COVID-19 February Update

February 17, 2021, 11:00 am – 12:30 pm

Process for Claiming Contact Hours for this Webinar

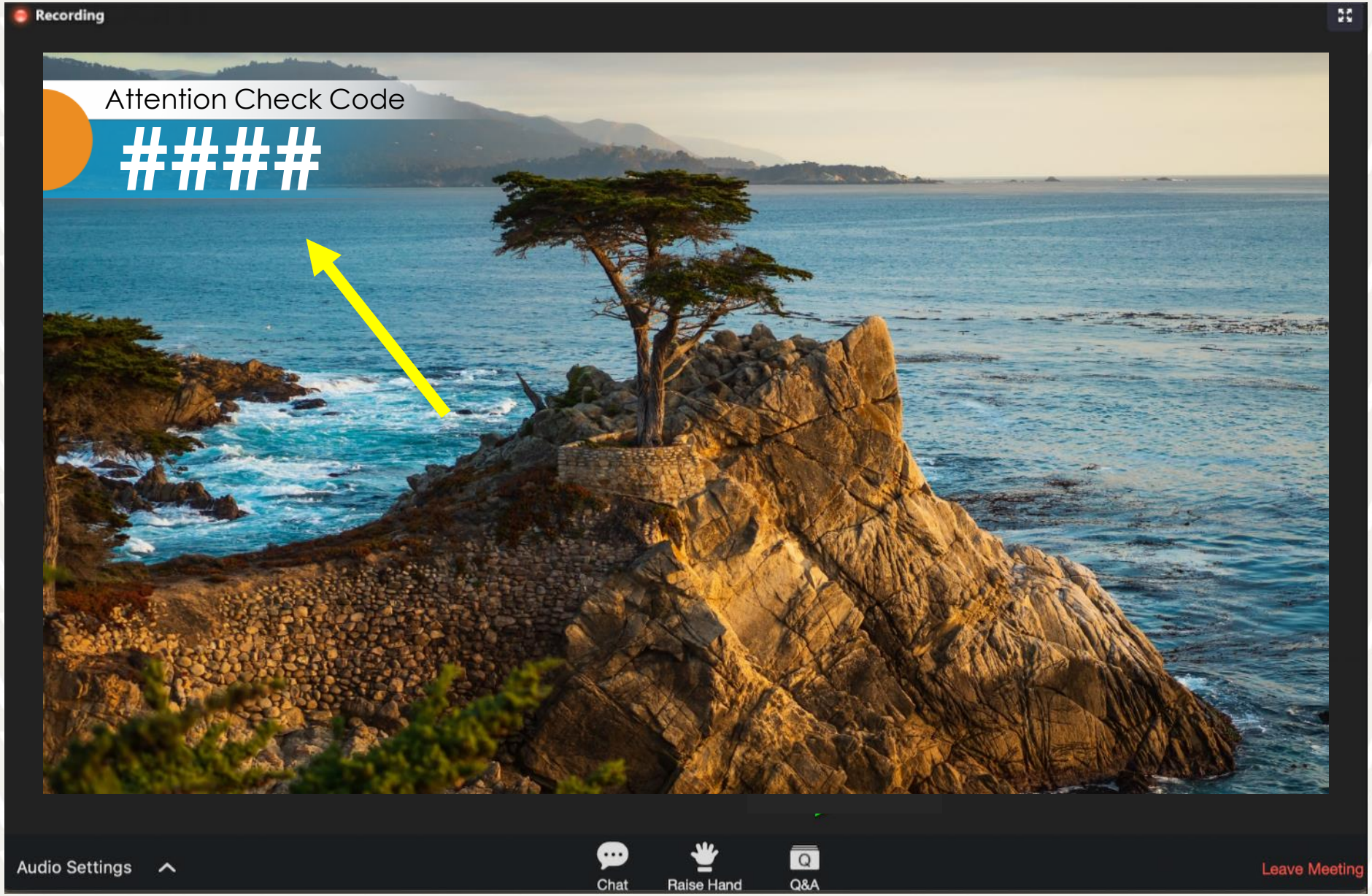
1. Note the two (2) different attention check codes that will appear for 60-90 seconds in the top left corner of the presentation.

2. Log in to **https://owen.cwea.org/** the Online Wastewater Education Network (OWEN) with your mycwea.org account info and find this program in "Your Dashboard".

3. Under the "Contents" tab, enter the correct attention check codes in the "Attention Check Code" component within 48 hours of the live webinar.

