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Our webinar will begin in a few moments.
Healthier Waterways, Healthier Alexandria
Partnering with the Community for Project Success

September 21, 2021
Presentation Outline

• AlexRenew Background

• AlexRenew’s New Water Environment Mission
  RiverRenew

• RiverRenew Tunnel Project
  The largest infrastructure project in Alexandria’s history

• Planning
  Leveraging Community Input to Select the Best Alternative for Alexandria

• Design
  Minimizing Community Impacts through the Selection and Siting of Facilities

• Construction
  Communicating Progress, Impacts, and Mitigation Approaches

• Education
  Growing the next generation of scientists, engineers, and mathematicians

• Takeaways
AlexRenew Background
Alexandria has an Educated and Engaged Citizenry

- Population of approximately 160,000
- 50% of residents with a bachelor’s degree or higher
- 65 standing boards, commissions, and committees
- Governed by a City Council
- Centralized historic district (Old Town)
How Water Works in Alexandria

- Potable (drinking) water
- Wastewater and Combined Sewer Treatment
- Sanitary and Combined Sewer System
- Stormwater
AlexRenew At-a-Glance

• Independent political subdivision created under the Virginia Water and Wastes Authorities Act in 1952
• Serves over 300,000 customers in Alexandria and Fairfax County
• Led by a five-member citizen Board of Directors
• Primarily funded through sewer fees
• Fairfax County pays AlexRenew for wholesale wastewater services for a portion of the County
• AlexRenew pays Arlington County to provide wastewater services for a small portion of Alexandria

4 pumping stations
4 combined sewer outfalls
20 miles of sewer interceptors
38 million gallons of wastewater treated daily
AlexRenew Serves both Separate and Combined Sewer Systems

Legend
- Fairfax County Separate Sewer System (24,578 acres)
- Alexandria Separate Sewer System (8,254 acres)
- Alexandria Combined Sewer System (540 acres)
- Alexandria Sewershed treated at Arlington WPCF (732 acres)
AlexRenew’s New Water Environment Mission
RiverRenew
AlexRenew’s New Water Environment Initiative: RiverRenew

• 2017 law enacted by Virginia General Assembly
  • Required City of Alexandria to plan, design, and construct a solution to bring four existing combined sewer outfalls into Federal and State compliance
  • Required completion by July 1, 2025
  • In July 2018, the City of Alexandria transferred the four existing outfalls and RiverRenew ownership to AlexRenew
The 2017 CSO Law Imposed One of the Most Aggressive Schedules of its Kind in the United States

![Progress Bar Chart]

- **Tunnel Project**
- **108 to 116 Million Gallons Per Day Project**
- **Building J Facilities Relocation and Decommissioning Project**
- **WRRF Site Security and Access Project**

Timeline:
- 2018: Planning, Design, Purchase
- 2019: Design, Construction
- 2020: Construction, Procurement
- 2021: Construction, Procurement
- 2022: Construction, Procurement
- 2023: Construction
- 2024: Construction
- 2025: Construction
- 2026: Construction

Legend:
- **Blue**: Planning
- **Blue**: Design
- **Green**: Procurement
- **Orange**: Construction
RiverRenew will Meet Strict Control Requirements Established by Total Maximum Daily Loads and EPA’s CSO Control Policy

<table>
<thead>
<tr>
<th>Combined Sewer Outfall</th>
<th>Control Requirement</th>
<th>Before RiverRenew*</th>
<th>After RiverRenew*</th>
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<tr>
<td></td>
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<td>Overflow Volume</td>
<td>Overflow Events</td>
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<tr>
<td></td>
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<td>(million gallons)</td>
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<tr>
<td>001</td>
<td>EPA Presumption Approach, 4-6 OF/yr</td>
<td>63</td>
<td>37</td>
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<td></td>
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<td>9</td>
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<td>002</td>
<td>TMDL, 80% Reduction</td>
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<tr>
<td>003</td>
<td>TMDL, 99% Reduction</td>
<td>31</td>
<td>70</td>
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<td>0.7</td>
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<tr>
<td>004</td>
<td>TMDL, 99% Reduction</td>
<td>8</td>
<td>44</td>
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<td></td>
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<td>1.5</td>
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<tr>
<td></td>
<td></td>
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<td>&lt;1</td>
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</table>

| System-wide Percent Capture | 70 percent | 98 percent |

*Performance based on 2000-2016 climate period*
RiverRenew Tunnel Project
The largest infrastructure project in Alexandria’s history
RiverRenew At-a-Glance

