AZ WATER ASSOCIATION PRESENTS: 2017 WATER REUSE PROJECT OF THE YEAR

OCOTILLO RECHARGE FACILITY ASR WELL EXPANSION PROJECT

Award Recipients: City of Chandler, Wilson Engineers, PCL Construction
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Project Background

As the City of Chandler continues to grow, it expands its wastewater facilities accordingly. The City currently utilizes two Aquifer Storage and Recovery (ASR) well systems to inject reclaimed water into a shallow aquifer for underground storage purpose. In times of need, the ASR wells are designed to recover reclaimed water and introduce within the reclaimed distribution system for delivery to customers. The City has two ASR well fields, the Tumbleweed Recharge Facility and the Ocotillo Recharge Facility. This project included permitting for the expansion of capacity at the Ocotillo Recharge Facility (ORF) from 10 MGD to 20 MGD and the drilling/equipping of four (4) new ASR wells which brings the total number of ASR wells in this well field to ten (10). This is the single largest recharge facility in Arizona utilizing ASR well technology. **Figure 1 – ORF Site Plan** provides the site layout and ASR Well locations.

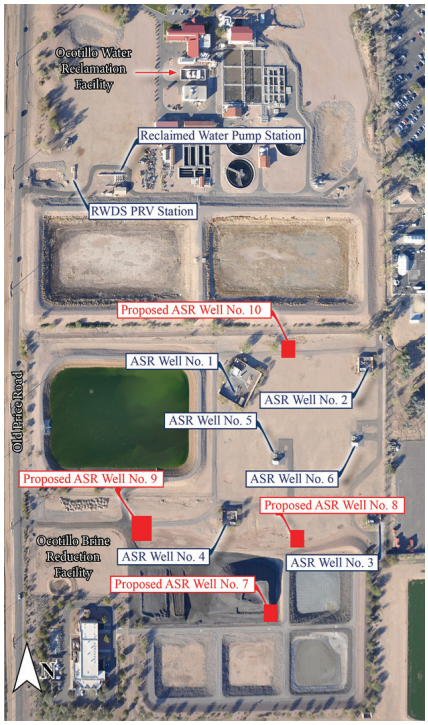

Figure 1 – ORF Site Plan

Each ASR well is designed to accommodate a recharge capacity of 1,500 gpm. Adjacent to each well is an air compressor and backup nitrogen gas system housed within an electrical building to actuate a Baski Flow Control Valve (FCV). **Figure 2 – Typical ASR Well Site** shows the typical above-ground pump and piping configuration of an ASR well site. The Baski FCV allows the flexibility to test and monitor the recharge capability of the facility under various flow scenarios. Over time, should the wells recharge capacity diminish, the City will have the ability to throttle back the variable recharge flow control valves at each ASR well, limit the recharge flow rate, and provide the City the flexibility to operate each well at their maximum recharge rate. These valves modulate the flow received by each well depending on the localized mounding conditions. In addition, the valves provide the ASR Wells with the ability to switch modes between recharge and purge/recovery cycles. Under the purge mode, vertical turbine well pumps will be used to backwash the ASR Wells. The Baski FCV, deep well check valve, and installation of the Baski FCV are shown within **Figure 3 – Baski Flow Control Valve**.

Figure 2 – Typical ASR Well Site

Original or Innovative Considerations

The Ocotillo Recharge Facility ASR wells are designed with a recharge capacity of 1,500 gpm. The 1,500 gpm was identified early in the design due the unique features of the underlying formations. The ancestral river course for the Salt River has provided a layer of sand and gravel which provides the exceptional recharge capabilities in the area. This allows each ASR well to be relatively close together and maintain their capacity during operation.

The technology to recharge 1,500 gpm into each ASR well is accomplished with a variable orifice recharge valve. The variable orifice recharge valve allows a rubber bladder to inflate/deflate depending on the desired injection flowrate. The inflation and deflation of the rubber bladder is accomplished by utilizing de-humidified compressed air or compressed nitrogen gas in 150 lb. cylinders as a back-up source. The reclaimed water then enters the formation through slots on the side of the variable orifice recharge valve. A high-pressure check valve is installed beneath the vertical turbine pump suction can to ensure reclaimed water is controlled through the recharge valve during an injection cycle.

