

South Central Connecticut Regional Water Authority
Via Remote Access**

AGENDA

Regular Meeting of Thursday, December 17, 2020 at 12:30 p.m.

- A. Safety Moment
- B. Non-core Business Committee: D. Borowy
 - 1. Approve Minutes – September 17, 2020 meeting
 - 2. Amare Advisors Non-core Strategy – Including Executive Session: B. Malarkey & W.X. Pek
 - 3. Non-core Business Update – Including Executive Session: B. Nesteriak and P. Singh
- C. Audit-Risk Committee: J. Cermola
 - 1. Approve minutes – September 17, 2020 meeting
 - 2. Cyber/Technology Resiliency Review – Including Executive Session: P. Singh
 - 3. Risk Management Update: J. Reckdenwald
- D. Meet as Environmental, Health & Safety Committee: K. Curseaden
 - 1. Approve Minutes – September 17, 2020 meeting
 - 2. 2021 Legislative Session Outlook: L. Vitagliano
 - 3. Deer Management Program Update: J. Triana
 - 4. Recreation Permit and Program Update: J. Triana
- E. Act on matters arising from Committee meetings
- F. Consent Agenda
 - 1. Approve Minutes – November 19, 2020 meeting
 - 2. Capital Budget Authorization – January 2021
 - 3. Capital Budget Transfer Notifications (no action required)
 - 4. Accounts Receivable Update – November 2020
 - 5. Key Performance Indicators
 - 6. RPB Quarterly Dashboard Report
 - 7. Derby Tank Update
 - 8. North Cheshire Update
- G. Finance: R. Kowalski
 - 1. Quarterly Financial Reports
- H. Elect Officers for Calendar Year 2021
- I. Updates: L. Bingaman
 - 1. COVID Update: B. Nesteriak and R. Kowalski
 - 2. Monthly Highlights: L. Bingaman
- J. RPB Committee assignments and reports on RPB Committee meetings
- K. *RPB Application: West River Water Treatment Plant Improvements: B. Nesteriak, J. Hill and O. Kelly
 - 1. Discussion regarding West River Water Treatment Plant Application

2. Consider and act on Application for the approval of West River Water Treatment Plant Improvements
 3. Affidavit of Edward O. Norris III regarding confidential information within said Application
 4. Motion for Protective Order of the SCCRWA's confidential information within said Application
 5. Protective Order concerning the SCCRWA's confidential and sensitive information to the Representative Policy Board, dated December 17, 2021
 6. West River Water Treatment Plant Improvements Project Financing
- L. Executive Session to discuss personnel matters

******In accordance with the Governor Lamont's, Executive Order No. 7B for the Protection of Public Health and Safety during COVID-19 Pandemic and Response, the public meeting will be held remotely. Members of the public may attend the meeting via conference call, videoconference or other technology. For information on attending the meeting via remote access, and to view meeting documents, please visit <https://www.rwater.com/about-us/our-boards/board-meetings-minutes?year=2020&category=1422&meettype=&page=>. For questions, contact the board office at jslubowski@rwater.com or call 203-401-2515.

**RPB Member (M. Levine) is excused at K*

Topic: Authority Meeting (incl. Non-Core Business Committee, Audit-Risk Committee and Environmental, Health and Safety Committee)

Time: Dec 17, 2020 12:30 PM Eastern Time (US and Canada)

Join Meeting (*via conference call*)

Dial by your location

+1 312 626 6799 US (Chicago)

+1 646 876 9923 US (New York)

+1 301 715 8592 US (Washington D.C)

+1 669 900 6833 US (San Jose)

+1 253 215 8782 US (Tacoma)

+1 346 248 7799 US (Houston)

+1 408 638 0968 US (San Jose)

Meeting ID: 829 5878 1065

Passcode: 560460

Find your local number: <https://us02web.zoom.us/j/kcg6PdoUq8>

SAFETY MOMENT

DECEMBER – HOW CLIMATE CHANGE AFFECTS WORKERS

Workers are often the first to be exposed to the effects of climate change and may be affected for longer durations and at greater intensities. Climate change may result in not only the increasing prevalence and severity of known occupational hazards and exposures, but also the emergence of new ones.

If we make no improvements, climate change will damage economies, promote resource scarcity, and drastically increase the cost of doing business.

The first step to reducing emissions is knowing how much carbon your business emits. Below are ways your business can reduce carbon emissions:

- Reduce, reuse, recycle
- Reduce food waste
- Invest in renewable energy
- Use green refrigerants and appliances
- Educate yourself, your staff and your customers
- Raise your business voice: support policy initiatives



Tap Into
Safety



Regional Water Authority

Service – Teamwork – Accountability – Respect – Safety

Safety is a core company value at the Regional Water Authority .
It is our goal to reduce workplace injuries to zero.

 Regional Water Authority

Confidential Information - For Board Use Only - Do not Redistribute Page 1 of 117

**South Central Connecticut Regional Water Authority
Minutes of the November 19, 2020 Meeting**

A regular meeting of the South Central Connecticut Regional Water Authority (“RWA” or “Authority”) took place on Thursday, November 19, 2020, via remote access. Chair DiSalvo presided.

Present: Authority Members Present – Messrs. DiSalvo, Borowy, Cermola, Curseaden, and Ms. Sack
Long Wharf Partners LLC: Mr. Gershman
Management – Mss. Collins, Kowalski, Reckdenwald, Nesteriak, and Messrs. Bingaman, Norris, and Singh
RPB –Mr. Oslander
Staff – Mrs. Slubowski

Chair DiSalvo called the meeting to order at 12:30 p.m.

Ms. Reckdenwald, RWA’s Senior Vice President of Corporate Services, reviewed the Safety Moment distributed to members.

At 12:34 p.m., on motion made by Mr. Cermola, seconded by Mr. Borowy, and unanimously carried, the Authority voted to go into executive session to discuss negotiations related to real estate acquisition. Present in executive session were the Authority members, Mss. Collins, Kowalski, Reckdenwald, Nesteriak, Slubowski and Messrs. Bingaman, Gershman, Norris and Singh.

Borowy Aye
Cermola Aye
Curseaden Aye
DiSalvo Aye
Sack Aye

At 1:06 p.m., Mr. Gershman withdrew from the meeting.

At 1:21 p.m., the Authority came out of executive session. On motion made by Mr. Cermola, seconded by Mr. Borowy, and unanimously carried, the Authority voted to recess the meeting to meet as the Strategic Planning Committee.

Borowy Aye
Cermola Aye
Curseaden Aye
DiSalvo Aye
Sack Aye

At 2:31 p.m., Mr. Oslander entered the meeting.

At 2:44 p.m., the Authority reconvened.

Chair DiSalvo stated it would be appropriate to remove Item #6, *2021 Calendar Year regular meeting dates*, from the Consent Agenda for further discussion. On motion made by Mr. Borowy, seconded by Mr. Curseaden, and unanimously carried, the Authority:

1. Approved minutes of its October 8, 2020 and October 15, 2020 meetings.
2. Approved the Capital Budget Authorization for December 2020.

RESOLVED, that the Vice President of Finance and Controller is authorized to submit to the Trustee one or more requisitions in an aggregate amount not to exceed \$1,650,000 for the month of December 2020 for transfer from the Construction Fund for capital expenditures. Each such requisition shall contain or be accompanied by a certificate identifying such requisition and stating that the amount to be withdrawn pursuant to such requisition is a proper charge to the Construction Fund. Such requisitions are approved notwithstanding the fact that amounts to be withdrawn for a particular project may exceed the amount indicated for such month and year in the current Capital Improvement Budget but will not cause the aggregate amount budgeted for fiscal year 2021 for all Capital Improvement Projects to be exceeded. In the absence of the Vice President of Financial Services, the Vice-President of Asset Management is authorized to sign in her place.

3. Received Capital Budget Transfer Notifications for November 2020.
4. Received Monthly Financial Report for October 2020.
5. Received the Accounts Receivable update for October 2020.
6. Approved a Bid Exemption for Xylem Pumps and Equipment.
7. Received the Derby Tank Update.
8. Received the North Cheshire Update.
9. Approved the DePodesta Property - OSWA Grant Agreement Resolutions.

Borowy	Aye
Cermola	Aye
Curseaden	Aye
DiSalvo	Aye
Sack	Aye

Authority members reviewed and revised the RWA Committees 2021 calendar year regular meeting dates.

Ms. Reckdenwald reported on a Seventh Amendment to the Authority Voluntary Investment Plan (401K). This amendment will address and amend an operational defect related to vesting of employer contributions to the Union plan. Mr. Curseaden moved for adoption of the following resolutions:

RESOLVED, that the Authority Voluntary Investment Plan be, and it hereby is, amended by the Seventh Amendment, effective as of the dates set forth therein; and be it

FURTHER RESOLVED, that the Chairperson of the Authority be, and he hereby is, authorized, empowered and directed to execute the Seventh Amendment to the Authority Voluntary Investment Plan on behalf of the Authority, and the appropriate officers of the Authority are authorized, empowered and directed to take any and all additional action which they deem necessary or appropriate in order to implement the same.

Mr. Cermola seconded the motion. After discussion, the Chair called for the vote:

Borowy	Aye
Cermola	Aye
Curseaden	Aye
DiSalvo	Aye
Sack	Aye

Ms. Kowalski, RWA's Vice President of Finance Services, provided a review of the proposed FY 2022 budget schedule. The Authority set the date of its special meeting to review the proposed budget for April 1, 2021.

Ms. Nesteriak, RWA's Executive Vice President and Chief Operating Officer, reported on activities over the past month, which included:

- Status of COVID at RWA
- Contact tracing
- Isolation efforts/remote work
- Disinfection and increased cleaning procedures

Ms. Kowalski provided an update of cash receipts and billing post-COVID. She reported that the impacts of COVID on cash collections are not as severe as expected but that there is still uncertainty of the effects of the pandemic. She stated that cash collections are being monitored on a weekly basis.

Authority members reported on recent RPB Committee meetings.

Mr. Bingaman:

- Commented on a cross function team to review and discuss the potential acquisition of a Connecticut-based water testing laboratory. Mr. Bingaman also commented on a non-core strategy project involving Amane Advisors. The work includes analyzing target segments, prioritizing non-core areas for emphasis and development of a high level strategic road map and timeline for priority initiatives.
- Advised the Authority of recruitment for key positions within the organization and status of progress with a potential lab acquisition.
- Reported on a second Good-to-Great session with the Leadership Team to discuss the future of the RWA.
- Discussed a contingency plan for unanticipated critical capital requirements and/or a need to conserve internally generated funds, which interim financing was previously approved by the Authority and the RPB.
- Provided an update on the RWA's Communications and Outreach team liaison program with municipal leaders, RPB members, health department representatives and fire officials in the 15 districts served by the RWA.
- Communicated that the Fiscal Year 2020 Annual Report was filed and a copy can be found on the RWA Website.

At 3:11 p.m., on motion made by Ms. Sack, seconded by Mr. Curseaden, and unanimously carried, the meeting adjourned.

Borowy	Aye
Cermola	Aye
Curseaden	Aye
DiSalvo	Aye
Sack	Aye

Respectfully submitted,

Kevin Curseaden, Secretary

South Central Connecticut Regional Water Authority
90 Sargent Drive, New Haven, Connecticut 06511-5966 203.562.4020
<http://www.rwater.com>

MEMORANDUM

TO: Anthony DiSalvo
David J. Borowy
Joseph A. Cermola
Kevin J. Curseaden
Suzanne C. Sack

FROM:  Rochelle Kowalski
Vice-President of Financial Services

DATE: December 14, 2020

SUBJECT: Capital budget authorization request for January 2021

Attached for your meeting on December 17, 2020 is a copy of the resolution authorizing expenditures against the capital improvement budget for January 2021. The amount of the requested authorization, for funds held by the trustee, is \$1,370,000.

This would result in projected expenditures through January 2021 of \$10,861,616 or 45% of the total 2021 fiscal year capital budget.

In addition, from the Growth Fund, approximately \$30,000 is expected to be used for the Non-Core Billing project.

Attachment

RESOLVED

That the Vice-President of Financial Services is authorized to submit to the Trustee one or more requisitions in an aggregate amount not to exceed \$1,370,000 for the month of January 2021 for transfer from the Construction Fund for capital expenditures. Each such requisition shall contain or be accompanied by a certificate identifying such requisition and stating that the amount to be withdrawn pursuant to such requisition is a proper charge to the Construction Fund. Such requisitions are approved notwithstanding the fact that amounts to be withdrawn for a particular project may exceed the amount indicated for such month and year in the current Capital Improvement Budget but will not cause the aggregate amount budgeted for fiscal year 2021 for all Capital Improvement Projects to be exceeded. In the absence of the Vice-President of Financial Services, the Vice-President of Asset Management is authorized to sign in her place.

South Central Connecticut Regional Water Authority
 90 Sargent Drive, New Haven, Connecticut 06511-5966 203-562-4020
<http://www.rwater.com>

TO: Anthony DiSalvo
 David J. Borowy
 Joseph A. Cermola
 Kevin J. Curseaden
 Suzanne C. Sack

FROM:  Rochelle Kowalski

DATE: December 14, 2020

SUBJECT: Capital Budget Transfers

The status of all capital projects are reviewed on a monthly basis. In an effort to obtain efficiencies in our capital program, any anticipated unspent funds are reallocated to support reprioritized projects or existing projects. Below is a summary of the attached capital budget transfers and amendments.

	Available Funds	Reallocation of Project/Funds
Lake Saltonstall FWR Roof Improvements & Valve Replacement	\$36,400	Lake Glen Aeration Compressor Replacement - \$16,400 Flow Telemetry Equipment \$20,000
Lake Gaillard Backwash Polymer System Upgrades	\$280,00	Lake Gaillard Water Treatment Chemical Feed System Improvements \$280,000
Cyber Security Upgrades	\$50,000	LIMS Upgrade \$50,000
Monthly Billing	\$350,000	LIMS Upgrade \$350,000

CAPITAL BUDGET AMENDMENT REQUEST

Request Date:	12/10/2020	Type	Log	Mo/Yr
Requesting Division:	Operations	B1	21-12	Dec/20
Requested By:	Jim Hill			

Transfer From:	
Account Number:	001-0-107142-044701
Project Description:	Lake Saltonstall WTP FWR Roof Improvements & Valve Replacement
A) Original Budget	66,000
B) Total Previous Transfers (In or Out)	20,000
C) This Transfer	16,400
D) Revised Budget (A+/-B-C)	29,600
E) Estimated Project Costs	10,000
F) Remaining Funds Available for Transfer, if any (D-E)	19,600
Explanation why funds are available: Project work for FY 2021 has completed under budget.	

Transfer To:	
Account Number:	To be Created
Project Description:	Lake Glen Aeration System Compressor Replacement
A) Original Budget	0
B) Previous Transfers (In or Out)	0
C) Revised Budget (A+/-B)	0
D) Amount to be Transferred	16,400
E) Proposed Revised Budget (C+D)	16,400
Explanation why funds are needed: This amendment will fund the replacement of the existing single compressor with two compressors. The compressors will be configured with auto-alternate operation, extending the life of the compressors while providing an adequate amount of air to the aeration system. The current system does not provide an adequate volume of of air, and is operated by a single compressor. The system is necessary to improve raw water quality. Total cost of the project is estimated at \$16,400.	

Approvals As Required By Type	Signature	Date
1) Requesting Vice President/Director	<i>Beth Nestorak</i>	12.10.20
2) Donor Vice President/Director	<i>[Signature]</i>	12.10.2020
3) Vice President - Finance	<i>[Signature]</i>	12/11/2020
4) Executive Vice President & Chief Operating Officer	<i>Beth Nestorak</i>	12.10.20
5) Chief Executive Officer		
6) Authority Members	Copy of minutes attached if required	

CAPITAL BUDGET AMENDMENT REQUEST

Request Date:	12/10/2020	Type	Log	Mo/Yr
Requesting Division:	Operations	B1	21-11	Dec/20
Requested By:	John Sykes			

Transfer From:	
Account Number:	001-0-107142-044701
Project Description:	Lake Saltonstall WTP FWR Roof Improvements & Valve Replacement
A) Original Budget	66,000
B) Total Previous Transfers (In or Out)	0
C) This Transfer	20,000
D) Revised Budget (A+/-B-C)	46,000
E) Estimated Project Costs	10,000
F) Remaining Funds Available for Transfer, if any (D-E)	36,000
Explanation why funds are available: Project work for FY 2021 has completed under budget.	

Transfer To:	
Account Number:	To be Created
Project Description:	Flow Telemetry Equipment
A) Original Budget	0
B) Previous Transfers (In or Out)	0
C) Revised Budget (A+/-B)	0
D) Amount to be Transferred	20,000
E) Proposed Revised Budget (C+D)	20,000
Explanation why funds are needed: This amendment will fund the purchase of flow telemetry equipment to support planning efforts, in particular with work to be performed at the Lake Gaillard Water Treatment Plant. Much of this work will involve limiting flows into the New Haven Service Area. Having accurate information with regard to the flow will allow us to develop more versatile operational strategies.	

Approvals As Required By Type	Signature	Date
1) Requesting Vice President/Director	<i>Beth Nesterak</i>	12.10.20
2) Donor Vice President/Director	<i>[Signature]</i>	12.10.2020
3) Vice President - Finance	<i>Michelle Blair</i>	12/11/20
4) Executive Vice President & Chief Operating Officer	<i>Beth Nesterak</i>	12.10.20
5) Chief Executive Officer		
6) Authority Members	Copy of minutes attached if required	

CAPITAL BUDGET AMENDMENT REQUEST

Request Date:	12/08/2020	Type	Log	Mo/Yr
Requesting Division:	Engineering & Env Services	B2	21-08	Dec/20
Requested By:	Orville Kelly			

Transfer From:	
Account Number:	001-000-107132-116111
Project Description:	Lake Gaillard Backwash Polymer System Upgrades
A) Original Budget	300,000
B) Total Previous Transfers (In or Out)	0
C) This Transfer	280,000
D) Revised Budget (A+/-B-C)	20,000
E) Estimated Project Costs	20,000
F) Remaining Funds Available for Transfer, if any (D-E)	0
Explanation why funds are available: Continuation of this multi-year project has been deferred to FY 2022 as a result of restrictions on outside personnel accessing our treatment facilities as a result of COVID-19.	

Transfer To:	
Account Number:	001-000-101732-116110
Project Description:	Lake Gaillard Water Treatment Plant Chemical Feed System Improvements
A) Original Budget	100,000
B) Previous Transfers (In or Out)	0
C) Revised Budget (A+/-B)	100,000
D) Amount to be Transferred	280,000
E) Proposed Revised Budget (C+D)	380,000
Explanation why funds are needed: This project is a multi-year project initiated in FY 20. As a result of budget reductions due to the pandemic, the majority of the project work was deferred for FY 21. Due to access restrictions as result of COVID-19, planned work in other parts of the treatment plant have been deferred. Due to the location of the work being performed on this project, there is no contact with treatment staff and project work is able to proceed. This amendment will shift funds from the deferred project into this project budget, allowing more work to be performed than originally anticipated. Project work will continue into FY 2022.	

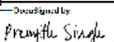
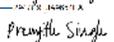
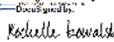
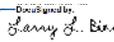
Approvals As Required By Type	Signature	Date
1) Requesting Vice President/Director	<i>[Signature]</i>	12.10.2020
2) Donor Vice President/Director	<i>[Signature]</i>	12.10.2020
3) Vice President - Finance	Michelle Kowalski	12/11/2020
4) Executive Vice President & Chief Operating Officer	Bill Mitchell	12/11/2020
5) Chief Executive Officer	Jason Singman	12/14/2020
6) Authority Members	Copy of minutes attached if required	

CAPITAL BUDGET AMENDMENT REQUEST

Request Date:	12/10/2020	Type	Log	Mo/Yr
Requesting Division:	Business Strategy	B1	21-10	Dec/20
Requested By:	Edward Carboni			

Transfer From:	
Account Number:	001-000-107181-100033
Project Description:	Cyber Security Upgrades
A) Original Budget	150,000
B) Total Previous Transfers (In or Out)	0
C) This Transfer	50,000
D) Revised Budget (A+/-B-C)	100,000
E) Estimated Project Costs	0
F) Remaining Funds Available for Transfer, if any (D-E)	100,000
Explanation why funds are available: Project has been deferred until FY 2022.	

Transfer To:	
Account Number:	001-000-107181-100414
Project Description:	LIMS Upgrades
A) Original Budget	710,000
B) Previous Transfers (In or Out)	500,000
C) Revised Budget (A+/-B)	1,210,000
D) Amount to be Transferred	50,000
E) Proposed Revised Budget (C+D)	1,260,000
Explanation why funds are needed: Amendment 2 of 2: This amendment is necessary to fund completion of the project as a result of the need for additional staff resources, as well as changes to the scope of the project and a shift in the go-live date. Total estimated expenditures in FY 21 are now \$1,260,000.	

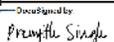
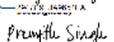
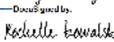
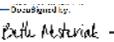
Approvals As Required By Type	Signature	Date
1) Requesting Vice President/Director		12/11/2020
2) Donor Vice President/Director		12/11/2020
3) Vice President - Finance		12/11/2020
4) Executive Vice President & Chief Operating Officer		12/14/2020
5) Chief Executive Officer		12/16/2020
6) Authority Members	Copy of minutes attached if required	

CAPITAL BUDGET AMENDMENT REQUEST

Request Date:	12/10/2020	Type	Log	Mo/Yr
Requesting Division:	Business Strategy	B2	21-09	Dec/20
Requested By:	Edward Carboni			

Transfer From:	
Account Number:	001-000-107181-100032
Project Description:	Monthly Billing
A) Original Budget	900,000
B) Total Previous Transfers (In or Out)	0
C) This Transfer	350,000
D) Revised Budget (A+/-B-C)	550,000
E) Estimated Project Costs	0
F) Remaining Funds Available for Transfer, if any (D-E)	550,000
Explanation why funds are available: Project schedule has shifted as a result of negotiations with vendor. Project will continue in FY 2022.	

Transfer To:	
Account Number:	001-000-107181-100414
Project Description:	LIMS Upgrades
A) Original Budget	710,000
B) Previous Transfers (In or Out)	150,000
C) Revised Budget (A+/-B)	860,000
D) Amount to be Transferred	350,000
E) Proposed Revised Budget (C+D)	1,210,000
Explanation why funds are needed: Amendment 1 of 2: This amendment is necessary to fund completion of the project as a result of the need for additional staff resources, as well as changes to the scope of the project and a shift in the go-live date. Total estimated expenditures in FY 21 are now \$1,260,000.	

Approvals As Required By Type	Signature	Date
1) Requesting Vice President/Director		12/11/2020
2) Donor Vice President/Director		12/11/2020
3) Vice President - Finance		12/11/2020
4) Executive Vice President & Chief Operating Officer		12/14/2020
5) Chief Executive Officer		12/16/2020
6) Authority Members	Copies of minutes attached if required	

South Central Regional Water Authority

Analysis of Accounts Receivable ("A/R")

(\$000 omitted)

Denotes City of New Haven Invoicing

Total Accounts Receivable Aging (in days)

	Nov 2020	Oct 2020	Sept 2020	Aug 2020	July 2020	June 2020	May 2020	April 2020	March 2020	Feb 2020	Jan 2020	Dec 2019	Nov 2019
Under 30	\$ 6,472	\$ 8,208	\$ 7,633	\$ 6,229	\$ 7,433	\$ 6,146	\$ 5,547	\$ 5,921	\$ 6,110	\$ 5,618	\$ 6,277	\$ 6,796	\$ 6,657
31-60	2,444	2,710	1,892	2,125	2,295	1,444	1,651	2,527	1,666	1,784	2,584	1,915	2,209
61-90	1,594	913	990	1,405	838	713	1,575	953	792	1,430	883	912	1,459
91-180	1,969	1,975	1,918	1,777	1,775	1,992	1,787	1,640	1,467	1,313	1,387	1,488	1,318
181-360	1,934	1,921	1,893	1,821	1,646	1,543	1,312	1,440	1,497	1,335	1,448	1,592	1,528
More than 1 year	4,408	4,388	4,449	4,207	4,266	4,331	4,207	4,333	4,243	4,092	4,174	4,272	4,063
Sub Total	18,821	20,115	18,775	17,564	18,253	16,169	16,079	16,814	15,775	15,572	16,753	16,975	17,234
Interest due	1,354	1,388	1,448	1,476	1,515	1,559	1,610	1,634	1,680	1,715	1,728	1,721	1,700
Total Gross A/R plus interest	\$ 20,175	\$ 21,503	\$ 20,223	\$ 19,040	\$ 19,768	\$ 17,728	\$ 17,689	\$ 18,448	\$ 17,455	\$ 17,287	\$ 18,481	\$ 18,696	\$ 18,934

Aged Accounts Receivable Focus of Collection Efforts

	Nov 2020	Oct 2020	Sept 2020	Aug 2020	July 2020	June 2020	May 2020	April 2020	March 2020	Feb 2020	Jan 2020	Dec 2019	Nov 2019
Greater than 60 days:													
A/R	\$ 11,235	\$ 10,585	\$ 10,677	\$ 10,659	\$ 10,011	\$ 10,114	\$ 10,470	\$ 9,930	\$ 9,248	\$ 9,487	\$ 9,124	\$ 9,542	\$ 9,678
Less: Multi-Tenants	(3,419)	(2,949)	(3,289)	(3,109)	(3,084)	(2,864)	(3,075)	(2,594)	(2,492)	(2,677)	(2,345)	(2,704)	(2,680)
Receiverships	(2,084)	(2,091)	(2,141)	(2,080)	(2,163)	(2,169)	(2,190)	(2,251)	(2,148)	(2,172)	(2,231)	(2,155)	(2,135)
Liens	(1,775)	(1,464)	(1,500)	(1,739)	(1,705)	(1,721)	(1,724)	(1,731)	(1,758)	(1,757)	(1,831)	(2,050)	(1,844)
Total	\$ 3,957	\$ 4,081	\$ 3,747	\$ 3,731	\$ 3,059	\$ 3,360	\$ 3,481	\$ 3,354	\$ 2,850	\$ 2,881	\$ 2,717	\$ 2,633	\$ 3,019
	35%	39%	35%	35%	31%	33%	33%	34%	31%	30%	30%	28%	31%

Collection Efforts

	Nov 2020	Oct 2020	Sept 2020	Aug 2020	July 2020	June 2020	May 2020	April 2020	March 2020	Feb 2020	Jan 2020	Dec 2019	Nov 2019
Shuts *	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	21	58	63	39	33
Red Tags **	-	-	-	-	-	-	-	-	7	15	22	9	13
Receivers	17	7	21	4	5	8	5	4	8	15	30	8	14
Top 100 Collection Calls	108	187											
Other ⁽¹⁾	1,163	1,319	1,544	1,192	1,338	1,282	1,159	989	1,409	1,671	1,647	1,468	1,261
Total	\$ 1,288	\$ 1,513	\$ 1,565	\$ 1,196	\$ 1,343	\$ 1,290	\$ 1,164	\$ 993	\$ 1,445	\$ 1,759	\$ 1,762	\$ 1,524	\$ 1,321
* Number of shuts	-	-	-	-	-	-	-	-	65	162	210	125	124
** Number of Red tags	-	-	-	-	-	-	-	-	32	83	80	60	78

⁽¹⁾ Includes: Notices and letters and legal initiatives.