4. Your contact hours will be reflected in your mycwea.org account within 2-3 weeks following completion.

CWEA



Watch for Two Different Attention Check Codes in Top Left Corner of Screen

Wendy A. Wert, PE, BCEE

CWEA PRESIDENT

CIVIL ENGINEER | PUBLIC INFORMATION OFFICE, LOS ANGELES COUNTY SANITATION DISTRICTS

562-908-4288 ext. 2308 | c 626-840-0039

wwert@lacsd.org

CASA CWEA

You are all...

Environmental Heroes

COVID-19 Pandemic is a First in CWEA's History

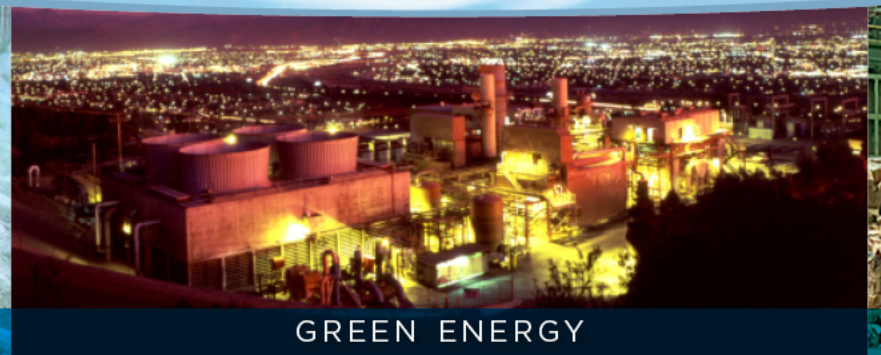

LOS ANGELES COUNTY
SANITATION DISTRICTS
Converting Waste Into Resources
Lancaster
Palmdale
Santa Clarita Valley
Pasadena
Beverly Hills
Malibu
Pomona
Long Beach
San Pedro
210
10
60
5
105
91
405
710
605
110
We collect and treat sewage from 5.6 million people
GOVERNANCE
24 special districts with one staff
SERVICE AREA
78 cities & unincorporated county
824 square miles
INFRASTRUCTURE
1,400 miles of sewers
11 wastewater treatment plants
Ocean outfall system

LOS ANGELES COUNTY
SANITATION DISTRICTS
Converting Waste Into Resources

OUR MISSION

To protect public health and the environment through innovative and cost-effective wastewater and solid waste management and, in doing so, convert waste into resources such as recycled water, energy, and recycled materials.


WATER RECYCLING


GREEN ENERGY

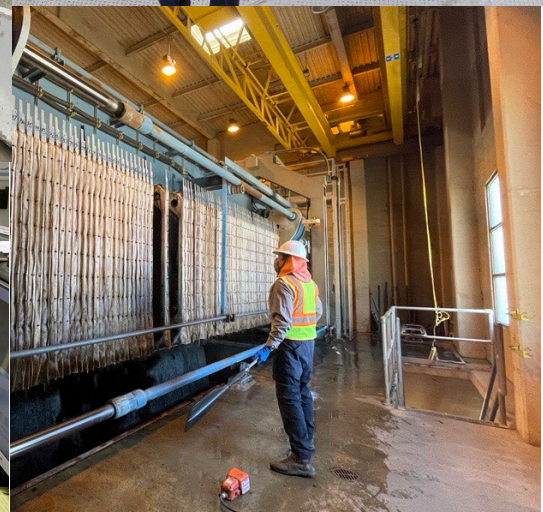

MATERIALS RECYCLING

Our Mission Continues.