When a well is injecting reclaimed water into the shallow aquifer for a pre-determined amount of time, like any filter, it requires a backwash cycle to remove suspended solids and maintain its capacity for the long term. The actuation of butterfly valves control the direction of reclaimed water at each ASR well and therefore, enables a backwash/purge cycle to occur. At the ORF, the purge water from the ASR Wells is discharged into the lake system managed by the Ocotillo Management Group (OMG).

Social and Economic Considerations

The Ocotillo Recharge Facility benefits the surrounding community by reusing all the recovered water or injecting all the surplus reclaimed water into the aquifer for future beneficial use. During periods of low reclaimed water demand from the community and partnering customers (winter conditions), the water can be banked or injected in the shallow aquifer. In times of

Figure 3 – Baski Flow Control Valve

high reclaimed water demand (summer conditions) where the demand is greater than supply, the water can be recovered from the aquifer and used to supplement the reclaimed water. This flexibility provides the residents with a consistent source of reclaimed water for parks, irrigation and lake features, saving valuable potable water resources. The ability to both store excess water that would otherwise be lost and reuse the stored water in lieu of potable water provides the municipality a sustainable solution to the overall reclaimed water system balance.

The reduced cost of utilizing reclaimed water provides an economical alternative for large business when compared with potable water. By monetarily incentivizing a sustainable practice, the city can easily convince large industrial customers to utilize reclaimed water for specific applications in lieu of the more expensive potable water alternative. Additionally, the city does not have to invest in infrastructure to expand potable water treatment and distribution facilities. Overall, the use and reuse of reclaimed water provides both the municipality and the customer with significant savings.

Complexity

The drilling of the new ASR wells is less complex. The most complex element of the project was the installation of the below grade FCVs and the check valves. The installation of the valves will need to be done correctly to enable proper operation of the ASR Wells. In addition to this, it was critical to complete the connections to the separate onsite recharge and purge water piping systems. The complexity of the piping system ultimately ensures the City maintains the largest margin of flexibility for operation. Figure 4 – Installation of VTP and Pump Column shows photos of the installation and Figure 5 – Underground Tie-in provides an example of the buried piping network. Maintaining flexibility in flowrates, isolation of wells and ensuring each well can purge independently is paramount because of the large dependency on weather or climate conditions. As seasons change and weather systems move through the valley, the recharge facility is the one system that maintains the constant flow of reclaimed water for the City. By maintaining flexibility, the city ensures that the reclaimed water system can provide a solution, no matter how the climate or weather effects reclaimed water demands.

Meeting and Exceeding Owner Needs

The Ocotillo Recharge Facility has consistently exceeded the expectations of the City. As the City undergoes changes, the facility has changed with it to ensure it meets the needs of operations and maintenance staff and the City management. Wells, piping and valves have all been added to the site over multiple expansions and throughout the process the facility has either maintained or gained operational flexibility. The facility has maintained consistent recharge capabilities for nearly a decade, far surpassing the expectations set by similar facilities, much to the satisfaction of the City. Overall, the Ocotillo Recharge Facility has constantly met or exceeded the city's needs in nearly all areas, including flexibility, complexity, budgetary constraints, constructability and the ability to work in conjunction with existing city infrastructure. The facility has implemented original and innovative ideas in order to meet their needs while considering the social and economic impacts of their decisions.

Figure 4 – Installation of VTP & Pump Column

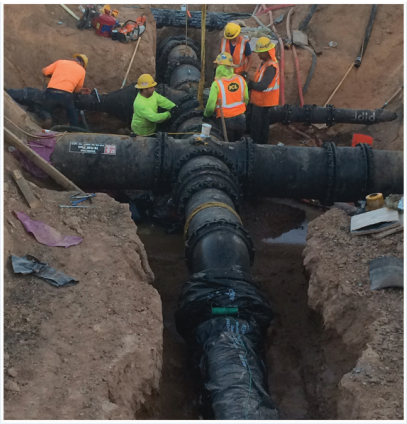

Figure 4 – Underground Tie-In