Project 7 Water Authority

Regional Water Supply & Resiliency Program

PROGRAM WORKSHOP #3

June 24, 2021

Project 7 Regional Resiliency Program: Decision-Making Roadmap

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Projected Funding Analysis

June 24, 2021

Project 7: Regional Water Supply Program	Funding Contribution*
Estimate of Total Program Costs* Equipment and Installation Costs (61% of Total) Contractor Overhead, Profit, Ancillary Costs (21% of Total) Engineering, Permitting, and Administrative Costs (19% of Total)	$50-70 million
Project 7 Capital Reserves**	$2-3 million / 3-5%
Plant Investment Fee** Scenario 1: 250 new taps @ $1,000 per tap ($250,000) Scenario 2: 750 new taps @ $5,000 per tap ($3,750,000)	$250K-$3.75 million / 0.4% - 5%
Revenue** Scenario 1: 2021 15% increase + 3 more 12% y.o.y revenue increases ($1,993,810) Scenario 2: 2021 15% increase + 4 more 21% y.o.y revenue increases ($3,166,035)	$1.9-$3.1 million / 3% - 5%
Low-Interest Loans*** (Interim Loan: $7 million) (State Revolving Fund Loan: TBD) (EPA WIFIA Loan: Up to $31.85 million) (USDA Water Loan & Grant Program: TBD)	$31.6 - 57.3 million / 63% - 80%
Grant Opportunities* (BOR, FEMA, EDA, DOLA, CDPHE, etc.)	Awarded / Pursuing $25,000 / $8.56 million

**preliminary estimates subject to change / **potential funding options shown for planning purposes only / ***future grant awards will be applied towards loan and fee amounts*

Identified Grant Opportunities

BOR Water and Energy Efficiency Grants	$2,000,000	Anticipated Open: Mid-July 2021
BOR Drought Resiliency Projects	$1,500,000	Anticipated Open: January 2022
BOR Drought Contingency Planning	$200,000	Anticipated Open: June/July 2021
BOR Water Conservation Field Services Program	$25,000	Funded
FEMA Building Resilient Infrastructure and Communities (BRIC) Program	$600,000	Anticipated Open: September 2021
EDA Public Works and Economic Adjustment Assistance Programs	$1,400,000	Rolling Application Window
CWCB Water Supply Reserve Fund Grants	$500,000	Rolling Application Window
DOLA Tier II Construction Grant (EIAF)	$600,000	Due September 3, 2021
DOLA Tier III Construction Grant (EIAF)	$2,000,000	TBD
CDPHE Water Quality Investment Fund Grant	$165,000	Anticipated Open: November 2021
Total	**$8,565,000**	

Program Options Evaluation

COST/BENEFIT ANALYSIS

June 24, 2021

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Raw Water Delivery Options			
Water Line *Roughly 5 mile pipeline (24") from Ridgway Dam to treatment site with potential for energy recovery at end of pipe.*	**Benefits**	**Drawbacks**	**Key Questions**
	Higher quality source water *(Low risk for silt intake or other source water contamination)*	Higher cost option ($18M in construction costs for 10 MGD system)	Feasibility of easement acquisitions?
	Most stable raw water source	Requires easements/property acquisition (~12 parcels) including BLM owned land.	Location of exact route/alignment?
	Gravity-powered – no pumping required	*Potential for lengthy permitting process*	What is the potential for multi-use path/maintenance road along route *or other multi-benefit opportunities, e.g., fiber, cost-sharing, etc.?*
	Lowest O&M costs and less staffing (Net Present Value of O&M - $2M over 50-year period)	*Maintenance of ~5 miles of pipe (infrastructure exposure)*	*What is the potential total energy generation from hydropower system? Net neutral design possible?*
	Most resilient to wildfire events	*Construction timeline*	*Can location of hydropower generator and pressure be managed? (Yes)*
	Possibility for energy recovery and hydropower generation		
	Greatest control of raw water flow from reservoir to WTP		
	Potential for multi-benefit opportunities (e.g., fiber, recreational path, cots-sharing)		

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Raw Water Delivery Options			
Alluvial Wells *2-5 horizontal directionally drilled wells adjacent to river with raw water pumped to WTP.*	**Benefits**	**Drawbacks**	**Key Questions**
	Naturally filtered source water could allow for a smaller sized water treatment plant	Constrained raw water capacity beyond 5MGD, ability to build out to 10 MGD would require significant increase in size and cost.	Maximum raw water delivery capacity?
	Less property acquisition effort than raw water line	Pumping required – more energy *(associated costs?)*	Susceptible to drought conditions/ groundwater levels?
	environmental benefits due to increased in-stream flow between dam and treatment site.	Highest maintenance requirements due to pump and well rehabilitation (Net Present Value of O&M - $4M over 50-year period)	Will lag time between pumping withdrawals and river depletions pose a challenge to water augmentation planning?
	Would allow raw water to pass through existing hydropower facility and generate more electrical power before flowing downstream to the facility	Higher cost option ($16M in construction costs for 10MGD system)	
		More property acquisition effort than river diversion (2-4 parcels)	
		Long-term access to site needed	

