



PREPARED BY: AMY BLAIN

SUBJECT: COLLECTOR WELL FEASIBILITY STUDY SUMMARY

DATE: MARCH 3, 2016

The following summary is provided to accompany and assist with review of the technical memorandum prepared by Layne Water Systems dated March 3, 2016 describing the results of the Cowlitz River Alluvial Aquifer Collector Well Feasibility Study.

Test wells were drilled at three locations – Fishers Lane, West Side Hwy at Solomon Rd, and Riverside Park. We chose a rotary sonic drilling method because it provides very discrete soil samples – a crude analogy would be a clam gun versus a drill bit. We were able to see each of the various soil layers which have been deposited over the years, exactly where they start and how thick they are. Armed with the soil information, a decision was made at each site about whether or not it was worthwhile to proceed with pump testing and water quality sampling.

The results at Fishers Lane were marginal. At 48-ft below grade, we encountered a 13-ft thick layer of coarse sand and gravel – less than we'd hoped for but enough to transmit water. Before pump testing, the water level in the well was about 13-ft below ground. At 91 gpm, the water level in the well dropped 8-ft and could not be pumped harder than that without dewatering the well screen. Specific capacity is a measure of well performance; it is calculated from the pumping rate and the drawdown so one well can be compared to another. The specific capacity of the Fishers Lane test well was 11 gpm per foot of drawdown. Transmissivity is a measure of how much water can pass through the aquifer horizontally to the well; it is calculated (estimated) from specific capacity and correction factors are sometimes applied depending on how thick the aquifer is and whether it's considered confined, unconfined or leaky. The transmissivity of the Fishers Lane test well is estimated at 35,000 gallons per day per foot and a collector well there might be capable of producing 1 to 4 MGD, at most. To put that into perspective, our current Average Day Demand is roughly 6 MGD, Max Day Demand is about 12 MGD. This site is not recommended for further study.

The results at Solomon Rd were poor. At 58-ft below grade, we encountered a 2½-ft thick layer of coarse sand and gravel, topped and underlain by clay, clayey silt, silty clay and silty sand - all things which do not transmit water. Even though the overall saturated thickness was greatest at this location (i.e., where the water level was with respect to the sand and gravel), the sand and gravel layer was too thin to produce enough water and a decision was made to abandon the hole. Pump testing was not conducted and no water samples were collected at Solomon Rd.

The results at Riverside Park were favorable. At 50-ft below grade, we encountered a 23-ft thick layer of coarse sand and gravel, the thickest of the three test wells. Before pump testing, the water level in the well was about 12½-ft below ground. At 121 gpm, the water level in the well had only dropped 1.66-ft. The specific capacity of the Riverside Park test well was 73 gpm per foot of drawdown, significantly higher than Fishers Lane. After applying correction factors, the transmissivity of the Riverside Park test well is estimated in the range of 136,000 to 240,000 gallons per day per foot. For the sake of comparison, the transmissivity of the Mint Farm aquifer was calculated to be 1,030,000 gallons per day per foot of aquifer width. Still, under test conditions, a collector well at Riverside Park would be capable of producing up to 9 MGD and there is sufficient property there that two collector wells could be installed for a combined capacity of 10 to 18 MGD.

Given the distance from Riverside Park to either of the City’s water treatment facilities, Layne suggests exploring a fourth site – a 14 acre parcel near 1300 West Side Hwy on the south side of Lexington opposite Rocky Point. A test well drilled here in 1977 suggests the site may be similar to Riverside Park (and a mile closer). The owner of this property previously did not want to complicate a potential sale and declined to participate in exploratory testing. After re-contacting the owner again this February, I was able to negotiate a temporary access and construction agreement if a decision is made to continue with the feasibility study. Layne recommends exploratory investigation at the Rocky Point property and, depending on the findings, detailed aquifer testing at Rocky Point and/or Riverside Park.

The report also includes discussion and analytical results of water quality sampling efforts. Samples from the test wells at Fishers Lane and Riverside Park were collected by CH2MHill and analyzed at ALS Environmental in Kelso; Cowlitz River samples were collected by Layne and analyzed by National Testing Laboratories in Cleveland, Ohio. The report presented water quality information in terms of whether or not the results constitute an exceedance or primary and secondary drinking water standards. Layne’s report does not attempt to compare test well water quality with Mint Farm water quality but water quality results are provided below for select analytes such that a general comparison can be made.

(mg/L)	Cowlitz River	Test Wells	Mint Farm
Iron ^(a)	0.4	11 – 12	1.1
Aluminum ^(b)	0.3	0.04 – 0.3	0.006
Arsenic ^(c)	ND	ND	0.006
Manganese ^(d)	0.05	0.3 – 0.6	0.5
Silica ^(e)	18	48 – 58	58
Hardness	24	74 – 82	98
Ammonia		0.3 – 0.4	
Dissolved Oxygen		1.2 – 2.3	0.8

^(a) All results exceed Secondary Maximum Contaminant Level (SMCL) of 0.3 mg/L

^(b) Cowlitz River and Fisher Lane test well results exceed SMCL of 0.2 mg/L

^(c) Non-detect result in Cowlitz River and both test wells

^(d) Both test well results and average Mint Farm result exceed SMCL of 0.05 mg/L

^(e) No SMCL exists for silica