

# Allentown Water Filtration Plant (WFP): 2022 Master Plan Update

Presented to: LCA Board of Directors  
January 10, 2022

# Concession and Lease Agreement

## Background

- What: Master Planning required every 5 years
- Who: Professional Engineer (registered in PA) with at least 10 years of experience with water system master planning
- When: 2017, 2022, 2027, etc.

that have registered a complaint or have otherwise contacted customer service within the prior 9 months.

- b. A copy of the independent survey results shall be submitted directly to the City from the independent firm. If the Concessionaire has an existing customer survey system in place, the City will consider acceptance of that survey system pending review of the protocol, questions, response level, and other components. The survey results, including independent follow-up by the City, will be discussed during quarterly meetings with the Concessionaire and considered during the annual evaluation.

## **9.0 Operational Management Practices**

### **9.1 Capital Improvement Planning**

Capital Improvement Planning shall include a comprehensive facility inspection, system performance evaluation, and development/update of a long-term improvement plan including project cost estimates.

The Concessionaire shall implement a long-term master planning/capital improvement planning process. The Comprehensive Planning Study shall be performed at 5 year intervals. The Concessionaire shall either perform the study using its own engineer or contract with an outside professional engineer, registered in Pennsylvania, provided either engineer must have a minimum of 10 years experience conducting similar water system studies. The Concessionaire shall provide the final study report to the City, include the long-term planned capital improvements and associated activities in routine reports to the City, and routinely report on progress. The Concessionaire shall be responsible for executing Capital Improvements, with the City's approval, as defined in the Agreement. Progress related to ongoing capital projects will be an agenda item during quarterly meetings.

# Concession and Lease Agreement: Operating Standards

## Section 9.1

# Task 1: Condition Assessment



Lehigh County Authority

CONDITION ASSESSMENT REPORT

Allentown Water Master Plan

March 2017

# Task 1: Condition Assessment

## Background

- What: Baseline condition, remaining useful life, criticality, risk score for each asset
- When: May 2016 on-site assessment
- Where: Water Filtration Plant, distribution reservoirs, storage tanks, pump stations
- **Quantity: 18 facilities, 6 asset types, 228 assets**
  - Building, electrical, HVAC, process equipment, process tank, roof

# Task 1: Condition Assessment

## Assessment Methodology

- Overall Condition (1-5): maximum [Physical Condition (1-5), Performance Condition (1-5)]
- Overall Criticality (1-3): maximum [Safety (1-3), Level of Service (1-3), Regulatory Compliance (1-3), Redundancy (1-3), and O&M impacts (1-3)]
- Risk Score = Overall condition score (1-5) x criticality score (1-3)
- Remaining Useful Life (RUL) = Estimated Useful Life (EUL)\* – Years in Service
  - \*Life adjustment factor

Table 2-11: Recommended Improvements

Facility / Process	0 – 10 years	10 – 25 years	25 – 50 years
Water Filtration Plant			
Pretreatment	Rehabilitate/replace chemical feed systems (sodium hydroxide, alum, polymer, fluoride, PAC), Chemical Building and Fluoride Building HVAC equipment, and flocculators and rapid mix systems	Rehabilitate/replace sodium hypochlorite system. Rehabilitate Chemical Building structure, electrical equipment, and Fluoride Building structure, roof, and electrical equipment	Replace Chemical Building roof
Sedimentation	Rehabilitate or replace the North and South Power Zone House HVAC equipment, the clarifier sludge vacuum and compressor systems, and the inclined plate settlers	Rehabilitate the electrical equipment, North and South Power House building structure and roofs, and clarifier basins	
Filtration	Rehabilitate the filters, filter valves, filter control panels, and building structure	Rehabilitate the electrical equipment and 1956 building roof <sup>1</sup>	
Finished Water	Rehabilitate or replace High Lift Pump Nos. 2 and 3, Crystal High Lift Pump Nos. 1 and 2, Schantz High Lift Pump No. 5, variable frequency drives for High Lift Pump Nos. 1 and 2, drives for the Crystal High	Rehabilitate High Lift Pump No. 1, Schantz High Lift Pump No. 4, the starter for High Lift Pump No. 3, High Lift Pump motors Nos. 1 and 2	Rehabilitate the variable frequency drive for Schantz High Lift Pump