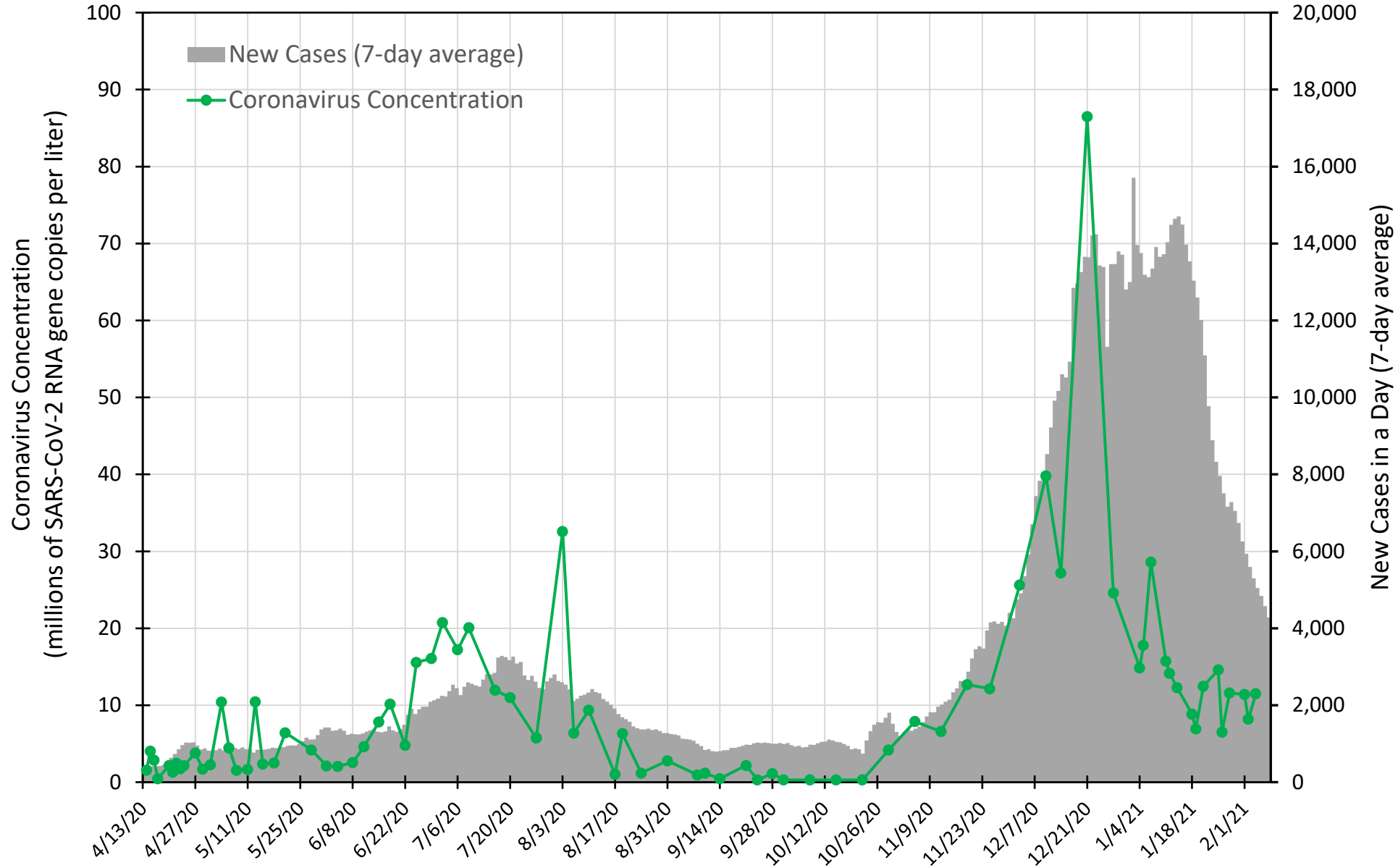


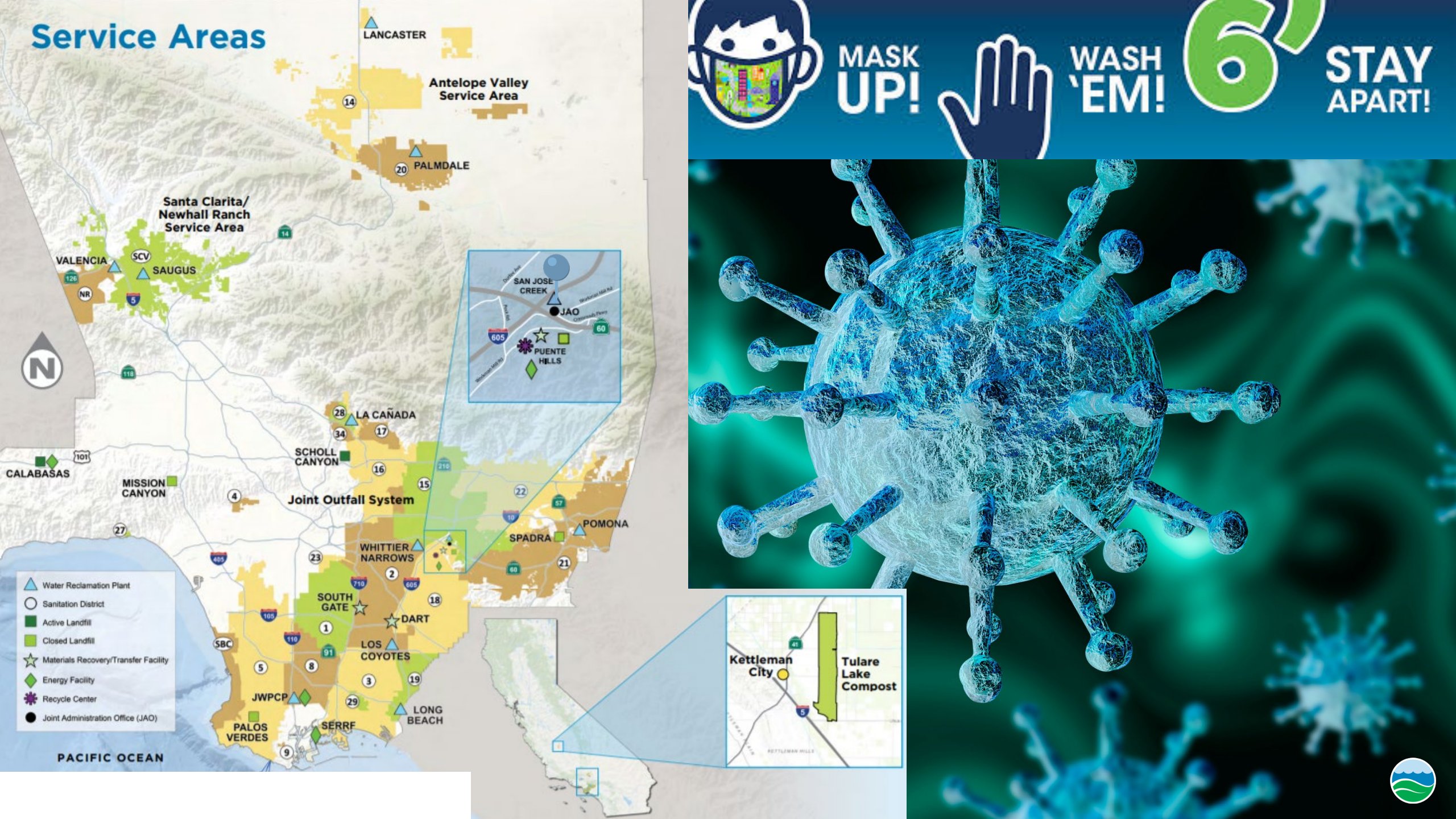


LOS ANGELES COUNTY SANITATION DISTRICTS
Converting Waste Into Resources

