

Cost Estimate, Water System							
11/26/2022							
Cost estimate is -50%/+100% based on Class 5, AACE; Planning level estimate only.							
Costs include markups of 10-percent for general conditions, 15-percent for contractor overhead and profit, 25-percent for engineering/legal/admin, 15-percent for mobilization, 30-percent for construction contingency							
https://library.aacei.org/pgd01/pgd01.shtml							
https://web.aacei.org/docs/default-source/toc/toc_18r-97.pdf?sfvrsn=4							
Planning Assumptions							
Max Units	110	Used for max calcs	input in cell F93				
Min Units	48	Use for min calcs					
People per Unit	2.5						
Max Population	275						
Min Population	120						
Water Usage/Demand							
gallons per capita per day, average	100						
water peaking factor, limited irrigation	2.5						
fire flow, gallons per minute	500	zero for no fire suppression system					
fire flow duration, hours	2	zero for no fire suppression system					
average day demand, maximum, gallons per minute	19.1						
average day demand, minimum, gallons per minute	8.3						
maximum day demand, maximum, gallons per minute	47.7						
maximum day demand, minimum, gallons per minute	20.8						
Well Design Flow							
Maximum, gallons per minute	47.7						
Minimum, gallons per minute	20.8						
Storage Volume							
=(2 x Average Day Demand + Fire Flow x Duration) x 1.2 for operational storage							
Maximum, gallons	138000						
Minimum, gallons	100800						
Water Distribution Pipeline							
Assume 6-inch diameter							
Minimum length of pipe for system service, feet	3000						
Length additional total applied per unit, feet, later scaled to specific customers	10000						
Elevation (feet)							
max elevation, feet	3400						
min elevation, feet	2950						
difference, feet	450						
pressure from difference, pounds per inch square	195						
at least four pressure zone, pressure range each pressure zone ~ 50 psi + likely individual pressure reducing valves or local pump stations in locations							
Water System Initial Capital Costs							
Component	Max Unit Cost \$ per	Unit Cost Description	Max Capital \$	Max Capital per Unit, \$/Unit	Min Multiplier Base Cost	Min Capital \$	Min Capital per Unit, \$/Unit
Well	\$ 3,500	\$3500 per gallon per minute	\$ 167,101	\$ 1,519	2.5	\$ 182,292	\$ 3,798
Storage	\$ 1.75	\$1.75 per gallon	\$ 241,500	\$ 2,195	1.3	\$ 229,320	\$ 4,778
Water Pipe Transmission	\$ 300	\$300 per linear ft	\$ 900,000	\$ 8,182	1.0	\$ 900,000	\$ 18,750

Water Distribution Piping	\$ 300	\$300 per linear ft inclusive of hydrants, valves	\$ 3,000,000	\$ 27,273	1.1	\$ 3,272,727	\$ 68,182												
Total			\$ 4,308,601	\$ 39,169		\$ 4,584,339	\$ 95,507												
Discount and Inflation Rates		110 Lots	\$ 39,169																
		48 Lots	\$ 89,763																
Discount Rate	6%																		
Inflation Rate	3%	20% Contingency	\$ 5,170,321																
Real Discount Rate	3%																		
Operations and Maintenance Annual Costs																			
Well	\$8,000	cost per year																	
Storage	\$3,500	cost per year																	
Pipeline	\$1	cost per linear foot per year																	
Energy Annual Costs																			
Energy unit cost per kilowatt hour	\$0.06																		
Pump run time (minimum), average pumping hours per year with storage	5,000																		
Total dynamic head (feet)	200																		
Pump efficiency	0.7																		
Energy annual kilowatt hours, max	12,856																		
Energy annual kilowatt hours, min	5,610																		
Life Cycle Cost, Equivalent Uniform Annual Cost																			
Infrastructure Component	Replacement Cycle (years)	Percentage of Unit Cost	Annual Replacement Cost Percent	Replacement Cost Infrastructure, Max Units, \$/year	Operations and Maintenance Max Cost, \$/year	Energy Max Cost, \$/year	Total Max Life Cycle Cost, \$/year	Total Max Life Cycle Cost, \$/unit /year	Replacement Cost Infrastructure, Min Units, \$/year	Operations and Maintenance Min Cost, \$/year	Energy Min Cost, \$/year	Total Min Life Cycle Cost, \$/year	Total Min Life Cycle Cost, \$/unit /year						
Pump Station/Well (mechanical & electrical)	25	40%	5.5%	\$ 3,694	\$ 8,000	\$ 771	\$ 12,465	\$ 113	\$ 4,029	\$ 8,000	\$ 337	\$ 12,366	\$ 258						
Pump Station/Well (structural)	50	60%	3.7%	\$ 3,724	\$ -	\$ -	\$ 3,724	\$ 34	\$ 4,062	\$ -	\$ -	\$ 4,062	\$ 85						
Storage	50	100%	3.7%	\$ 8,970	\$ 3,500	\$ -	\$ 12,470	\$ 113	\$ 8,517	\$ 3,500	\$ -	\$ 12,017	\$ 250						
Pipeline	100	100%	3.0%	\$ 117,005	\$ 13,000	\$ -	\$ 130,005	\$ 1,182	\$ 125,187	\$ 7,364	\$ -	\$ 132,550	\$ 2,761						
Total				\$ 133,392	\$ 24,500	\$ 771	\$ 158,663	\$ 1,442	\$ 141,796	\$ 18,864	\$ 337	\$ 160,996	\$ 3,354						
Capital Cost Comparison		Max Units	Min Units																
		110	48																
Single Unit Well System, No Fire	Max Capital (includes markups) \$	Compare to Max # Units Costs for Neighborhood Water System	Compare to Min # Units Costs for Neighborhood Water System																
5 gpm maximum	\$25,000	\$ 39,169	\$ 95,507																
Life Cycle Cost Comparison		Max Units	Min Units																
		110	48																
Single Unit Well System, No Fire	Replacement Cost Infrastructure, \$/year	Operations and Maintenance, \$/year	Energy Cost, \$/year	Total Life Cycle Cost, \$/year	Compare to Max # Units Costs for Neighborhood Water System	Compare to Min # Units Costs for Neighborhood Water System													
5 gpm maximum	\$ 1,110	\$ 800	\$ 337	\$ 2,246	\$ 1,442	\$ 3,354													
				Max Units	110	<--Toggle Max Here													