# Task 1: Condition Assessment

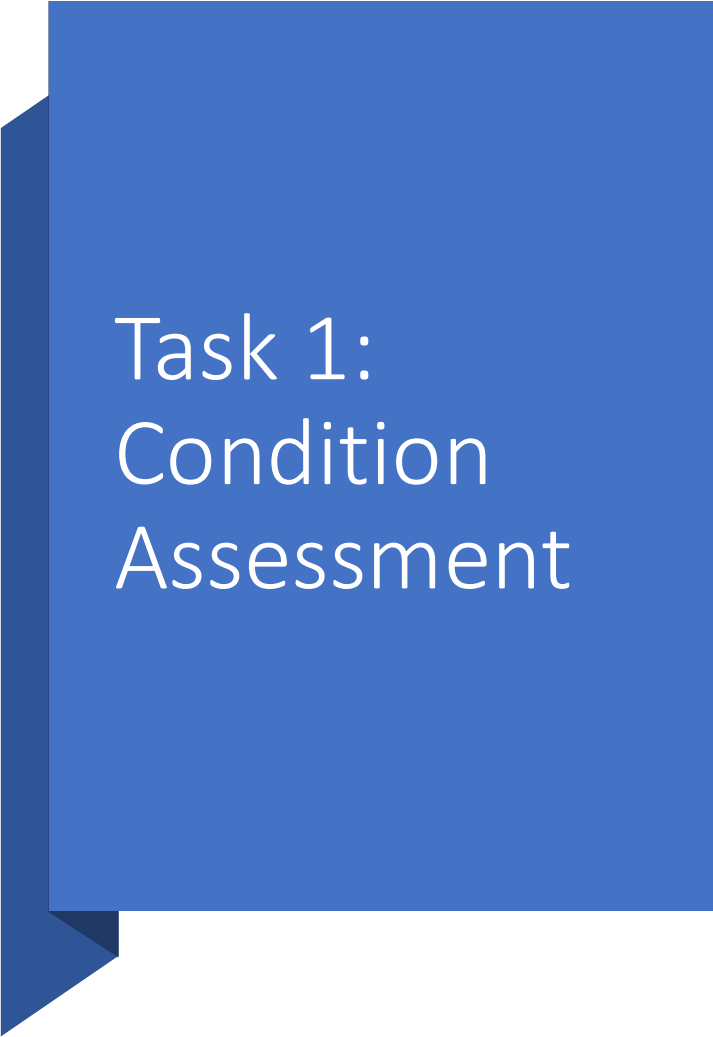
Table 2-11

# Task 1: Condition Assessment

### Asset Spreadsheet Tool

Facility/System (Location, City/Work)	Process (City/Work)	Discipline	Asset Group	Asset	Installation Date	Years in Service	Adjusted RUL	RUL	Life Cycle Rating	Overall Condition Score (1 - 5)	Physical Condition (1-4)	Physical Condition Notes	Performance Condition Rating (1-4)	Performance Condition Notes	Criticality (1-4)	Regulatory Compliance (1 - 3)	Level of Service (1 - 3)	Safety (1 - 5)	Financial (O&M) Impacts	Redundancy (1-4)	Risk Score (1-15)	
Water Filtration Plant	Production	Electrical	Chemical Bldg. Feed	na	1980	44	38	17	87%	2	2		3							3	4	
Water Filtration Plant	Production	Electrical	Fluoride Bldg. Feed	na	1980	44	32	17	87%	2	2		3							3	4	
Water Filtration Plant	Production	HydAC	Chemical Bldg. HVAC	na	1980	44	18	-3	87%	2	2	4-5 unit outside chemical room	3							3	4	
Water Filtration Plant	Production	HydAC	Fluoride Bldg. HVAC	na	1980	44	21	18	-3	87%	2		3							3	4	
Water Filtration Plant	Production	Process Equipment	Chlorine P. System	na	1980	44	14	14	87%	2	2		3							3	4	
Water Filtration Plant	Production	Process Equipment	Sodium Hypo System	na	2014	10	11	8	87%	2	2		3							3	4	
Water Filtration Plant	Production	Process Equipment	Aqua System	na	1980	44	13	-4	87%	3	3		3							3	4	
Water Filtration Plant	Production	Process Equipment	Fluoride System	na	1980	44	11	-4	87%	3	3		3							3	4	
Water Filtration Plant	Production	Process Equipment	Waterman System	na	1980	44	13	13	87%	2	2		3							3	4	
Water Filtration Plant	Production	Process Equipment	Sodium Hydrox System	na	1980	44	11	-4	87%	3	3		3							3	4	
Water Filtration Plant	Production	Process Equipment	Protonated Acid Addition System	na	1980	44	11	-4	87%	3	3		3	reliability improvements ongoing						3	4	
Water Filtration Plant	Production	Process Equipment	Flocculation II	na	1980	44	22	4	87%	2	2		3							3	4	
Water Filtration Plant	Production	Process Equipment	Flocculation II	na	1980	44	18	25	4	87%	2		3							3	4	
Water Filtration Plant	Production	Process Equipment	Coag. Mfg. II	na	1980	44	13	23	4	87%	2		3							3	4	
Water Filtration Plant	Production	Process Equipment	Coag. Mfg. II	na	1980	44	13	23	4	87%	2		3							3	4	
Water Filtration Plant	Production	Building	Fluoride Mfg.	na	1980	44	48	21	87%	2	2		3							3	4	
Water Filtration Plant	Production	Building	Chemical Bldg.	na	1980	44	53	53	87%	2	2		3							3	4	
Water Filtration Plant	Production	Roof	Chemical Bldg. Roof	na	2014	10	11	8	87%	2	2		3							3	4	
Water Filtration Plant	Production	Roof	Fluoride Bldg. Roof	na	2000	24	38	30	87%	2	2		3							3	4	
