ATTACHMENT 8. WATER QUALITY AND OTHER EXPECTED BENEFITS

Water Quality Benefits

Aquifer storage of imported water will improve water quality for AVEK'S consecutive system (the consecutive system includes those water systems served by AVEK) by:

- Reducing disinfection byproduct (DBP) precursors and DBPs
- Improving mineral quality

State Water Project (SWP) water contains certain organic materials that, when combined with chlorine used for disinfection of public water supplies, produces DBPs. Regulated DBPs include trihalomethanes (THMs) and halo-acetic acids (HAAs). As a result of recent changes in DBP regulations, certain locations in the AVEK consecutive system no longer meet the regulations. This has caused AVEK to modify some treatment plants and consider modification of disinfection methods.

Granular Activated Carbon (GAC) Treatment

AVEK has considered adding DBP treatment to the existing Rosamond Water Treatment plant, consisting of granular activated carbon (GAC) treatment. GAC is a common water treatment method used to remove organic materials, and is comprised of vessels containing the GAC, which is a specially treated granular carbon material with extremely high specific surface area. As water passes through the GAC, organic materials (which are typically hydrophobic) adsorb onto the surface of the GAC and are removed from the water. GAC has a specific capacity for the organic materials which eventually becomes exhausted, at which time the GAC must be replaced.

Aquifer Storage Benefits In-Lieu of GAC Treatment

Aquifer storage has been documented as being capable of reducing both DBPs and DBP precursors (Singer et al., J. AWWA, 1993; McQuarrie et al., J. Env. Eng., 2003; Pyne et al., AWWARF, 1996), presumably by microbial degradation, although mixing with native supplies also appears to play a role. Thus, storing SWP water underground can be expected to reduce DBP formation in the AVEK consecutive system, allowing AVEK to forego installation of equipment to reduce DBP formation. This equipment would most likely consist of GAC treatment, and its cost is presented in Table 16.

In addition to DBP benefits, aquifer storage provides benefits in reducing concentrations of certain minerals. The "Initial Study for the proposed WSSP-2 Groundwater Recharge Project" prepared in June 2008 notes "Recharge and recovery reduce groundwater levels of arsenic, boron, chromium, fluoride, and nitrates…".

Estimated Cost With Project

Construction of WSSP2 will reduce THMs through aquifer storage without the need to construct and operate a GAC treatment facility. For this reason, there is no cost associated with improving water quality as a result of this project.

Estimated Cost Without Project

If WSSP2 is not constructed, a GAC treatment facility will be required to be constructed and operated. It is assumed that this treatment facility will be located at the existing AVEK Rosamond Water Treatment

Plant. The cost for this facility is divided into two parts, capital costs and annual operation & maintenance costs.

Capital Costs

Construction of the GAC treatment facility will include contact vessels, a pump station, and a backwash facility. It is estimated that such a facility would cost $0.50 per gallon treated per day. Assuming a treatment capacity of 20 MGD, construction cost would be about $10,000,000 not including contingencies.

Annual Operation & Maintenance Costs

Operation and maintenance of the GAC treatment facility will include electrical costs and equipment repair associated with operation of the pump station and backwash facility. The GAC media will also require regular replacement as it is expended. It is estimated that operation and maintenance of the GAC treatment facility would cost $50 per acre-foot, or about $1,000,000 per year assuming 20,000 AFU is treated.

Contingency

The contingency for the avoided projects is estimated to be 30%. This estimate is based on a Class 3 estimate as defined by the Association for the Advancement of Cost Engineering (AACE), which is the same as previously used in Attachment 4 for the proposed project contingency.

Summary

The following table presents a summary of the estimated costs without the proposed WSSP2 project.

	Base Cost	Contingency	Total
Capital Cost	$10,000,000	$3,000,000	$13,000,000
Annual Operation & Maintenance Cost	$50	$15	$65

Table 16 - Water Quality and Other Expected Benefits

(All benefits should be in 2009 dollars)