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December, 14, 2020

An Important Note About Second -Quarter FY2021 Results

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What happens in the next few months is especially important as the revised and reduced Fiscal Year 2021 budget assumed a full back-to-normal as of January 2021 with strong cash flows in the latter part of this fiscal year. To that end, if the financial fallout of the pandemic is less than anticipated and we are projecting no or a minimal draw from discretionary funds, the Leadership Team is prepared to revisit the shared sacrifices and other deferred expenditures.

November 2020

Executive Summary of FY2021 Key Performance Indicators (KPIs)

Purpose: To make life better for people by delivering water for life.

Mission: Provide customers with high quality water and services at a reasonable cost while promoting the preservation of watershed land and aquifers.

Our Vision is to be an innovative water utility that sustains life, strengthens our communities, and protects resources for future generations.

Cat.	Measure	Prior Month	FYTD	Target	Comments
Customer/Constituent	Average Speed of Answer (seconds)	32	38	70	Fiscal year to date calls offered to the customer care area were 31,093 with 27,607 calls handled. The month of November brought us 4931 calls offered with 3328 handled by the customer care area. The Covid pandemic played a big part in the downward trend of calls answered due to staff being out sick. The need to begin to remote staff for safety reasons occurred with great efficiency on November 17. Since this remote effort began, we are seeing a positive trend related to staffs ability to handle more calls while working remotely. The comfort of being home and the desire to do good for our customers due to the fact that they have the ability to safely work from home has shown great enthusiasm and call handling is on an upward swing. The customer care agents have fewer distractions and are fully committed to handling each call with positive and efficient manners. Their ability to use streamlined processes as well as online SOPs has given the staff more confidence and "at your finger tip" call handling abilities.
	% Abandoned	4.1%	5.0%	5.0%	The creation of the collections team during the last week in October placed dedicated staff on collection activity initiatives in order to reduce outstanding receivables, reducing CSRs dedicated to call handling. To address the reduced call staffing, we will make adjustments to schedules and breaks when needed to maximize service levels, utilizing collections staff only on an exception basis when other options to maintain service levels are exhausted. The need to fill some open positions and shared sacrifice continues to offer challenges as we work around the Covid pandemic.
	Ebill %	26.2%	26.7%	27.0%	As of the end of November, there are 30,933 customers enrolled in electronic billing and reflects a growth of 1679 customers FYTD.
	Complaints/1000 Accounts	1.13	1.20	2.31	There have been 8 complaints FYTD, less than half the number received at the same time last year.
	Disruptions/1000 Accounts	0.43	0.51	1.37	There have been 59 disruptions FYTD, including 25 emergency shutdowns, and 32 scheduled shutdowns. These disruptions lasted a total of 347.5 hours and affected 705 customers.
	Positive/Neutral News items	120	128	115	There were a total of 8 positive or neutral media mentions of the RWA in November.
Employee	Preventable Injuries	1	3	0	In November, we had 2 recordable COVID cases. We are in the process of denying the cases, they still need to be recorded. There have been 19 positive COVID cases. Sanitization and social distancing practices are being followed in accordance with CDC and State guidelines to help minimize work-related exposure.
	Preventable MVAs per 100,000 miles	0.85	0.73	1.01	RWA employees have driven over 450K miles and had 5 PMVAs FYTD, 3 backing incidents and 2 involving other vehicles. Based on the types of incidents to-date, EH&S will be focusing on backing and driver awareness training.
	Near Miss Reports with Corrective Actions Taken	100%	100%	100%	A near miss is an unplanned event that did not result in injury, illness or damage - but had the potential to do so. One Near Miss Reported and Corrected Action Taken FYTD
	Training Hrs per FTE	2.16	2.39	3.86	FYTD RWA employees have received 637 hours of training, despite social distancing restrictions and modified work schedules. Electronic and other delivery methods to maintain appropriate social distancing have enabled continued developmental and safety training. Employees are also taking advantage of individual training offered remotely by other organizations and institutions.

November 2020

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Cat.	Measure	Prior Month	FYTD	Target	Comments
Process Excellence	Disinfection Byproducts	100%	100%	90%	There were 0 near-misses for the THMs and HAAs in September, our last compliance sampling period. Our aggressive flushing and source water management appear to be working. Additional DBP research and management activities are on-going. THM and HAA levels continue to fluctuate widely and, while well within USEPA standards, remain high enough to bear continued focus.
	Environmental Services Growth	On Track	On Track	0%	Kayak Fishing at Lake Saltonstall will be one new program. Mountain Biking at Genesee, a concept that looked promising will likely will not go forward. Now looking at establishing new authorized trails for anglers to use at Lakes Chamberlain and Saltonstall.
	Environmental Compliance	91%	91%	90%	FYTD there have been 5 parameters that fell outside the Near Miss threshold. The Gaillard daily sewer flow exceeded the discharge limit on 2 days in November. Treatment is investigating a leak from the mechanical seal on the main shaft of the hydroturbine.
	Watershed Inspection Completion	65	71	104	FYTD, 68.3% of targeted inspections have been completed. No violations noted in November. There have been 5 violations and 5 violations corrected so far this fiscal year. CoVID-related restrictions are impacting access to facilities and slowing completion of inspections.
	Dashboard Analytics Rollout	33%	75%	25%	The PMO dashboarding tools have been established to share real time reporting on both a Portfolio and Project-by-Project basis. The Center of Excellence Dashboard has been developed and shared to support the CoE Teams kicking off in December. The COVID-19 Impacts Dashboard is being evaluated in light of additional enhancement from our vendor.
	Net Unaccounted For Water	10.39%	10.97%	10.00%	The YTD Net Unaccounted for Water calculation is 10.97% for the annualized reporting period of September 1, 2019 through August 31, 2020. This represents an increase from the previous month and a decrease from the same period of reporting one year prior.
	I.T. Help Desk Tickets Closed in 4 Hours	82.4%	82.3%	80.0%	Of the 1753 tickets YTD, 1442 were able to be closed within 4 hours.

At or better than target*	18
Near Target*	2
Off Target*	4

*Financial Results provided in cover notice.

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Representative Policy Board
Dashboard Metric - 2Q FY21

Metrics	Quarter ended 11/30/19 (2Q FY 2020)	Quarter ended 5/31/20 (4Q FY 2020)	Quarter ended 8/31/20 (1Q FY 2021)	Quarter ended 11/30/20 (2Q FY 2021)
Customer/Stakeholders				
Combined Customer Satisfaction & Reputation (Note 1)	Target: 96% +/-2% Results: 96.2%* *Period ending September 2019, most recent available S&P rating AA-, affirmed 10/2019	Target: 96% +/-2% Results: 93.1%* *Period ending March 2020, most recent available S&P rating AA-, affirmed 10/2019	Target: 96% +/-2% Results: 93.1%* *Period ending March 2020, most recent available S&P rating AA-, affirmed 10/2019	Target: 96% +/-2% Results: 93.1%* *Period ending March 2020, most recent available S&P rating AA-, affirmed 10/2019
Underlying Credit Rating	Moody's rating Aa3, affirmed 10/2019	Moody's rating Aa3, affirmed 10/2019	Moody's rating Aa3, affirmed 10/2019	Moody's rating Aa3, affirmed 10/2019
Water Rates	Rates as of Sept. 2019, prepared for refinancing	Update to be provided with the next Official Statement	Update to be provided with the next Official Statement	Update to be provided with the next Official Statement
Financial Metrics (Note 2)				
Accrued Metered Water Revenues to Budget (000 omitted)	Budget: \$55.931 million Result: \$55.036 million	Budget: \$105.736 million Result: \$103.686 million	Budget: \$28.174 million Result: \$30.429 million	Budget: \$54.540 million Budget Org: \$56.028 million Result: \$58.581 million
Other Net Revenues to Budget	Budget: \$3.111 million Result: \$3.550 million	Budget: \$6.243 million Result: \$6.196 million	Budget: \$1.376 million Result: \$1.555 million	Budget: \$2.753 million Result: \$2.932 million
O&M Expenditures to Budget (Note 3)	Budget: \$30.302 million Result: \$27.285 million	Budget: \$61.049 million Result: \$55.585 million	Budget: \$13.915 million Result: \$12.772 million	Budget: \$27.582 million Budget Org.: \$29.915 Result: \$25.741 million
Capital Expenditures to Budget (Note 4)	Budget: \$14.075 million Result: \$12.211 million	Budget: \$31.614 million Result: \$26.001 million	Budget: \$4.683 million Result: \$3.355 million	Budget: \$9.885 million Result: \$7.126 million
Cash Collections (Water and Fire Service)	Budget: \$60.317 million Result: \$58.701 million	Budget: \$116.16 million Result: \$114.14 million	Budget: \$22.60 million Result: \$31.76 million	Budget: \$43.30 million Budget Org: \$60.23 million Result: \$61.80 million
Coverage	Budget: 1.14 w/draw Projected: 1.14 w/o draw	Budget: 1.14 w/draw Result: 1.30 w/o draw	Budget: 1.14 w/draw Projected: 1.14 w/draw	Budget: 1.14 w/draw Projected: 1.14 w/draw
Draw Requirement	Budget: \$829,000 Projected: \$0	Budget: \$829,000 Result: \$0	Budget: \$12.045 million Projected: \$4,961 million	Budget: \$12.045 million Projected: \$0.6 million

Representative Policy Board
Dashboard Metric - 2Q FY21

Metrics	Quarter ended 11/30/19 (2Q FY 2020)	Quarter ended 5/31/20 (4Q FY 2020)	Quarter ended 8/31/20 (1Q FY 2021)	Quarter ended 11/30/20 (2Q FY 2021)
System Metrics				
<i>Average Daily Production (Draft) to Budget (MG/D)/Prior Year (Note 5)</i>	Budget: 48,361 MGD Result: 47,106 MGD	Budget: 43,598 MGD Result: 42,504 MGD	Prior Year: 51,816 MGD Result: 56,883 MGD	Prior Year: 47,106 MGD Result: 50,707 MGD
<i>Disinfection By-products</i>	Target: 90% Result: 99%* * As of Sep 30, 2019, updated quarterly based on calendar year	Target: 90% Result: 100%* * As of Mar 31, 2020, updated quarterly based on calendar year	Target: 90% Result: 100%* * As of June 30, 2020, updated quarterly based on calendar year	Target: 90% Result: 100%* * As of Sept. 30, 2020, updated quarterly based on calendar year
<i>Net Unaccounted For Water (annualized)</i>	Target: 10.0% Result: 11.7% as of 8/31/2019	Target: 10.0% Result: 10.58% as of 2/29/2020	Target: 10.0% Result: 10.35% for the annualized period of June 2019 to May 2020	Target: 10.0% Result: 10.97% for the annualized period of Sept. 2019 to August 2020
<i>Reservoir Levels (% full)</i>	79% vs. 66% LTA	96% vs. 93% LTA	75% vs. 74% LTA	67% vs. 66% LTA

Notes:

Note 1: FY 2020 metric is Northeast Average for Customer Billing & Payment

Note 2: FY 2020 results have been updated to reflect final numbers

Note 3: Excludes impact of governmental accounting standards for pension and opeb and may include expenses from non-revenue fund sources

Note 4: Excludes State and Redevelopment and contingency. FY 2021 also excludes capital funded by Growth Fund

Note 5: FY 2020 is vs. budget and FY 2021 is vs. prior year

South Central Connecticut Regional Water Authority

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<http://www.rwater.com>

TO: Anthony DiSalvo, Chair
David J. Borowy
Joseph A. Cermola
Kevin J. Curseaden
Suzanne C. Sack

FROM: Ted Norris

DATE: December 17, 2020

SUBJECT: Derby Tank Update

This memo is written to provide the Authority with an update on the Derby Tank Project and the land purchases associated with it.

Property Acquisition:

No change to previous update: Second Amendments to the Purchase and Sale Agreements for the Saint Peter and Saint Paul Church (Chatfield Street) and Durante (Lombard Drive) properties were executed and extend the closing date until final decisions are made on the pending litigation, as provided for in the First Amendments.

Planning and Zoning Approval:

The Derby Planning and Zoning Commission unanimously approved our site plan application on June 18, 2019. After the approval, an appeal was filed with the Superior Court by Attorney Cava, representing two residents – Sharlene McEvoy and Dorothy Marinelli (the only residential neighbor near the tank site), against the City and RWA.

Oral arguments for the case were heard on September 22nd via Zoom. The main issues argued were related to RWA's standing to submit a site plan application to the Planning and Zoning Commission, the exemption issued by the City for the height of the tank, the environmental impact of tank site development, and the lighting of the cars in the parking lot into the Marinelli house.

Judge Berger presided over the hearing. The City of Derby's attorney Barbara Schellenberg and RWA's attorney's Kari Olson and Joe Szerejko represented the defendants. Attorney Greg Cava represented the plaintiffs. Rose Gavrilovic and Orville Kelly of RWA and Mayor Richard Dzieken attended on behalf of RWA and the City of Derby, respectively. There were no additional representatives on behalf of the plaintiffs. As relayed by our attorneys, Judge Berger appeared to be very familiar with land use issues. By law, the judge has 120 days to make his ruling, or until January 20, 2021.

December 17, 2020 update: Judge Berger has not ruled on the appeal yet.

EON: lm

CC: Larry Bingaman
Beth Nesteriak
Orville Kelly

South Central Connecticut Regional Water Authority

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<http://www.rwater.com>

TO: Anthony DiSalvo
David J. Borowy
Joseph A. Cermola
Kevin J. Curseaden
Suzanne C. Sack

FROM: Ted Norris

DATE: December 17, 2020

SUBJECT: North Cheshire Development Update

The following is an update to the Authority on the status of the discussions with the Developer, Town of Cheshire, and Town of Southington Water Department (SWD) regarding the Stone Bridge Crossing development at the northwest quadrant of the intersection of Routes 10 and I-691.

1. Developer, Paul Bowman and his partners:

No change to previous update: Mr. Bowman was informed that RWA has been working through the details of the MOUs with Cheshire and SWD staff, as well as their respective Town Council and Board, to come to agreements on the terms and conditions of the MOUs. Mr. Bowman took part in a meeting in early September between RWA and SWD to discuss the terms and conditions of the MOU as they relate to the development. (Update) Discussions with both parties continued and a draft MOU was developed by Murtha Cullina. It is currently under review by RWA staff.

2. Town of Cheshire:

No change to previous update: The Town of Cheshire Council proposed, and RWA agreed to the following terms related to the Town's financial support for the project.

- a. A five-year waiver, estimated at \$175,000, of the PILOT payments for the water mains within the development when and if RWA takes over these mains and;
- b. A 50% discount (reduction) for five years of the PILOT, estimated at \$215,000 (approximately \$108,000 discounted), for the water mains along Route 10 and on west side of the development connecting at Dickerman Road. This item would remain contingent upon the sale and/or redevelopment of the state-owned property.

December 17, 2020 update: The MOU between RWA and the Town of Cheshire was approved by the Cheshire Town Council on December 8, 2020.

3. Southington Water Department:

No change to previous update: RWA has been in discussions with the SWD to discuss the terms and conditions that would allow Southington to initially own and operate the distribution system to the development, then transfer ownership to RWA. While not the entire cost of the mains, the SWD Board determined that RWA should make some payment to Southington when the transfer of ownership occurs. The Southington Board rejected our initial offer of \$150,000. Following multiple discussions, a one-time payment of \$200,000 was agreed to by both parties.

December 17, 2020 update: A draft MOU between the developer, the Town of Southington, and RWA was submitted to the developer and Southington on October 29, 2020. Comments from Southington and the developer have been received and are under review.

EON: Im

CC: Larry Bingaman
Beth Nesteriak
Hetal Shah

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TO: Anthony DiSalvo
David J. Borowy
Joseph A. Cermola
Kevin J. Curseaden
Suzanne C. Sack

FROM:  Rochelle Kowalski
Vice President of Financial Services

DATE: December 14, 2020

SUBJECT: Quarterly financial statements for fiscal year 2021 (ending May 31, 2021)

Attached are the following financial reports regarding the second quarter of fiscal year 2021. i.e., the quarter ended November 30, 2020:

- Statements of net position as of November 30, 2020 and November 30, 2019;
- Schedules A-1 & A-2: Statements of revenues, expenses and changes in net position as of November 30, 2020, maintenance test, and commentary;
- Schedule B: Operating and maintenance expenses;
- Schedule C: Capital budget report;
- Schedule D: Investment earnings report - comparison of investment rates of return

The reports bulleted above incorporate the Authority's experience from June 2020 through November 2020. For the remainder of fiscal year 2021, the reports include the projections shown on schedules A-2 and B which use the assumptions explained below.

Schedule A-2: Statements of Revenues, Expenses and Changes in Net Position

Section of page entitled "Six Months Ended November 30"

The figures shown present June through November 30 as well as comparative budget vs. actual results for the six months ended November 30, 2020.

Section of page entitled "Year Ending May 31, 2021"

The "budget" column is the budget for fiscal year 2021, as approved by the Five-Member Authority.

Assumption 1

The column labeled *Assumption 1* presents earned metered water revenues that reflect six months (June through November 2020) of consumption and six months of budgeted consumption for (December 2020 through May 2021).

Other revenues and expenses shown in this column reflect six months of results and six months, as projected.

Assumption 2

The column labeled *Assumption 2* projects consumption for the months of December 2020 through May 2021 at 4% above budget. Operating expense for "pump power" and chemicals for these same months is adjusted to reflect the 4% increase.

Assumption 3

The column labeled *Assumption 3* projects consumption for the months of December 2020 through May 2021 at 2% below budget. Operating expense for "pump power" and chemicals for these same months is adjusted to reflect the 2% decrease.

Section of page entitled "Maintenance Test"

The maintenance test reflects the same three assumptions described above except that water sales are not accrued revenue, but cash collections from June through November 2020, plus projected cash collections for December 2020 through May 2021. Management assumes that the billings are collected over the course of the subsequent twelve months.

Schedule B: Operating and Maintenance Expense

This schedule provides details of the operating and maintenance expense for the second quarter of fiscal year 2021, as well as projections for December 2020 through May 2021 under the three assumptions presented above.

Schedule C: Capital Budget Report

This schedule shows capital expenditures for June through November 2020, as well as projections for the full fiscal year 2021.

Schedule D: Interest Earned

Compared here are “budgeted” versus “actual” interest rates earned on the Authority’s invested funds.

Attachments

REGIONAL WATER AUTHORITY
STATEMENTS OF NET POSITION
AS OF NOVEMBER 30, 2020 AND 2019

Assets	FY 2021	FY 2020	Y/Y Variance
Utility plant			
Property, plant and equipment in service	\$ 892,096,243	\$ 875,291,867	\$ 16,804,376
Accumulated depreciation	(374,541,227)	(351,000,074)	(23,541,153)
Utility plant in service	517,555,016	524,291,794	(6,736,777)
Land	28,090,328	28,085,948	4,380
Construction work in progress	27,116,071	21,510,900	5,605,171
Total utility plant, net	572,761,415	573,888,641	(1,127,226)
Nonutility land, at cost	64,983,522	64,987,903	(4,380)
Goodwill	14,423,704	14,423,704	-
Current assets			
Cash and cash equivalents	52,811,008	40,114,471	12,696,537
Investments	-	-	-
Accounts receivable, less allowance for doubtful accounts	16,393,560	14,410,962	1,982,598
Accrued revenue	17,505,693	18,069,145	(563,452)
Accrued interest receivable	10,014	118,888	(108,874)
Materials and supplies	1,874,421	1,464,561	409,860
Prepaid expenses and other assets	2,235,589	2,316,281	(80,692)
Total current assets	90,830,285	76,494,308	14,335,977
Long-Term Note Receivable	500,000	500,000	-
Pension Assets			
OPEB Assets			
Restricted assets	103,533,360	114,248,831	(10,715,471)
Regulatory assets	10,205,549	10,914,247	(708,697)
Total assets	857,237,835	855,457,633	1,780,202
Deferred Outflows of Resources			
Deferred charge on refunding	17,878,258	17,409,069	469,189
Deferred charge on pension plans	4,359,065	3,494,171	864,895
Deferred charge on OPEB plans	1,048,118	1,227,510	(179,392)
Total	\$ 880,523,276	\$ 877,588,382	\$ 2,934,894

Liabilities and Net Assets	FY 2021	FY 2020	Y/Y Variance
Liabilities			
Revenue bonds payable, less current portion	\$ 495,615,000	\$ 509,660,000	\$ (14,045,000)
Net premiums and discounts from revenue bonds payable	43,228,233	53,234,741	(10,006,507)
DWSRF loans payable, less current portion	20,600,934	21,634,552	(1,033,618)
Net pension liability	19,071,269	17,122,195	1,949,074
Net OPEB obligation	18,344,539	20,030,271	(1,685,732)
Total noncurrent liabilities	596,859,976	621,681,759	(24,821,783)
Current liabilities			
Current portion of revenue bonds payable	20,565,000	19,045,000	1,520,000
Current portion of DWSRF loans payable	1,033,618	1,028,467	5,151
Accounts payable	3,885,196	3,629,917	255,279
Notes payable	5,937,343	5,632,964	304,379
Customer deposits and advances	1,353,737	1,684,141	(330,404)
Other accrued liabilities	8,427,316	7,354,566	1,072,750
Total current liabilities	41,202,211	38,375,055	2,827,156
Liabilities payable from restricted assets			
Accounts payable for construction	1,340,287	1,015,300	324,987
Accrued interest payable	7,209,198	8,097,378	(888,181)
Customer deposits and advances	1,379,169	1,107,938	271,231
Total liabilities payable from restricted assets	9,928,654	10,220,617	(291,963)
Other liabilities	41,385	224,179	(182,794)
Total liabilities	648,032,226	670,501,611	(22,469,385)
Deferred inflows of resources			
Deferred inflows related to pensions	458,394	1,699,979	(1,241,585)
Deferred inflows related to OPEB	3,670,932	3,225,623	445,308
Net Assets			
Invested in capital assets, net of related debt	83,066,770	63,906,343	19,160,428
Restricted assets	94,104,706	101,095,463	(6,990,758)
Unrestricted assets	51,190,248	37,159,364	14,030,885
Total net assets	228,361,724	202,161,170	26,200,555
Total liabilities and net assets	\$ 880,523,276	\$ 877,588,382	\$ 2,934,894

REGIONAL WATER AUTHORITY
REVIEW OF FINANCIAL DATA
November 30, 2020 (FY 2021)

SCHEDULE A-1 - COMMENTARY

STATEMENT OF REVENUES, EXPENSES AND CHANGES IN NET POSITION

Operating Revenues

FY21 revenue for water, including wholesale and fire service, is over budget by \$4,029 (approx. 6.6%) primarily due to higher than anticipated consumption. Metered water revenue is over budget by \$4,041k (approx. 7.4%)

Total net other revenue is \$649k above budget primarily due higher other water revenues . Other proprietary revenues are also contributing to this variance.

Operating Expenses

Operating and Maintenance Expenses are currently under budget due to the following:

Payroll is under budget primarily due to head count under runs.	\$ (598,000)
Employee Benefits are under budget primarily due to lower medical and dental expense and payroll tax.	(545,000)
General & Admin is under budget primarily due to timing related to printer and replacement computer purchases.	(66,000)
Transportation is over budget primarily due to timing.	50,000
Utilities & Fuel is over budget primarily due to sewer use fees and timing.	81,000
Pump Power is under the budget primarily due to timing	(104,000)
Business Improvement is under budget. However, this under run is largely offset in other proprietary expenses.	(65,000)
Public/Customer Information is under budget primarily due to timing.	(51,000)
Outside Services are under budget in multiple areas.	(282,000)
Central Lab/Water Quality is under budget primarily due to timing.	(139,000)
All Other	(122,000)
	<u>\$ (1,841,000)</u>

Interest Income

Interest Income is under budget due to lower investment earnings.

PROJECTED MAINTENANCE TEST

The projected shortfall to meet 1.14 coverage is \$.6 million vs. a budgeted shortfall of \$12.045 million.