Water Filtration Plant	Production	Process Tank	Flocculator Basin II	na	1980	44	23	3	87%	2	2		3							3	4	
Water Filtration Plant	Production	Process Tank	Flocculator Basin II	na	1980	44	23	3	87%	2	2		3							3	4	
Water Filtration Plant	Production	Electrical	South Power Zone House	MOCC 5 Electrical	1980	44	38	17	86%	2	2		3							3	4	
Water Filtration Plant	Production	Electrical	North Power Zone House	MOCC 5 Electrical	1980	44	38	17	86%	2	2		3							3	4	
Water Filtration Plant	Production	Electrical	South Power Zone House	MOCC 5 Electrical	1980	44	38	17	86%	2	2		3							3	4	
Water Filtration Plant	Production	Electrical	South Power Zone House	MOCC 5 Electrical	1980	44	38	17	86%	2	2		3							3	4	
Water Filtration Plant	Production	Process Equipment	Clarifier Basin #1	Inclined Plate Settlers	1980	44	22	3	84%	2	2		3	Capacity - Clarifier performance was reliable at higher flow rates or under certain WQ conditions. O&M - challenges with cleaning plates	3	2	3	1	3	1	4	
Water Filtration Plant	Production	Process Equipment	Clarifier Basin #2	Inclined Plate Settlers	1980	44	22	3	84%	2	2		3	Capacity - Clarifier performance was reliable at higher flow rates or under certain WQ conditions. O&M - challenges with cleaning plates	3	2	3	1	3	1	4	
Water Filtration Plant	Production	Process Equipment	Clarifier Basin #3	Inclined Plate Sett	1980	44	22	3	84%	2	2		3	Capacity - Clarifier performance was reliable at higher flow rates or under certain WQ conditions. O&M - challenges with cleaning plates	3	2	3	1	3	1	4	
Water Filtration Plant	Production	Process Equipment	Clarifier Basin #4	Inclined Plate Settlers	1980	44	22	3	84%	2	2		3	Capacity - Clarifier performance less reliable at higher flow rates or under certain WQ conditions. O&M - challenges with cleaning plates	3	2	3	1	3	1	4	
Water Filtration Plant	Production	Process Equipment	Clarifier Basin #1	Gauge Vacuum System	1980	44	18	-1	84%	2	2		3							3	4	
Water Filtration Plant	Production	Process Equipment	Clarifier Basin #2	Gauge Vacuum System	1980	44	18	-1	84%	2	2		3							3	4	
Water Filtration Plant	Production	Process Equipment	Clarifier Basin #3	Gauge Vacuum System	1980	44	18	-1	84%	2	2		3							3	4	
Water Filtration Plant	Production	Process Equipment	Clarifier Basin #4	Gauge Vacuum System	1980	44	18	-1	84%	2	2		3							3	4	
Water Filtration Plant	Production	Process Equipment	South Power Zone House	Flas Val. Compressor System	1980	44	18	-1	84%	2	2		3							3	4	
Water Filtration Plant	Production	Process Equipment	North Power Zone House	Flas Val. Compressor System	1980	44	18	-1	84%	2	2		3							3	4	
