LCA Main Office:
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Wescosville, PA 18106
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Agendas & Minutes Posted:
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LEHIGH COUNTY AUTHORITY

Published: October 17, 2022

BOARD MEETING AGENDA – October 24, 2022 – 12:00 p.m.

In-Person or Virtual Meeting Attendance Options Available: Meetings of the LCA Board of Directors will be held at LCA's Main Office as well as online using the Zoom Meetings application, which includes a telephone option. Public participation is welcomed both in-person or virtually. Instructions for joining the meeting online or by phone are posted on the LCA website in the morning on the day of the meeting, prior to the start of each meeting. You may also issue comment to LCA via email to LCABoard@lehighcountyauthority.org in advance of any meeting or view the meeting at a later time by visiting the LCA website. Please visit https://www.lehighcountyauthority.org/about/lca-board-meeting-videos/ for specific instructions to join the meeting if you are attending virtually. If attending in-person at LCA's Main Office, please follow all safety and sanitation protocols posted.

1. Call to Order
   - NOTICE OF MEETING RECORDINGS

     Meetings of Lehigh County Authority's Board of Directors that are held at LCA's Main Office at 1053 Spruce Road, Wescosville, PA, may be recorded for viewing online at lehighcountauthority.org. Recordings of LCA meetings are for public convenience and internal use only and are not considered as minutes for the meeting being recorded, nor are they part of public record. Recordings may be retained or destroyed at LCA's discretion.
   - *Public Participation Sign-In Request*
2. Review of Agenda / Executive Sessions
   - Additions to Agenda (vote required if action will be taken)
3. Approval of Minutes
   - *October 10, 2022 Board meeting minutes*
4. Public Comments
5. Action / Discussion Items:

   FINANCE AND ADMINISTRATION
   - *Suburban Water Rate Study – Preliminary Review (Presentation & Discussion)* ***(yellow)*** *(digital Board packet, pages 8-18)*
   - *2023 Budget – Final Review (Approval)* ***(gray)*** *(digital Board packet, pages 19-24)*
   - *LCA Strategic Plan – 2022 Quarterly Progress Reporting (Discussion)* ***(blue)*** *(digital Board packet, pages 25-30)*
   - *Asset Management Roadmap & Strategic Asset Management Plan (Approval)* ***(white)*** *(digital Board packet, pages 31-105)*

   WATER

   WASTEWATER
6. Monthly Project Updates / Information Items (1st Board meeting per month)
7. Monthly Financial Review (2nd Board meeting per month) **- September report to be distributed at a later date**

8. Monthly System Operations Overview (2nd Board meeting per month) (digital Board packet, page 106) **– September report attached**
9. Staff Comments
10. Solicitor's Comments
11. Public Comments / Other Comments
12. Board Member Comments
13. Executive Sessions
14. Adjournment

UPCOMING BOARD MEETINGS		
November 14, 2022	November 28, 2022	December 12, 2022

PUBLIC PARTICIPATION POLICY

In accordance with Authority policy, members of the public shall record their name, address, and discussion item on the sign-in sheet at the start of each meeting; this information shall also be stated when addressing the meeting. During the Public Comment portions of the meeting, members of the public will be allowed 5 minutes to make comments/ask questions regarding non-agenda items, but time may be extended at the discretion of the Chair; comments/questions regarding agenda items may be addressed after the presentation of the agenda item. Members of the public may not request that specific items or language be included in the meeting minutes.

REGULAR MEETING MINUTES
October 10, 2022

Notice of Preparation of Authority Meeting Minutes: Authority staff who are in attendance at each Authority Board meeting prepare a draft of the Minutes, which are subsequently distributed to all Board members for review. Board members may offer corrections prior to a vote of the full Board of Directors to approve the Minutes.

The Regular Meeting of the Lehigh County Authority Board of Directors was called to order at 12:08 p.m. on Monday, October 10, 2022, Vice Chairman Scott Bieber presiding. The meeting was hybrid via in-person and video and audio advanced communication technology ("ACT"), using the Zoom internet application, including telephone option. Each Board member and other attendees of the meeting were able to hear each other attendee and be heard by each other attendee. The public could also participate in the meeting in-person or via ACT, using the Zoom internet application, including telephone option. A Roll Call of Board members present was taken. Scott Bieber, Richard Bohner, Norma Cusick, Ted Lyons, Kevin Baker, and Jeff Morgan were present for the duration of the meeting. Subsequent to commencement of the meeting, Brian Nagle entered the meeting at the time noted below, and was thereafter present for the remainder of the meeting.

Solicitor Michael Gaul of KingSpry was present along with Authority Staff, Liesel Gross, Ed Klein, Chris Moughan, Chuck Volk, Andrew Moore, Phil DePoe, Susan Sampson, and Lisa Miller.

Vice Chairman Bieber announced there was an Executive Session prior to the regular meeting to discuss potential litigation and legal advice from the Solicitor.

Vice Chairman Bieber announced that the Board received their electronic and hard copies of the Board packet in advance and asked if anyone did not receive their copy of the packet. A copy of the packet is also available online.

REVIEW OF AGENDA

Liesel Gross announced that there are no changes or additions to the agenda; however, there will be an Executive Session at the close of the regular meeting to discuss potential real estate acquisition and other matters with the Solicitor.

APPROVAL OF MINUTES

September 12, 2022 Meeting Minutes

Richard Bohner noted an error on a vote count related to the LCA Munis ERP System Planning & Re-Implementation item, as Linda Rosenfeld's yes vote was missing. On a motion by Richard Bohner, seconded by Norma Cusick, the Board approved the minutes of the September 12, 2022, Board meeting as amended (6-0).

September 19, 2022 Meeting Minutes

Richard Bohner noted some grammatical errors. On a motion by Jeff Morgan, seconded by Norma Cusick, the Board approved the minutes of the September 19, 2022, Board meeting as corrected (4-0). Ted Lyons and Scott Bieber abstained.

PUBLIC COMMENTS

None.

Brian Nagle entered the meeting at 12:15 p.m.

2023 Preliminary Budget Review

Liesel Gross announced that today's presentation is focused on reviewing the preliminary 2023 Budget figures with some recent changes made since the previous review. The draft 2023 Budget that was distributed for today's meeting includes the most current proposed budget figures. Rates will also be discussed at today's meeting.

A presentation was shared with the Board to review the draft of the 2023 Budget. Ed Klein reviewed the summary, providing highlights on the operating and capital expenses, cash flows, and fund balances. Assumptions in the Internal Service budget have not changed since the first preliminary review.

The Suburban Water Division budget changed mostly in capital expenses to reflect the allocation of administrative capital projects across all Authority funds. He also noted minor changes to the way invested funds will be managed in 2023. Ted Lyons asked about depreciation, how it is calculated, and how many assets are past their useful life. Mr. Klein explained that asset depreciation is calculated using accepted government accounting standards and a schedule of expected useful life of each asset type. He said he could provide additional information on remaining useful life of the assets according to these depreciations tables if the Board would like to see that.

Liesel Gross commented that the Suburban Water Rate Study is currently being conducted with preliminary rates to be presented at the October 24th meeting. The public comment period for the 2023 rates is November 1st through January 1st, 2023.

Mr. Klein then reviewed the Suburban Wastewater Division budget changes, noting that the capital expenses increased from the last presentation due to the addition of the allocated costs for administrative capital projects. Liesel Gross commented on the rates, noting that wastewater rates impacting the Authority's direct customers will not change in 2023. However, the Western Lehigh sewer rates charged to the Authority's municipal signatories will be increased, and these rate changes will be reviewed later in this meeting with the presentation of the Western Lehigh Interceptor User Charge Report.

For the City Division, Mr. Klein stated the operating expenses have not changed since the previous review. Capital expenses were increased by $1.7 million due to allocation of costs for the administrative capital projects. Ms. Gross reviewed the preliminary 2023 rates for the City Division, which are developed based on formulas included the City of Allentown Water & Sewer Lease Agreement. The volume and flow charges will increase 10.1 percent. Additional rates are added for Capital Cost Recovery as well as Administrative Order charges that are turned back to the City. Since the inception of the lease, almost $34 million of major capital projects have been completed and a cost recovery charge is included in the charge on customers bills. The overall impact of these rate changes will be about $19.55 per quarter for the average residential customer in Allentown. Ms. Gross explained that these preliminary rates have been submitted to the City's Office of Compliance for review and will be presented for Board approval in November.

There was some Board discussion regarding City rates and the cost components, including debt service on the 2013 Lease bonds.

Mr. Klein reviewed the next steps that include the upcoming Suburban Wastewater signatory user charge report, the Suburban water rate study, and reporting any changes to the final Budget.

Ms. Gross asked the Board to review the draft 2023 Budget and submit any questions to her prior to the next meeting on October 24th so the responses can be incorporated into the final presentation of the Budget.

Western Lehigh Interceptor User Charge Report

Jennifer Montero, the Authority's Contracts Administrator, presented the 2023 Wastewater User Charge Report explaining the derivation of the various billing rates that are charged to the users of the Western Lehigh Interceptor, Little Lehigh Relief Interceptor Phase 1, and Little Lehigh Relief Interceptor Phase 2. The rate calculation reflects the actual 2023 capital spending being recovered in the calendar year through the rates. For 2023, the rates increases will have the impact of increasing charges to an average residential customer by 16%.

Liesel Gross commented that the rates shown in this report are charged to the municipalities. The municipalities then determine their own sewer rates to their customers, so the rate impact calculated in this report may be different depending on the actual municipal sewer rates applied to the customers. The municipalities received this User Charge Report in September and no comments were received.

There was some Board discussion regarding rate impact and format of the report. Jennifer Montero explained that the report format is a requirement of the intermunicipal agreements, so it cannot be changed significantly. However, she has worked with the municipalities to provide other supplemental information that helps them to understand the Authority's wastewater expenses.

Liesel Gross explained that the rates included in the User Charge Report are used as the basis of the 2023 Budget figures that were presented earlier in the meeting. The staff asks for preliminary approval of the rates so the municipalities can move forward with their own wastewater budgeting process.

On a motion by Ted Lyons, seconded by Jeff Morgan, the Board approved the 2023 WLI, LLRI-Phase 1 and Phase 2 User Charges (7-0).

Kline's Island WWTP: Disinfection and Dechlorination System Improvements

Chuck Volk gave an overview of the history of the sodium hypochlorite project, which was initiated in 2020 to eliminate the use of gaseous chlorine at the Kline's Island Wastewater Treatment Plant. As part of the project, a temporary hypochlorite effluent disinfection system was constructed along with the permanent tank mixers. These components were placed into service in early 2021 to allow for demolition and removal of the gaseous chlorine system. The permanent hypochlorite system and pumps were anticipated to be constructed after the demolition and removal of the gaseous chlorine system. However, operational difficulties were encountered with the use of the new hypochlorite system, specifically in balancing the required fecal coliform kill with the required residual chlorine concentration in the final plant effluent. Completion of the project was paused pending a detailed hydraulic study of the chlorine contact tank.

Bryan Geissel, project engineer, described some of the operational difficulties and troubleshooting that occurred to find a permanent solution. To achieve the correct balance of fecal coliform kill and reduced chlorine residual in the plant effluent, a dechlorination system would be required. Mr. Volk explained that dechlorination prior to discharge of treated water is very common with hypochlorite systems, and is likely to become a future permit requirement. Adding the dechlorination system now

is beneficial to achieving both current and future permit requirements. The Pa. Department of Environmental Protection (DEP) was engaged to review the Authority's plans, and the operations staff conducted a dechlorination system pilot study this summer. The pilot study was successful, and DEP has approved the design for a permanent dechlorination system. Therefore, the project will resume with the construction of the dechlorination system, demolition of the gaseous chlorine system, and construction of the permanent hypochlorite system.

There was some Board discussion regarding the cost and scope of the project. Mr. Volk explained that the engineers and staff did not anticipate the difficulties with the hypochlorite system as originally designed; however, because the dechlorination system is a future permit requirement, the solution is appropriate and achieves the project's goals.

On a motion by Ted Lyons, seconded by Jeff Morgan, the Board approved the Capital Project Authorization for the Construction Phase in the amount of $843,403.65 which includes the Professional Services Authorization to D'Huy Engineering, Inc. in the amount of $58,500.00, the General Contract Award to LB Industries, Inc. in the amount of $495,509.85, and the Electrical Contract Award to Diefenderfer Electric Contractors, Inc. in the amount of $214,393.80 (7-0).

KISS System Modeling – Preliminary Screening of Alternatives (PSOA)

Phil DePoe gave a presentation regarding the Preliminary Screening of Alternatives (PSOA) project for the preparation of Kline's Island Sewer System updated Act 537 plan. The objectives of the project are to eliminate sanitary sewer overflow, eliminate Outfall 003 at the Kline's Island Wastewater Treatment Plant, and achieve the desired dry-day and wet-weather operating guidelines for the interceptors and trunklines as established by the municipalities.

Mr. DePoe reviewed each task in the proposal provided by Arcadis, highlighting the different scenarios that will be modeled, and the data and deliverables. There was some discussion about the alternatives to be analyzed and the future work included in the Act 537 Plan development process.

On a motion by Jeff Morgan, seconded by Norma Cusick, the Board approved the Capital Plan Authorization for the Preliminary Screening of Alternatives – Planning Phase in the amount of $454,000.00 which includes the Professional Services Authorization to Arcadis in the amount of $404,000.00 (7-0).

MONTHLY PROJECT UPDATES / INFORMATION ITEMS

Liesel Gross highlighted the October 2022 items that will be coming up at the next meeting.

STAFF COMMENTS

None.

SOLICITOR'S COMMENTS

None.

PUBLIC COMMENTS / OTHER COMMENTS

None.

BOARD MEMBER COMMENTS

Richard Bohner commented on The Morning Call article regarding the Penn Environment report regarding the Lehigh River water quality. Liesel Gross said the Authority did not reach out to the group with comments but staff have reviewed the report. There was some discussion.

EXECUTIVE SESSION

There will be an Executive Session after the regular meeting to discuss matters of real estate acquisition. No action is expected.

ADJOURNMENT

There being no further business, the Chairman adjourned the meeting at 1:49 p.m.

Richard Bohner
Secretary

Lehigh County Authority

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MEMORANDUM

TO: LCA Board of Directors
FROM: Liesel Gross, Chief Executive Officer
DATE: October 17, 2022
RE: Suburban Water Division – Water Rate Study

Attachment: Suburban Water Rate Study Results: 2023-2027

In many of Lehigh County Authority's service areas, rates that are charged to LCA customers are calculated based on formulas established in legal contracts or agreements. For example, the City of Allentown Water & Sewer Lease Agreement includes a specific formula for calculating the rates applied to our water and sewer customers who live in the City. Other rates are calculated based on formulas and methods included in the intermunicipal agreements that govern the operation of the Kline's Island Sewer System and the Western Lehigh Interceptor.

Where there is no agreement dictating LCA's rate calculations, we apply "cost of service" principles established by industry associations such as the American Water Works Association to develop LCA's rate structures. Further, we must meet the definitions and requirements of the Pa. Municipality Authorities Act (the Act) for "uniform and reasonable" rates.

For the approximately 20,000 residential, commercial, and industrial customers who receive water service via LCA's Suburban Water Division, our water rates are not calculated on the basis of any pre-existing contracts or agreements. Therefore, rate studies are conducted on multi-year intervals to calculate LCA's water rate based on the cost of providing service to different customer classes. In addition, the study offers a third-party review of LCA's rate structure to determine if it meets the statutory requirements of the Act, since rate adjustments are made in the intervening years between studies.

LCA last conducted a rate study in 2017 for the rates to be applied in 2018 through 2022. Since that time, LCA's cost structure for its Suburban Water Division has changed significantly due to changes in the cost of water purchased from the City of Allentown and a shift toward more recurring system improvements such as water main replacements. In the last two years, more significant rate increases were required to keep pace with these changing costs.

David Busch from Keystone Alliance Consulting conducted the attached 2023-2027 rate study on LCA's behalf, and he will attend the October 24, 2022 Board meeting to review results. Pending Board review and discussion, the 2023 rates outlined in the attached study report will be distributed to key stakeholders for review and comment, and incorporated into the rate approval request that will be presented to the Board in November.

TABLE 1
LEHIGH COUNTY AUTHORITY
PROJECTED REVENUE REQUIREMENT UNDER PRESENT RATES

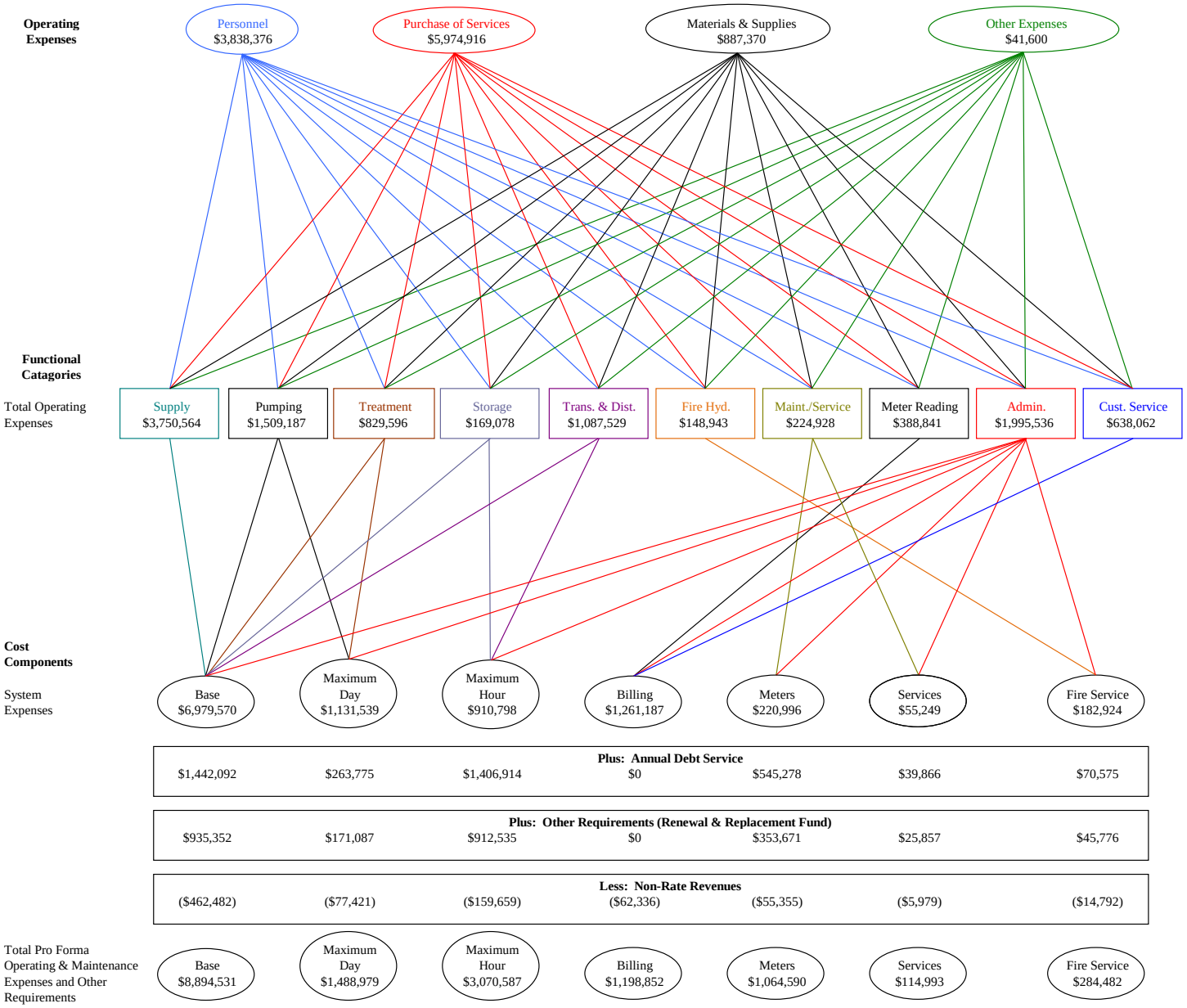
	2022 BASE YEAR	PROJECTED 2023	2024	2025	2026	2027
OPERATING EXPENSES						
Personnel	$3,135,718	$3,838,376	$3,953,530	$4,072,140	$4,194,300	$4,320,120
Purchase Of Services	6,112,353	5,974,916	6,154,160	6,338,800	6,528,950	6,724,810
Materials & Supplies	816,837	887,370	913,980	941,410	969,660	998,760
Other Expenses	0	41,600	42,850	44,140	45,460	46,820
TOTAL OPERATING EXPENSES	$10,064,908	$10,742,262	$11,064,520	$11,396,490	$11,738,370	$12,090,510
		6.73%				
CAPITAL EXPENDITURES BUDGET						
Annual Projects	$662,500					
Water Main Replacements	2,400,000					
Additional(Redundant) Water Supply - Small Satellite Divisions	50,000					
Fixed Base Metering Reading System	100,000					
North Whitehall Division System Improvements Study Phase	25,000					
Arcadia Water Tank Replacement	400,000					
CLD Well Improvements and Capacity Study	100,000					
Water Meter Replacement Program	450,000					
Upper System Pump Station and Water Main (New)	200,000					
SCADA	1,100,000					
TOTAL CAPITAL EXPENDITURES BUDGET	$5,487,500	$6,751,000	$6,480,000	$5,330,000	$3,760,000	$3,600,000
LESS TAPPING AND CAPITAL RECOVERY FEES	$469,295	$356,400	$469,295	$469,295	$469,295	$469,295
LESS PORTION FUNDED VIA BORROWING	3,075,000	3,950,323	4,455,000	699,677		
NET CAPITAL EXPENDITURES BUDGET	$1,943,205	$2,444,277	$1,555,705	$4,161,028	$3,290,705	$3,130,705
DEBT SERVICE						
Future Debt	$0	$0	$0	$0	$0	$0
Financing Fees	2,750	2,750	2,750	2,750	2,750	2,750
Debt Retirement	1,925,177	2,010,541	2,081,689	2,167,856	1,969,039	2,280,241
Interest Expense	1,200,301	1,320,356	1,403,499	1,463,928	1,376,987	1,296,186
Coverage	468,822	499,634	522,778	544,768	501,904	536,464
Less: Debt Service Reductions	(50,125)	(64,782)	(50,125)	(50,125)	(50,125)	(50,125)
TOTAL DEBT SERVICE	$3,546,925	$3,768,499	$3,960,591	$4,129,177	$3,800,555	$4,065,516
TOTAL REVENUE REQUIREMENT	$15,555,038	$16,955,038	$16,580,816	$19,686,695	$18,829,630	$19,286,731

TABLE 1
LEHIGH COUNTY AUTHORITY
PROJECTED REVENUE REQUIREMENT UNDER PRESENT RATES

	2022 BASE YEAR	PROJECTED 2023	2024	2025	2026	2027
NON-OPERATING REVENUES						
Site Visit Turn-On Charges	$11,313	$11,313	$11,313	$11,313	$11,313	$11,313
Penalties	108,071	138,000	94,711	94,711	94,711	94,711
Lien Fees	901	901	901	901	901	901
Reimbursement Of Lab Costs	0	0	0	0	0	0
Other Water Sales	89,558	93,200	89,558	89,558	89,558	89,558
Meter Sales	87,439	71,300	87,439	87,439	87,439	87,439
Inspection, Plan Review, and Project Reimbursements	376,744	253,000	376,743	376,743	376,743	376,743
Other Income	33,078	31,800	33,078	33,078	33,078	33,078
Arcadia Private Fire Service Revenue	238,510	238,510	238,510	238,510	238,510	238,510
TOTAL NON-OPERATING REVENUES	$945,614	$838,024	$932,253	$932,253	$932,253	$932,253
NET REVENUE REQUIREMENT	$14,609,424	$16,117,014	$15,648,563	$18,754,442	$17,897,377	$18,354,478
OPERATING REVENUES						
Residential	$6,561,433	$6,700,193	$6,836,007	$6,974,407	$7,115,440	$7,260,031
Commercial	1,916,026	1,944,740	1,974,808	2,005,549	2,036,749	2,066,918
Industrial	3,444,224	3,495,149	3,547,908	3,601,543	3,656,068	3,712,166
Institutional	132,634	134,385	136,395	138,444	140,533	142,549
Large Industrial	1,839,461	1,866,759	1,895,013	1,923,736	1,952,936	1,982,978
Private - Fire Protection	716,369	720,022	728,666	738,034	744,953	744,953
Public - Fire Protection	456,385	456,385	456,385	456,385	456,385	456,385
TOTAL OPERATING REVENUES	$15,066,532	$15,317,634	$15,575,183	$15,838,099	$16,103,064	$16,365,980
SURPLUS / (DEFICIT)	$457,108	($799,380)	($73,381)	($2,916,343)	($1,794,313)	($1,988,498)
DEFICIT AS A PERCENT OF OPERATING REVENUES		5.22%	0.47%	18.41%	11.14%	12.15%
DEBT SERVICE COVERAGE	193.38%	165.74%	158.45%	150.04%	160.71%	147.68%

FIGURE 1
LEHIGH COUNTY AUTHORITY

ALLOCATION TO FUNCTIONAL CATAGORIES
AND COST FUNCTIONS
FOR FISCAL YEAR 2023



COMMON RATE DIVISION

TABLE 4
LEHIGH COUNTY AUTHORITY
PROPOSED USER CHARGES

			CURRENT RATES	PROPOSED RATES 2022	2023	2024	2025	2026	2027
FIXED CHARGES:									
MINIMUM CHARGES									
QUARTERLY									
5/8"			$31.30	$31.30	$31.30	$31.30	$31.30	$31.30	$31.30
3/4"			31.30	31.30	31.30	31.30	31.30	31.30	31.30
1"			55.48	55.48	55.48	55.48	55.48	55.48	55.48
MONTHLY									
1-1/2"			42.04	42.04	42.04	42.04	42.04	42.04	42.04
2"			58.18	58.18	58.18	58.18	58.18	58.18	58.18
3"			105.05	105.05	105.05	105.05	105.05	105.05	105.05
4"			154.00	154.00	154.00	154.00	154.00	154.00	154.00
6"			288.54	288.54	288.54	288.54	288.54	288.54	288.54
8"			448.27	448.27	448.27	448.27	448.27	448.27	448.27
10"			631.04	631.04	631.04	631.04	631.04	631.04	631.04
12"									
VOLUMETRIC CHARGES:									
USAGE RATE BLOCKS (GALS.)			RATES PER 1,000 GALLONS						
	QUARTER	MONTH							
FIRST	120,000	40,000	$3.26	$3.26	$3.58	$3.70	$3.77	$3.85	$3.88
NEXT	2,880,000	960,000	3.17	3.17	3.24	$3.35	$3.42	$3.48	3.51
NEXT	24,000,000	8,000,000	2.75	2.75	2.83	$2.93	$2.99	$3.04	3.06
NEXT	147,000,000	49,000,000	2.38	2.38	2.63	$2.68	$2.74	$2.79	2.84
OVER	174,000,000	58,000,000	2.15	2.15	2.44	$2.49	$2.55	$2.60	2.65
PRIVATE FIRE PROTECTION									
			CHARGE PER MONTH						
SERVICE SIZE									
RSS			$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00
2"			13.61	13.61	13.61	13.61	13.61	13.61	13.61
2-1/2"			21.26	21.26	21.26	21.26	21.26	21.26	21.26
3"			30.62	30.62	30.62	30.62	30.62	30.62	30.62
4"			54.43	54.43	54.43	54.43	54.43	54.43	54.43
6"			122.47	122.47	122.47	122.47	122.47	122.47	122.47
8"			217.72	217.72	217.72	217.72	217.72	217.72	217.72
10"			340.18	340.18	340.18	340.18	340.18	340.18	340.18
12"			489.87	489.87	489.87	489.87	489.87	489.87	489.87
PUBLIC FIRE PROTECTION									
			ANNUAL CHARGES						
DIRECT FIRE COSTS PER HYDRANT			$120.12	$120.12	$124.92	$129.92	$135.12	$140.52	$146.14
INDIRECT FIRE COSTS PER INCH-SQUARED FOOT			$0.00167	$0.00167	$0.00174	$0.00181	$0.00188	$0.00196	$0.00204

TABLE 5
LEHIGH COUNTY AUTHORITY
PROJECTED REVENUE REQUIREMENT UNDER PROPOSED RATES

	2022 BASE YEAR	PROJECTED 2023	2024	2025	2026	2027
OPERATING EXPENSES						
PERSONNEL	$3,135,718	$3,838,376	$3,953,530	$4,072,140	$4,194,300	$4,320,120
PURCHASE OF SERVICES	6,112,353	5,974,916	6,154,160	6,338,800	6,528,950	6,724,810
MATERIALS & SUPPLIES	816,837	887,370	913,980	941,410	969,660	998,760
OTHER EXPENSES	0	0	0	0	0	0
TOTAL OPERATING EXPENSES	$10,064,908	$10,700,662	$11,021,670	$11,352,350	$11,692,910	$12,043,690
CAPITAL EXPENDITURES BUDGET						
Annual Projects	$662,500					
Water Main Replacements	2,400,000					
Additional(Redundant) Water Supply - Small Satellite Divisions	50,000					
Fixed Base Metering Reading System	100,000					
North Whitehall Division System Improvements Study Phase	25,000					
Arcadia Water Tank Replacement	400,000					
CLD Well Improvements and Capacity Study	100,000					
Water Meter Replacement Program	450,000					
Upper System Pump Station and Water Main (New)	200,000					
SCADA	1,100,000					
TOTAL CAPITAL EXPENDITURES BUDGET	$5,487,500	$6,751,000	$6,480,000	$5,330,000	$3,760,000	$3,600,000
LESS TAPPING AND CAPITAL RECOVERY FEES	$469,295	$356,400	$469,295	$469,295	$469,295	$469,295
LESS PORTION FUNDED VIA BORROWING	3,075,000	3,750,323	3,355,000	1,999,677		
NET CAPITAL EXPENDITURES BUDGET	$1,943,205	$2,644,277	$2,655,705	$2,861,028	$3,290,705	$3,130,705
DEBT SERVICE						
FUTURE DEBT	$0	$0	$0	$0	$0	$0
FINANCING FEES	2,750	2,750	2,750	2,750	2,750	2,750
DEBT RETIREMENT	1,925,177	2,010,541	2,081,689	2,167,856	1,969,039	2,280,241
INTEREST EXPENSE	1,200,301	1,320,356	1,403,499	1,463,928	1,376,987	1,296,186
COVERAGE	468,822	499,634	522,778	544,768	501,904	536,464
LESS: DEBT SERVICE REDUCTIONS	(50,125)	(64,782)	(50,125)	(50,125)	(50,125)	(50,125)
TOTAL DEBT SERVICE	$3,546,925	$3,768,499	$3,960,591	$4,129,177	$3,800,555	$4,065,516
TOTAL REVENUE REQUIREMENT	$15,555,038	$17,113,438	$17,637,966	$18,342,555	$18,784,170	$19,239,911

