SEWERSHED SURVEILLANCE FOR COVID-19 EPIDEMIOLOGY

DIVISION OF WATER QUALITY AND GUEST SPEAKERS

AGENDA ITEM #3

AUGUST 18, 2020

PRESENTATION OVERVIEW

Information Item Segment	Presenter	Affiliation
Introduction to sewershed surveillance for COVID-19	Claire Waggoner	State Water Board
SCAN: Sewer Coronavirus Alert Network	Ali Boehm	Stanford University
Analytical method with QAQC to reliably monitor for SARS-CoV-2 and other pathogens in wastewater	Brian Pecson Adam Olivieri	Trussell Technologies EOA, Inc.
Identifying utilities monitoring for SARS-CoV-2 in wastewater and ongoing efforts in Los Angeles and San Francisco Bay	Karen Mogus	State Water Board
Addressing critical research needs to improve the efficacy of sewershed surveillance to inform COVID-19 epidemiology and decision-making	Peter Grevatt	The Water Research Foundation
Wrap up and next steps	Claire Waggoner	State Water Board

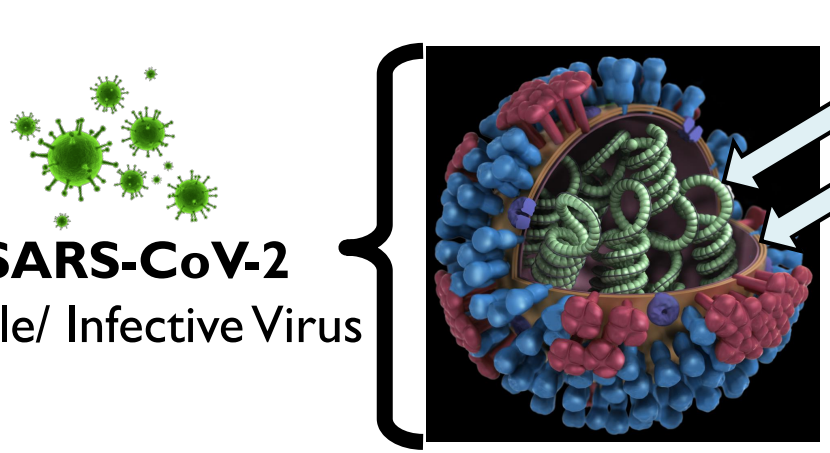





INTRODUCTION TO SEWERSHED SURVEILLANCE FOR COVID-19

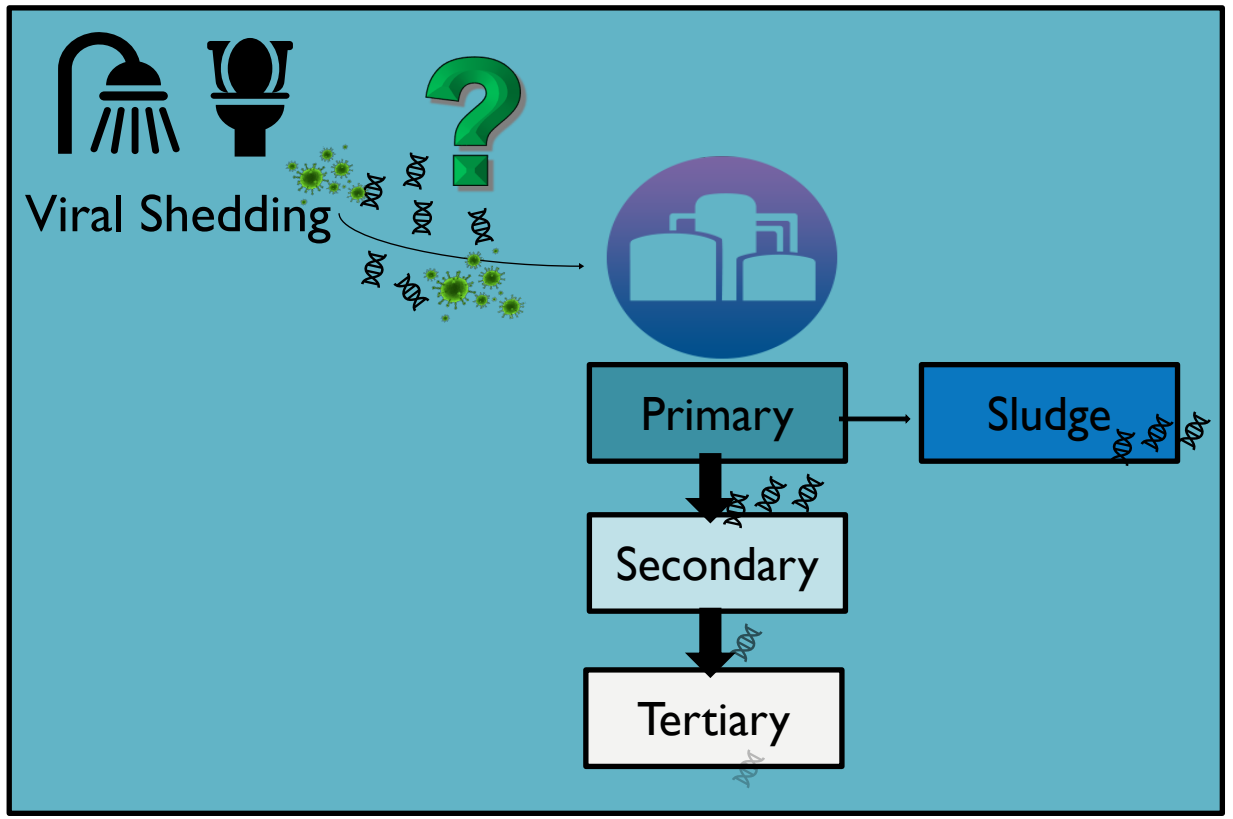
CLAIRE WAGGONER
SUSTAINABLE WATER PLANS AND POLICIES
DIVISION OF WATER QUALITY
STATE WATER RESOURCES CONTROL BOARD

DRINKING WATER AND WASTEWATER TREATMENT SYSTEMS EFFECTIVELY TREAT SARS-COV-2



SARS-CoV-2
Viable/ Infective Virus

- SARS-CoV-2 tends to associate with particulate matter
- Susceptible to physical and chemical treatment processes
- Uncertainty about if and how much infective virus is being shed and enters the sewershed



DRINKING WATER AND WASTEWATER TREATMENT SYSTEMS EFFECTIVELY TREAT SARS-COV-2

- Water and wastewater treatment facilities are designed to protect public health from pathogens, including SARS-CoV-2
- Studies are not detecting viable SARS-CoV-2 in drinking water, treated wastewater, or recycled water

Links to factsheets are at the end of the presentation

WHAT IS SEWERSHED SURVEILLANCE?

Scientists turn to LA wastewater to track coronavirus outbreaks

Hosted by Steve Chiotakis • Jul. 29, 2020 CORONAVIRUS KCRA

"SARS-CoV-2 was detected in Barcelona sewage long before the declaration of the first COVID-19 case"

-Bosch et al. 2020

Presence of SARS-Coronavirus-2 in sewage in the Netherlands -Brouwer et al., 2020 Envt. Sci. & Tech.

Poop tests in sewage might predict coronavirus surge

The race is on to study wastewater as a possible early warning for COVID-19.

By MARTIN WISCKOL | mwisckol@scng.com | Orange County Register

PUBLISHED: May 8, 2020 at 9:26 a.m. | UPDATED: May 8, 2020 at 10:59 a.m.

"Early in the Covid-19 pandemic, research revealed that people infected with the virus "shed" viral material in their faeces. That insight prompted an interest in "sewage epidemiology."" BBC News

The proof is in the sewage: hundreds of Yosemite visitors may have had coronavirus By Paulina Velasco, The Guardian, Jul 2020

Coronavirus found in Paris sewage points to early warning system

By Christa Lesté-Lasserre | Apr. 21, 2020 , 2:10 PM

FIRST OPINION

It's time to begin a national wastewater testing program for Covid-19

By ANNA MEHROTRA, DAVID A. LARSEN, *and* ASHISH K. JHA / JULY 9, 2020

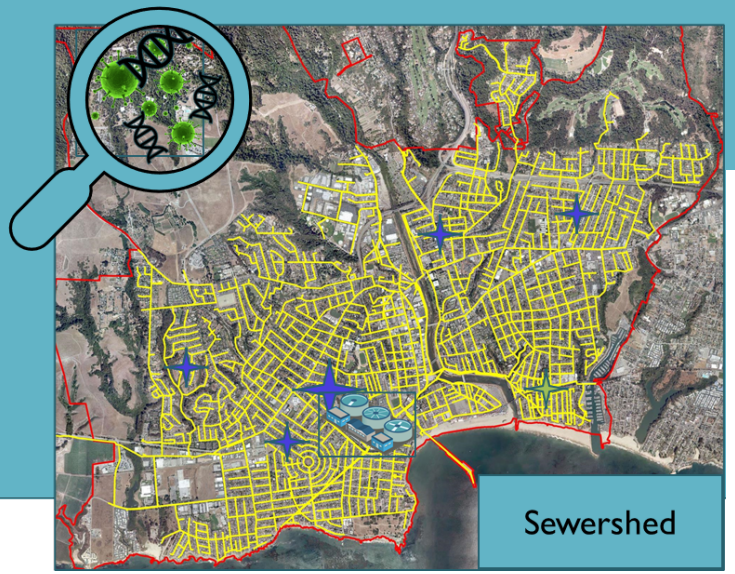
Science & Environment

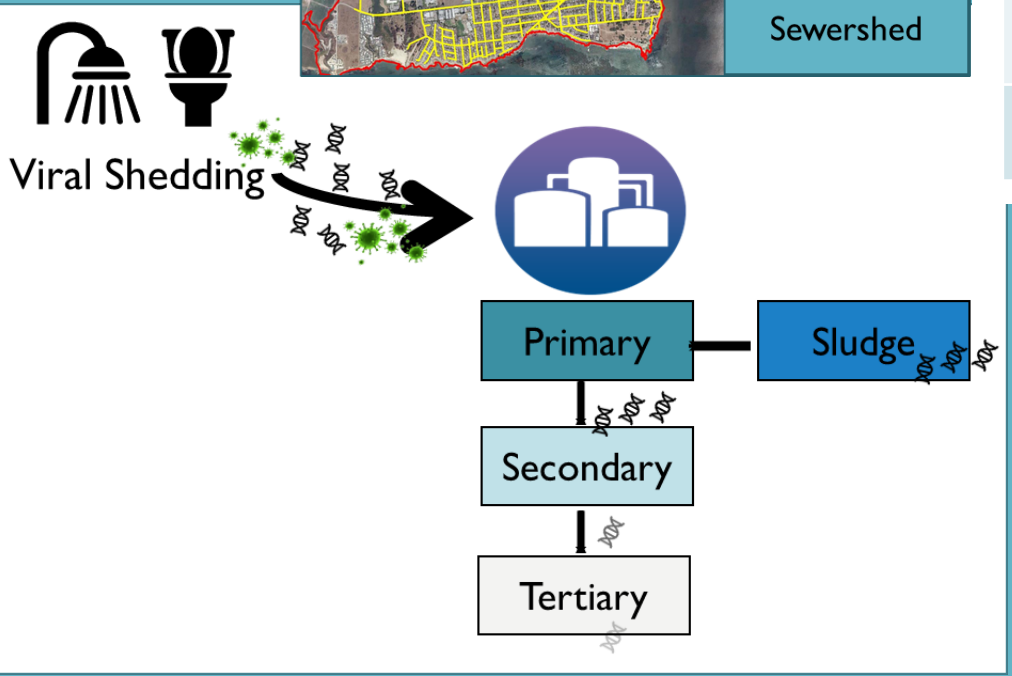
Coronavirus: Testing sewage an 'easy win'

