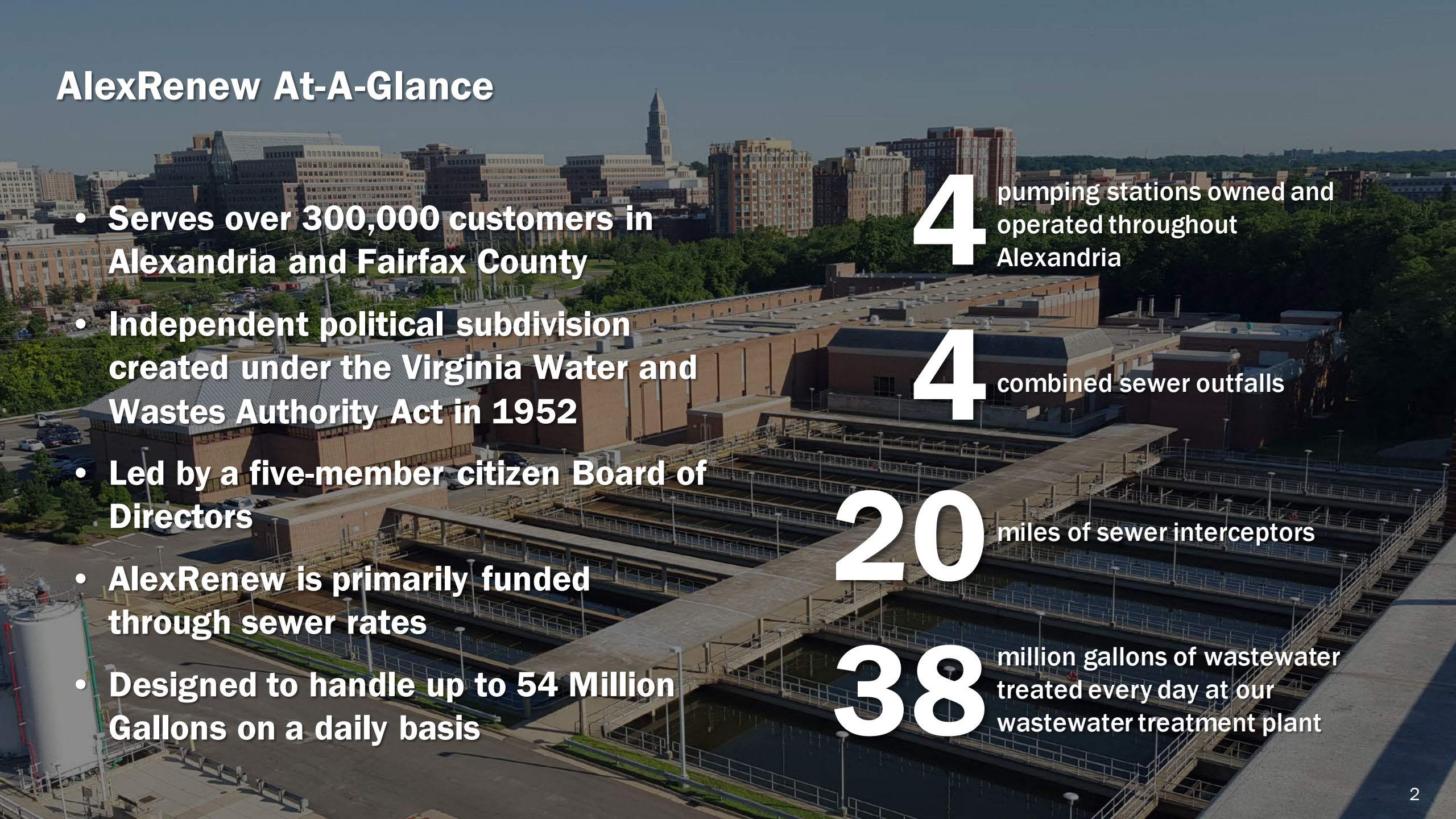
Wastewater-based Epidemiology

Chesapeake Bay Policy Commission

March 18, 2022

AlexRenew At-A-Glance



- Serves over 300,000 customers in Alexandria and Fairfax County
- Independent political subdivision created under the Virginia Water and Wastes Authority Act in 1952
- Led by a five-member citizen Board of Directors
- AlexRenew is primarily funded through sewer rates
- Designed to handle up to 54 Million Gallons on a daily basis