TABLE 5
LEHIGH COUNTY AUTHORITY
PROJECTED REVENUE REQUIREMENT UNDER PROPOSED RATES

	2022 BASE YEAR	PROJECTED 2023	2024	2025	2026	2027
NON-OPERATING REVENUES						
Site Visit Turn-On Charges	$11,313	$11,313	$11,313	$11,313	$11,313	$11,313
Penalties	94,711	94,711	94,711	94,711	94,711	94,711
Lien Fees	901	901	901	901	901	901
Reimbursement Of Lab Costs	0	0	0	0	0	0
Other Water Sales	89,558	89,558	89,558	89,558	89,558	89,558
Meter Sales	87,439	87,439	87,439	87,439	87,439	87,439
Inspection, Plan Review, and Project Reimbursements	376,743	376,743	376,743	376,743	376,743	376,743
Other Income	33,078	33,078	33,078	33,078	33,078	33,078
Arcadia Private Fire Service Revenue	238,510	238,510	238,510	238,510	238,510	238,510
TOTAL NON-OPERATING REVENUES	$932,253	$932,253	$932,253	$932,253	$932,253	$932,253
NET REVENUE REQUIREMENT	$14,622,785	$16,181,185	$16,705,713	$17,410,302	$17,851,917	$18,307,658
OPERATING REVENUES						
RESIDENTIAL	$6,561,433	$7,081,536	$7,380,764	$7,625,608	$7,889,979	$8,096,202
COMMERCIAL	1,916,026	2,016,175	2,104,287	2,173,624	2,241,738	2,291,411
INDUSTRIAL	3,444,224	3,693,923	3,857,620	3,999,991	4,132,364	4,245,669
INSTITUTIONAL	132,634	139,350	144,967	149,378	153,830	157,047
LARGE INDUSTRIAL	1,839,461	2,044,564	2,121,010	2,201,827	2,276,703	2,350,678
PRIVATE - FIRE PROTECTION	716,369	720,022	728,666	738,034	744,953	744,953
PUBLIC - FIRE PROTECTION	456,385	475,097	494,165	513,588	534,821	556,445
TOTAL OPERATING REVENUES	$15,066,532	$16,170,667	$16,831,478	$17,402,049	$17,974,387	$18,442,405
SURPLUS / (DEFICIT)	$443,747	($10,518)	$125,764	($8,253)	$122,470	$134,747
DEFICIT AS A PERCENT OF OPERATING REVENUES		0.07%		0.05%		
DEBT SERVICE COVERAGE	192.86%	195.94%	196.19%	194.86%	218.79%	207.82%

COMMON RATE DIVISION

APPENDIX H
LEHIGH COUNTY AUTHORITY
COMPARISON OF QUARTERLY BILLS - SMALL METERS
2022 RATES VS. PROPOSED RATES FOR THE YEAR 2023

QUARTERLY CONSUMPTION (1000 GALS)	5/8" METERS				3/4" METERS				1" METERS			
	PRESENT	PROPOSED	CHANGE	CHANGE	PRESENT	PROPOSED	CHANGE	CHANGE	PRESENT	PROPOSED	CHANGE	CHANGE
	$	$	$	%	$	$	$	%	$	$	$	%
0	31.30	31.30	0.00	0.00%	31.30	31.30	0.00	0.00%	55.48	55.48	0.00	0.00%
1	34.56	34.88	0.32	0.93%	34.56	34.88	0.32	0.93%	58.74	59.06	0.32	0.54%
2	37.82	38.46	0.64	1.69%	37.82	38.46	0.64	1.69%	62.00	62.64	0.64	1.03%
3	41.08	42.04	0.96	2.34%	41.08	42.04	0.96	2.34%	65.26	66.22	0.96	1.47%
4	44.34	45.62	1.28	2.89%	44.34	45.62	1.28	2.89%	68.52	69.80	1.28	1.87%
5	47.60	49.20	1.60	3.36%	47.60	49.20	1.60	3.36%	71.78	73.38	1.60	2.23%
6	50.86	52.78	1.92	3.78%	50.86	52.78	1.92	3.78%	75.04	76.96	1.92	2.56%
7	54.12	56.36	2.24	4.14%	54.12	56.36	2.24	4.14%	78.30	80.54	2.24	2.86%
8	57.38	59.94	2.56	4.46%	57.38	59.94	2.56	4.46%	81.56	84.12	2.56	3.14%
9	60.64	63.52	2.88	4.75%	60.64	63.52	2.88	4.75%	84.82	87.70	2.88	3.40%
10	63.90	67.10	3.20	5.01%	63.90	67.10	3.20	5.01%	88.08	91.28	3.20	3.63%
11	67.16	70.68	3.52	5.24%	67.16	70.68	3.52	5.24%	91.34	94.86	3.52	3.85%
12	70.42	74.26	3.84	5.45%	70.42	74.26	3.84	5.45%	94.60	98.44	3.84	4.06%
13	73.68	77.84	4.16	5.65%	73.68	77.84	4.16	5.65%	97.86	102.02	4.16	4.25%
14	76.94	81.42	4.48	5.82%	76.94	81.42	4.48	5.82%	101.12	105.60	4.48	4.43%
15	80.20	85.00	4.80	5.99%	80.20	85.00	4.80	5.99%	104.38	109.18	4.80	4.60%
16	83.46	88.58	5.12	6.13%	83.46	88.58	5.12	6.13%	107.64	112.76	5.12	4.76%
17	86.72	92.16	5.44	6.27%	86.72	92.16	5.44	6.27%	110.90	116.34	5.44	4.91%
18	89.98	95.74	5.76	6.40%	89.98	95.74	5.76	6.40%	114.16	119.92	5.76	5.05%
19	93.24	99.32	6.08	6.52%	93.24	99.32	6.08	6.52%	117.42	123.50	6.08	5.18%
20	96.50	102.90	6.40	6.63%	96.50	102.90	6.40	6.63%	120.68	127.08	6.40	5.30%
21	99.76	106.48	6.72	6.74%	99.76	106.48	6.72	6.74%	123.94	130.66	6.72	5.42%
22	103.02	110.06	7.04	6.83%	103.02	110.06	7.04	6.83%	127.20	134.24	7.04	5.53%
23	106.28	113.64	7.36	6.93%	106.28	113.64	7.36	6.93%	130.46	137.82	7.36	5.64%
24	109.54	117.22	7.68	7.01%	109.54	117.22	7.68	7.01%	133.72	141.40	7.68	5.74%
25	112.80	120.80	8.00	7.09%	112.80	120.80	8.00	7.09%	136.98	144.98	8.00	5.84%
30	129.10	138.70	9.60	7.44%	129.10	138.70	9.60	7.44%	153.28	162.88	9.60	6.26%
35	145.40	156.60	11.20	7.70%	145.40	156.60	11.20	7.70%	169.58	180.78	11.20	6.60%
40	161.70	174.50	12.80	7.92%	161.70	174.50	12.80	7.92%	185.88	198.68	12.80	6.89%
45	178.00	192.40	14.40	8.09%	178.00	192.40	14.40	8.09%	202.18	216.58	14.40	7.12%
50	194.30	210.30	16.00	8.23%	194.30	210.30	16.00	8.23%	218.48	234.48	16.00	7.32%
60	226.90	246.10	19.20	8.46%	226.90	246.10	19.20	8.46%	251.08	270.28	19.20	7.65%
75	275.80	299.80	24.00	8.70%	275.80	299.80	24.00	8.70%	299.98	323.98	24.00	8.00%
100	357.30	389.30	32.00	8.96%	357.30	389.30	32.00	8.96%	381.48	413.48	32.00	8.39%
125	438.35	477.10	38.75	8.84%	438.35	477.10	38.75	8.84%	462.53	501.28	38.75	8.38%
250	834.60	882.10	47.50	5.69%	834.60	882.10	47.50	5.69%	858.78	906.28	47.50	5.53%

COMMON RATE DIVISION

APPENDIX H
LEHIGH COUNTY AUTHORITY
COMPARISON OF MONTHLY BILLS - LARGE METERS
PRESENT RATES VS. PROPOSED RATES FOR THE YEAR 2023

MONTHLY CONSUMPTION (1000 GALS)	1 1/2" METERS				2" METERS				3" METERS			
	PRESENT	PROPOSED	CHANGE	CHANGE	PRESENT	PROPOSED	CHANGE	CHANGE	PRESENT	PROPOSED	CHANGE	CHANGE
	$	$	$	%	$	$	$	%	$	$	$	%
0	42.04	42.04	0.00	0.00%	58.18	58.18	0.00	0.00%	105.05	105.05	0.00	0.00%
10	74.64	77.84	3.20	4.29%	90.78	93.98	3.20	3.53%	137.65	140.85	3.20	2.32%
15	90.94	95.74	4.80	5.28%	107.08	111.88	4.80	4.48%	153.95	158.75	4.80	3.12%
20	107.24	113.64	6.40	5.97%	123.38	129.78	6.40	5.19%	170.25	176.65	6.40	3.76%
25	123.54	131.54	8.00	6.48%	139.68	147.68	8.00	5.73%	186.55	194.55	8.00	4.29%
30	139.84	149.44	9.60	6.86%	155.98	165.58	9.60	6.15%	202.85	212.45	9.60	4.73%
40	172.44	185.24	12.80	7.42%	188.58	201.38	12.80	6.79%	235.45	248.25	12.80	5.44%
50	204.14	217.64	13.50	6.61%	220.28	233.78	13.50	6.13%	267.15	280.65	13.50	5.05%
60	235.84	250.04	14.20	6.02%	251.98	266.18	14.20	5.64%	298.85	313.05	14.20	4.75%
70	267.54	282.44	14.90	5.57%	283.68	298.58	14.90	5.25%	330.55	345.45	14.90	4.51%
80	299.24	314.84	15.60	5.21%	315.38	330.98	15.60	4.95%	362.25	377.85	15.60	4.31%
90	330.94	347.24	16.30	4.93%	347.08	363.38	16.30	4.70%	393.95	410.25	16.30	4.14%
100	362.64	379.64	17.00	4.69%	378.78	395.78	17.00	4.49%	425.65	442.65	17.00	3.99%
125	441.89	460.64	18.75	4.24%	458.03	476.78	18.75	4.09%	504.90	523.65	18.75	3.71%
135	473.59	493.04	19.45	4.11%	489.73	509.18	19.45	3.97%	536.60	556.05	19.45	3.62%
150	521.14	541.64	20.50	3.93%	537.28	557.78	20.50	3.82%	584.15	604.65	20.50	3.51%
160	552.84	574.04	21.20	3.83%	568.98	590.18	21.20	3.73%	615.85	637.05	21.20	3.44%
175	600.39	622.64	22.25	3.71%	616.53	638.78	22.25	3.61%	663.40	685.65	22.25	3.35%
200	679.64	703.64	24.00	3.53%	695.78	719.78	24.00	3.45%	742.65	766.65	24.00	3.23%
225	758.89	784.64	25.75	3.39%	775.03	800.78	25.75	3.32%	821.90	847.65	25.75	3.13%
250	838.14	865.64	27.50	3.28%	854.28	881.78	27.50	3.22%	901.15	928.65	27.50	3.05%
275	917.39	946.64	29.25	3.19%	933.53	962.78	29.25	3.13%	980.40	1,009.65	29.25	2.98%
300	996.64	1,027.64	31.00	3.11%	1,012.78	1,043.78	31.00	3.06%	1,059.65	1,090.65	31.00	2.93%
400	1,313.64	1,351.64	38.00	2.89%	1,329.78	1,367.78	38.00	2.86%	1,376.65	1,414.65	38.00	2.76%
500	1,630.64	1,675.64	45.00	2.76%	1,646.78	1,691.78	45.00	2.73%	1,693.65	1,738.65	45.00	2.66%
600	1,947.64	1,999.64	52.00	2.67%	1,963.78	2,015.78	52.00	2.65%	2,010.65	2,062.65	52.00	2.59%
700	2,264.64	2,323.64	59.00	2.61%	2,280.78	2,339.78	59.00	2.59%	2,327.65	2,386.65	59.00	2.53%
800	2,581.64	2,647.64	66.00	2.56%	2,597.78	2,663.78	66.00	2.54%	2,644.65	2,710.65	66.00	2.50%
900	2,898.64	2,971.64	73.00	2.52%	2,914.78	2,987.78	73.00	2.50%	2,961.65	3,034.65	73.00	2.46%
1,000	3,215.64	3,295.64	80.00	2.49%	3,231.78	3,311.78	80.00	2.48%	3,278.65	3,358.65	80.00	2.44%
2,000	5,965.64	6,125.64	160.00	2.68%	5,981.78	6,141.78	160.00	2.67%	6,028.65	6,188.65	160.00	2.65%
5,000	14,215.64	14,615.64	400.00	2.81%	14,231.78	14,631.78	400.00	2.81%	14,278.65	14,678.65	400.00	2.80%
7,500	21,090.64	21,690.64	600.00	2.84%	21,106.78	21,706.78	600.00	2.84%	21,153.65	21,753.65	600.00	2.84%
10,000	27,595.64	28,565.64	970.00	3.52%	27,611.78	28,581.78	970.00	3.51%	27,658.65	28,628.65	970.00	3.51%
25,000	63,295.64	68,015.64	4720.00	7.46%	63,311.78	68,031.78	4720.00	7.46%	63,358.65	68,078.65	4720.00	7.45%
50,000	122,795.64	133,765.64	10970.00	8.93%	122,811.78	133,781.78	10970.00	8.93%	122,858.65	133,828.65	10970.00	8.93%

COMMON RATE DIVISION

APPENDIX H
LEHIGH COUNTY AUTHORITY
COMPARISON OF MONTHLY BILLS - LARGE METERS
PRESENT RATES VS. PROPOSED RATES FOR THE YEAR 2023

MONTHLY CONSUMPTION (1000 GALS)	4" METERS				6" METERS				8" METERS			
	PRESENT	PROPOSED	CHANGE	CHANGE	PRESENT	PROPOSED	CHANGE	CHANGE	PRESENT	PROPOSED	CHANGE	CHANGE
	$	$	$	%	$	$	$	%	$	$	$	%
0	154.00	154.00	0.00	0.00%	288.54	288.54	0.00	0.00%	448.27	448.27	0.00	0.00%
10	186.60	189.80	3.20	1.71%	321.14	324.34	3.20	1.00%	480.87	484.07	3.20	0.67%
15	202.90	207.70	4.80	2.37%	337.44	342.24	4.80	1.42%	497.17	501.97	4.80	0.97%
20	219.20	225.60	6.40	2.92%	353.74	360.14	6.40	1.81%	513.47	519.87	6.40	1.25%
25	235.50	243.50	8.00	3.40%	370.04	378.04	8.00	2.16%	529.77	537.77	8.00	1.51%
30	251.80	261.40	9.60	3.81%	386.34	395.94	9.60	2.48%	546.07	555.67	9.60	1.76%
40	284.40	297.20	12.80	4.50%	418.94	431.74	12.80	3.06%	578.67	591.47	12.80	2.21%
50	316.10	329.60	13.50	4.27%	450.64	464.14	13.50	3.00%	610.37	623.87	13.50	2.21%
60	347.80	362.00	14.20	4.08%	482.34	496.54	14.20	2.94%	642.07	656.27	14.20	2.21%
70	379.50	394.40	14.90	3.93%	514.04	528.94	14.90	2.90%	673.77	688.67	14.90	2.21%
80	411.20	426.80	15.60	3.79%	545.74	561.34	15.60	2.86%	705.47	721.07	15.60	2.21%
90	442.90	459.20	16.30	3.68%	577.44	593.74	16.30	2.82%	737.17	753.47	16.30	2.21%
100	474.60	491.60	17.00	3.58%	609.14	626.14	17.00	2.79%	768.87	785.87	17.00	2.21%
125	553.85	572.60	18.75	3.39%	688.39	707.14	18.75	2.72%	848.12	866.87	18.75	2.21%
135	585.55	605.00	19.45	3.32%	720.09	739.54	19.45	2.70%	879.82	899.27	19.45	2.21%
150	633.10	653.60	20.50	3.24%	767.64	788.14	20.50	2.67%	927.37	947.87	20.50	2.21%
160	664.80	686.00	21.20	3.19%	799.34	820.54	21.20	2.65%	959.07	980.27	21.20	2.21%
175	712.35	734.60	22.25	3.12%	846.89	869.14	22.25	2.63%	1,006.62	1,028.87	22.25	2.21%
200	791.60	815.60	24.00	3.03%	926.14	950.14	24.00	2.59%	1,085.87	1,109.87	24.00	2.21%
225	870.85	896.60	25.75	2.96%	1,005.39	1,031.14	25.75	2.56%	1,165.12	1,190.87	25.75	2.21%
250	950.10	977.60	27.50	2.89%	1,084.64	1,112.14	27.50	2.54%	1,244.37	1,271.87	27.50	2.21%
275	1,029.35	1,058.60	29.25	2.84%	1,163.89	1,193.14	29.25	2.51%	1,323.62	1,352.87	29.25	2.21%
300	1,108.60	1,139.60	31.00	2.80%	1,243.14	1,274.14	31.00	2.49%	1,402.87	1,433.87	31.00	2.21%
400	1,425.60	1,463.60	38.00	2.67%	1,560.14	1,598.14	38.00	2.44%	1,719.87	1,757.87	38.00	2.21%
500	1,742.60	1,787.60	45.00	2.58%	1,877.14	1,922.14	45.00	2.40%	2,036.87	2,081.87	45.00	2.21%
600	2,059.60	2,111.60	52.00	2.52%	2,194.14	2,246.14	52.00	2.37%	2,353.87	2,405.87	52.00	2.21%
700	2,376.60	2,435.60	59.00	2.48%	2,511.14	2,570.14	59.00	2.35%	2,670.87	2,729.87	59.00	2.21%
800	2,693.60	2,759.60	66.00	2.45%	2,828.14	2,894.14	66.00	2.33%	2,987.87	3,053.87	66.00	2.21%
900	3,010.60	3,083.60	73.00	2.42%	3,145.14	3,218.14	73.00	2.32%	3,304.87	3,377.87	73.00	2.21%
1,000	3,327.60	3,407.60	80.00	2.40%	3,462.14	3,542.14	80.00	2.31%	3,621.87	3,701.87	80.00	2.21%
2,000	6,077.60	6,237.60	160.00	2.63%	6,212.14	6,372.14	160.00	2.58%	6,371.87	6,531.87	160.00	2.51%
5,000	14,327.60	14,727.60	400.00	2.79%	14,462.14	14,862.14	400.00	2.77%	14,621.87	15,021.87	400.00	2.74%
7,500	21,202.60	21,802.60	600.00	2.83%	21,337.14	21,937.14	600.00	2.81%	21,496.87	22,096.87	600.00	2.79%
10,000	27,707.60	28,677.60	970.00	3.50%	27,842.14	28,812.14	970.00	3.48%	28,001.87	28,971.87	970.00	3.46%
25,000	63,407.60	68,127.60	4720.00	7.44%	63,542.14	68,262.14	4720.00	7.43%	63,701.87	68,421.87	4720.00	7.41%
50,000	122,907.60	133,877.60	10970.00	8.93%	123,042.14	134,012.14	10970.00	8.92%	123,201.87	134,171.87	10970.00	8.90%

COMMON RATE DIVISION

APPENDIX H
LEHIGH COUNTY AUTHORITY
COMPARISON OF MONTHLY BILLS - LARGE METERS
PRESENT RATES VS. PROPOSED RATES FOR THE YEAR 2023

MONTHLY CONSUMPTION (1000 GALS)	10" METERS			
	PRESENT	PROPOSED	CHANGE	CHANGE
	$	$	$	%
0	631.04	631.04	0.00	0.00%
10	663.64	666.84	3.20	0.48%
15	679.94	684.74	4.80	0.71%
20	696.24	702.64	6.40	0.92%
25	712.54	720.54	8.00	1.12%
30	728.84	738.44	9.60	1.32%
40	761.44	774.24	12.80	1.68%
50	793.14	806.64	13.50	1.70%
60	824.84	839.04	14.20	1.72%
70	856.54	871.44	14.90	1.74%
80	888.24	903.84	15.60	1.76%
90	919.94	936.24	16.30	1.77%
100	951.64	968.64	17.00	1.79%
125	1,030.89	1,049.64	18.75	1.82%
135	1,062.59	1,082.04	19.45	1.83%
150	1,110.14	1,130.64	20.50	1.85%
160	1,141.84	1,163.04	21.20	1.86%
175	1,189.39	1,211.64	22.25	1.87%
200	1,268.64	1,292.64	24.00	1.89%
225	1,347.89	1,373.64	25.75	1.91%
250	1,427.14	1,454.64	27.50	1.93%
275	1,506.39	1,535.64	29.25	1.94%
300	1,585.64	1,616.64	31.00	1.96%
400	1,902.64	1,940.64	38.00	2.00%
500	2,219.64	2,264.64	45.00	2.03%
600	2,536.64	2,588.64	52.00	2.05%
700	2,853.64	2,912.64	59.00	2.07%
800	3,170.64	3,236.64	66.00	2.08%
900	3,487.64	3,560.64	73.00	2.09%
1,000	3,804.64	3,884.64	80.00	2.10%
2,000	6,554.64	6,714.64	160.00	2.44%
5,000	14,804.64	15,204.64	400.00	2.70%
7,500	21,679.64	22,279.64	600.00	2.77%
10,000	28,184.64	29,154.64	970.00	3.44%
25,000	63,884.64	68,604.64	4720.00	7.39%
50,000	123,384.64	134,354.64	10970.00	8.89%

Lehigh County Authority

1053 SPRUCE RD * P.O. BOX 3348 * ALLENTOWN, PA 18106-0348
610-398-2503 * email: service@lehighcountyauthority.org
www.lehighcountyauthority.org

MEMORANDUM

TO: LCA Board of Directors
FROM: Liesel Gross, Chief Executive Officer
DATE: October 17, 2022
RE: 2023 Proposed Budget

Attachment: Executive Summary, 2023 Budget

At the October 24, 2022 meeting of Lehigh County Authority's Board of Directors, the 2023 Budget will be presented in summary form with a staff request for approval. Attached to this memo is an Executive Summary that highlights key items included in the 2023 Budget proposal, including topics that have been discussed over the past several weeks, such as:

- LCA's Strategic Plan and key initiatives
- Inflationary impacts & staffing
- Water and sewer rates for LCA's Allentown and Suburban divisions

Since our last discussion and presentation on October 10, 2022, there has been one small change within LCA's Suburban Wastewater Division budget. Over the past two weeks, discussions with the contract operator for LCA's Pretreatment Plant (PTP), Jacobs, have focused on the impacts of increasing costs associated with treatment chemicals and biosolids disposal. Due to the increased organic loadings the PTP is receiving from Boston Beer and the waste hauler program, these specific operating costs are expected to increase in 2023. Therefore, the Contract Operating Services budget for the PTP will change as follows:

Original 2023 Budget Draft (10/10/2022):	$6,143,900
Revised 2023 Budget Proposal:	$6,400,000
Budget Revision Impact:	**$ 256,100**

This change will impact not only the cost side of this budget, but also the expected revenues, as the increased cost will be passed through to the rates applied to Boston Beer and the waste haulers. This change will also generate very minor adjustments to various other schedules within the budget. However, as the Suburban Wastewater Division enjoys very low debt and strong reserve balances, the impact will be negligible.

If the change described above is acceptable to the Board and the 2023 Budget is approved with this requested amendment, a complete copy of the updated 2023 Budget document will be published and supplied to the Board and posted to LCA's website.

Thank you for your attention to the important issues that LCA must address in the year ahead, as captured in this 2023 Budget presentation.

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2023 BUDGET – EXECUTIVE SUMMARY

Submitted by: Liesel M. Gross, Chief Executive Officer
October 17, 2022

By all accounts, 2022 has been a year of soaring highs and troubling lows for Lehigh County Authority (LCA). The year began with a spike in COVID-19 infections that surpassed all others from the prior two years, threatening to undo the progress made in recovering from the global pandemic. However, as time passed, LCA's employees remained healthy and dedicated to their work, and the water kept flowing to our customers.

From this dubious beginning of this year, the challenges kept coming, and LCA responded with resolve and focus on its mission, adopted in December 2021:

> *LCA's Mission: To protect public health and the environment by providing high-quality, safe, and reliable water and wastewater services.*

The adoption of LCA's 2022-2027 Strategic Plan provided inspiration across the organization to reach beyond the day-to-day work and direct new energy toward achieving our vision:

> *LCA's Vision: To be a trusted and engaged community partner, advancing the vitality of our region through exceptional water and wastewater services.*

Throughout the year, internal teams were developed to begin putting shape to LCA's strategies, creating enthusiasm for the organization's future. Also in 2022, the easing of pandemic concerns led to opportunities for more in-person team interaction, which added a much-needed burst of positivity and creativity to our planning efforts. External to LCA, we saw this same energy repeated in other organizations and settings, leading to great progress on collaborative efforts such as the regional sewer system planning we are undertaking with the City of Allentown and our 14 municipal partners in the Kline's Island Sewer System.

These soaring highs were tempered by challenges that threaten our progress – the most glaring being the current economic climate. With inflation impacting all expense categories and ever-increasing lead times for major equipment and materials, LCA has seen project costs quickly escalate. An early 2022 decision by our Board of Directors to complete bond financing helped to secure capital funding for our Suburban Water Division projects prior to the steepest interest rate hike implemented this year, but the borrowing environment will be challenging for the foreseeable future. This has led LCA to place greater focus on seeking alternative financing and grant opportunities available now through the Infrastructure Investment and Jobs Act passed in November 2021. Related to the current economic conditions, LCA faced significant staffing challenges this year, an issue that will likely continue into 2023.

The 2023 Budget is presented to the LCA Board with resources allocated to address these troubling lows, but also to continue the exciting progress made on our new strategic initiatives.

Moving Forward on Strategy

LCA's 2022-2027 Strategic Plan outlines six major priority areas, 21 specific strategies, and hundreds of action steps that we will work on over the next five years. However, to help us stay focused, LCA staff and Board have focused on a smaller number of key programs. The 2023 Budget has been developed around the following strategic initiatives:

Asset Management – In the year ahead, LCA will complete the onboarding of additional staff focused on developing our comprehensive asset management approach. Consultant support will also be required to help define LCA's needs and design a multi-year roadmap to achieve our goals in this area. At the heart of our asset management strategy is the desire to lower overall cost to customers, maintain or increase the level of service provided, and minimize risks associated with the operation or potential failure of critical water and sewer system assets.

Process Improvement – During 2022, a needs assessment was conducted to review the current state of LCA's enterprise resource planning (ERP) software, which drives administrative and financial processes across the entire organization. The recommended path forward to achieve improved efficiency and increased reporting capabilities is to re-implement the existing ERP system, with a reconfigured accounting structure that meets the organization's current and future needs. This year-long effort will require significant staff and consultant resources.

Water & Sewer Capacity – In 2021, the Pa. Department of Environmental Protection approved a five-year plan for the Kline's Island Sewer System to develop its first-ever regional Act 537 Sewage Facilities Plan. The planning effort led by LCA staff and representatives from the City of Allentown requires significant support from engineering, financial, and legal consultants, as reflected in the 2023 Budget proposal. This planning effort is focused on ensuring continued sewer capacity is available for economic development in our region, while solving environmental challenges associated with aging infrastructure. Companion planning projects on the water supply side are necessary to ensure water supplies are similarly available for growing portions of LCA's service area.

Operational Excellence – This strategy area focuses on a variety of smaller projects and initiatives aimed at increasing service to customers, improving system resiliency, and achieving enhanced regulatory compliance. Key projects in 2023 will include implementation of enhanced process control and instrumentation for LCA's small, remote systems including the addition of staffing to support this effort, implementing a lead service line replacement program in the City of Allentown, and kicking off an ongoing replacement program for large water system valves.

To support these initiatives, the following resources are included in the 2023 Budget as proposed to the LCA Board.

Strategy Area	**2023 Resources**
Asset Management	$365,000
Process Improvement	$1,476,000
Water & Sewer Capacity	$1,400,000
Operational Excellence	$220,000
TOTAL	**$3,461,000**

Addressing Economic Impacts Starts with Employees

As discussed above, the current economic conditions have challenged LCA with increasing expenses, lengthening lead times for equipment and materials, and rising interest rates. Staffing shortages have added to the burden as more work must be outsourced if LCA staff are not available to complete our work, project timelines lengthen due to staff availability, and more time is spent training and onboarding new employees.

The most significant cost driver in our 2023 Budget continues to be personnel related expenses – representing more than 40 percent of LCA's total operating budget. This year, our personnel budget will increase 9.22 percent over our expected 2022 personnel costs, based on the following key assumptions:

- All vacant positions will be filled in 2023 – this will require significant effort and focus on recruiting, onboarding, retention, and employee engagement.
- Health insurance costs are expected to increase by 5 percent.
- Pay increases awarded to all union and non-union employees.
- Addition of a Training Coordinator position to support employee development.
- Increased payroll expense for succession planning related to key retirements expected in 2023.

With emphasis placed on recruiting and retaining a high-performing team of employees, greater resources will become available for LCA's other strategic initiatives described above. In time, this will have the impact of increasing efficiency, lowering overall cost to our customers, and increasing the level of service LCA provides.

2023 Rates: Impact of LCA Strategy, Inflation & Personnel Expenses, Project Costs

In this Executive Summary, we have described some of the key features of LCA's 2023 Budget proposal relating to updated strategic initiatives and responses to inflationary and personnel challenges. The 2023 Budget proposal also includes nearly $29 million in capital improvements, which are described in greater detail in the body of the budget document.

Like many water and sewer utilities across the nation, LCA faces a significant burden of caring for and replacing aging infrastructure. In the City of Allentown, many water and sewer lines are 100 years old or older and face significant integrity challenges. In addition, much of our water and wastewater treatment plant equipment is at the end of its useful life and needs to be replaced or upgraded. In our Suburban service areas, while the systems may be "younger" in many cases, LCA's infrastructure requires greater attention in the form or preventive maintenance and strategic asset management.