REGIONAL WATER AUTHORITY
STATEMENTS OF REVENUES, EXPENSES AND CHANGES IN NET POSITION
FOR THE MONTHS ENDING NOVEMBER 30, 2020

Schedule A-1

	FY 2020 Actual	FY 2021 Budget	FY 2021 Actual	(Under)Over Budget
Operating revenues				
Metered water revenues	\$ 55,036	\$ 54,540	\$ 58,581	\$ 4,041
Fire service	6,013	6,037	6,066	29
Wholesale	430	441	400	(41)
Other revenue - water	1,769	1,295	1,828	533
Other revenue - proprietary	5,122	4,539	4,932	393
Total operating revenues	<u>68,369</u>	<u>66,853</u>	<u>71,807</u>	<u>4,954</u>
Operating expenses				
Operating and maintenance expense	27,285	27,582	25,741	(1,841)
Expense associated with other revenue - water	842	941	952	12
Expense associated with other revenue - proprietary	1,580	1,734	1,999	265
Provision for uncollectible accounts	738	516	455	(61)
Depreciation	12,600	12,600	12,600	-
Payment in lieu of taxes	4,265	4,411	4,347	(64)
Amortization Pension Outflows/Inflows	185	798	798	(0)
Amortization OPEB Outflows/Inflows	(181)	(273)	(273)	0
Total operating expenses	<u>47,314</u>	<u>48,308</u>	<u>46,619</u>	<u>(1,689)</u>
Operating income	<u>21,056</u>	<u>18,544</u>	<u>25,188</u>	<u>6,645</u>
Nonoperating income and (expense)				
Interest income	2,355	604	147	(457)
(Loss) Gain on disposal of assets	(59)	-	-	-
Realized and unrealized (losses) gains on investments	-	-	-	-
Interest expense	(12,416)	(11,246)	(11,182)	63
Amortization of bond discount, premium, issuance cost and deferred losses	1,830	1,388	1,378	(10)
Intergovernmental revenue	180	-	-	-
Total nonoperating income and (expense)	<u>(8,109)</u>	<u>(9,253)</u>	<u>(9,658)</u>	<u>(405)</u>
Income (expense) before contributions	<u>12,946</u>	<u>\$ 9,291</u>	<u>15,530</u>	<u>\$ 6,240</u>
Capital contributions	<u>884</u>		<u>1,242</u>	
Change in net assets	<u>13,831</u>		<u>16,773</u>	
Total net assets - beginning of fiscal year	<u>188,331</u>		<u>211,589</u>	
Total net assets - end of reporting month	<u>\$ 202,161</u>		<u>\$ 228,362</u>	

	Budget FY 2021 @114%	Projected FY 2021 @114%	(Under)Over FY 2021 @114%	(Under)Over FY 2021 Original Budget
FY 2021 MAINTENANCE TEST				
(Budget vs. Projected)				
Revenue Collected:				
Water sales	101,381	112,881	\$ 11,500	(4,321)
Interest Income	986	232	(754)	(1,091)
BABs Subsidy	656	656	-	-
Other Net	6,302	6,772	470	(266)
Common Non-Core	(200)	(200)	-	-
Total	<u>109,124</u>	<u>120,341</u>	<u>11,217</u>	<u>(5,678)</u>
Less:				
Operating and maintenance expenses	(56,200)	(56,200)	-	4,851
Common Non-Core	100	50	(50)	(50)
Depreciation	(6,500)	(6,500)	-	-
PILOT (A)	(8,700)	(8,581)	119	119
Net Avail for Debt Service (B)	<u>\$ 37,824</u>	<u>\$ 49,110</u>	<u>\$ 11,286</u>	<u>\$ 4,920</u>
Debt Service Payments (C)	<u>\$ 43,745</u>	<u>43,605</u>	<u>\$ (140)</u>	<u>\$ (163)</u>
Debt Service @ 114% (D)	<u>\$ 49,869</u>	<u>49,710</u>	<u>\$ (160)</u>	<u>\$ (186)</u>
Difference (B-D)	<u>\$ (12,045)</u>	<u>\$ (600)</u>		
RSF, Growth and/or General Fund (D)	<u>12,045</u>	<u>600</u>		
Coverage (A+D/C)	<u>114%</u>	<u>114%</u>		

REGIONAL WATER AUTHORITY
May 31, 2021
(\$000 Omitted)

SCHEDULE A-2

STATEMENTS OF REVENUES, EXPENSES
AND CHANGES IN NET ASSETS

	Six Months Ending November 30				Twelve Months Ending May 31			
	FY 2020 Actual	FY 2021 Budget	FY 2021 Actual	(Under)Over Budget	Budget	Assumption 1	Assumption 2	Assumption 3
Operating Revenues								
Metered Water Revenues	\$ 55,036	\$ 54,540	\$ 58,581	\$ 4,041	\$ 102,888	\$ 106,929	\$ 108,191	\$ 106,282
Fire Service	6,013	6,037	6,066	29	12,074	12,103	12,103	12,103
Wholesale Water	430	441	400	(41)	846	805	805	805
Other revenue - water	1,769	1,295	1,828	533	2,889	3,336	3,336	3,336
Other revenue - proprietary	5,122	4,539	4,932	393	9,306	9,606	9,606	9,606
Total Operating Revenues	68,369	66,853	71,807	4,954	128,002	132,778	134,041	132,132
Operating Expenses								
Operating and Maintenance	27,285	27,582	25,741	(1,841)	56,200	56,200	56,285	56,157
Expenses associated with other revenue-water	842	941	952	12	1,900	1,911	1,911	1,911
Expenses associated with other revenue-proprietary	1,580	1,734	1,999	265	3,438	3,703	3,703	3,703
Provision for uncollectible accounts	738	516	455	(61)	975	975	975	975
Depreciation	12,600	12,600	12,600	-	25,200	25,200	25,200	25,200
Payment in lieu of taxes	4,265	4,411	4,347	(64)	8,700	8,581	8,581	8,581
Amortization Pension Outflows/Inflows	185	798	798	(0)	1,674	1,674	1,674	1,674
Amortization OPEB Outflows/Inflows	(181)	(273)	(273)	0	(546)	(546)	(546)	(546)
Total Operating Expenses	47,314	48,308	46,619	(1,689)	97,540	97,698	97,783	97,655
Operating Income	21,055	18,544	25,188	6,645	30,462	35,080	36,257	34,476
Nonoperating income and (expense)								
Interest Income	2,355	604	147	(457)	1,910	1,156	1,156	1,156
(Loss)/Gain on disposal of assets	(59)	-	-	-	-	(100)	(100)	(100)
Interest Expense	(12,416)	(11,246)	(11,182)	63	(22,370)	(22,319)	(22,319)	(22,319)
Amortization of bond discount, premium issuance cost and deferred losses	1,830	1,388	1,378	(10)	2,670	2,650	2,650	2,650
Intergovernmental revenue	180	-	-	-	800	800	800	800
Total nonoperating income & (expense)	(8,109)	(9,253)	(9,658)	(405)	(17,789)	(17,813)	(17,813)	(17,813)
(Expense) income before contributions	12,946	\$ 9,291	15,530	\$ 6,240	\$ 12,672	\$ 17,267	\$ 18,444	\$ 16,663
Capital contributions								
Change in net assets	13,830	-	16,773	-	-	-	-	-
Total net assets - beginning of fiscal year	188,331	-	211,589	-	-	-	-	-
Total net assets - end of reporting month	\$202,161	-	\$228,362	-	-	-	-	-

MAINTENANCE TEST

	Twelve Months Ending May 31			
	Budget	Assumption 1	Assumption 2	Assumption 3
Revenue Collected:				
Water Sales	\$ 101,381	\$ 112,881	\$ 113,863	\$ 112,390
Interest Income	986	232	232	232
BABs Subsidy	656	656	656	656
Other Net	6,302	6,772	6,772	6,772
Common Non-Core	(200)	(200)	(200)	(200)
Total	109,124	120,341	121,323	119,850
Less:				
Operating and Maintenance Expenses	(56,200)	(56,200)	(56,285)	(56,157)
Common Non-Core	100	50	50	50
Depreciation	(6,500)	(6,500)	(6,500)	(6,500)
PILOT (A)	(8,700)	(8,581)	(8,581)	(8,581)
Net Avail for Debt Service (B)	37,824	49,110	50,007	48,662
Debt service payments (C)	\$ 43,745	\$ 43,605	\$ 43,605	\$ 43,605
Debt Service @ 114% (D)	\$ 49,869	\$ 49,710	\$ 49,710	\$ 49,710
Difference (B-D)	\$ (12,045)	\$ (600)	\$ 297	\$ (1,048)
RSF, Growth and/or General Fund (D)	\$ 12,045	\$ 600	-	\$ 1,048
Coverage (A+D/C)	114%	114%	115%	114%
Required Coverage	114%	114%	114%	114%

REGIONAL WATER AUTHORITY
 OPERATING AND MAINTENANCE EXPENSES
 MAY 31, 2021 (FY 2021)
 (\$000 Omitted)

SCHEDULE B

	SIX MONTHS ENDING NOVEMBER 30				YEAR ENDED MAY 31, 2021			
	FY 2020	FY 2021	FY 2021	(Under)	PROJECTED ACTUAL			
	Actual	Budget	Actual	Over	Budget	Assump 1	Assump 2	Assump 3
1 Payroll	\$ 11,103	\$ 11,344	\$ 10,746	\$ (598)	23,088	22,913	22,913	22,913
2 Employee Benefits Allocation	3,910	4,095	3,550	(545)	8,182	8,182	8,182	8,182
Pension	1,966	1,330	1,330	-	2,661	2,661	2,661	2,661
3 Administrative Building Space Allo	498	467	500	33	928	968	968	968
4 General & Administrative	705	624	558	(66)	1,347	1,347	1,347	1,347
5 Transportation Allocation	320	330	380	50	673	673	673	673
6 Tools & Stores Allocation	162	156	185	29	305	345	345	345
7 Utilities & Fuel	586	602	683	81	1,253	1,293	1,293	1,293
8 Material From Inventory	123	94	96	1	239	239	239	239
9 Pump Power Purchased	1,391	1,620	1,516	(104)	2,970	2,970	3,022	2,944
10 Chemicals	893	926	960	34	1,855	1,890	1,923	1,873
11 Road Repairs	90	100	62	(38)	200	200	200	200
14 Postage	132	144	106	(38)	288	288	288	288
15 Printing & Forms	42	48	40	(8)	83	83	83	83
17 Collection Expense	290	301	270	(31)	648	648	648	648
18 Business Improvement	84	97	32	(65)	366	366	366	366
19 Public/Customer Information	138	136	85	(51)	289	289	289	289
20 Outside Services	1,101	1,079	797	(282)	2,485	2,485	2,485	2,485
21 Insurance Premiums	595	761	760	(1)	1,540	1,540	1,540	1,540
22 Worker's Compensation, pre-Churc	157	28	8	(20)	54	54	54	54
23 Damages	19	30	47	17	60	60	60	60
24 Training & Cont. Education	118	86	46	(40)	214	214	214	214
25 Authority Fees	66	78	66	(13)	157	157	157	157
26 Consumer Counsel	9	31	12	(19)	63	63	63	63
27 RPB Fees	42	84	51	(34)	169	169	169	169
28 Organizational Dues	69	26	47	20	102	102	102	102
29 Donations	17	10	5	(5)	19	19	19	19
34 Central Lab/Water Quality	214	254	115	(139)	433	433	433	433
40 Environmental Affairs	33	45	49	4	93	93	93	93
44 Info. Technology Licensing & Maintenance Fees	1,020	1,127	1,090	(36)	2,293	2,293	2,293	2,293
45 Maintenance and Repairs	1,393	1,316	1,338	22	2,726	2,746	2,746	2,746
46 Regulatory Asset Amortization	-	211	211	0	422	422	422	422
	<u>\$ 27,286</u>	<u>\$ 27,371</u>	<u>\$ 25,531</u>	<u>\$ (1,841)</u>	<u>\$ 56,200</u>	<u>\$ 56,200</u>	<u>\$ 56,285</u>	<u>\$ 56,157</u>

	Period Ending November 30, 2020			Period Ending May 31, 2021		
	Budget	Expenditures	(Under)/Over	Budget	Projected	(Under)/Over
I. NATURAL RESOURCES						
Hamden Middle School Remediation	54	79	25	120	120	-
Lake Whitney Dam & Spillway Improvements	210	140	(70)	450	490	40
Peat Swamp Dam Modifications Filtration Pone	-	-	-	25	-	(25)
Tunnel Diversion Raw Water Main Rehabilitation Program	-	1	1	25	25	-
Miscellaneous Natural Resources	55	77	22	75	101	26
Prior Year	-	-	-	-	56	56
TOTAL	319	296	(23)	695	792	97
II. PUMPING						
Raynham Hill Pump Station Equipment & Generator Replacement	15	-	(15)	50	-	(50)
Burwell Hill Pump Station Equipment Replacement	249	571	322	819	800	(19)
Lake Gaillard Pump Station Improvements	495	354	(141)	778	778	-
MCC Replace/Improvements -Northwest Cheshire Pump Station	-	79	79	92	92	-
Sanford Street Pump Station Rehabilitation	100	82	(18)	270	270	-
Hill Street Pump Station Repairs	80	57	(23)	350	350	-
Miscellaneous Pumping	20	-	(20)	40	40	-
Prior Year	-	-	-	-	-	-
TOTAL	959	1,143	184	2,399	2,330	(69)
III. TREATMENT						
Filter Media Replacement	125	31	(94)	425	125	(300)
LGWTP - Process Valve Replacements	-	-	-	30	28	(2)
LGWTP - Chemical Feed Improvements	10	5	(5)	100	380	280
LGWTP - Backwash Polymer System	285	16	(269)	300	20	(280)
LGWTP -Roof Replacements	22	3	(19)	22	3	(19)
LGWTP -Electrical Upgrades	-	-	-	70	70	-
LGWTP -Structural Improvements	10	1	(9)	66	1	(65)
LGWTP -Clarifiers Recycle Pumps	17	4	(13)	80	80	-
LSWTP - Lagoon Discharge Pipe Replacement Footbridge Rehat	16	1	(14)	20	3	(17)
LSWTP -Hypochlorite System	150	41	(109)	165	45	(120)
LSWTP -Chemical Treatment System Improvements	105	89	(16)	120	120	-
LWWTP Improvements	15	10	(5)	30	30	-
West River WTP-Dissolved Air Flotation (DAF)	25	52	27	100	250	150
West River WTP-Effluent Pipe Injection	250	2	(248)	304	10	(294)
West River WTP-Chemical System Improvements	10	4	(6)	50	50	-
Seymour Wellfield Back-Up Well and Metering	30	43	13	70	61	(9)
Seymour Wellfield Treatment System Improvements	45	-	(45)	75	25	(50)
NSG Wellfield Facility Improvements	180	143	(37)	800	800	-
North Sleeping Giant Well 1B Pump & Motor Replacement	-	-	-	-	160	160
Well Rehabilitations	90	98	8	200	215	15
Well Replacements	30	3	(27)	75	5	(70)
Rocky Corner Satellite System	30	12	(18)	30	50	20
WRWTP Backwash & Surface Wash Pump Repl	350	35	(315)	700	700	-
Prior Year	-	4	4	-	4	4
TOTAL	1,795	597	(1,197)	3,832	3,235	(597)
IV. TRANSMISSION AND DISTRIBUTION						
Pipe	2,102	1,694	(408)	2,967	2,975	8
Ruden Street Cleaning Lining, West Haven	150	111	(39)	150	220	70
Valve Replacements	75	133	58	150	200	50
Service Connections	750	693	(57)	1,500	1,500	-
Capital Pipe Service Transfers	300	256	(44)	350	350	-
Meters	20	24	4	50	50	-
Hydrants and Connections	55	87	32	100	125	25
AMI Meters	135	9	(126)	230	100	(130)
Sanitary Survey Improvements-WRWTP Finished Water Reservoirs	10	3	(7)	200	200	-
East West Transmission System	-	-	-	200	200	-
West Johnson Ave Transmission Main Connector	75	9	(66)	75	9	(66)
Brushy Plains System Upgrade-Phase II	115	112	(3)	151	151	-
Grand Avenue Pipe Bridge & Main Replacement	-	1	1	6	7	1
Ansonia-Derby Tank	100	18	(82)	1,000	400	(600)
West Avenue Tank Painting	754	425	(329)	754	500	(254)
Water Quality Improvements	130	-	(130)	130	150	20
Lake Saltonstall WTP FWR Roof Improv Valve Replac	66	9	(57)	66	9	(57)
Western Service Area Bulk Fill Station, Ansonia	75	76	1	92	92	-
Miscellaneous Transmission and Distributor	-	259	259	-	550	550
Branford Gaskets	-	-	-	-	200	200
Prior Year	-	101	101	-	101	101
TOTAL	4,912	4,021	(891)	8,171	8,089	(82)
V. GENERAL PLANT						
SAP Business Enhancements	25	-	(25)	50	50	-
SAP SQL Upgrade	180	-	(180)	190	190	-
SAP Customer Channels Sales Marketing	-	-	-	150	150	-
Monthly Billing	410	31	(379)	900	550	(350)

	Period Ending November 30, 2020			Period Ending May 31, 2021		
	Budget	Expenditures	(Under)/Over	Budget	Projected	(Under)/Over
Cyber Security Enhancements	50	-	(50)	150	85	(65)
System-Wide Radio Telemetry Unit (RTU) Upgrade	250	123	(127)	1,000	600	(400)
SCADA Upgrades	40	66	26	100	100	-
LIMS Upgrades	596	754	158	860	1,260	400
Information Systems	227	5	(222)	400	315	(85)
Miscellaneous IT	3	-	(3)	3	3	-
Equipment	-	2	2	100	100	-
Miscellaneous Equipment	30	10	(20)	37	37	-
90 Sargent Drive	40	1	(39)	50	40	(10)
Miscellaneous 90 Sargent Drive	50	13	(37)	60	70	10
Prior Year	-	65	65	-	65	65
TOTAL	1,901	1,069	(832)	4,050	3,614	(435)
Project Acceleration/Move-up					321	321
VII. CONTINGENCY	71	-	(71)	500	-	(500)
TOTAL	9,957	7,126	(2,830)	19,647	18,381	(1,265)
VIII. STATE & REDEVELOPMENT PIPE	2,800	974	(1,826)	3,800	2,500	(1,300)
IX. NON-CORE BILLING	290	-	(290)	746	596	(150)
TOTAL	13,047	8,100	(4,947)	24,193	21,477	(2,715)

Reflects anticipated amendments

Investment Earnings Report
Comparison of Investment Rates of Return

Fund Type	Balance @ November 30, 2020	Budgeted Return	Rate of Return November 30, 2020	Rate of Return Fiscal Year to Date
Less than Six Months				
Revenue Investment (A)	\$ 23,828,806	1.01%	0.07%	0.15%
Revenue (B)	5,486,081	0.00%	0.00%	0.00%
Rate Stabilization (A)	10,000,000	1.01%	0.07%	0.15%
Operating Reserve (A)	8,435,679	1.01%	0.07%	0.15%
Capital Contingency (A)	6,005,834	1.01%	0.07%	0.15%
Debt Reserve (A)	20,377,697	1.01%	0.07%	0.15%
Debt Reserve (C)	11,493	0.25%	0.01%	0.01%
Debt Service (A)	16,877,242	1.01%	0.07%	0.15%
Debt Service (C)	22	0.25%	0.01%	0.01%
PILOT (A)	4,243,705	1.01%	0.07%	0.15%
General Fund (A)	16,126,128	1.01%	0.07%	0.15%
Sub-Total	\$ 111,392,686			
Long Term Investments now less than Six Months				
Operating Reserve	1,750,000	1.97%	1.79%	1.69%
Debt Reserve	299,914	2.12%	1.68%	1.32%
Sub-Total	\$ 2,049,914			
Other				
Construction (A)	\$ 33,892,781	1.01%	0.07%	0.15%
Construction (C)	50,786	0.25%	0.01%	0.01%
Growth Fund	6,451,495	0.00%	0.09%	0.15%
Interim Financing	897	0.00%	0.05%	0.08%
Sub-Total	\$ 40,395,959			
Total	\$ 153,838,560			

(A) Investments are in the Connecticut Short Term Investment Fund (STIF).

(B) Overnight investment sweep. Balances earn credits to offset bank fees.
Alternative sweep product being reviewed.

(C) Investments are in the First American Government Obligation Fund.

Fund	Budgeted Interest (Cash Basis) as of November 30, 2020	Interest Received (Cash Basis) as of November 30, 2020	(Under)/ Over
Debt Reserve	141,840	67,985	(73,855)
Operating Reserve	70,149	39,363	(30,786)
Capital Contingency	35,109	16,034	(19,075)
PILOT	8,658	3,537	(5,121)
Debt Service	73,611	24,568	(49,043)
Revenue	36,313	12,657	(23,656)
Rate Stabilization	50,159	7,325	(42,834)
General	46,165	10,577	(35,588)
Sub Total	<u>462,004</u>	<u>182,046</u>	<u>(279,958)</u>
Construction	130,934	37,599	(93,335)
Growth Fund	-	4,859	4,859
Interim Financing	-	-	-
Total	<u>592,938</u>	<u>224,504</u>	<u>(368,434)</u>

RPB COMMITTEE MEETINGS

Month	Meeting	Will Attend
October - 2020	<i>Finance Committee</i> Monday, October 5 at 5:00 p.m.	David
	<i>RPB Bylaws and Rules Review Committee</i> Wednesday, October 7 at 5:00 p.m.	David and Suzanne
	<i>Land Use Committee</i> Wednesday, October 14 at 4:30 p.m.	Suzanne
	<i>Consumer Affairs Committee</i> Monday, October 19 at 5:30 p.m.	Kevin
November - 2020	<i>RPB Bylaws and Rules Review Committee</i> Wednesday, November 4 at 5:00 p.m.	David and Suzanne
	<i>Finance Committee</i> Monday, November 9 at 5:00 p.m.	Kevin
	<i>Land Use Committee</i> Wednesday, November 18 at 5:30 p.m.	David
	<i>Consumer Affairs Committee</i> Monday, November 16 at 5:30 p.m.	Suzanne
December - 2020	<i>Finance Committee</i> Monday, December 14 at 5:00 p.m.	Joe
	<i>Land Use Committee</i> Wednesday, December 9 at 5:30 p.m.	Kevin
	<i>Consumer Affairs Committee</i> Monday, December 21 at 5:30 p.m.	Suzanne

RPB COMMITTEE MEETINGS

Month	Meeting	Will Attend
January 2021	<i>Finance Committee</i> Monday, Jan 11 at 5:00 p.m.	
	<i>Land Use Committee</i> Wednesday, Jan 13 at 5:30 p.m.	
	<i>Consumer Affairs Committee</i> Monday, Jan 25 at 5:30 p.m.	
February 2021	<i>Finance Committee</i> Monday, Feb 8 at 5:00 p.m.	
	<i>Land Use Committee</i> Wednesday, Feb 10 at 5:30 p.m.	
	<i>Consumer Affairs Committee</i> Monday, Feb 22 at 5:30 p.m.	
March 2021	<i>Finance Committee</i> Monday, Mar 8 at 5:00 p.m.	
	<i>Land Use Committee</i> Wednesday, Mar 10 at 5:30 p.m.	
	<i>Consumer Affairs Committee</i> Monday, Mar 15 at 5:30 p.m.	

West River Water Treatment Plant Improvements

Project Presentation to the Regional Water Authority



December 17, 2020
Orville Kelly and Jim Hill



West River Treatment Plant



Lake Glen Algae bloom



Project Background

- West River Water Treatment Plant (WRWTP) is located in Woodbridge
- Treatment facility went on-line in March 1981
- Provides potable water and fire protection for the Woodbridge, New Haven, Seymour, Ansonia, Derby, West Haven, Orange and Milford as well as two consecutive water systems
- Consists of in-line direct filtration with three terminal reservoirs
- Nominal capacity of 10.4 MGD
- Chemical Treatment consists of:
 - Chlorination – Disinfection
 - Aluminum sulfate, Cationic Polymer, Anionic Filter Aid – Pretreatment for organics and solids
 - Phosphate, Sodium Hydroxide - Corrosion control
 - Potassium Permanganate – Manganese removal
 - Fluoridation – Tooth decay

Project Approach

- Multi-project Application consisting of three distinct projects
 - New Dissolved Air Flotation (DAF) system
 - Chlorination system upgrade
 - Electric service upgrade
- Benefits of the multi-project approach
 - Provides management with efficiency to complete more projects under one RPB application
 - Increases the efficiency of conducting RWA's capital program
 - Reduces time, expense, and facility impacts
 - Increases capital efficiency – economies of scale by combining projects

Project Scope

- Construction of Dissolved Air Floatation Unit Process
 - Addition of a new DAF building with three DAF trains
 - Sized for a firm capacity of 7.8 mgd
 - Replacing filter underdrains and adding an additional 12 inches of Granular Activated Carbon
- Disinfection System Replacement
 - New system utilizes an on-site Sodium Hypochlorite generation system for primary disinfection
 - Includes storage tanks, piping, generation equipment, chemical feed pumps and salt silo
- Electrical Service Upgrades
 - Diesel Generator Replacement
 - New Utility Service and new Transformer
 - New Switchgear

DAF Project Need

- Dissolved Air Flootation
 - Improve Water Quality for RWA's customers
 - Reduction of organic compounds, including taste and odor, helping maintain regulatory compliance related to disinfection by-products
 - Seasonal algal blooms will no longer create operational limitations
 - Maintain a firm capacity of 7.8 mgd during all seasons and reduces reliance on groundwater during peak seasonal demand
 - Maintaining a firm capacity helps RWA with long term planning and system maintenance
 - Maximum anticipated cost: \$12.6 million

Disinfection Project Need

- Disinfection System Replacement
 - System over 15 years old, replacement is needed
 - Minimize chlorate and chlorite Disinfectant by Product formation
 - Reduced maintenance costs
 - Increased chemical feed system capacity
 - Intrinsically safer technology
 - Maximum anticipated cost: \$1.4 million

Electrical Service Project Need

- Electrical Service System Replacement
 - Replaces aged electrical equipment, improving employee safety
 - Provides sufficient power for all equipment, including DAF and on-site Sodium Hypochlorite generation
 - Reduced maintenance costs
 - Increased system reliability
 - Maximum anticipated cost: \$2.3 million

Summary of DAF Alternatives Analysis

- Alternative No. 1 - Status Quo, no action
- Alternative No. 2 - New Dissolved Air Floatation System:
 - DAF Alternative No. 1: Two extended retrofit basins
 - DAF Alternative No. 2: Three regular retrofit basins
 - DAF Alternative No. 3: Two new basins in new building
 - DAF Alternative No. 4: Three new basins in new building
- Alternative No. 3 - Pipe to York Hill Service Area
- Alternative No. 4 - Additional Wellfield/Source of Supply
- DAF Alternate No. 4 selected

Summary of Disinfection Alternatives Analysis

- Alternative No. 1 - Replace Sodium Hypochlorite system in kind
 - Lower upfront cost; does not address safety hazards or regulatory compliance
- Alternative No. 2 - On-site Sodium Hypochlorite generation
 - Higher capital cost but addresses both regulatory compliance issues and safety concerns
- Alternative No. 3 - Status Quo, no action
 - Lowest cost, but increases scheduled and unscheduled maintenance and does not address safety hazards or regulatory compliance
- Alternate No. 2 selected

Summary of Electrical Service Alternatives Analysis

- Alternative No. 1 - Addition of a smaller generator
 - Adds system complexity and electrical coordination issues
- Alternative No. 2 - Larger generator replacement
 - Meets operational reliability needs, avoids risk and unplanned equipment failure
- Alternative No. 3 - Status Quo, no action
 - Reduces system reliability, employee safety, increases maintenance expenditures

 - Alternate No. 2 selected

Budget and Schedule

- Total Project Budget – Not to Exceed \$16.3M
 - Previous Spend – approximately \$590k
 - Multi-Year Project – \$7 Million budgeted in FY22
- Proposed Project Schedule
 - Anticipated RPB Action – March/April 2021
 - Bids Received – May 2021
 - Construction – June 2021 – July 2022
 - Start-up – August – September 2022

Summary

- WRWTP is a critical facility serving over 50,000 persons in Woodbridge, New Haven, Seymour, Ansonia, Derby, West Haven, Orange and Milford, as well as two consecutive water systems.
- The Proposed project:
 - Replaces aging treatment systems and improves water treatment processes providing high quality water for RWA's customers.
 - Optimizes treatment and plans for future regulatory requirements with Dissolved Air Floatation and the Sodium Hypochlorite on site generation chemical feed system.
 - Helps maintain regulatory compliance related to disinfection by-products.
 - Improves stability, safety and reliability of the water produced and treated.