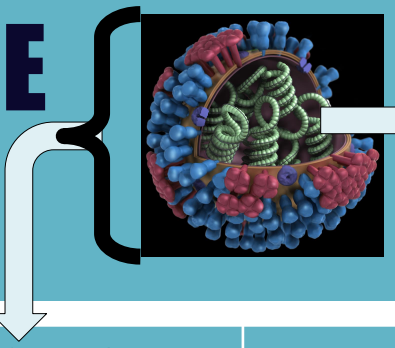
By Victoria Gill
Science correspondent, BBC News

2 July 2020

MONITORING FOR SARS-COV-2 IN WASTEWATER AND SLUDGE

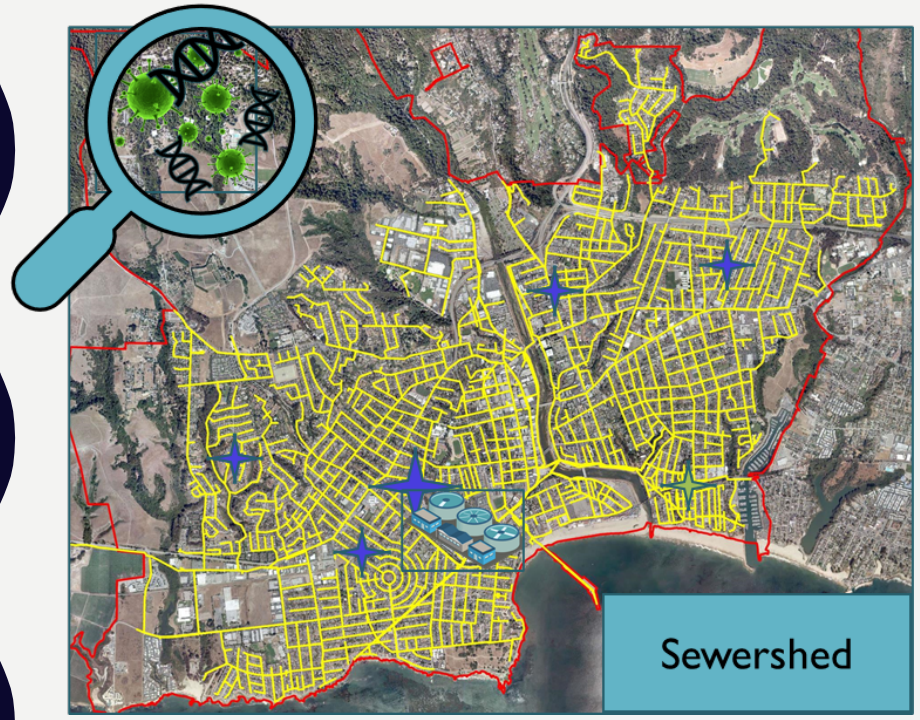






Target Analysis	"Live virus"	Viral RNA
Viable/infective	Yes	No
Monitoring method	Cell culture	RT-qPCR

HOW COULD SEWERSHED SURVEILLANCE BE USED TO INFORM THE COVID-19 PANDEMIC?



ID trends or changes in infection

Assess level of community infection

Risk assessment

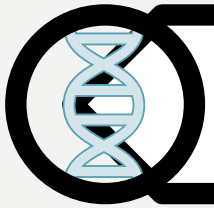
Epidemiology

- Study design needs to target your question(s)
- Data collected to inform public health needs to done in close coordination with public health officials

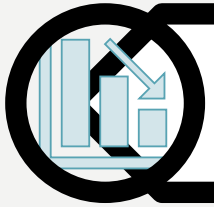
DATA GAPS AND RESEARCH NEEDS

Wastewater Data

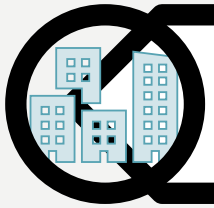
Best practices/standard methods for sample collection, storage, prep, analysis, and QAQC



Baseline prevalence of viral RNA

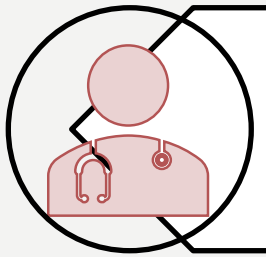


Viral RNA decay rate in the sewer

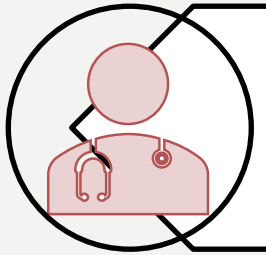


Sewershed characteristics (travel time, dilution, GIS layer)

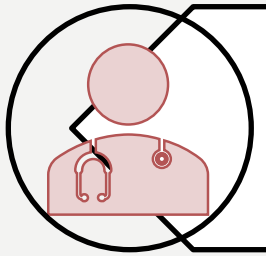
Public Health/ Clinical Data



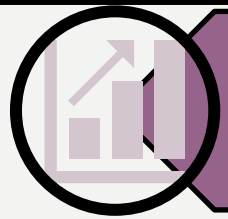
Fecal shedding rates of the virus



Changes in shedding based on state of infection (pre-symptomatic, asymptomatic, post infection, etc.)



Gene copies per gram of feces



e.g., Using SARS-CoV-2 concentration in wastewater to predict prevalence of COVID-19 infection in the population

DATA GAPS AND RESEARCH NEEDS

DRS ALEXANDRIA BOEHM AND KRISTA WIGGINTON

SCAN: Sewer Coronavirus Alert Network

DRS BRIAN PECSON AND ADAM OLIVIERI

Optimizing a method to analyze selected pathogens, including SARS-CoV-2, in untreated wastewater

KAREN MOGUS, DEPUTY DIRECTOR DWQ

Survey and Case Studies: Monitoring for SARS-CoV-2 in untreated wastewater in California

DR PETER GREVATT THE WATER RESEARCH FOUNDATION

Addressing critical research needs to improve the efficacy of sewershed surveillance to inform COVID-19 epidemiology and decision-making

SCAN: SEWER CORONAVIRUS ALERT NETWORK

ALEXANDRIA BOEHM, Ph.D.
STANFORD UNIVERSITY

FOUR FOCI

- Sampling
- Measurements
- Modeling
- Partnerships

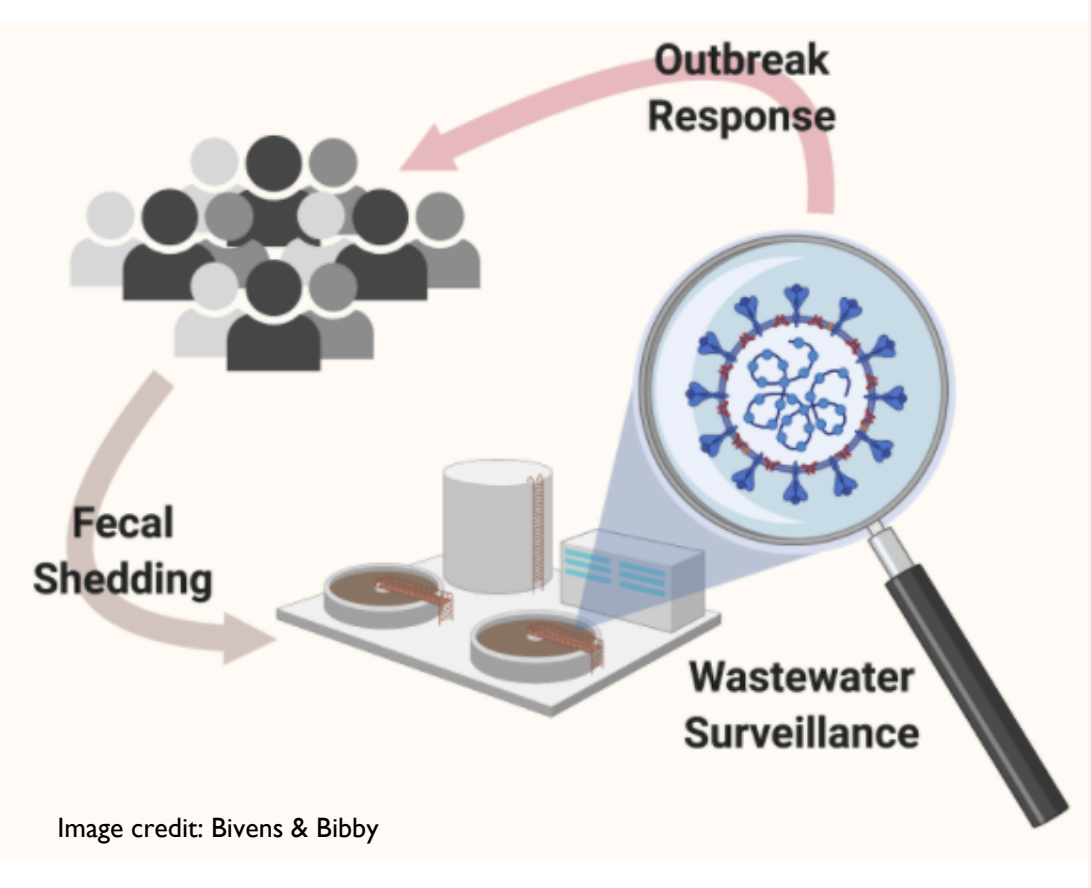
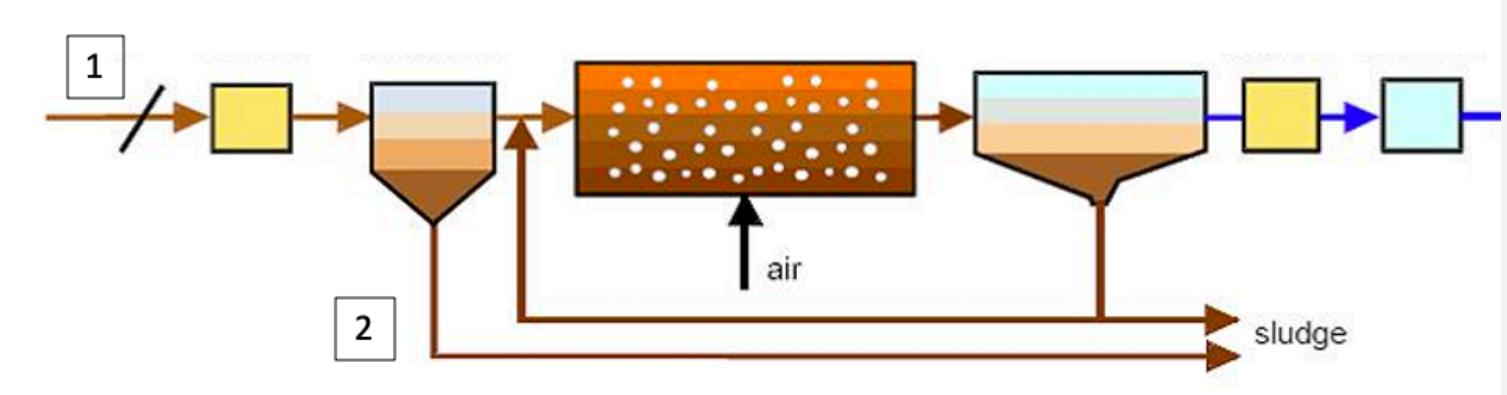


Image credit: Bivens & Bibby

I'd like to acknowledge our hard-working team of scientists, students, and post docs: Katy Graham, Stephanie Loeb, Marlene Wolfe, Nasa Sinnott-Armstrong, Lorelay Mendoza, Laura Roldan, Suzy Kim, Kevan Yamahara, Lauren Sassoubre