Over the past several years, LCA's water and sewer rates have been increased to accommodate this increase in system rehabilitation and replacement. Additional increases will be needed in 2023, and annually for the foreseeable future. The following summary illustrates the rate changes included in this year's budget proposal:

City Division: 9.8% (Average residential customer impact: $19.55 per quarter, water & sewer)

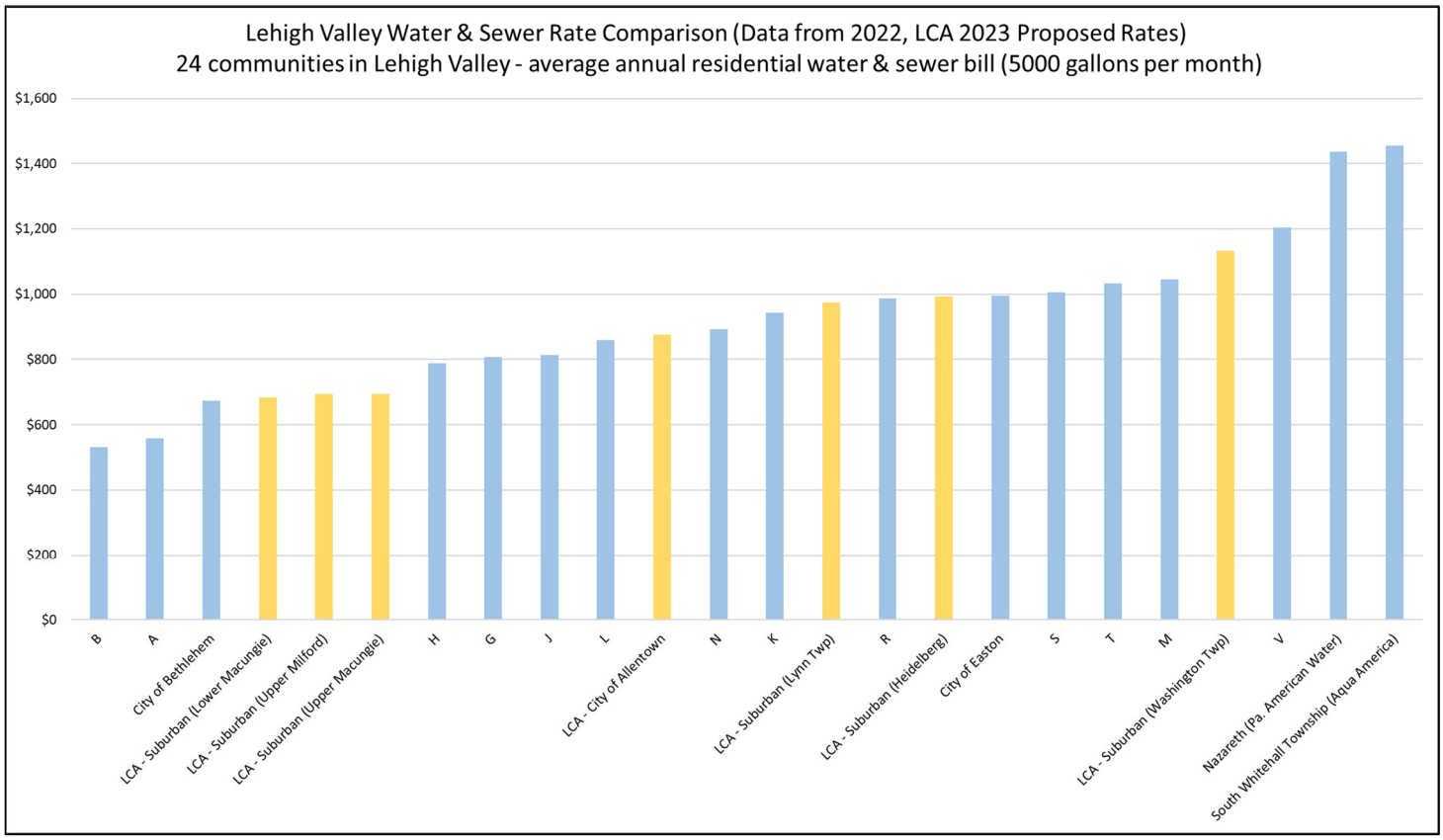
Suburban Water Division: 5.5% (Average residential customer impact: $4.95 per quarter, water only)

Suburban Wastewater Division: 16% (Average residential customer impact: varies by municipality)

The differences in rate changes between LCA's various divisions is driven primarily by contractual requirements including the Water & Sewer Lease Agreement between LCA and the City Allentown, and LCA's wastewater signatory agreements with the municipalities served by the Kline's Island Sewer System and Western Lehigh Interceptor.

Regional Rate Comparisons:

While LCA would always prefer to keep rates as low as possible, the increases described above are necessary. The graph below illustrates how LCA's 2023 proposed rates compare to other communities in the Lehigh Valley. With the 2023 increases included, most LCA customers will continue to enjoy some of the lowest water and sewer rates in our region.



2023 BUDGET – SUMMARY OF EXPECTED RESULTS

The sections above describe the breadth of issues that were evaluated and discussed through the development of the 2023 Budget. The summary below shows that the 2023 Budget is presented with positive cash flows, meeting debt service requirements, and providing alternative funding for capital improvements that limits the borrowing required to pay for these investments. In 2023, we also see positive movement toward our target for operational cash balances, which supports overall financial sustainability of the organization.

Budget Overview	**Suburban Water**	**Suburban Wastewater**	**City Division**	**Total**
Operating, Non-Operating & Other Revenue	$ 17,064,782	$ 22,785,541	$ 54,975,421	$ 94,825,744
Operating Expenses (net of depreciation)	$ 10,700,662	$ 14,235,107	$ 23,182,225	$ 48,117,994
Net Revenues Available for Debt Service	$ 6,364,120	$ 8,550,434	$ 31,793,196	$ 46,707,750
Debt Service	$ 3,474,867	$ 729,123	$ 15,130,921	$ 19,334,911
Debt Service Coverage Ratio (indenture based)	1.83	11.73	2.10	2.42

Capital Budget Overview	**Suburban Water**	**Suburban Wastewater**	**City Division**	**Total**
Capital Expenses	$ 6,751,000	$ 7,033,500	$ 15,191,000	$ 28,975,500
Funding from 2023 Revenue & Operating Reserves	$ 2,800,677	$ 7,033,500	$ 13,991,000	$ 23,825,177
Funding from Existing Project Reserves	-	-	-	-
Funding from New Borrowing	$ 3,950,323	-	$ 1,200,000	$ 5,150,323
Year-End Project Reserve Balance	$ 319,718	$ 5,955,385	$ 3,022,601	$ 9,297,704

Total Cash Flow	**Suburban Water**	**Suburban Wastewater**	**City Division**	**Total**
Beginning Operations Cash Balance (2022 forecast)	$ 7,029,282	$ 4,201,848	$ 15,593,342	$ 26,824,472
2023 Surplus	$ 2,847,330	$ 7,796,112	$ 16,662,275	$ 27,305,717
Provided From (To) Capital	$(2,800,677)	$(7,033,500)	$(13,991,000)	$(23,825,177)
Ending Operations Cash Balance	$ 7,075,935	$ 4,964,460	$ 18,264,617	$ 30,305,012
Operating Days Cash on Hand	241	127	208	221
Project Reserve Balance	$ 319,718	$ 5,955,385	$ 3,022,601	$ 9,297,704
Other Reserves & Investments (includes restricted)	$ 4,919,064	$ 7,315,908	$60,788,279	$ 73,023,251
Ending Total Fund Balance - 2023 Budget	**$12,314,717**	**$18,235,753**	**$82,075,497**	**$112,625,967**

LCA Strategic Plan (2022-2027)

2022 Quarterly Progress Report: October 2022

Overview

Lehigh County Authority (LCA) adopted an updated Strategic Plan in December 2021, which included a refreshed look at our Mission, Vision, Values and Priorities. An ambitious list of strategies, activities, and tasks were developed to support the achievement of LCA's plan over the next five years. This progress report was developed to help our employees and Board of Directors keep a sharp focus on the plan and, specifically, the work we plan to achieve in 2022. While not all inclusive, the 2022 focus areas and milestones outlined in this report describe the breadth of activities LCA is focused on this year. We expect to report on specific work we've accomplished each quarter, and we will track organizational performance broadly using key metrics identified in the Strategic Plan. Any questions about this report should be directed to LCA's Chief Executive Officer, Liesel Gross.

Asset Management

2022 Focus:

1. Develop multi-year approach / roadmap to developing LCA's Asset Management (AM) program
2. Track all maintenance activities in a standard Computerized Maintenance Management System (CMMS) platform

2022 Milestones:

- **Staffing assessment & organization structure for AM**

  1st Quarter 2022 Status: Staffing assessment complete with 2022 staffing focused on maintenance management activities.
  2nd Quarter 2022 Status: New maintenance-focused positions filled; beginning to define job requirements for future director-level AM position.
  3rd Quarter 2022 Status: Director of Engineering & Asset Management recruiting kicked off and concluded with the addition of Albert J. Capuzzi to the team on 10/17/2022.

- **Develop 3-year roadmap of AM activities**

  1st Quarter 2022 Status: Preliminary 18-month technology roadmap is complete to help with defining roles and responsibilities.
  2nd Quarter 2022 Status: Significant barriers encountered due to lack of documented AM processes; beginning to define need for external support for AM program development.
  3rd Quarter 2022 Status: Consultant support fully defined and issued as a request for proposals, with four strong proposals received, pending Board approval.

- **Identification and definition of all Preventive Maintenance (PM) and Corrective Maintenance (CM) programs within CMMS**

  1st Quarter 2022 Status: Currently hosting workshops to review existing and future preventive programs for linear and vertical assets with internal staff.
  2nd Quarter 2022 Status: Significant progress made in defining PM programs; work will continue and will be contingent upon other AM program definitions.
  3rd Quarter 2022 Status: No change, on target.

- **Develop standardized inventory list**

  1st Quarter 2022 Status: Kicked off the metering inventory review with Customer Care in March. The plan is to continue reviewing inventory lists with each department to standardize naming and numbering.
  2nd Quarter 2022 Status: Inventory system development placed on hold; potential use of inventory module in MUNIS reimplementation (see Process Improvement below).
  3rd Quarter 2022 Status: No change, subject to Munis re-implementation project.

- **Identify and implement project management system**

  1st Quarter 2022 Status: Munis project accounting module implementation abandoned as needs not met with current system configuration. Scheduling demos of other systems.
  2nd Quarter 2022 Status: Full-service project management system requires completion of MUNIS reimplementation (see Process Improvement below). MS Project installed on a trial basis to support standardization of project management approach.
  3rd Quarter 2022 Status: No change.

Process Improvement

2022 Focus:

1. Evaluate long-term viability of current Enterprise Resource Planning (ERP), Munis, and decide next steps for enhancement
2. Process improvements in Customer Care and Employee Time Recording

2022 Milestones:

- **ERP needs assessment & road map**

  1st Quarter 2022 Status: Three consultant proposals received with final selection to be considered for Board approval in April.
  2nd Quarter 2022 Status: Raftelis completed "current state" evaluation and best practices review; final report expected by August with implementation roadmap. (Note: Expected recommendation is full re-implementation of Munis requiring detailed business process evaluation and development of new accounting / code structure to allow for technology integrations and implementation of updated or missing business processes and modules.)
  3rd Quarter 2022 Status: Munis re-implementation project kicked off with project teams meeting regularly to plan improvements in system configuration related to accounting structure, procurement/inventory processes, time recording and payroll, and other cross-organizational function. (Note, this work ties to several other strategy areas.)

- **Simplify & improve time recording process within existing system**

  1st Quarter 2022 Status: Initial review and streamlining of time-recording codes (focusing on old project codes) complete. After second review, the next step is to repair linked timesheet files and then implement electronic upload for payroll.
  2nd Quarter 2022 Status: No change.
  3rd Quarter 2022 Status: No change, subject to Munis re-implementation project.

- **Improved delinquency tracking program**

  1st Quarter 2022 Status: New Customer Care Director hired in March 2022. Current focus on evaluating existing processes.
  2nd Quarter 2022 Status: Internal reporting on delinquencies in general billing and utility billing developed for monthly team review.
  3rd Quarter 2022 Status: No change, subject to Munis re-implementation project.

- **Enhanced customer self-service tools**

  1st Quarter 2022 Status: Due to delay in planned Munis upgrade, integration of phone system and online payment portal have been pushed back on the schedule.
  2nd Quarter 2022 Status: No change.
  3rd Quarter 2022 Status: No change, subject to Munis re-implementation project.

Water & Wastewater Capacity

2022 Focus:

1. Advancing regional Act 537 Plan development
2. Water supply evaluation for Central Lehigh Division (CLD) & North Whitehall Division (NWD)

2022 Milestones:

- **CLD & NWD water supply study**

  1st Quarter 2022 Status: Water supply study was authorized by the LCA Board on February 14, 2022, and work is under way and on schedule.
  2nd Quarter 2022 Status: Study is on schedule, with final report expected in 2022.
  3rd Quarter 2022 Status: No change, on target. Final report may be delivered early 2023.

- **Kickoff of specific water projects (system interconnection, storage evaluation)**

  1st Quarter 2022 Status: Emergency interconnection with South Whitehall Township for the Central Lehigh Division-Upper System is under design. Design of a new Upper System storage tank has been incorporated into the 2023-2027 Suburban Capital Plan.
  2nd Quarter 2022 Status: System interconnection with South Whitehall Township construction complete.
  3rd Quarter 2022 Status: No change.

- **Completion of Pretreatment Plant (PTP) master plan**

  1st Quarter 2022 Status: PTP Master Plan was authorized by the LCA Board on December 13, 2021, and work is under way and on schedule.
  2nd Quarter 2022 Status: Master plan is under way and on schedule with final report expected in 2022. Preliminary review indicates near-term work to increase organic capacity of PTP will be required to address current and future industrial needs.
  3rd Quarter 2022 Status: No change, on target. Final report may be delivered early 2023.

- **Preliminary screening / modeling of Act 537 alternatives**

  1st Quarter 2022 Status: All municipalities received detailed 2021 flow monitoring data and analysis of their systems' rainfall derived inflow and infiltration in March. Modeling of the entire KISS system is under way and will be completed by June 2022.
  2nd Quarter 2022 Status: KISS model complete with review of strengths and weaknesses provided to municipalities. Problem definition modeling work authorized in June, with modeling for preliminary screening of alternatives expected in October 2022.
  3rd Quarter 2022 Status: Problem definition modeling completed and preliminary screening of alternatives designed and authorized. Benchmark I&I source reduction plans defined and shared with municipalities.

Employee Engagement & Safety

2022 Focus:

1. Employee & supervisory onboarding and training
2. Safety program enhancements

2022 Milestones:

- **Develop structured approach to employee onboarding**

  1st Quarter 2022 Status: Onboarding checklist for safety training drafted for review. Pilot program for updated onboarding process for new employees and new supervisors is under development.
  2nd Quarter 2022 Status: Pilot program for updated onboarding process remains under development. Employee and manager feedback required to further refine needs.
  3rd Quarter 2022 Status: Feedback sessions with managers and all employees conducted with feedback compiled for staff consideration of next steps. Strong feedback received regarding employee desire for broader exposure to LCA organization and systems to enhance knowledge and awareness of how their individual role contributes to LCA success.

- **Develop internal employee & supervisor training program**

  1st Quarter 2022 Status: Internal "train the trainer" program under development for key safety courses required for employees in operational roles. Scan of external resources for other programs (bullying, harassment, etc.) is under way.
  2nd Quarter 2022 Status: Internal "train the trainer" program rolled out for selected safety program requirements. Bullying training rolled out to all managers and employees.
  3rd Quarter 2022 Status: No change.

- **Improve root cause analysis process to enhance understanding and tracking of safety incidents**

  1st Quarter 2022 Status: Preliminary review of safety incident cause categories under way. Conducting process evaluation for root cause, reporting, tracking and follow-up.
  2nd Quarter 2022 Status: No change.
  3rd Quarter 2022 Status: No change.

- **Enhance safety metrics, reporting and communication**

  1st Quarter 2022 Status: Currently reporting on injuries and added measure of the number of days without lost-time incident or vehicle accident.
  2nd Quarter 2022 Status: Number of days without lost-time incident or vehicle accident added to employee SharePoint site for increased visibility to employees.
  3rd Quarter 2022 Status: No change.

Operational Excellence

2022 Focus:

1. Completion of specific operational projects/programs that support Operational Excellence goals
2. Small systems compliance review and operational enhancements to achieve compliance

2022 Milestones:

- **Large diameter valve maintenance & replacement program development**

  1st Quarter 2022 Status: Proposal received from Gannett Fleming to evaluate and prioritize maintenance and repair of large diameter valves in Allentown Division.

2nd Quarter 2022 Status: Program evaluation and prioritization expected to be complete in 2022, with kick-off of top-tier valve replacements in 2023.
3rd Quarter 2022 Status: No change, on target.

- **Suburban Water Supervisory Control and Data Acquisition (SCADA) system enhancements**
  1st Quarter 2022 Status: Four-year project is out for bid.
  2nd Quarter 2022 Status: Project authorized in May to complete upgrades at selected facilities in 2022, with standard construction specs developed for remaining facilities.
  3rd Quarter 2022 Status: Standard construction specifications under development.

- **Small systems compliance review and operational enhancements**
  1st Quarter 2022 Status: Developed and implemented a root cause analysis program for operational issues and trigger levels for specific water and wastewater monitoring analytes. Focused effort on achieving compliance at Sand Springs WWTP.
  2nd Quarter 2022 Status: Process control plan developed for small systems to increase regulatory compliance, but will require additional resources to implement enhanced sampling protocols. Sand Springs WWTP challenges under continued investigation.
  3rd Quarter 2022 Status: Staffing needs identified for 2023 implementation of process control and instrumentation enhancements.

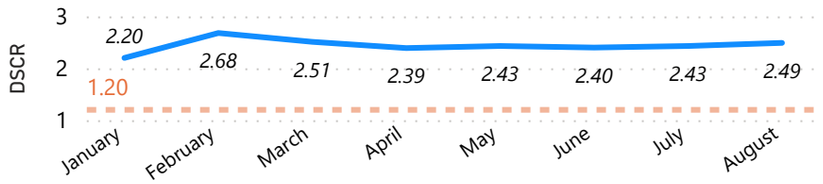
Lehigh County Authority

LCA Strategic Plan Metrics

Print Date
10/11/2022

Financial

2022 Debt Service Coverage Ratio - Total LCA



Debt Service Coverage Ratio - Current

City Division	Suburban Wastewater	Suburban Water
2.22	7.45	2.56

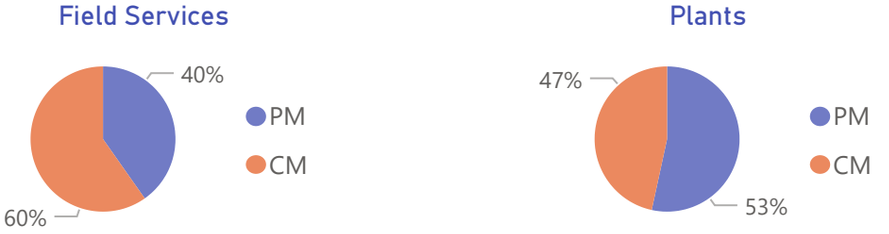
Unrestricted Days Cash On Hand

City Division	Suburban Wastewater	Suburban Water
263	147	262

** Target of 180 days.*

Asset Management

2022 Corrective Maintenance vs. Preventive Maintenance Hours



** Metric to show 2022 progress on preventive program redesign and implementation.*

Safety

Days No Vehicle Accident

18

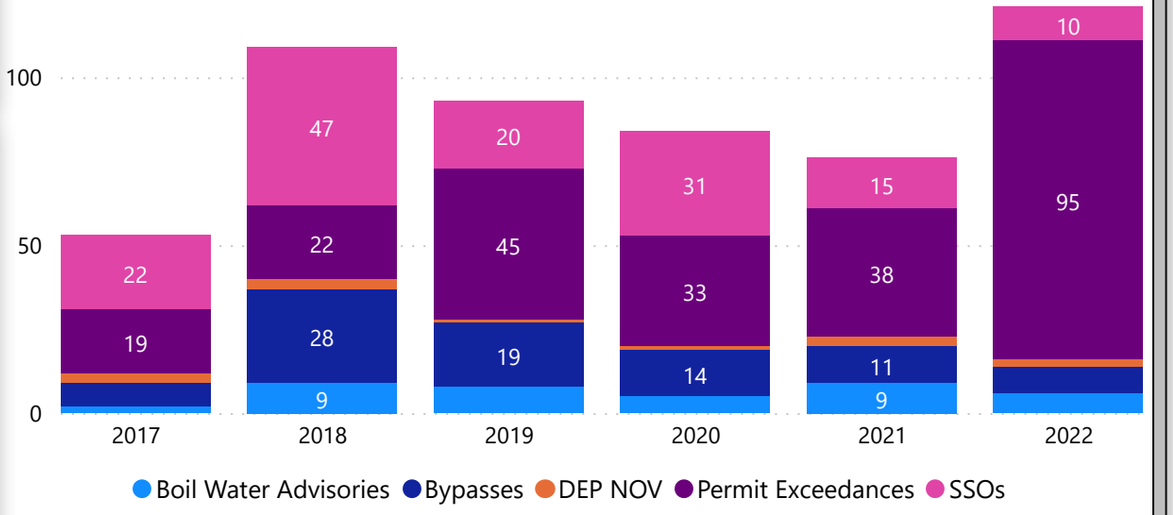
Days No Lost Time

48

Of Recordable Injuries YTD

4

Environmental Compliance



Employees

Total Employees

159

Average Age

47.2

Average Yrs of Service

12.1

Total Vacancies

12

Customer Care

DEVELOPING METRIC

Capital Program

DEVELOPING METRIC

MEMORANDUM

Date: October 17, 2022

To: LCA Board of Directors

From: Liesel Gross, CEO

Subject: LCA Asset Management Roadmap & Strategic Asset Management Plan

MOTIONS / APPROVALS REQUESTED:

No.	Item	Amount
1	Professional Services Authorization: Hazen and Sawyer	$283,878

BACKGROUND:

For many years, LCA has developed aspects of an asset management (AM) strategy to address key components such as technical knowledge capture, documenting maintenance procedures, and addressing aging infrastructure through its capital investment program. The early investment in effective data and information technology solutions such as Esri Geographic Information Systems (GIS) set the foundation for advancing the program through the use of technology. LCA's GIS is the system of record and contains all of LCA's linear and vertical assets and attributes. Cityworks was launched as LCA's Computerized Maintenance Management System (CMMS) in 2015, initiating digital tracking of work activities in the Field Services and Plant Operations departments.

In 2015, LCA began conducting condition assessments for various facilities to generate system rehabilitation and replacement programs based on risk. Condition assessments for large treatment facilities and certain other assets are performed on a scheduled interval. However, LCA's ability to incorporate condition information into the Cityworks system has been limited by a variety of factors:

- Lack of integrated systems
- No standardized process for conducting these risk assessments
- Limited internal asset management expertise
- Use of various external consultants to conduct the assessments, each using their own methods

Organizationally, over the past 10 years, LCA has undergone significant transformations, driven primarily by the assumption of operating responsibility for the City of Allentown water and wastewater systems through a 50-year lease agreement. This organizational transformation has brought other important priorities to light, which require more comprehensive asset management approaches:

- Risk of knowledge loss associated with high rates of employee turnover and retirement
- Community concerns over water/sewer rate affordability and equity
- Risks and impacts of aging infrastructure and historical under-investment in asset rehabilitation or replacement programs
- Economic growth in our region, requiring expensive system capacity projects
- Increased customer demand for service, responsiveness, and environmental advocacy

In 2021, LCA developed a five-year strategic plan. Developing a comprehensive approach to Asset Management was identified as a high-priority strategic objective. LCA staff have begun preliminary work to build organizational buy-in for a more comprehensive asset management approach, and LCA's Board of Directors has offered strong support for the program.

To move forward, LCA wishes to develop a structured roadmap that will identify key milestones, objectives, and actions we can take to implement a comprehensive, sustainable asset management program.

ASSET MANAGEMENT ROADMAP & STRATEGIC ASSET MANAGEMENT PLAN:

To develop a Strategic Asset Management Plan (SAMP) that will guide LCA's efforts over the next several years, consultant support is needed. LCA wishes to retain the services of a qualified consultant to provide a broad range of services and support. The list below provides an outline of the services LCA expects will be included in the SAMP development project:

Build LCA's Understanding of Asset Management

Conduct workshops and other facilitated discussions to assist LCA in gaining an understanding of AM best practices. Provide case studies and examples of other water/sewer utility AM plans.

Create Asset Management Building Blocks

Facilitate team learning and discussion, and then document the key building blocks of LCA's future AM program, such as:

- How LCA will define an asset within its systems
- Standardized methods for LCA to assess asset condition and capture asset data
- Development of a standardized scoring system to evaluate asset risk
- Identify which assets are critical for sustained system performance
- Define the level of service LCA seeks to provide and how LCA will track this data

Conduct a technology gap analysis to determine immediate and future areas for improvement.

Develop the Strategic Asset Management Plan (SAMP)

Create a vision and detailed definition of LCA's desired future approach to AM, including identification of gaps from the current program to that future state. Define a multi-year / phased approach to implementing program improvements that will support LCA's achievement of the desired future approach to asset management (the roadmap). This would include milestones and objectives to implement a comprehensive, sustainable asset management program, as well as a resource needs assessment.

Support Current Work

Recognizing that an AM program will cut across the entire organization, and that significant efforts are already under way on various aspects of asset management, the selected consultant will support LCA's current work in these areas. This will include a review of various technology programs, staffing and organizational structure, capital planning process, master planning work, capital project management systems, preventive maintenance programs, and more.

Key deliverables of this work include:

- Asset Management (AM) maturity assessment
- LCA AM policy statement
- AM implementation roadmap
- Level of service statements & key performance indicators
- Recommendations for standardizing asset hierarchies & asset register
- Development of a risk framework & review of asset data requirements
- Document O&M guidelines for vertical and linear assets (focus is on establishing a robust, cyclical process of combining capital improvements planning with O&M optimization improvements)
- Formalize LCA's methodology to calculate remaining useful life of its assets
- Develop LCA's method to capture asset lifecycle costing within Cityworks
- Documentation of "as-is" and "to-be" workflows for LCA's capital improvements prioritization process
- Prepare a Strategic Asset Management Plan (SAMP) (focus is on documenting work completed during this project in an expandable format as future elements and information is developed)

CONSULTANT SELECTION PROCESS:

Based on qualifications and LCA staff's prior experience working with these firms, four consulting firms were selected to participate in the request for proposal process. All four firms are staffed with industry-leading experts in asset management with a strong presence in national water industry associations specializing in this growing area of utility management.

Results of the proposal process are as follows:

Consultant	Hours	Proposal Cost
GHD	1,036	$230,030
Hazen and Sawyer (recommended for approval)	***1,194***	***$283,878***
Arcadis	1,250	$284,970
Burgess-Niple	2,695	$612,706

Hazen and Sawyer's proposal is recommended for approval, and their proposal is attached for Board review if desired.

LCA staff believe Hazen and Sawyer's proposal is highly responsive to LCA's needs, and the project team offers an appropriate balance of technology, engineering, and business process expertise to the project. Hazen and Sawyer's team has demonstrated familiarity with LCA's current systems and other available AM technologies, and the firm has worked effectively with LCA in prior engagements.

A critical component of the selection process, in addition to reviewing technical qualifications, was the cultural fit with the LCA organization and team. LCA's internal Asset Management Team is made up of 11 members who span multiple disciplines including operations, maintenance, technology, finance, engineering, and planning. The work included in this project will require involvement of a large cross-section of LCA's employee base to properly plan the future of our AM program and generate excitement and buy-in for the results of this work. The LCA team met with all four consultants who proposed on this work and felt the Hazen and

Sawyer team would provide the best fit for the organization in terms of culture, communication, and collaboration styles.

FINANCIAL:
The project will be financed through LCA's Internal Services budget as a "Special Study." The cost of this work was also captured in the 2023 Budget proposal, since the work will be completed primarily in the next calendar year.

CURRENT STATUS:
Pending Board approval for professional consulting services to assist with this Asset Management Roadmap & Strategic Asset Management Plan develop project.

SCHEDULE:
This work is expected to be completed by December 31, 2023. An interim milestone includes the submission of the draft AM implementation roadmap and resource assessment in Summer 2023 for inclusion of appropriate resources in the 2024 Budget.

FUTURE AUTHORIZATIONS:
Future authorizations may be requested to assist the Authority with moving forward on implementation of various phases of the Asset Management Roadmap and SAMP.

Lehigh County Authority

1053 Spruce Street * P.O. Box 3348 * Allentown, PA 18106-0348
(610)398-2503 * FAX (610)398-8413 * Email: service@lehighcountyauthority.org

PROFESSIONAL SERVICES AUTHORIZATION

Professional: Hazen and Sawyer
1 South Broad Street, Suite 900
Philadelphia, PA 19107

Date: October 24, 2022
Requested By: Liesel Gross

Approvals
Department Head: _____
Chief Executive Officer: _____

LCA Asset Management Roadmap & Strategic Asset Management Plan (SAMP) Development

As outlined in LCA's 2022-2027 Strategic Plan, asset management is a critical priority for the organization. Hazen and Sawyer has proposed an approach to developing LCA's asset management roadmap and SAMP in a way that will foster increased employee engagement in the work and drive future program development in a comprehensive, standardized way that follows industry best practices. These services include, but are not limited to, the following:

Professional Services
• Create Asset Management Building Blocks
• Develop the Strategic Asset Management Plan (SAMP)
• Support Current Work

• Key Deliverables:
  • *Asset management (AM) maturity assessment*
  • *LCA AM policy statement*
  • *AM implementation roadmap*
  • *Level of service statements & key performance indicators*
  • *Recommendations for standardizing asset hierarchies & asset register*
  • *Development of a risk framework & review of asset data requirements*
  • *Document O&M guidelines for vertical and linear assets*
  • *Formalize LCA's methodology to calculate remaining useful life of its assets*
  • *Develop LCA's method to capture asset lifecycle costing within Cityworks*
  • *Documentation of "as-is" and "to-be" workflows for LCA's capital improvements prioritization process*
  • *Prepare a strategic asset management plan (SAMP)*

(1) Please reference the cover Memo for additional information.

Prior Approval:
Amount: *$0*

This Approval:
Amount: *$283,878*

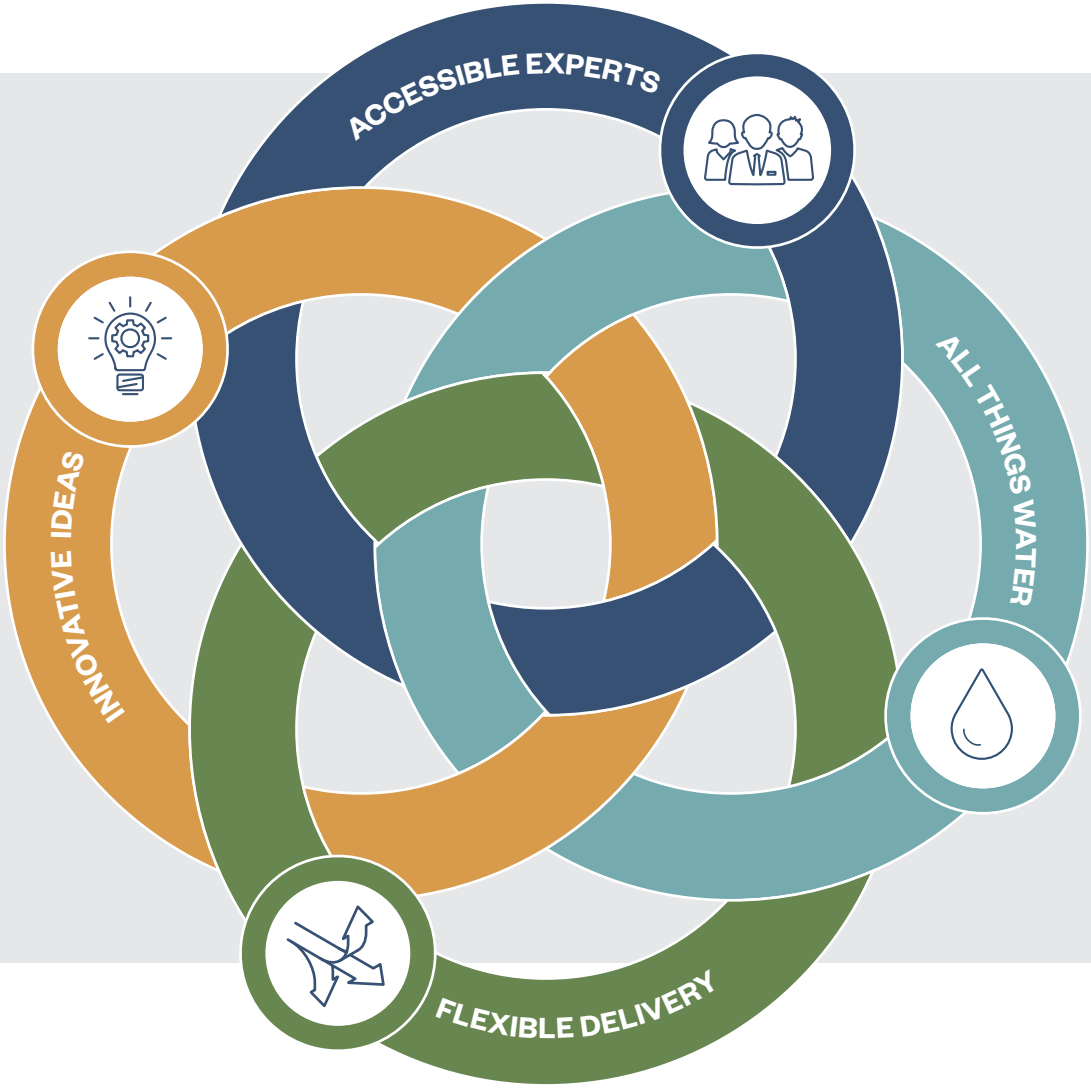
Time Table and Completion Deadline: Expected completion of SAMP by 12/31/2023.