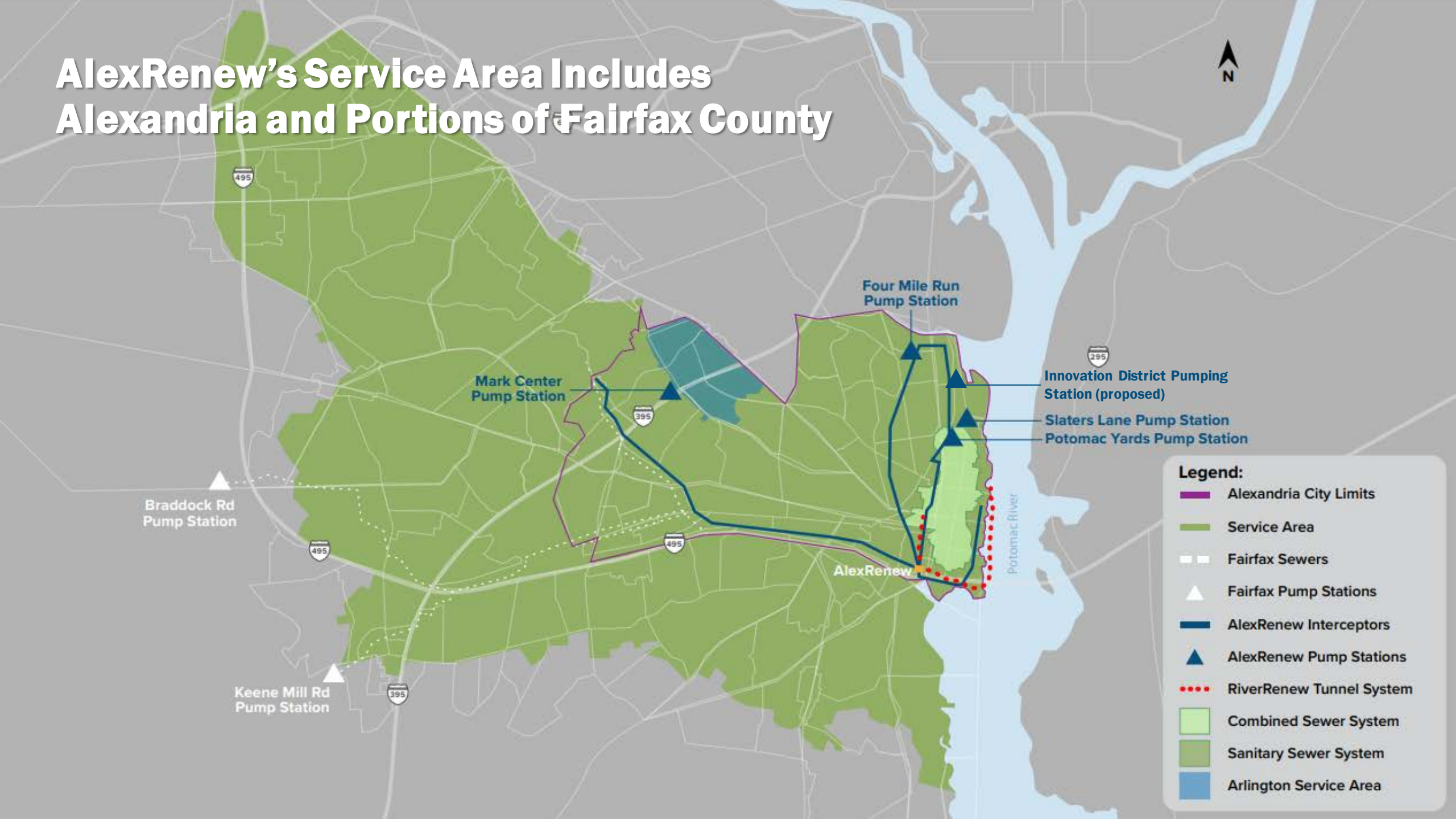
4 pumping stations owned and operated throughout Alexandria