Project: Water Supply Stabilization Project No. 2

(a) Year	(b) Type of Benefit	(c) Measure of Benefit (Units)	(d) Without Project	(e) With Project	(f) Change Resulting from Project (d) – (e)	(g) Unit $ Value [1]	(h) Annual $ Value (f) x (g) [1]	(i) Discount Factor [1]	(j) Discounted Benefits (h) x (i) [1]
2009							$0	1.000	$0
2010							$0	0.943	$0
2011	Capital Costs	Each	1	0	1	$11,570,000	$11,570,000	0.890	$10,297,300
2012							$0	0.840	$0
2013	Treatment	AF	20,000	0	20,000	$65	$1,300,000	0.792	$1,029,600
2014	Treatment	AF	20,000	0	20,000	$65	$1,300,000	0.747	$971,100
2015	Treatment	AF	20,000	0	20,000	$65	$1,300,000	0.705	$916,500
2016	Treatment	AF	20,000	0	20,000	$65	$1,300,000	0.665	$864,500
2017	Treatment	AF	20,000	0	20,000	$65	$1,300,000	0.627	$815,100
2018	Treatment	AF	20,000	0	20,000	$65	$1,300,000	0.592	$769,600
2019	Treatment	AF	20,000	0	20,000	$65	$1,300,000	0.558	$725,400
2020	Treatment	AF	20,000	0	20,000	$65	$1,300,000	0.527	$685,100
2021	Treatment	AF	20,000	0	20,000	$65	$1,300,000	0.497	$646,100
2022	Treatment	AF	20,000	0	20,000	$65	$1,300,000	0.469	$609,700
2023	Treatment	AF	20,000	0	20,000	$65	$1,300,000	0.442	$574,600
2024	Treatment	AF	20,000	0	20,000	$65	$1,300,000	0.417	$542,100
2025	Treatment	AF	20,000	0	20,000	$65	$1,300,000	0.394	$512,200
2026	Treatment	AF	20,000	0	20,000	$65	$1,300,000	0.371	$482,300
2027	Treatment	AF	20,000	0	20,000	$65	$1,300,000	0.350	$455,000
2028	Treatment	AF	20,000	0	20,000	$65	$1,300,000	0.331	$430,300
2029	Treatment	AF	20,000	0	20,000	$65	$1,300,000	0.312	$405,600
2030	Treatment	AF	20,000	0	20,000	$65	$1,300,000	0.294	$382,200
2031	Treatment	AF	20,000	0	20,000	$65	$1,300,000	0.278	$361,400
2032	Treatment	AF	20,000	0	20,000	$65	$1,300,000	0.262	$340,600
2033	Treatment	AF	20,000	0	20,000	$65	$1,300,000	0.247	$321,100
2034	Treatment	AF	20,000	0	20,000	$65	$1,300,000	0.233	$302,900
2035	Treatment	AF	20,000	0	20,000	$65	$1,300,000	0.220	$286,000
2036	Treatment	AF	20,000	0	20,000	$65	$1,300,000	0.207	$269,100
2037	Treatment	AF	20,000	0	20,000	$65	$1,300,000	0.196	$254,800
2038	Treatment	AF	20,000	0	20,000	$65	$1,300,000	0.185	$240,500
2039	Treatment	AF	20,000	0	20,000	$65	$1,300,000	0.174	$226,200
2040	Treatment	AF	20,000	0	20,000	$65	$1,300,000	0.164	$213,200
2041	Treatment	AF	20,000	0	20,000	$65	$1,300,000	0.155	$201,500
2042	Treatment	AF	20,000	0	20,000	$65	$1,300,000	0.146	$189,800
2043	Treatment	AF	20,000	0	20,000	$65	$1,300,000	0.138	$179,400
2044	Treatment	AF	20,000	0	20,000	$65	$1,300,000	0.130	$169,000
2045	Treatment	AF	20,000	0	20,000	$65	$1,300,000	0.123	$159,900
2046	Treatment	AF	20,000	0	20,000	$65	$1,300,000	0.116	$150,800
2047	Treatment	AF	20,000	0	20,000	$65	$1,300,000	0.109	$141,700
2048	Treatment	AF	20,000	0	20,000	$65	$1,300,000	0.103	$133,900
2049	Treatment	AF	20,000	0	20,000	$65	$1,300,000	0.097	$126,100
2050	Treatment	AF	20,000	0	20,000	$65	$1,300,000	0.092	$119,600
2051	Treatment	AF	20,000	0	20,000	$65	$1,300,000	0.087	$113,100
2052	Treatment	AF	20,000	0	20,000	$65	$1,300,000	0.082	$106,600
2053	Treatment	AF	20,000	0	20,000	$65	$1,300,000	0.077	$100,100
							Total Present Value of Discounted Benefits Based on Unit Value (Sum of the values in Column (j) for all Benefits shown in table) Transfer to Table 20, column (f), Exhibit F: Proposal Costs and Benefits Summaries		$26,821,600

Comments: Capital Costs represent the cost to construct the facilities. Treatment represents the operation and maintenance costs associated with treating the water.