Water Filtration Plant	Production	Process Equipment	South Power Zone House	MOCC 5 Electrical	1980	44	38	17	86%	2	2		3							3	4	
Water Filtration Plant	Production	Building	North Power Zone House	Building	1980	44	38	17	86%	2	2		3							3	4	
Water Filtration Plant	Production	Roof	South Power Zone House	Roof	1980	44	38	17	86%	2	2		3							3	4	
Water Filtration Plant	Production	Process Tank	Clarifier Basin #1	Clarifier Basin	1980	44	33	13	84%	2	2		3							3	4	
Water Filtration Plant	Production	Process Tank	Clarifier Basin #2	Clarifier Basin	1980	44	33	13	84%	2	2		3							3	4	
Water Filtration Plant	Production	Process Tank	Clarifier Basin #3	Clarifier Basin	1980	44	33	13	84%	2	2		3							3	4	
Water Filtration Plant	Production	Process Tank	Clarifier Basin #4	Clarifier Basin	1980	44	33	13	84%	2	2		3							3	4	
Water Filtration Plant	Filtration	Electrical	Electrical	na	1980	44	38	38	23%	2	2		3							3	4	
Water Filtration Plant	Filtration	HydAC	HydAC	na	1980	44	18	-3	87%	2	2	11 - equipment at lower level	3							3	4	
Water Filtration Plant	Filtration	Process Equipment	Flas #1	na	1980	44	22	20	-3	23%	4	underdrains	4	control panels - difficult to get spare parts						3	1	3
Water Filtration Plant	Filtration	Process Equipment	Flas #2	na	1980	44	20	20	-3	23%	4	underdrains	4	control panels - difficult to get spare parts						3	1	3
Water Filtration Plant	Filtration	Process Equipment	Flas #3	na	1980	44	20	20	-3	23%	4	underdrains	4	control panels - difficult to get spare parts						3	1	3
Water Filtration Plant	Filtration	Process Equipment	Flas #4	na	1980	44	20	20	-3	23%	4	underdrains	4	control panels - difficult to get spare parts						3	1	3
Water Filtration Plant	Filtration	Process Equipment	Flas #5	na	1980	44	22	22	-3	23%	4	underdrains	4	control panels - difficult to get spare parts						3	1	3
Water Filtration Plant	Filtration	Process Equipment	Flas #6	na	1976	48	22	22	-3	23%	4	underdrains	4	control panels - difficult to get spare parts						3	1	3
Water Filtration Plant	Filtration	Process Equipment	Flas #7	na	1980	44	20	20	-3	23%	4	underdrains	4	control panels - difficult to get spare parts						3	1	3
Water Filtration Plant	Filtration	Process Equipment	Flas #8	na	1980	44	20	20	-3	23%	4	underdrains	4	control panels - difficult to get spare parts						3	1	3
Water Filtration Plant	Filtration	Process Equipment	Process Island	na	1980	44	20	20	-3	23%	4	underdrains	4	control panels - difficult to get spare parts						3	1	3
Water Filtration Plant	Filtration	Building	1980 Building	na	1979	45	48	-1	23%	2	2	Clarifier 20%	3	New replacement panels - difficult to get spare parts						3	1	3