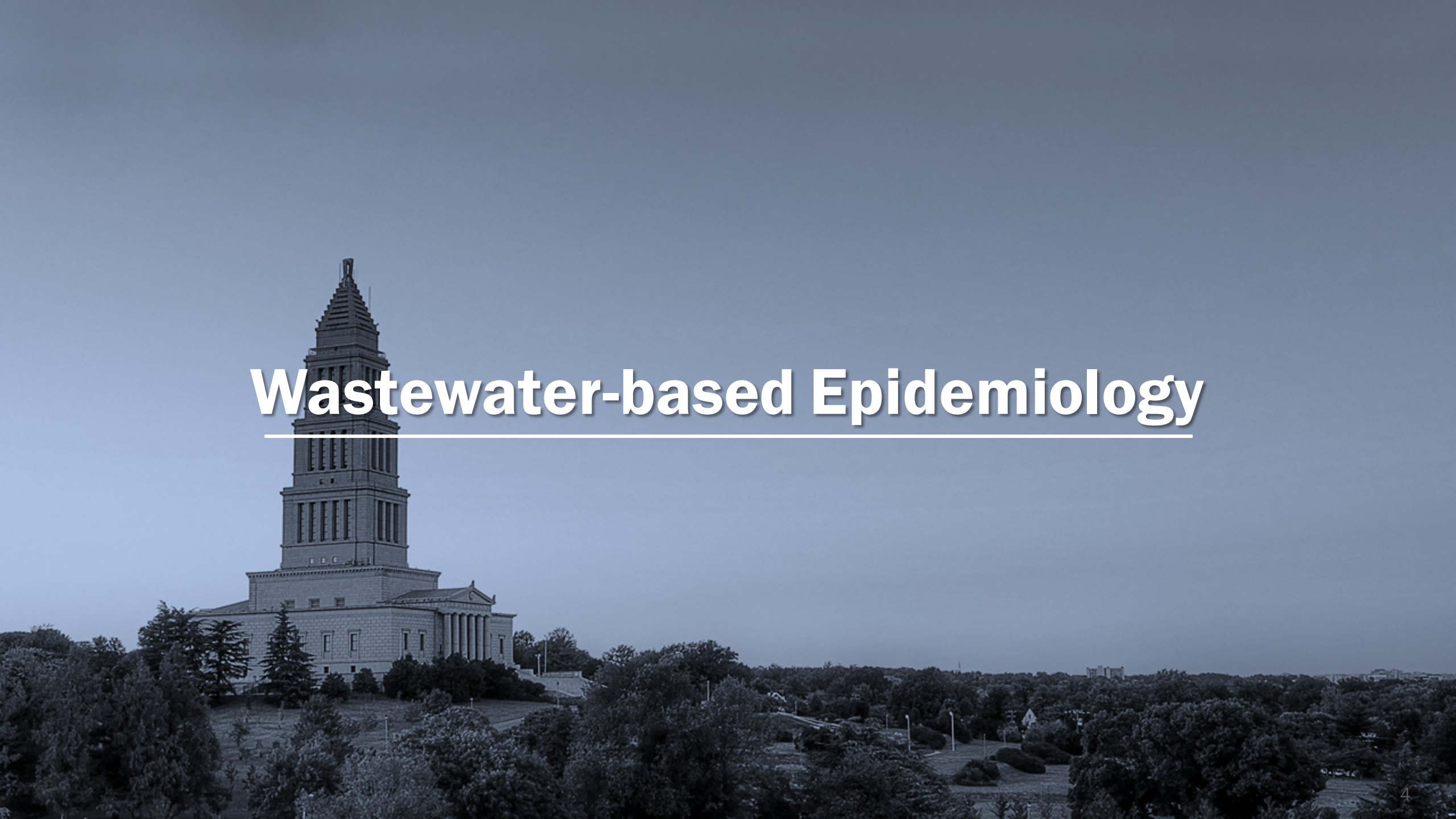
4 combined sewer outfalls

20 miles of sewer interceptors

38 million gallons of wastewater treated every day at our wastewater treatment plant

AlexRenew's Service Area Includes Alexandria and Portions of Fairfax County





Wastewater-based Epidemiology

Wastewater-based epidemiology (WBE) is the practice of sampling wastewater to inform public health decisions.

People excrete chemicals or pathogens in their feces and urine.

These enter the collection system.

Wastewater at the head of the plant can be collected to sample the entire population.

Sampling within the collection system can help identify hotspots.

Water Based Epidemiology (WBE) relies on collaboration between the water sector, analytical laboratories, and public health departments.

The practice of Water Based Epidemiology (WBE) has been used around the world to address public health crises.

Israel's Silent Polio Epidemic Breaks All the Rules

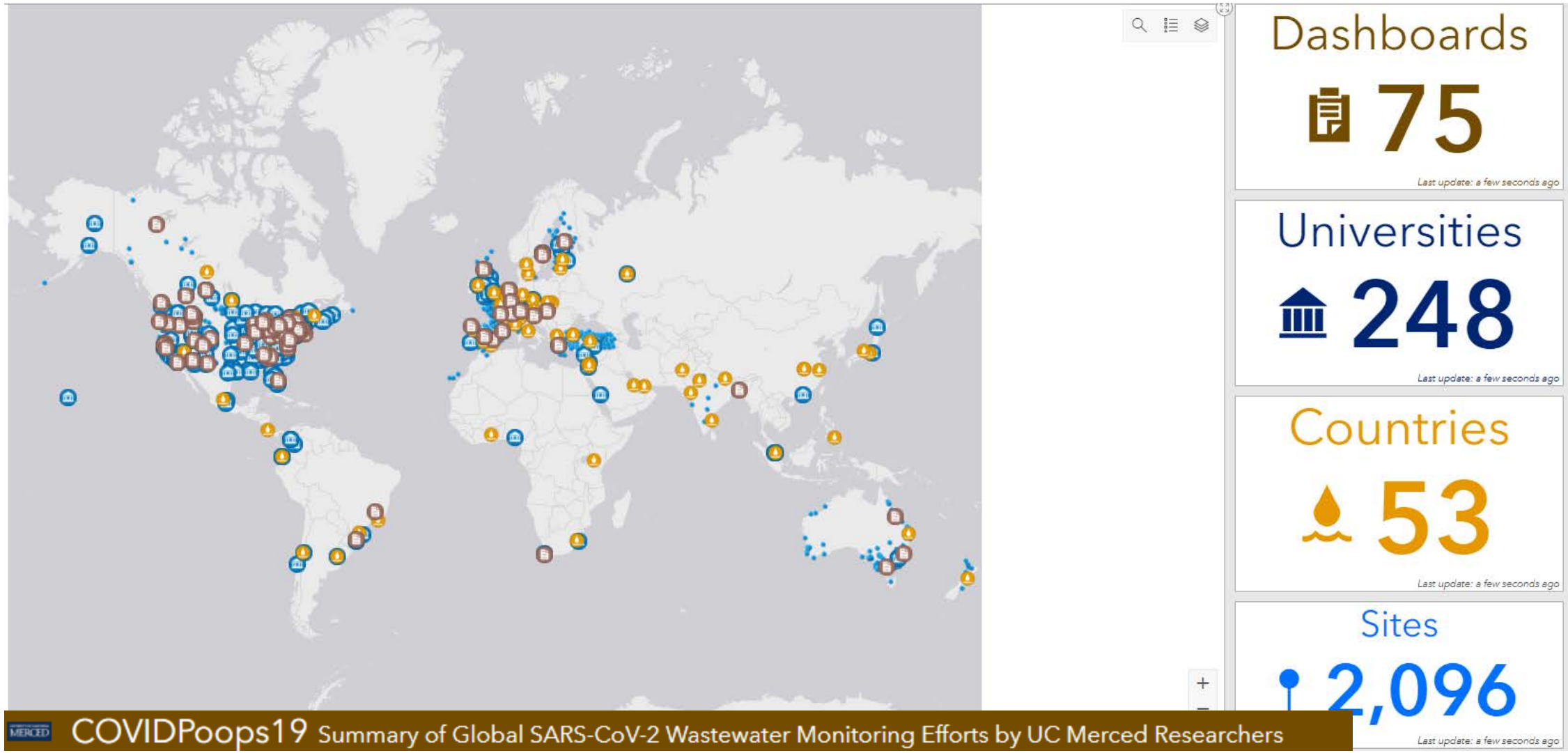
Source: *Science*, New Series, Vol. 342, No. 6159 (8 November 2013), pp. 679-680

Population Normalization with Ammonium in Wastewater-Based Epidemiology: Application to Illicit Drug Monitoring