South Central Connecticut Regional Water Authority

90 Sargent Drive, New Haven, Connecticut 06511-5966 203.562.4020

<http://www.rwater.com>

TO: Anthony DiSalvo
David Borowy
Joseph A. Cermola
Kevin Curseaden
Suzanne Sack

FROM: Ted Norris
Vice President - Asset Management

DATE: December 14, 2020

SUBJECT: Application to the Representative Policy Board for Approval of a Project to Construct Improvements at the West River Water Treatment Plant located in Woodbridge, CT

Attached for your review is an application to the Representative Policy Board (RPB) for approval of a Project to Construct Improvements at the West River Water Treatment Plant located in Woodbridge, CT. This project will include the design and construction of Dissolved Air Flotation processes with the associated building addition, processes for the on-site generation of sodium hypochlorite for use as a disinfectant in water treatment, and electrical service and system improvements.

Section 19 of Special Act 77-98, as amended, requires RPB approval before the Authority commences any capital project that will cost more than \$2,000,000. The proposed project is a not-to-exceed amount of \$16.3 million and is expected to be completed during FY 2023.

This application is a multi-project application consisting of three distinct projects as discussed below. The multi-project concept provides the Regional Water Authority's (RWA) Management with a method to complete more than one project at a time at a water treatment plant or within a distribution subsystem without returning to the RPB for separate project approvals. With an increasing number of planned projects expected to exceed the \$2 million RPB application threshold, this multi-project method will increase the efficiency of conducting the RWA's capital program by reducing the time, expenses, and facility impacts associated with individual project applications. Importantly, this method will also increase capital efficiencies by achieving economies of scale for multiple projects bid as a combined project.

Multi-project applications may include projects that are at the conceptual stage versus applications based on more complete designs. The sodium hypochlorite system replacement and electrical service replacement projects in this application are examples of projects at the conceptual stage. The design of these projects are at an early juncture and their cost estimates were developed without detailed engineering data and therefore their contingencies are relatively high at 30%. The inclusion of conceptual stage projects in multi-project applications will result in total project cost estimates that are in terms of a 'not-to-exceed' dollar amount, as is the case with this application. The inclusion of conceptual stage projects in multi-project applications provides a method to incorporate evolving projects into applications that are anchored on a well-developed large project, and allows for the development of RPB applications to be completed sooner than if fully developed projects were included. This results in expediency in conducting the capital program and captures the attendant efficiencies. The conceptual projects included in a multi-project application will be brought to full design after the project approval, if so granted by the RPB.

Also attached is a draft cover letter to the RPB and a resolution for the Authority's consideration.

Section 1-210(b)(19) of the Connecticut General Statutes provides that documents describing critical infrastructure and related operational details of water supply and distribution systems are exempt from the public disclosure. This application contains material that falls within the category of confidential protected information. This material is contained in Appendices A, B, C, D, E, F and G of the Application is attached as a separate PDF document for forwarding to the RPB along with an affidavit, the Motion for Protective Order and the Protective Order. I respectfully request that this material be protected from public disclosure and be discussed in executive session.

This Application will be presented to you at your December 17, 2020 meeting. If you have any questions regarding the application prior to your meeting, please contact me to discuss them.

EON/lm
Enclosures

cc: L. Bingaman
R. Kowalski
B. Nesteriak

South Central Connecticut Regional Water Authority

90 Sargent Drive, New Haven, Connecticut 06511-5966; 203-562-4020

<http://www.rwater.com>**RESOLUTIONS FOR ADOPTION
BY REGIONAL WATER AUTHORITY**Authority Meeting December 17, 2020

Resolved, that the Authority hereby accepts the new Application, dated December 17, 2020, for a Project to Construct Improvements at the West River Water Treatment Plant located in Woodbridge, Connecticut, as a completed Application, substantially in the form submitted to this meeting, and authorizes filing said Application with the Representative Policy Board (“RPB”); and

Further Resolved, if approved by the RPB, the President and CEO, the Executive Vice President and Chief Operating Officer, and the Vice President of Asset Management, are authorized to take any and all actions necessary to complete the construction improvements at the West River Water Treatment Plant in Woodbridge, Connecticut.

South Central Connecticut Regional Water Authority
90 Sargent Drive, New Haven, Connecticut 06511-5966 203.562.4020
<http://www.rwater.com>

December 17, 2020

Members of the Representative Policy Board
South Central Connecticut Regional Water District
90 Sargent Drive
New Haven, CT 06511-5966

Subject: Application to the Representative Policy Board for Approval of a
Project to Construct Improvements at the West River Water Treatment Plant
located in Woodbridge, CT

Ladies and Gentlemen:

The South Central Connecticut Regional Water Authority requests that the Representative Policy Board (RPB) accept the following enclosed document as complete:

Application for Approval to the Representative Policy Board
of a Project to Construct Improvements at the West River Water Treatment Plant
located in Woodbridge, CT

Based on our conclusion that the proposed actions are consistent with the policies and advance the goals of the South Central Connecticut Regional Water Authority, are in the best interests of our customers, and will have no significant adverse impact on the environment, we are further requesting that the RPB approve this action following a public hearing.

Section 1-210(b)(19) of the Connecticut General Statutes provides that documents describing critical infrastructure and related operational details of water supply and distribution systems are exempt from public disclosure. This application contains materials that fall within the category of confidential protected information. This material is contained in Appendices A, B, C, D, E, F, G of the Application, and is attached separately herein.

To protect this material from public disclosure during Application processing, including public hearings, contemplated by Sections 10 and 19 of the Authority's enabling legislation we are requesting that the RPB take the following protective measures:

- Grant the protective order that accompanies the application.
- Conduct any part of the public hearing on this application that includes detailed discussion of the protected material in a special session closed to the public, including keeping the recording of that session confidential.

Counsel to the Authority and RPB recommends that the procedures put in place for the closed public hearing follow closely the procedures followed by the Public Utilities Regulatory Authority in similar circumstances. You should feel free to follow up regarding details of these procedures directly with counsel.

Any questions regarding this Application may be directed to Ted Norris, Vice President - Asset Management.

Sincerely,

SOUTH CENTRAL CONNECTICUT REGIONAL WATER AUTHORITY

Anthony DiSalvo, Chairman
Joseph A. Cermola
David Borowy
Kevin Curseaden
Suzanne Sack

Enclosures

TN/lm

Application for Approval to the Representative Policy Board of a Project to Construct Improvements at the West River Water Treatment



South Central Connecticut Regional Water Authority
December 17, 2020

Application for Approval to the Representative Policy Board: West River Water Treatment Plant Improvements Project

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Appendix A: 50% Design Drawings - ANNEXED

Appendix B: Phase 1 Report for the Conceptual Design for Regulatory Compliance, November 2014, prepared by CH2MHill/Tighe & Bond - ANNEXED

Appendix C: West River WTP DAF Winter Pilot Report, May 2015, prepared by Tighe & Bond - ANNEXED

- Appendix D:** West River WTP DAF Summer Pilot Report, December 2015, prepared by Tighe & Bond - ANNEXED
- Appendix E:** West River WTP DAF Preliminary Design Report, November 2020, prepared by Tighe & Bond - ANNEXED
- Appendix F:** West River WTP DAF Business Case Evaluation, December 2020, prepared by RWA - ANNEXED
- Appendix G:** West River WTP Chlorination System Business Case Evaluation, November 2020, prepared by RWA and Tighe & Bond - ANNEXED
- Appendix H:** Engineer's Opinion of Probable Cost for DAF System Upgrade
- Appendix I:** American Association of Cost Engineers (AACE) standards

1. Statement of Application

In accordance with Section 19 of Special Act 77-98, as amended, the South Central Connecticut Regional Water Authority (RWA) is pleased to present this application for West River Water Treatment Plant (WRWTP) improvements to the Representative Policy Board (RPB) for review and approval. Section 19 of Special Act 77-98, as amended, requires the RPB approval before the RWA commences any capital project that will cost more than \$2 million. The proposed project cost is a not-to-exceed amount of \$16.3 million. The proposed upgrades will improve treatment performance, provide consistent water quality, and strengthen the organization's present and future ability to serve our customers with high quality drinking water.

This application is a multi-project application consisting of three distinct projects as discussed below. The multi-project concept provides the RWA's management with a method to complete more than one project at a time at a water treatment plant or within a distribution system without returning to the RPB for separate project approvals. With an increasing number of planned projects expected to exceed the \$2 million RPB application threshold, this multi-project method will increase the efficiency of conducting the RWA's capital program by reducing the time, expenses, and facility impacts associated with individual project applications. Importantly, this method will also increase capital efficiencies by achieving economies of scale for multiple project bids as a combined project.

Multi-project applications may include projects that are at the conceptual stage versus applications based on more complete designs. The sodium hypochlorite system replacement and electrical service replacement projects in this application are examples of projects at the conceptual stage. The design of these projects are at an early juncture and their cost estimates were developed without detailed engineering data and therefore their contingencies are relatively high at (+)30%. The inclusion of conceptual stage projects in multi-project applications will result in total project cost estimates that are in terms of a 'not-to-exceed' dollar amounts, as is the case with this application. The inclusion of conceptual stage projects in multi-project applications provides a method to incorporate evolving projects into applications that are anchored on a well-developed large project, and allows for the development of RPB applications to be completed sooner than if fully developed projects were included. This results in expediency in conducting the capital program and captures the associated efficiencies. The conceptual projects included in a multi-project application will be brought to full design after the project approval, if so granted by the RPB.

The WRWTP provides drinking water to the western part of the RWA's service area (New Haven, West Haven, Woodbridge, Seymour, Ansonia, and Derby). The WRWTP was initially constructed by the New Haven Water Company (NHWC) in 1980 to serve Woodbridge, New Haven, and interconnections with the Birmingham Utilities (BUI) and the Bridgeport Hydraulic Company (BHC). At that time, BUI served the towns of Ansonia, Seymour and Derby primarily through its Housatonic River well system. The RWA acquired BUI in 2008.

This comprehensive improvement project will allow the existing WRWTP to be operated at its design capacity under any conditions while improving water quality to customers. After thorough review of operating and capacity challenges associated with the legacy BUI wellfield system, the RWA is further recommending capital investment in the WRWTP to more efficiently serve customers in that area. The remaining interconnection with BHC, now Aquarion, would also be strengthened. The project's intent, summarized in this application, is to invest financial and human capital resources into facilities that will allow the organization to most effectively provide water to its northwestern service areas. Through improvements to the WRWTP's treatment process, disinfection system, and electrical equipment, the RWA achieves strategic goals of increasing resiliency and redundancy including water supply accessibility to the vast majority of its entire system. The WRWTP, located off Litchfield Turnpike in Woodbridge, CT, treats water from West River's surface water impoundments of Lake Glen, Lake Watrous, and Lake Dawson. Lake Bethany and Lake Chamberlain also feed into Lake Watrous and Lake Glen, respectively. The WRWTP is an in-line, direct filtration plant with a design capacity of 10.4 million gallons per day (MGD) and has a firm capacity of 7.8 MGD with one filter out of service.

Despite RWA's longstanding commitment to source water protection through aggressive land management practices, upgrades to the WRWTP are now necessary for the facility to run consistently greater than 8 MGD during summer months. The current treatment process that was state-of-the-art in the 1970s needs to be modified so that it can operate at its design capacity during times when raw water quality in the impoundments degrades from various environmental issues such as reservoir stratification, heavy precipitation events, and drought conditions, which are likely related to regional climate change. At times, the WRWTP can be reduced to operating at a maximum of only 5 MGD with available production limited to 3 MGD due to the high number of backwashes required.

This application outlines the components needed to address the issues described above, thus allowing full use of the existing facility's capacity. The projects in this application are:

1. Dissolved Air Flootation Unit Process Addition
2. Sodium Hypochlorite System Replacement
3. Electrical Service Upgrades

For each of the above components this application will provide: a description of the proposed work, an explanation of why it is necessary, a discussion of what alternatives were considered, and the estimated cost. The accuracy and completeness of this document are critical to the RPB's ability to make an informed decision on behalf of the RWA's customers and member communities. Tighe & Bond is providing design and construction administration services for the project.

2. Dissolved Air Flootation Unit Process Addition

2.1 Description of the Proposed Action

The existing WRWTP treatment process consists of caustic soda and potassium permanganate addition followed by two contact basins to oxidize manganese. Alum, polymer, and filter-aid polymer are added to the three-stage rapid-mix tanks. Following rapid mixing, the water is filtered using four dual-media filters [Granular Activated Carbon (GAC) and sand]. Sodium hypochlorite, fluoride, and caustic soda are applied to the filtered water before it flows into the two concrete filtered water reservoirs. A phosphate-based corrosion inhibitor and caustic soda, for pH adjustment, are added after the filtered water reservoirs, from which the treated water flows by gravity to the WRWTP service areas.

This project will include construction of three new Dissolved Air Flootation (DAF) basins within a new DAF building to the south of the existing filter building. Dissolved Air Flotation is a water treatment process often employed in drinking water supplies that are particularly vulnerable to unicellular algal blooms, as the WRWTP is. The DAF process clarifies previously coagulated water by the removal of suspended matter and solids. The removal is achieved by dissolving air in the water under pressure and then releasing the air at atmospheric pressure in a flotation tank basin. The released air forms tiny bubbles that attach to the algal floc created by coagulation, and mixing and floating it, which results in a floating mass of concentrated floc that is removed by a skimming device. The Lake Whitney WTP in Hamden employs DAF in its treatment train and has been found to be very effective in removal of algae.

To integrate the DAF system into the current WRWTP treatment process, the rapid mix tank effluent will be redirected to the new DAF basins, and the DAF effluent piping will be connected to the existing rapid mix tank effluent piping. Coagulant and primary polymer will be injected in the existing rapid mix chamber, and filter-aid polymer will be moved to the DAF effluent channel upstream of the filters.

Appendix A contains the 50% design drawings for the Improvements Project.

Specifically, the DAF facility upgrades consist of:

- Site Work
 - Excavation for DAF basins, adjacent piping and associated paving
 - Access driveway extension and filtration building retaining wall
 - Site stairs and retaining wall along the south wall of the water treatment plant
 - Drainage infrastructure around the new building
 - Demolition of abandoned chlorine gas scrubber for access driveway extension
 - Relocation of the propane tank
- Existing Building Renovations
 - Core hole in the wall from rapid mix tank effluent chamber for 36-inch diameter pipe to new flocculation basins
 - Core hole in wall east of rapid mix tanks for 36-inch diameter pipe from DAF effluent
 - Cut existing 36-inch diameter pipe from the rapid mix tanks and replace with a tee and valve that allows for a potential DAF bypass
 - Remove existing filter media and replace with new media plus 12 inches of additional depth by using 36 inches of granular activated carbon (GAC) on top of 10 inches of sand.
 - Adsorption is the primary mechanism by which GAC works and the primary reason it is widely used to reduce undesirable taste, odor and color and to improve the safety of drinking water by also effectively removing common disinfection byproducts (THMs), organic contaminants like chlorinated solvents and other industrial pollutants, pesticides, and select heavy metals such as lead and mercury. By increasing the volume of GAC, 12 inches, the Empty Bed Contact Time (EBCT) is increased 30%, enabling more effective removal of contaminants and cleaner water for RWA's customers
 - Replace the existing filter underdrains to allow for more efficient and effective filtration, by improving the plant's hydraulic profile, enabling the addition of more GAC and to replace the current underdrain system that is beyond its useful life and has allowed sand filter media to pass underneath
 - Replace windows and add a door for access from the existing building operation floor level to a new walkway to the new DAF building
 - Add a new online turbidimeter for DAF effluent monitoring
- New Building
 - Building housing three entirely new basins
 - Concrete including exterior walls, interior baffles, and floor
 - Masonry walls and a roof above the basins including heating and ventilation

- Accommodations for a staircase, HVAC equipment, electrical equipment, and instrumentation and controls
- Exterior stairs for roof access
- Two bridges for access to existing building at main level and at roof level
- DAF System
 - Additional structural steel or concrete above the basins for walkways and mounting equipment
 - DAF System including flocculation mixers, adjustable weirs for hydraulically controlled wasting, collection systems, recycle pumps, saturation tanks, air compressors, and residual spray systems
- Piping
 - 36-inch diameter ductile iron (DI) header piping from the rapid mix tanks to the DAF basins
 - 24-inch diameter DI individual DAF train piping from header
 - 36-inch diameter DI header piping from DAF basins to the existing filter piping
 - DAF basin drain piping from DAF basins into residuals pipe
 - Residuals piping from residuals trough to existing lagoons
 - Filter aid polymer injection piping from rapid mix tanks to DAF effluent channel
- Electrical/Instrumentation
 - Variable frequency drives (VFD), starters and control panel for DAF equipment
 - New motor control center (MCC) cabinets within DAF building to house VFDs and starters
 - Power and control wiring for new DAF equipment and heating, ventilation, and air conditioning equipment
 - Lighting for new building

2.2 Need for the Proposed Action

The RWA operates four surface water treatment plants and seven wellfields with a combined total rated capacity of 138 MGD. However, due to operational issues at the various facilities including high algae at the surface water supplies in the summer months, the actual system capacity is currently 95 MGD. The maximum day system demand is approximately 90 MGD (103.5 MGD with a 15% safety margin), which means that the system capacity is lower than the maximum day demand when the safety margin is included.

The WRWTP has a capacity of 10.4 MGD with all 4 filters operating at 3 gpm/sf and has a firm capacity of 7.8 MGD with one filter out of service. However, due to algal impacts on the filters, the capacity of the WRWTP is reduced from 10.4 MGD to 8 MGD and the firm capacity is further reduced in the summer months. The WRWTP is an important source of supply for RWA's water system. It is a source of supply for two consecutive water systems, a partial redundant source of supply for the New Haven Service Area

and the Seymour and Derby service areas which allow the shutdown of other plants for maintenance. The addition of DAF and the additional media depth will improve the reliability of the WRWTP, especially in the summer enabling further system flexibility, reliability and reduction of risk.

Specifically, it has been determined that DAF is necessary based on the following reasons:

- DAF will treat seasonal algae blooms that cause algal toxins to negatively impact the finished water taste and odor. EPA issued a public National Health Advisory for these types of blooms on June 17, 2015.
- In the winter months, the filter runs typically range between 30-40 hours. In the summertime, when algae blooms occur, the filter runs can be 12 hours or lower. With DAF, RWA will be able maintain a firm capacity of 7.8 mgd and a maximum capacity of 11.7 mgd during all seasons with high quality water and a significant reduction in risk. Maintaining capacity is critical for all seasons but especially so for peak months during the summer.
- With DAF, the frequency of backwashing will be reduced. This will reduce electrical costs and the amount of spent filter backwash, and conserve significant amounts of process water.
- Currently, RWA's operational goal is that all sampling locations do not exceed 80% of the maximum contaminant levels (MCL's) for disinfection by-products (DBPs). Several locations in WRWTP's distribution system exceed the goal. To reduce the DBP precursors, RWA has installed GAC in its filters at the WRWTP but the GAC has to be replaced frequently at a considerable cost. With DAF, the RWA will be able to practice enhanced coagulation to reduce DBP precursors.
- Currently, WRWTP is the only source of water for the Woodbridge Pump Station and several customers along Route 69, which require a peak flow of 3.6 MGD. With DAF, the reliability of the WRWTP will be increased.

2.3 Analysis of the Alternatives to the Proposed Action

The evaluation of plant capacity began in November 2014 through a report titled *Phase 1 Report for the Conceptual Design for Regulatory Compliance for SCCRWA* (available in Appendix B) prepared by Tighe & Bond and CH2MHill. In that report, it was identified that installation of High Rate Dissolved Air Flotation (DAF) would be a viable alternative to increase the capacity of the WRWTP.

Tighe & Bond and subcontractor Blueleaf, Inc. further evaluated alternatives to increasing the capacity of the WRWTP in 2015 through jar testing and winter pilot testing. The *WRWTP DAF Winter Pilot Report* dated May 2015 (available in Appendix C) summarized DAF trials with various loading rates and filter media (sand and anthracite). The report recommended adding DAF for clarification and particulate removal and increasing the filter loading to 4.3 gpm/sf.

A subsequent report entitled *West River WTP DAF Summer Pilot Report* dated December 2015 (available in Appendix D) summarized how the same trials from the winter pilot test responded with the presence of high algae in the water during the summer months. The report recommended the following chemical dosages:

- Chemical Pretreatment
 - Polyaluminum chloride (PACl): 22 - 24 mg/L
 - Potassium Permanganate: 0.25 – 0.6 mg/L
 - Diallyldimethylammonium chloride (DADMAC) Polymer: 0-3 ppm

- Filter Chemicals
 - Filter Aid Polymer: 0.08-0.10 mg/L

To evaluate the different alternatives for optimizing system capacity and performance at the WRWTP, Tighe & Bond prepared the *West River WTP DAF Preliminary Design Report* dated November 2020 (available in Appendix E). Tighe & Bond evaluated several different DAF system alternatives. In addition, RWA identified other service area modification alternatives that conceptually could be implemented in lieu of a DAF system at the WRWTP.

1. **No Action Alternative** – Not completing any additions or upgrades to the existing WTP impacts the capacity and reliability of the facility. It also impacts the accessibility and quality of the water. Algae will continue to be an issue in the summer months, which reduces the plant's firm capacity and significantly impacts water quality thereby increasing the water's odor and taste issues, and organics loading which allows more precursors for disinfectant by-product production. West River has some of the highest DBPs leaving the finished water reservoirs out of the four surface water treatment plants operated by RWA.
2. **New Dissolved Air Flotation System** – This project includes the construction and operation of a new DAF system at the WRWTP. Also included in the construction of this project would be modifications to the existing media, improvements to filter underdrains, and modifications to the existing rapid mix basin to remove mixers made unnecessary by changes to the coagulation scheme. Operational costs for this alternative include cost of additional power to the DAF system; reductions in power due to the removal of mixers; additional raw water pumping; and reduction in power and water production increases due to the reduction in number of filter backwashes per year needed. This alternative fully addresses both the water quality and water quantity aspects of the project need. Below are four options that were considered for integrating a DAF system into the WRWTP. Ultimately, DAF Alternative 4 was chosen.

DAF Alternative No. 1 - Two Extended Retrofit Basins: Retrofitting the existing potassium permanganate contact basins to house two retrofit DAF basins. This alternative would require extending the contact basins south into the existing pipe gallery. The alternative also required moving the potassium permanganate injection location to the access road and construction of a 280-foot long 96-inch diameter potassium permanganate contact pipe in the access driveway to obtain a 10 minute contact time at the proposed future flowrate prior to entering the new in-line mixer and adding coagulants.

DAF Alternative No. 2 - Three Regular Retrofit Basins: Retrofitting the existing potassium permanganate contact basins to house two retrofit DAF basins, each sized for one third of the current plant design flow rate. A third matching DAF basin would be constructed in a building addition parallel to the first two basins, adjacent to the existing building on the east side. This alternative also required moving the potassium permanganate injection location to the access road and construction of a 280-foot long 96-inch diameter potassium permanganate contact pipe in the access driveway to obtain a 10 minute contact time at the proposed future flow rate prior to entering the new in-line mixer and adding coagulants.

DAF Alternative No. 3 - Two New Basins/New Building: Construction of two entirely new 5.2 MGD DAF basins within a new building outside and to the south of the existing filter building. The existing potassium permanganate contact basins would continue to be used for potassium permanganate contact time. This alternative would also continue to use the rapid mix tanks. The rapid mix tank effluent would be redirected to the new DAF basins. Coagulant and DAF polymer would be injected in the existing rapid mix chamber. Filter aid polymer would be added into the DAF effluent channel upstream of the filters. 0.

DAF Alternative No. 4 - Three New Basins/New Building: Construction of three entirely new 3.9 MGD DAF basins within a new building outside and to the south of the existing filter building.

The existing potassium permanganate contact basins would continue to be used for potassium permanganate contact time. This alternative would also continue to use the rapid mix tanks. The rapid mix tank effluent would be redirected to the new DAF basins. Coagulant and DAF polymer would be injected in the existing rapid mix chamber. Filter aid polymer would be added into the DAF effluent channel upstream of the filters. The principal advantage of DAF Alternative No. 4 over the other DAF alternatives is maintaining the firm capacity of 7.8 MGD with one DAF train out-of-service.

3. **New Haven Service Area: HDD Pipe to York Hill Service Area** – This project includes the construction and operation of a high-density directional drilled pipeline connecting the York Hill Service Area to mains on the Litchfield Turnpike. This involves the installation of a 20-inch diameter main of approximately 3,000 feet through the ridge of West Rock Park. The exact location would need to be determined after the completion of a geological report. A pump station will be necessary to supply the higher gradient. This alternative was first conceptualized in the New Haven Service Area Phase III Report (2014), and also provides the ability to send water to the southern and western areas of the system in the event of a shutdown at the West River or Gaillard WTPs. The additional source of supply in this scenario is provided by the Lake Whitney WTP. Operational costs for this alternative include the difference in production costs per MG for the Lake Whitney WTP vs. West River WTP (increases), and increases in operation, maintenance, and pumping costs by the addition of the new pumping facility. This alternative fully addresses the water quantity aspect of the project need but does not address the water quality aspect, with water quality anticipated to be comparable to existing conditions.
4. **Additional Wellfield/Source of Supply** – This project includes the construction and operation of a new groundwater source of supply and treatment facility located in the western area of the system. This involves the siting, permitting, and development of the wellfield and design and construction of the treatment systems. In addition to the chemical treatment processes typical for RWA groundwater facilities, a manganese treatment system would also be anticipated. The existing wellfields in the western area of the system do not have the required area for expansion to adequately address the quantity of water necessary to supplement the existing supply, therefore a new source of supply was considered in this alternative. Operational costs for this alternative include the difference in production costs per MG for the groundwater source (estimated to be similar to South Cheshire Wellfield) and West River WTP, and increases in maintenance costs associated with a new site and equipment. This alternative fully addresses the water quantity aspect of the project need, and addresses about 30% of the water quality aspect (due to the fact that water quality at West River, the primary source of water for the area, would not change).

