Power

Each well shall be equipped to receive power from a portable generator. A standby engine/generator (E/G) shall allow continued operation during a power outage.

1.6.3 Well Building Interior Lighting

Interior lighting shall consist of surface-mounted fluorescent, 1-foot by 4-foot enclosed and gasketed fixtures. Lighting fixtures and lamps shall be California Title 24 compliant. Lighting fixtures with emergency battery packs will be used to provide egress lighting during the transition from normal power to emergency generator power.

1.6.4 Site Exterior (Security) Lighting

Exterior site lighting (security lighting) shall consist of metal halide wall packs mounted on the exterior walls. The exterior lighting will be controlled via photocell controls to turn on at dusk and turn off at

dawn. The site lighting levels shall be kept within the property and shall not spill to the neighboring properties.

1.7 Border Avenue Facility Building Intrusion Alarms

The building intrusion alarm shall consist of motion sensors located in the building interior. The motion sensors will be deactivated when the vehicle electrical gate is opened via the proximity cards. Proximity cards shall match the existing City's cards. The system is monitored by a 3rd-party firm via POTS phone lines. The intrusion system shall be as follows:

- Bosch 7412-GV4 control unit
- Bosch D1255 keypad
- Exterior Door Contacts GE 1076D concealed GE 2507 Surface mounted DPDT
- Interior Protection will be detailed as the building design becomes finalized.

1.8 Facility SCADA System Overview

Border Avenue Facilities and Well Nos. 12, 13, and 14 shall be designed to allow for automatic operation with remote monitoring and supervision.

Each well shall be controlled by a local PLC. All PLCs shall be tied together with the City Yard SCADA workstations.

The plant SCADA system shall include Wonderware software.

A design objective is to have all PLCs by Allen-Bradley Logix platform (ControlLogix and/or CompactLogix).

The plant shall communicate with the City SCADA system using a DSL connection, which will be ordered by the City.

The plant shall be equipped with an Ethernet spread spectrum radio, to be used as a backup communications media. The radio will be tied to the City's existing water system SCADA at City Yard.

Border Avenue Facility control system shall be stand-alone and will be integrated by the design-build team. Design-build team will contract control system integrator designated by the City ("City's Integrator") to expand existing City's Water SCADA system to accommodate the plant.

City has pre-negotiated the existing SCADA modifications and cost with the City's Integrator.

Upgrade of the existing City of Torrance SCADA system, including new radio system infrastructure, is not in the DB scope.

1.9 Chemical Treatment Vaults

A vault shall be provided just ahead of the inlet connection to the reservoir for application of chlorine, ammonia, and polyphosphate. Alternatively, the inlet pipe could be relocated above ground adjacent to the existing reservoir for chemical injection. A second vault shall be located between the reservoir and the BPS for application of chlorine and ammonia.

1.10 Work at Border Avenue Facility

The Van Ness Avenue Transmission Main Project will construct the raw water transmission main into the Border Avenue Facility and connect to the existing reservoir and construct a storm drain for draining the reservoir. The existing Booster Pump Station has three (3) horizontal split case pumping units each with a capacity of 2,000 gpm for an operational capacity of 4,000 gpm, two (2) in operation and one (1) on standby. Work at the Border Avenue Facility shall include the following:

- Connection of transmission main and drain line to existing reservoir.
- Installation of SCADA system and communication antenna and radios, pursuant to City's SCADA Upgrade Project designs.
- Demolition of Well No. 7 per state and local requirements.
- Demolition of the Well No. 7 building and construction of chemical storage building.
- Installation of Disinfection System.