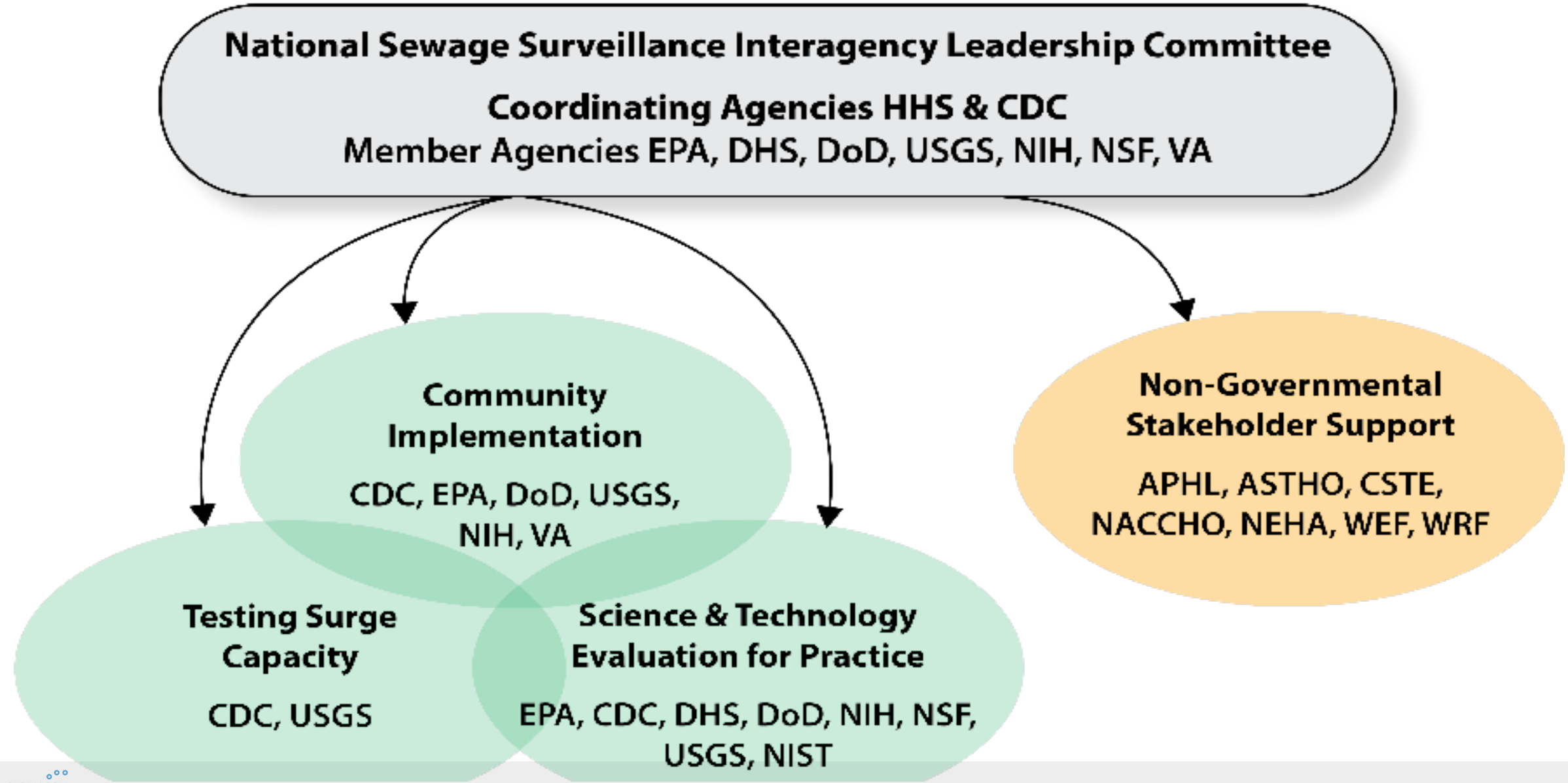
Frederic Been,*[,†] Luca Rossi,[‡] Christoph Ort,[§] Serge Rudaz,[∥] Olivier Delémont,[†] and Pierre Esseiva[†]

dx.doi.org/10.1021/es5008388 | *Environ. Sci. Technol.* 2014, 48, 8162−8169

During the pandemic, researchers collaborated to improve the use of Water Based Epidemiology (WBE) for tracking COVID-19.