METHODS OVERVIEW

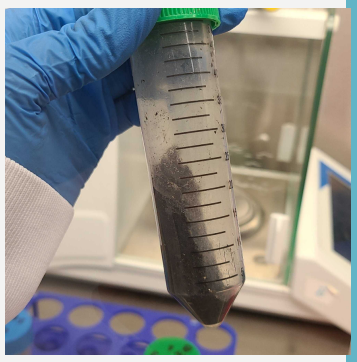


- Previous work from our group suggested enveloped viruses have an affinity for solids
- Capture viral RNA by concentrating them from influent using an organic flocculant method (PEG)
- Extract viral RNA directly from primary wastewater solids
- Recovery and inhibition controls, measure of wastewater "strength"
- Measurements made using digital droplet RT-PCR
- Includes virus recovery controls
- Protocols available on protocols.io
  - https://www.protocols.io/workspaces/wastewaterbased-epidemiology-working-group
- Manuscript in preparation

METHOD EVALUATION STUDY

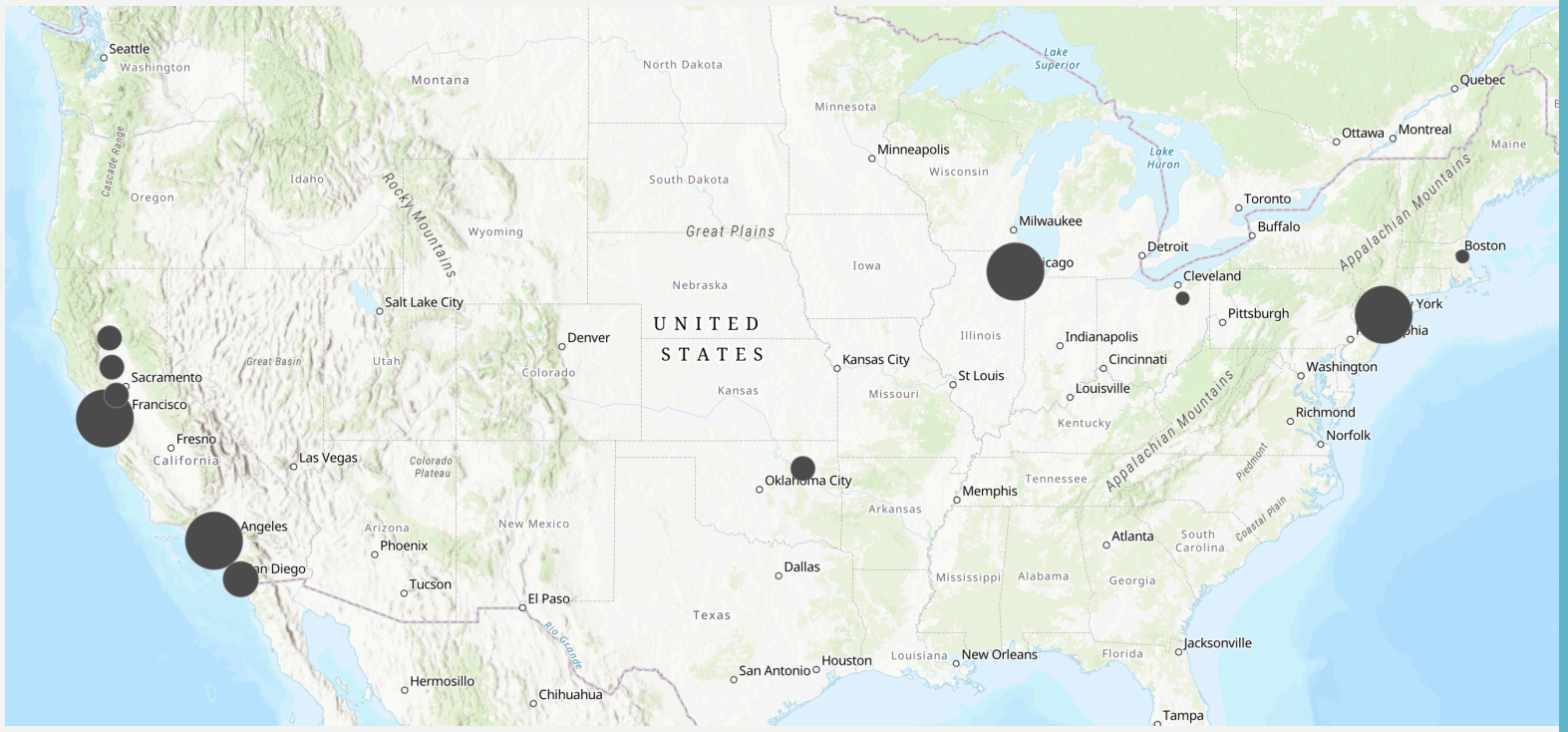
Paired influent and primary settled solids samples from 2 POTWs analyzed for SARS-CoV-2 genes as well as various recovery controls

- More consistent detection of SARS-CoV-2 in solids compared to influent
- Replicate samples of solids taken at the same time yielded similar results
- On a per mass basis, SARS-CoV-2 targets present in solids at 400-3000 fold higher concentrations than influent
- Many viruses have an affinity for solids
- Manuscript in preparation for submission to peer-reviewed journal

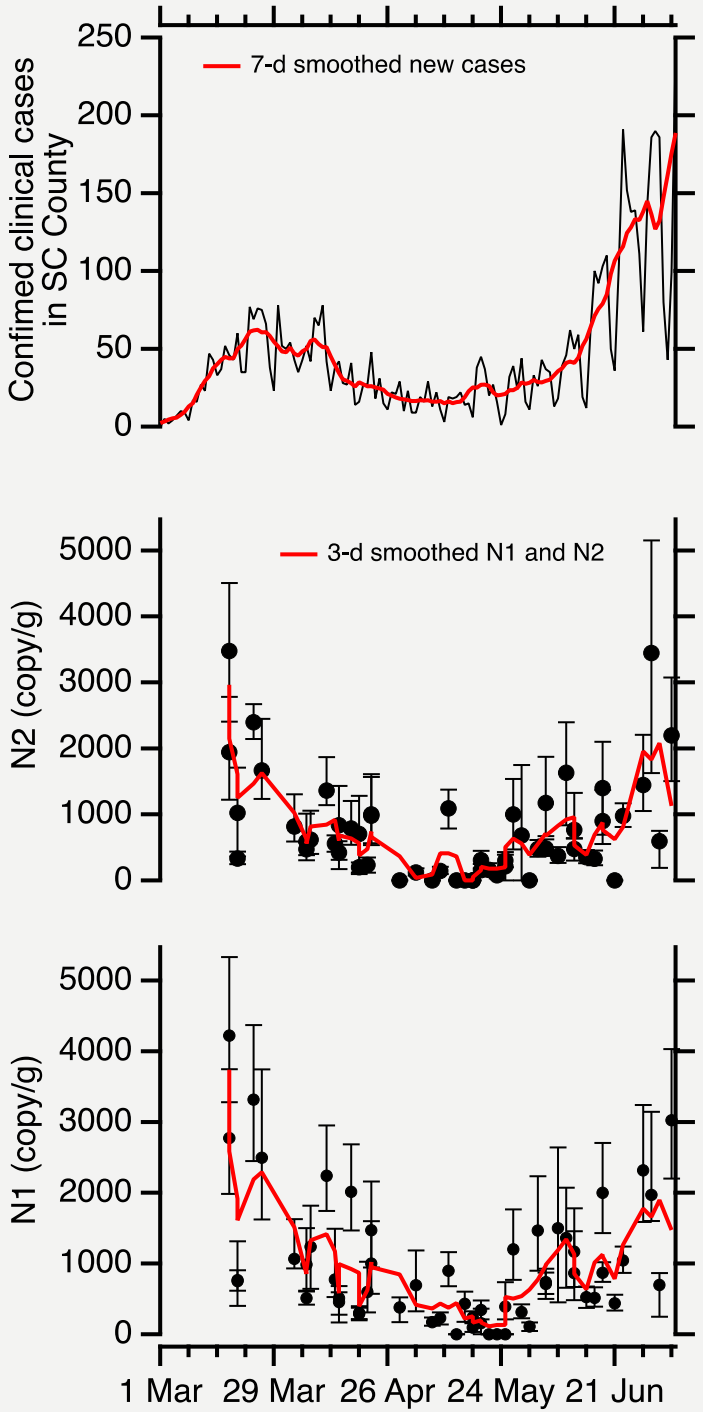


SAMPLING OVERVIEW

- Influent and primarily settled solids at 50 POTWs across the US
  - Ideally influent collected before any pre-treatment
  - Primary settled solids do not contain additives like polymers
- 25 POTWs in CA
  - Bay area
  - Socal counties
  - Norcal



- Samples are shipped on dry ice
- Sampled weekly to daily depending on POTW
- Sub-sewershed pilot project with local county



EXAMPLE DATA FROM SAN JOSE POTW

- N1 and N2 are RNA genes from SARS-CoV-2
- Samples are primary settled solids
- Confirmed clinical cases in Santa Clara County
- N1 and N2 trends track new confirmed clinical cases

How could these data have been used retrospectively?

- In early June during apparent rise in new cases, POTW data could have confirmed not a testing artifact
- Could have been used to confirm disappearance of cases during late April / early May

How can results be used to learn about infectious prevalence?

- Was first peak actually much higher than reflected in case data (owing to limitation in testing)?
- Can these data provide insight into time course of fecal shedding or infection prevalence?

PREDICTING PREVALENCE?

Relate the concentration of SARS-CoV-2 in solids to fraction of sewershed infected. Assumes:

- a fraction of settled solids are fecal solids (f_{fecal_solids})
- we know the amount of virus shed in feces (C_{feces}) and the fraction of infected people shedding it (f_{inf_shed})
- we know about virus persistence in the wastewater (k) and the amount of time it spends in the sewer network (t)
- we understand the tendency of the virus to partition to solids (Kd)

Most important unknown is amount of virus shed in feces; current estimates are inadequate and do not capture shedding during pre-symptomatic phase

Predictions of COVID-19 prevalence are unrealistically high

CANNOT USE THESE DATA TO PREDICT PREVALENCE at the present time

PARTNERSHIPS / COLLABORATORS

- All the WWTPs
- Andrea Silverman (NYU) - interfacing with NY plants
- Amy Pickering (Tufts) – interfacing with MA plant
- Emily Martin / Marisa Eisenberg / Andrew Brouwer (UM) – epidemiologists
- Jonathan Pritchard (Stanford) – statistics, genetics
- Craig Criddle (Stanford) – WWTP treatment processes
- Marc Salit (Stanford) - measurements
- Southern CA Coastal Water Research Project (Steve Weisberg / John Griffith / Josh Steele)
- Santa Clara Dept of Public Health
- New York Dept of Environmental Protection
- CDC (Mia Mattioli and team, WBE response)
- The Water Research Foundation
- International Water Association
- Academic researchers in Switzerland, Washington, Midwest, California
- Verily
- CASA (California Association of Sanitation Agencies)

GUIDANCE FOR USING WASTEWATER TO UNDERSTAND COVID-19*

- **Use-cases**
  - Community surveillance using POTW
  - Facility specific sampling (universities, prisons, nursing homes, food processing facilities)
  - Sub-sewershed specific sampling (hot spots, high risk communities)
- **How frequently do you need to sample?**
  - Adaptive sampling depending on the phase of the pandemic and response
    - More frequent sampling after policy changes
    - Less frequent sampling during low prevalence with no policy changes
- **Does every plant need to be sampled? No!**
  - Sentinel plants are likely needed
  - Other considerations: plants in under-tested areas, plants serving areas with hot spots
  - Public health information must guide sampling or supply chain issues and costs will be problematic
- **Guidelines for sample analysis**
  - Pre-analytical sample processing: Lots of folks working on this? Will a one size fit all?
  - Analytical measurements (including recovery, inhibition controls and normalizing controls)
- **Data analysis and reporting**