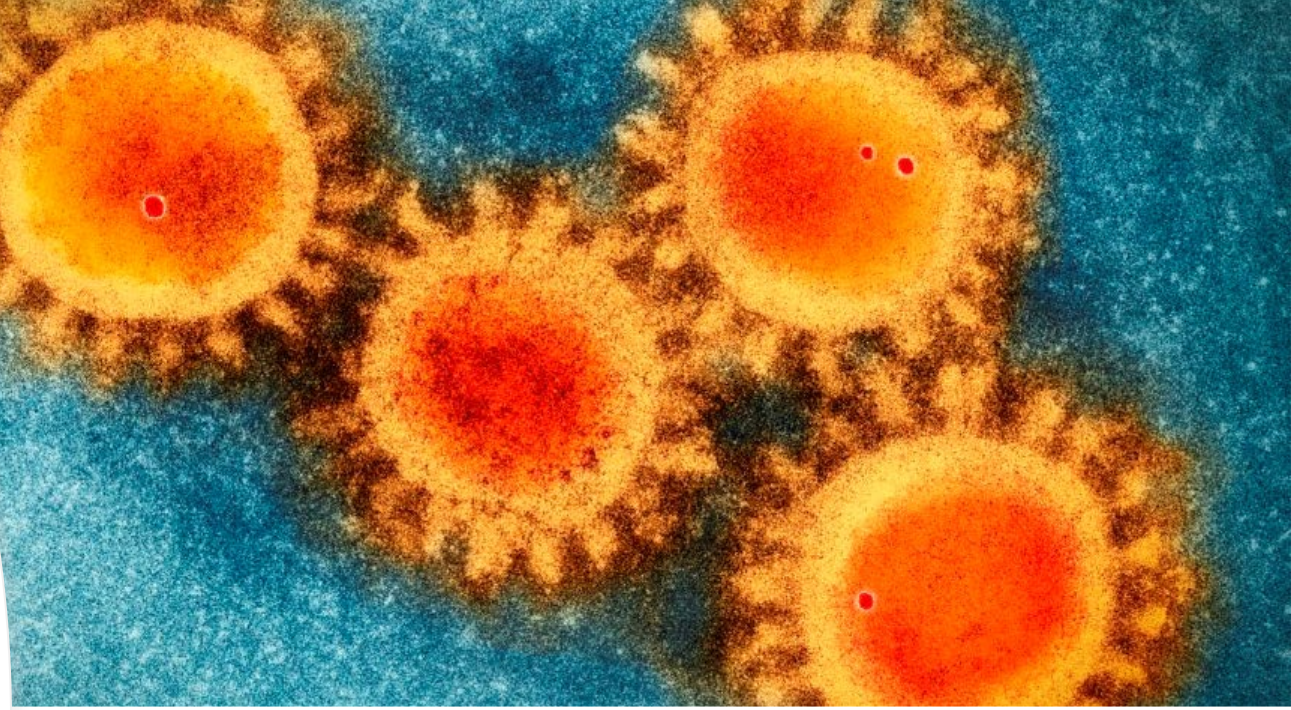
Coronavirus in Sewage at Inlet to Joint Water Pollution Control Plant (Data thru 2/4/2021)