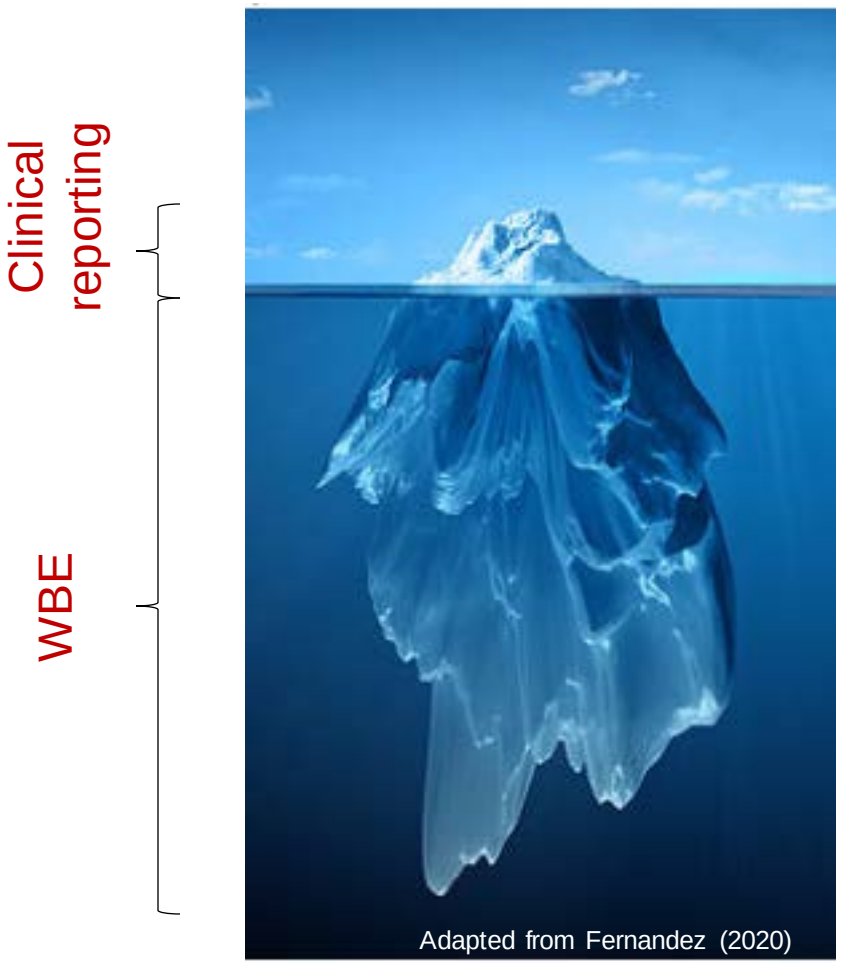
Federal Partnering Framework for Wastewater Surveillance

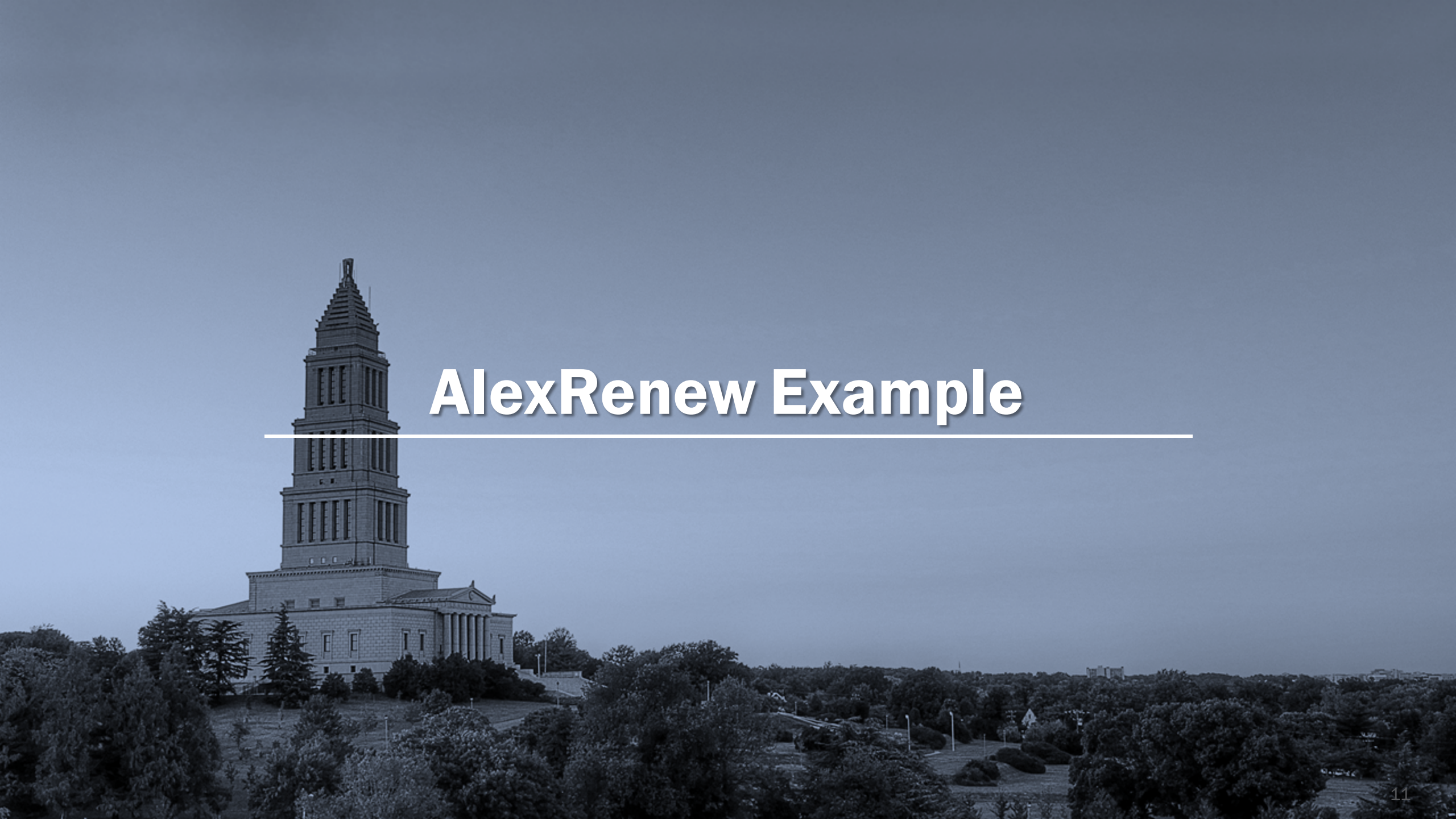


Wastewater-based epidemiology (WBE) for COVID allows communities to act quickly to prevent spread and support traditional public health approaches.