A Business Case Evaluation (BCE) was performed by RWA to compare and evaluate the alternatives above and is included in Appendix F. To summarize the results, Alternative 2, DAF at WRWTP was found to have the least life cycle cost – annuitized cost stream, most effective risk reduction, and overall greatest cost benefit ratio.

Of the DAF options available the alternatives analysis concluded that DAF Alternative No. 4 is most favorable in terms of water quality, availability, and reliability. The three new basins and building alternative was selected for the following reasons:

- Constructability is improved because the stand-alone DAF building can be installed with minimal impact to water treatment operations during construction
- Three DAF trains maintain the design capacity of 10.4 MGD as well as firm capacity of 7.8 MGD during the summer months
- DAF was proven effective at the design loading rates and chemical doses during winter and summer pilot testing

- DAF most completely meets the RWA's project goals of improving water quality and increasing quantity of treated water available to the service area

2.4 Statement of the Cost to Be Incurred and/or Saved

2.4.1 Capital Cost

This project will result in a capital expenditure of \$12.6 million a (+) 20% when contingency factor is included. The RWA has expended approximately \$589,669 to conduct the preliminary pilot testing of the DAF process, develop the Preliminary Design Report, and develop design documents. A breakdown of the capital cost for this project is presented in Table 1 below, and a detailed breakdown of this cost estimate is contained in Appendix H of this application. The project costs presented are based on a 50% design level of completion prepared in November 2020.

TABLE 1
Estimated Project Capital Cost for DAF Facility Addition

Cost Description	Estimated Cost
Previous Expenditures (from 2015 through November 2020)	\$589,669
Final Design Cost	\$161,323
Estimated Construction Cost	\$8,008,300
Escalation to Mid-point of Construction – 2.7% per year	\$216,224
Construction Cost Subtotal	\$8,224,524
Consultant cost During Construction	\$991,748
RWA Costs During Construction	\$648,650
Engineering and Construction Oversight Sub-total	\$1,640,398
Construction Sub-total (w/o previous spend & final design)	\$9,864,922
Total	\$10,615,914
Rounded Total	\$10,616,000
Minimum Anticipated Project Cost (-15%)	\$9,136,176*
Maximum Anticipated Project Cost (+20%)	\$12,588,898*

* Minimum and Maximum project costs includes (-15%) to (+20%) American Association of Cost Engineers (AACE) accuracy factors respectively on construction subtotal.

In accordance with cost estimating principles, the project costs have been adjusted for inflation forward 12 months from the date of the cost estimate, November 2020, to the mid-point of construction, which is anticipated to be January 2022. An inflation factor of 2.7% per year has been used in the cost estimate. This factor was calculated by Tighe & Bond from the ENR Construction Cost Index from August 2015 through August 2020.

For the construction cost estimate, a 20% contingency is included in the maximum anticipated project cost. This is consistent with the (AACE) International Recommended Practices and Standards for a Class 2 estimate, which is included in Appendix I. In a Class 2 estimate, the design of the project is normally expected to be between 30% to 70% complete and accurate within -15% to +20%. This implies that there is a high probability that the final project cost will fall within the specified range. The AACE defines

contingency as a specific provision for unforeseeable elements of cost within the defined project scope, particularly where experience has shown that unforeseeable costs are likely to occur. The percent contingency allowance is included at this design stage in anticipation of items that will be further defined in subsequent phases of the design process, as well as for uncertainty in future bid prices and as a means to reduce the risk of possible cost overruns.

2.4.2 Operation and Maintenance Cost

The DAF system includes the following mechanical equipment that will require routine maintenance:

- Recycle pumps
- Compressors
- Mechanical Weirs
- Mixers
- Unit Heaters
- Exhaust Fans
- Air Handling Units

Maintenance of equipment will vary depending upon the manufacturer. However, the following basic maintenance activities can be expected.

It is anticipated that routine maintenance of the recycle pumps includes periodic inspection of oil level in thrust pots and changing lubrication in the gear drive approximately every 2,000 hours of operation or once a year, whichever occurs more frequently. Re-greasing motor bearings will be required approximately every 2,000 operating hours. In addition, systematic inspections of the pump and its components should be made at regular intervals.

Anticipated routine maintenance of the air compressors is dependent upon frequency of operation. After 8 hours of operation, the oil level should be checked and filled if needed. Operators should also observe if the unit loads and unloads properly, and check the discharge pressure and temperature. After 125 hours of operation, operators should check for dirt accumulation on oil/aftercooler core faces and the cooling fan. After 1,000 hours of operation, the oil filter element should be changed. After 4,000 hours of operation, the compressor lubricant should be changed. Once a year the relief valve should be checked for proper operation, and the oil separator should be changed.

The mechanical weirs have a mechanical actuator. The lubrication should be changed at a minimum of once a year.

Recommended maintenance for the mixers includes replacing the oil after the first 1,500 hours of operation and every 5,000 hours of operation after that. The level of lubricant should be monitored and filled as needed.

The HVAC exhaust fans should be initially checked after the first month and then every three months if there are no issues during the first check. Twice a year, operators should inspect the bolts and setscrews, belts, bearings, and fan cleanliness.

The filters in the dehumidifier should be checked after the first month and every three months if there are no issues during the first check.

In general, air handling units do not require special maintenance other than routine cleaning and maintenance work. Once a week, the air filters should be checked. Once a month, the fan belt tension, spray nozzle condition, drain condition, and the access door hinge condition should be checked. Twice a year, the condition of the motor running current, function controls, fan and motor bearings, electric heater battery elements, circulation pump and motor, inlet strainers, and chilled/hot water should be checked. In addition, the drain line should be flushed twice a year. Once a year, the operation of the dampers, condition of filter frame, access doors, controls, coils and fin condition, insulation, motor and fan lubrication, and wiring, controls, isolation devices, and terminal connections should be checked. Once a year, the belts on the air handling unit should be replaced.

It is anticipated that the maintenance of the DAF system equipment will require approximately 6 hours per month.

3. Sodium Hypochlorite System Replacement

3.1 Description of the Proposed Action

The West River Water Treatment Plant Improvements Project includes replacement of the existing sodium hypochlorite system. The existing hypochlorite system will be replaced with an on-site hypochlorite generation system with a brine or salt silo, day tank, metering pumps, and two on-site sodium hypochlorite generators. The equipment will be installed in the existing sodium hypochlorite room where the chemical resistant floor coating will be removed and replaced. A temporary sodium hypochlorite system will be furnished, installed, and operated by the RWA in the northeast corner of the Filter Building.

Specifically, the work consists of:

- General Work
 - Demolition of the existing sodium hypochlorite storage room
 - Installation of a temporary sodium hypochlorite system
- Existing Building Renovations
 - Removal and replacement of the chemical resistant floor coating
 - Elevated concrete pad for the day tank to ensure flooded suction to the metering pumps
 - Concrete pads for the brine silo and the metering pumps
- On-Site Sodium Hypochlorite Generation System
 - 1 brine or salt storage silo
 - 2 on-site chlorine generators
 - 1 water filter, 1 brine filter
 - 2 brine boost pumps
 - 2 water heaters
 - 1 water softener

- 2 day tanks
- 4 chemical metering pumps
- Piping
 - Piping and valves inside sodium hypochlorite room to be replaced; piping outside room to remain in service
- Electrical/Instrumentation
 - As necessary to support new sodium hypochlorite generation system
 - Lights and miscellaneous electrical devices are being replaced under a different RWA project.

The proposed improvements will replace the existing sodium hypochlorite system with a new on-site sodium hypochlorite generation system. These improvements will increase reliability of the system, reduce the risk of DBPs, reduce off-gassing odors, and meet the design requirement of 300 lbs. Cl₂/day.

3.2 Need for the Proposed Action

The existing sodium hypochlorite system was installed 15 years ago, at the time replacing a chlorine gas system, and is rated for 200 lbs. Cl₂/day. Installation of a new DAF system and upgrades to the filter underdrains and media will cause both the hydraulic capacity and chlorine demand to increase.

When all three DAF trains are in service, the projected maximum capacity of the plant could increase from 10.4 MGD to 11.7 MGD if the RWA elects to increase the filter loading rate in the future. The design criteria of 300 lbs./day will allow for a dose of approximately 3.07 mg/L at the projected future capacity, or a dose of 3.46 mg/L at the current plant capacity of 10.4 MGD. This design criteria was selected based on WTP data, including usage at the plant from 2017-2019.

Specifically, the existing sodium hypochlorite system requires a replacement based on the following reasons:

- At 15 years old, and with the use of the highly corrosive sodium hypochlorite, the existing tanks and associated piping have reached their useful life and are scheduled for replacement.
- RWA is interested in replacing the existing vacuum feeders with gear metering pumps. Vacuum feeders require excessive water use, can be maintenance intensive and gear metering pumps are preferred by the RWA.
- The design criteria will increase from 200 lbs./day to 300 lbs./day once filter improvements and the DAF system have been completed. The current system is not rated for this increased capacity.
- RWA needs to minimize their risk of DBPs being produced (chlorate and chlorite) through degradation resulting from long-term sodium hypochlorite storage.

3.3 Analysis of the Alternatives to the Proposed Action

To evaluate the different alternatives for replacing the existing chlorine system at the WRWTP, Tighe & Bond prepared a *West River WTP Chlorination System Business Case Evaluation Memorandum* dated November 2020 (available in Appendix G). Tighe & Bond evaluated several different alternatives,

including one replacement in-kind option, one on-site generation option, and one option using a no action approach as follows:

Alternative 1 - Replace Sodium Hypochlorite System: This alternative includes replacement of the existing sodium hypochlorite system with two new bulks tanks, one new day tank, two new transfer pumps, and new gear metering pumps. These metering pumps would take the place of existing vacuum feeders. Piping and valves within the sodium hypochlorite room would be replaced, while piping outside of this room would remain in service. The chemical resistant floor coating also requires replacement due to its failing condition. An elevated concrete pad would be constructed for the new day tank to ensure flooded suction to the metering pumps.

While this alternative offers lower upfront costs and operation/maintenance consistent with RWA's current routine, the 12.5% hypochlorite solution presents safety hazards and storage concerns. In addition to off-gassing tendencies, this highly concentrated solution carries a higher risk of forming disinfection byproducts (DBPs) such as chlorate and chlorite during the degradation process. The corrosive fumes may cause premature failure of building elements, and the solution is often aggressive to piping systems, thus increasing the maintenance demand of operation staff.

Alternative 2 - On-Site Chlorine Generation: This alternative includes replacement of the existing sodium hypochlorite system with an on-site sodium hypochlorite generation system that uses a brine solution and electricity to create a 0.8% hypochlorite solution. This alternative would consist of a brine or salt storage silo, a water filter and softener, two water heaters, two electrolytic cell on-site generators (OSG), two day tanks, two boost pumps, and four metering pumps. The same piping and valve replacement, chemical resistant floor coating replacement, and elevated concrete pad addition would occur as stated in Alternative 1. As indicated by the DPH, RWA would not need to conduct a pilot test, provided that only sodium hypochlorite is generated and injected in the WTP.

This alternative does not require long-term storage of concentrated sodium hypochlorite, therefore reducing the risk of DBP production. The 0.8% hypochlorite solution has some of the same safety concerns as the 12.5% solution, but a dilute solution is more stable and inherently safer. The use of an on-site generation system would also result in less maintenance as new OSG cells are self-cleaning and report essentially no maintenance, while the water softener requires minimal maintenance. A less concentrated solution is also less of a challenge for operators to work with, including reduction of hypochlorite off-gassing fumes. The disadvantages of this alternative are the higher upfront and electrical costs, as well as the risks associated with using a lesser-known technology.

Alternative 3 - No Action: The existing vacuum feeders remain in service, and the replacement of existing chemical tanks and piping is deferred. At 15 years old, the existing chemical tanks and piping have reached the end of their anticipated life. Experience with similar vacuum feeder systems at our other treatment facilities, confirms that risk of failure significantly increases after approximately 15 years. The current feed systems have experienced numerous vacuum leaks due to degraded seals and PVC glue joints, interrupting continuous chemical feed. WRWTP is the last treatment facility that is using this type of feeder system, and the electronics are no longer supported by the manufacturer. Any electronic failure will mean a temporary sodium hypochlorite feed system will need to be installed to maintain operations.

This alternative has the lowest cost, but also presents no solution to the aging tanks and piping. The vacuum feeders require excessive water use and the existing vacuum chlorinators are not sufficiently rated for the capacity that will be necessary once the DAF system and filter upgrades have been completed.

Alternate 2 is the most favorable in terms of DBP reduction, non-cost advantages, and long-term benefits. On-site generation was selected for the following reasons:

- Reduction of chlorite and chlorate; as soon as sodium hypochlorite is manufactured, it begins to dissociate into disinfection byproducts including chlorate and chlorite. The process of dissociation

increases due to increasing temperature, available light and time all of which occur during product storage. A study conducted by the RWA found significant increases in these DBPs well above the CTDPH Health Reference Level, especially during warmer months. Chlorite is currently regulated and chlorate is expected to be soon.

- Gear metering pumps are preferred by RWA and will take the place of vacuum feeders which use an excessive volume of water and are maintenance intensive.
- Off-gassing odors will be reduced.
- The 0.8% hypochlorite solution is more dilute and therefore safer, although safety precautions will likely remain the same.
- Table salt is less likely to be subject to market cost fluctuations and is also more stable, therefore it can be delivered less frequently. This also makes the plant more resilient in the event that natural disasters, weather, other issues impact deliveries or the plant itself.
- The OSGs and water softener require minimal maintenance.

3.4 Statement of the Cost to Be Incurred and/or Saved

3.4.1 Capital Cost

This project will result in a capital expenditure of \$1.4 million when a (+) 30% contingency factor is included. A breakdown of the capital cost for this project is presented in Table 2 below, and a detailed breakdown of this cost estimate is contained in Appendix G of this application. The project costs presented are based on unit costs provided by De Nora, the manufacturer of an on-site hypochlorite generation system, which are available in Appendix G.

TABLE 2

Estimated Project Capital Cost for On-Site Generation of Sodium Hypochlorite – Including Escalation and Construction Phase Engineering

Cost Description	Estimated Cost
Consultant Design Cost	\$55,000
RWA Design Cost	\$10,000
Estimated Construction Cost	\$752,000
Escalation to Mid-point of Construction – 2.7% per year	\$20,304
Construction Total with Inflation	\$772,304
Consultant cost During Construction	\$93,128
RWA Costs During Construction (Includes temporary system)	\$180,000
Engineering and Construction Oversight Sub-total	\$273,128
Construction Sub-total (w/o final design)	\$1,045,432
Total	\$1,110,432
Rounded Total	\$1,110,000
Minimum Anticipated Project Cost (-15%)	\$953,617*
Maximum Anticipated Project Cost (+30%)	\$1,424,062*

* Minimum and Maximum project costs include (-15%) or (+30%) American Association of Cost Engineers (AACE) accuracy factors, respectively, on the Construction Subtotal.

In accordance with cost estimating principles, the project costs have been adjusted for inflation forward 12 months from the date of the cost estimate, November 2020, to the mid-point of construction, which is anticipated to be February 2022. An inflation factor of 2.7% per year has been used in the cost estimate. This factor was calculated by Tighe & Bond from the ENR Construction Cost Index from August 2015 through August 2020.

For the construction cost estimate, a 30% contingency is included in the maximum anticipated project cost. This is consistent with the American Association of Cost Engineers (AACE) International Recommended Practices and Standards for a Class 4 estimate, which is included in Appendix I. The cost estimates were developed without detailed engineering data and are considered approximate. A Class 4 estimate is prepared for budget authorization, appropriation, and/or funding. In a Class 4 estimate, the design of the project is normally expected to be accurate within -15% to +30%. This implies that there is a high probability that the final project cost will fall within the specified range. The AACE defines contingency as a specific provision for unforeseeable elements of cost within the defined project scope, particularly where experience has shown that unforeseeable costs are likely to occur. The 30% contingency allowance is included at the beginning of the detailed design stage in anticipation of items that will be further defined in subsequent phases of the design process, as well as for uncertainty in future bid prices and as a means to reduce the risk of possible cost overruns.

3.4.2 Operation and Maintenance Cost

The chlorination system includes the following mechanical equipment that will require routine maintenance:

- Chemical metering pumps
- On-site generators (OSG)
- Water softener
- Water heaters
- Water and brine filters
- Brine boost pumps

Maintenance of equipment will vary depending upon the manufacturer. However, the following basic maintenance activities can be expected.

- Anticipated routine maintenance of the on-site generators is minimal. The newer OSG cells are self-cleaning and reportedly require essentially no maintenance. Two OSG units are estimated to be installed for redundancy, but only one unit will be expected to operate at a time.
- The water softener requires minimal maintenance.
- The water heater will keep the raw water within range for the OSG to work properly, which is between 50-80°F. This means that the heater only needs to operate during very cold periods (De Nora estimates 121 days/year).

- Maintaining an appropriate amount of salt on-site is also an important factor to consider. The plant averages about 31,177 lbs. Cl₂ each year, which translates into 62,354 lbs. salt/year. This amount will be delivered in predetermined quantities throughout the year.
- Electrolytic cells in the OSGs are expected to last approximately 10 years. Metering pumps should be replaced every 15 years.

4. Electric Service Improvements

4.1 Description of the Proposed Action

The existing electric system will also be upgraded as a part of the West River Water Treatment Plant Improvements Project. These upgrades are necessary in order to replace aged-out equipment and increase the emergency generator capacity to include the entire electrical system and provide capacity for the new DAF building.

This work includes:

- Site Work
 - Excavation required to locate generator, switchgear, automatic transfer switch (ATS) and transformer and associated electrical ductbank to distribute power to the existing buildings and new DAF building
- Electrical
 - New utility service
 - New transformer (furnished by UI)
 - New exterior switchgear and automatic transfer switch with walk-in enclosure
 - New generator
 - Connection box (cam-lock style) for connection of a portable generator as a backup to the facility generator

The proposed improvements will provide the buildings with updated equipment and a correctly sized generator capable of powering the entire facility, as well as a new transformer, switchgear and automatic transfer switch for improved reliability and safety.

4.2 Need for the Proposed Action

Currently, the existing electric system uses an outdoor 500KW diesel generator. The system is designed to shut down various equipment when running on generator power as the entire facility requires more power than the generator can provide. The addition of a DAF system and building would require even more power from an already deficient system. Electric system improvements such as the new transformer, automatic transfer switch (ATS) and switchgear are crucial to maintain a reliable power supply to the entire WRWTP.

The existing electrical equipment is obsolete and is beyond its rated life-expectancy. Most of the equipment is original to the plant and therefore well surpassing the typical 30-year life for this type of equipment. Finding replacement parts for this equipment is becoming more difficult and time consuming. Additionally, RWA would like one system that is able to power both the existing building and proposed DAF building.

Specifically, the existing electrical system requires a replacement based on the following reasons:

- Safety is compromised when working with the existing electrical equipment as it is aging and needs to be replaced.
- Time spent locating replacement parts would be reduced if the electrical equipment was newer and more widely used.
- A larger generator would sufficiently power the existing and proposed buildings without needing to design a system to strategically shutdown specific equipment when generator power is required.

4.3 Analysis of the Alternatives to the Proposed Action

In determining the best course of action to address the issue of upgrading aged electrical equipment to meet the increased electricity demand, several different alternatives were evaluated. The alternatives evaluated include the addition of a smaller generator to the DAF building, replacement of the existing generator with one that is correctly sized to provide power to the entire facility, motor control center (MCC) replacement, and a no action approach.

Alternative 1 – Addition of a Smaller Generator: Install a smaller, 300 KW generator to provide backup power for the new DAF building. This would include a new utility service, utility transformer, 1600A, 480V outdoor main switchgear with automatic transfer switch and walk-in enclosure, and new equipment to replace MCC-1, MCC-2, MCC-3, and panelboards.

While this is a less expensive alternative, it does not address the issue that the existing generator is already too small to handle existing loads. It also would add complexity, electrical coordination issues, and safety issues to operate two generators on this site.

Alternative 2 - Larger Replacement Generator: The replacement of the existing generator with a larger generator that is sized to power the entire facility would provide the existing buildings and proposed DAF building with a more reliable electric system. This would include the same upgrades noted in Alternative 1, but instead of adding a smaller generator, the existing generator would be removed and re-purposed at a RWA facility, and a larger generator would be installed in its place. In addition to the cost savings associated with locating the new ATS in the exterior switchgear, there are constructability benefits as well. Providing a new ATS in the new switchgear allows the contractor to fully install and wire the new switchgear, ATS and generator while the existing switchgear, ATS and generator serve the treatment plant during construction, eliminating the need for electrical tie-ins to the existing ATS if it were reused.

This alternative addresses the safety concerns operators may have when working near aging equipment, while also providing a solution to insufficient generator power for the facility.

Alternative 3 - No Action: Keep the electric system in service without additional generators or completing any upgrades. The existing electrical equipment is old, obsolete, and passed its rated life. The equipment is no longer reliable and finding replacement parts is increasingly more difficult and time consuming. This alternative is not feasible to ensure reliable operation of the WTP. The current generator is already undersized for the facility, and will not support the power requirement of both the DAF and on-site sodium hypochlorite generation. This alternative will result in continued excessive operation and maintenance expenditures to find replacement parts and deal with any potential equipment failures.

The most cost-effective approach to meeting the operational reliability needs of the RWA, to avoid losses resulting from unplanned equipment failure, and to supply the power required by the WRWTP, is to install a new transformer, new exterior switchgear and automatic transfer switch, and replace the existing generator with a larger generator (Alternative No. 2).

This alternative was selected for the following major reasons:

- Significantly increases reliability of the entire WRWTP.
- Provides sufficient generator power for the entire facility.
- Reduces the risk of possible failure of electrical equipment
- Increases the safety of operators working within the facility.
- Constructability benefits and cost savings to fully install and wire the new switchgear, ATS and generator.

4.4 Statement of the Cost to Be Incurred and/or Saved

4.4.1 Capital Cost

This project will result in a capital expenditure of approximately \$2.3 million when a (+) 30% contingency factor is included. A breakdown of the capital cost for this project is presented in Table 3 below.

TABLE 3
Estimated Project Capital Cost for Electric Service Improvements

Cost Description	Estimated Cost
Consultant Design Cost	\$65,000
RWA Design Cost	\$10,000
Estimated Construction Cost	\$1,370,000
Escalation to Mid-point of Construction – 2.7% per year	\$36,990
Construction total with Inflation	\$1,406,990
Consultant cost During Construction	\$169,667
RWA Costs during Construction	\$128,562
Engineering and Construction Oversight Sub-total	\$298,229
Construction Sub-total (w/o final design)	\$1,705,219
Total	\$1,780,219
Rounded Total	\$1,780,000
Minimum Anticipated Project Cost (-15%)	\$1,524,436*
Maximum Anticipated Project Cost (+30%)	\$2,291,785*

* Minimum and Maximum project costs includes (-15%) or (+30%) American Association of Cost Engineers (AACE) accuracy factors, respectively, on the Construction Subtotal.

In accordance with cost estimating principles, the project costs have been adjusted for inflation forward 12 months from the date of the cost estimate, November 2020, to the mid-point of construction, which is anticipated to be February 2022. An inflation factor of 2.7% per year has been used in the cost estimate. This factor was calculated by Tighe & Bond from the ENR Construction Cost Index from August 2015 through August 2020.

For the construction cost estimate, a 30% contingency is included in the maximum anticipated project cost. This is consistent with the American Association of Cost Engineers (AACE) International Recommended Practices and Standards for a Class 4 estimate, which is included in Appendix I. The cost estimates were developed without detailed engineering data and are considered approximate. A Class 4 estimate is prepared for budget authorization, appropriation, and/or funding. In a Class 4 estimate, the design of the project is normally expected to be accurate within -15% to +30%. This implies that there is a high probability that the final project cost will fall within the specified range. The AACE defines contingency as a specific provision for unforeseeable elements of cost within the defined project scope, particularly where experience has shown that unforeseeable costs are likely to occur. The 30% contingency allowance is included at the beginning of the detailed design stage in anticipation of items that will be further defined in subsequent phases of the design process, as well as for uncertainty in future bid prices and as a means to reduce the risk of possible cost overruns.

4.4.2 Operation and Maintenance Cost

The electrical service equipment includes the following mechanical equipment that will require routine maintenance:

- Switchgear
- Automatic Transfer Switch
- Generator

5. Summary of Combined Project Costs

5.1 Cost Summary

The following table summarizes the combined opinion of probable construction costs for the DAF facility addition, sodium hypochlorite system replacement, and electrical service improvements.

TABLE 4
Summary of Combined Project Costs and Variability

<i>Project</i>	<i>AACE Cost Accuracy</i>	<i>Minimum Cost</i>	<i>Maximum Cost</i>	<i>Calculated Cost</i>
DAF Facility Addition	-15% to 20%	\$9,136,176	\$12,588,898	\$10,616,000
Sodium Hypochlorite System Replacement	-15% to +30%	\$953,617	\$1,424,062	\$1,110,000
Electric System Improvements	-15% to +30%	\$1,524,436	\$2,291,785	\$1,780,000
TOTAL		\$11,614,224	\$16,304,738	\$13,506,000

The requested approval amount is not-to-exceed \$16.3 million and is based upon the higher range of the AACE cost accuracy factors

5.2 Bonds or Other Obligations the RWA Intends to Issue

The annual cost of this project to a typical residential customer, assuming a conservative financing assumption of RWA Bonds, would be approximately \$5.55, based on the project cost of \$16.3 million.

However, we expect this project to be funded by a combination of funding sources. This project has the potential for funding under the Connecticut Department of Public Health's (CTDPH) Drinking Water State Revolving Fund (DWSRF). By utilizing this funding source, the total financing costs associated with this project are lower than RWA issued bonds. Internally generated funds are also expected to be used. RWA has submitted an Eligibility Application with the State of Connecticut – Department of Public Health (DPH) Drinking Water State Revolving Fund (DWSRF). Since the time of the application, the project scope has become more comprehensive. As a result, RWA is currently working with the DPH to review the project scope, schedule and funding opportunities, and a revised Eligibility Application.