Service Areas
LANCASTER
Antelope Valley Service Area
PALMDALE
Santa Clarita/ Newhall Ranch Service Area
VALENCIA
SAUGUS
SCV
NR
SAN JOSE CREEK
JAO
PUENTE HILLS
LA CAÑADA
SCHOLL CANYON
CALABASAS
MISSION CANYON
Joint Outfall System
POMONA
SPADRA
WHITTIER NARROWS
SOUTH GATE
DART
LOS COYOTES
SBC
JWPCP
LONG BEACH
PALOS VERDES
SERRF
PACIFIC OCEAN
Water Reclamation Plant
Sanitation District
Active Landfill
Closed Landfill
Materials Recovery/Transfer Facility
Energy Facility
Recycle Center
Joint Administration Office (JAO)
Kettleman City
Tulare Lake Compost
MASK UP!
WASH 'EM!
6'
STAY APART!

Current and future work:

- National Wastewater Surveillance System pilot study.
- Increased sensitivity direct extraction method.
- WRF 5093- Factors affecting the detection and variability of SARS-CoV-2 in wastewater.
- Is the SARS-CoV-2 in wastewater infectious?
- Wastewater biobank.



For questions on Los Angeles County Sanitation Districts wastewater surveillance, please contact program leads:

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Ryan Reinke, Ph.D.
Research Scientist | Wastewater Research Section
562-908-4288 ext. 3059 rreinke@lacsd.org

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For reporters: all speakers today are off the record.

CWEA

Eileen White

MODERATOR
DIRECTOR OF WASTEWATER
EAST BAY MUNICIPAL UTILITY DISTRICT

POLL QUESTION: Organizations Represented

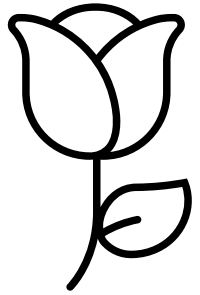
Rasha Maal-Bared

SENIOR MICROBIOLOGIST

EPCOR WATER SERVICES INC.

The Water Professional's COVID-19 Update: roses, buds and thorns

CWEA/CASA Webcast February 17, 2021
Rasha Maal-Bared, PhD
Wastewater Specialist, EPCOR Water
WEF DPHC WIDOC Subcommittee



PROVIDING MORE EPCOR

Forbes

Here's How Scientists Are Using Sewage Water To Control Covid-19

Misha Gajewski Contributor

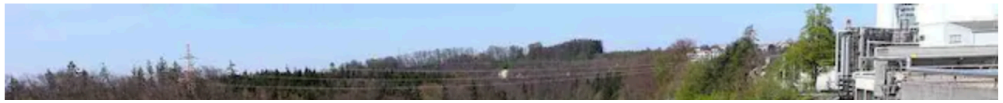
Healthcare

I write about the brain and the body but sometimes other things.

Japanese researchers find presence of COVID-19 in sewage plants, proves to be an early warning signal for transmission

Public health experts say such sampling of sewage could be used to estimate the number of infected people in a region without testing every individual.

Reuters | June 17, 2020 10:05:58 IST



TheScientist

EXPLORING LIFE, INSPIRING INNOVATION

Home / News & Opinion

Countries Begin Large-Scale Screening for SARS-CoV-2 in Sewage

Researchers have found traces of the coronavirus at wastewater treatment plants in various locations around the world.