	Traditional Approaches	WBE
Diagnostic Testing	Generally captures symptomatic individuals	Captures all individuals in sewershed including asymptomatic individuals
Test Results	Can lag behind outbreak	Can provide a leading indicator of outbreaks
Cost per person	Can be expensive to screen a population	Can more cost-effectively screen an entire population

WBE can't identify individuals with COVID; however, it can provide leading, unbiased, cost-effective information on trends within the population.





AlexRenew Example

AlexRenew has been supporting research and WBE pilots since May 2020.

Howard University

- May 2020 – January 2021
- Research to pilot and refine sampling methodologies.

NATIONAL ™ WASTEWATER SURVEILLANCE SYSTEM
NWSS

CDC National Wastewater Surveillance Program

- June 2021 – September 2021
- National program to track COVID-19 prevalence in major urban areas.

VDH Sentinel Program

- September 2021 - present
- State program to track COVID-19 prevalence.

Early results showed that WBE data was correlated with the local daily case count.

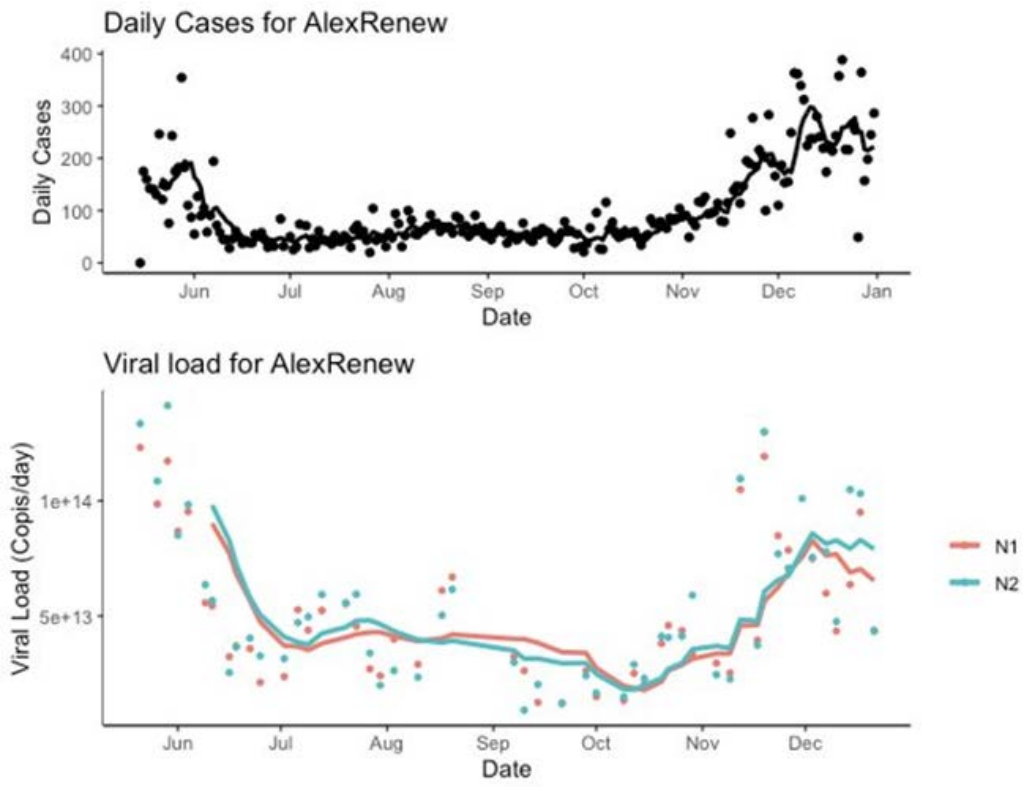


Fig. 1 *New reported cases of COVID-19 and Viral Concentrations of SARS-CoV-2 Detected in AlexRenew's Influent: May 2020 – January 2021.*

Sample collection from June – September 2021 forecasted the Delta Surge.