# Task 1: Condition Assessment

## 2022 Deliverables

- PowerPoint Presentation
- Technical Memorandum
  - Updated Summary of Recommendations (Table 2-11)
  - Updated Asset Spreadsheet Tool

# Task 2: Process Evaluation

Lehigh County Authority

## **WATER PLANT PROCESS OPTIMIZATION REPORT**

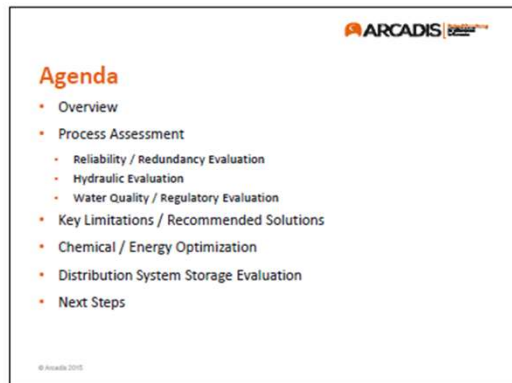
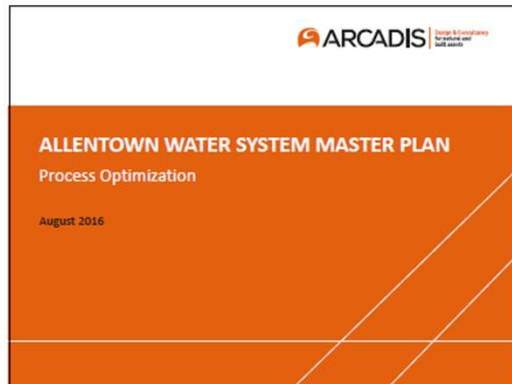
Allentown Water Master Plan