6. Preliminary Project Schedule and Permitting

6.1 Schedule

The project schedule presented below includes typical agency and local approvals from the State of Connecticut Department of Public Health and the municipal Planning and Zoning Commission.

- | | |
|--|-------------------------|
| 1. RPB Application | Submitted December 2020 |
| 2. Assuming RPB approval, Final Design, Permitting and Bidding | April to May 2020 |
| 3. Construction | June 2021 to July 2022 |
| 4. Start-up, Optimization and Punch List | July to September 2022 |

6.2 Permitting

Permitting/agency considerations for construction of the DAF system, sodium hypochlorite system, and electrical service are as follows:

- State of Connecticut Department of Public Health (CTDPH) Notification - The RWA will submit a CTDPH Public Water System General Application for Approval or Permit, Chemical Changes Permit, and Surface Water Treatment Plant Permit, and a CTDPH Water Company Owned Land Permit Application and DWSRF Construction Contract Approval for the project.
- State of Connecticut Department of Energy and Environmental Protection Approval - The RWA will submit an Environmental Review Request form to the Connecticut Natural Diversity Database.
- CT Department of Economic and Community Development – The Office of Culture and Tourism will be contacted in order to request information regarding the potential presence of significant historic and archeological resources at or near the proposed project area.
- Town of Woodbridge Permits – The RWA will submit a Site Plan and Zoning Permit Application to the Woodbridge Planning and Zoning Commission.

7. Statement of the Facts on Which the Board Is Expected to Rely in Granting the Authorization Sought

- The existing plant capacity, 10.4 MGD, is reduced to 8 MGD and even 4 MGD during the summer months due to algae. With DAF, an additional 12-inches of filter media and filter underdrain replacement, the design capacity can be restored to 10.4 MGD and the firm capacity can be restored to 7.8 MGD.
- The filter run times are reduced from 30-40 to 12-24 hours due to increased algae during summer months. With DAF the filter runs will be up to 30-40 hours even with algae.
- Decreasing filter run time leads to increased backwashing frequency and backwash water use, increasing power and residual disposal costs.
- The WRWTP currently treats by installing granular activated carbon (GAC) in the filters. With high rate DAF, RWA can practice enhanced coagulation to reduce DBP precursors and may be able to switch from GAC to anthracite in the filters to further reduce costs in the future.
- With DAF, the filters will not have to be backwashed as often, thereby reducing power costs.
- The reliability of the WRWTP will be increased with the installation of DAF, replacement of the existing sodium hypochlorite system, and improvements to the existing electrical system. Currently, WRWTP is the only source of water for the Woodbridge Pump Station and several customers along Route 69.
- Sodium Hypochlorite is the RWA's most important chemical as it is critical to the reliability of treatment and safety of our drinking water to our customers. Eliminating bulk storage of the highly concentrated 12.5% sodium hypochlorite solution will reduce the risk of DBP production (chlorate and chlorite) and corrosive off-gassing odors.
- Replacing the sodium hypochlorite system will allow for the new design requirement of 300 lbs. Cl₂/day to be met. The current vacuum feeders are only rated at 200 lbs./day
- While a dilute 0.8% sodium hypochlorite solution still presents safety concerns, this solution is inherently safer than the 12.5% solution that is currently stored on-site.
- Table salt is stable in a brine silo, therefore reducing the frequency of deliveries that need to be made for the chlorination system. Salt is also less likely to be subject to market fluctuations.
- Installing a new, larger generator that is sized to power the entire facility will ensure that no parts of the facility need to shut down in the event that generator power is required.
- Upgrading the transformer and replacing the switchgear will improve electric service reliability and safety for personnel.
- United Illuminating wants to replace the outdated 4-bay trans-closure transformer with a newer reliable transformer. This facility is a critical facility and has one of the older model transformer in the UI inventory.

8. Explanation of Unusual Circumstances Involved in the Application

There were no unusual circumstances involved in this application.

9. Conclusion

The WRWTP provides service to over 44,000 customers or approximately 9.6% of the RWA demand when the plant is running at capacity and is an important source of supply for RWA's water system. It is a source of supply for two consecutive water systems a partial redundant source of supply for the New Haven Service Area, as well as for the Seymour and Derby service areas. The plant is frequently only able to operate at 8 MGD, or 77% of its design capacity, during seasonal peak demands which contributes to system strain to match water demand. WRWTP is important for the redundancy of RWA's water treatment systems. The addition of DAF and the additional media depth will improve the reliability of the WRWTP.

Based on the studies completed from November 2014 through November 2020, at \$16.3 million, the selected project maximizes the cost and non-cost benefits for the RWA. As such, the RWA has concluded that the proposed action is consistent with and advances the policies and goals of the South Central Connecticut Regional Water Authority. .

Appendix H

Engineer's Opinion of Probable Cost for DAF System Upgrade

ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST								Tighe & Bond	
Project:		West River Water Treatment Plant Dissolved Air Flotation Upgrade Project							
Location:		Woodbridge, CT							
Estimate Type:		<input type="checkbox"/> Conceptual <input type="checkbox"/> Preliminary Design <input checked="" type="checkbox"/> Design Development		<input type="checkbox"/> Construction <input type="checkbox"/> Change Order 50 % Complete		Prepared By: Tighe & Bond Date Prepared: 11/25/2020 T&B Project No.: S-1889-30			
Spec. Section	Item No.	Description	Qty	Units	Material/Installed Cost		Installation	Total	
					\$/Unit	Total	Total		
DIVISION 1 - GENERAL CONDITIONS									
(Costs included in unit prices in other Divisions)									
	1	15% of Construction Subtotal	1	LS	\$1,044,564	\$1,044,564		\$1,044,564	
SUBTOTAL - DIVISION 1								\$1,044,564	
DIVISION 2 - SITE WORK									
02075	1	Geosynthetics	1	LS	\$11,000	\$11,000		\$11,000	
02200	2	Site Preparation							
	a	Haybales & Silt Fence	150	LF	\$10	\$1,500		\$1,500	
	b	Silt Sac	1	EA	\$90	\$90		\$90	
02210	3	Subsurface Investigations	1	LS	\$11,000	\$11,000		\$11,000	
02225	4	Selective Demolition							
	a	Exterior Drain Piping and Headwall	1	LS	\$550	\$550		\$550	
	b	Trees	3	EA	\$1,100	\$3,300		\$3,300	
	c	Chain Link Fence Remove and Reset	200	LF	\$45	\$9,000		\$9,000	
	d	Clearing and Grubbing	5,800	SF	\$2	\$11,600		\$11,600	
	e	Demolish 36" elbow and pipe	2,100	LB	\$2	\$4,200		\$4,200	
	f	Demolish and Relocate Sample Tap	1	LS	\$500	\$500		\$500	
	g	Demolish 4" chlorine booster pipe bend	1	LS	\$500	\$500		\$500	
	h	Core Hole for 42" DI Influent Pipe	1	LS	\$5,000	\$5,000		\$5,000	
	i	Core (3) Holes for polymer, water, and sump piping	1	LS	\$5,000	\$5,000		\$5,000	
	j	Core Hole for 36" DI Effluent Pipe	1	LS	\$5,000	\$5,000		\$5,000	
	k	Demolish Windows and Wall at New Door Location	1	LS	\$5,000	\$5,000		\$5,000	
	l	Raise filter surface wash pipes	4	EA	\$3,000	\$12,000		\$12,000	
	m	Demolish Scrubber	1	LS	\$11,000	\$11,000		\$11,000	
	n	Scrubber Media Disposal	21	TON	\$200	\$4,200		\$4,200	
	o	Filter Underdrain Demolition	2,400	SF	\$80	\$192,000		\$192,000	
02315	5	Excavation/Backfill/Compaction							
	a	Building foundation, walls, and Retaining Walls	1,200	CY	\$80	\$96,000		\$96,000	
	b	36" and 42" Pipe	52	CY	\$80	\$4,166		\$4,166	
	c	Drop Inlets	40	CY	\$80	\$3,200		\$3,200	
	d	18" Sanitary Drain	83	CY	\$80	\$6,667		\$6,667	
	e	Plant Water, Polymer, and Sump Pump Lines	4	CY	\$80	\$296		\$296	
02317	6	Underground Warning Tape	1,000	LF	\$2	\$2,000		\$2,000	
02320	7	Borrow Materials							
	a	Crushed stone - Below Slab	188	TON	\$40	\$7,524		\$7,524	
	b	Crushed Stone - Under Drains	19	TON	\$40	\$760		\$760	
	c	Process Trap Rock	130	TON	\$40	\$5,200		\$5,200	
02503	8	Sanitary Sewer and Storm Drain Systems Testing	1	LS	\$1,000	\$1,000		\$1,000	

ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

Tighe & Bond

Project: West River Water Treatment Plant Dissolved Air Flotation Upgrade Project
Location: Woodbridge, CT

Estimate Type: Conceptual
 Preliminary Design
 Design Development

Construction
 Change Order
 50 % Complete

Prepared By: Tighe & Bond
 Date Prepared: 11/25/2020
 T&B Project No.: S-1889-30

Spec. Section	Item No.	Description	Qty	Units	Material/Installed Cost		Installation	Total
					\$/Unit	Total	Total	
02515	9	Polyvinyl Chloride (PVC) Pipe and Fittings						
	a	6" Perf PVC Pipe	280	LF	\$110	\$30,800		\$30,800
	b	4" Perf PVC Pipe	335	LF	\$100	\$33,500		\$33,500
	c	12" Roof Leader Piping	150	LF	\$130	\$19,500		\$19,500
02516	10	HDPE						
	a	18" HDPE	185	LF	\$110	\$20,350		\$20,350
02530	11	Manholes & Catchbasins						
	a	Drop Inlets	3	EA	\$4,000	\$12,000		\$12,000
	b	Manholes	1	EA	\$10,500	\$10,500		\$10,500
02740	12	Bituminous Concrete Pavement						
	a	Paving and Repair- Driveway	600	SY	\$30	\$18,000		\$18,000
02775	13	Portland Cement Sidewalks	2	CY	\$1,500	\$3,000		\$3,000
02820	14	Chain Link Fences						
	a	Retaining Wall Fence	65	LF	\$40	\$2,600		\$2,600
02922	15	Hydroseeding						
	a	Loam	450	CY	\$50	\$22,500		\$22,500
	b	Hydroseeding	1	LS	\$1,000	\$1,000		\$1,000
SUBTOTAL - DIVISION 2								\$593,003
DIVISION 3 - CONCRETE								
03300	1	Cast in Place Concrete						
	a	Building base mat	270	CY	\$1,200	\$324,000		\$324,000
	b	Foundation and tank separation and baffle walls	480	CY	\$1,500	\$720,000		\$720,000
	c	Elevated slabs and beams	80	CY	\$1,500	\$120,000		\$120,000
	d	Exterior concrete apron @ East entrance door	3	CY	\$100	\$300		\$300
	e	Retaining walls	50	CY	\$1,500	\$75,000		\$75,000
	f	Housekeeping pads	1	LS	\$5,000	\$5,000		\$5,000
	g	Concrete site stairs	5	CY	\$1,500	\$7,500		\$7,500
	h	Pier at bottom of exterior aluminum stair	2	CY	\$1,000	\$2,000		\$2,000
	i	Pier at bottom of room aluminum stair	2	CY	\$1,000	\$2,000		\$2,000
	j	Concrete at pipe penetration into existing rapid mix tank	2	CY	\$2,000	\$4,000		\$4,000
	k	Concrete infill at existing building brick removal	5	CY	\$1,200	\$6,000		\$6,000
	l	Concrete fillets	9	LS	\$1,000	\$9,000		\$9,000
	m	Concrete fillets and fill	15	LS	\$800	\$12,000		\$12,000
	n	Raise Overflow Weirs in Contact Tanks	1	CY	\$1,200	\$1,200	\$3,200	\$4,400
03410	2	Precast Structural Concrete						
	a	Double tee roof planks	3,355	SF	\$160	\$536,800		\$536,800
SUBTOTAL - DIVISION 3								\$1,828,000

ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST								Tighe & Bond	
Project:		West River Water Treatment Plant Dissolved Air Flotation Upgrade Project							
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Estimate Type:		<input type="checkbox"/> Conceptual <input type="checkbox"/> Preliminary Design <input checked="" type="checkbox"/> Design Development		<input type="checkbox"/> Construction <input type="checkbox"/> Change Order 50 % Complete		Prepared By: Tighe & Bond Date Prepared: 11/25/2020 T&B Project No.: S-1889-30			
Spec. Section	Item No.	Description	Qty	Units	Material/Installed Cost		Installation		
					\$/Unit	Total	Total	Total	
DIVISION 4 - MASONRY									
04810	1	Unit Masonry Assembly							
	a	8" Glazed CMU & 4" Brick exterior wall	2,445	SF	\$90	\$220,050			\$220,050
	b	8" CMU & 4" Brick Exterior Wall @ Electrical Room & Parapets	830	SF	\$75	\$62,250			\$62,250
	c	8" CMU Interior Walls	600	SF	\$35	\$21,000			\$21,000
	d	Brick Cavity Wall at Pipe Gallery	1,030	SF	\$60	\$61,800			\$61,800
	e	Brick removal on existing Filter Building	250	SF	\$25	\$6,250			\$6,250
	f	Brick removal and reinstallation to install flashing on existing Filter Building	50	SF	\$55	\$2,750			\$2,750
	g	Miscellaneous masonry repairs at new door opening in existing Filter Building	1	LS	\$1,500	\$1,500			\$1,500
SUBTOTAL - DIVISION 4									\$375,600
DIVISION 5 - METALS									
05500	1	Miscellaneous Metals							
	a	Aluminum Grating	700	SF	\$45	\$31,500			\$31,500
	b	Exterior Stair Risers	17	EA	\$300	\$5,100			\$5,100
	c	Interior Stair Risers	30	EA	\$300	\$9,000			\$9,000
	d	Exterior Roof Stair Risers	29	EA	\$300	\$8,700			\$8,700
	e	Aluminum Guardrail - Exterior Lower Bridge & Stairs	120	LF	\$115	\$13,800			\$13,800
	f	Aluminum Guardrail and Gates - Floc Tank and DAF Basins	250	LF	\$115	\$28,750			\$28,750
	g	Aluminum Guardrail - Pipe Gallery Stairs	65	LF	\$115	\$7,475			\$7,475
	h	Aluminum Guardrail - Roof Perimeter	220	LF	\$115	\$25,300			\$25,300
	i	Aluminum Guardrail - Roof on Filter Building	50	LF	\$115	\$5,750			\$5,750
	j	Aluminum Guardrail - Roof Bridge	40	LF	\$115	\$4,600			\$4,600
	k	Aluminum Guardrail - Roof Access Stairs	36	LF	\$115	\$4,140			\$4,140
	l	Aluminum Structural Framing - Exterior Walkway & Stairs	1,350	LB	\$20	\$27,000			\$27,000
	m	Aluminum Structural Framing - Interior Grating and Pump Support	600	LB	\$20	\$12,000			\$12,000
	n	Aluminum Structural Framing - Exterior Roof Stairs and Walkway	1,200	LB	\$20	\$24,000			\$24,000
	o	Aluminum Structural Framing - Interior Pipe Gallery Stair	1,250	LB	\$20	\$25,000			\$25,000
	p	Galvanized Steel Lintels	2,566	LB	\$10	\$25,660			\$25,660
	q	Galvanized Steel Lateral Support Angles at Top of Interior CMU Walls	120	LB	\$10	\$1,200			\$1,200
	r	Stainless Steel Weir Plates & Angles	3,200	LB	\$25	\$80,000			\$80,000
	s	Aluminum Gutters	132	FT	\$40	\$5,280			\$5,280
SUBTOTAL - DIVISION 5									\$344,255
DIVISION 6 - WOOD & PLASTICS									
06100	1	Rough Carpentry							
	a	Rough Carpentry	1	LS	\$5,000	\$5,000			\$5,000
	b	Miscellaneous Items	1	LS	\$5,000	\$5,000			\$5,000
SUBTOTAL - DIVISION 6									\$10,000

ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST								Tighe & Bond	
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Estimate Type:		<input type="checkbox"/> Conceptual <input type="checkbox"/> Preliminary Design <input checked="" type="checkbox"/> Design Development		<input type="checkbox"/> Construction <input type="checkbox"/> Change Order 50 % Complete		Prepared By: Tighe & Bond Date Prepared: 11/25/2020 T&B Project No.: S-1889-30			
Spec. Section	Item No.	Description	Qty	Units	Material/Installed Cost		Installation		
					\$/Unit	Total	Total	Total	
DIVISION 7 - THERMAL & MOISTURE PROTECTION									
07110	1	Dampproofing behind retaining walls	600	SF	\$3	\$1,800			\$1,800
07170	2	Bentonite Waterproofing - Under Slab and Foundation Walls	6,538	SF	\$10	\$65,379			\$65,379
07210	3	Building Insulation							
	a	Foundation Insulation	1,120	SF	\$3	\$3,360			\$3,360
	b	Building Insulation	4,550	SF	\$3	\$13,650			\$13,650
	c	Roofing Insulation	3,355	SF	\$3	\$10,065			\$10,065
07541	4	Thermoplastic Membrane Roofing System	3,355	SF	\$25	\$83,875			\$83,875
07620	5	Sheet Metal Flashing and Trim							
	a	Painted Metal Trim, Gutters & Downspouts	260	LF	\$50	\$13,000			\$13,000
	b	Painted Metal Coping	101	LF	\$75	\$7,575			\$7,575
07920	7	Joint Sealants	1	LS	\$15,000	\$15,000			\$15,000
SUBTOTAL - DIVISION 7									\$213,704
DIVISION 8 - DOORS & WINDOWS									
08110	1	Steel Doors & Frames							
	a	Exterior Insulated Double Door	1	EA	\$5,000	\$5,000			\$5,000
	b	Electrical Room Double Door	1	EA	\$5,000	\$5,000			\$5,000
08410	2	Aluminum Framed Storefront Door & Windows							
	a	Exterior Door In DAF Building	1	EA	\$4,000	\$4,000			\$4,000
	b	New Exterior Door in Existing Filter Building	1	EA	\$4,000	\$4,000			\$4,000
	c	Windows in DAF Building	7	EA	\$3,000	\$21,000			\$21,000
	d	New Windows in Existing Filter Building	3	EA	\$3,000	\$9,000			\$9,000
SUBTOTAL - DIVISION 8									\$48,000
DIVISION 9 - FINISHES									
09900	1	Painting							
	a	Walls	1,200	SF	\$6	\$7,200			\$7,200
	b	Piping (36" Influent, 36" Effluent, and Drain Piping)	500	SF	\$10	\$5,000			\$5,000
	c	Doors	80	SF	\$10	\$800			\$800
	d	Miscellaneous (Equipment to be Painted)	1	LS	\$5,000	\$5,000			\$5,000
SUBTOTAL - DIVISION 9									\$18,000
DIVISION 10 - SPECIALTIES									
10440	1	Signage	1	LS	\$5,000	\$5,000			\$5,000
10522	2	Fire Extinguishers and Accessories	1	LS	\$525	\$525			\$525
SUBTOTAL - DIVISION 10									\$5,525

ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST **Tighe & Bond**

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Location: Woodbridge, CT

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 Change Order
 50 % Complete

Prepared By: Tighe & Bond
 Date Prepared: 11/25/2020
 T&B Project No.: S-1889-30

Spec. Section	Item No.	Description	Qty	Units	Material/Installed Cost		Installation	Total
					\$/Unit	Total	Total	
DIVISION 11 - EQUIPMENT								
11210	1	Pumping Equipment						
	a	Sump Pump	1	EA	\$1,500	\$1,500		\$1,500
11228	2	Packaged Dissolved Air Flotation System	1	LS	\$900,000	\$900,000	\$360,000	\$1,260,000
	a	Recycle Pumps (including standby)	3	EA	Included			
	b	Saturation Tank & Accessories	2	EA	Included			
	c	Air Compressors	2	EA	Included			
	d	Mechanical Weir	2	EA	Included			
	e	Mixers	4	EA	Included			
	f	Influent Weir	2	EA	Included			
	g	Air Header Manifold	2	Sets	Included			
	h	Collection System	2	Sets	Included			
	i	Wash Water System & Valves	2	Sets	Included			
	j	Control Panel	2	EA	Included			
SUBTOTAL - DIVISION 11								\$1,261,500
DIVISION 13 - SPECIAL CONSTRUCTION								
	1	PCB Abatement	1	LS	\$10,000	\$10,000		\$10,000
13220	2	Filter Underdrain	2,400	SF	\$200	\$480,000	\$192,000	\$672,000
13222	3	Removal of Existing Filter Media	250	CY	\$325	\$81,250		\$81,250
13223	4	Filter Media						
	a	10" Sand	75	CY	\$160	\$12,000	\$20,000	\$32,000
	b	36" Anthracite	284	CY	\$370	\$104,895	\$70,000	\$174,895
13420	5	Instrumentation						
	a	Level Transmitter	2	EA	\$4,000	\$8,000		\$8,000
	b	Turbidimeter	1	EA	\$4,000	\$4,000		\$4,000
	c	Miscellaneous	1	LS	\$5,000	\$5,000		\$5,000
13850	6	Fire Alarm System	1	LS	\$5,000	\$5,000		\$5,000
13860	7	Intrusion Detection Systems	1	LS	\$5,000	\$5,000		\$5,000
SUBTOTAL - DIVISION 13								\$997,145

ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

Tighe & Bond

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Construction
 Change Order
 50 % Complete

Prepared By: Tighe & Bond
 Date Prepared: 11/25/2020
 T&B Project No.: S-1889-30

Spec. Section	Item No.	Description	Qty	Units	Material/Installed Cost		Installation Total	Total
					\$/Unit	Total		
DIVISION 15 - MECHANICAL								
15080	1	Mechanical Insulation						
	a	1-1/2 inch Water line	110	LF	\$10	\$1,100		\$1,100
	b	1-1/2 inch Polymer Feed Line	90	LF	\$10	\$900		\$900
	c	3" Plant Water Piping	150	LF	\$15	\$2,250		\$2,250
15101	2	Ductile Iron Pipe and Fittings						
	a	DAF Effluent						
		42" Wall Pipe	1	EA	\$3,000	\$3,000		\$3,000
		36" DI Pipe	20	LF	\$310	\$6,200		\$6,200
		42" DI Pipe	20	LF	\$330	\$6,600		\$6,600
		36" Tee	1	EA	\$24,000	\$24,000	\$1,780	\$25,780
		42" DI Elbow	1	EA	\$12,000	\$12,000	\$1,780	\$13,780
		36" 45 Degree Elbow	2	EA	\$16,000	\$32,000	\$3,560	\$35,560
		42" Romac RC400 Steel Coupling	1	EA	\$4,000	\$4,000	\$1,780	\$5,780
		Link seal 525-C	66	EA	\$30	\$1,980		\$1,980
		36" FL x PE CL X 3-6	1	EA	\$3,000	\$3,000	\$1,780	\$4,780
		36" FL x FL CL x 2-0	1	EA	\$4,000	\$4,000	\$1,780	\$5,780
		36" Flange Full Face Gasket	14	EA	\$260	\$3,640		\$3,640
	b	DAF Influent						
		42" DI Pipe	75	LF	\$330	\$24,750		\$24,750
		42" 45 Degree Elbow	3	EA	\$16,000	\$48,000	\$5,340	\$53,340
		42" x 36" Tee	3	EA	\$25,000	\$75,000	\$5,340	\$80,340
		36" DI 90 Degree Elbow	3	EA	\$20,000	\$60,000	\$5,340	\$65,340
		36" Seal and Sleeve	3	EA	\$3,000	\$9,000	\$2,670	\$11,670
		42" MJ Cap	1	EA	\$4,200	\$4,200	\$890	\$5,090
		36" Influent Pipe	15	LF	\$310	\$4,650		\$4,650
		42" Wall Pipe	1	EA	\$1,400	\$1,400		\$1,400
		42" Romac RC400 Steel Coupling	1	EA	\$4,000	\$4,000		\$4,000
		36" Romagrip Accessory Pack	3	EA	\$2,500	\$7,500		\$7,500
		42" Romagrip Accessory Pack	9	EA	\$4,000	\$36,000		\$36,000
		36" FI x PE CL x 6-0	3	EA	\$8,000	\$24,000		\$24,000
		Link seal 525-C	38	EA	\$30	\$1,140		\$1,140
	c	Bolts	600	EA	\$50	\$30,000		\$30,000
	d	Hex Nut	600	EA	\$20	\$12,000		\$12,000
	e	18" DI Process Drain	75	LF	\$150	\$11,250		\$11,250
	f	6" Floc Tank Drain Lines	60	LF	\$110	\$6,600		\$6,600
	g	6" Recycle Pipe	140	LF	\$110	\$15,400		\$15,400
	h	Rigid Insulation for 36"	10	LF	\$7	\$70		\$70
	i	3" Plant Water Piping	150	LF	\$85	\$12,750		\$12,750

ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

Tighe & Bond

Project: West River Water Treatment Plant Dissolved Air Flotation Upgrade Project
Location: Woodbridge, CT