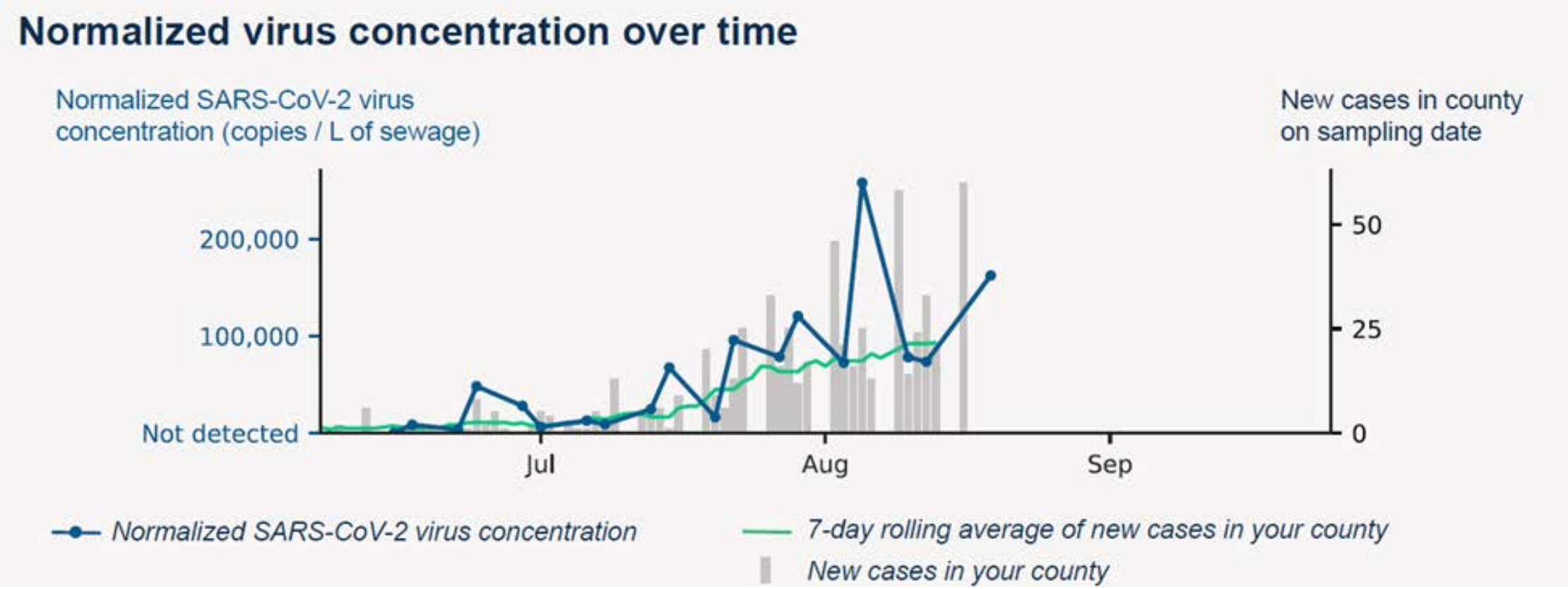


Fig. 2 *New reported cases of COVID-19 and Normalized Viral Concentrations of SARS-CoV-2 Detected in AlexRenew's Influent: June - August 2021. Samples in this project were normalized by flow.*

Data from the VDH Sentinel program shows the Omicron surge.

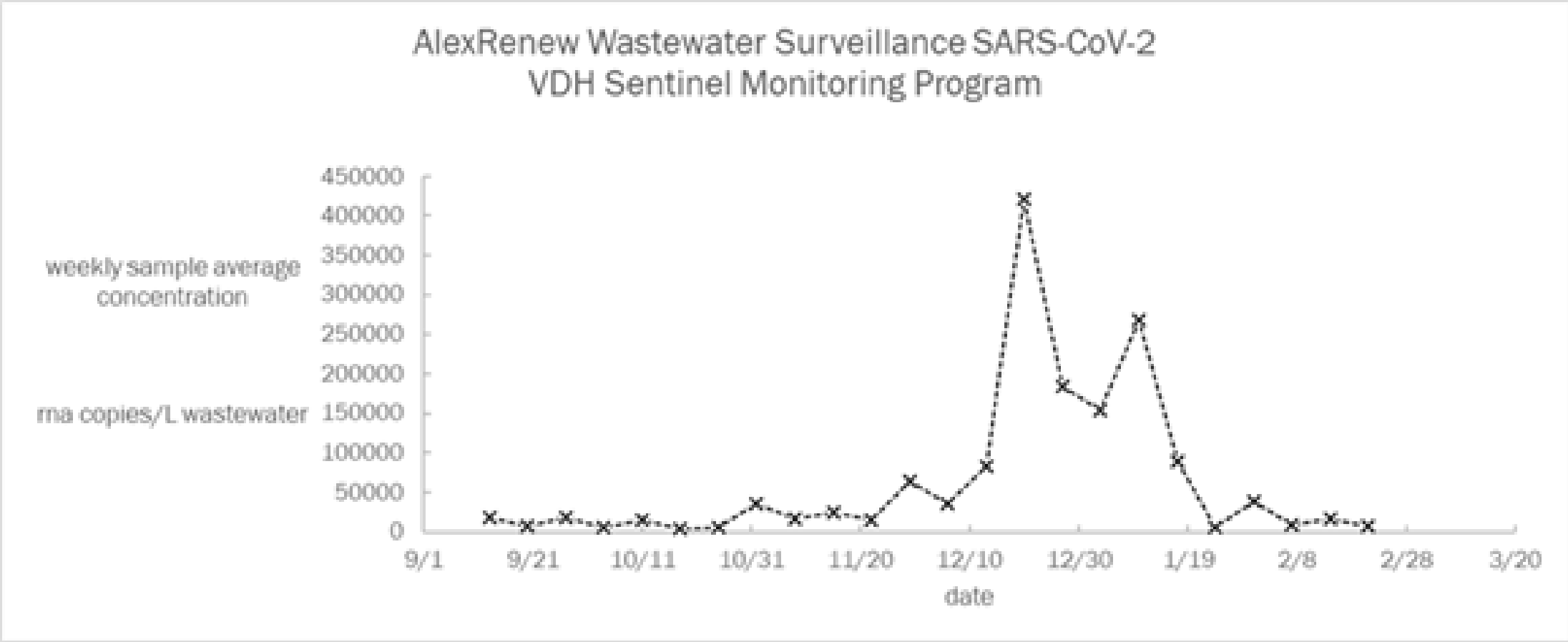
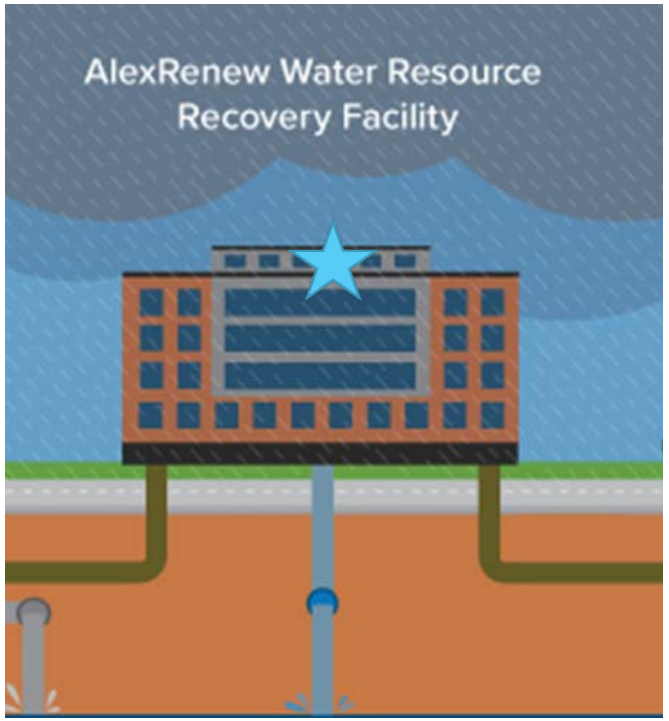


Fig. 3 *Normalized Viral Concentrations of SARS-CoV-2 Detected in AlexRenew's Influent: September 2021 – February 2022. Samples in this project were normalized by flow.*

Lessons learned

WBE requires strong partnerships between water sector, analytical labs, and public health departments.