Chris Baraniuk

May 14, 2020

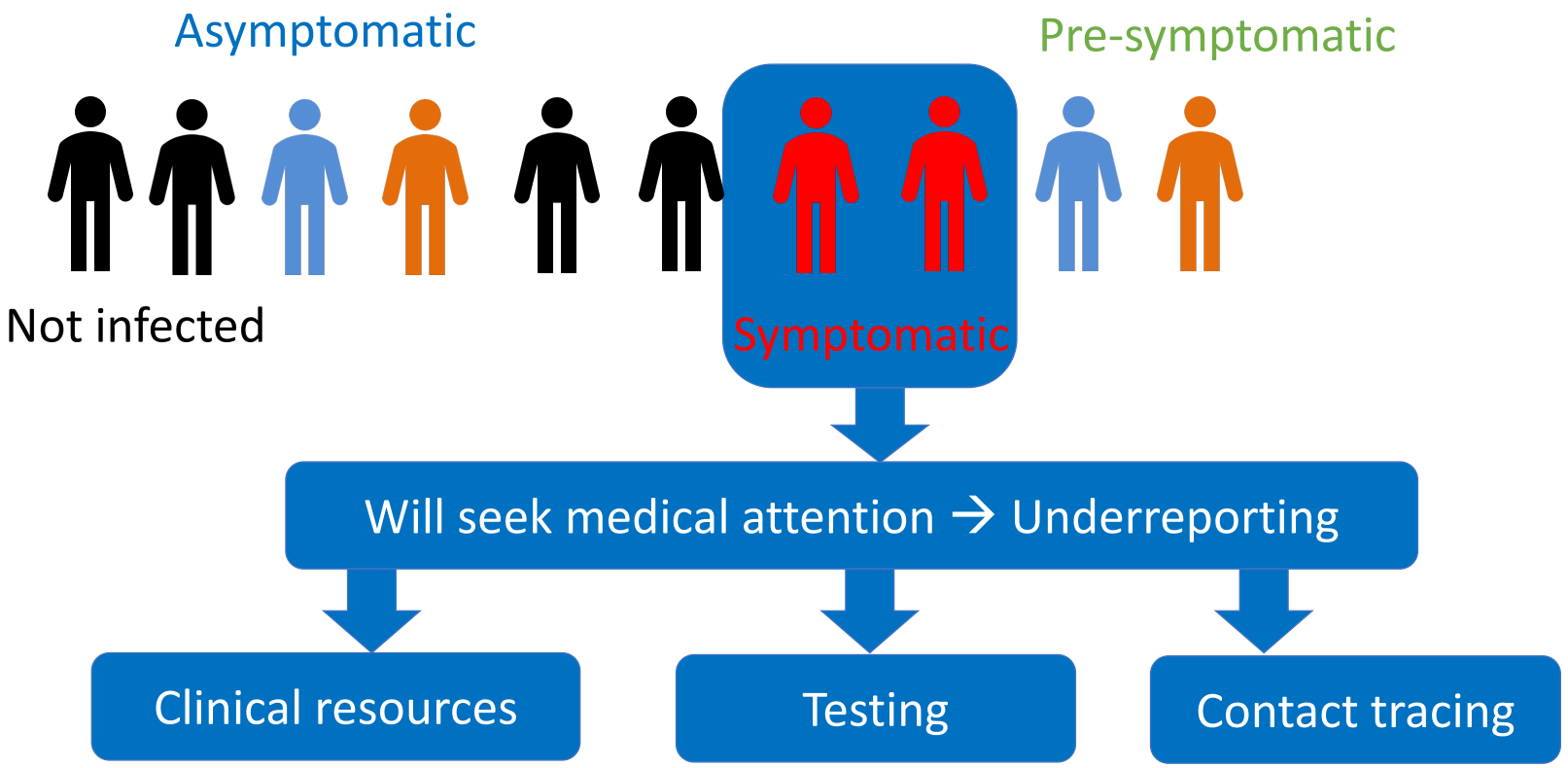
CNN US Crime + Justice Energy + Environment Extreme Weather Space + Science LIVE TV Edition

Some scientists are using sewage to measure the prevalence of coronavirus in their communities