Recommended removal from future consideration

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Raw Water Delivery Options			
River Diversion *In-stream diversion and pumphouse on river adjacent to site with raw water pumped to WTP.*	**Benefits**	**Drawbacks**	**Key Questions**
	Lowest cost option ($8M in construction costs for 10 MGD system)	Pumping required – more energy	*Timeline and permitting required to perform work within the floodway or river bottom? (likely not a significant challenge)*
	Lowest Net Present Value ($10M, construction costs and annual O&M costs over planning period)	Higher maintenance requirements than raw water line due to pump rehabilitation*, riverbank and structure stabilization* and maintenance. (Net Present Value of O&M - $4M over 50-year period)	*Significance of susceptibility to environmental events, e.g., drought, flooding, and river migration issues, etc.?*
	Easiest to build	Source water more susceptible to runoff, contamination, spills, wildfire effects, etc.	*Will additional access requirements to river pump station require direct purchase of property vs. acquiring an easement?*
	Less property acquisition effort (1 or 2 parcels)	*Less stable water supply and quality could require more robust and costly treatment system*	
	environmental benefits due to increased in-stream flow between dam and treatment site.	*Long-term access to river diversion, maintenance responsibilities/liabilities*	
	Would allow raw water to pass through existing hydropower facility and generate more electrical power before flowing downstream to the facility	*Flooding impacts and large changes in river morphology cited as significant concern (Uncompahgre River changes course often within the floodway)*	

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Value Characteristics (rank in order of importance: 1 most important / 5 least important)

Raw Water Delivery System	Value Characteristics	Rank
	Quality of source water and resistance to the possible effects of wildfire, runoff, and contamination *(strongly aligned with "resiliency project")*	
	Reliable and environmentally sustainable system that is less reliant on pumping and energy use	
	Control and predictability for managing raw water supply, operations and maintenance	
	Life cycle costs (design, construction, operations & maintenance)	
	Other (please describe): *What is the long-term risk of failure, and can those risks be managed and/or mitigated?* *Can inter-related treatment and water delivery decisions be sequenced and aligned for energy use and other operational considerations?* *Maximum return on investment based on life-cycle costs.* *Hydropower generation (energy recovery) for the new facility is a major benefit.*	

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Water Treatment Options			
Conventional Lime Softening *Conventional softening facility with upflow clarifiers, lime addition, filtration, solids disposal.*	**Benefits**	**Drawbacks**	**Key Questions**
	The most tried and true option available	Highest capital cost (most expensive) of all options ($75 M with 20% contingency)	
	More operators will be familiar with this technology than others	O&M costs are expected to be higher than other options due to sludge disposal and chemical costs	
	Integrated with conventional filtration for regulatory requirements	Requires the most space of all options	
	"Low Tech" option	Chemical application and solid waste processing are messy and undesirable	
		Landfilling of solids will likely be required, very high solids production	
	Recommended removal from future consideration		

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Water Treatment Options			
Pellet-Lime Reactor Softening *Softening completed in front of WTP using sodium hydroxide feed and a pellet reactor. Pellets disposed of beneficially or taken to landfill.*	Benefits	Drawbacks	Key Questions
	Reasonable capital cost (not lowest, but low - $55.2M with 20% contingency)	Pellet reactor and alkalinity loss expected to impact downstream coagulation and filtration, piloting will be required	How does pellet reactor pretreatment impact downstream processes, including filtration?
	Lowest expected O&M costs of all options	Magnesium fines, if produced, may be hard to filter	Can Fe/Mn be effectively removed by pellet softening?
	More compact footprint and better use of space than Conventional Softening	*Different treatment process would require training and fine tuning – learning curve for operators*	Is there a market for pellets to be beneficially reused as a soil or feed amendment and is this a long-term/ low-cost solution?
	The same tried and true chemical process as conventional, but with an improved solids handling system	*Not many other plants using this technology in U.S.*	*Adaptable to source water changes and amenable to future expansion?*
	Ability to target only Calcium Hardness reduces chemical use, solids production and is more efficient	*River intake may create water quality challenges*	*Accessibility of parts, training, etc. given few operating plants in the U.S.?*
	Operation with caustic instead of lime possible which improves cold weather operations		
	Beneficial reuse of pellet byproducts is possible		
	Modular/ease of expansion		