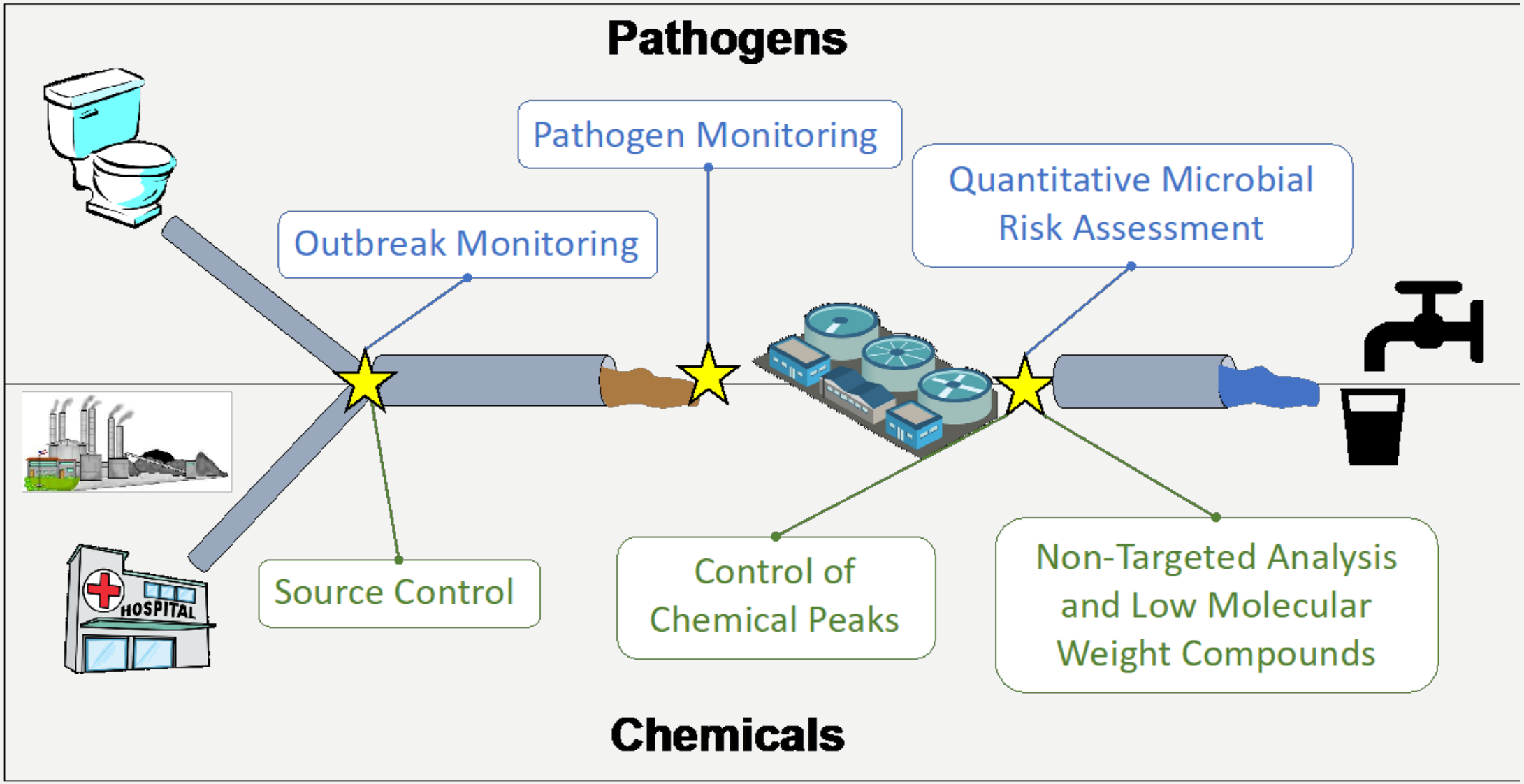
*Developed with a large working group of researchers with input from CDC, will be published on CDC website

PATHOGEN MONITORING IN CALIFORNIA UNTREATED WASTEWATER: FOCUS ON SARS-COV-2

BRIAN PECSON, Ph.D., P.E.
TRUSSELL TECHNOLOGIES, INC.

ADAM OLIVIERI, Dr.PH, P.E.
EOA, INC.

PRIORITY DPR RESEARCH PROJECTS



IMPORTANCE OF PATHOGENS IN POTABLE REUSE

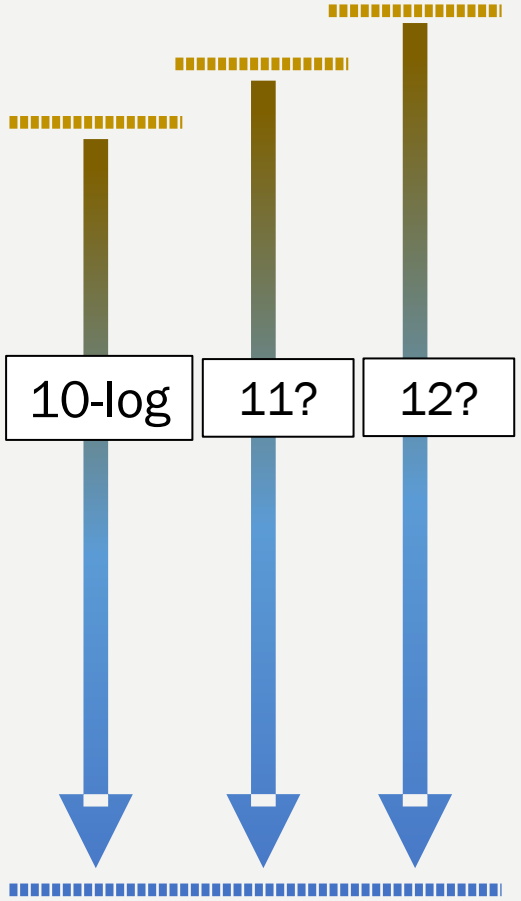
Raw wastewater

10-log

Drinking water

IMPORTANCE OF PATHOGENS IN POTABLE REUSE

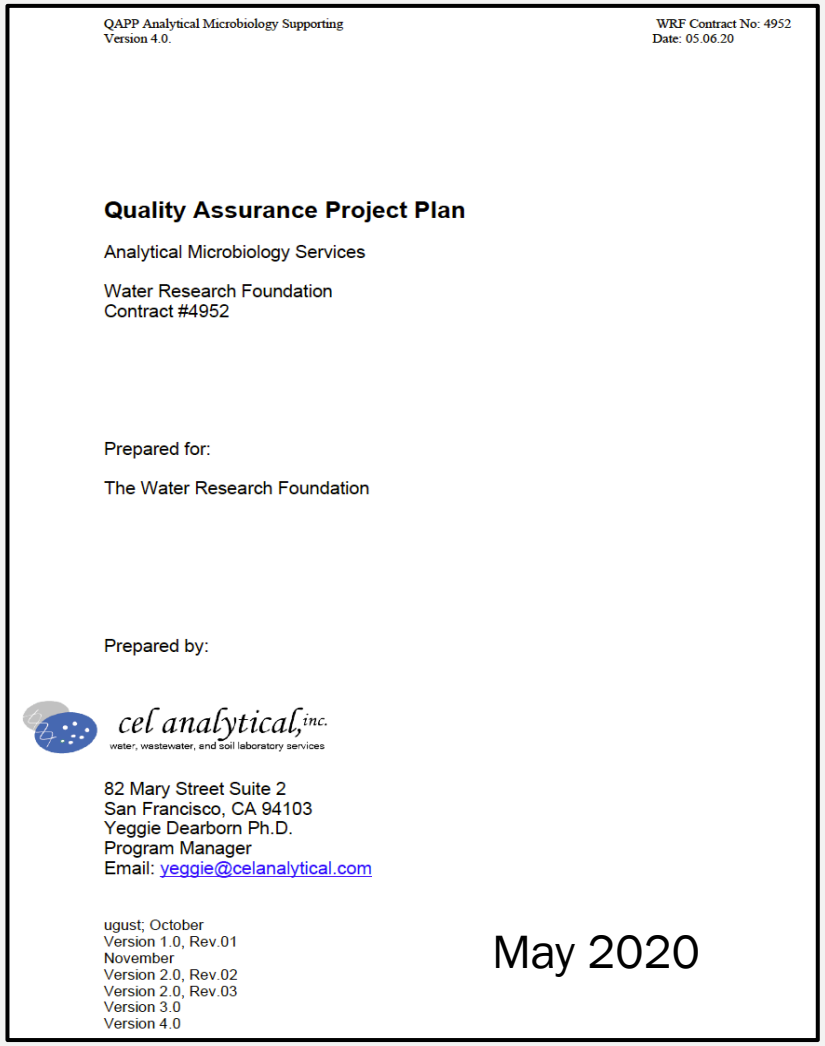
Raw wastewater



DPR-2: Pathogen Monitoring

Drinking water

STANDARD OPERATING PROCEDURES SET NEW BAR FOR WASTEWATER MONITORING



QAPP Analytical Microbiology Supporting
Version 4.0.

WRF Contract No: 4952
Date: 05.06.20

Quality Assurance Project Plan

Analytical Microbiology Services

Water Research Foundation
Contract #4952

Prepared for:

The Water Research Foundation

Prepared by:

cel analytical, inc.
water, wastewater, and soil laboratory services

82 Mary Street Suite 2
San Francisco, CA 94103
Yeggie Dearborn Ph.D.
Program Manager
Email: yeggie@celanalytical.com

ugust; October
Version 1.0, Rev.01
November
Version 2.0, Rev.02
Version 2.0, Rev.03
Version 3.0
Version 4.0

May 2020

- Developed through **lit review** and **methods pre-testing** study (Tasks 1 & 2)
- Further refined through **methods optimization study** using multiple wastewaters (Task 3)
- Findings **compared across three laboratories** (Task 3)