By Alec Snyder and Susannah Cullinane, CNN

Updated 7:45 PM ET, Sun April 26, 2020

Challenges with Clinical COVID-19 Testing



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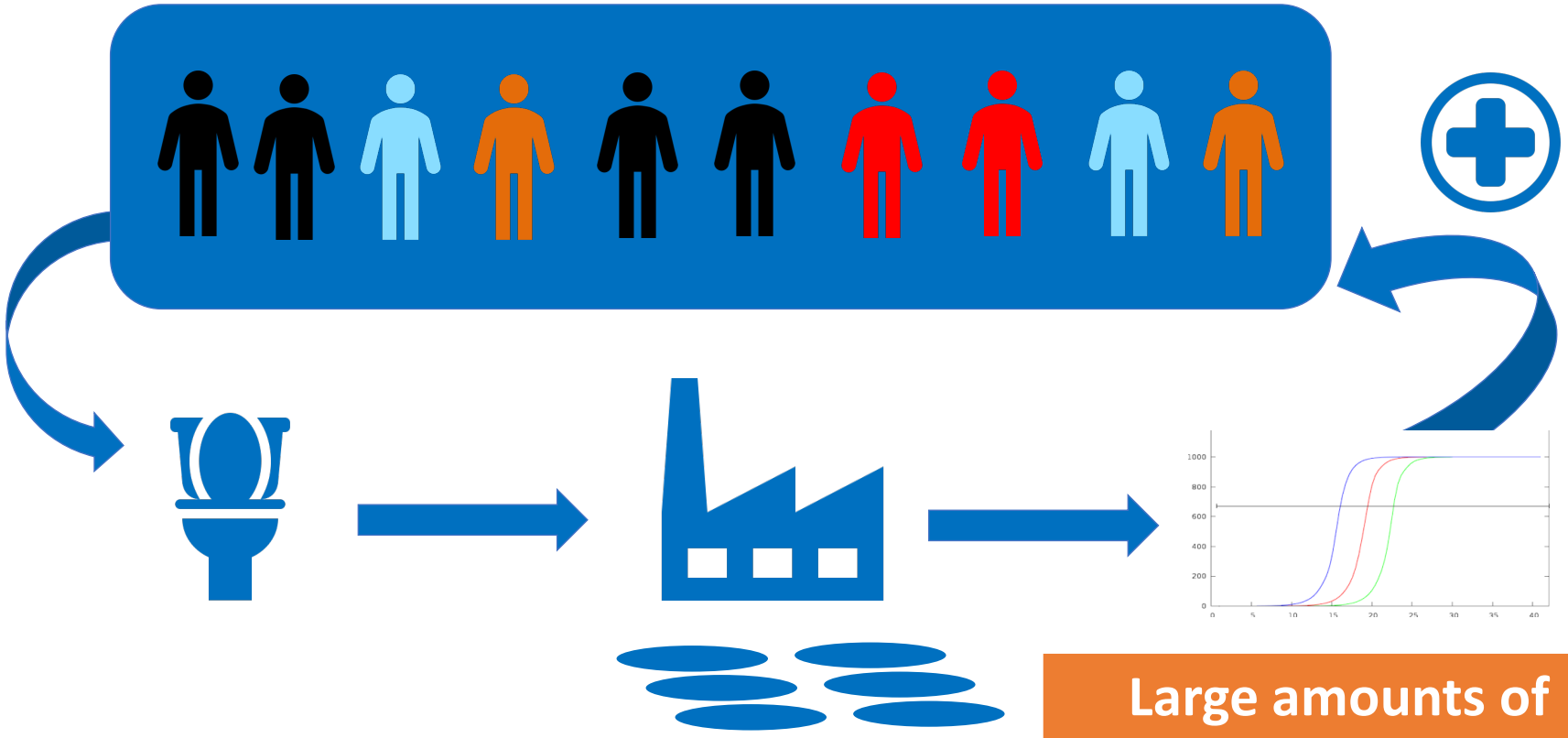
WBE for COVID-19 Decision Making