(For Authority Use Only)

Authorization Completion:

Approval: _____ **Actual Cost:** _____ **Date:** _____

Hazen



Lehigh County Authority

Proposal for

Strategic Asset Management Plan

September 9, 2022

Hazen and Sawyer
1 South Broad Street, Suite 900
Philadelphia, PA 19107 • 215.592.0690

September 9, 2022

Ms. Liesel Gross, Chief Executive Officer
Lehigh County Authority
PO Box 3348
Allentown, PA 18106

Re: Professional Services for Strategic Asset Management Plan (SAMP) Development

Dear Ms. Gross and members of the Selection Committee:

Hazen and Sawyer (Hazen) is pleased to provide our proposal and associated cost and work schedule for Lehigh County Authority's (LCA's) Strategic Asset Management Plan (SAMP) Development. The enclosed document details our robust asset management qualifications and experience, along with our approach to collaboratively developing your SAMP. We are committed to providing high quality and responsive service, as Hazen has already demonstrated for LCA and other clients.

We have assembled a superior team of asset management professionals that have proven, relevant experience and technical expertise required to take LCA's program to the next level. We share your vision for standardized processes, data-driven decision making, and superior staff understanding. We believe you will find our team to be uniquely qualified to develop a SAMP for LCA and support current work; we stand apart from the others because:

- Hazen is ***All things Water®***. Our sole business is water and wastewater infrastructure, nothing else. Our team offers the breadth and depth of water industry experience and knowledge necessary to benefit LCA.
- Hazen provides ***Flexible Delivery*****.** Our approach aligns with industry standards, but our delivery and communication is tailored to your culture, needs, and preferences.
- Our ***Accessible Experts*** will be fully engaged in the SAMP development including support, review and advise on current work.
- Hazen employs ***Innovative Ideas*** in everything we do. We will build upon existing practices to optimize how your infrastructure is planned, designed, constructed, and managed.

We welcome the opportunity to help you build on the existing momentum and partner with you on this important endeavor. We would be happy to answer any questions you may have and look forward to discussing our proposal with you in more detail.

Sincerely,

Ryan Nagel, PE, PMP, ENV SP
Asset Management Expert | Vice President

Mark Bottin, PE
Project Director | Associate Vice President

1010-696

Executive Summary

Hazen and Sawyer couples our expertise as the largest water, wastewater, and stormwater consulting firm in the nation with the extensive asset management experience of our team members to provide LCA with unmatched knowledge and capabilities relative to this RFP.

The Hazen Team

Our team of accessible asset management practitioners, technologists, and water | wastewater engineers are committed to LCA's success.

Ryan Nagel, PE, PMP, ENV SP

As Hazen's Corporate Utility Management Solutions Leader, Mr. Nagel is a seasoned asset and utility management consultant with a wealth of project experience from around the nation.

Jeff Naumick, PE

Mr. Naumick has current and recent project experience with LCA, strong knowledge of your major facilities, and extensive experience in project management.

Madeleine Driscoll, PE, MIAM

Ms. Driscoll is Hazen's Mid-Atlantic Utility Management Solutions Leader, and brings a wealth of relevant experience from her history as Chief of Baltimore's Office of Asset Management.

Specialists

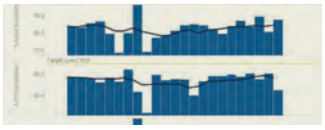
Russ Dalton, PE, PMP
Mid-Atlantic Asset Management Lead

Steve Hutchings, CMRP, CRL
Maintenance Optimization Lead

James MacDonald
Technology Applications Lead

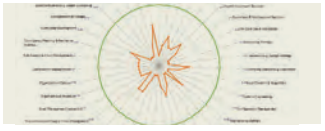
Grantley Pyke, PE
Business Intelligence Lead

Project Examples



Gwinnett County Department of Water Resources, GA
Strategic Asset Management Plan Development and Performance Reporting

City of Somerville, MA
Professional Engineering and Water Utility Management Services



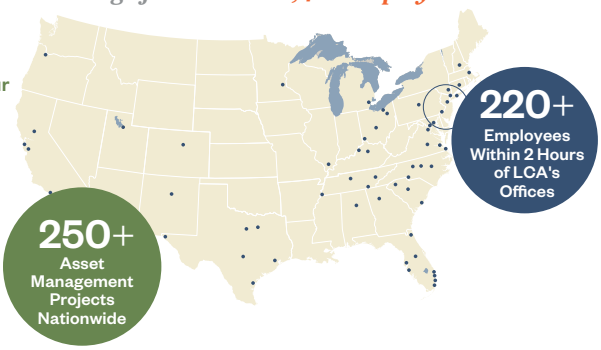
Newport News, Waterworks, VA
Asset Management Program Development and Support

Hazen's Experience

With over seventy years of engineering experience, Hazen has unmatched experience and expertise in the water industry. Our business is your business.

Hazen has the backing of more than 1,400 employees.

We are committed to maintaining our position as a leader in asset management and advanced water and wastewater technologies.



Hazen Offers LCA:

Hazen is **All things Water®**. Our sole business is water and wastewater infrastructure, nothing else. Our team offers the breadth and depth of water industry experience and knowledge necessary to benefit LCA.

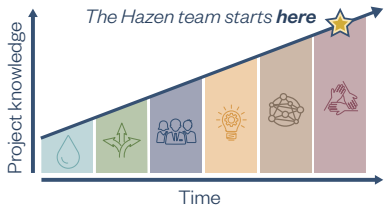
Hazen provides **Flexible Delivery**. Our approach aligns with industry standards, but our delivery and communication is tailored to your culture, needs, and preferences.

Our **Accessible Experts** are involved with project delivery and will be fully engaged in the SAMP development. In addition, they will be engaged to support, review and advise on current work.

Hazen employs **Innovative Ideas** in everything we do. We will build upon existing practices to optimize how your infrastructure is planned, designed, constructed, and managed.

Flexible and Proven Approach to Project Delivery

Hazen will couple our experience working with LCA with our asset management expertise to build on existing momentum to embed the principles of asset management deeper into the organization.



We are ready to build upon what LCA has **already accomplished**

1010-696 IL-ExecSummary

Hazen

Table of Contents

1. Experience and Qualifications

Section No. 1

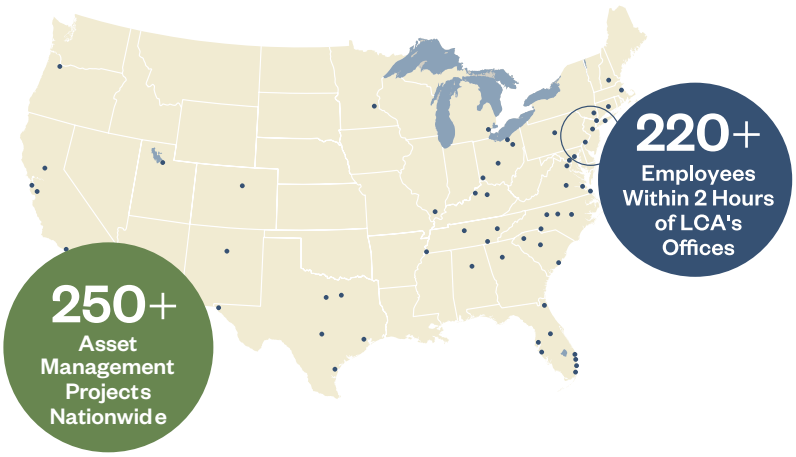
Experience and Qualifications

Hazen provides industry-leading expertise in all facets of asset management. Our team of nationally-recognized asset management and water professionals will provide innovative ideas to make your organization more effective and efficient.

Firm Background

Hazen is a nationally-recognized environmental engineering firm, built on a strong foundation of technical and professional excellence. Since 1951 we have focused solely on water, wastewater, and stormwater infrastructure projects. With over 1,400 professionals and a passion for smart innovation, we have maintained our core values and firm stability in an era of mergers and acquisitions. Our corporate culture of entrepreneurialism, lack of "profit centers," and working principals enables us to mobilize the right resources for each engineering challenge at hand. Our culture is built on the principles of empowerment at the local-office level and minimal bureaucracy. This organizational structure allows us to respond rapidly, with quick turnaround times to inquiries and requests.

Our local staff is seamlessly supported by firm-wide resources. Our team is a proven provider of the highest level of professional services, fully encompassing the technical elements to support LCA's asset management program. LCA will benefit from Hazen's focus and technical expertise in "all things water," resulting in unmatched asset management and project development capabilities that will meet LCA's objectives. We have the vision, discipline, and passion to provide the highest level of service to LCA to effectively serve your needs, ultimately resulting in the success of each task, regardless of scale, scope, or schedule.



Together, we will develop a structured roadmap for implementing a formal asset management program over the next several years. The resulting SAMP will reflect LCA's values, goals, and preferences.

With over 250 utility management and asset management projects nationwide, Hazen has the experience and expertise to develop the best possible SAMP.

Since 1951

Hazen and Sawyer has been focused on

Improving the Environment & *Enhancing Infrastructure*

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Utility Management Solutions Group

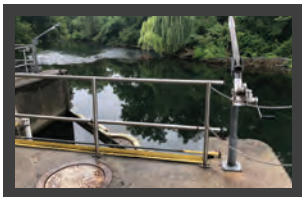
Hazen offers a full suite of water utility management services as illustrated in **Figure 1-1**. Hazen's Utility Management Solutions (UMS) Group specializes in management and technology consulting, offering a powerful combination of technical expertise and business acumen to help utilities such as LCA identify and implement cost-saving and innovative solutions. Asset Management is a prominent service line within UMS that is uniquely comprised of asset management consultants, business analysts and engineers. Through broad-based evaluation of the assets and the organization, we work with water / wastewater utilities to assess current capabilities and determine best next steps to achieve quick wins while simultaneously developing long-term plans. Our team has a strong history of delivering practical, yet innovative, asset management programs for water and wastewater utilities.

Our team combines our technical expertise with your knowledge of the assets and organizational culture to create a Strategic Asset Management Plan that promotes synergy amongst people, process, and technology and serves as the basis for future work activities.

Figure 1-1

Experience Working with Lehigh County Authority

Hazen has provided engineering services on numerous assignments at LCA's Allentown WTP (**Figure 1-2**).



Raw Water Intake Study & Alternatives Analysis

Alternative analysis for the rehabilitation of the two raw water intakes at the WTP with modern equipment.

Innovative Ideas

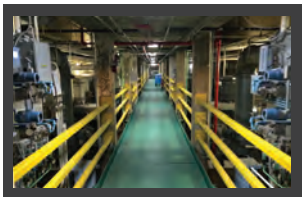
Recommended upgrades for the rehabilitation of the plant raw water intakes, focused on preservation of reliable existing assets while leveraging modern technology to make operations safer and more reliable.

Filter Asset Condition Assessment and Scoring & Inspections

Condition, performance assessment, and asset scoring of all major filter process components and filtration process analysis.

Accessible Experts

Assessed filter performance and provided recommendations to enhance and optimize the filtration process - all by using the plant's existing infrastructure. Our engineers are experts in process and infrastructure alike.



Filter Rehabilitation Alternatives Analysis and Conceptual Design

Concept design for the replacement of the filter underdrains which included focus on constructibility and resiliency of future operations.

All things Water

Our concept design leveraged our process expertise and solicited input from our licensed WTP operators to lay out a construction project focused on minimizing impact to the Allentown WTP and its staff.

Filter Rehabilitation Detailed Design (Ongoing)

Advancement of the previously completed alternatives analysis and concept design to bid-ready construction documents.

Flexible Delivery

The concept design focused on studying all the necessary aspects to ensure successful upgrades. Our approach has positioned LCA to meet their capital and program goals - by having signed/sealed documents well before bid day.

Figure 1-2

1010-696

Why Hazen?

Hazen provides the following key qualities ensuring LCA satisfaction and project success.

Our business is yours: **All things Water**

Benefits

- Know industry needs and trends
- All of our prior experience is relevant to your asset portfolio

Project delivery is **Flexible and collaborative**

Benefits

- Maintain current momentum and staff–buy in
- Sustainable Program expansion

Our asset Management **Experts are Accessible** to LCA

Benefits

- Provide an understanding of what industry experts are doing around the nation
- Involved with project delivery

We bring **Innovative ideas** to reality

Benefits

- Our solutions can provide near real-time situational awareness
- Data-driven CIP

Shared Vision for an enhanced Program

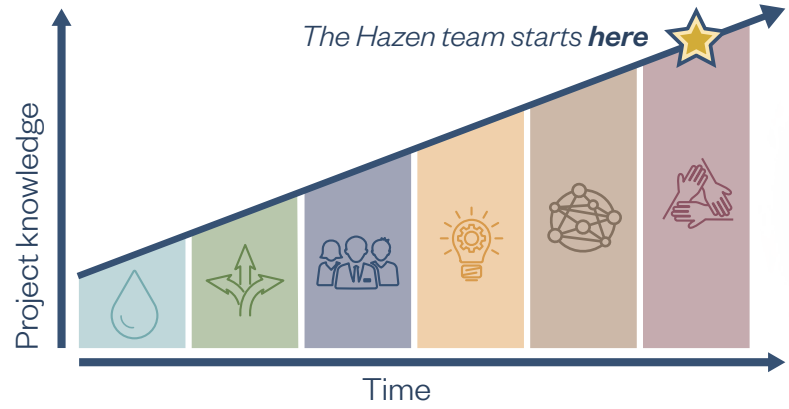
Benefits

- Formalized, repeatable procedures
- Engaged and happy staff

Proven team dynamic that is professional and pleasant

Benefits

- Proficiency in working with all project contributers
- Equal parts technical expertise and proliferation of a successful, collaborative project



We are ready to build upon what LCA has **already accomplished**

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Relevant Experience

Table 1.1 illustrates Hazen's vast experience planning and implementing all facets of a strategic asset management program. We've included six key projects in the subsequent pages that highlight our asset management experience similar to that requested by LCA.

Table 1.1: Asset Management Experience

Key Projects

Client Name/Description	Maturity Assessment | Gap Analysis	Risk Management	Maintenance Planning	Technology and Data Management Support	Performance Management and Reporting	Capital Planning	Strategic | Asset Management Plan Creation
Asset Management Program Development and Implementation Hampton Roads Sanitation District (HRSD), VA	■	■	■	■	■	■	■
Newport News Waterworks Professional Engineering and Water Utility Management Services Newport News, VA	■	■	■	■	■	■	■
Asset Management Program Development and Support City of Somerville, MA	■			■	■		■
Strategic Asset Management Plan Development and Performance Reporting Gwinnett County Department of Water Resources, GA	■	■	■	■	■	■	■
Digital Twin and Data Management Assistance Passaic Valley Sewerage Commission, Newark, NJ		■	■	■	■	■	
Asset Management Plan Goleta Sanitary District, CA	■	■	■	■	■	■	■
North Regional WWTP Condition Assessment & Risk analysis Broward County, FL	■	■				■	■
Condition Assessment and Risk Analysis Rio Hondo Recycled Water Pump Station Central Basin Municipal Water District, CA		■				■	■
Condition Assessment and 20-yr Renewal and Replacement Plan City of Fort Lauderdale, FL		■				■	■
Sewer Design and Implementation Program Manager (CMOM and Sewer Asset Management) City of Fort Lauderdale, FL	■	■	■	■	■	■	■
Stormwater and Sewer Asset Management Planning City of Keene, NH	■	■	■	■	■	■	■
Collection System CIP, CMMS Support, and Regulatory Inventory City of Lowell, MA	■	■	■	■	■	■	■
Water Treatment Plant Asset Inventory Development Cleveland Water, OH		■		■			■
Water Treatment Facilities Assessment, Risk Prioritization and Asset Management Plan Development Cobb County Marietta Water Authority, GA	■	■			■	■	■
Asset Management Program Assessment/5-yr CIP DC Water, District of Columbia	■		■		■	■	■
Sewer Interceptor Condition Assessment Program Management Hampton Roads Sanitation District, VA	■	■	■	■	■	■	■
Condition/Risk Assessment /R&R prioritization Henrico County, VA		■			■	■	■
Asset Management Program Hillsborough County, FL	■	■	■	■	■	■	■

Table 1.1: Asset Management Experience

Client Name/Description	Maturity Assessment | Gap Analysis	Risk Management	Maintenance Planning	Technology and Data Management Support	Performance Management and Reporting	Capital Planning	Strategic | Asset Management Plan Creation
Pumping Facilities Review and Extraction Schedule Jupiter, FL		■				■	■
Performance Optimization Program and Business Model Development Mesa Water District, CA	■		■	■	■	■	■
Vertical Asset Management Program Development Montgomery County Environmental Services, OH	■	■	■	■	■	■	■
WWTPs and Sewer Collection System Condition/Risk Assessment/R&R Recommendations Montgomery County Environmental Services, OH		■				■	■
Sewer System Replacement and Rehabilitation Planning Model Moulton Niguel Water District, CA	■	■	■			■	■
Vertical Asset Management Pilot Program Development Moulton Niguel Water District, CA	■						■
As-Needed Engineering and Asset Management Services Nassau County, NY		■	■	■		■	■
Statewide Asset Management Program Development New York City DEP, NY	■	■	■	■	■	■	■
Asset Management Program Implementation New York DEC/EFC, NY	■	■		■	■	■	■
CMMS Procurement Assistance Palm Beach County, FL			■	■			■
Engineering Project Management Data Analytics and Visualization Portland Water, ME			■	■	■		■
Force Main Assessment and Rehabilitation Program Reneweable Water Resources (ReWa), SC		■		■	■	■	■
Collection System Asset Management Program Update Sanford, NC	■	■		■	■	■	■
ISO 55001 Gap Assessment San Francisco Public Utilities Commission, CA	■						■
Asset Valuation/Continuous Sewer Assessment/RR priorities San Francisco Public Utilities Commission, CA		■			■	■	■
Asset Management Program Sanitation District No. 1 of Northern Kentucky, KY	■	■	■	■	■	■	■
Asset Management Plan Santa Clara Valley Water District, CA	■	■		■	■	■	■
Asset Renewal and Condition Assessment South Coast Water District, CA		■					■
Asset Data and CMMS Gap Assessment South Orange County Wastewater Authority, CA	■	■	■		■	■	■
CMMS Procurement Assistance Town of Cary, NC			■	■			■
Water Distribution System Condition Assessment and Construction Program Management United States Army - Fort Bragg, NC		■					■
Stormwater Asset Management Program/R&R Planning and Financial Analysis Virginia Beach Department of Public Utilities, VA		■				■	■
Asset Management Program Implementation Services Virginia Beach Department of Public Works, VA		■	■	■	■	■	■

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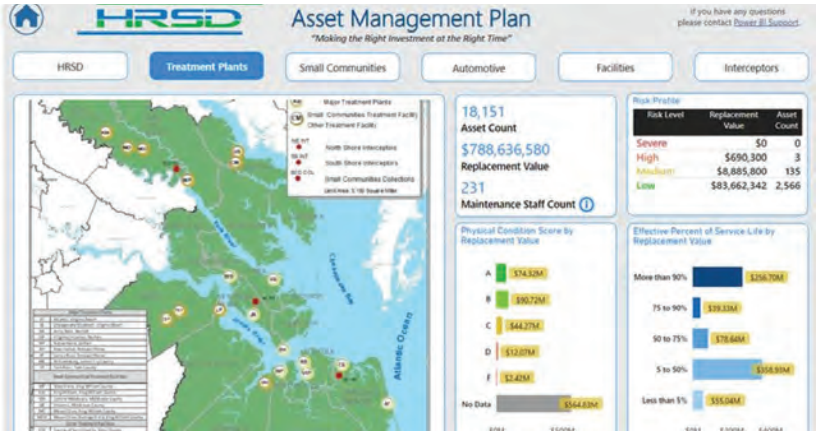

Asset Management Program Development and Implementation

Hampton Roads Sanitation District (HRSD), VA

Hazen has been working with HRSD for the past several years developing their overall Asset Management Program, associated implementation plan, and providing implementation assistance for ISO 55001. As part of the program, Hazen developed an intelligent Building Information Model (BIM) for HRSD using standard Project Templates and a selection of a bridging software to connect BIM data to HRSD's Infor EAM. The BIM Project Templates, provided by Hazen, were used to develop model elements such as families, parameters and content to standardize methods for integration of new facility design data (including EUL for depreciation purposes) into both HRSD's Infor EAM and their financial system.

Hazen worked with HRSD treatment plant staff to define HRSD's approach to assessment of treatment plant asset condition. The procedure enables consistency when evaluating the condition of treatment plant assets, provides details of the approach to condition assessments and provides a standardized set of condition grades, supported by verbal and visual descriptions. Asset condition is used as one factor in the calculation of likelihood of failure for an asset risk assessment.

Development of this comprehensive set of guidelines and standard practices by HRSD (for use by their consultants and contractors) streamlines the collection of asset information. Hazen has recently been focused on the development of Replacement Planning Models (RPMs) for HRSD's priority work centers/asset classes, leveraging Microsoft Power BI. These RPMs provide a projection of capital and O&M needs for HRSD's assets for the next 50 years.

Project Relevance

- ✓ ISO 55001 Maturity assessment
- ✓ Risk management
- ✓ Technology and data management support
- ✓ Performance management and reporting
- ✓ Capital planning
- ✓ Strategic Asset management plan creation Enterprise
- ✓ Digital Asset Management Plans (SAMP and AMPs)

Reference

Anas Malkawi
Chief of Asset Management
Hampton Roads Sanitation District
(757) 460-4273
AMalkawi@hrsd.com

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Newport News Waterworks Professional Engineering and Water Utility Management Services

Newport News, VA

Development and implementation of an integrated, multi-phased utility and asset management program enables cohesive maintenance and management of infrastructure, helps meet customer service goals, and ensures regulatory compliance.

Overall Integrated Asset Management Program Strategy: Developed the overall integrated asset management strategy including development of plans for infrastructure, comprehensive risk assessment frameworks, robust capital improvement planning strategies, organizational assessments, and technology (CMMS) selection and implementation assistance.

Business Intelligence and Performance Reporting Framework: Development and implementation of performance reporting dashboards using business intelligence and data analytics tools (Microsoft Power BI). The dashboards leverage data from various sources (i.e., condition assessment, risk assessment databases) and provide valuable performance insights (available via desktop and mobile application) to staff at all levels.

Program Adoption and Change Management: Active engagement of operations and maintenance staff and extensive hands-on training enabled staff to adopt and implement all of the business process changes and frameworks developed as part of the program.

Organizational Efficiency Assessment: Hazen helped develop a comprehensive organizational efficiency study to assess organizational structure and resource needs compared with the strategic direction of Waterworks and current industry trends.

Project Relevance

- ✓ Gap analysis
- ✓ Risk framework development
- ✓ Technology and data management support
- ✓ All-systems baseline risk assessment
- ✓ Digital AMP development
- ✓ Capital planning
- ✓ Strategic Asset management plan creation

Reference

Eric Nice, PE
Chief of Facilities Engineering
Newport News Waterworks
(757) 234-6706
enice@nnva.gov

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Asset Management Program Development and Support

City of Somerville, MA

The management, operation and maintenance of the City of Somerville's assets is shared amongst multiple departments and divisions and each business unit has a unique management style. As such, the City engaged Hazen to develop an Asset Management Roadmap to help guide them through the process of formalizing their asset management program across all departments and the full portfolio of assets.

Asset Management Assessment and Implementation Roadmap: Work commenced by performing an asset management maturity assessment using the Institute of Asset Management (IAM) Framework. Through a series of facilitated meetings with staff representing all levels of the organization, Hazen evaluated the current situation against the IAM Standard of best practice. The level of competency was scored against all 39 elements and initiatives were developed to help advance the organization towards the desired state.

Prioritization and Staffing Analysis: The initiatives set forth in the Implementation Roadmap were prioritized and a high-level resourcing analysis was conducted to assess internal capacity and capabilities and need for external support. Detailed work plans were written for the highest priority initiatives. These work plans provided details about the goals, objectives, resources, and steps required for full implementation.

Asset Inventory Gap Analysis: Each business unit manages data in an individualized manner, including paper records, databases and workbooks, and GIS files. This task consisted of inventorying the various sources of asset information and evaluating the completeness through the lens of computing asset-level risk. Findings were summarized and presented to the City to help identify and prioritize data management improvements.

Asset Management Communication Plan: Hazen facilitated meetings with the newly created Asset Management Steering Committee to identify a complete list of stakeholders for the Program. Work on this task is on-going, but will result in a written Communication Plan that articulates Program stakeholders and their associated focus and communications needs and preferences.

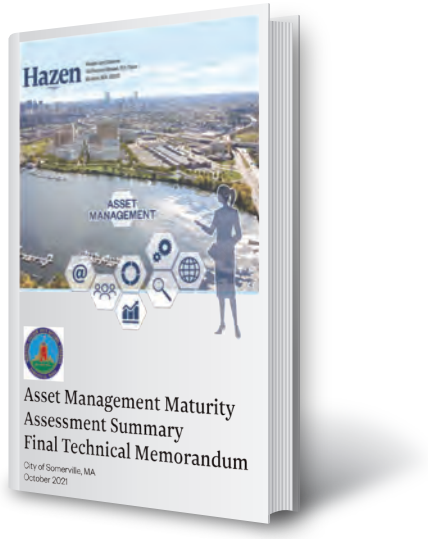
On-call, As-Needed Support: Hazen provided the City with as-needed professional services. Work performed included reviewing and commenting on the Asset Management Policy Statement; developing briefing presentations for incoming staff; and recommending an approach for transitioning to a standard data model.

Project Relevance

- ✓ Conducted asset management maturity assessment
- ✓ Developed a prioritized Implementation Roadmap
- ✓ Created an Asset Management Policy Statement
- ✓ Provided technology and data management support
- ✓ Available for on-call, as-needed support

Reference

Richard E. Raiche, PE, PMP, MCPPO
Director of Infrastructure and Asset Management
City of Somerville, MA
(617) 625-6600 x5410
rraiche@somervillema.gov



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Strategic Asset Management Plan Development and Performance Reporting

Gwinnett County Department of Water Resources, GA

The Gwinnett County Department of Water Resources (GCDWR) was interested in formalizing its asset management practices for all assets into an overall Strategic Asset Management Plan (SAMP) designed to close any practice area gaps. In addition, the SAMP needed to provide direction for GCDWR's leadership to update, develop, submit, finalize, and implement subsequent Tactical Asset Management Plans (TAMPs) for the continued management and improvement of various systems, including water filtration, water distribution, water reclamation, sewer conveyance, and stormwater.

GCDWR engaged Hazen to facilitate efforts to: (1) develop an over-arching document outlining the strategy for using asset management best practices to advance County priorities, and (2) provide a consistent framework/structure that will be common for all TAMPs. This framework serves to guide the updating of existing TAMPs (including water distribution, collection systems, stormwater systems and sewer force mains), as well as for development of new TAMPS. The facility asset management strategy covers operations and maintenance, performance monitoring, rehabilitation/replacement, and final disposal of all assets. This helps ensure that desired levels of service and other operational objectives are achieved at an optimized lifecycle cost and minimized infrastructure risk to GCDWR.

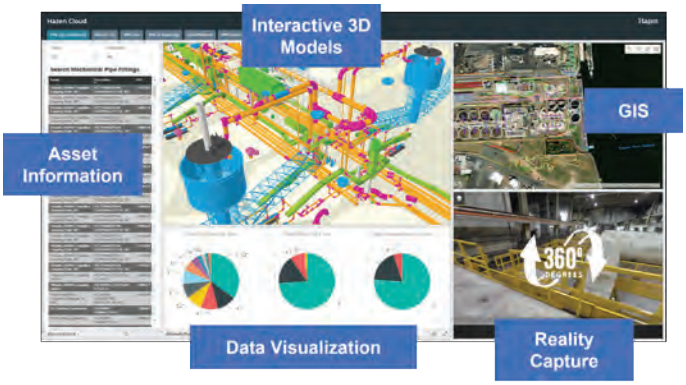
To pilot this approach, Hazen assisted GCDWR in the development of a digital TAMP using Tableau for the Yellow river WRF. Business intelligence dashboards will enable GCDWR to connect directly to various data sources for on-demand monitoring of critical metrics including facility performance, work order status, maintenance cost, and asset availability. Viewing this information side-by-side with Asset Management Parameters such as asset criticality, maintenance and replacement schedules, and the 5-year capital improvement plan (CIP) allows GCDWR staff to interpret data more powerfully than ever, opening the pathway to more financially intelligent and risk-conscious decisions.

Project Relevance

- ✓ Strategic and tactical Asset Management Plan frameworks development
- ✓ Maturity assessment/gap analysis
- ✓ Risk management
- ✓ Technology and data management support
- ✓ Performance management and reporting
- ✓ Capital planning

Reference

Jennifer Suttles, PE, ENV SP
Division Director of Operations
Technical Services
Gwinnett County Department of Water Resources
(678) 376-7008
jennifer.suttles@gwinnettcounty.com



Digital Twin and Data Management Assistance

Passaic Valley Sewerage Commission, Newark, NJ

Hazen has been working with the Passaic Valley Sewerage Commission (PVSC) to provide BIM, GIS, and Enterprise BI support services. The initial tasks of this project focus upon understanding user requirements, identifying business goals and planning for PVSC's current/future technologies related to engineering, operations and maintenance and asset management. The overall goal is to assist PVSC with the integration of different existing IT systems within an Enterprise GIS to enable cross-platform data sharing among the various datasets and platforms currently utilized by PVSC.

PVSC is currently developing and implementing an Enterprise GIS system that meets operational needs and aligns with existing PVSC Information Technology (IT) strategies and roadmaps. Close collaboration between the Hazen team and PVSC engineering, process, operations, and IT personnel is essential for a successful project. A key element to a successful project implementation is to use Commercial Off-The-Shelf (COTS) solutions and to use existing technology already in place at PVSC to the greatest extent possible.

The project expands the use of PVSC's ESRI ArcGIS Server and Portal and implements cloud options for part of their existing GIS system. The initial task of the project focuses on support for ArcG IS Enterprise, cloud deployment strategy, and implementation of PVSC's existing GIS. Integration with BIM and Power BI application will be developed during later stages of the project.

Project objectives and goals for PVSC Data Management Project included:

- Implement a cloud-based GIS deployment using Microsoft Azure.
- Develop Guidelines and SOPs for GIS/BIM Integration.
- Develop Guidelines and SOPs for BIM/CAD Integration.
- Develop strategies and prototypes of user interfaces using Power BI.

Project Relevance

- ✓ Technology and data management roadmap
- ✓ Asset management data integration
- ✓ Facility GeoBIM development
- ✓ Asset Management data visualization and analytics

Reference

John Rotolo
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Passaic Valley Sewerage Commission
(973) 817-5962
jrotolo@pvsc.nj.gov

Goleta Asset Management Plan

Goleta Sanitary District, CA

Hazen assisted the Goleta Sanitary District with development of an asset management program. The program allowed the District to set a sound foundation for development of the annual budget, ensure their finances are adequate for delivery of services, and provide a transparent basis for communicating fiscal requirements with the public and other stakeholders. Efforts completed as part of the project include:

- Data analysis and review.
- Condition assessment and field data collection to address identified data gaps.
- Calculation of estimated lifespans for each asset class using industry standards and data collected.
- Identification of financial requirements associated with rehabilitation and replacement.
- Development and implementation of risk assessment framework with quantified consequence of failure for assets.
- Translation of needs identified through asset management program to CIP project development using a business case evaluation (BCE) tool.
- Development of digital asset management plan (AMP) using PowerBI and integrating with CMMS and financial system.