DPR-2 SOPs ARE SENSITIVE AND REPRODUCIBLE

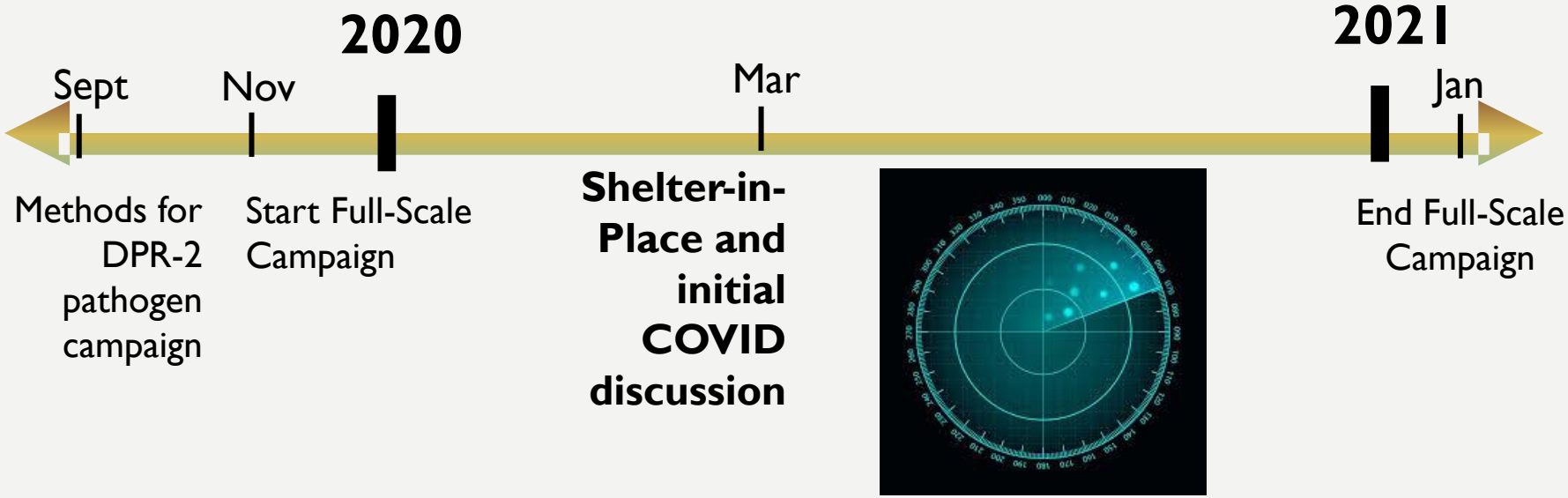
Organism	Fraction of Detects	Mean Recovery
Crypto (cyst/L)	40/41	31%
Giardia (oocyst/L)	41/41	44%
Enterovirus culture (MPN/L)	41/41	70% MS2, 75% PhiX174
Adenovirus culture (MPN/L)	41/41	
Enterovirus molecular (GC/L)	41/41	24% MS2, 55% PhiX174
Adenovirus molecular (GC/L)	41/41	
Norovirus GIA molecular (GC/L)	38/41	
Norovirus GIB molecular (GC/L)	40/41	
Norovirus GII molecular (GC/L)	41/41	

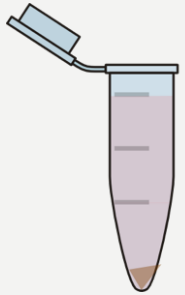
Preliminary results through 4/2020:

- High rate of detection for all organisms
- Effective for wastewater from 5 different facilities
- Reproducible across 3 different labs
- Matrix spike samples providing ability to correct for recovery

HOW DOES SARS-COV-2 FIT IN?

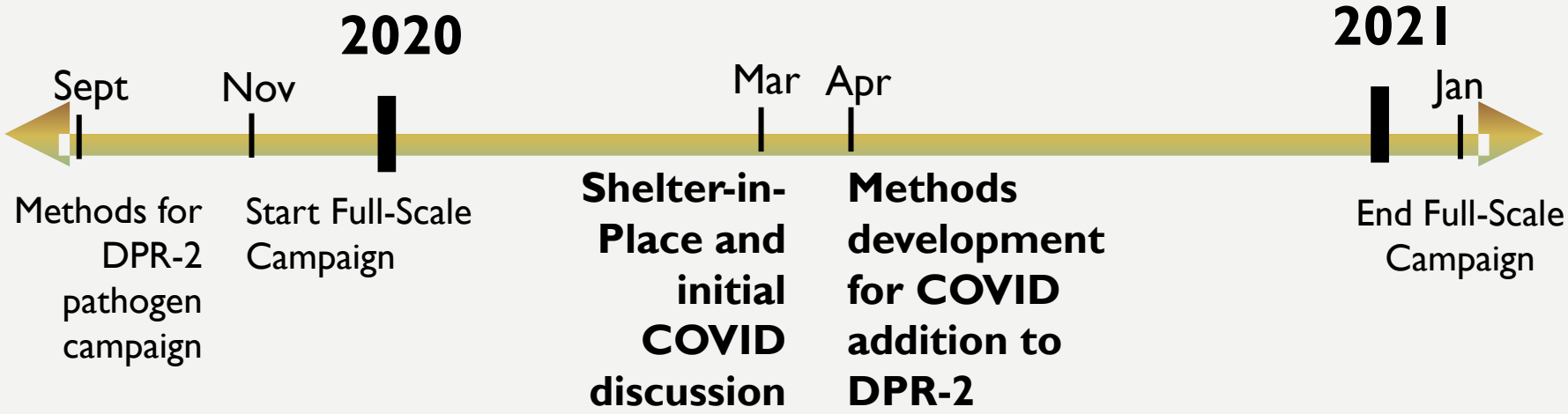
HOW DOES SARS-COV-2 FIT IN?





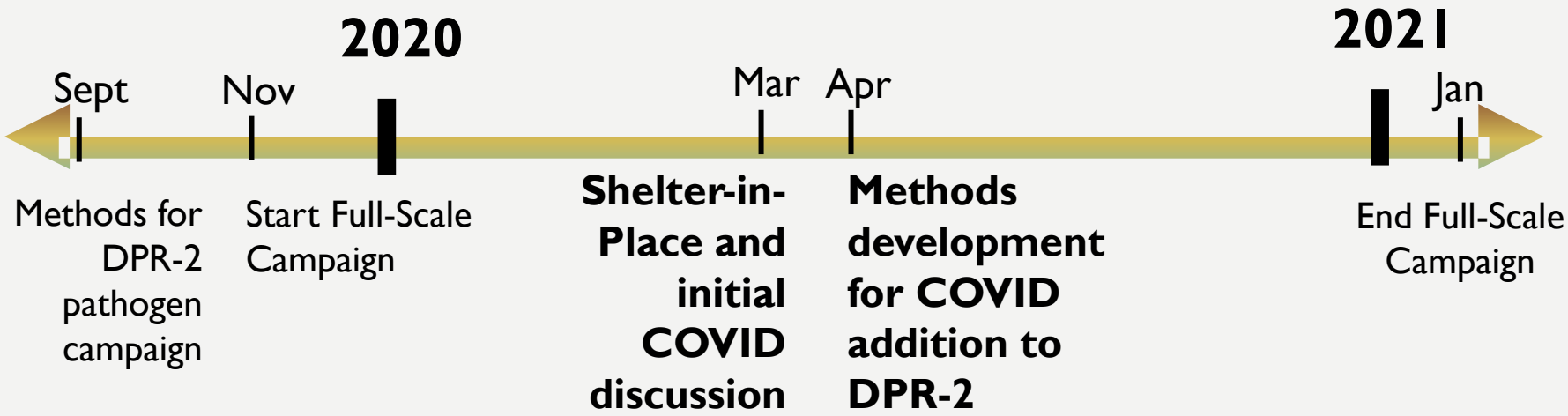
- State Water Board mobilizes to expand surveillance for SARS CoV-2
- Campaign has archived DNA/RNA extracts since November 2019
- Previous SOPs not optimized for SARS-CoV-2

HOW DOES SARS-COV-2 FIT IN?



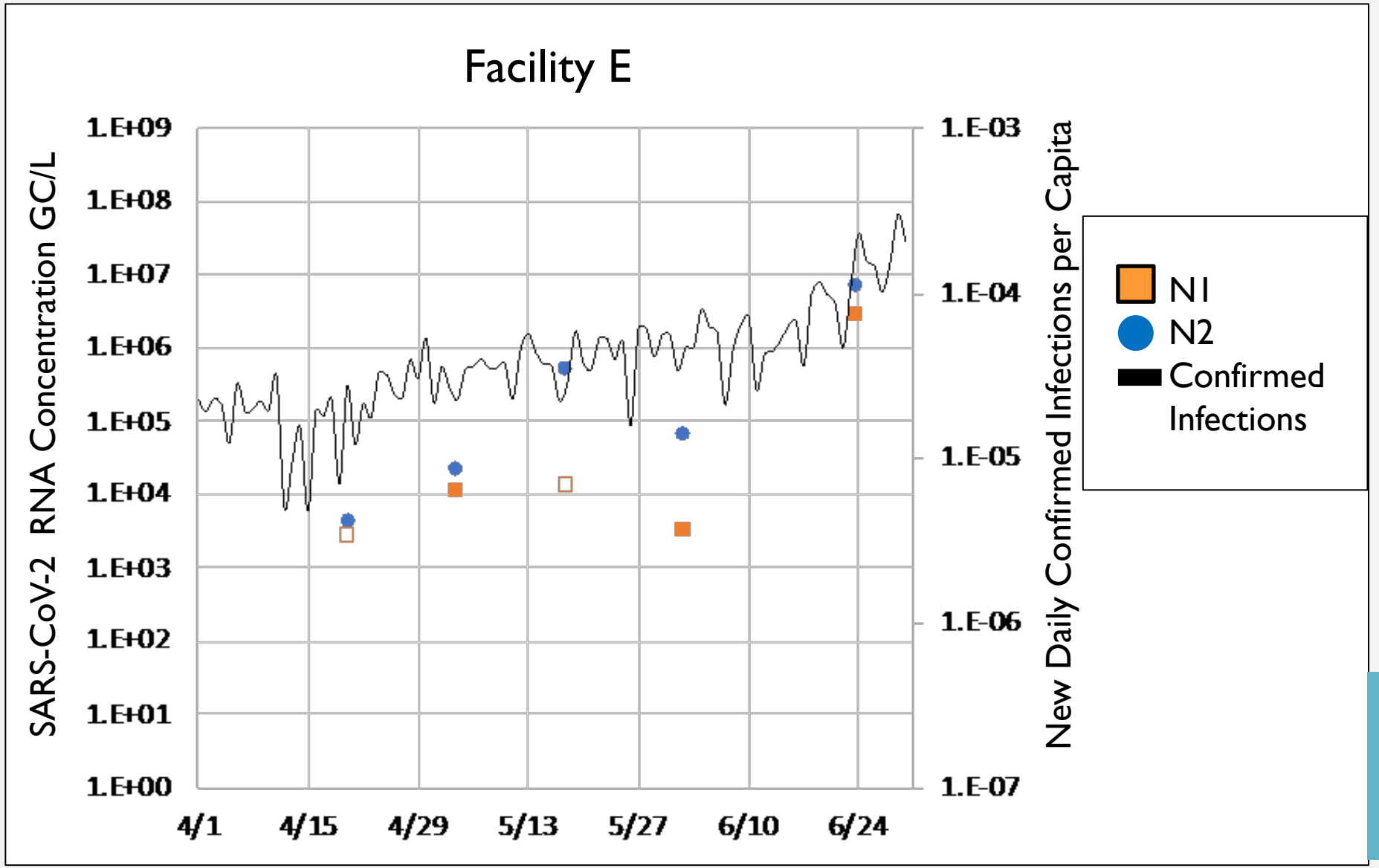
- Methods: optimize concentration and extraction methods
- QA/QC: apply same rigor to COVID as other DPR-2 pathogens
- Finalized SOPs in May 2020 and expanded scope for initial phase

HOW DOES SARS-COV-2 FIT IN?



Phase 1: Evaluate archived samples with previous SOP	Phase 2: Evaluate future samples with optimized COVID SOP

PRELIMINARY FINDINGS



N1 and N2 are RNA genes from SARS-CoV-2

Undergoing QA/QC Review – Do Not Cite

NEXT STEPS

PRESENT

- Conduct Original Pathogen Monitoring Campaign: October 2019 to January 2021
- Conduct SARS-CoV-2 Monitoring Campaign: April 2020 to January 2021

FUTURE

- Analyze data and develop final report with recommendations

WHY IS THIS RESEARCH IMPORTANT FOR POTABLE REUSE?