Tunnel Project
Construction of tunnel to capture and transport CSOs
Dec 2020 – July 2025
Ongoing
$454.4M*

Outfall 001
Outfall 003
Outfall 004
Outfall 002

Legend
- Existing Outfall
- Hooff’s Run Interceptor
- Waterfront Tunnel
- Diversion Facility
- Pumping Station

Wastewater Projects to Pave the Way for the Tunnel Project

108 to 116 Million Gallons per Day Project
Increase of primary pumping capacity to 116 MGD
Aug 2019 – Dec 2020
Complete
$5.0M*

Building J Facilities Relocation and Decommissioning Project
Relocation of building uses and building demolition
Jul 2019 – Jun 2021
Complete
$19.4M*

Site Security and Access Project
Upgrades to existing access and security systems
Aug 2019 – Dec 2020
Complete
$1.5M*

*Denotes construction cost
RiverRenew Tunnel Project At-a-Glance

Components:
- Two-mile-long, 12-foot-wide Waterfront Tunnel approximately 100 feet below ground
- Diversion facilities to direct combined sewage into the tunnel system
- Half-mile-long, six-foot-wide Hooffs Run Interceptor
- Pumping stations housed in two large shafts
- Superstructure to house pumping station equipment

Construction Cost:
- $454.4 million

Tunnel Project Schedule:
- December 2020 – July 2025
Major RiverRenew Tunnel Project Components

Waterfront Tunnel constructed using Earth Pressure Balance Tunnel Boring Machine

Diversion Facilities

20 mgd and 130 mgd Pumping Stations

<table>
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<tr>
<th>Manufacturer</th>
<th>Herrenknecht</th>
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<tr>
<td>ID</td>
<td>OD (ft)</td>
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<td>Shield Length (ft)</td>
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<td>Overall Length (ft)</td>
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<tr>
<td># of Disc Cutters</td>
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<tr>
<td>Operating Pressure</td>
<td>4.5 bar</td>
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<tr>
<td>Conveyor Type</td>
<td>Screw and Belt</td>
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The Geologic Profile for the Waterfront Tunnel was Developed from Nearly 100 Borings and Over 2,000 Soil Samples
Community Feedback has been Vital in Shaping RiverRenew

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<tr>
<th>Item</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
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<td>Long Term Control Plan Update (LTCPU)</td>
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<td>Preliminary Engineering Report</td>
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<td>Environmental Assessment</td>
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<td>Third Party Coordination</td>
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<td>Boring Program</td>
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<td>Request for Proposal Documents</td>
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<td>Tunnel Project Procurement</td>
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<tr>
<td>Tunnel Project Design-Build</td>
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Major Outcomes of the 2017-18 PLANNING Stakeholder Advisory Group:
- **Recommended Option B+** Unified Tunnel
- Challenged team to reduce **overflow volume** at Outfall 001
- Noted Alexandria’s historic character and requested the team to consider potential **impacts to historic structures**

Major Outcomes of 2019-20 DESIGN Stakeholder Advisory Group:
- Promoted **Community Listening Sessions**
- Gave feedback on **tunnel routes and facility locations**
- Reviewed **procurement** criteria
- Reviewed the development of **Request for Proposal Documents**
- Supported development and approval of **Special Use Permits**
- Served as liaisons to community while AlexRenew completed **site investigation program**

2021-22 CONSTRUCTION Stakeholder Advisory Group:
- Review and monitor construction progress
- Communicate progress to the community by leveraging existing networks
- Identify concerns and receive input from the public
- Provide recommendations regarding mitigation of construction impacts
Planning
Leveraging Community Input to Select the Best Alternative for Alexandria
AlexRenew Evaluated an Array of Technologies to Achieve CSO Reduction Goals

- **End of Pipe Treatment**
- **Sewer Separation**
- **Storage Tanks**
- **Green Infrastructure**
- **Storage Tunnels**
- **Conveyance Tunnels**
- **Wet-Weather Treatment**
- **Combination of technologies**
Tunnels or Tanks: Weighing the Best Alternative for Alexandria