Project Relevance

- ✓ EPA 10-Step/WERF SIMPLE Maturity Assessment/Gap Analysis
- ✓ Risk framework development
- ✓ Technology and data management support
- ✓ Enterprise-wide risk assessment
- ✓ Performance management and reporting
- ✓ Capital planning
- ✓ Strategic Asset Management Plan creation

Reference

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2. Project Team

Section No. 2

Project Team

Hazen has assembled a team of experienced asset management and technical specialists to provide LCA with the highest level of service and meet the needs expressed in the RFP. Our team is comprised of experts who share LCA's values and priorities, thereby creating a comprehensive and harmonious project team.

Organizational Structure

As the Philadelphia Office Operation's Manager, and proposed **Project Director, Mark Bottin, PE**, will ensure every task has the resources necessary for successful completion and LCA is continuously satisfied with the team's performance. **Project Manager, Jeff Naumick, PE,** will provide day-to-day management and be responsible for maintaining the scope, schedule, and budget. **Asset Management Expert, Ryan Nagel, PE, PMP** will provide a national perspective throughout all aspects of the project, ensuring LCA receives the highest level of experience and expertise. **Madeleine Driscoll, PE, MIAM,** will provide LCA with asset management expertise and leadership for the project delivery team across all elements of SAMP development and support of on-going work. The leadership team is supported by an experienced team of asset management professionals and technical specialists capable of meeting all of LCA's needs.

The Hazen team provides the following benefits:

- Project Manager you know and trust
- Flexible staffing which provides the right resources at the right time
- Industry leading technical experts available to support and advise on current work
- A proven, scalable approach to project delivery

Availability of Key Staff

Our organizational chart (**Figure 2-1**) was developed with both technical ability and availability in mind; the strongest resource offers no value if it is not available to contribute to the task at hand. We affirm that our entire management and technical leadership team is committed to seeing this project through completion, and are available October 10, 2022, the estimated contract start date provided in the RFP.

As we have demonstrated in past projects, we are committed to providing LCA with the resources required to overcome any project challenge. Our team is exceptionally well equipped to address contract work as well as unanticipated needs due to our unmatched technical expertise in all things water and our ability to work as an extension to LCA staff, anticipating agency and program needs.

Resumes for all personnel are located in **Appendix A - Resumes.**

● Local Hazen Office Locations

220+ *staff locally*

1,400+ *staff nationally*

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Team Organization

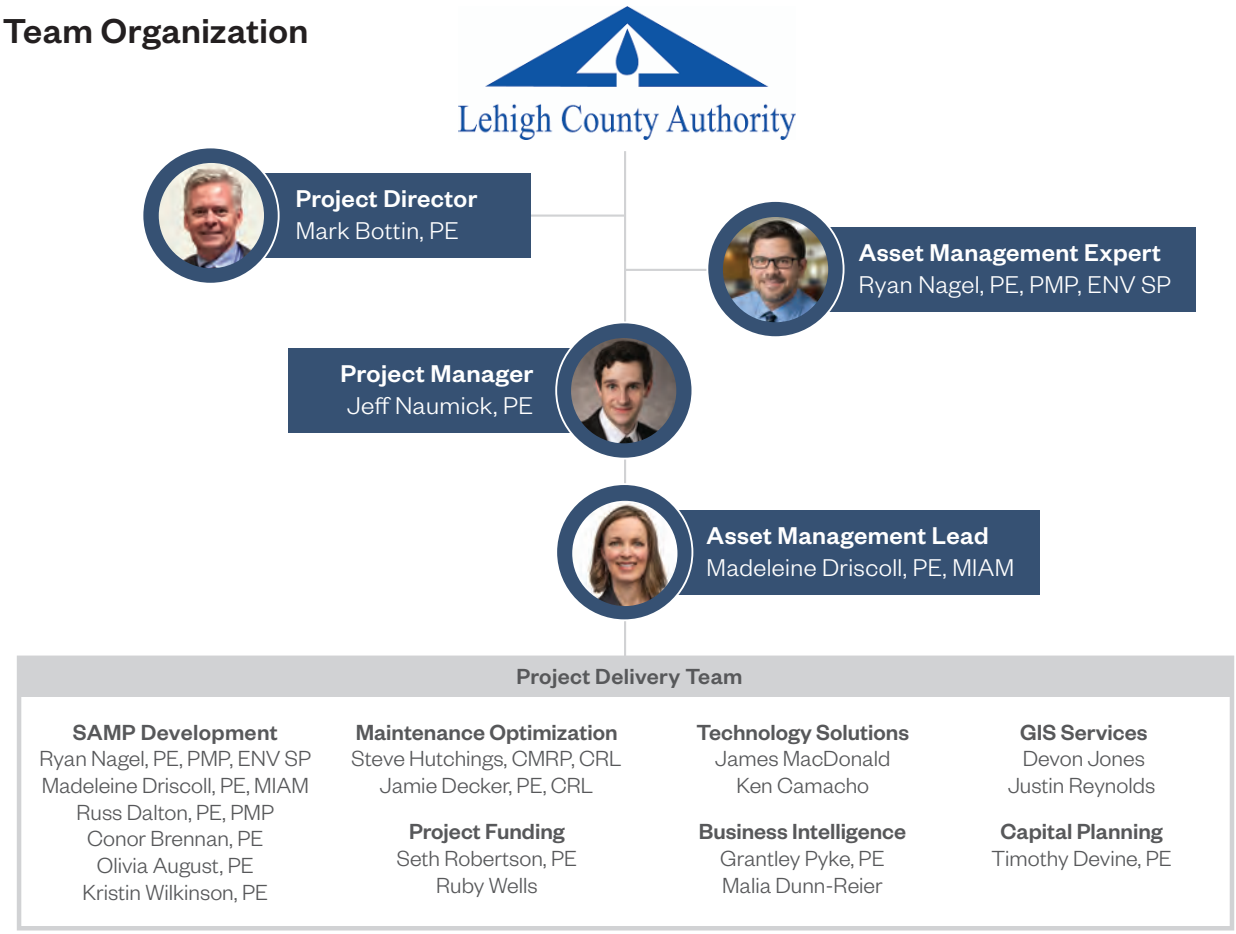

Figure 2-1

Mark Bottin, PE
Project Director

Benefit:

✓ Water infrastructure experience

Mark Bottin, PE, Hazen's Philadelphia Office Operations Manager, will ensure project resources are available when needed. He brings a true client-focused approach to delivering projects for utilities like LCA. Mark will leverage his experiences with LCA to provide strategic direction and insight to ensure our technical approach aligns with LCA culture and vision. With 35 years of experience in water/wastewater industry, Mark Bottin brings proven experience in project management, project delivery as well as keen insights of this specialized industry.

Jeff Naumick, PE
Project Manager

Benefit:

✓ Past and current project experience with LCA

Based in Philadelphia, Jeff Naumick will serve as the local Project Manager, a role he has performed on several other projects with LCA. His responsiveness and commitment to LCA is proven and he is familiar with LCA's procedures and preferences. He is familiar with LCA facilities and will help coordinate work on this project, ensuring smooth project delivery. Mr. Naumick has extensive experience in project management including the directing of workshops and meetings for large engineering design and construction projects.

Experienced Leadership and Responsive Service

Ryan and Madeleine have been working together in the same capacity proposed for LCA to deliver asset management professional services for the City of Somerville, MA. As a team, they will provide LCA with:

- National expertise, including leadership roles in industry committees
- Client-side experience that includes developing and implementing similar programs
- Technical direction of all work
- Review of all work
- Clear communication of asset management principles

Ryan Nagel, PE, PMP, ENV SP
Asset Management Expert

Lehigh County Authority

Madeleine Driscoll, PE, MIAM
Asset Management Lead

With over 27 years of experience in the industry, **Ryan Nagel** is a seasoned asset and utility management consultant with a wealth of project experience from around the nation.

Mr. Nagel has successfully led asset and utility management and optimization projects for major utilities across the country, providing a national perspective on delivering strategic and innovative utility management solutions. He has helped clients enhance the efficiency and reliability of their physical assets by providing key asset management services, including strategic asset management planning, business process optimization, and training.

As Hazen's corporate Utility Management Solutions Group leader, he engages in a variety of challenges and solutions with utilities nationwide.

Madeleine Driscoll, Hazen's Mid-Atlantic Utility Management Service Group Lead, brings a wealth of relevant experience from her eight-year history with the City of Baltimore. As the former Chief of the Office of Asset Management, she was directly responsible for developing a new asset management program for linear and vertical infrastructure. Ms. Driscoll has a deep understanding of the nuances associated with planning and implementing an AM program for a water utility and will work with LCA to make smart and informed decisions.

Ms. Driscoll's personal style of leadership is marked by honesty, integrity, accountability, and dedication to partnership. She will assure the continuation of collaborative and innovative program expansion.

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Additional Team Members

Russ Dalton, PE, PMP | Senior Asset Management Consultant

As a leader within Hazen's Asset Management Group, Mr. Dalton helps clients develop strategies and implement initiatives to achieve them. He specializes in assisting water utilities with enterprise asset management, data management and analytics, asset condition assessment, risk assessment, and capital and O&M prioritization and optimization. Mr. Dalton has worked with diverse clients and therefore understands the wide range of drivers for investing in asset management. He will lead and support tasks associated with SAMP development.

Benefit:

✓ Proven experience with asset management "building blocks"

Steve Hutchings, CMRP, CRL | Maintenance Optimization

With over 27 years of experience, Mr. Hutchings is an expert in maintenance, reliability, and asset management. He specializes in helping water and wastewater utilities tailor and upgrade their preventive maintenance and assessment programs. Over the course of his career, he has risen through the ranks to a senior role, assessing, planning, and advising on ways to improve asset management practices, with a strong focus on maintenance programs. Steve guides utilities on maintenance and asset management principles including maintenance and organizational optimization, reliability centered maintenance (RCM) analyses and reliability centered design (RCD).

Benefit:

✓ Unmatched expertise in maintenance planning and optimization

James MacDonald | Technology Solutions

Mr. MacDonald is a strategic thinker and the firm's Application Technology Leader. As nationally recognized expert in the field of GIS and technology, he often liaises between IT and utility managers. He focuses on developing long-term solutions for water utilities by implementing innovative solutions founded upon current and emerging technologies and helping clients sustainability adopt new technologies and workflows. He is well versed in system integration, cyber security, system integration, and digital strategy. Mr. MacDonald will support current work associated with technology implementation.

Benefit:

✓ Technology guru familiar with cutting edge solutions

Grantley Pyke, PE | Business Intelligence

Mr. Pyke is a Water Supply Engineer that specializes in data management and visualization. A demonstrated ability to manage complex, interdisciplinary water resource systems projects. He combines a strong background in water supply planning with in-depth experience in water quality modeling, climate and hydrology analysis, policy development, and data management and visualization. As Hazen's corporate business intelligence lead, Mr. Pyke has a unique skillset focused on optimizing utility data and system integration and management and will bring this relevant expertise to LCA.

Benefit:

✓ Translates data into actionable information

3. Technical Approach

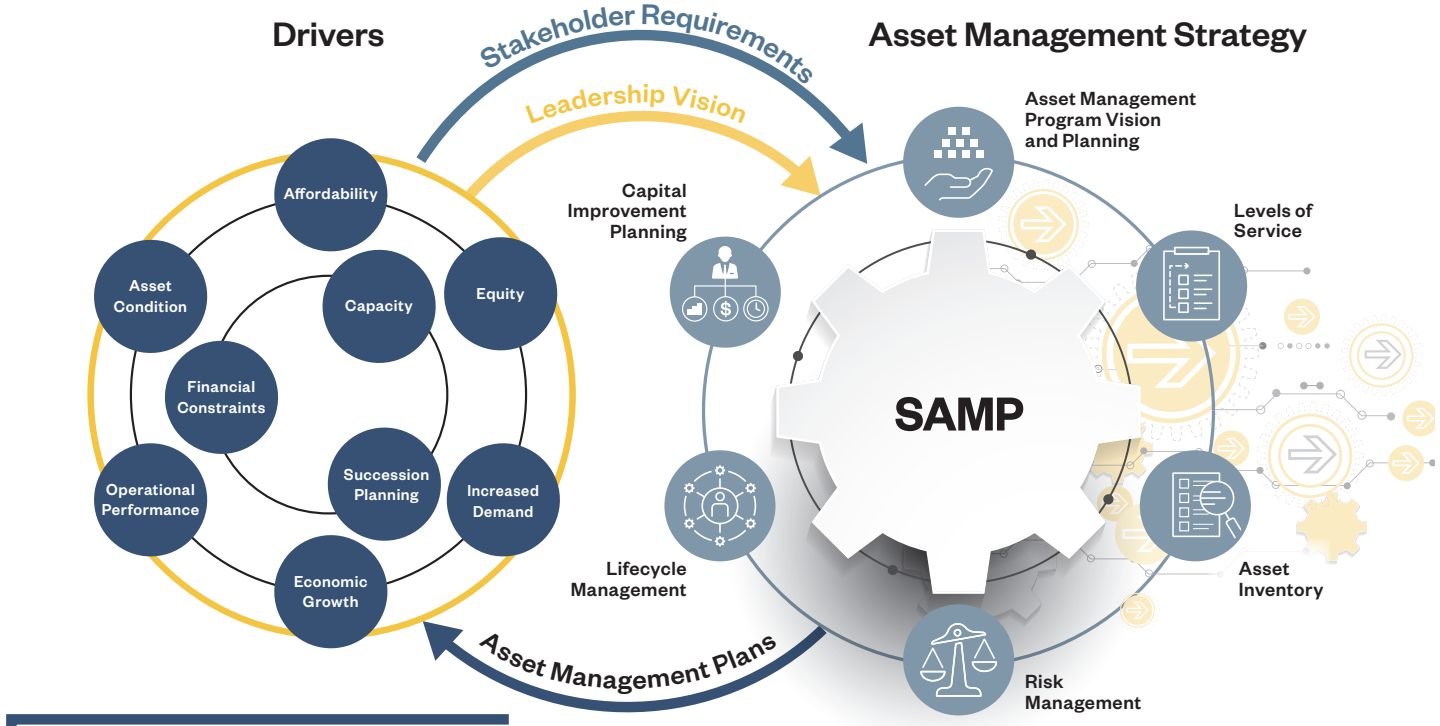
Section No. 3

Technical Approach

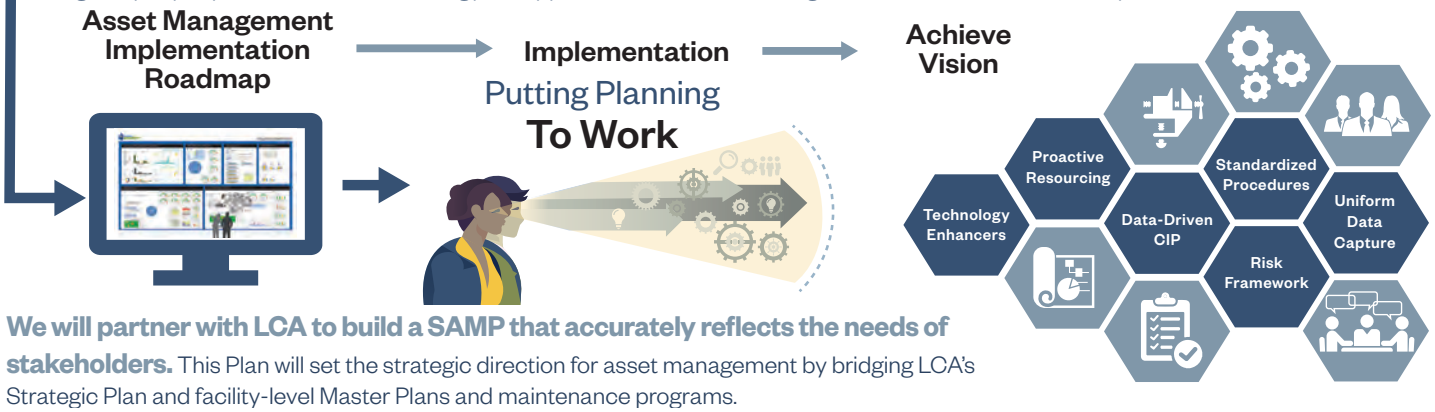
The Hazen team brings the experience, tools, systems, knowledge, and abilities to maximize the value of LCA's portfolio of infrastructure assets.

Project Understanding and Vision

As shown in **Figure 3-1**, this strategy will culminate with the development of a Strategic Asset Management Plan (SAMP) that is informed by LCA's unique organizational and drivers and vision, is guided by targeted levels of service, and utilizes an industry-standard framework to achieve LCA's asset management goals and optimize asset lifecycle management.



Lehigh County Authority continues to advance and formalize its asset management program that encompasses water and wastewater treatment, conveyance and distribution across City and Suburban geographies. The asset management program aims to seamlessly integrate people, processes, and technology to support LCA's role as a leading, resource-conscious, reliable provider of essential services.



We will partner with LCA to build a SAMP that accurately reflects the needs of stakeholders. This Plan will set the strategic direction for asset management by bridging LCA's Strategic Plan and facility-level Master Plans and maintenance programs.

Figure 3-1

Approach

Hazen's approach to SAMP development is a collaborative journey, segmented by asset management elements. The delivery of each element is flexible and scalable to fit LCA's needs and preferences. We promote knowledge transfer and interim deliverables that serve as the building blocks for the written strategy and implementation roadmap as illustrated by ***Figure 3-2****.*

Figure 3-2

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Asset Management Program Vision and Planning

To continue along the journey of formalizing and expanding the current Asset Management Program, it is important to understand where LCA stands in comparison with industry standards and LCA's desired end state. With this information in mind, the vision for the Asset Management Program can be communicated throughout the organization. As such, at the onset of the engagement, Hazen will conduct an Asset Management Maturity Assessment and help LCA develop an initial Asset Management Program Policy that aligns with its organizational Strategic Plan and provides a foundation for the Asset Management Strategy (i.e. the SAMP).

Hazen is well versed in asset management industry standards and frameworks

Asset Management Maturity Assessment

The purpose of a maturity assessment is to understand the current situation within LCA by identifying maturity and opportunities with the current state. Hazen will review existing documents such as the LCA Strategic Plan, recent Wastewater Master Plan, capital plans and other financial plans, maintenance plans, organization charts, and readily available documentation of existing information systems and business processes to ensure the focus is aligned with LCA's broader mission and strategic goals. Hazen's maturity assessment team, consisting of Institute of Asset Management (IAM) Endorsed Assessors, will conduct a series of structured interviews with a cross-section of LCA staff, including Plant Operations, Maintenance, Service & Technology, Capital Works, and Planning. Hazen will document the findings of the interviews against an industry standard framework such as ISO 50001, IAM, or EPA 10-Step Assessment. Each element of the collaboratively-selected framework will be scored for maturity and displayed on a radar plot like the one shown below (**Figure 3-3**).

The Institute of Asset Management (IAM) has an Endorsed Assessor scheme for the ISO 55001 and IAM Conceptual Model asset management standards. Hazen is a Corporate Member of the IAM and is an IAM Endorsed Assessor approved to undertake ISO 55001 and IAM maturity assessments. By qualifying for this endorsement, Hazen has demonstrated a commitment and a sufficient level of expertise, rigor, and impartiality in our approach to conducting assessments of this type.

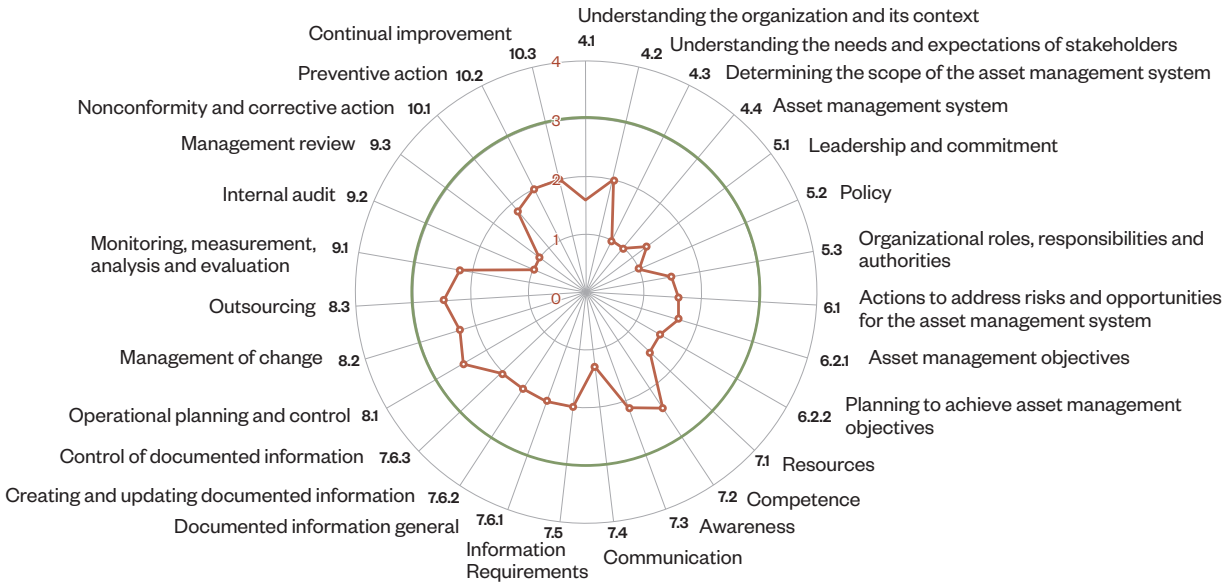

Figure 3-3: Radar plots visualize maturity and identify focus areas for the most gains.

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The Asset Management Maturity Assessment will provide valuable insight into the current state of each "building block" used to create the SAMP. Hazen will develop a Maturity Assessment Technical Memorandum, which will summarize the findings and identify specific gaps and improvement opportunities. The initial results will be presented at a Results Workshop to allow LCA staff to validate and confirm the findings. Potential gap closure improvement initiatives will also be identified and prioritized.

Asset Management Implementation Roadmap

The implementation roadmap is a key component to setting the vision, setting priorities, and resourcing near and long-term asset management initiatives. Hazen recommends developing the initial Roadmap using an excel workbook as illustrated in **Figure 3-4,** but a future activity could include building a PowerBI dashboard to visualize and track the progress of the initiatives.

The same dashboard could be used to track asset management initiatives and other on-going projects including, but not limited to the ERP Upgrade and Technology Roadmap implementation. The Integrated Implementation Dashboard would provide one united view of all implementation work activities, the associated task managers, and other ongoing activities impacting the Asset Management Program. Dependencies and critical path elements can easily be identified and visualized in the dashboard and used to inform planning, prioritizing, scheduling and resourcing today and into the future.

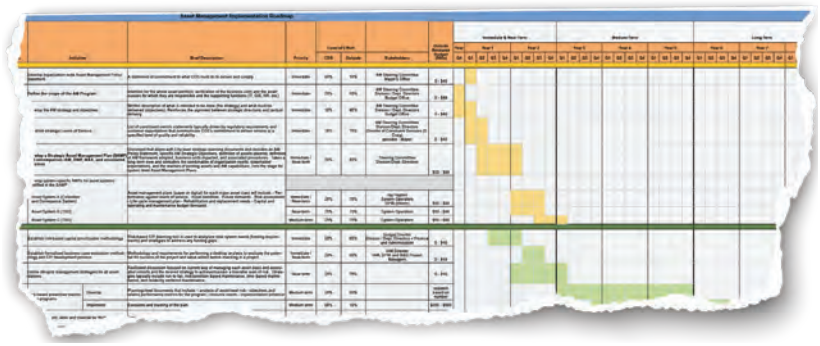


Figure 3-4: Excerpt from an illustrative example of an Asset Management Implementation Roadmap

For each initiative resulting from the Asset Management Maturity Assessment, the following items will be included in the Asset Management Implementation Roadmap:

- Initiative ID
- Description
- Predecessors
- Priority
- High-level assessment of resource requirements
- Suggested initiative leadership
- Key stakeholders

Hazen will facilitate an Asset Management Implementation Roadmap Workshop with LCA staff to validate the initiatives and associated priorities. Following the workshop, Hazen will update the Asset Management Implementation Roadmap, which is intended to be a living document.

Asset Management Policy

The three core elements of asset management include policy, strategy, and plan. To set the stage for the SAMP, Hazen will help LCA develop an Asset Management Policy statement to describe the overall statement of intent for its asset management program.

Table 3.1: Expectations for Asset Management Program Vision and Planning

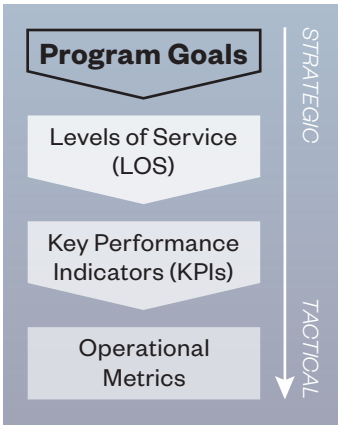
Knowledge Enhancement Opportunities	• Discussions about the various industry-standard AM Frameworks and guidance on which framework is most appropriate for LCA • Discussion and understanding of the alignment between the Strategic Plan, AM Policy, AM Strategy (SAMP) and System-Level AM Plans and Master Plans • Provide example Policy Statements as a starting point
Expected LCA Staff Resource Requirements	• Participation in staff interviews • Provide existing documents, if not accessible via LCA's website • Participation in meeting to discuss and validate the Asset Management Implementation Roadmap
Deliverables	• Technical Memorandum summarizing the results of the Maturity Assessment • Results Workshop to confirm and validate Maturity Assessment • Facilitated discussion to develop an Asset Management Policy Statement for LCA • Draft and Final Asset Management Policy Statement • Draft and updated Draft of the Asset Management Implementation Roadmap • Meeting to discuss and validate Asset Management Implementation Roadmap

Levels of Service

Assets exist to deliver services and goods that are of value to others; therefore, establishing an appropriate level of service (LOS) across its asset portfolio will help inform LCA's priorities and the necessary capital and Operations and Maintenance (O&M) cost investments to maintain and upgrade existing assets.

Define LOS and Set Objectives

Levels of Service (LOS) are the parameters or combination of parameters that reflect social, political, economic, and environmental outcomes that an organization delivers to its customers and key stakeholders. LOS typically relate to service attributes such as quality, reliability, responsiveness, sustainability, timeliness, accessibility and cost and provide the link between higher level organizational goals and objectives and more detailed technical and operational objectives (2015 International Infrastructure Management Manual).



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Hazen considers Levels of Service a major component of any asset management program to ensure the quality of facilities, services, and amenities provided to customers. Typically, Hazen will facilitate the validation and/or creation of several LOS measures and associated targets that can be tracked over time to better prioritize maintenance and capital expenditures. We will review common service level measures across core utility functions including collection, customer service, regulatory compliance, water quality, and other key areas aligned with an organization's overarching strategic plan.

Hazen will validate programmatic LOS, aligned with LCA's asset management strategic goals, objectives, and corresponding operational performance metrics. The Maturity Assessment results will be helpful in identifying any infrastructure performance gaps. We will also discuss and validate current business drivers including external pressures from the public and stakeholders, current and future growth projections, aging and deteriorating infrastructure, and financial considerations. This will provide a better understanding of what service level measures are most appropriate and how they link to overall organizational goals and infrastructure investments.

Hazen will facilitate the creation of several LOS statements and leverage existing, relevant key performance indicators that can be tracked over time to better prioritize maintenance and capital expenditures and strike an optimized balance between infrastructure risk, lifecycle cost, and level of service provided to LCA's customers, as shown in **Figure 3-5**. Hazen will bring an extensive toolkit of measures, reference materials, and templates that are based on our own experience, as well as industry standards such as AWWA, WEF, and the International Water Association.

We will also facilitate a group work session, allowing participants to score and rank individual performance measures from the list. The outcome will be consensus around a preliminary list of performance measures and targets that can be measured, actively tracked and reported that align with LCA's organizational and AM goals and stakeholder expectations. LCA has a robust set of existing performance indicators that will be reviewed for applicability and included in the performance measure alignment and selection exercises.

Figure 3-5

LOS goals will be considerate of future service demand, regulatory requirements, and managing the system(s) to an acceptable level of risk.

The updated (2017) *Effective Utility Management Primer* and most recent (2018) AWWA/WEF *Benchmarking Performance Indicators Report* are two primary resources we often use for LoS development.

Monitor Performance Against Objectives

Once the LOS and associated performance measures are confirmed, it is important to establish an appropriate method for reporting and tracking organizational and asset performance against specific and measurable outcomes. Hazen recommends using an Excel workbook that contains details about data sources and data format to initially track LOS and KPIs.

This workbook can be used to identify what data management procedures can be automated and consumed by PowerBI. With minimal effort, a PowerBI dashboard can be used to display LOS and KPIs identified during the SAMP development process. Using an integrated platform to consolidate data from multiple information management systems (i.e., GIS, Cityworks, MUNIS, Laboratory Information Management System, SCADA etc.) will allow LCA to properly track performance and define program progress and implementation success.

Illustrative example of a dashboard used to display performance measures

Drivers for Monitoring Performance:

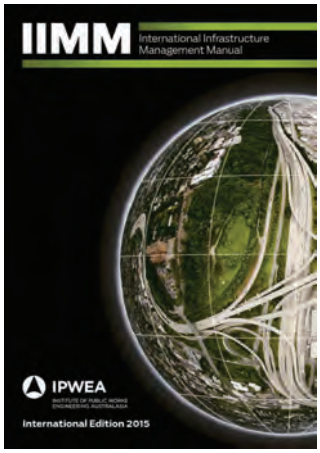
- Providing staff with tangible objectives to manage day-to-day and long-term decisions
- Providing a framework to optimize investments based on cost
- Service level impact
- Providing a mechanism to measure the outcome of business process improvement initiatives and IT investments

Table 3.2: Expectations for Levels of Service

Knowledge Enhancement Opportunities	• Initiate LOS Workshop with an overview of LOS • Hazen will share examples from our toolkit of measures, reference material, and templates • Relate LOS to LCA's Strategic Plan
Expected LCA Staff Resource Requirements	• Active participation in LOS Workshop
Deliverables	• Workbook of LOS Statements and associated KPIs • Text about LOS tailored to LCA that will be included in the SAMP

Asset Inventory

We understand that LCA has already invested extensive effort to collect, populate and manage asset attribute and condition data for both vertical (wastewater treatment plants, water treatment plants, water and wastewater pump stations, wells, and storage tanks) and linear (pipelines and associated appurtenances) assets within GIS. Hazen will help LCA formalize the definition of an asset that can be used across all asset classes. In addition, we will help LCA standardize current practices by reviewing/developing/refining asset naming conventions, hierarchies, and attributes that make up the asset register.



The 2015 International Infrastructure Management Manual (IIMM)

Asset Definition

The International Infrastructure Management Manual (IIMM) defines an asset as "an object (physical or intangible) that has an identifiable value and a useful life greater than 12 months, that is or could be used by the entity responsible for it to provide a service." Most utilities also consider whether an asset requires regularly scheduled preventive maintenance to be documented in its enterprise asset management system (e.g., Cityworks).