Estimate Type: Conceptual
 Preliminary Design
 Design Development

Construction
 Change Order
 50 % Complete

Prepared By: Tighe & Bond
 Date Prepared: 11/25/2020
 T&B Project No.: S-1889-30

Spec. Section	Item No.	Description	Qty	Units	Material/Installed Cost		Installation	
					\$/Unit	Total	Total	Total
15102	3	Carbon Steel Piping for Propane						
	a	3/4" pipe	150	LF	\$50	\$7,500		\$7,500
	b	Fittings	1	EA	\$3,000	\$3,000		\$3,000
15103	4	Copper Pipe and Fittings						
	a	1-1/2" Cold Water Piping	110	LF	\$85	\$9,350		\$9,350
	b	1-1/2" Process Water Piping	150	LF	\$85	\$12,750		\$12,750
15104	5	Plastic Pipe and Fittings						
	a	1-1/2" Polymer Feed Piping	100	LF	\$110	\$11,000		\$11,000
15110	6	Valves						
	a	Flap Valves	6	EA	\$500	\$3,000		\$3,000
	b	36" Butterfly Valves (DAF Influent, Effluent)	4	EA	\$25,000	\$100,000	\$16,000	\$116,000
	c	6" Mud Valves	3	EA	\$2,000	\$6,000		\$6,000
	d	3/4" Ball valves for Propane	5	EA	\$200	\$1,000		\$1,000
15120	7	Piping Specialties						
	a	Hose bibbs	2	EA	\$250	\$500		\$500
15150	8	Sanitary Waste and Vent Piping						
	a	1 1/2" Sump Pump Drain Pipe	100	LF	\$110	\$11,000		\$11,000
15951	9	Fuel Fired Unit Heaters (Gas)						
	a	GUH	2	EA	\$3,000	\$6,000		\$6,000
	b	Vent	2	EA	\$1,500	\$3,000		\$3,000
15721	10	Air Handling Units	1	LS	\$35,000	\$35,000		\$35,000
15733	11	Split System AC Unit	1	LS	\$7,500	\$7,500	\$6,000	\$13,500
15810	12	Ducts						
	a	14" Diameter Duct	20	LF	\$135	\$2,700		\$2,700
	b	16" Diameter Duct	15	LF	\$175	\$2,625		\$2,625
	c	20" Diameter Duct	15	LF	\$240	\$3,600		\$3,600
	d	22" Diameter Duct	10	LF	\$260	\$2,600		\$2,600
	e	27" Diameter Duct	10	LF	\$350	\$3,500		\$3,500
	f	10" x 10" Duct	25	LF	\$115	\$2,875		\$2,875
	g	8" x 8" Duct	30	LF	\$115	\$3,450		\$3,450
15820	13	Ductwork Accessories						
	a	20" x 10" Supply Grille	4	EA	\$110	\$440		\$440
	b	8" x 8" Supply Grille	2	EA	\$80	\$160		\$160
	c	6" x 6" Supply Grille	1	EA	\$70	\$70		\$70
	d	28" x 14" Return/Exhaust inlet Grille	3	EA	\$130	\$390		\$390
	e	transitions as shown	1	LS	\$9,000	\$9,000		\$9,000

ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

Tighe & Bond

Project: West River Water Treatment Plant Dissolved Air Flotation Upgrade Project
Location: Woodbridge, CT

Estimate Type: Conceptual
 Preliminary Design
 Design Development

Construction
 Change Order
 50 % Complete

Prepared By: Tighe & Bond
 Date Prepared: 11/25/2020
 T&B Project No.: S-1889-30

Spec. Section	Item No.	Description	Qty	Units	Material/Installed Cost		Installation	Total
					\$/Unit	Total	Total	
15850	14	Air Outlets and Inlets						
	a	Louvers (L-1)	1	EA	\$600	\$600		\$600
	c	Exhaust Fan (EF-1)	1	EA	\$6,000	\$6,000		\$6,000
15935	15	HVAC Control System	1	LS	\$20,000	\$20,000		\$20,000
15950	16	Testing, Adjusting, and Balancing	1	LS	\$3,000	\$3,000		\$3,000
	18	Davit	2	EA	\$5,000	\$10,000		\$10,000
SUBTOTAL - DIVISION 15								
DIVISION 16 - ELECTRICAL								
16091	1	Minor Electrical Demolition	1	LS	\$20,000	\$20,000		\$20,000
16120	2	Conductors and Cable	1	LS	\$30,000	\$30,000		\$30,000
16131	3	Conduit	1	LS	\$75,000	\$75,000		\$75,000
16140	4	Wiring Devices	1	LS	\$15,000	\$15,000		\$15,000
16410	5	Enclosed Switches and Circuit Breakers	1	LS	\$15,000	\$15,000		\$15,000
16440	6	Panelboards	1	LS	\$15,000	\$15,000		\$15,000
16445	7	Motor Control Centers	1	LS	\$200,000	\$200,000		\$200,000
16460	8	Dry Type Transformers	1	LS	\$15,000	\$15,000		\$15,000
16500	9	Luminaries	1	LS	\$30,000	\$30,000		\$30,000
16520	10	Exterior Luminaries	1	LS	\$5,000	\$5,000		\$5,000
	11	SCADA Integration	1	LS	\$15,000	\$15,000		\$15,000
SUBTOTAL - DIVISION 16								
SUBTOTAL CONSTRUCTION COST						\$7,309,087	\$699,240	\$8,008,327
Escalation (from Nov. 2020 to Mid-Point Construction Nov. 2021)								\$160,167
TOTAL CONSTRUCTION COST								\$8,168,493
CONSTRUCTION PHASE ENGINEERING					@	12%		\$980,219
CONTINGENCY					@	15%		\$1,225,274
TOTAL							SAY	\$10,373,986
								\$10,400,000

Appendix I

American Association of Cost Engineers (AACE) standards

AACE International Recommended Practice No. 18R-97

**COST ESTIMATE CLASSIFICATION SYSTEM – AS APPLIED IN
ENGINEERING, PROCUREMENT, AND CONSTRUCTION FOR
THE PROCESS INDUSTRIES**

TCM Framework: 7.3 – Cost Estimating and Budgeting

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COST ESTIMATE CLASSIFICATION SYSTEM – AS APPLIED IN ENGINEERING, PROCUREMENT, AND CONSTRUCTION FOR THE PROCESS INDUSTRIES

TCM Framework: 7.3 – Cost Estimating and Budgeting



February 2, 2005

PURPOSE

As a recommended practice of AACE International, the Cost Estimate Classification System provides guidelines for applying the general principles of estimate classification to project cost estimates (i.e., cost estimates that are used to evaluate, approve, and/or fund projects). The Cost Estimate Classification System maps the phases and stages of project cost estimating together with a generic maturity and quality matrix, which can be applied across a wide variety of industries.

This addendum to the generic recommended practice provides guidelines for applying the principles of estimate classification specifically to project estimates for engineering, procurement, and construction (EPC) work for the process industries. This addendum supplements the generic recommended practice (17R-97) by providing:

- a section that further defines classification concepts as they apply to the process industries;
- charts that compare existing estimate classification practices in the process industry; and
- a chart that maps the extent and maturity of estimate input information (project definition deliverables) against the class of estimate.

As with the generic standard, an intent of this addendum is to improve communications among all of the stakeholders involved with preparing, evaluating, and using project cost estimates specifically for the process industries.

It is understood that each enterprise may have its own project and estimating processes and terminology, and may classify estimates in particular ways. This guideline provides a generic and generally acceptable classification system for process industries that can be used as a basis to compare against. It is hoped that this addendum will allow each user to better assess, define, and communicate their own processes and standards in the light of generally-accepted cost engineering practice.

INTRODUCTION

For the purposes of this addendum, the term process industries is assumed to include firms involved with the manufacturing and production of chemicals, petrochemicals, and hydrocarbon processing. The common thread among these industries (for the purpose of estimate classification) is their reliance on process flow diagrams (PFDs) and piping and instrument diagrams (P&IDs) as primary scope defining documents. These documents are key deliverables in determining the level of project definition, and thus the extent and maturity of estimate input information.

Estimates for process facilities center on mechanical and chemical process equipment, and they have significant amounts of piping, instrumentation, and process controls involved. As such, this addendum may apply to portions of other industries, such as pharmaceutical, utility, metallurgical, converting, and similar industries. Specific addendums addressing these industries may be developed over time.

This addendum specifically does not address cost estimate classification in nonprocess industries such as commercial building construction, environmental remediation, transportation infrastructure, "dry" processes such as assembly and manufacturing, "soft asset" production such as software development, and similar industries. It also does not specifically address estimates for the exploration, production, or transportation of mining or hydrocarbon materials, although it may apply to some of the intermediate processing steps in these systems.

The cost estimates covered by this addendum are for engineering, procurement, and construction (EPC) work only. It does not cover estimates for the products manufactured by the process facilities, or for research and development work in support of the process industries. This guideline does not cover the



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significant building construction that may be a part of process plants. Building construction will be covered in a separate addendum.

This guideline reflects generally-accepted cost engineering practices. This addendum was based upon the practices of a wide range of companies in the process industries from around the world, as well as published references and standards. Company and public standards were solicited and reviewed by the AACE International Cost Estimating Committee. The practices were found to have significant commonalities that are conveyed in this addendum.

COST ESTIMATE CLASSIFICATION MATRIX FOR THE PROCESS INDUSTRIES

The five estimate classes are presented in figure 1 in relationship to the identified characteristics. Only the level of project definition determines the estimate class. The other four characteristics are secondary characteristics that are generally correlated with the level of project definition, as discussed in the generic standard. The characteristics are typical for the process industries but may vary from application to application.

This matrix and guideline provide an estimate classification system that is specific to the process industries. Refer to the generic standard for a general matrix that is non-industry specific, or to other addendums for guidelines that will provide more detailed information for application in other specific industries. These will typically provide additional information, such as input deliverable checklists to allow meaningful categorization in those particular industries.

ESTIMATE CLASS	Primary Characteristic	Secondary Characteristic			
	LEVEL OF PROJECT DEFINITION Expressed as % of complete definition	END USAGE Typical purpose of estimate	METHODOLOGY Typical estimating method	EXPECTED ACCURACY RANGE Typical variation in low and high ranges [a]	PREPARATION EFFORT Typical degree of effort relative to least cost index of 1 [b]
Class 5	0% to 2%	Concept Screening	Capacity Factored, Parametric Models, Judgment, or Analogy	L: -20% to -50% H: +30% to +100%	1
Class 4	1% to 15%	Study or Feasibility	Equipment Factored or Parametric Models	L: -15% to -30% H: +20% to +50%	2 to 4
Class 3	10% to 40%	Budget, Authorization, or Control	Semi-Detailed Unit Costs with Assembly Level Line Items	L: -10% to -20% H: +10% to +30%	3 to 10
Class 2	30% to 70%	Control or Bid/Tender	Detailed Unit Cost with Forced Detailed Take-Off	L: -5% to -15% H: +5% to +20%	4 to 20
Class 1	50% to 100%	Check Estimate or Bid/Tender	Detailed Unit Cost with Detailed Take-Off	L: -3% to -10% H: +3% to +15%	5 to 100

- Notes: [a] The state of process technology and availability of applicable reference cost data affect the range markedly. The +/- value represents typical percentage variation of actual costs from the cost estimate after application of contingency (typically at a 50% level of confidence) for given scope.
- [b] If the range index value of "1" represents 0.005% of project costs, then an index value of 100 represents 0.5%. Estimate preparation effort is highly dependent upon the size of the project and the quality of estimating data and tools.

Figure 1. – Cost Estimate Classification Matrix for Process Industries
CHARACTERISTICS OF THE ESTIMATE CLASSES

The following charts (figures 2a through 2e) provide detailed descriptions of the five estimate classifications as applied in the process industries. They are presented in the order of least-defined estimates to the most-defined estimates. These descriptions include brief discussions of each of the estimate characteristics that define an estimate class.

For each chart, the following information is provided:

- **Description:** a short description of the class of estimate, including a brief listing of the expected estimate inputs based on the level of project definition.
- **Level of Project Definition Required:** expressed as a percent of full definition. For the process industries, this correlates with the percent of engineering and design complete.
- **End Usage:** a short discussion of the possible end usage of this class of estimate.
- **Estimating Methods Used:** a listing of the possible estimating methods that may be employed to develop an estimate of this class.
- **Expected Accuracy Range:** typical variation in low and high ranges after the application of contingency (determined at a 50% level of confidence). Typically, this results in a 90% confidence that the actual cost will fall within the bounds of the low and high ranges.
- **Effort to Prepare:** this section provides a typical level of effort (in hours) to produce a complete estimate for a US\$20,000,000 plant. Estimate preparation effort is highly dependent on project size, project complexity, estimator skills and knowledge, and on the availability of appropriate estimating cost data and tools.
- **ANSI Standard Reference (1989) Name:** this is a reference to the equivalent estimate class in the existing ANSI standards.
- **Alternate Estimate Names, Terms, Expressions, Synonyms:** this section provides other commonly used names that an estimate of this class might be known by. These alternate names are not endorsed by this Recommended Practice. The user is cautioned that an alternative name may not always be correlated with the class of estimate as identified in the chart.

CLASS 5 ESTIMATE	
<p>Description: Class 5 estimates are generally prepared based on very limited information, and subsequently have wide accuracy ranges. As such, some companies and organizations have elected to determine that due to the inherent inaccuracies, such estimates cannot be classified in a conventional and systemic manner. Class 5 estimates, due to the requirements of end use, may be prepared within a very limited amount of time and with little effort expended—sometimes requiring less than an hour to prepare. Often, little more than proposed plant type, location, and capacity are known at the time of estimate preparation.</p> <p>Level of Project Definition Required: 0% to 2% of full project definition.</p> <p>End Usage: Class 5 estimates are prepared for any number of strategic business planning purposes, such as but not limited to market studies, assessment of initial viability, evaluation of alternate schemes, project screening, project location studies, evaluation of resource needs and budgeting, long-range capital planning, etc.</p>	<p>Estimating Methods Used: Class 5 estimates virtually always use stochastic estimating methods such as cost/capacity curves and factors, scale of operations factors, Lang factors, Hand factors, Chilton factors, Peters-Timmerhaus factors, Guthrie factors, and other parametric and modeling techniques.</p> <p>Expected Accuracy Range: Typical accuracy ranges for Class 5 estimates are - 20% to -50% on the low side, and +30% to +100% on the high side, depending on the technological complexity of the project, appropriate reference information, and the inclusion of an appropriate contingency determination. Ranges could exceed those shown in unusual circumstances.</p> <p>Effort to Prepare (for US\$20MM project): As little as 1 hour or less to perhaps more than 200 hours, depending on the project and the estimating methodology used.</p> <p>ANSI Standard Reference Z94.2-1989 Name: Order of magnitude estimate (typically -30% to +50%).</p> <p>Alternate Estimate Names, Terms, Expressions, Synonyms: Ratio, ballpark, blue sky, seat-of-pants, ROM, idea study, prospect estimate, concession license estimate, guesstimate, rule-of-thumb.</p>

Figure 2a. – Class 5 Estimate

CLASS 4 ESTIMATE	
<p>Description: Class 4 estimates are generally prepared based on limited information and subsequently have fairly wide accuracy ranges. They are typically used for project screening, determination of feasibility, concept evaluation, and preliminary budget approval. Typically, engineering is from 1% to 15% complete, and would comprise at a minimum the following: plant capacity, block schematics, indicated layout, process flow diagrams (PFDs) for main process systems, and preliminary engineered process and utility equipment lists.</p> <p>Level of Project Definition Required: 1% to 15% of full project definition.</p> <p>End Usage: Class 4 estimates are prepared for a number of purposes, such as but not limited to, detailed strategic planning, business development, project screening at more developed stages, alternative scheme analysis, confirmation of economic and/or technical feasibility, and preliminary budget approval or approval to proceed to next stage.</p>	<p>Estimating Methods Used: Class 4 estimates virtually always use stochastic estimating methods such as equipment factors, Lang factors, Hand factors, Chilton factors, Peters-Timmerhaus factors, Guthrie factors, the Miller method, gross unit costs/ratios, and other parametric and modeling techniques.</p> <p>Expected Accuracy Range: Typical accuracy ranges for Class 4 estimates are -15% to -30% on the low side, and +20% to +50% on the high side, depending on the technological complexity of the project, appropriate reference information, and the inclusion of an appropriate contingency determination. Ranges could exceed those shown in unusual circumstances.</p> <p>Effort to Prepare (for US\$20MM project): Typically, as little as 20 hours or less to perhaps more than 300 hours, depending on the project and the estimating methodology used.</p> <p>ANSI Standard Reference Z94.2-1989 Name: Budget estimate (typically -15% to + 30%).</p> <p>Alternate Estimate Names, Terms, Expressions, Synonyms: Screening, top-down, feasibility, authorization, factored, pre-design, pre-study.</p>

Figure 2b. – Class 4 Estimate

CLASS 3 ESTIMATE	
<p>Description: Class 3 estimates are generally prepared to form the basis for budget authorization, appropriation, and/or funding. As such, they typically form the initial control estimate against which all actual costs and resources will be monitored. Typically, engineering is from 10% to 40% complete, and would comprise at a minimum the following: process flow diagrams, utility flow diagrams, preliminary piping and instrument diagrams, plot plan, developed layout drawings, and essentially complete engineered process and utility equipment lists.</p> <p>Level of Project Definition Required: 10% to 40% of full project definition.</p> <p>End Usage: Class 3 estimates are typically prepared to support full project funding requests, and become the first of the project phase "control estimates" against which all actual costs and resources will be monitored for variations to the budget. They are used as the project budget until replaced by more detailed estimates. In many owner organizations, a Class 3 estimate may be the last estimate required and could well form the only basis for cost/schedule control.</p>	<p>Estimating Methods Used: Class 3 estimates usually involve more deterministic estimating methods than stochastic methods. They usually involve a high degree of unit cost line items, although these may be at an assembly level of detail rather than individual components. Factoring and other stochastic methods may be used to estimate less-significant areas of the project.</p> <p>Expected Accuracy Range: Typical accuracy ranges for Class 3 estimates are -10% to -20% on the low side, and +10% to +30% on the high side, depending on the technological complexity of the project, appropriate reference information, and the inclusion of an appropriate contingency determination. Ranges could exceed those shown in unusual circumstances.</p> <p>Effort to Prepare (for US\$20MM project): Typically, as little as 150 hours or less to perhaps more than 1,500 hours, depending on the project and the estimating methodology used.</p> <p>ANSI Standard Reference Z94.2-1989 Name: Budget estimate (typically -15% to + 30%).</p> <p>Alternate Estimate Names, Terms, Expressions, Synonyms: Budget, scope, sanction, semi-detailed, authorization, preliminary control, concept study, development, basic engineering phase estimate, target estimate.</p>

Figure 2c. – Class 3 Estimate

CLASS 2 ESTIMATE	
<p>Description: Class 2 estimates are generally prepared to form a detailed control baseline against which all project work is monitored in terms of cost and progress control. For contractors, this class of estimate is often used as the "bid" estimate to establish contract value. Typically, engineering is from 30% to 70% complete, and would comprise at a minimum the following: process flow diagrams, utility flow diagrams, piping and instrument diagrams, heat and material balances, final plot plan, final layout drawings, complete engineered process and utility equipment lists, single line diagrams for electrical, electrical equipment and motor schedules, vendor quotations, detailed project execution plans, resourcing and work force plans, etc.</p> <p>Level of Project Definition Required: 30% to 70% of full project definition.</p> <p>End Usage: Class 2 estimates are typically prepared as the detailed control baseline against which all actual costs and resources will now be monitored for variations to the budget, and form a part of the change/variation control program.</p>	<p>Estimating Methods Used: Class 2 estimates always involve a high degree of deterministic estimating methods. Class 2 estimates are prepared in great detail, and often involve tens of thousands of unit cost line items. For those areas of the project still undefined, an assumed level of detail takeoff (forced detail) may be developed to use as line items in the estimate instead of relying on factoring methods.</p> <p>Expected Accuracy Range: Typical accuracy ranges for Class 2 estimates are -5% to -15% on the low side, and +5% to +20% on the high side, depending on the technological complexity of the project, appropriate reference information, and the inclusion of an appropriate contingency determination. Ranges could exceed those shown in unusual circumstances.</p> <p>Effort to Prepare (for US\$20MM project): Typically, as little as 300 hours or less to perhaps more than 3,000 hours, depending on the project and the estimating methodology used. Bid estimates typically require more effort than estimates used for funding or control purposes.</p> <p>ANSI Standard Reference Z94.2-1989 Name: Definitive estimate (typically -5% to + 15%).</p> <p>Alternate Estimate Names, Terms, Expressions, Synonyms: Detailed control, forced detail, execution phase, master control, engineering, bid, tender, change order estimate.</p>

Figure 2d. – Class 2 Estimate

CLASS 1 ESTIMATE	
<p>Description: Class 1 estimates are generally prepared for discrete parts or sections of the total project rather than generating this level of detail for the entire project. The parts of the project estimated at this level of detail will typically be used by subcontractors for bids, or by owners for check estimates. The updated estimate is often referred to as the current control estimate and becomes the new baseline for cost/schedule control of the project. Class 1 estimates may be prepared for parts of the project to comprise a fair price estimate or bid check estimate to compare against a contractor's bid estimate, or to evaluate/dispute claims. Typically, engineering is from 50% to 100% complete, and would comprise virtually all engineering and design documentation of the project, and complete project execution and commissioning plans.</p> <p>Level of Project Definition Required: 50% to 100% of full project definition.</p> <p>End Usage: Class 1 estimates are typically prepared to form a current control estimate to be used as the final control baseline against which all actual costs and resources will now be monitored for variations to the budget, and form a part of the change/variation control program. They may be used to evaluate bid checking, to support vendor/contractor negotiations, or for claim evaluations and dispute resolution.</p>	<p>Estimating Methods Used: Class 1 estimates involve the highest degree of deterministic estimating methods, and require a great amount of effort. Class 1 estimates are prepared in great detail, and thus are usually performed on only the most important or critical areas of the project. All items in the estimate are usually unit cost line items based on actual design quantities.</p> <p>Expected Accuracy Range: Typical accuracy ranges for Class 1 estimates are -3% to -10% on the low side, and +3% to +15% on the high side, depending on the technological complexity of the project, appropriate reference information, and the inclusion of an appropriate contingency determination. Ranges could exceed those shown in unusual circumstances.</p> <p>Effort to Prepare (for US\$20MM project): Class 1 estimates require the most effort to create, and as such are generally developed for only selected areas of the project, or for bidding purposes. A complete Class 1 estimate may involve as little as 600 hours or less, to perhaps more than 6,000 hours, depending on the project and the estimating methodology used. Bid estimates typically require more effort than estimates used for funding or control purposes.</p> <p>ANSI Standard Reference Z94.2 Name: Definitive estimate (typically -5% to + 15%).</p> <p>Alternate Estimate Names, Terms, Expressions, Synonyms: Full detail, release, fall-out, tender, firm price, bottoms-up, final, detailed control, forced detail, execution phase, master control, fair price, definitive, change order estimate.</p>

Figure 2e. – Class 1 Estimate

COMPARISON OF CLASSIFICATION PRACTICES

Figures 3a through 3c provide a comparison of the estimate classification practices of various firms, organizations, and published sources against one another and against the guideline classifications. These tables permits users to benchmark their own classification practices.



AACE Classification Standard	ANSI Standard Z94.0	AACE Pre-1972	Association of Cost Engineers (UK) ACostE	Norwegian Project Management Association (NFP)	American Society of Professional Estimators (ASPE)
Class 5	Order of Magnitude Estimate -30/+50	Order of Magnitude Estimate	Order of Magnitude Estimate Class IV -30/+30	Concession Estimate	Level 1
				Exploration Estimate	
				Feasibility Estimate	
Class 4	Budget Estimate -15/+30	Study Estimate	Study Estimate Class III -20/+20	Authorization Estimate	Level 2
Class 3		Preliminary Estimate	Budget Estimate Class II -10/+10	Master Control Estimate	Level 3
Class 2	Definitive Estimate -5/+15	Definitive Estimate	Definitive Estimate Class I -5/+5	Current Control Estimate	Level 4
Class 1		Detailed Estimate			Level 5
					Level 6

Figure 3a. – Comparison of Classification Practices

AAACE Classification Standard	Major Consumer Products Company (Confidential)	Major Oil Company (Confidential)	Major Oil Company (Confidential)	Major Oil Company (Confidential)
Class 5	Class 5 Strategic Estimate	Class V Order of Magnitude Estimate	Class A Prospect Estimate	Class V
			Class B Evaluation Estimate	
Class 4	Class 1 Conceptual Estimate	Class IV Screening Estimate	Class C Feasibility Estimate	Class IV
			Class D Development Estimate	
Class 3	Class 2 Semi-Detailed Estimate	Class III Primary Control Estimate	Class E Preliminary Estimate	Class III
			Class F Master Control Estimate	
Class 2	Class 3 Detailed Estimate	Class II Master Control Estimate	Class F Master Control Estimate	Class II
			Class I Current Control Estimate	
Class 1		Class I Current Control Estimate	Current Control Estimate	Class I

Figure 3b. – Comparison of Classification Practices

AAACE Classification Standard	J.R. Heizelman, 1988 AAACE Transactions [1]	K.T. Yeo, The Cost Engineer, 1989 [2]	Stevens & Davis, 1988 AAACE Transactions [3]	P. Behrenbruck, Journal of Petroleum Technology, 1993 [4]
Class 5	Class V	Class V Order of Magnitude	Class III*	Order of Magnitude
Class 4	Class IV	Class IV Factor Estimate	Class II	Study Estimate
Class 3	Class III	Class III Office Estimate		Budget Estimate
Class 2	Class II	Class II Definitive Estimate	Class I	Control Estimate
Class 1	Class I	Class I Final Estimate		

- [1] John R. Heizelman, ARCO Oil & Gas Co., 1988 AAACE Transactions, Paper V3.7
- [2] K.T. Yeo, The Cost Engineer, Vol. 27, No. 6, 1989
- [3] Stevens & Davis, BP International Ltd., 1988 AAACE Transactions, Paper B4.1 (* Class III is inferred)
- [4] Peter Behrenbruck, BHP Petroleum Pty., Ltd., article in Petroleum Technology, August 1993

Figure 3c. – Comparison of Classification Practices

ESTIMATE INPUT CHECKLIST AND MATURITY MATRIX

Figure 4 maps the extent and maturity of estimate input information (deliverables) against the five estimate classification levels. This is a checklist of basic deliverables found in common practice in the process industries. The maturity level is an approximation of the degree of completion of the deliverable. The degree of completion is indicated by the following letters.

- None (blank): development of the deliverable has not begun.
- Started (S): work on the deliverable has begun. Development is typically limited to sketches, rough outlines, or similar levels of early completion.
- Preliminary (P): work on the deliverable is advanced. Interim, cross-functional reviews have usually been conducted. Development may be near completion except for final reviews and approvals.
- Complete (C): the deliverable has been reviewed and approved as appropriate.