March 2017

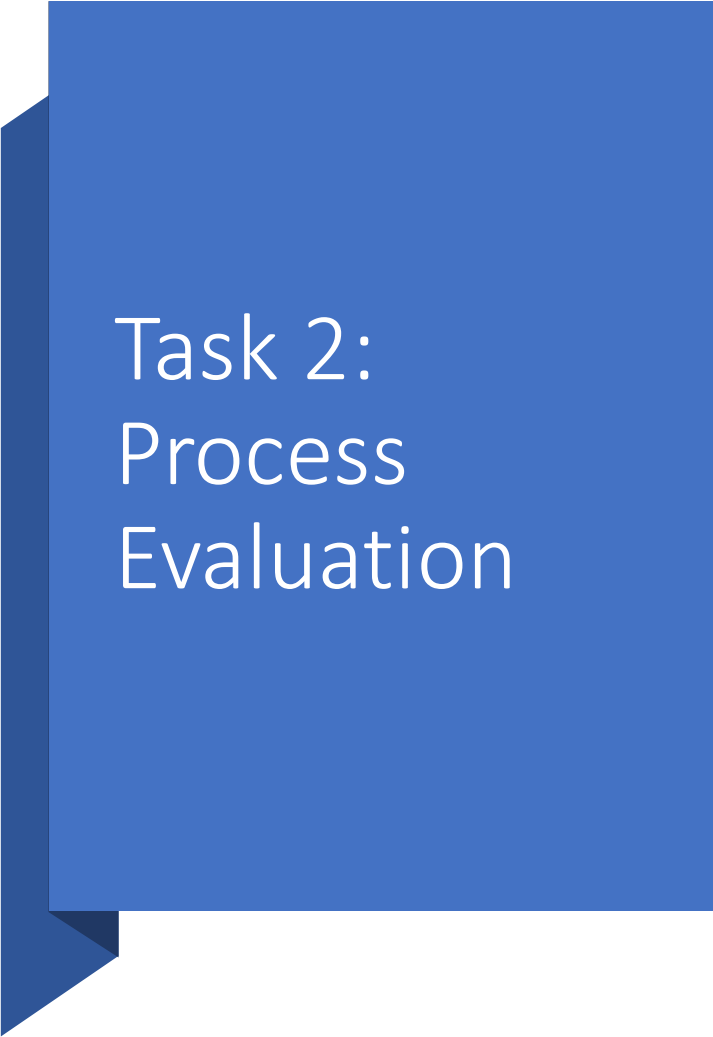
## Task 2: Process Evaluation

### Background

- Main Objectives: Identify existing and potential future process limitations =
  - Reliability, hydraulic capacity, water quality, regulatory compliance
  - Determine if operations improvements or low-cost modifications could address issue
  - Provide recommendations for overall reliability and efficiency
  - Identify opportunities to reduce energy usage and chemical costs
- When: Findings presented to LCA Staff in August 2016
- Where: Water Filtration Plant, Distribution System Storage Evaluation



## Task 2: Process Evaluation



## Task 2: Process Evaluation

### 2022 Deliverables

- PowerPoint Presentation
- Technical Memorandum
  - Updated Summary of Operational and/or Water Quality Evaluations
  - Various desktop assessments and evaluations as needed

# Task 3: Capital Improvement Plan



Lehigh County Authority

## **ALLENTOWN WATER MASTER PLAN** Capital Improvement Plan

August 2017



## Task 3: Capital Improvement Plan

### Background

- Main Objectives: Incorporate results from Task 1 and 2 into a prioritized CIP (including preparations of opinions of probable project costs)
- When: August 2017
- Where: Water Filtration Plant, distribution reservoirs, storage tanks, pump stations

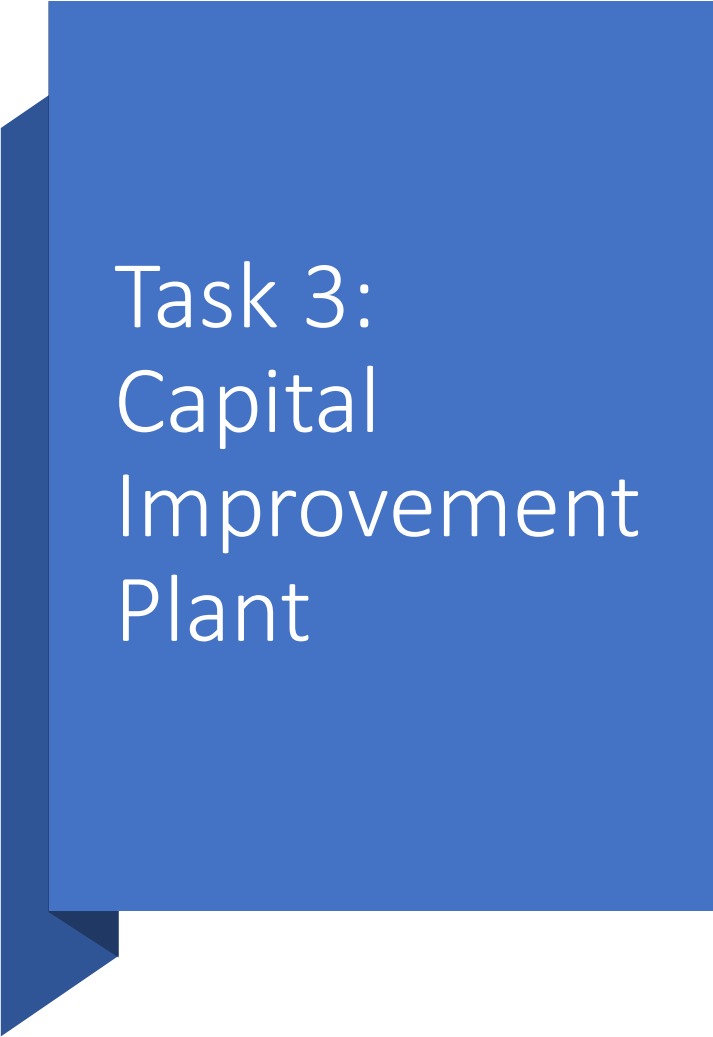
Project	Near Term		Mid Term	Long Term
	Yrs 0-5 2020 Dollars	Yrs 5-10 2025 Dollars	Yrs 10-25 2035 Dollars	Yrs 25-50 2055 Dollars
<b>Water Filtration Plant</b>				
Filter Upgrades	\$ 12,000,000			\$ 16,000,000
Pretreatment / Sedimentation		\$ 1,500,000	\$ 21,500,000	
High Lift VFDs/Pumps	\$ 6,000,000			\$ 8,000,000
Elec Improvements/Pumps		\$ 7,000,000		\$ 8,000,000
Auxiliary Generator		\$ 2,500,000		\$ 3,000,000
Big Lehigh Screens and PAC	\$ 5,500,000			\$ 7,500,000
Little Lehigh Intake and Screens <sup>4</sup>	\$ 2,000,000	\$ 7,500,000		\$ 11,000,000
Ultraviolet Disinfection			\$ 12,000,000	
Security Improvements		\$ 500,000		
CO <sub>2</sub> Feed System <sup>5</sup>	\$ 300,000			
Concrete/Brick Repairs <sup>6</sup>	\$ 800,000			
SCADA Replacement <sup>7</sup>	\$ 750,000		\$ 1,000,000	\$ 2,000,000
Watershed Control Plan	\$ 100,000			
<b>Pump Stations</b>				
			\$ 7,500,000	\$ 6,000,000
<b>Reservoirs and Tanks</b>				
	\$ 3,000,000			
Rehab Buried Concrete Reservoirs				\$ 46,000,000
Rehab Tanks and Reservoirs			\$ 4,000,000	\$ 6,000,000
<b>Roof Replacements<sup>8</sup></b>				
	\$ 900,000		\$ 1,000,000	\$ 6,000,000
<b>Total</b>	<b>\$ 31,400,000</b>	<b>\$ 19,000,000</b>	<b>\$ 47,000,000</b>	<b>\$ 119,500,000</b>