Hazen will work with LCA to determine an appropriate and reasonable definition of an asset, for which unique asset identification (asset IDs) should exist, and by which all subsequent asset inventory, risk assessment, maintenance, and replacement planning should be aligned. The outcome of a facilitated discussion is an agreed upon definition that allows LCA to optimize the O&M and renewal of its portfolio of assets, while minimizing the administrative requirements to the greatest degree.

Asset Register

The Asset Register is the backbone of asset management as it provides the organization with a list of assets (the inventory) and associated attributes. Together the inventory and attributes make up the Asset Register. A fully developed asset register contains physical attributes, asset management attributes, financial attributes, and tracking attributes.

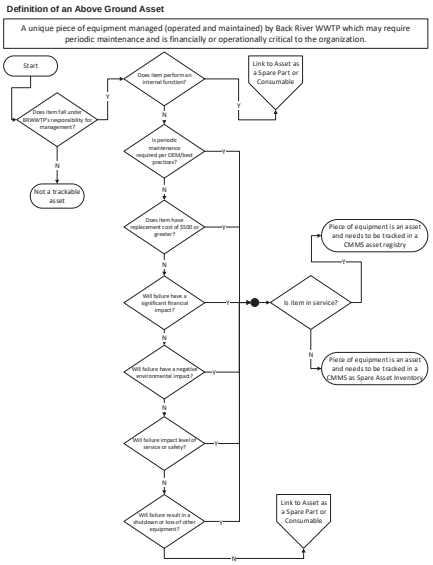
- **Physical Attributes:** Physical attributes define the physical and operational characteristics of the asset and typically include asset name, description, location, type, manufacturer, model number, etc. For linear assets location and proximity to sensitive features is also important.
- **Asset Management Attributes:** The asset management attributes facilitate risk management for O&M and capital planning and include: physical condition, performance condition, and criticality.
- **Financial Attributes:** Financial attributes support O&M optimization, capital planning and depreciation. Typical examples include install date, rehabilitation date, install cost, expected life, remaining life, replacement cost, cost basis, and inflation/escalation factors.
- **Tracking Attributes:** Tracking attributes help maintain the integrity of the overall asset data and to support sound data management. Typical tracking attributes at the asset level include date created, created by, date last edited, and edited by.

Our team will work with LCA to define the appropriate asset attributes for each asset class in its portfolio for inclusion in the SAMP. This will serve as a guide for LCA's subsequent AMP inventory development.

Project Proof

Definition of an Asset, City of Baltimore, MD

Hazen is working with Managers and Operators alike to help the City of Baltimore develop a formal definition of an asset; develop a framework and associated definitions for quantifying likelihood and consequence of failure; and develop an asset naming convention. Collaboratively we tailored templates developed by Hazen to fit the City's needs and preferences.



Example decision tree used to define asset across multiple asset classes.

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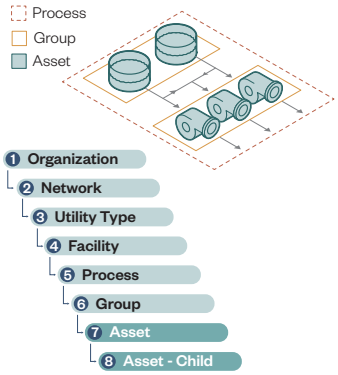
Asset Hierarchy

An asset hierarchy represents the relationship between assets without regard to the location of the asset or asset type and assigns a parent-child relationship between assets and defines the lowest level of assets. An asset hierarchy for vertical assets may be "process" based or "location" based. Hazen will work with LCA to determine the optimal type of asset hierarchy and standardize it across all facilities, to the maximum extent practical. For linear assets, the typical hierarchy consists of the identification of all valves, manholes and other appurtenances associated with specific pipe segments within a particular pipe network.



Illustrative example of Asset Hierarchy

Table 3.3: Expectations for Asset Inventory

Knowledge Enhancement Opportunities	• Discussion around the definition of an asset and how it impacts future asset management tasks, including maintenance planning • Put the current topic of discussion in context of the bigger picture • Facilitated workshops to gain consensus about foundational elements such as hierarchy, asset definition, and attributes • Provide examples from which to customize and build upon
Expected LCA Staff Resource Requirements	• Participation in Asset Definition Workshop • Review and comment on alternative hierarchies • Direct or indirect access to existing asset information system (GIS)
Deliverables	• Definition of an Asset Decision Tree • Recommendations for standardizing asset hierarchies amongst City and Suburban facilities • Review of the existing Asset Register and recommendation for improvements, if needed

Risk Management

Condition Assessment

A typical SAMP establishes the framework, requirements, and procedures for subsequently developed Asset Management Plans (AMPs). The SAMP will describe what data is required / desired to evaluate the condition of vertical and linear assets. Hazen will review LCA's current condition assessment procedures and recommend ways to standardize data capture and the information gathered for each asset class. Example of physical condition ratings are illustrated in **Table 3.4.**

Establishing a comprehensive condition assessment strategy and framework for both vertical and linear assets is a major step in developing an Asset Management Plan, and a requirement for efficient capital and financial planning.

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Table 3.4: Example of Physical and Performance Conditional Ratings

Score	Physical Condition Rating Guidelines	Performance Condition Rating Guidelines
1 - Excellent	Fully operable, well-maintained, and consistent with current standards. Little wear shown and no further action required.	Meets all design and legal/regulatory requirements in all demand conditions - i.e., capacity exceeds maximum designed flow and adequate standby or emergency protection provided. Overall performance excellent and meets all expected future requirements.
2 - Good	Sound and well-maintained but may be showing slight signs of early wear. Delivering full efficiency with little or no performance deterioration. Only minor renewal or rehabilitation may be needed in the future.	Meets all design and legal/regulatory requirements. May have minor risk under extreme conditions. Overall performance excellent and will likely meet expected future requirements.
3 - Moderate	Functionality sound and acceptable and showing normal signs of wear. May have minor failures or diminished efficiency and with some performance deterioration or increase in maintenance cost. Moderate renewal or rehabilitation needed.	Current performance is acceptable but would likely not meet future additional requirements or increased demand (e.g. capacity, level of service goals, regulatory requirements, reliability, obsolesnce.)
4 - Poor	Functions but requires a high level of maintenance to remain operational. Shows abnormal wear and is likely to cause significant performance deterioration in the near term. Near term scheduled replacement or rehabilitation needed.	Current performance is marginal and will not meet future additional requirements or increased demand (e.g. capacity, level of service goals, regulatory requirements, reliability, obsolescence.)
5 - Very Poor	Effective life exceeded and/or excessive maintenance cost incurred. A high risk of breakdown or imminent failure with serious impact on performance. No additional life expectancy with immediate replacement or rehabilitation needed.	Current performance is unacceptable and does not meet currently required performance criteria (e.g. capacity, level of service goals, regulatory requirements, reliability, obsolescence.)

Risk Framework

Hazen has helped to define and implement asset risk frameworks for dozens of utilities across the country.

The Hazen team will implement a comprehensive risk assessment approach built from current industry standards. Established likelihood and consequence of failure assessment methodologies will be used to develop an overall risk rating for both vertical and linear assets. **Figure 3-6** illustrates a typical risk framework, upon which Hazen will work with LCA to tailor the LOF and COF factors and associated definitions.

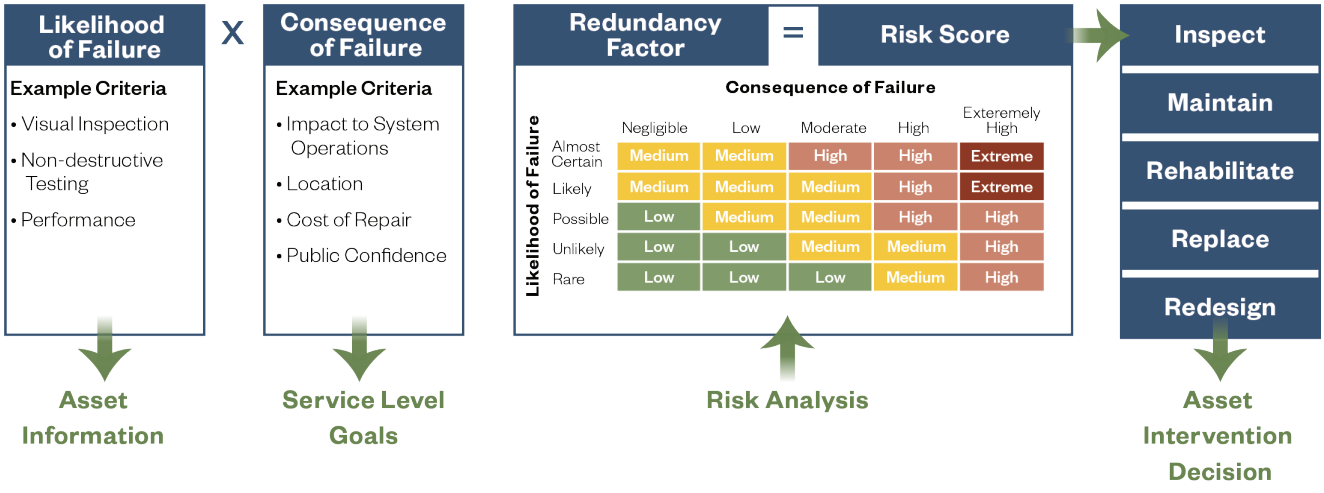

Figure 3-6

Likelihood of Failure (LOF)

Hazen will begin by reviewing existing data currently being captured by LCA to assess asset condition and/or performance. Armed with this information, we will guide LCA through the process of identifying and defining likelihood of failure (LOF) factors and associated definitions that align with available data. Where there are gaps in condition / performance data, Hazen will recommend ways to fill them.

Hazen will facilitate a workshop with key LCA stakeholders to determine any changes to LCA's existing LOF criteria. Likelihood of Failure typically includes condition / performance, age, annual maintenance costs and / or other factors that can influence an asset's service life but are dependent on the type of asset. Typical failure modes are associated evaluation criteria and mitigation strategies are shown in **Table 3.5**.

Physical Condition. The current state of repair and operation for the equipment item. The physical condition is determined by an inspection in the field.

Performance Condition. The ability of the equipment item to meet operational requirements now and in the future determined by discussions with O&M staff and performance history.

Table 3.5: Example LOF Criteria based on Physical and Performance Failure

Condition	Failure Mode	Evaluation Criteria	Probable Mitigation Strategy
Physical	Mortality	Information	Capital or Maintenance
		Mechanical and Electrical Testing	
Performance	Mortality	Reliability (breakdowns)	Capital or Maintenance
	Capacity	Current capacity testing	Capital or Maintenance
		Future capacity needs	Capital
	Level of Service	Current and future regulatory needs	Capital
		Other LOS measures	Capital or Maintenance
	Efficiency	Obsolescence	Capital
		O&M Issues (not breakdowns)	Capital or Maintenance

Consequence of Failure

Equally important to condition and LOF assessment of assets is the determination of consequence of failure (COF) criteria to help focus limited resources on those assets that have the highest importance based on impacts such as financial, environmental, reliability, public safety, etc., while considering issues such as likely failure mode and redundancy. Using our existing tools and templates, Hazen will work with LCA to identify any potential desired changes to its current COF approach and develop a set of common criteria customized for LCA, which can then be applied to the full portfolio of assets.

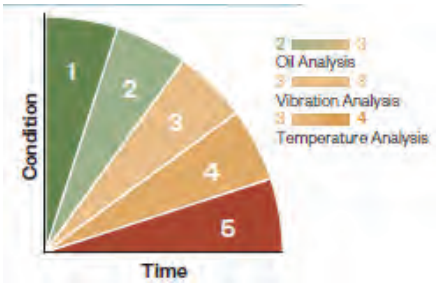

Figure 3-6: Hazen has the experience to conduct advanced physical condition testing based on asset criticality.

Similar to LOF, we will work with LCA staff to establish common scoring criteria and weightings covering factors such as redundancy, O&M impact, safety, climate change vulnerability, and other appropriate factors. As illustrated by **Figure 3-6**, the resulting information can be used to support capital and O&M programs.

Criticality is the measure of importance of something, such as a system or asset, to the mission, objectives, and values of an organization. Understanding criticality will enable LCA to optimize their planning and perform reliability centered maintenance (RCM).

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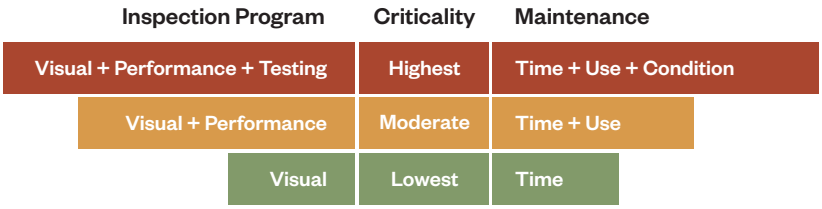
Table 3.6: Expectations for Risk Management

Knowledge Enhancement Opportunities	• Process for developing a risk framework, inclusive of all factors, weightings and definitions • Alignment of risk factors with organizational values (service, engagement, dedication, positivity, and excellence) • Provide examples, including peer-reviewed references, upon which to tailor and build upon
Expected LCA Staff Resource Requirements	• Participation in Risk Framework Workshop • Institutional knowledge to identify critical assets
Deliverables	• Risk Framework, inclusive of LOF and COF factors and definitions, to include in the SAMP • List of asset data required / desired to evaluate asset condition and/or performance

Lifecycle Management

Managing Assets Across the Lifecycle

Typically, Asset Management frameworks provide extensive emphasis on risk assessment leading to an effective multi-year CIP. A risk-based optimization of preventive and predictive maintenance strategies is a very powerful approach, as the results are based on a sound foundation of asset condition, criticality and overall risk.



Hazen will work with LCA to establish a robust, cyclical process of combining CIP Planning efforts with O&M optimization improvements to provide an all-encompassing, optimized, and prioritized capital and renewal plan that prioritizes specific inspection and maintenance activities based on overall asset criticality and risk.

Maintenance Program Planning

Hazen will work with LCA to evaluate and optimize O&M activities and work practices through development of current/updated standard operating procedures (SOPs) covering the major work activities that are performed on a daily, or frequent, basis, and by conducting a best practices gap analysis to produce a roadmap for ongoing improvements to O&M practices and procedures.

Specific Outcomes of O&M Practices and Procedures include:

- Greater staff understanding of important key performance indicators (KPIs) and their relationship to day-to-day activities
- Improved and consistent utilization of Cityworks
- Useful data to inform decision making
- System and organizational performance trends can be shared with stakeholders
- Improved and consistent work processes, procedures, and documentation
- Focus on maintenance activities that offer the highest benefit to LCA and its customers
- Understanding the impacts of staffing levels and training opportunities on LCA's ability to meet accepted LOS targets

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This effort aims to ensure that a performance management and continuous improvement culture and strategy are in place to foster operational optimization and financial and infrastructure sustainability in the future. Additionally, Hazen understands that LCA is moving towards data-driven preventive and predictive maintenance. Hazen will collaborate with LCA to establish processes and procedures for leveraging data captured through condition assessment activities and in Cityworks to plan asset maintenance activities by leveraging asset and system criticality information to drive the appropriate preventive and reliability-based maintenance activities and frequencies.

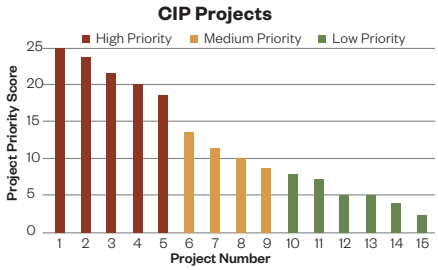
Table 3.7: Expectations for Lifecycle Management

Knowledge Enhancement Opportunities	• Introduction to industry standard frameworks and tools • Collaborative workshops for staff participation and learning
Expected LCA Staff Resource Requirements	• Attendance and participation in workshops/discussions of maintenance procedures and planning
Deliverables	• O&M Guidelines for vertical and linear assets • Language included in the SAMP regarding maintenance optimization and prioritization

Capital Improvement Planning

Capital Planning Process

Asset management strives to maximize asset service life and minimize lifecycle costs by evaluating investments throughout its full lifecycle – acquisition through disposal. Full lifecycle costing is considerate of up-front capital costs, operational costs, maintenance costs, renewal costs and may also include 'triple bottom line' costs associated with social, environmental, safety and reputational considerations. Hazen understands that LCA currently has a somewhat informal and iterative process for capital improvement program (CIP) development and prioritization, but is striving towards a data-driven, standardized approach to developing its 5-year CIP. Hazen will leverage RUL and replacement cost information to develop a long-term, risk-prioritized CIP that integrates the replacement needs of LCA's asset infrastructure. Our team has developed financial forecasting models to project asset replacement needs/costs for the next 50 years.



Sample CIP Project Prioritization

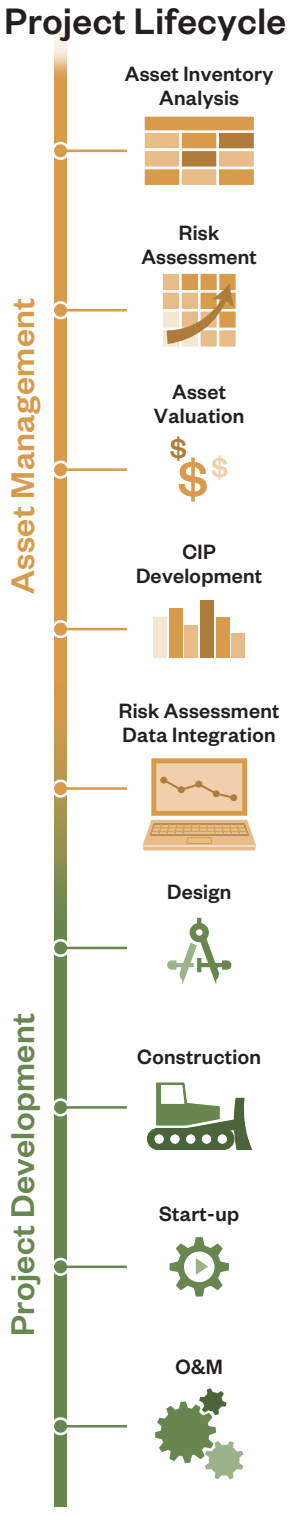
These models will allow LCA to bundle assets into larger replacement/rehabilitation projects based on risk and remaining useful life, under any annual capital budget constraint. The financial models also provide a basis of comparison for LCA's existing CIP to help identify priority project needs. Hazen has developed SOPs and corresponding training regimes to keep the models current with new/retired assets, updated risk scores, and replacement costs, and has helped our clients to establish condition assessment work orders within their CMMS system.

Lifecycle Costing and Long-Term Financial Planning

Optimizing asset lifecycle activities requires a detailed knowledge of the asset renewal and operations costs. Replacement costs for each asset can be calculated using recent bids, purchase orders, financial inventory, and cost tables. Where available, operations and maintenance costs are broken down and assigned to individual assets. Once costs and risks are all recorded in the asset register, Hazen works closely with our clients' staff to determine replacement, rehabilitation, and major maintenance trends for assets. This often involves alignment with, or reconciliation of, the annual O&M costs per asset type with the financial depreciation recorded in the financial record. While these two asset records do not often coincide, if the protocols and procedures are put in place to delineate installed assets by the individual assets within the financial record instead of by overall project, this alignment and integration can be performed more easily.

In order to inform appropriate asset depreciation schedules, Hazen projects effective useful life (EUL) for each asset type, assuming routine and consistent preventive maintenance practices are employed, using industry-values derived from the Water Environment Research Foundation's (WERF) Remaining Effective Life Tool Version 4.0. These values are then revised to better reflect the actual EULs that specific customers have historically experienced for these types of assets. Hazen team members are currently serving in a leadership role for an AWWA Asset Management Subcommittee formed to identify and standardize EULs for water system assets across the industry. Hazen will work with LCA staff to formalize an agreed upon methodology to calculate a modified Remaining Useful Life (RUL) based on asset condition and performance, and will collaborate to standardize the methodology that LCA uses to capture and record asset lifecycle costing within Cityworks. This will be documented in the established SAMP.

The maintenance management strategies for asset types can be used as the logic to model the activities and costs of all assets into the future. Hazen utilizes in-house tools to model the major future maintenance, replacement, and rehabilitation projections. These tools incorporate the developed asset register and life cycle logics to forecast the life cycle cost of ownership for each asset in the asset register. Budgetary requirements and average investment requirements can be modeled for the next 20 years, or can extend beyond 100 years, to ensure the planning horizon is long enough to capture the full life-cycle of all assets in LCA's portfolio.



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An example of how risk assessment and maintenance scheduling across an asset portfolio lifecycle drives cost estimating techniques for long-term capital renewal is illustrated in **Figure 3-7** for the Hampton Roads Sanitation District.

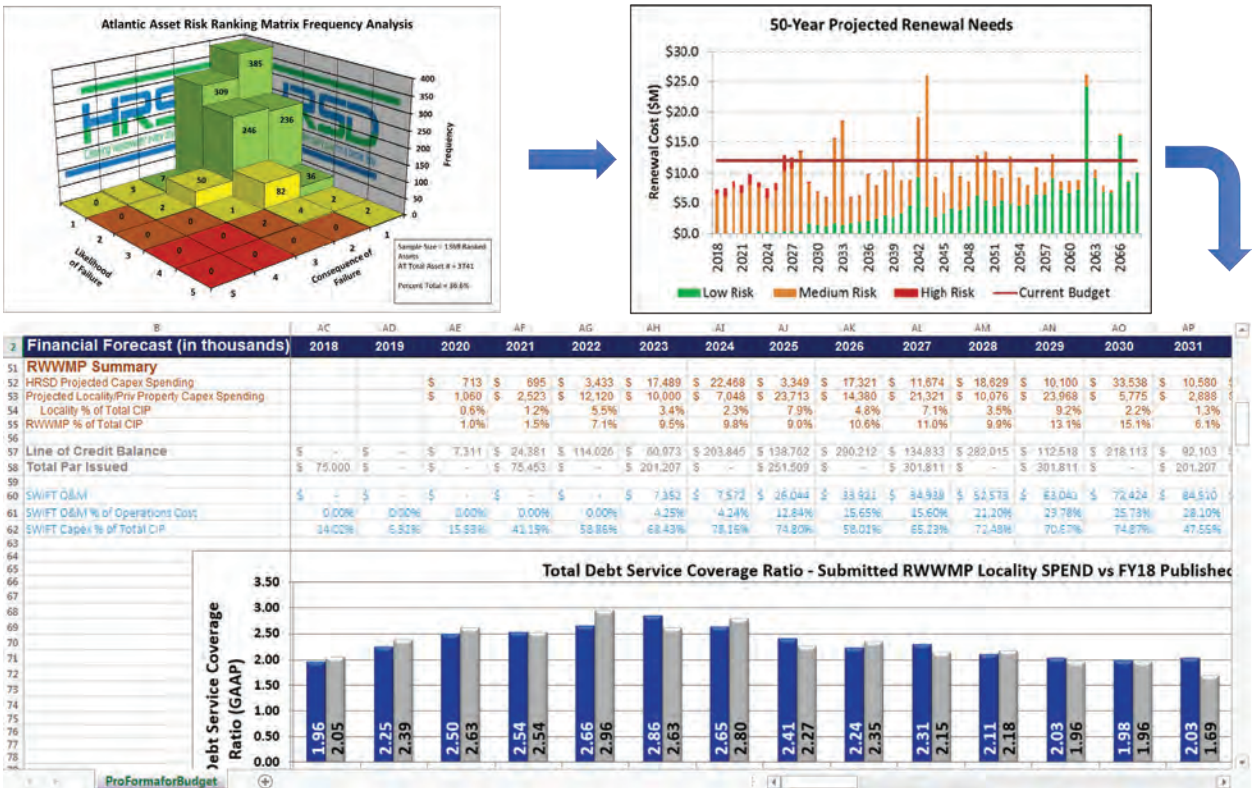

Figure 3-7: Illustrative example of a long-term financial forecast based on system needs and risk

*If needed and upon request, Hazen will evaluate LCA's current methodology for estimating asset or system replacement costs. **Hazen has extensive experience developing Association for the Advancement of Cost Engineering (AACE) cost estimates** for the construction of new, comparable facilities and assets. To estimate total construction cost, a combination of broad unit cost information (e.g., $/MG), research reports, expert trend analysis and existing cost values from similar construction projects are often leveraged. To estimate asset replacement values, a combination of industry standards, Original Equipment Manufacturer (OEM) guidelines, research reports, and existing schedule of values from ongoing construction projects are typically utilized. Industry accepted cost escalation factors for labor and materials can also be applied (ENR, American City and County Municipal Cost Index, etc.).*

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Table 3.8: Expectations for Capital Improvement Planning

Knowledge Enhancement Opportunities	• Facilitated discussion focused on what is currently working and what is not, associated with LCA's CIP development and prioritization process. • Identification of ways to leverage the principles of asset management to inform decision making
Expected LCA Staff Resource Requirements	• Participation in discussion about the current process for developing and prioritizing the CIP
Deliverables	• Language to include the SAMP about the process for identifying and prioritizing CIP projects, as well as for tracking and documenting asset lifecycle costing and renewal needs • "As-is" and "To-be" workflows for CIP Prioritization Process

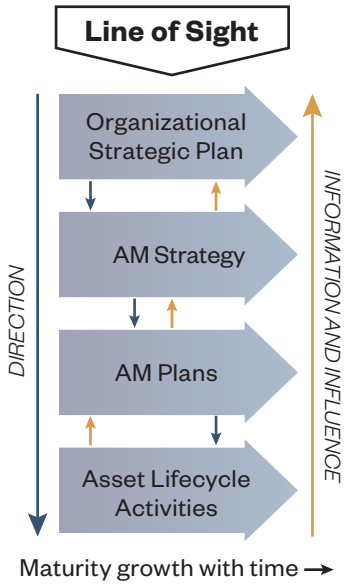
Strategic Asset Management Plan

Per the Institute of Asset Management, the SAMP includes documented information that specifies how organizational objectives are to be converted into:

- Asset management objectives
- The approach for developing Asset Management Plans (AMPs)
- The role of the asset management system in supporting achievements of the asset management objectives

Compile Elements to Create the SAMP

The IAM definition is a formal way of explaining the outcome of this final task: a written document that compiles the elements described and created in the previous sections. The SAMP will serve as guidance for all future asset management activities by defining a clear way forward (the framework), what the strategic objectives are (AM goals and LOS), and how they will be delivered (methodologies).



Relationship between Strategic Planning Documents per the Institute of Asset Management

Assist with SAMP Implementation to Sustain LCA's AM Program

Developing a Strategic Asset Management Plan is just the beginning of the asset management journey. The formalization of current procedures coupled with the collaborative process of creating it will serve as a strong foundation for obtaining staff buy-in, understanding, and adoption. Hazen's experience developing and implementing SAMPS for water utilities around the nation has showed that there are a number of keys to sustainable implementation including:

- Periodically revisit the SAMP and update it as needed. Every 3-5 or in conjunctions with updating the organizational Strategic Plan years is a typical timeframe. It is important that the contents remain relevant and continues to drive improvements.

The success of the Asset Management Program is ultimately determined by the LCA employees who implement and sustain it.

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- Define a process for reviewing and updating the SAMP and identify resources to champion the effort.
- Make it accessible to LCA staff at all levels of the organization.
- Create an Asset Management Steering Committee to help communicate the message deeper into the organization.
- Link future AMPs to the content and principles described in the SAMP. The AMPs will translate policy into tangible actions.

Tips for Developing the SAMP:

- ✓ Leverage examples, but make it your own
- ✓ Use language that the audience can relate to
- ✓ Include a mix of quick-wins and long-term initiatives
- ✓ Recognize the diversity in stakeholder needs
- ✓ Start small and grow at a rate that is appropriate for LCA

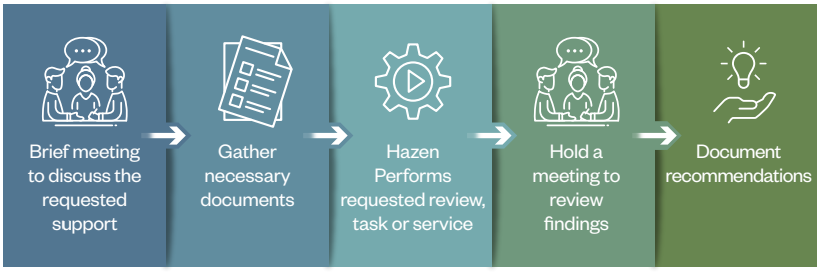
Table 3.9: Expectations for the Strategic Asset Management Plan

Knowledge Enhancement Opportunities	• Review meeting to discuss the final product and answer questions from LCA staff • Presentation and/or publication at water and wastewater conferences
Expected LCA Staff Resource Requirements	• Review and comment on Draft SAMP • Participation in review meeting
Deliverables	• Draft and Final written SAMP • Meeting to review and discuss draft SAMP

On-Call, As-Needed Support for Current Work

LCA is taking a hybrid top-down, bottom-up approach to embedding asset management within the organization. As such, a lot of work is currently underway that needs to continue, not to be interrupted by the process of developing the SAMP. To maintain alignment between current progress and the long-range vision, Hazen welcomes the opportunity to serve as your trusted advisor, sharing firm and staff experience alike to provide another perspective on the progress made with past and current activities, and provide vision and implementation assistance with any new activities.

Work will be performed on an as-needed, on-call basis and with approval from LCA's Project Manager. As needed, Hazen will engage our national experts to provide high-level of expertise and creative solutions. We envision that work performed under this task will follow a similar format, but will adapt the approach on each potential task to the nature of the request and LCA's needs.



Typical process anticipated for supporting current work.

A majority of Hazen's asset management work is performed under on-call contracts and we are experts in delivering on-call services. We are able to manage multiple tasks in different phases concurrently and seamlessly. Hazen's reputation for exceptional client service and superior technical detail extends to our on-call tasks, regardless of project size. The proof is in the results. Hazen has been performing services on uninterrupted on-call contracts for several clients for decades.

On-call Experience

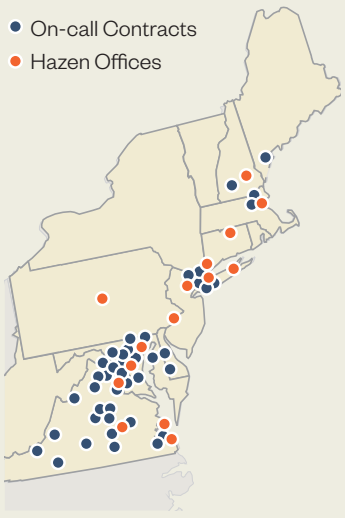


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Table 3.10 highlights how we may be able to assist LCA with the needs described in the RFP and why Hazen is best suited to be your trusted advisor.