**Life Cycle Costs**
Minimize impacts to rate payers

**O&M Complexity and Reliability**
Maximize reliability of meeting permits

**Adaptability**
Maximize ability to meet changing regulatory and climate conditions

**Schedule**
Minimize schedule and third party risk

**Community Acceptance**
Minimize community disruptions

![Legend](image)
- Existing Outfall
- Combined Sewer Area (544 ac)
- Potential Area for Tunnel Routes
- Potential Storage Tank Locations

Tunnels: **4.1**

Tanks: **1.7**
AlexRenew’s Water Resource Recovery Facility is Central to Achieving CSO Goals

- Conveyance tunnel sized to meet the Hunting Creek TMDL at Outfalls 003/4
- Storage tunnel sized to meet the Presumption Approach at Outfall 001 and TMDL at Outfall 002
- 40 MGD wet weather treatment facility
Ensuring RiverRenew is Adaptable and Resilient

Future climate precipitation projection generated to evaluate performance of Option B due to potential climate change

- "Baseline" Year 2004 used for actual historical precipitation
- Future climate for 2100 from IPCC climate model outputs using highest greenhouse gas emissions (RCP 8.5)
- Baseline precipitation scaled to create an estimated future climate precipitation
- Range of projections reflects uncertainty
  - Median (50th percentile of climate model results)
  - High (90th percentile of climate model results)
  - Higher (90th percentile of climate model results)

Estimated future climate precipitation for year 2100

Modeled Overflow Events

- Current Number of Overflow Events
- Overflow Events with RiverRenew (2025)
- Overflow Events with RiverRenew (2100)
Design
Minimizing Community Impacts through the Selection and Siting of Facilities
AlexRenew Sought Input on Tunnel Routes and Diversion Facility Locations through a Series of Community Listening Sessions
Spaghetti Map of Potential Tunnel Routes and Diversion Facility Locations

- Minimize proximity to **existing structures**
- Avoid tunneling **below structures**
- Construct tunnel from AlexRenew
- Locate **Outfall 002 Diversion Facility** as far south as possible
- Stay within **Potomac Formation**
- Keep Pressure **below 3-Bar**
- Avoid piles and foundations
- Maintain tunnel curves at or above **1,200-feet**
- Consider depths for **pumping**
The Waterfront Tunnel and Outfall 002 Diversion Facility were Sited Outside of South Old Town.
The Multiple Civic and Environmental Benefits at the Restored Sites Helps the Community See and Understand their Water Infrastructure Investment

- Oronoco Bay Promenade at Outfall 001
- Hooffs Run Riparian Buffer Enhancements
- Jones Point Park Native Plantings
Construction
Communicating Progress, Impacts, and Mitigation Approaches
Proposed Pendleton Street Diversion Facility
# Pendleton Street Diversion Facility Schedule

<table>
<thead>
<tr>
<th>2021</th>
<th>2022</th>
<th>2023</th>
<th>2024</th>
<th>2025</th>
</tr>
</thead>
</table>

Note: Schedule is generalized and subject to change

### Site Preparation

### Support of Excavation

### Excavation

### Permanent Structures

### Tunnel Boring Machine Arrival and Removal

### Restoration
Proposed Tunnel Project Facilities to be Constructed at AlexRenew

- **Pumping Shaft**
  - 65-feet-wide
  - 135 feet deep

- **Screening Shaft**
  - 35-feet-wide
  - 135 feet deep
AlexRenew Spent the Last Two Years Preparing its Wastewater Plant to Support Tunnel Construction
Renderings of Pumping Station Superstructure
Education
Growing the next generation of scientists, engineers, and mathematicians
Cloe’s Corner on RiverRenew.com

Storybook Series

Edie the Excavator Clears a Path

Build Demo

Cloe the Tunnel Boring Machine

Site Setup Maze

Name me!

Vote to name the tunnel boring machine that will build toward Alexandria’s clean waterways future.

Elaine’s Last Lift

Frex! After a long week of lifting, Elaine the All-Terrain Crane only has one more Corner Box left to place at the Holland Lane Ltd. Help her find her way to the correct spot, then to the exit. She’ll need to go home for some rest before the RiverRenew team needs her for another project.
Takeaways

• Public works projects benefit the public
• Planning and design cannot be done in a vacuum – public input is crucial
• Technical solutions need to be designed to the environment
• Projects like RiverRenew provide STEM benefits
• Good engineering requires listening
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Questions?
Email Marisa Waterman at mwaterman@aaees.org with any questions you may have.