**Notes:**

1. Project costs have been escalated at an annual 3% inflation rate.
2. Estimates are consistent with an AACE Class 5 construction cost estimate. AACE Class 5 estimates are typically accurate on the low range between -20% & -50% and on the high range between +30% & +100%.
3. Project costs include construction, design engineering and bidding, engineering during construction, and legal/financial/administration.
4. Screen housing estimate provided by LCA based on experience with similar work. Does not include engineering or legal/financial/administration.
5. Cost based on Technical Memorandum, pH chemical evaluation, May 2017.
6. Project cost based on LCA Indentured Services Report 2017
7. Near term (0-5 year) project cost provided by LCA.
8. Near term (0-5 Year) project costs based on 2017-2021 CIP.

## Task 3: Capital Improvement Plan






## Task 3: Capital Improvement Plant

### 2022 Deliverables

- Updated CIP Schedule and Project Costs
- Updated CIP Project Descriptions
- Updated Summary of Anticipated Permits per Project

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## 2022 Next Steps

### Next Steps

- Complete Tasks #1-3 for the Master Plan Update
- Presentation to the LCA Board
- Anticipated Completion: July or August 2022

# Authorization Requested 1/10/2022

**Prior Authorization:** 2016-2017 Authorization for the first Allentown WFP Master Plan development.

**This Authorization:** 2022 Allentown WFP Master Plan development.

See attached Board Memo for further project details.

## **Authorization Status:**

Requested This Authorization	
<i>Design Phase</i>	
Staff	\$15,000
Contractor	\$0
Engineering Consultant	\$85,000
Contingency	\$10,000
<b>Total This Authorization</b>	<b>\$110,000</b>
Prior Authorization	
\$295,000	
<b>Subtotal (Both Authorizations)</b>	<b>\$405,000</b>
<i>Future Authorizations (2027)</i>	
TBD	

QUESTIONS?