Table 3.10: Support of Current Work at LCA

A	Potential Deliverable	Benefits of working with Hazen
Review LCA's Asset Management Technology Roadmap and provide short-term and long-term recommendations regarding sequence and scope of planned work	• Updated AM Technology Roadmap with additional columns to indicate priority (low to immediate) and dependencies • Implementation schedule in MS Project	• Our experience and strong understanding of asset management programs supported by Cityworks makes us uniquely qualified to help LCA prioritize and implement technology initiatives
B		

As-needed, support LCA decision making on asset management staffing, organization structure to support asset management and team building	• Informal discussion to share experiences from firm and staff experiences
	• Written Position Descriptions
	• Document review and comment
		• Innovative ideas stemming from:
		  • Experience working with similar organizations across the nation
		  • Staff with client-side experience developing AM Programs

C		
Support LCA decision-making on its Enterprise Resource Planning (ERP) system implementation on aspects related to asset management such as inventory management and project accounting	• Owner's Advisory Services to help LCA leverage enterprise systems to implement the processes and procedures identified while developing the SAMP: lifecycle costing, CIP project tracking, and inventory management	• Our team of Digital Strategy and Solutions experts will work with you to evaluate where you are on your digital journey and help to select modular and portable solutions that will integrate with your broader technology vision, allowing you to own your own digital future
D		
Review LCA's 5 year capital plans and other facility-specific Master Plans and provide recommendations for improvements	• Recommendations for improvements to LCA's 5 year capital plan documented in a Technical Memorandum • Alignment of Master Plan with initiatives in AM Implementation Roadmap • Updated costing data	• Since Hazen is All Things Water(R), we have unmatched experience and expertise with water and wastewater infrastructure needs
E		
Review current capital project management approach / systems and provide recommendations for improvement and/or technology solutions	• Informal discussion with Project Management experts • "As-is" and "To-be" Flow Diagrams • Recommendations for enhanced Project Management and/or technology solutions documented in a Technical Memorandum • Comparison of Project Management Software	• Hazen provides Program Management Services for large, multi-million-dollar programs. We routinely use commercially available scheduling and project control software and can help guide LCA towards an enhanced process supported by appropriate technology

F	Potential Deliverable	Benefits to LCA
How LCA will plan its asset maintenance activities using the data captured in the system	• Technical Memorandum summarizing observations and recommendations for enhancing the existing PM Programs • Technical Memorandum describing how existing Cityworks data can be used to plan, prioritize, and optimize maintenance activities for each critical asset class • Risk-based O&M Programs	• Data-driven decision making is at the core of what we do. We leverage technology to enhance situational awareness and engage a Planner|Scheduler to prioritize work and engage resources
G		
Review LCA's existing schedule of Preventive Maintenance Programs and optimize as needed	• Analysis of work order history compared with asset performance • Review of energy consumption data and recommendations for improvements • Staff interviews to identify hot spots / chronic conditions	• Our team of Digital Strategy and Solutions experts will work with you to evaluate where you are on your digital journey and help to select modular and portable solutions that will integrate with your broader technology vision, allowing you to own your own digital future
H		
Assist LCA staff with determining which asset groups require maintenance programs	• Lifecycle management strategies for critical asset classes • Evaluation of different maintenance strategies to achieve desired LOS	• Maintenance and Reliability Experts readily available to help formalize maintenance activities on linear and vertical assets
I		
Review LCA's existing Esri GIS database and asset naming/numbering conventions to determine usability or to identify areas for improvement (gap analysis)	• Asset Naming Convention Gap Analysis • Examples of asset naming conventions supported by an agreed upon asset hierarchy	• Geospatial and asset management experts that understand the importance of developing a smart naming convention that aligns with the definition of an asset and how work is managed

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ACCESSIBLE EXPERTS
ALL THINGS WATER
FLEXIBLE DELIVERY
INNOVATIVE IDEAS

4. Schedule

Section No. 4

Schedule

Hazen is committed to meeting the dates requested in the RFP. We will ensure the required staffing resources are available, when needed, to deliver high-quality products and services.

Following Notice to Proceed, Hazen will organize a project kickoff meeting to establish project communications protocols, solidify project logistics, and otherwise ensure the assignment begins on the right foot. For all meetings and workshops, we will provide ample preparation time to ensure the full project team is available.

Our proposed delivery begins with the Asset Management Maturity Gap Assessment, as this task will reveal current practices against industry standards across all elements of the asset management "system." In addition, we will prioritize support of current work, particularly tasks that impact the next budget cycle and planned technology projects.

Reviewing the asset inventory and GIS schema will provide Hazen with a deeper understanding of LCA's digital maturity, so this will also be conducted within the first couple of months. It will pave the way for formalizing the definition of an asset and developing a risk framework, both of which are precursors to preventive maintenance planning.

The Lifecycle Management element and support of on-going preventive maintenance planning will be delivered in the same relative time frame – Spring and Summer 2023.

The later months of the project timeframe – Fall 2023 – will focus on enhanced CIP development and pulling all of the program elements together in a consolidated document.

Hazen has a developed a preliminary schedule (**Figure 4-1**) based on the information provided in the RFP and the Exploratory Workshop held on August 17th. The proposed sequencing is informed by previous experience with similar clients but can be adjusted, as needed, to maintain the current momentum, address critical or time sensitive needs, and optimize buy-in and understanding.

Project Schedule

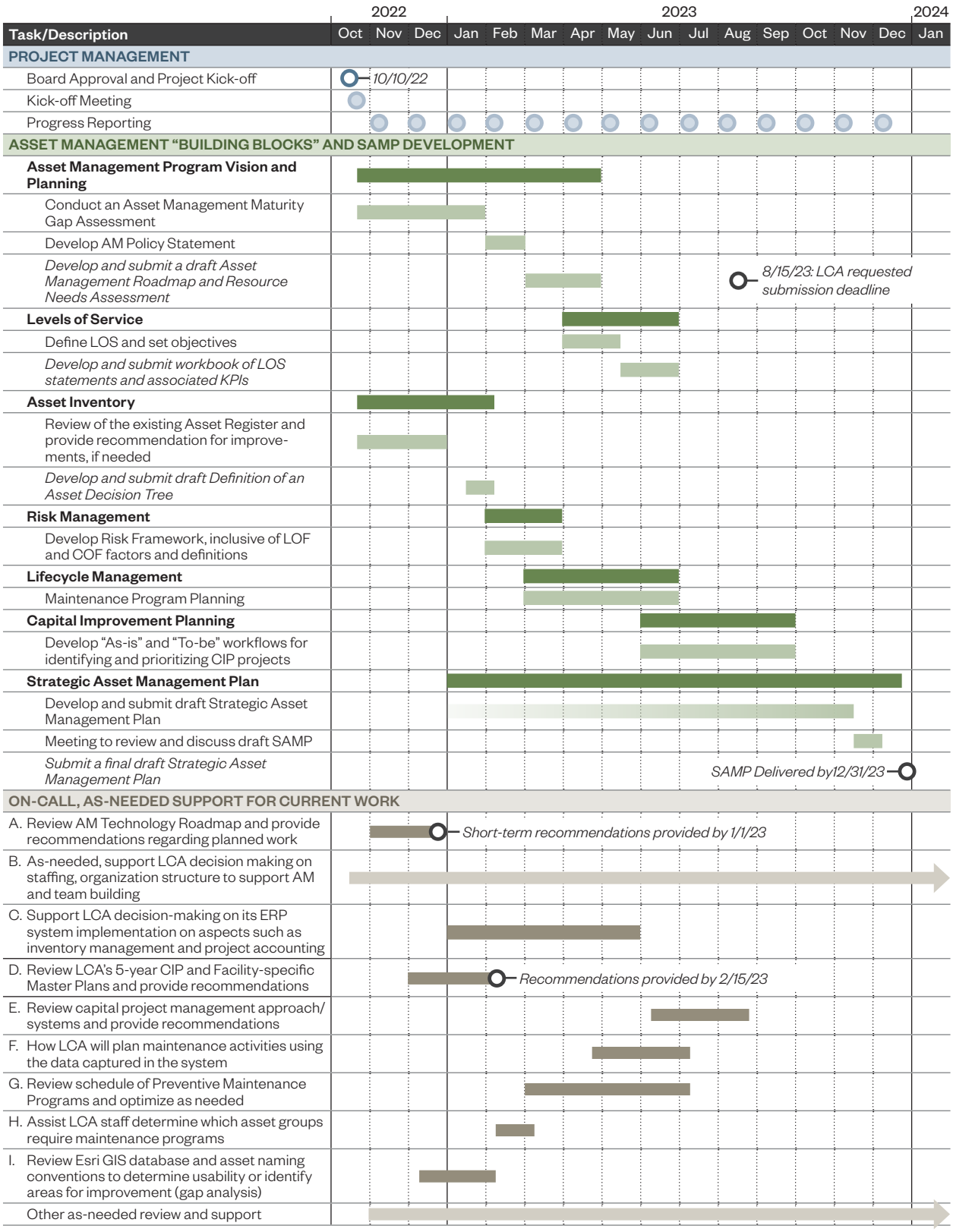

Figure 4-1

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5. Cost Proposal

Section No. 5

Cost Proposal

Hazen will work with LCA to fulfill your technical needs in a manner that fits your budget. We have a reputation of being fair and reasonable when negotiating scope and fee.

Hazen has a developed a preliminary cost proposal (**Table 1.1**) based on the information provided in the RFP and the Exploratory Workshop held on August 17th. The level of effort required to develop a SAMP and Asset Management Implementation Roadmap is based on prior experiences with similar clients. However, the level of effort to support on-going work is subject to change as the scope of the request is refined. Work will be performed on a time and materials basis with a not-to-exceed fee, unless otherwise requested by LCA.

Typical billing rates for the proposed project team are summarized in **Table 1.2**. Other staff and subject matter experts may be engaged with LCA concurrence for task-specific needs.

***We are committed to collaborating with you and refining our cost proposal to achieve your objectives.** As such, we consider these preliminary numbers and look forward to discussing the value we can provide LCA in more detail.*

Table 1.2: Billing Rates

Job Classification	Average Loaded Bill Rate
Vice President	$295
Associate Vice President	$275
Senior Associate	$250
Associate	$183
Principal Engineer I Senior Business Analyst	$146
Principal Engineer	$145
Senior GIS Analyst I Assistant Engineer II	$126

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Table 1.1: Cost Proposal

	Job Classification	Vice President	Associate Vice President	Senior Associate	Associate	Principal Eng. I Sr. Business Analyst	Sr. GIS Analyst I Asst. Eng. II	Labor	
	TASK DESCRIPTION **Loaded Hourly Rate**	**$295**	**$275**	**$250**	**$183**	**$145**	**$126**	**Hours**	**Cost**
Project Management									
	Overall Project Management		8		40			48	$9,520
Project Management Subtotal		0	8	0	40	0	0	48	$9,520
Asset Management "Building Blocks" and SAMP Development									
	Asset Management Program Vision and Planning (inclusive of Maturity Assessment and Roadmap I Resourcing)	56		120	4	80		260	$58,852
	Levels of Service	8		24	4	32		68	$13,732
	Asset Inventory	2		16	4	16	40	78	$12,682
	Risk Management	16		32	4	16		68	$15,772
	Lifecycle Management	4		16	4	16		40	$8,232
	Capital Improvement Planning	8		24	4	12	24	72	$13,856
	Strategic Asset Management Plan	16		32	4	60		112	$22,152
AM "Building Blocks" and SAMP Development Subtotal		110	0	264	28	232	64	698	$145,278
On-Call, As-Needed Support for Current Work									
A	Review LCA's Asset Management Technology Roadmap and provide short term and long term recommendations regarding sequence and scope of planned work			16			40	56	$9,040
B	As-needed, support LCA decision making on asset management staffing, organization structure to support asset management and team building	8	4	8				20	$5,460
C	Support LCA decision-making on its Enterprise Resource Planning (ERP) system implementation on aspects related to asset management such as inventory management and project accounting		8	20		20		48	$10,100
D	Review LCA's 5-year CIP and Facility-Specific Master Plans and provide recommendations for improvements	8		16	16	8		48	$10,448
E	Review current capital project management approach / systems and provide recommendations for improvement and/or technology solutions	8		16	40			64	$13,680
F	How LCA will plan its asset maintenance activities using the data captured in the system			40		40		80	$15,800
G	Review LCA's existing schedule of Preventive Maintenance Programs and optimize as needed			80	24			104	$24,392
H	Assist LCA staff with determining which asset groups require maintenance programs			40		16		56	$12,320
I	Review LCA's existing Esri GIS database and asset naming / numbering conventions to determine usability or to identify areas for improvement (gap analysis)			16		40	40	96	$14,840
On-Call, As-Needed Support for Current Work Subtotal		24	12	252	80	124	80	448	$116,080
Labor Totals		134	20	516	148	356	144	1,194	**$270,878**
Other Direct Cost Totals									**$13,000**
Total									**$283,878**

1010-696

Appendix A: Resumes

Mark Bottin, PE

Associate Vice President

Mr. Bottin has served as Project Director for numerous Hazen contracts, including several assignments with LCA. He leads project teams with a staunch commitment to quality service and products.

Education

MS, Civil and Environmental Engineering, Rutgers University, 1994

BS, Civil Engineering, University of Vermont, 1987

Certification/License

Professional Engineer: PA, NJ

Areas of Expertise

- CSO/SSO management
- Consent order programs
- Management of general engineering design services

Experience

- 35 total years
- 28 years with Hazen

Professional Activities

American Society of Civil Engineers

American Water Works Association

Water Resources Association of the Delaware River Basin

- Board Member

Water Environment Federation

Lehigh County Authority, PA

Project Director on several assignments for the Authority's Allentown Water Treatment Plant, including:

- Filter Asset Inventories, Condition Assessments and Filter Inspections - Performed filter inspections and provided operational performance assessments and recommendations to enhance the filtration process.
- Alternatives Analysis and Conceptual Design for the Rehabilitation of the Filters - Provided filter rehabilitation alternatives, associated capital and life cycle costs, and a conceptual design for the rehabilitation of the eight gravity filters.
- Detailed Design for the Rehabilitation of the Filters (ongoing) - Providing detailed design documents to be used for bidding of the rehabilitation for the eight gravity filters, based on the previously completed conceptual design.

Long Term Management Plan, Cape May County Municipal Utilities Authority, NJ

Project Director. Hazen was selected to provide engineering services to help develop a long term comprehensive biosolids management plan. The Authority has four regional wastewater treatment facilities with a centralized composting facility to treat dewatered biosolids that is nearing the end of its life expectancy. The plan helped identify potential biosolids handling technologies available, determine the level of biosolids stabilization necessary, and assess how much biosolids capacity should be built (taking into consideration the impact from seasonal vacationers).

Fritz Island Wastewater Treatment Plant, City of Reading, PA

Project Manager. Hazen was directed to redevelop the City's Alternatives Analysis and Capital Improvement Plan (CIP), along with other sub-tasks, including the development of several documents - the Final Act 537 Special Study, the 6th & Canal Pump Station CIP, the 19th Ward Pump Station CIP, and several technical memorandums.

Hazen

Ryan Nagel, PE, PMP, ENV SP

Vice President

Mr. Nagel serves as Hazen's Utility Management Solutions Corporate Leader. His expertise includes developing and implementing full-scale asset management programs and strategic business plans.

Education

MBA, Finance, University of Kansas, 2002

MS, Environmental Engineering, North Dakota State University, 1998

BS, Civil Engineering, North Dakota State University, 1996

Certification/License

Professional Engineer: NY, MD, VA, DC, KS

Project Management Professional

Envision Sustainability Professional

Areas of Expertise

- Asset and utility management
- Strategic business planning
- Utility optimization
- Financial studies

Experience

- 27 total years
- 7 years with Hazen

Professional Activities

American Water Works Association

- Board Trustee and Management and Leadership Division Chair

Water Environment Federation

- Utility Management Committee, Strategic Organizational Practices Subcommittee Chair

Strategic Asset Management Plan (SAMP) Development Assistance, Gwinnett County Department of Water Resources, Lawrenceville, GA

Project Manager. Engaged by the Gwinnett County Department of Water Resources (GCDWR) to facilitate the development of a SAMP and subsequent Tactical Asset Management Plan (TAMP) framework, and to establish policies, processes, and procedures to allow GCDWR to sustain the SAMP and TAMPs as a part of normal course of business long-term. The project included:

- Providing an overview of critical asset management concepts such as: purpose and strategic goals, levels of service and associated performance measure development, infrastructure condition, risk, and criticality analysis, data and system integration, etc.
- Discussing key GCDWR business drivers including infrastructure and investment priorities, organizational competencies and roles, business processes and practices, regulatory environment, etc.
- Developing prioritization and reporting requirements for key performance measures and service level metrics and goals across such areas as: reliability, preventive maintenance, quality, and regulatory.
- Enhancing capital planning processes to include the development of a life-cycle costing methodology, formal "business cases" and a structured prioritization methodology for capital investments.
- Identifying necessary financial planning activities, including long-term renewal and replacement (R&R) projections, reserve levels, and overall financial sustainability.

Asset Management Program Development, City of Somerville, MA

Technical Lead. Engaged by the City to provide professional services related to the development of a city-wide asset management program. Hazen is currently executing a two-phased approach that began with an asset management maturity assessment and program implementation roadmap development. This first phase established the strategy for the City's asset management program, including the organization structure,

Hazen

roles and responsibilities, standards, data and information management, policies, processes, and resources. The second phase is more tactical and focuses on development of the specific program elements as defined by the implementation roadmap developed in Phase 1. These include:

- Asset policy statement development
- Program communications plan development
- Asset inventory and analysis
- Levels of service definition
- Asset prioritization / risk assessment
- Capital improvement plan (CIP) development and funding strategy
- Data visualization

Asset Management Gap Analysis and Improvement Roadmap Development, HRSD, VA

Technical Lead. Responsible for conducting an ISO 55001 Maturity Assessment and Developing an Asset Management Improvement Roadmap for HRSD. Assisted with a series of structured interviews and workshops to assess HRSD's approach to asset management to identify specific gaps and areas for improvement. Following the identification of initial improvement initiatives, corresponding scope, duration, resource requirements, and initiative owners were identified and defined to serve as an initial asset management strategic roadmap to guide HRSD's Asset Management Program for the next several years.

Professional Engineering and Water Utility Management Services, Newport News Waterworks, VA

Technical Lead and Project Director. Assisted with the development and implementation of an integrated, multi-phased utility and asset management program, enabling cohesive maintenance and management of infrastructure assets and resources, meeting customer service goals, and ensuring regulatory compliance; ultimately contributing to the overall success and long-term sustainability of waterworks. Key program services included the development of an integrated asset management program strategy, the design and implementation of a business intelligence and performance reporting framework, providing an organizational efficiency assessment, and facilitating overall program adoption and organizational change management.

Asset Evaluation, City of Norfolk, VA

Project Manager. Responsible for providing engineering and asset management services related to the evaluation of the assets at the Moores Bridges Water Treatment Plant to establish preliminary short and long-term R&R needs for the plant. The scope included conducting an asset inventory analysis, reviewing historical operating reports, and conducting site visits to develop a full inventory of all major/priority plant assets.

Jeff Naumick, PE

Associate

Mr. Naumick has 13 years of experience in planning, design, and construction administration services for water, wastewater, and wet weather projects. He is located in Hazen's Philadelphia office and has served as project manager for many assignments consisting of large, multi-disciplinary teams.

Education

MS, Water Resources and Environmental Engineering, Villanova University, 2014

BS, Civil Engineering, Pennsylvania State University, 2009

Certification/License

Professional Engineer: PA

Confined Space Entry

Areas of Expertise

- Project management
- Water and wastewater treatment process mechanical design
- Design and construction project management
- Field inspection and construction phase services

Experience

- 13 total years
- 13 years with Hazen

Professional Activities

American Water Works Association

Water Environment Federation

Lehigh County Authority, PA

Project Manager and Lead Engineer on several assignments for the Authority's Allentown Water Treatment Plant, including:

- Raw Water Intake Study and Alternatives Analysis – Inspected existing raw water intakes and provided upgrade alternative recommendations and associated capital costs.
- Filter Asset Inventories, Condition Assessments and Filter Inspections - Performed filter inspections and provided operational performance assessments and recommendations to enhance the filtration process.
- Alternatives Analysis and Conceptual Design for the Rehabilitation of the Filters - Provided filter rehabilitation alternatives, associated capital and life cycle costs, and a conceptual design for the rehabilitation of the eight gravity filters.
- Detailed Design for the Rehabilitation of the Filters (ongoing) - Providing detailed design for the upgrades of the eight gravity filters.

PlaNYC 2030/Climate Change, New York City Department of Environmental Protection, New York, NY

Key Team Member. Following Superstorm Sandy, responsible for reviewing, evaluating, and making recommendations for the City's existing wastewater treatment plants with regard to future climate change and flooding/weather events. Performed the on site investigation of the Bowery Bay, Jamaica Bay, and Coney Island plants to assess the condition, criticality, and vulnerability of each plant's 3,000+ cataloged assets in the wake of the storm. Following analysis of the field data, findings and recommendations were provided to protect the City's wastewater assets. The final "Climate Risk Assessment and Adaptation Study" report provided recommendations for all of NYC's wastewater treatment facilities and pumping stations and serves as the foundation for the Citywide resiliency planning and capital improvements.

Hazen

Madeleine Driscoll, PE, MIAM

Senior Associate

Ms. Driscoll is a licensed professional engineer and former utility manager with 21 years of experience in asset management and civil engineering. She has led diverse teams through the process of developing and implementing strategic asset management plans; roadmaps; and associated asset inspection, renewal, and maintenance programs.

Education

MEE, Environmental Engineering, The Johns Hopkins University, 2010

BS, Civil Engineering, Bucknell University, 2001

Certification/License

Professional Engineer: MD

Areas of Expertise

- Utility management
- Strategic planning
- Asset management
- Preventative maintenance program planning

Experience

- 21 total years
- 2 years with Hazen

Professional Activities

Institute of Asset Management

American Water Works Association

- Strategic Management Practices Committee

Water Environment Federation

Chesapeake Water Environment Association

- Collection Systems Committee Chair

Maturity Assessment and Implementation Roadmap, City of Somerville, MA

Asset Management (AM) Consultant. Responsible for the conduct of a maturity assessment of the City's current management approach against the 27 elements of the ISO 55001 framework with the purpose of identifying specific gaps and areas for improvement. Based on the maturity assessment results, recommended high-level enhancements to develop and execute an AM program that is fully aligned with the ISO 55001 standard. The resulting AM roadmap contained a prioritized list of detailed recommendations and was accompanied by detailed Work Plans for the highest priority initiatives.

GIS and AM On-Call Support, Capital Region Water, Harrisburg, PA

Project Manager and AM Consultant for numerous tasks orders from 2017 to 2021 that helped the water utility develop and implement a strategic plan for maximizing the value of the water and wastewater infrastructure. Provided management consulting professional services aimed at enhancing enterprise systems such as GIS and Cityworks and formalizing life cycle management strategies. Also led strategic and tactical work activities that included the development of written AM plans; designed an AM readiness gap analysis framework; facilitated an organization-wide capability assessment; wrote a request for information to solicit vendor responses for decision support software; and authored outreach articles connecting the principles of AM with Capital Region Water-specific examples. In addition, led condition assessment activities for the collection and distribution systems, and oversaw the GIS updates and financial forecast modeling efforts performed by others.

Hazen

Water and Wastewater Emergency Operations, Baltimore City Department of Public Works (DPW), MD

Task Manager and AM Consultant. Through two Emergency Operations Contracts, assisting the City's DPW to develop a formal AM program for the water and wastewater facilities. Initial work includes developing asset inventories for the Back River Wastewater Treatment Plant and all three water filtration plants. This information will be used to configure Cityworks and track all planned and unplanned work at the asset level. Upcoming work includes detailed condition assessment, quantification of consequence of failure, and development of facility-specific preventive maintenance programs. Also facilitated the expansion of Cityworks to the vertical facilities.

Asset and Work Order Management Planning, Anne Arundel County DPW, MD

AM Consultant. Worked with DPW personnel to develop a Strategic Asset Management Plan (SAMP) and prepare for the implementation of an enterprise Asset and Work Order Management system. The result was a comprehensive, specific, and actionable roadmap to implement best practices in AM throughout the Department. To prepare for a new software solution, facilitated information gathering workshops with participants from all levels and functions within the organization and surveys; documented workflows; and developed technical requirements to include in the RFP.

Phase II AM Support Services, City of Durham DPW, NC

Project Manager. Collaborated with the City's DPW to establish an AM Program, develop an implementation roadmap, and implement high priority initiatives for its key assets. Provided professional services to define and implement an overall Utility Management Program for the City; interviewed senior managers to identify asset and work order management needs across their core business; and worked with senior/middle management to develop life cycle management plans for stormwater pipes and roadways. Key tasks included conducting a risk analysis, developing a long-term renewal forecast, preparing written AM plans, and facilitating an AM steering committee composed of DPW decision-makers.

Wet Weather Consent Decree Compliance and Program Management Services, Baltimore City DPW, MD

Utility AM Project Manager. As part of the Consent Decree Program Management Team, developed an SAMP for buried utilities, developed planning documents for the implementation of a new division within the Bureau of Water and Wastewater, and implemented various preventive maintenance programs. Actively involved with stakeholder engagement throughout the duration of the program.

Russ Dalton, PE, PMP

Senior Associate

Mr. Dalton is Hazen's Mid-Atlantic Asset Management Service Group Leader. He has assisted many regional utilities with enterprise asset and maintenance management, data analytics, and risk assessment.

Education

ME, Project Management, University of Maryland, 2016

BS, Civil Engineering, Virginia Polytechnic Institute and State University, 2009

Certification/License

Professional Engineer: VA, MD, DE, DC

Project Management Professional

NASSCO: MACP/PACP; MH Rehabilitation Inspector Certification; CIPP Inspector Certification

Confined Space Certification

OSHA: 10hr Safety Training

Areas of Expertise

- Utility and asset management
- Data analytics and visualization
- Data management
- Condition assessment and rehabilitation

Experience

- 13 total years
- 13 years with Hazen

Professional Activities

American Water Works Association

- Chesapeake Chapter

Asset Management Basic Ordering Agreement (BOA), HRSD, Hampton Roads, VA
Project Engineer. Responsible for the development of Weibull Curves predicting life expectancy for 10 asset groups at HRSD's Atlantic Water Treatment Plant, life-cycle cost analysis for multiple asset types using historical work order data, and O&M procedures for select non-critical asset groups and compared to existing practices at the Atlantic plant.

Creek Crossing Program Pilot, Fairfax County Wastewater Collection Division, VA
Project Manager/Task Lead. Responsible for sewer condition assessment and rehabilitation planning. The project includes development of an InfoAsset Planner risk model and advanced field assessment methodology specific to sewer assets within the stream corridor merging traditional sewer asset management approaches with stream geomorphology.

Asset Management Program BOA, Newport News Waterworks, VA
Task Lead. Contributed to multiple task orders, including:

- Developing standard CIP business case processes and prioritization methodology, and developing and implementing a business case evaluation pilot study.
- Conducting staff survey and interviews assessing current organization and identifying and developing optimized alternative organizational structures.
- Developing requirements for CMMS solution and RFP technical language for procurement.

Enterprise Information and Utility Management BOA, Prince William County Service Authority, VA
Project Engineer. Assisted in the development and documentation of data governance plans and data stories for Service Authority Financial Dashboard Metrics. Task order involved stakeholder and owner interviews and process documentation.

Hazen

Steve Hutchings, CMRP, CRL

Senior Associate

Mr. Hutchings has experience in utility management with a focus on both asset and organizational management. This includes providing in-depth analysis, implementation, review, and improvement recommendations to organizations that manage multiple water and wastewater utility contracts.

Education

MS, Information Systems, University of Phoenix, 2015

BS, Management, University of Phoenix, 2013

Certification/License

Certified Maintenance and Reliability Professional

Certified Reliability Leader

Areas of Expertise

- Maintenance optimization
- Utility and asset management
- Maintenance and planning

Experience

- 28 total years
- 2 years with Hazen

Professional Activities

Association of Asset Management Professionals

American Water Works Association

Institute of Asset Management

Rancho California Water District Maintenance Management Program Optimization, CA

Utility Asset Management Specialist. Hazen assisted in identifying pump station asset criticality, executing a comprehensive asset condition assessment, and developing detailed maintenance strategies for 65 classes of the District's pump station assets. Based on the asset classification maintenance tasks, an estimate of labor resource effort and associated costs were assigned to each asset for presentation of cost-benefit analysis and compared to asset criticality.

Asset Risk Assessment, Mohawk Valley Water Authority, Utica, NY

Project Director responsible for facilitating a two-day asset risk workshop with Authority officials and plant staff across all assets at the water treatment facility and ancillary locations. This information was compiled and presented to the authority to aid in capital investment planning for the next 10 years. Local to the facility, the risk values were uploaded into the Computerized Maintenance Management System (CMMS) and used to aid in day-to-day maintenance work prioritization.

City of Rio Rancho Utilities Department Preventive Maintenance Optimization, NM

Project Lead. Responsible for performing an extensive analysis on maintenance data to determine which asset classes were absorbing the most labor resource hours. Focused on the top three asset classes, performed further analysis of historical preventive and corrective work orders, along with workshops, responsible for developing an implementation plan to include removal or addition of tasks; rewriting current preventive maintenance task language to remove ambiguity; adjustment of task frequency based on factors such as overall criticality, asset value, and technical feasibility; conducting of asset or technology-specific training with technicians; adjustment of maintenance management workflow processes; and establishment of key performance indicators to be monitored through a Power BI dashboard.

Hazen

James MacDonald

Senior Associate

Mr. MacDonald serves as Hazen's Application Technology Leader. His experience focuses on IT solutions during design, construction, and operations; solutions that implement innovative solutions and lead to client success.

Areas of Expertise

- Asset management technology
- IT system architecture and systems integration
- GIS and BIM
- Virtual, augmented, and mixed realities
- Database design and development
- Microsoft Azure Cloud (database, compute, analytics, web services)
- Data analysis/visualization; specializing in Microsoft Power BI
- CMMS technology
- Mobile applications and device management

Experience

- 27 total years
- 7 years with Hazen

GeoBIM Pilot, HRSD, Virgina Beach, VA

Technology Lead. HRSD provides service to 18 cities and counties of southeast Virginia, an area of over 3,087 square miles with a population of 1.7 million. SWIFT (the Sustainable Water Initiative for Tomorrow) is HRSD's newest water treatment innovation. Hazen collaborated with HRSD to design the SWIFT facility in Autodesk Revit and then maintain the BIM data during construction to create accurate as-built BIM models for the operational facility. Responsible for developing proof-of-concept workflows for BIM integration with GIS, CMMS, and other systems - and then working with HRSD and Hazen team members to test and implement them.

Capital Project Management Tool, ReWa, Greenville County, SC

Technology Manager. Responsible for helping ReWa develop a strategy to introduce Enterprise Business Intelligence (BI) so they can utilize data created in different departments in a common view that is accessible to team members at all levels of their organization. Like many of Hazen's clients, ReWa uses Microsoft back-office and business applications. Hazen introduced Microsoft Power BI with an integrated web application that allow ReWa project managers to enter, manage, and visualize capital project information they are responsible for. Also responsible for working with ReWa IT to design a solution that meets their security requirements and deployment needs.

Experience Prior to Hazen

Enterprise GIS and Asset Management Implementation, Town of Framingham, MA

Technology Manager. Designed and implemented the Town's Enterprise GIS which is implemented on the Town's IT network and used by dozens of desktop, web, and mobile users at the Town as well as consultants working with the Town. Worked with the Town's CIO and other IT professionals to lead and implement the current VUEWorks, which is also installed on the Town's IT network. Led teams in continuously collecting survey, inspection information, and other field data to develop a wide system mapping and a holistic asset condition inventory.

Hazen

Grantley Pyke, PE

Senior Associate

Mr. Pyke has led Hazen's data integration and visualization efforts for multiple clients, which includes the development of a wide range of tools that enhance situational awareness, improve operational efficiency, and guide sound planning and operations.