- DPR-2 refined Standard Operating Procedures for several waterborne pathogens
- QAPP includes strict QA/QC that produces more accurate information
- State Water Board expanding DPR-2 to stay vigilant on new SARS-CoV-2 threat
- Useful in developing public health criteria for various water-related applications including potable reuse

IDENTIFYING UTILITIES MONITORING FOR SARS-COV-2 IN WASTEWATER & MONITORING IN LOS ANGELES & SAN FRANCISCO BAY

KAREN MOGUS
DEPUTY DIRECTOR
DIVISION OF WATER QUALITY
STATE WATER RESOURCES CONTROL BOARD

SURVEY OF WASTEWATER TREATMENT PLANTS VOLUNTARILY MONITORING FOR SARS-COV-2 IN WASTEWATER

Questionnaire

- Are there fiscal and operational impacts from COVID-19?
- Are you sampling for SARS-CoV-2 in wastewater?
- Sent to ~2900 facilities on July 7, 2020

Responses

- 256 facilities responded by August 7, 2020
- 27 are monitoring for SARS-CoV-2
- 25 send results to the local public health department

IMPORTANCE OF COLLECTING SEWERSHED MAPS FROM UTILITIES

eSewershed maps are needed for sewershed surveillance data analyses

- Updating sanitary sewer system permit
- Staff proposing require electronic maps of the collection system
- These maps are a key element for aligning sewershed data with clinical data

LOS ANGELES COUNTY SANITATION DISTRICT: PILOT MONITORING

GENERATE DATA TO INFORM SEWERSHED SURVEILLANCE FOR COVID-19

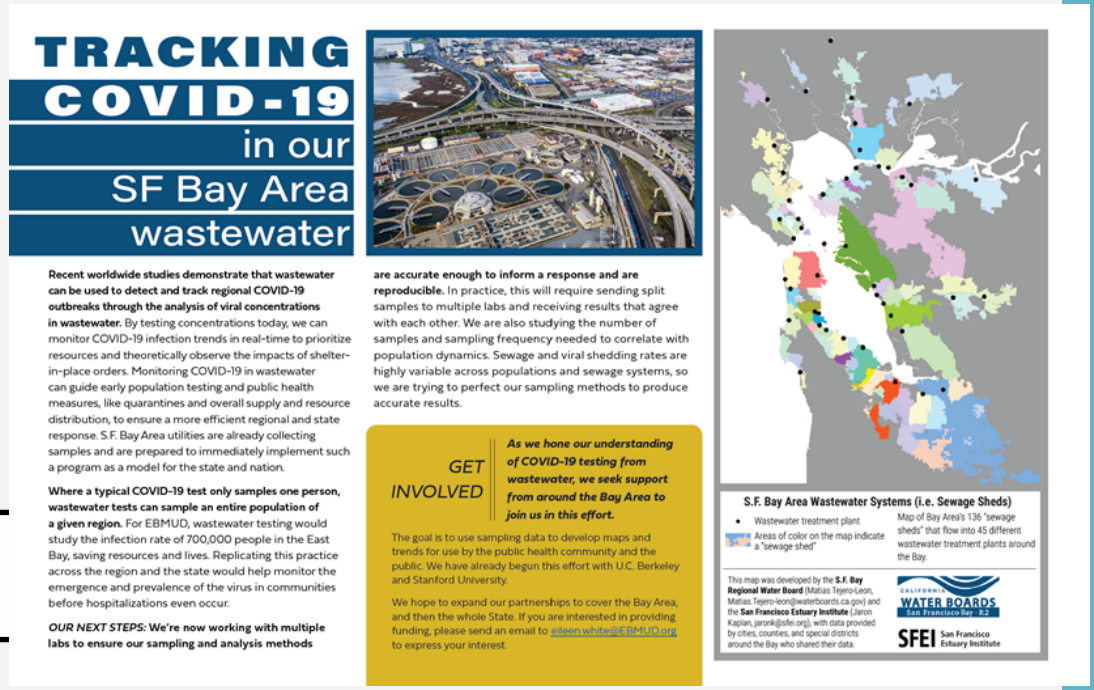
Determine presence and concentration of viral RNA in untreated wastewater	**Determine whether the virus is completely removed by the treatment processes**	**Confirm virus in the collection system is not viable/infective**
• Developed analytical method • Sample preparation matters • Viral RNA consistently detected in 30 influent samples from 2 facilities April- July 2020	• No viral RNA detected at 10 water reclamation plants in effluent to surface water or recycled water • Conventional wastewater treatment processes effectively destroy SARS-CoV-2	• Cell culture methods to determine infectivity • Samples sent to the University of Arizona • Results not available yet Pending

EAST BAY MUNICIPAL WATER DISTRICT

Pilot sampling: EBMUD sewershed (70,000 residents) since March 2020

Quantify, locate, and track trends in viral RNA in untreated wastewater

Develop maps and SARS-CoV-2 trend data for use by the public health community



TRACKING COVID-19 in our SF Bay Area wastewater

Recent worldwide studies demonstrate that wastewater can be used to detect and track regional COVID-19 outbreaks through the analysis of viral concentrations in wastewater. By testing concentrations today, we can monitor COVID-19 infection trends in real-time to prioritize resources and theoretically observe the impacts of shelter-in-place orders. Monitoring COVID-19 in wastewater can guide early population testing and public health measures, like quarantines and overall supply and resource distribution, to ensure a more efficient regional and state response. S.F. Bay Area utilities are already collecting samples and are prepared to immediately implement such a program as a model for the state and nation.

Where a typical COVID-19 test only samples one person, wastewater tests can sample an entire population of a given region. For EBMUD, wastewater testing would study the infection rate of 700,000 people in the East Bay, saving resources and lives. Replicating this practice across the region and the state would help monitor the emergence and prevalence of the virus in communities before hospitalizations even occur.

***OUR NEXT STEPS:* We're now working with multiple labs to ensure our sampling and analysis methods are accurate enough to inform a response and are reproducible.** In practice, this will require sending split samples to multiple labs and receiving results that agree with each other. We are also studying the number of samples and sampling frequency needed to correlate with population dynamics. Sewage and viral shedding rates are highly variable across populations and sewage systems, so we are trying to perfect our sampling methods to produce accurate results.

GET INVOLVED

As we hone our understanding of COVID-19 testing from wastewater, we seek support from around the Bay Area to join us in this effort.

The goal is to use sampling data to develop maps and trends for use by the public health community and the public. We have already begun this effort with U.C. Berkeley and Stanford University.

We hope to expand our partnerships to cover the Bay Area, and then the whole State. If you are interested in providing funding, please send an email to eileen.white@EBMUD.org to express your interest.

S.F. Bay Area Wastewater Systems (i.e. Sewage Sheds)

- Wastewater treatment plant
- Areas of color on the map indicate a "sewage shed"

Map of Bay Area's 136 "sewage sheds" that flow into 45 different wastewater treatment plants around the Bay.

This map was developed by the **S.F. Bay Regional Water Board** (Matias Tejero-Leon, Matias.Tejero-leon@waterboards.ca.gov) and the **San Francisco Estuary Institute** (Jaron Kaplan, jaronk@sfei.org), with data provided by cities, counties, and special districts around the Bay who shared their data.

CALIFORNIA WATER BOARDS San Francisco Bay - R2

SFEI San Francisco Estuary Institute

Eileen.White@EBMUD.org
https://www.ebmud.com/customers/alerts/coronavirus/

RESOURCES FOR GENERATING QUALITY DATA AND DATA REPOSITORIES

Voluntary monitoring data need to be coordinated with public health officials for the data to be used for decisions about public health

Letter to dischargers and labs: QAPP and SOP available to assist in generating high-quality data

- https://www.waterrf.org/resource/quality-assurance-project-plan-analytical-microbiology-services
- Need to coordinate to prevent resource shortages (e.g., PPE, reagents)

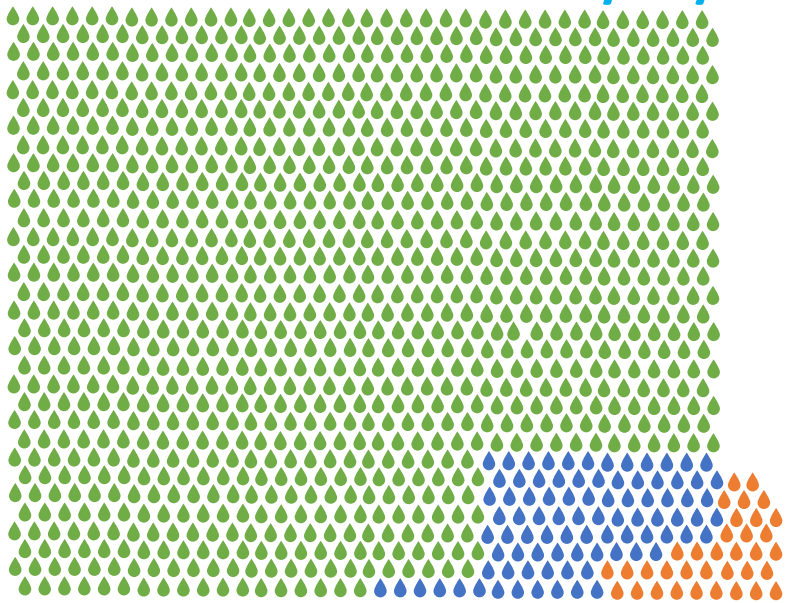
Staff are collaborating with GovOps, CDPH, and CDC to investigate repositories for SARS-CoV-2 monitoring data

- Data for Center for Disease Control's National Sewage Surveillance Database must be submitted by public health officials and meet certain quality standards

ADDRESSING CRITICAL RESEARCH NEEDS TO IMPROVE THE EFFICACY OF SEWERSHED SURVEILLANCE

PETER GREVATT, Ph.D., CEO
THE WATER RESEARCH FOUNDATION

WRF AT A GLANCE – 03/31/20



SUBSCRIBERS

1034 UTILITIES

39 MANUFACTURERS

89 CONSULTANTS

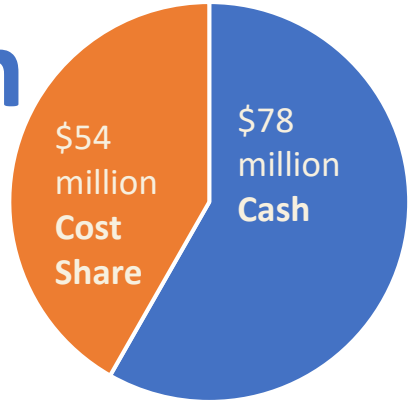
PROGRAMS

- Research Priority
- Tailored Collaboration
- Emerging Opportunities
- Unsolicited Research
- Grants/Awards
- Facilitated Research
- Paul L. Busch Award