WBE data can be a cost-effective tool to help monitor public health trends and be a leading indicator, allowing for action.



Pooled sample at WRRF
Number of individuals included:
Everyone in community
Data provided: Viral prevalence trends
Cost: $250/sample

Community testing
Number of individuals included:
Generally captures only symptomatic individuals
Data provided: Individual case counts
Cost: $10-20 pp/Thousands per event

What questions remain about WBE?

Privacy and protection of personal medical information?

Capacity of local wastewater agencies to support continued testing?

Training and resources at local health departments?

Best practice for communication of results and trends to the public?

Continued Federal and State support and oversight of program and data?

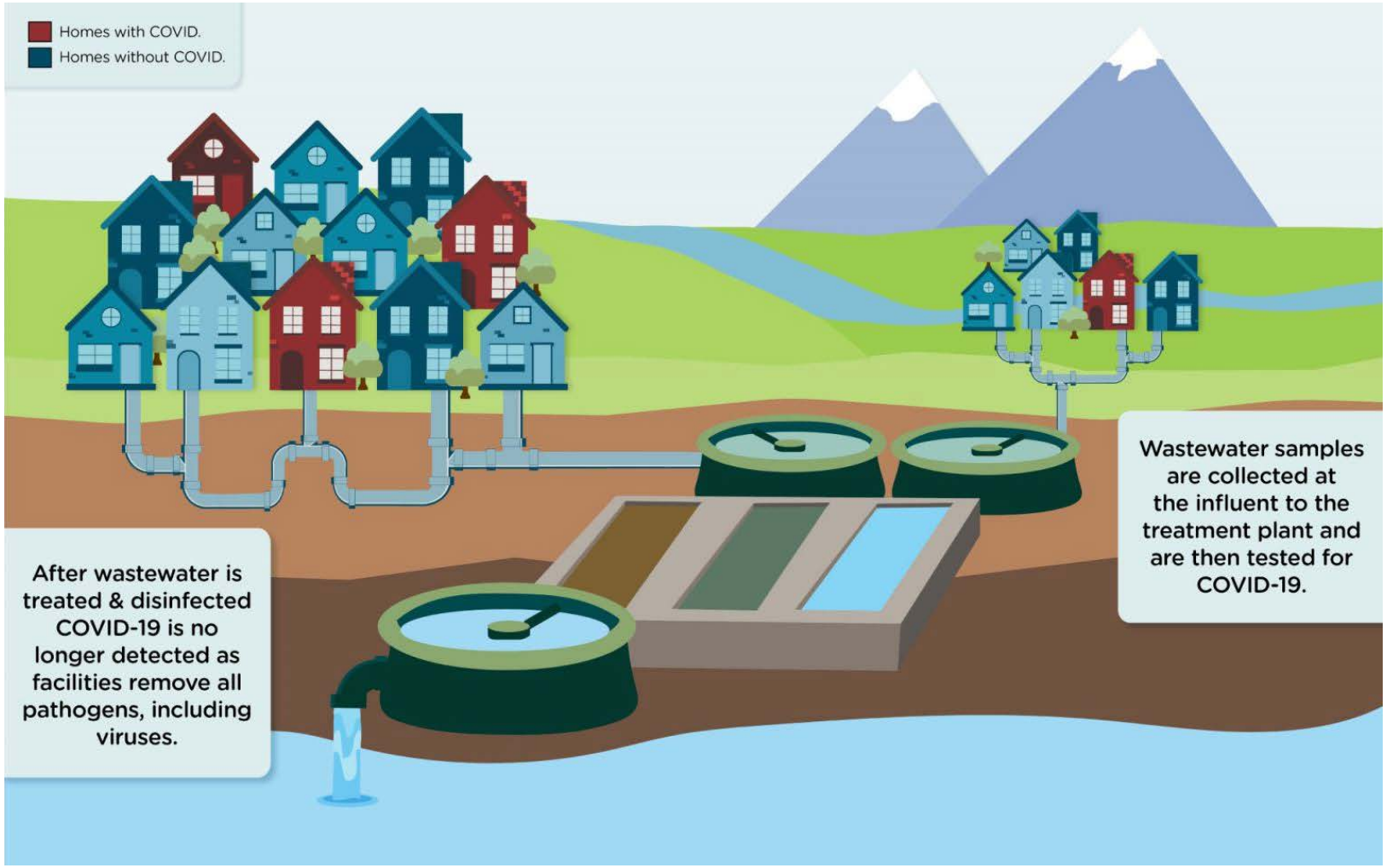


Image courtesy of Utah Department of Environmental Quality: https://deq.utah.gov/communication/news/utah-scientists-using-sewage-to-track-coronavirus

Questions?

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Helpful Links

- CDC National Wastewater Surveillance System (NWSS)
- Virginia Department of Health Wastewater Surveillance Program

To learn more, visit www.alexrenew.com