Education

MS, Environmental Engineering, The Johns Hopkins University, 2000

BS, Civil Engineering, Drexel University, 1999

BA, Philosophy, Haverford College, 1991

Certification/License

Professional Engineer: MD, VA, NY

Areas of Expertise

- Data management and visualization
- System operations

Experience

- 31 total years
- 20 years with Hazen

Professional Activities

American Water Works Association

American Water Resources Association

American Society of Civil Engineers

Utility Operations and Planning Dashboard, Pima County, AZ
Lead Developer for a data system and analytical dashboard that integrates data from collection system, treatment plant, lab, O&M, finance, and customer service data sources into a central BI data warehouse. This data warehouse serves a dashboard with displays tailored to meet the needs of a wide array of end users including operators, managers, scientists, and engineers. The system is scaled to return SCADA data from seven treatment plants plus data from County-wide LIMS, CMMS, and Finance Systems.

Capital Improvement Plan (CIP) Dashboard, Loudoun Water, VA
Lead Developer of a CIP prioritization dashboard for the Broad Run Water Reclamation Facility Treatment Expansion Project. To support the overall near-term and long-term master planning project, led development of an analytical tool that allows system planners to examine major treatment train and process options under a range of future flow, nutrient loading, and effluent limit scenarios. The tool was used to examine the sensitivity of long-term costs to treatment process options, and to develop a prioritized CIP that addresses the temporal uncertainty inherent in key process drivers.

Machine Learning Inflow Prediction Tool, City of Raleigh, NC
Lead Developer for a data system and analytical tool that uses the Azure Machine Learning environment to predict flows entering a wastewater treatment plant. The system acquires observed streamflow and plant inflow data, plus observed and forecasted precipitation data, and feeds this data into a machine learning script that predicts hourly plant inflow over the next 72 hours. The prediction runs hourly to provide plant operators with timely guidance on when to drain or fill their equalization basin to best manage peak inflows during large storm events. Operational guidance is disseminated to users via a Power BI dashboard, which also provides analysts with tools for assessing the accuracy of past predictions.

Hazen

Conor Brennan, PE

Principal Engineer

Mr. Brennan is an integral part of the firm's Asset Management Service group. He brings years of experience working with utilities on enterprise asset management projects.

Education

ME, Environmental Engineering, Manhattan College, 2015

BS, Civil/Environmental Engineering, Manhattan College, 2014

Certification/License

Professional Engineer: VA

Areas of Expertise

- Asset management
- Data analysis and management
- Risk assessment

Experience

- 6 total years
- 6 years with Hazen

Professional Activities

American Water Works Association

City of Somerville Asset Management Maturity Assessment, MA
Project Engineer. Hazen provided professional services for the development of an asset management program for the City. The program integrated past efforts and formed the basis for a unified long-term management strategy for both vertical and horizontal infrastructure. It included an asset management maturity assessment, inventory, level of service evaluation, risk evaluation, and prioritization and implementation/communications strategy development. The maturity assessment involved evaluating the City's current related program activities and compared them with industry standard best practices, as defined by the Institute of Asset Management (IAM) Anatomy. Opportunities for improvement were identified and the assessment established the foundation that would be used to develop the City's first Asset Management Implementation Roadmap. The Implementation Roadmap will be used to develop a formal Asset Management Program to fill strategic gaps identified.

Asset Management BOA, WSSC Water, Prince George's County, MD
Project Engineer. Performed key roles in multiple task orders, including:

- LOS Performance Assessment Framework Pilot - Responsible for aiding in pilot efforts including evaluating the feasibility, resources required, and identifying opportunities for improvement to the framework prior to system wide implementation. Tasks of the pilot project include reviewing years of asset work order data.
- Anacostia Depot Facility Asset Register – Assisted with the completion of WSSC Water Pumping Station and Water Storage Tank Asset Registers. Objectives included identifying, updating, and/or completing the attribute information for each asset.

Fleet Assets Replacement Planning Model, HRSD, Virginia Beach, VA
Project Engineer. Hazen developed a replacement planning model (RPM) for fleet assets for HRSD's Asset Management Division. As part of the efforts, key performance indicators were developed to serve as reporting metrics, which included preventive maintenance, corrective maintenance, vehicle mileage, downtime, and asset age. The RPM tool was created in Microsoft Power BI so that the data and other reporting metrics can be visually assessed in a dashboard environment.

Hazen

Olivia August, PE

Principal Engineer

Ms. August is a recent addition to Hazen's Asset Management team. She brings solid experience in with asset management plans, water affordability, and data analysis.

Education

MS, Civil Engineering, Duke University, 2022

BS, Environmental Engineering, University of Notre Dame, 2017

Certification/License

Professional Engineer: CA

Areas of Expertise

- Asset management
- Data management
- Stormwater management
- Stormwater infrastructure condition assessment
- Stormwater design
- Hydrologic and hydraulic analysis and modeling
- Green infrastructure

Experience

- 5 total years
- <1 year with Hazen

Professional Activities

American Water Works Association

American Society of Civil Engineers

Georgia Association of Water Professionals

Experience Prior to Hazen

Watershed Asset Management Plan, City of San Diego, CA

Project Manager. Led efforts to assist the City of San Diego to update the 2013 Watershed Asset Management Plan (WAMP). The WAMP and its associated database provide an assessment of stormwater assets, needs, levels of service, and associated costs. The WAMP forecasts asset conditions and maintenance needs to enable proactive resource planning. As the Project Manager, tasked with managing the identification and definition of program and reporting requirements, and outline of implementation requirements and performance tracking to ensure efficient processes and results of system recommendations. The main challenge of the project was to utilize the City's adopted enterprise asset management (EAM) system and to fully integrate the updated system into the WAMP. Additionally, developed the Operations Plan which maps data and activities from existing plans to allow for adaptive management and updates to the WAMP as conditions change.

Cast-in-Place Concrete Pipe Assessment, City of San Diego, CA

Project Manager. Coordinated the use of CCTV to inspect over 30 miles of cast-in-place concrete pipes and document current conditions while also developing an asset management tool to highlight priority areas for maintenance. Analysis included a map-based reporting tool to relay information, exact locations of pipe inspections, and potential deficiencies (i.e., cleaning needs, emergency maintenance, or other issues). The dataset gathered was utilized to develop a predictive deterioration curve of the assets to better advise the City for long-term planning, since the previous investigations of asset conditions were static and were only used to determine immediate needs. The effort served to equip operation and maintenance facilities with a comprehensive dataset to inform future decision-making and ensure stormwater asset longevity.

Drainage Fee Study Analysis, City of Solvang, CA

Project Engineer. Assisted the City of Solvang with the development of a Drainage Impact Fee Strategy to ensure that the City was maximizing their revenue opportunities to improve the funding pool for future stormwater projects. The strategy consisted of a cost analysis.

Hazen

Ken Camacho

Senior GIS Analyst

Mr. Camacho specializes in developing technology solutions blending commercial off-the-shelf and custom-developed tools.

Education

MS, Geography, Michigan State University, 2020

BS, Environmental Science, Colby-Sawyer College, 2015

Areas of Expertise

- ArcGIS Enterprise
- Python
- Cloud services

Experience

- 5 total years
- 1 year with Hazen

Water Main Asset Management Assistance, Connecticut Water Company, CT

GIS Administrator/Developer. Led GIS and database management efforts for the development of an excel-based asset management tool which will be used by Connecticut Water to help plan and prioritize water main replacements. The project was a collaborative effort between the utility and Hazen, with regular meetings serving to guide the progress and develop probability of failure (POF) and consequence of failure (COF) criteria and rankings. The tool utilized pipe data, including water main installation date location, diameter, material, and break history to generate a POF score for each water main segment in the 1,800 mile system. Distribution system modeling was conducted to support demand shortfall ratings for calculating COF scores. Hazen then developed a dynamic excel based tool which allows Connecticut Water to modify the POF and COF scoring system as distribution system improvements are made over time. The project also included generation of shapefiles with the scores for POF, COF, and risk to be viewed spatially using GIS.

Enterprise GIS Deployment, Passaic Valley Sewerage Commission, Newark NJ

GIS Administrator/Developer. Worked closely with client to assess needs for the configuration and upgrade of an Enterprise GIS system hosted on Azure client. Wrote python code and developed the digital infrastructure to integrate live sensor data with Enterprise GIS environment. Used GeoEvent server with python to detect, log, and send email alerts in response to changing system conditions.

Water Main Asset Management Risk-Based Prioritization Tool, Connecticut Water, CT

GIS Analyst. Worked with water system modeling experts to develop probability of failure and likelihood of failure analyses. Ran spatial analysis to develop reports and make recommendations on water main improvement project prioritization.

Hazen

Jamie Decker, PE, CRL

Senior Associate

Mr. Decker has 20 years of experience with project management and asset management, specializing in implementing strategies and tools for water, wastewater, and stormwater systems. He also is experienced in facilitating workshops to document business practices and streamline workflows, utility benchmarking, risk assessments, and roadmap development.

Education

BS, Civil Engineering, Ohio State University, 2002

Certification/License

Professional Engineer: OH

Certified Reliability Leader

Certificate Institute of Asset Management

Areas of Expertise

- Asset management
- Condition assessment
- Maintenance and reliability best practices
- Water and sewer master planning

Experience

- 20 total years
- <1 year with Hazen

Professional Activities

Institute of Asset Management

American Water Works Association

- Ohio Asset Management Committee

Water Environment Federation

Ohio Water Environment Association

- Asset Management Committee

Asset Management CMOM Implementation, Sarasota County Public Utilities, FL

Technical Lead for the development and implementation of the Sarasota County collection system asset management and lift programs. Program tasks include the development and implementation of the SAMP that incorporates all aspects of the collection and transmission system. Supported development of as-is and to-be business process mapping to support the program and development of the lift station risk framework, asset inventory process, and maintenance programs. Also supported evaluation of the CMMS enhancements to improve the use and functionality of their existing systems.

Vertical Asset Management Program, Montgomery County, OH

Technical Lead to develop an asset management program that includes condition assessment, risk model development, and implementation of Cityworks improvements for all vertical water and wastewater assets. The risk model will be used to develop and prioritize the County's Capital Improvements Plan (CIP). Helped to analyze and provide recommendations for the County's preventive maintenance program, and helped to develop key metric dashboards using Power BI.

SS1 and SS2 Storm Pump Station Assessment, City of Fort Lauderdale, FL

Technical Lead for the assessment of the City's main storm pump stations. The project included the review of existing data and field collection to gather asset inventory information to be loaded into Cityworks, risk and condition assessment of the stations in line with the Watershed Asset Management Plan (WAMP), and the development of condition assessment forms to be utilized. The results of this work will serve as a template for other storm and sanitary lift station assessments and the data will be used to create a prioritized CIP and rehabilitation plan.

Hazen

Malia Dunn-Reier

Senior Business Analyst

Ms. Dunn-Reier is a senior business analyst with experience in Power BI and asset management.

Education

MS, Analytics, North Carolina State University, 2021

BS, International Economics and Spanish, University of Kentucky, 2016

Areas of Expertise

- Business analytics
- Power BI

Experience

- 4 total years
- 4 years with Hazen

Pump Station and Interceptor Condition Assessment and Digital Replacement Planning Model, HRSD, VA

Senior Business Analyst. Developed a replacement planning model Power BI dashboard to include Key Performance Indicators (KPIs), condition assessments results, and life expectancy curves. The condition assessment data was analyzed in InfoAsset Planner to develop a replacement planning model which calculated remaining useful life for all pump station and linear assets. The project included a dashboard integrated with an existing, enterprise-wide data model with both financial and operational performance data. The dashboard featured the ability to view overall life expectancy, financial performance (e.g, cost per kWh etc.), and efficiency for different asset classes as well as the ability to view risk and resiliency KPIs at an individual asset level.

Reclaimed Water System Digital Evaluation, Loudoun Water, Ashburn, VA

Senior Business Analyst. Developed a non-potable reuse (NPR) system assessment as a Power BI dashboard to support integrated, efficient management of NPR production, storage, discharge to the distribution system and management of total dissolved solids (TDS) for Loudoun Water's Broad Run Water Reclamation Facility. The project included development of a Power BI dashboard to assist in decision making and understanding of the reclaimed water system. The developed dashboard included the ability to manage reclaimed water projections, to include a probability factor and projections for average day, max day, and peak hour. Projections were based on customer growth in the area and data center cooling technology (e.g., air-cooled or water-cooled). Generation and transport of TDS to develop a TDS mass balance for TDS discharge was also included using Loudoun Water's daily sewershed-specific blowdown meter data and reclaimed water meter data.

BI Software Selection, Clayton County Water Authority, GA

Senior Business Analyst. Conducted hands-on testing of four BI software platforms. The goal was to facilitate the selection of one BI platform to be deployed across all of the Authority's departments. The project required a robust understanding of the Authority's existing software architecture through data characterization workshops with an inter-departmental team of County staff. Based on information gathered, a BI software implementation strategy was prepared to demonstrate how the enterprise-wide software would integrate with the County's existing systems.

Hazen

Devon Jones

Senior GIS Analyst

Ms. Jones specializes in GIS and utility data management. She routinely leverages and visualizes data to help inform asset management decision making.

Education

BS, Civil Engineering, University of Massachusetts Amherst, 2011

Certification/License

Engineer-in-Training

NASSCO PACP, LACP, MACP, ITCP Certified

Areas of Expertise

- GIS data management
- Tech app project integration
- AutoCAD Civil 3D
- Power BI

Experience

- 10 total years
- 7 years with Hazen

City of Somerville On-Call Engineering Services, MA

GIS Data Tech Analyst. Responsible for development of a CMOM program for the City and submittal of various deliverables in compliance with an Administrative Order. This program includes completion of the EPA CMOM Checklist, development of a CMOM Program Manual, CCTV inspection oversight, rehabilitation planning/recommendations development, GIS updates, and a summary report.

Jones Falls Comprehensive Sewershed Evaluation, Baltimore County, MD

GIS Data Tech Analyst. The evaluation encompassed 213 miles of 8 to 42-inch sewers in the Jones Falls Sewershed, including review of existing condition assessment data, system characterization and data gap analysis, field inspections, hydraulic model refinement and calibration, assessment of septic system elimination, future flow projections and capacity assessment. This on-going project will culminate in a prioritized asset management program and capital improvement plan for five planning horizons including a 50-year planning horizon. Responsibilities included project setup in SQL database for project deployment and development; Survey123 forms and SOP development for Acoustic/Sonar/CCTV inspections, field reconnaissance, manhole survey; web mapping application development for field work; and map series production and design.

Data Management Phase I, Passaic Valley Sewerage Commission, Newark, NJ

GIS Data Specialist. Initial tasks included understanding user requirements, identifying business goals and planning for the wastewater utility's current/future technologies, and asset management. Hazen provided ArcGIS Enterprise support, cloud deployment strategy, and implementation of the Commission's existing GIS. The overall goal was to assist with the integration of different existing IT systems within an Enterprise GIS to enable cross-platform data sharing among the various datasets and platforms currently utilized by the Passaic Valley Sewerage Commission. The project will expand the use of their ESRI ArcGIS Server and Portal and implements cloud options for part of their existing GIS system.

Hazen

Justin Reynolds

Assistant Engineer II

Mr. Reynolds has 4 years of experience in GIS, ranging from data collection to data analysis and preliminary planning for conveyance projects and right-of-way green infrastructure.

Education

BS, Civil Engineering, University of Kentucky, 2016

Certification/License

Engineer-In-Training: KY

Areas of Expertise

- GIS data analysis and map publishing
- GIS data collection
- Bidding and construction administration services

Experience

- 4 total years
- 3 years with Hazen

Sewer Mapping Phase II, Fort Lauderdale Public Works Department, FL
GIS Analyst. Reviewed as-built drawings for Ft. Lauderdale's sewer system for comparison with their existing sewer geodatabase. Verified locations of sanitary manholes, pipes, valves, and pump stations, and updated asset data based on the as-built drawings.

2021 – 2040 Comprehensive Facilities Plan, Louisville Water Company, KY
GIS Analyst. Analyzed Louisville Water's existing water main GIS data to determine locations for future water main replacement projects based on age of existing pipe, material, and main breaks. Published heat maps showing areas where water main breaks were most frequent and where replacement projects would be most efficient in mitigating future water main breaks.

National Avenue Water Main Replacement, Kentucky American Water Company, Lexington, KY
Project Engineer. Assisted in design services for approximately 7,000 LF of 4" and 6" water mains to be replaced with 8" DIP as part of Kentucky American Water's Qualified Infrastructure Program. Created maps with GIS for the area to identify utility conflict locations and to verify the survey. Completed CAD design for the project.

East Frankfort Interceptor, Frankfort Sewer Department, KY
GIS Analyst. Developed mapping for the Preliminary Engineering Report (PER), including maps for alternate preliminary alignments and flow contribution areas. Also created mapping to identify survey areas and geotechnical investigation areas for the final sewer alignment.

Castlewood Water Main Replacement, Kentucky American Water Company, Lexington, KY
Project Engineer. Assisted in design services for approximately 14,000 LF of 4" and 6" water mains to be replaced with 8" DIP as part of Kentucky American Water's Qualified Infrastructure Program. Created maps with GIS for the area to identify utility conflict locations and to verify the survey. Completed CAD design for Phase 2 of the project.

Hazen

Seth Robertson, PE

Associate Vice President

Mr. Robertson serves as Hazen's Corporate Infrastructure Funding Leader. His experience includes development of asset management programs, capital improvement planning, financial modeling and rate studies, and funding strategy development and implementation.

Education

BS, Environmental Engineering, North Carolina State University, 1997

Certification/License

Professional Engineer: NC

Areas of Expertise

- Asset management
- Funding assistance
- Financial analysis
- Capital planning

Experience

- 24 total years
- 1 year with Hazen

Professional Activities

Water Environment Federation

Island Water Reclamation Facility Relocation, Fort Pierce Utility Authority, FL

Funding Strategy Development. The Island Water Reclamation Facility has a history of damage from coastal events and presents a substantial ongoing risk due to its current location on South Hutchinson Island. Responsible for developing a funding strategy and implementation plan that evaluates feasible funding options including the use of State Revolving Funds (SRF), Florida Resiliency Grants, Water Infrastructure Finance and Innovation Act Funds, and emerging funding sources through the American Rescue Plan and Infrastructure Investment and Jobs Act to fund the approximately $100 million project. This strategy includes timelines, estimated chance of funding, and true cost of each funding alternative to provide a comprehensive evaluation that maximizes the best funding available.

Experience Prior to Hazen

Asset Condition Assessment, Financial Modeling, Sewer Rehabilitation and Replacement, Town of Selma, NC

Funding Assistance. The Town of Selma has been experiencing significant infiltration and inflow since Hurricanes Florence and Michael. The resulting I/I created system overflows and excessive treatment costs. Two projects were identified as priorities for reducing flows in addition to the need for system condition assessment and financial modeling. Responsible for managing the securing of a total of $5.5 million (including $3 million in grants) through the Clean Water SRF Additional Supplemental Appropriations for Disaster Relief Act of 2009, Community Development Block Grant-Infrastructure program, and the North Carolina Asset Inventory and Assessment grant program to fund the identified needs.

North Carolina Division of Water Infrastructure, NC

SRF Section Chief. Responsible for the management of over $2 billion in critical need water and wastewater infrastructure funds. Also served as the co-chair of the national EPA and SRF workgroup.

Hazen

Ruby Wells

Senior Associate

Ms. Wells has over 20 years of experience in environmental science and planning for water supply infrastructure, stormwater, wastewater and watershed planning. In addition to these efforts, she assists clients with navigating local, state, and federal grant and loan programs in order to secure critical capital funding.

Education

BS, Chemical Engineering,
University of South Florida, 2004

Areas of Expertise

- Funding support
- Inter-agency coordination and planning
- Permitting

Experience

- 21 total years
- 10 years with Hazen

Cedar Creek Water Pollution Control Facility, Nassau County Department of Public Works, NY

Funding Assistance. Providing financial assistance support for Nassau County, including via Environmental Facilities Corporation grant and loan programs. The County has initiated a project to clean and repair six anaerobic digesters tanks and ancillary equipment at the Cedar Creek facility for the purpose of improving the efficiency of the wastewater treatment process, increasing gas production for power and plant heating requirements, and extending the service life of the structural and mechanical components of the digester system. The evaluation and inspection of the structural and mechanical components are especially important to remove hazardous materials and avoid catastrophic failure of the tanks, which are located near sensitive areas such as a large public park and protected waterways.

Indian Brook Water Treatment Plant, Village of Ossining, NY

Funding Assistance. The existing Indian Brook facility has provided water to the Village and Town of Ossining's consumers for many years. However, the service area is undergoing a period of growth; therefore, with implementation of a new facility the Village seeks to ensure it can reliably meet the water demands of its population for the foreseeable future. Responsible for successfully securing over $3 million in grant funding for the project through the Consolidated Funding Application/Green Infrastructure Grant Program) and the Water Infrastructure Improvement Act. As a result of these efforts, the project was identified as a regional priority by the Mid-Hudson Regional Economic Development Council.

Hazen

Timothy Devine, PE

Senior Associate

Mr. Devine specializes in the application of analytical tools to assist utilities with optimizing investments under multiple constraints, and subsequently in developing defensible, data-driven capital improvement plans.

Education

MBA, University of North Carolina at Chapel Hill, 2012

MEM,Duke University, 2012

BS, Environmental Engineering, United States Military Academy at West Point, 2004

Certification/License

Professional Engineer: NC, NY

Areas of Expertise

- Capital and master planning
- Financial and economic analysis
- Environmental permitting and analysis
- Municipal water and wastewater process and design

Experience

- 15 total years
- 10 years with Hazen

Professional Activities

Water Environment Federation

NC One Water

- Management Committee Chair

American Water Works Association

- Veterans Initiative Liaison

CIP Financial Evaluation, Town of Nantucket, MA

Project Task Lead. Developed a CIP financial model to evaluate different methods of CIP financing and the associated revenue generation required to cover financing costs at a high-level. Modeled outputs of user generated scenarios provide quantified impacts for the execution of the CIP that can be used by decision makers when developing financing and funding plans. Preferable scenarios developed in the CIP financial model were carried forward for more detailed evaluation using a dynamic rate model to fully develop revenue generation strategies.

Use as an analytical tool to support capital expenditure planning processes

Charles County Water Supply Program Analysis, Charles County, MD

Task Lead. Led a team of engineers, economist, and financial analysts in the development of an analytical planning tool to help inform the County's capital planning decision-making process as they evaluated different infrastructure implementation approaches to meet their future water service area demands. Assessed the financial implications of the County's water supply program under alternative scenarios including the use of different financing instruments and modifications to the implementation plan. A custom CIP Timing Analysis model was developed to evaluate alternative financing and timing scenarios on the cost of the water supply program and potential impacts to customer rates and residential affordability.

Long-Term Wastewater Treatment Regionalization Analysis, City of Southport, NC

Task Lead. Led a team of engineers, economist, and financial analysts in the development of an analytical planning tool to help inform the City's capital planning decision-making process as they evaluated two potential long-term wastewater treatment alternatives. The alternatives included building a new greenfield wastewater treatment plant on City-owned property (which they would own and maintain), or entering into a regional partnership with Brunswick County and the three other municipal partners who form the West Regional Wastewater Treatment System.

Hazen

Kristin Wilkinson, PE

Principal Engineer

Ms. Wilkinson is a water and wastewater process mechanical design engineer. She has experience in planning, permitting, design, and construction administration services on water and wastewater projects.

Education

ME, Environmental Engineering, North Carolina State University, 2021

BS, Environmental Engineering, North Carolina State University, 2016

Certification/License

Professional Engineer: PA

Areas of Expertise

- Wastewater treatment designs
- Permitting
- Water treatment designs
- Design services during construction

Experience

- 5 total years
- 4 years with Hazen

Professional Activities

American Water Works Association

American Water Resources Association

Water Environment Association

Sustainable Business Network of Greater Philadelphia Area

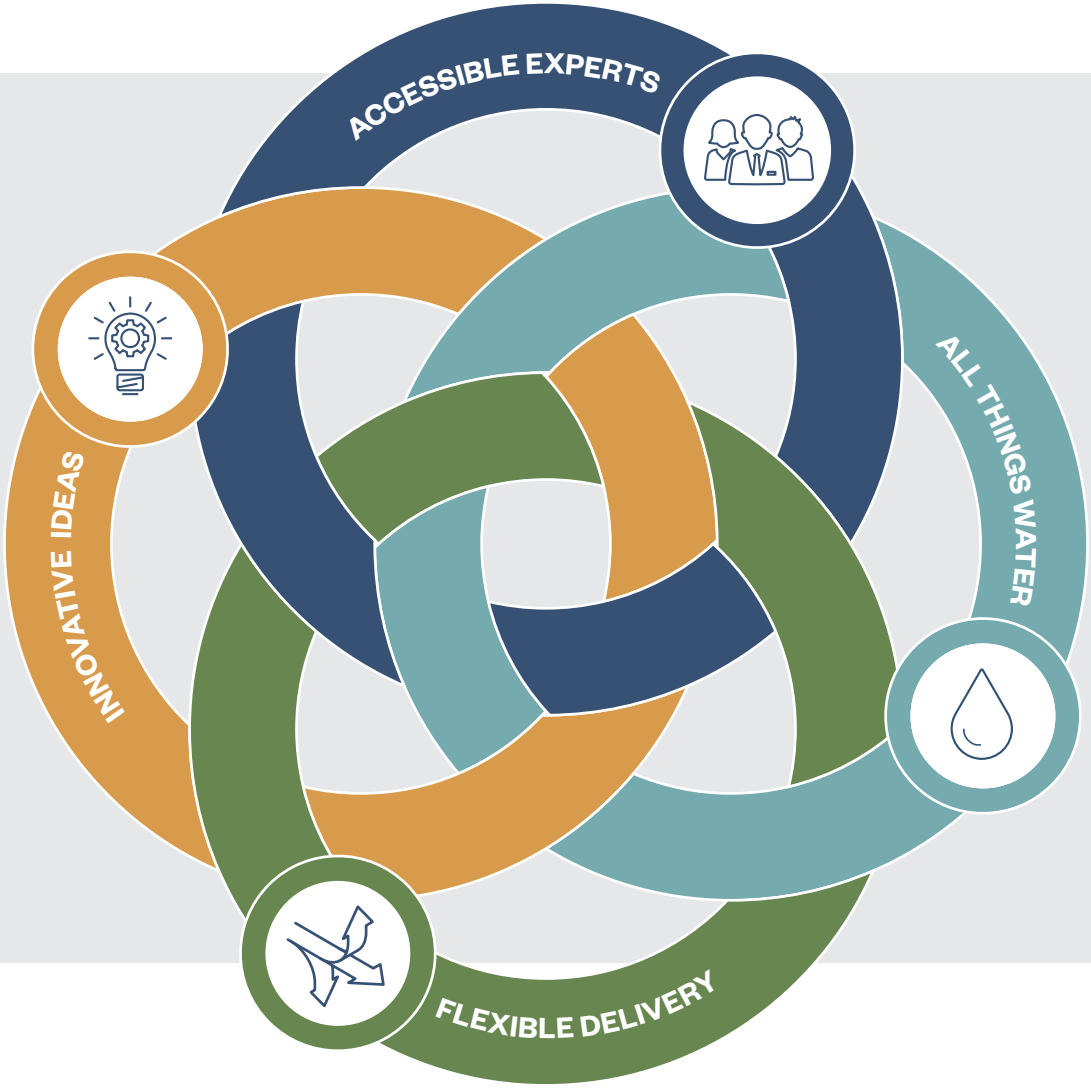
Conceptual Design of Filter Rehabilitation for the City of Allentown Water Treatment Plant, Lehigh County Authority (LCA), PA
Design Engineer on the filter rehabilitation project assisting with preliminary engineering services. The project included the conceptual design of the filter underdrains which were selected through an alternatives analysis. A cost estimate and review of constructability, sequencing, and maintenance of plant operations were also completed.

Water Intake Feasibility Study for the Allentown Water Filtration Plant, LCA, PA
Assistant Design Engineer for the Authority's water intake alternatives analysis. The plant currently operates a traveling screen that has reached the end of its useful life. The study will analyze alternatives, which include the rehabilitation of the existing traveling screen as well as the replacement with a new passive screen system.

Stormwater and Wastewater Asset Management Program, City of Keene, NH
Consultant for the planning, management, and delivery of an asset management program centered around the City's stormwater and wastewater collection systems. Assisting with the data evaluation and gap analysis in the preparation of a prioritization risk assessment framework and developed a comprehensive risk protocol for all assets and prepared asset valuation while focusing on the triple bottom line.

Municipal Sewage System Asset Management Pilot Program, New York State Department of Environmental Conservation/New York State Environmental Facilities Corporation/NYSDEC, Albany, NY
Assistant Engineer for the development and implementation of asset management plans for ten municipalities as part of a state-wide pilot program. The program included developing asset inventories, present worth, remaining useful life, and risk. Workshops were conducted with each municipality for education and training.

Hazen



Hazen

Hazen and Sawyer
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Lehigh County Authority

System Operations Review - September 2022

Presented: October 24, 2022

Critical Activities	System	Description	Sep-22	2022 Totals	2021 Totals	Permit
			Daily Avg (MGD)	Daily Avg (MGD)	Daily Avg (MGD)	Daily Max (MGD)
Water Production	Allentown	Total	22.95	22.59	22.00	39.0
		Schantz Spring	6.38	6.98	7.29	9.0
		Crystal Spring	3.87	3.87	3.75	4.0
		Little Lehigh Creek	12.70	11.74	10.84	30.0
		Lehigh River	0.00	0.03	0.11	28.0
	Central Lehigh	Total	11.20	11.63	10.98	19.04 MGD Avg
		Feed from Allentown	7.23	7.20	7.29	7.0 MGD Avg 10.5 MGD Max
		Well Production (CLD)	3.97	4.43	3.69	8.54 MGD Avg
		Sum of all (12) other Suburban Water Systems	0.15	0.14	0.13	1.71 Sum of all wells
Wastewater Treatment		Kline's Island	30.57	32.94	32.27	40.0
		Pretreatment Plant	4.90	5.19	5.17	5.75 (design capacity)
		Sum of all (5) other Suburban WW Systems	0.19	0.20	0.21	0.36

		Sep-22	2022 Totals	2021 Totals	2020 Totals
Precipitation Totals (inches)		3.47	34.2	44.67	60.66
Compliance Reports Submitted to Allentown		17	216	280	278
Notices of Violation (NOVs)	(Allentown + Suburban)	0	2	3	1
Sanitary Sewer Overflows (SSOs)/Bypasses	(Allentown + Suburban)	1	15	26	37
Main Breaks Repaired	Allentown	2	22	20	20
	Suburban	4	11	14	12
Customer Service Phone Inquiries	(Allentown + Suburban)	710	7,930	15,857	22,992
Water Shutoffs for Non-Payment	(Allentown + Suburban)	188	1,482	1,773	1,956
Injury Accidents	(Allentown + Suburban)	1	5	8	10
Emergency Declarations	Allentown	(1) @ $45.000	(2) @ $258,993	0	(2)@ $152,053
	Suburban	(1) @ $20,000	(3) @ $857,939.60	(1) @ $48,000	(1) @ $19,335

Significant Repairs/Upgrades:

An emergency repair was completed on the 30" wash water line at the Allentown Water Filtration Plant. The repair was made due to a leak that that was found in close proximty to the filter building. An emergency pump replacement was made in the Clearview Farms Division. A Boil Water Advisory was avoided by maintaing pressure using hauled in water.

Description of NOVs and/or SSOs:

A boil water advisory was issued for the Mill Creek Division on 9/6/2022. The advisory was issued due to loss of pressure and was lifted on 9/8/2022. A bypass occurred at Heidelberg Heights WWTP from 9/13-14/2022 due to 1.5" of rainfall.

Other Highlights:

One injury was reported in September resulting from a finger laceration. The Smart Ball project was completed in the Allentown Division, a final report will follow.