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Water Treatment Options			
Membrane Softening *Softening completed at end of treatment process using membranes. Brine disposed of in a deep injection well or via river discharge.*	**Benefits**	**Drawbacks**	**Key Questions**
	Potentially the lowest capital cost ($46.5M with 20% contingency)	Annual O&M costs are less than conventional softening, but more than pellet-lime reactor softening	Is brine disposal via river outfall feasible (now and in the future)?
	Greater control of water quality (both brine and treated) allows staff to match existing distribution system water *(significant benefit)*	Highest pumping and energy use of all options *(significant drawback could be offset by water line hydrogeneration)*	Can process be retrofitted to high recovery membranes with brine injection well in future?
	Ability to fully automate reduces O&M effort	Brine stream produced that will be difficult to manage (river discharge or injection well)	*Potential to offset high energy consumption with hydrogeneration from raw water line?*
	Smallest footprint of all options	Uncertainty around long-term regulatory structure that allows for river discharge and injection wells	
	The most modular of all options	*Environmental challenges of managing brine byproduct – existing aquifers already have high salinity*	
	Minimal solid waste stream produced	*Lifespan of membrane and more frequent membrane replacement*	

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Value Characteristics (rank in order of importance: 1 most important / 6 least important)

Water Treatment/ Softening System	Value Characteristics	Rank
	Softening technology that is tried and true – one that has proven itself over and over across the country	
	Ability to adjust finished water quality to compare to what is produced by the Montrose WTP and account for seasonal changes	
	Flexibility to adapt to future water quality and environmental regulations for disposal of softening byproducts	
	Control and predictability for managing treatment capacity, starting/stopping, operations and maintenance	
	Life cycle costs (design, construction, operations & maintenance)	
	Other (please describe): *What is the long-term risk of failure, and can those risks be managed and/or mitigated?* *Can inter-related treatment and water delivery decisions be sequenced and aligned for energy use and other operational considerations?* *Lifespan expectancy flexible with changing volumes and use?*	

Value Drivers Scoring Summary

Workshop #3 (June 24, 2021)	**Board** (1=top priority)						**Board Scoring**	**Normalized Board** (10=top priority)	**Participant** (1=top priority)						**Participant Scoring**	**Normalized Participant** (10=top priority)	**Combined Score**	**Normalized Combined** (10=top priority)
Value Drivers: Raw Water Delivery																		
Quality of source water and resistance to the possible effects of wildfire, runoff, and contamination	1	4	1	1	2	1	10	10	1	1	1	2	4	2	11	10	21	10
Reliable and environmentally sustainable system that is less reliant on pumping and energy use	4	2	3	3	3	2	17	5.9	4	4	4	3	2	1	18	6.1	35	6
Control and predictability for managing raw water supply, operations and maintenance	3	3	2	2	1	4	15	6.7	2	3	3	4	1	4	17	6.5	32	6.6
Life cycle costs (design, construction, operations & maintenance)	2	1	4	4	4	3	18	5.6	3	2	2	1	3	6	17	6.5	35	6
Other: Long-term risk (+5); minimize power use; ROI; pipeline preference; hydropower generator	-	-	-	-	-	-			-	-	-	-	-	3 and 5				
	Board (1=top priority)						**Board Scoring**	**Normalized Board** (10=top priority)	**Participant** (1=top priority)						**Participant Scoring**	**Normalized Participant** (10=top priority)	**Combined Score**	**Normalized Combined** (10=top priority)
Value Drivers: Treatment																		
Softening technology that is tried and true – one that has proven itself over and over across the country	5	5	3	4	5	2	24	5.4	5	-	3	5	5	5	23	3.5	47	4.5
Ability to adjust finished water quality to compare to what is produced by the Montrose WTP and account for seasonal changes	3	3	1	1	2	3	13	10	1	-	2	2	1	2	8	10	21	10
Flexibility to adapt to future water quality and environmental regulations for disposal of softening byproducts	2	4	2	5	3	2	18	7.2	3	-	1	4	2	3	13	6.2	31	6.8
Control and predictability for managing treatment capacity, starting/stopping, operations and maintenance	4	2	3	2	1	3	15	8.7	2	-	4	3	4	1	14	5.7	29	7.2
Life cycle costs (design, construction, operations & maintenance)	1	1	3	3	4	4	16	8.1	4	-	5	1	3	4	17	4.7	33	6.4
Other (please describe): Don't know enough, very complex	-	-	-	-	-	-			-	-	-	-	-	-				