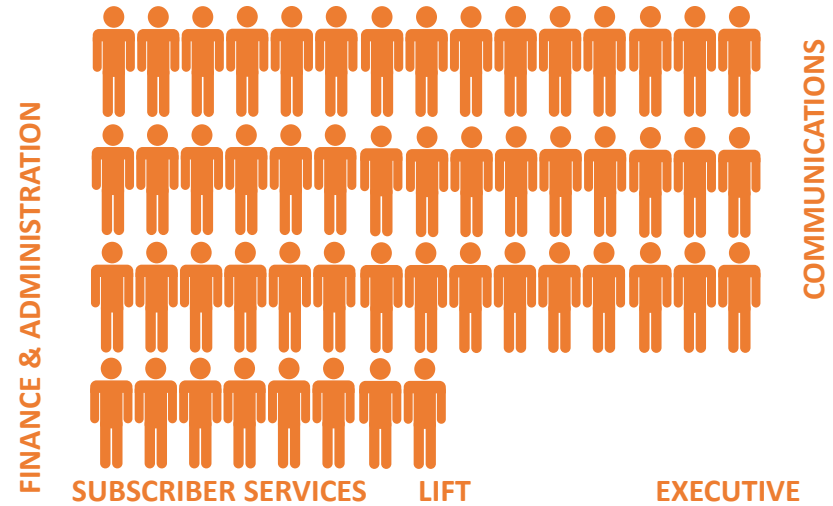
FUNDED RESEARCH

$132 Million

Contractually Funded Research



STAFF- 53



225 Avg Contracts/year

64 Contracts in process

180 Payments/month

100 Reimbursements/month

RESEARCH PORTFOLIO

1 Federal Contracts

4 Federal/ State Grants

172 Co-funders IN **291** Co-funded projects

WATER RESEARCH FOUNDATION ACTIVITY IN CALIFORNIA

162

SUBSCRIBERS

81

CA RESEARCHERS

244

PROJECTS INVOLVING CA

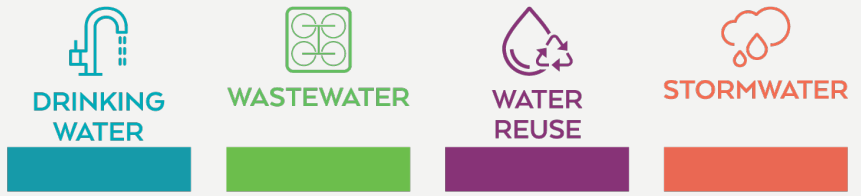
25 PROJECTS

$4.5M

CA SWB GRANTS TO SUPPORT PROJECTS ON POTABLE AND NON-POTABLE REUSE

www.waterrf.org/california-state-water-board-grant

RESEARCH PRIORITY PROGRAM: RESEARCH AREAS



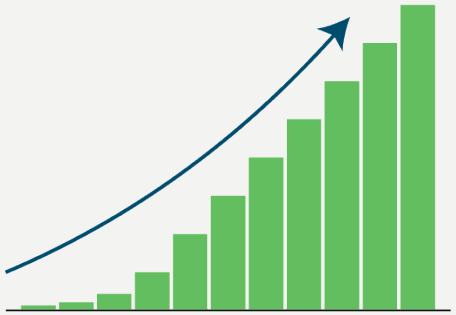
	DRINKING WATER	WASTEWATER	WATER REUSE	STORMWATER
Advancing System-Level Resilience for Water Infrastructure	■	■	■	■
Compounds of Current and Future Interest and Implications for One Water	■	■	■	■
Cyanobacterial Blooms and Cyanotoxins: Monitoring, Control, and Communication Strategies	■		■	
Emerging Disinfection By-products	■		■	
Energy Production & Efficiency	■	■	■	■
Intelligent Water Systems	■	■	■	■
Lead & Copper Management	■	■	■	
Linkages in Receiving Water Quality		■		■
Management, Analysis, Removal, Fate, and Transport of PFAS in Water	■	■	■	■
Microplastics in Water: Occurrence, Removal, Fate, and Transport in Water Treatment	■	■	■	■
Nutrients Treatment: Intensification, Reliability, and Efficiency		■		
Optimizing Advanced Treatment for Potable Reuse Without Brine Generation	■		■	
Stormwater and Flood Management	■	■	■	■
Waterborne Pathogens in Distribution and Premise Plumbing Systems	■		■	
Water Reuse and Beyond: Water Quality Monitoring Methods, Data, and Interpretation	■		■	


THE
Water
Research
FOUNDATION®
International Water Research Summit
Environmental Surveillance of COVID-19 Indicators in Sewersheds
April 27-30, 2020

WHAT CAN YOU USE SEWERSHED SURVEILLANCE DATA FOR NOW?

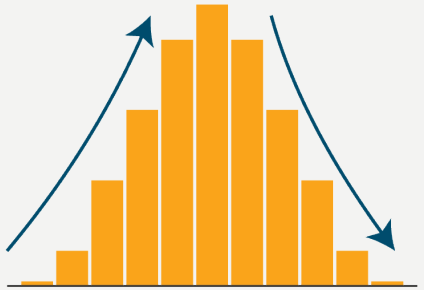
General Use Cases	Can Inform	Current Feasibility
Trends/Changes in Occurrence	Early detection of Occurrence. Tracking the impact of medical and social interventions: A) curve increasing; B) curves decreasing	A) ++ B) +
Assessment of Community Infection	Tracking disease prevalence in the community. Identification of areas of concern	+/-
Risk Assessment	Risk to utility workers and those exposed to raw sewage	+/-
Viral Evolution	Source tracking of the virus	-

Trend Occurrence



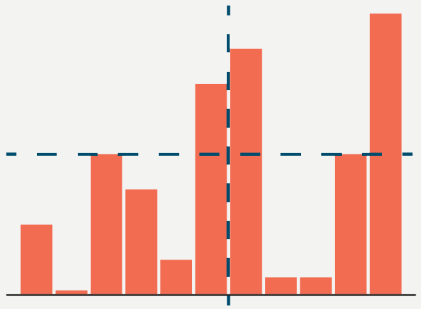
1 variable, 1 direction

Changes in Trends



1 variable, 2 directions

Community Prevalence



multiple variables, need to establish trigger levels

4 Priority Areas to Accelerate the Pace of Progress

1. Standardized procedures for the collection and storage of wastewater samples
2. Use of tools to identify the genetic signal of SARS-CoV-2 in wastewater samples
3. Recommended approaches for the use of data on the genetic signal of SARS-CoV-2 to inform trends and estimates of community prevalence
4. Strategies to communicate the implications of wastewater surveillance results with the public health community, elected officials, wastewater workers, and the public

NEAR-TERM RESEARCH PRIORITIES TO ACCELERATE PROGRESS

Methods Comparison

Sample Collection and Storage

Sample Design at Multiple Scales:

- Urban Centers
- Mid-sized Cities
- Small Towns

COVID-19 RESEARCH PROJECTS

- Interlaboratory and Methods Assessment of the SARS-CoV-2 Genetic Signal in Wastewater (#5089)
- Understanding the Factors that Affect the Detection and Variability of SARS-CoV-2 in Wastewater (#5093)
- Environmental Persistence and Disinfection of Lassa Virus and SARS-CoV-2 to Protect Worker and Public Safety (#5029)
- Impact of Storage and Pre-Treatment Methods on Signal Strength of SARS-CoV-2 Genetic Signal in Wastewater *(under development)*
- NSF Research Coordination Network on SARS-CoV-2 wastewater surveillance (*recently awarded*)

ADD-ONS TO CA SWB PROJECTS ALREADY UNDERWAY

Measuring Pathogens in Wastewater (#4989 & #4952)

SARS-CoV-2 added to list of organisms of concern; research team is investigating the feasibility of analyzing SARS-CoV-2 in samples archived since Nov. 2019 and going forward

Collecting Pathogens in Wastewater During Outbreaks (#4990)

Added coronavirus to the list of organisms of concern

WRAP UP AND NEXT STEPS

CLAIRE WAGGONER
SUSTAINABLE WATER PLANS AND POLICIES
DIVISION OF WATER QUALITY
STATE WATER RESOURCES CONTROL BOARD

A TOOL WITH PROMISE THAT NEEDS REFINEMENT

Active research area with rapidly emerging information

- Possible to start to detect trends
- Cannot use SARS-CoV-2 in wastewater data to predict prevalence of COVID-19 infection at the present time
- More clinical and sewershed research is needed

COORDINATE TO IMPROVE DATA QUALITY AND COMPARABILITY

Need to ensure data quality and comparability, but also flexibility

- SOPs for measuring SARS-CoV-2 in untreated wastewater are available
- Establish minimum QAQC and performance metrics
- Need method flexibility to minimize supply chain disruption

COORDINATION IS THE KEY TO SUCCESS OF A FUTURE STATEWIDE PROGRAM

Data for public health decisions needs to be led/coordinated by public health officials

- Data for CDC's National Sewage Surveillance System needs to be submitted by public health officials
- Data needs to meet the need of the end user (e.g., research scientist vs. public health officials)

Statewide surveillance would need a statewide study design, sampling regime, etc. (QAPP)

- Develop lab capacity and ensure timely reporting, within 24 hours
- Statewide planning and coordination is needed to prevent supply chain disruptions and ensure timely analyses

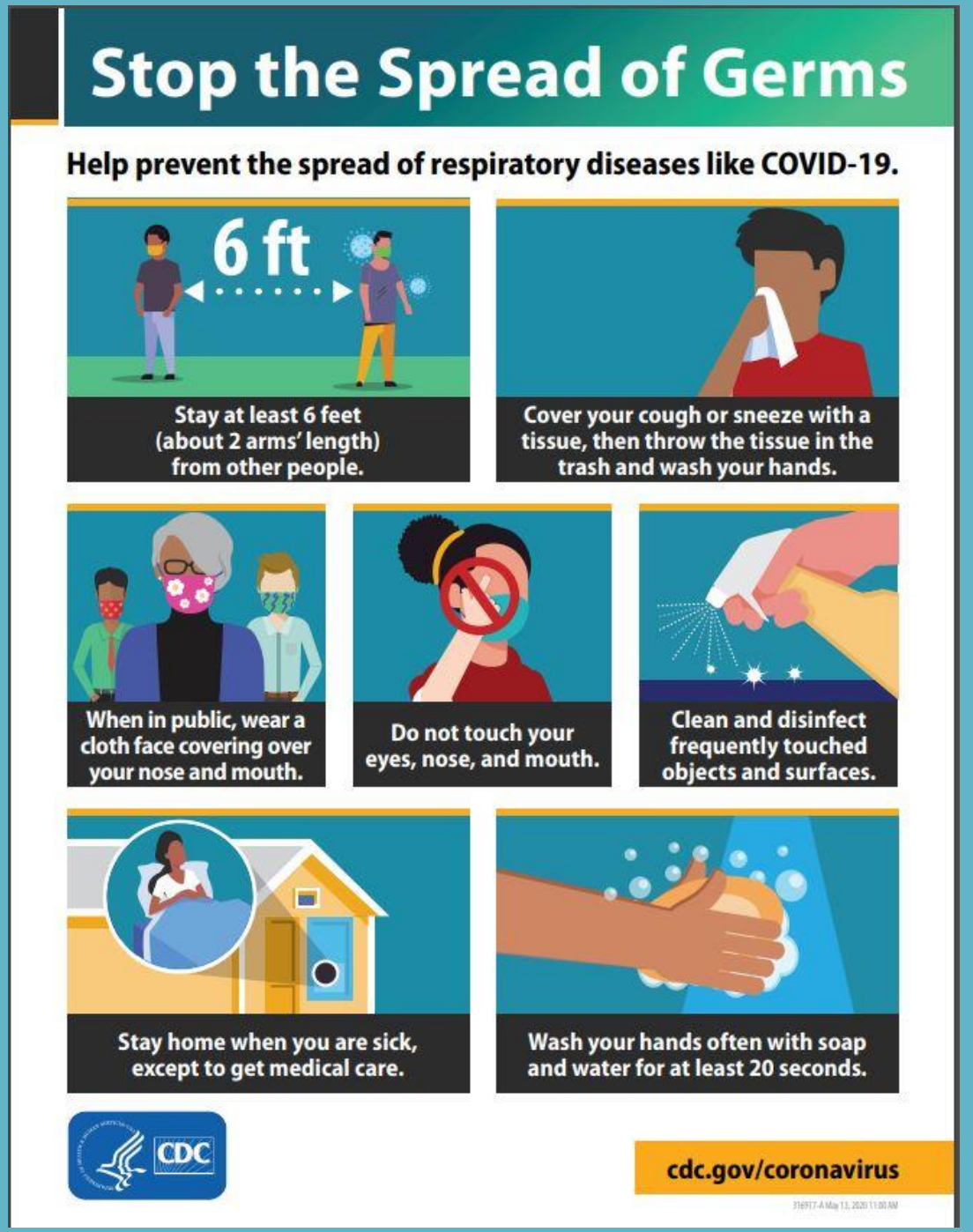
Utility in a statewide data repository for all SARS-CoV-2 data