General Project Data:	ESTIMATE CLASSIFICATION				
	CLASS 5	CLASS 4	CLASS 3	CLASS 2	CLASS 1
Project Scope Description	General	Preliminary	Defined	Defined	Defined
Plant Production/Facility Capacity	Assumed	Preliminary	Defined	Defined	Defined
Plant Location	General	Approximate	Specific	Specific	Specific
Soils & Hydrology	None	Preliminary	Defined	Defined	Defined
Integrated Project Plan	None	Preliminary	Defined	Defined	Defined
Project Master Schedule	None	Preliminary	Defined	Defined	Defined
Escalation Strategy	None	Preliminary	Defined	Defined	Defined
Work Breakdown Structure	None	Preliminary	Defined	Defined	Defined
Project Code of Accounts	None	Preliminary	Defined	Defined	Defined
Contracting Strategy	Assumed	Assumed	Preliminary	Defined	Defined
Engineering Deliverables:					
Block Flow Diagrams	S/P	P/C	C	C	C
Plot Plans		S	P/C	C	C
Process Flow Diagrams (PFDs)		S/P	P/C	C	C
Utility Flow Diagrams (UFDs)		S/P	P/C	C	C
Piping & Instrument Diagrams (P&IDs)		S	P/C	C	C
Heat & Material Balances		S	P/C	C	C
Process Equipment List		S/P	P/C	C	C
Utility Equipment List		S/P	P/C	C	C
Electrical One-Line Drawings		S/P	P/C	C	C
Specifications & Datasheets		S	P/C	C	C
General Equipment Arrangement Drawings		S	P/C	C	C
Spare Parts Listings			S/P	P	C
Mechanical Discipline Drawings			S	P	P/C
Electrical Discipline Drawings			S	P	P/C
Instrumentation/Control System Discipline Drawings			S	P	P/C
Civil/Structural/Site Discipline Drawings			S	P	P/C

Figure 4. – Estimate Input Checklist and Maturity Matrix

REFERENCES

- ANSI Standard Z94.2-1989. **Industrial Engineering Terminology: Cost Engineering.**
 AACE International Recommended Practice No.17R-97, **Cost Estimate Classification System.**

CONTRIBUTORS

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Recommended Practice No. 17R-97

Cost Estimate Classification System



August 12, 1997

PURPOSE

As a recommended practice of AACE International, the Cost Estimate Classification System provides guidelines for applying the general principles of estimate classification to asset project cost estimates. Asset project cost estimates typically involve estimates for capital investment, and exclude operating and life-cycle evaluations. The Cost Estimate Classification System maps the phases and stages of asset cost estimating together with a generic maturity and quality matrix that can be applied across a wide variety of industries.

This guideline and its addenda have been developed in a way that:

- provides common understanding of the concepts involved with classifying project cost estimates, regardless of the type of enterprise or industry the estimates relate to;
- fully defines and correlates the major characteristics used in classifying cost estimates so that enterprises may unambiguously determine how their practices compare to the guidelines;
- uses degree of project definition as the primary characteristic to categorize estimate classes; and
- reflects generally-accepted practices in the cost engineering profession.

An intent of the guidelines is to improve communication among all of the stakeholders involved with preparing, evaluating, and using project cost estimates. The various parties that use project cost estimates often misinterpret the quality and value of the information available to prepare cost estimates, the various methods employed during the estimating process, the accuracy level expected from estimates, and the level of risk associated with estimates.

This classification guideline is intended to help those involved with project estimates to avoid misinterpretation of the various classes of cost estimates and to avoid their misapplication and misrepresentation. Improving communications about estimate classifications reduces business costs and project cycle times by avoiding inappropriate business and financial decisions, actions, delays, or disputes caused by misunderstandings of cost estimates and what they are expected to represent.

This document is intended to provide a guideline, not a standard. It is understood that each enterprise may have its own project and estimating processes and terminology, and may classify estimates in particular ways. This guideline provides a generic and generally-acceptable classification system that can be used as a basis to compare against. If an enterprise or organization has not yet formally documented its own estimate classification scheme, then this guideline may provide an acceptable starting point.

INTRODUCTION

An AACE International guideline for cost estimate classification for the process industries was developed in the late 1960s or early 1970s, and a simplified version was adopted as an ANSI Standard Z94.0 in 1972. Those guidelines and standards enjoy reasonably broad acceptance within the engineering and construction communities and within the process industries. This recommended practice guide and its addenda improves upon these standards by:

1. providing a classification method applicable across all industries; and
2. unambiguously identifying, cross-referencing, benchmarking, and empirically evaluating the multiple characteristics related to the class of cost estimate.

This guideline is intended to provide a generic methodology for the classification of project cost estimates in any industry, and will be supplemented with addenda that will provide extensions and additional detail for specific industries.



CLASSIFICATION METHODOLOGY

There are numerous characteristics that can be used to categorize cost estimate types. The most significant of these are degree of project definition, end usage of the estimate, estimating methodology, and the effort and time needed to prepare the estimate. The "primary" characteristic used in this guideline to define the classification category is the degree of project definition. The other characteristics are "secondary."

Categorizing cost estimates by degree of project definition is in keeping with the AACE International philosophy of Total Cost Management, which is a quality-driven process applied during the entire project life cycle. The discrete levels of project definition used for classifying estimates correspond to the typical phases and gates of evaluation, authorization, and execution often used by project stakeholders during a project life cycle.

Five cost estimate classes have been established. While the level of project definition is a continuous spectrum, it was determined from benchmarking industry practices that three to five discrete categories are commonly used. Five categories are established in this guideline as it is easier to simplify by combining categories than it is to arbitrarily split a standard.

The estimate class designations are labeled Class 1, 2, 3, 4, and 5. A Class 5 estimate is based upon the lowest level of project definition, and a Class 1 estimate is closest to full project definition and maturity. This arbitrary "countdown" approach considers that estimating is a process whereby successive estimates are prepared until a final estimate closes the process.

ESTIMATE CLASS	Primary Characteristic	Secondary Characteristic			
	LEVEL OF PROJECT DEFINITION Expressed as % of complete definition	END USAGE Typical purpose of estimate	METHODOLOGY Typical estimating method	EXPECTED ACCURACY RANGE Typical +/- range relative to best index of 1 [a]	PREPARATION EFFORT Typical degree of effort relative to least cost index of 1 [b]
Class 5	0% to 2%	Screening or Feasibility	Stochastic or Judgment	4 to 20	1
Class 4	1% to 15%	Concept Study or Feasibility	Primarily Stochastic	3 to 12	2 to 4
Class 3	10% to 40%	Budget, Authorization, or Control	Mixed, but Primarily Stochastic	2 to 6	3 to 10
Class 2	30% to 70%	Control or Bid/Tender	Primarily Deterministic	1 to 3	5 to 20
Class 1	50% to 100%	Check Estimate or Bid/Tender	Deterministic	1	10 to 100

Notes: [a] If the range index value of "1" represents +10/-5%, then an index value of 10 represents +100/-50%.
 [b] If the cost index value of "1" represents 0.005% of project costs, then an index value of 100 represents 0.5%.

Figure 1 – Generic Cost Estimate Classification Matrix

DEFINITIONS OF COST ESTIMATE CHARACTERISTICS

The following are brief discussions of the various estimate characteristics used in the estimate classification matrix. For the secondary characteristics, the overall trend of how each characteristic varies with the degree of project definition (the primary characteristic) is provided.

Level of Project Definition (Primary Characteristic)

This characteristic is based upon percent complete of project definition (roughly corresponding to percent complete of engineering). The level of project definition defines maturity or the extent and types of input information available to the estimating process. Such inputs include project scope definition, requirements documents, specifications, project plans, drawings, calculations, learnings from past projects, reconnaissance data, and other information that must be developed to define the project. Each industry will have a typical set of deliverables that are used to support the type of estimates used in that industry. The set of deliverables becomes more definitive and complete as the level of project definition (i.e., project engineering) progresses.

End Usage (Secondary Characteristic)

The various classes (or phases) of cost estimates prepared for a project typically have different end uses or purposes. As the level of project definition increases, the end usage of an estimate typically progresses from strategic evaluation and feasibility studies to funding authorization and budgets to project control purposes.

Estimating Methodology (Secondary Characteristic)

Estimating methodologies fall into two broad categories: stochastic and deterministic. In stochastic methods, the independent variable(s) used in the cost estimating algorithms are generally something other than a direct measure of the units of the item being estimated. The cost estimating relationships used in stochastic methods often are somewhat subject to conjecture. With deterministic methods, the independent variable(s) are more or less a definitive measure of the item being estimated. A deterministic methodology is not subject to significant conjecture. As the level of project definition increases, the estimating methodology tends to progress from stochastic to deterministic methods.

Expected Accuracy Range (Secondary Characteristic)

Estimate accuracy range is an indication of the degree to which the final cost outcome for a given project will vary from the estimated cost. Accuracy is traditionally expressed as a +/- percentage range around the point estimate after application of contingency, with a stated level of confidence that the actual cost outcome would fall within this range (+/- measures are a useful simplification, given that actual cost outcomes have different frequency distributions for different types of projects). As the level of project definition increases, the expected accuracy of the estimate tends to improve, as indicated by a tighter +/- range.

Note that in figure 1, the values in the accuracy range column do not represent + or - percentages, but instead represent an index value relative to a best range index value of 1. If, for a particular industry, a Class 1 estimate has an accuracy range of +10/-5 percent, then a Class 5 estimate in that same industry may have an accuracy range of +100/-50 percent.

Effort to Prepare Estimate (Secondary Characteristic)

The level of effort needed to prepare a given estimate is an indication of the cost, time, and resources required. The cost measure of that effort is typically expressed as a percentage of the total project costs for a given project size. As the level of project definition increases, the amount of effort to prepare an estimate increases, as does its cost relative to the total project cost. The effort to develop the project deliverables is not included in the effort metrics; they only cover the cost to prepare the cost estimate itself.

RELATIONSHIPS AND VARIATIONS OF CHARACTERISTICS

There are a myriad of complex relationships that may be exhibited among the estimate characteristics within the estimate classifications. The overall trend of how the secondary characteristics vary with the level of project definition was provided above. This section explores those trends in more detail. Typically, there are commonalities in the secondary characteristics between one estimate and the next, but in any given situation there may be wide variations in usage, methodology, accuracy, and effort.

The level of project definition is the "driver" of the other characteristics. Typically, all of the secondary characteristics have the level of project definition as a primary determinant. While the other characteristics are important to categorization, they lack complete consensus. For example, one estimator's "bid" might be another's "budget." Characteristics such as "accuracy" and "methodology" can vary markedly from one industry to another, and even from estimator to estimator within a given industry.

Level of Project Definition

Each project (or industry grouping) will have a typical set of deliverables that are used to support a given class of estimate. The availability of these deliverables is directly related to the level of project definition achieved. The variations in the deliverables required for an estimate are too broad to cover in detail here; however, it is important to understand what drives the variations. Each industry group tends to focus on a defining project element that "drives" the estimate maturity level. For instance, chemical industry projects are "process equipment-centric"—i.e., the level of project definition and subsequent estimate maturity level is significantly determined by how well the equipment is defined. Architectural projects tend to be "structure-centric," software projects tend to be "function-centric," and so on. Understanding these drivers puts the differences that may appear in the more detailed industry addenda into perspective.

End Usage

While there are common end usages of an estimate among different stakeholders, usage is often relative to the stakeholder's identity. For instance, an owner company may use a given class of estimate to support project funding, while a contractor may use the same class of estimate to support a contract bid or tender. It is not at all uncommon to find stakeholders categorizing their estimates by usage-related headings such as "budget," "study," or "bid." Depending on the stakeholder's perspective and needs, it is important to understand that these may actually be all the same class of estimate (based on the primary characteristic of level of project definition achieved).

Estimating Methodology

As stated previously, estimating methodologies fall into two broad categories: stochastic and deterministic. These broad categories encompass scores of individual methodologies. Stochastic methods often involve simple or complex modeling based on inferred or statistical relationships between costs and programmatic and/or technical parameters. Deterministic methods tend to be straightforward counts or measures of units of items multiplied by known unit costs or factors. It is important to realize that any combination of methods may be found in any given class of estimate. For example, if a stochastic method is known to be suitably accurate, it may be used in place of a deterministic method even when there is sufficient input information based on the level of project definition to support a deterministic method. This may be due to the lower level of effort required to prepare an estimate using stochastic methods.

Expected Accuracy Range

The accuracy range of an estimate is dependent upon a number of characteristics of the estimate input information and the estimating process. The extent and the maturity of the input information as measured by percentage completion (and related to level of project definition) is a highly-important determinant of accuracy. However, there are factors besides the available input information that also greatly affect estimate accuracy measures. Primary among these are the state of technology in the project and the quality of reference cost estimating data.

State of technology—technology varies considerably between industries, and thus affects estimate accuracy. The state of technology used here refers primarily to the programmatic or technical uniqueness and complexity of the project. Procedurally, having "full extent and maturity" in the estimate basis deliverables is deceptive if the deliverables are based upon assumptions regarding uncertain technology. For a "first-of-a-kind" project there is a lower level of confidence that the execution of the project will be successful (all else being equal). There is generally a higher confidence for projects that repeat past practices. Projects for which research and development are still under way at the time that the estimate is prepared are particularly subject to low accuracy expectations. The state of technology may have an order of magnitude (10 to 1) effect on the accuracy range.

Quality of reference cost estimating data—accuracy is also dependent on the quality of reference cost data and history. It is possible to have a project with "common practice" in technology, but with little cost history available concerning projects using that technology. In addition, the estimating process typically employs a number of factors to adjust for market conditions, project location, environmental considerations, and other estimate-specific conditions that are often uncertain and difficult to assess. The accuracy of the estimate will be better when verified empirical data and statistics are employed as a basis for the estimating process, rather than assumptions.

In summary, estimate accuracy will generally be correlated with estimate classification (and therefore the level of project definition), all else being equal. However, specific accuracy ranges will typically vary by industry. Also, the accuracy of any given estimate is not fixed or determined by its classification category. Significant variations in accuracy from estimate to estimate are possible if any of the determinants of accuracy, such as technology, quality of reference cost data, quality of the estimating process, and skill and knowledge of the estimator vary. Accuracy is also not necessarily determined by the methodology used or the effort expended. Estimate accuracy must be evaluated on an estimate-by-estimate basis, usually in conjunction with some form of risk analysis process.

Effort to Prepare Estimate

The effort to prepare an estimate is usually determined by the extent of the input information available. The effort will normally increase as the number and complexity of the project definition deliverables that are produced and assessed increase. However, with an efficient estimating methodology on repetitive projects, this relationship may be less defined. For instance, there are combination design/estimating tools in the process industries that can often automate much of the design and estimating process. These tools can often generate Class 3 deliverables and estimates from the most basic input parameters for repetitive-type projects. There may be similar tools in other industry groupings.

It also should be noted that the estimate preparation costs as a percentage of total project costs will vary inversely with project size in a nonlinear fashion. For a given class of estimate, the preparation cost percentage will decrease as the total project costs increase. Also, at each class of estimate, the preparation costs in different industries will vary markedly. Metrics of estimate preparation costs normally exclude the effort to prepare the defining project deliverables.

ESTIMATE CLASSIFICATION MATRIX

The five estimate classes are presented in figure 1 in relationship to the identified characteristics. Only the level of project definition determines the estimate class. The other four characteristics are secondary characteristics that are generally correlated with the level of project definition, as discussed above.

This generic matrix and guideline provide a high-level estimate classification system that is nonindustry specific. Refer to subsequent addenda for further guidelines that will provide more detailed information for application in specific industries. These will provide additional information, such as input deliverable checklists, to allow meaningful categorization in that industry.

REFERENCES

ANSI Standard Z94.2-1989. **Industrial Engineering Terminology: Cost Engineering.**

**REPRESENTATIVE POLICY BOARD
OF THE
SOUTH CENTRAL CONNECTICUT REGIONAL WATER DISTRICT**

RE: Application to the Representative) DATE: December 17, 2020
Policy Board for Approval of a Project)
to Construct Improvements at the)
West River Water Treatment Plant)
dated December 17, 2020)

MOTION FOR PROTECTIVE ORDER
OF THE SOUTH CENTRAL CONNECTICUT REGIONAL WATER AUTHORITY

The South Central Connecticut Regional Water Authority (the "Authority") moves herein that the Representative Policy Board of the South Central Connecticut Regional Water District (the "RPB") issue the attached Protective Order, so that certain confidential information (the "Information") provided to the RPB in the above-referenced proceeding, also attached hereto, be maintained under protective seal, subject to review by the RPB's personnel, as well as representatives of the Office of Consumer Affairs, and subject to appropriate safeguards as spelled out in the proposed Protective Order.

Specifically, the release of this information could potentially pose a security risk to the Authority's water supply. Because of the sensitivity of this information, the Authority respectfully requests that the RPB grant its Motion for Protective Order. In support of this Motion, also attached hereto is the affidavit of Mr. Edward O. Norris, III, P.E., Vice President-Asset Management.

Respectfully submitted,

SOUTH CENTRAL CONNECTICUT REGIONAL
WATER AUTHORITY

By: _____
Anthony DiSalvo, Chairperson

By: _____
Larry L. Bingaman, Chief Executive Officer

**REPRESENTATIVE POLICY BOARD
OF THE
SOUTH CENTRAL CONNECTICUT REGIONAL WATER DISTRICT**

RE: Application to the Representative) DATE: December 17, 2020
Policy Board for Approval of a Project)
to Construct Improvements at the West)
River Water Treatment Plant, dated)
December 17, 2020)

**PROTECTIVE ORDER CONCERNING THE SOUTH CENTRAL
CONNECTICUT REGIONAL WATER AUTHORITY'S
CONFIDENTIAL AND SENSITIVE INFORMATION**

WHEREAS, the South Central Connecticut Regional Water Authority (the "Authority") is providing information in the above-referenced proceeding to the Representative Policy Board of the South Central Connecticut Regional Water District (the "RPB") and the Office of Consumer Affairs ("OCA") and, upon direction of the RPB, to certain authorized parties and or consultants, which would, in the judgment of the Authority, result in the disclosure of confidential and sensitive information, and which information the Authority contends is exempt from disclosure and constitutes safety risk within the meaning of General Statutes § 1-210(b)(19).

NOW, THEREFORE, IT IS HEREBY ORDERED, that the following procedure is adopted for the protection of the information provided by the Authority ("Confidential Information"):

1. Any Confidential Information provided by the Authority, whether in documentary form or otherwise, shall be identified as follows: "Authority's Confidential Information", and will be governed by the terms of this Protective Order (the "Order"). The Order is applicable to

all such Confidential Information, whether in the form of documents, data, testimony, studies, or otherwise.

2. All Confidential Information made available pursuant to this Order shall be given only to Members and staff of the RPB, the OCA, and its staff, upon execution of the Acknowledgment referenced below. Consultants retained by, and other parties approved by the RPB and consultants retained by the OCA shall also be provided with the Confidential Information upon execution of the Acknowledgement referenced below and becoming signatories to the Order (“Signatories” and in the singular, “Signatory”) and executing the attached form of nondisclosure agreement. Upon a showing of good cause, the RPB may place additional restrictions upon the access to Confidential Information.

Members and staff of the RPB are bound by the terms of the Order. The OCA (including staff members) shall be bound by the terms of the Order, provided that representatives thereof have executed the Acknowledgement found at the close of the Order.

All Signatories to this Order agree to be bound by its terms and shall not use or disclose the Confidential Information except for purposes of this proceeding. All parties in receipt of any Confidential Information under the Order shall maintain a written log of all individuals granted access to said Confidential Information. All persons granted access to the Confidential Information shall neither use nor disclose the Confidential Information for any other purpose, other than the purpose of preparation for and conduct of this proceeding solely as contemplated herein and shall in good faith take all reasonable precautions to keep the Confidential Information secure in accordance with the purposes and intent of the Order.

3. Confidential Information will be marked as such and delivered in sealed

envelopes to the Executive Secretary of the RPB and the OCA. A statement in the following form shall be placed prominently on each envelope:

"CONFIDENTIAL"

"This envelope is not to be opened nor the contents to be displayed or revealed except pursuant to the pertinent Protective Order issued to the Authority by the RPB in **Application to the Representative Policy Board For Approval of a Project to Construct Improvements at the West River Water Treatment Plant located in Woodbridge, CT, dated December 17, 2020.**"

4. Any Confidential Information made available pursuant to the Order shall be part of the record in the docket cited above, subject to the same relevancy and other evidentiary considerations as non-confidential information, subject to the conditions stated in Paragraphs Five and Six of the Order.

5. If the Confidential Information is used in any manner in any interrogatory, letter, petition, brief or other writing ("Document"), all reference to the Confidential Information in the Document shall be either:

- (a) in a separate document, prominently labeled "Confidential Information", which document shall be safeguarded in accordance with the Order and distributed only to Members and staff of the RPB and to OCA; or
- (b) solely by title or exhibit reference, in a manner reasonably calculated not to disclose the Confidential Information.

6. If the Confidential Information is used in any manner in any proceeding or during the course of a public hearing before the RPB or its Members ("Hearing"), the proceeding or Hearing shall not be held before, nor any record of it made available to, any party, intervenor, or other person or entity not a Signatory, other than the appropriate RPB or OCA staff. Presence at the Hearing shall be limited to RPB Members and appropriate staff of the RPB, staff of OCA, representatives of the Authority, and any other Signatories. No record shall be disclosed nor any communication made, of use of the Confidential Information in the Hearing to any person or entity not a Signatory, other than the appropriate RPB and OCA staff. Any transcript or other recording of the Hearing which relates to the Confidential Information shall be placed in sealed envelopes or containers and a statement in the following form placed prominently on such envelope or container:

"CONFIDENTIAL"

"This envelope is not to be opened nor the contents to be displayed or revealed except pursuant to the pertinent Protective Order issued to the Authority by the RPB in **Application to the Representative Policy Board For Approval of a Project to Construct Improvements at the West River Water Treatment Plant located in Woodbridge, CT, dated December 17, 2020.**"

7. Nothing herein shall be construed as a final determination that any of the Confidential Information will be admissible as substantive evidence in this proceeding or at any hearing or trial. Moreover, nothing herein shall be considered a waiver of any party's right to

assert at a later date that the material is or is not proprietary or privileged. A party seeking to change the terms of the Order shall by motion give every other party five (5) business days prior written notice. No Confidential Information protected by the Order shall be made public until the RPB rules on any such motion to change the terms of the Order. Confidential Information otherwise properly discovered, even though also subject to the terms of the Order, shall not be considered protected by the Order.

8. All copies of such Confidential Information shall be returned to the Authority no later than thirty (30) days after the expiration of all appeal periods applicable to the final decision rendered in this proceeding.

REPRESENTATIVE POLICY BOARD OF THE
SOUTH CENTRAL CONNECTICUT REGIONAL
WATER DISTRICT

DATED: _____

By _____
Member

REVIEWED AND ACKNOWLEDGED:

The undersigned hereby acknowledges that he or she has reviewed this Protective Order, and hereby agrees to abide by the terms thereof, in exchange for receipt of the Confidential Information from the South Central Connecticut Regional Water Authority.

RECIPIENT: _____

REPRESENTING: Office of Consumer Affairs

DATE: _____

RECIPIENT: _____

REPRESENTING: _____

DATE: _____

RECIPIENT: _____

REPRESENTING: _____

DATE: _____

**NONDISCLOSURE AGREEMENT AND AGREEMENT
TO BE BOUND BY THE TERMS OF THE PROTECTIVE ORDER**

The undersigned hereby acknowledges review of the Protective Order filed on **December 17, 2020** in **Application to the Representative Policy Board For Approval of a Project to Construct Improvements at the West River Water Treatment Plant located in Woodbridge, , CT, dated December 17, 2020**, and hereby agrees to abide by the terms thereof in exchange for receipt of the Confidential Information from the South Central Connecticut Regional Water Authority.

PARTY: _____

Recipient: _____

Print Name: _____

Date: _____

Affiliation: _____

**SOUTH CENTRAL CONNECTICUT REGIONAL WATER AUTHORITY
RESOLUTION
APPROVING THE PROPOSED ISSUANCE OF BONDS**

RESOLVED: That the Authority hereby establishes the general terms and provisions of the Authority's Bonds which may be issued as Project Loan Obligations delivered to the State of Connecticut (the "Bonds") which are to be issued under its Water System Revenue Bond Resolution, General Bond Resolution adopted by the Authority and approved by the Representative Policy Board on July 31, 1980, as amended (the "General Bond Resolution").

1. The Bonds shall not exceed Seventeen Million Five Hundred Thousand Dollars (\$17,500,000) in aggregate principal amount.
2. The Bonds may be issued as obligations in one or more series pursuant to the General Bond Resolution and a supplemental resolution to be adopted by the Authority for each series of Bonds, each of which shall specify the amount of the Bonds, the purposes for which the Bonds are to be issued, the date or dates, maturities, sinking fund installments if any, interest rates, series, denominations, form, redemption prices, security provisions and such other details of the Bonds as the Authority shall determine in accordance with the limits established by the General Bond Resolution and hereby.
3. The purposes of the Bonds shall be (I) to finance or refinance the cost of certain capital improvements to the water system of the Authority including improvements to the West River Water Treatment Plant consisting of (a) the construction of three new dissolved air floatation (DAF) basins within a new DAF building to the south of the existing filter building; (b) the replacement of the hypochlorite system with an on-site hypochlorite generation system with a brine or salt silo, day tank, metering pumps, and two on-site sodium hypochlorite generators; and (c) electrical service upgrades including new utility service, new transformer (furnished by UI), new exterior switchgear and automatic transfer switch with walk-in enclosure and new emergency stand-by generator; (II) to provide funds for deposit to the Capital Contingency Fund and the Debt Reserve Fund, as necessary pursuant to the General Bond Resolution and as permitted by the Internal Revenue Code of 1986, as amended and (III) to pay costs of issuance (the "Project").
4. The Bonds may be sold by negotiation as serial or term bonds with stated maturities and may be sold in a private or direct placement to a bank or the State of Connecticut.
5. The Authority reasonably expects to incur expenditures (the "Expenditures") in connection with the Project of which a general functional description is provided above. The Authority reasonably expects to reimburse itself for the cost of Expenditures with respect to the Project with the proceeds of tax-exempt debt to

be issued by the Authority within eighteen (18) months after the date of any Expenditure or the date the Project is placed in service or abandoned, whichever is later. The maximum principal amount of such debt with respect to the Project is not expected to exceed \$17,500,000.

6. The form of this resolution entitled “Resolution Approving the Proposed Issuance of Bonds” a copy of which shall be filed with the records of the Authority, shall be submitted to the Representative Policy Board for its approval in accordance with Section 22 of Special Act No. 77-98, as amended.

BE IT FURTHER RESOLVED that:

1. Temporary notes of the Authority which may be issued as Interim Funding Obligations delivered to the State of Connecticut may be issued by the Authority in the amount of \$17,500,000 in anticipation of the receipt of the proceeds from the sale of such Bonds.
2. The President / Chief Executive Officer, the Vice President of Financial Services and any Vice President or any one of them may apply to the State Department of Public Health for eligibility and funding of the Project or any part of the Project and sign such application and any other documents which may be necessary or desirable to apply for eligibility of and to apply for and obtain financial assistance for the Project from the State’s Drinking Water Fund Program and that any such action taken prior hereto is hereby ratified and confirmed.