QUESTIONS AND DISCUSSION

https://www.waterboards.ca.gov/resources/covid-19_updates/
or contact: Claire.Waggoner@Waterboards.ca.gov

SAVE LIVES
STOP THE SPREAD

1. Wash your hands
2. Wear a mask/ face covering
3. Practice physical distancing
4. Stay home
5. Virtual parties only or party with your quarantine buddies
6. Tell your friends, family, co-workers, etc. to do the same



ADDITIONAL RESOURCES AND LINKS

- Main Page: https://www.waterboards.ca.gov/resources/covid-19_updates/
- California's Recycled Water and Treated Wastewater Is Safe from the COVID-19 Virus: https://www.waterboards.ca.gov/publications_forms/publications/factsheets/docs/covid-19/recycled_and_treated_ww_safe_from_covid19_factsheet.pdf
- Reminder About California's Drinking Water Systems State-Required Treatment Process Removes Viruses, Including COVID-19: https://www.waterboards.ca.gov/publications_forms/publications/factsheets/docs/covid-19/covid19_drinking_water_factsheet_english.pdf
- Editorial Perspectives: will SARS-CoV-2 reset public health requirements in the water industry? Integrating lessons of the past and emerging research: https://watereuse.org/wp-content/uploads/2020/06/Pecson-et-al-2020_ESWRT-editorial.pdf
- https://update.covid19.ca.gov/#top

STATE WATER BOARD WEBPAGE AND RESOURCES

CALIFORNIA
Water Boards
STATE WATER RESOURCES CONTROL BOARD
REGIONAL WATER QUALITY CONTROL BOARDS

Staff Contact:
Claire.Waggoner@waterboards.ca.gov

DATA QUALITY MATTERS: GENERATE USEABLE DATA

QAPP & SOPS AVAILABLE NOW!

FOR SARS-COV-2 AND OTHER SELECTED PATHOGENS IN UNTREATED WASTEWATER

www.waterrf.org/research/projects/measure-pathogens-wastewater

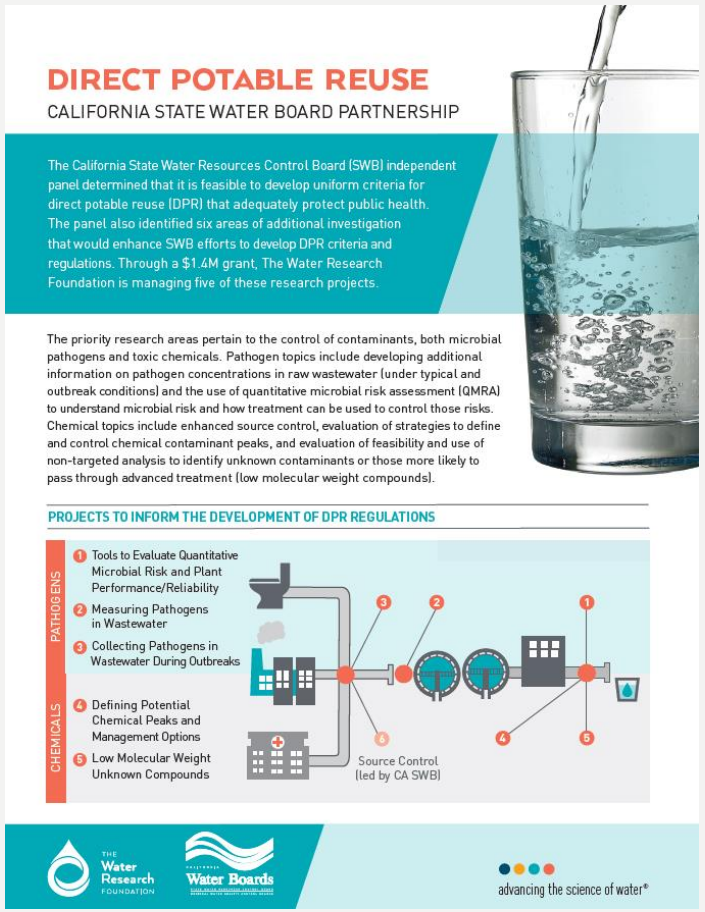
DIRECT POTABLE REUSE RESEARCH

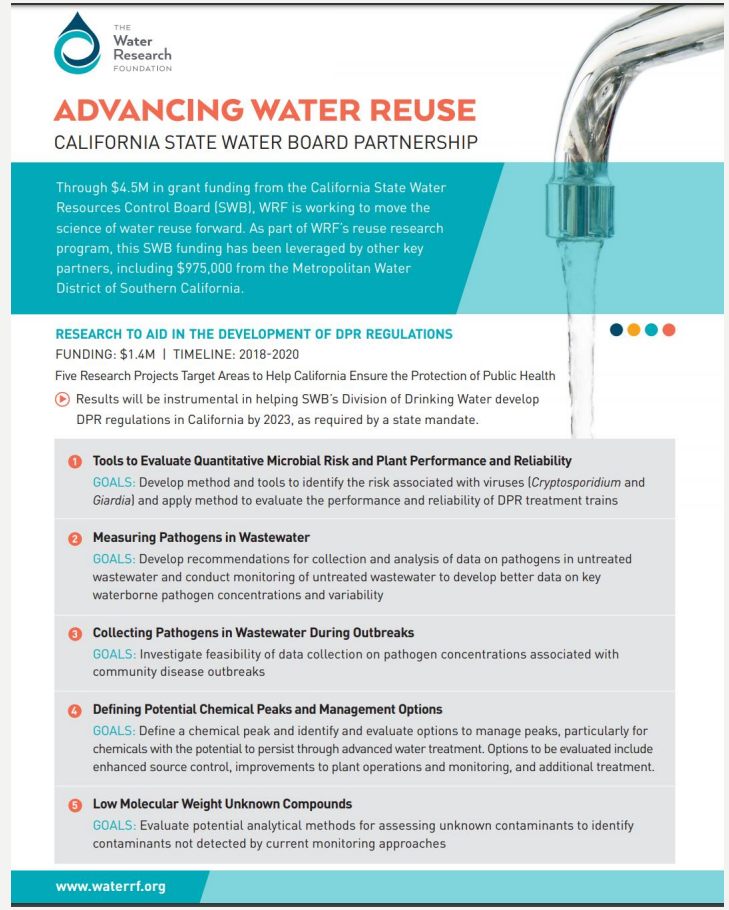
https://www.waterrf.org/research/topics/reuse

https://www.waterrf.org/california-state-water-board-grant

THE Water Research FOUNDATION

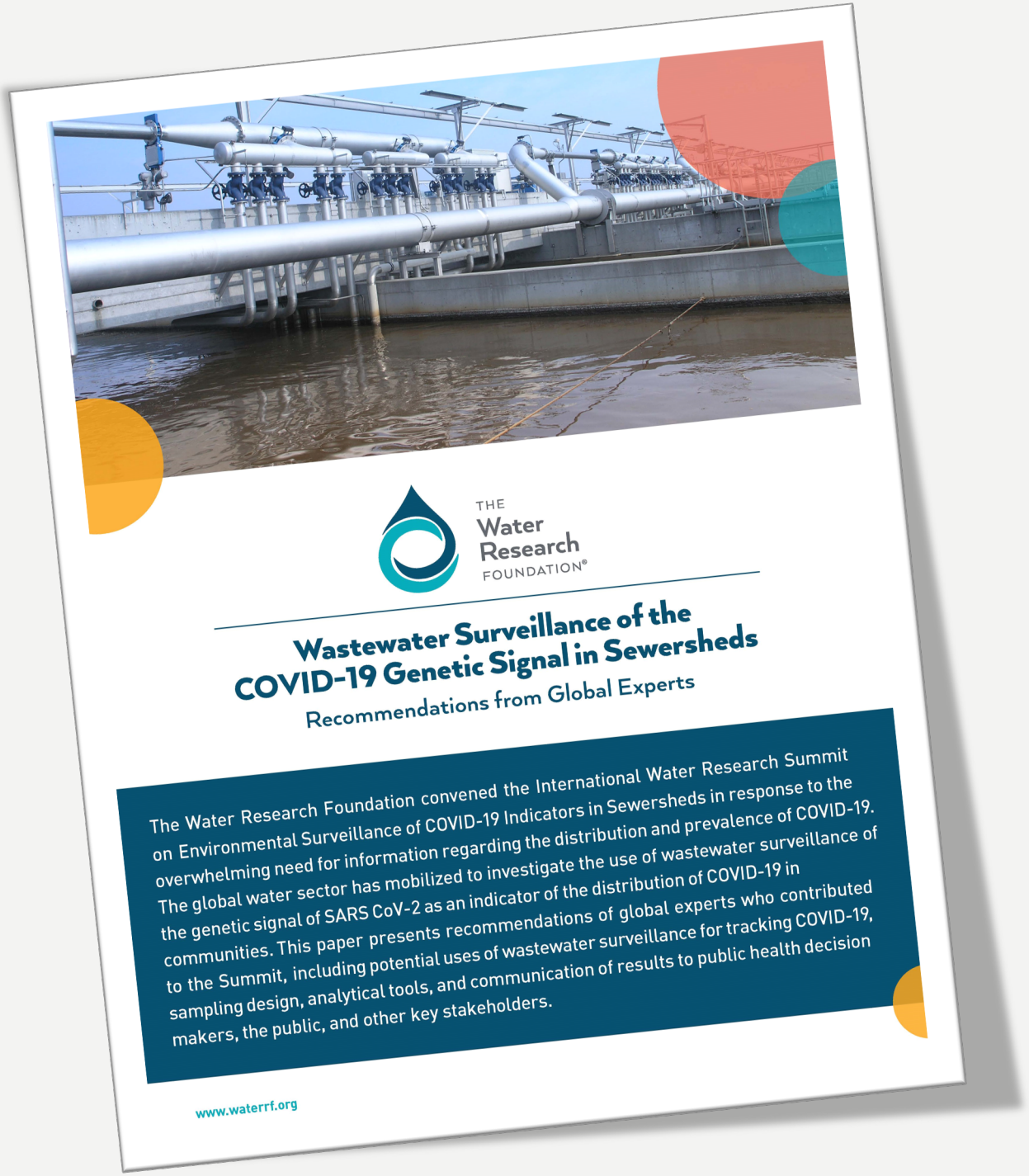
CALIFORNIA Water Boards
STATE WATER RESOURCES CONTROL BOARD
REGIONAL WATER QUALITY CONTROL BOARDS





Fact Sheet:
https://www.waterrf.org/sites/default/files/file/2020-05/CA-State-Water-Board-Grant-Overview.pdf

Fact Sheet – including "COVID Updates" to some projects:
https://www.waterrf.org/sites/default/files/file/2020-05/Direct-Potable-Reuse-CA-SWB.pdf



- **Request For Qualifications for SARS-CoV-2 Study:** www.waterrf.org/news/wrf-releases-rfq-sars-cov-2-study

Virtual International Water Research Summit on COVID-19: www.waterrf.org/event/virtual-international-water-research-summit-covid-19

Recommendations from Global Experts Whitepaper (following Summit):

- www.waterrf.org/sites/default/files/file/2020-06/COVID-19_SummitHandout-v3b.pdf
- **Virtual Congressional Briefing on Environmental Surveillance of the Genetic Fingerprint of COVID-19 in Sewersheds:** www.waterrf.org/event/virtual-congressional-briefing-environmental-surveillance-genetic-fingerprint-covid-19