Large amounts of SARS-CoV-2 RNA data

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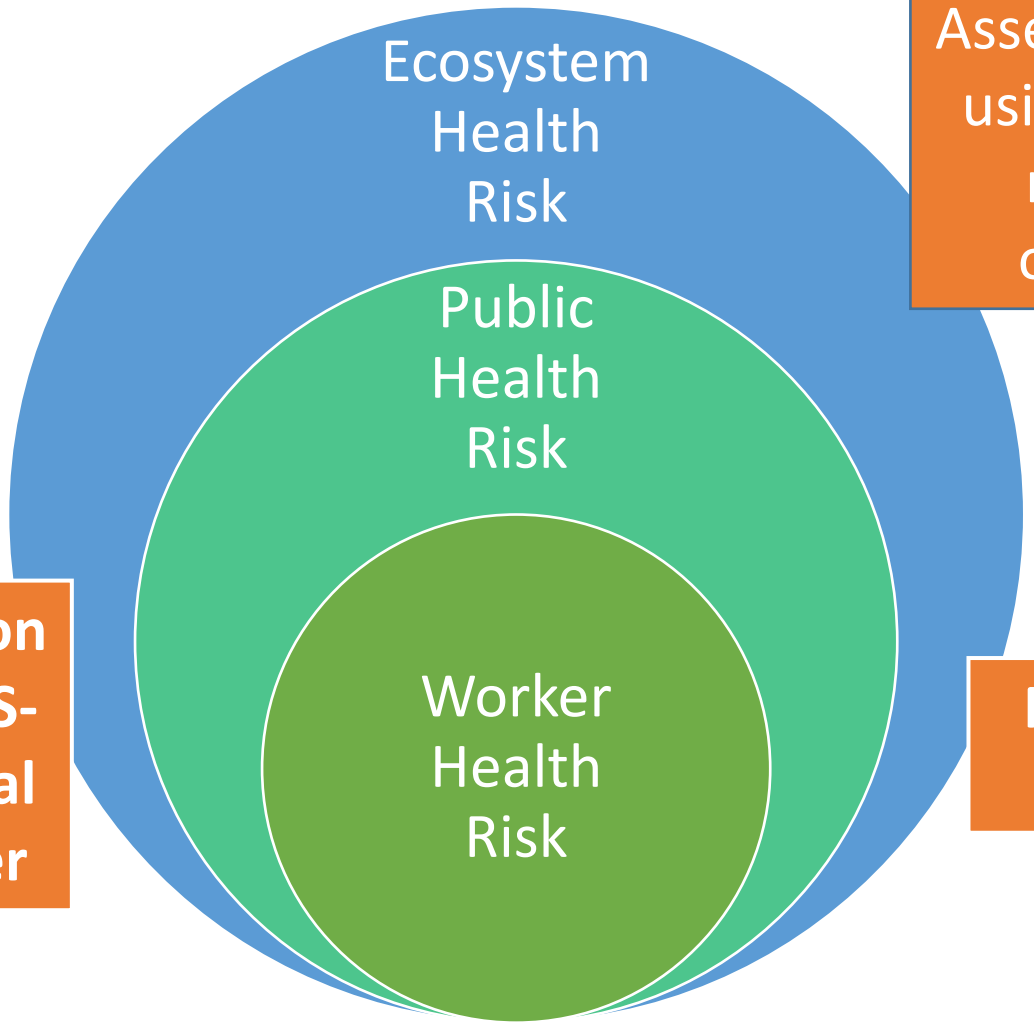
Challenges in risk deduction



Assessing risk by using RNA and reference organisms

Limited data on infective SARS-CoV-2 survival in wastewater

No infective dose

Occupational Risk Estimates

Quantitative microbial risk assessment of SARS-CoV-2 for workers in wastewater treatment plants

Rafael Newton Zaneti [a], Viviane Girardi [b], Fernando Rosado Spilki [b], Kristina Mena [c], Ana Paula Campos Westphalen [a], Evandro Ricardo da Costa Colares [a], Allan Guedes Pozzebon [a], Ramiro Gonçalves Etchepare [d,*]

Source: Zaneti et al., 2021

- Three scenarios were assessed: moderate infections (Porto Alegre, Brazil), aggressive (Madrid, Spain), and extreme (New York City, USA).
- Used SARS-CoV-2 RNA concentrations with SARS-CoV-1 infective dose estimates.
- Risk for aggressive and extreme scenarios above tolerable limit.

Occupational Risk Estimates

Current measures still protective!

Short Communication

Quantitative microbial risk assessment (QMRA) of occupational exposure to SARS-CoV-2 in wastewater treatment plants

Ayokunle Christopher Dada [a,*], Pradip Gyawali [b]

[a] QMRA Data Experts, P.O. Box 37 Waikato Mail Centre, Hamilton, New Zealand
[b] Enteric, Environmental and Food Virology Laboratory, Institute of Environmental Science and Research Ltd (ESR), Porirua, New Zealand

Source: Dada and Gyawali, 2021

- Inhalation risk specifically examined.
- Based on assumption that 0.03%, 0.3% and 3% of served population are infected.
- More conservative reference pathogens (norovirus, enterovirus, adenovirus).
- Risk low when <0.3% of the population infected.

Public Health Risk Estimation

Impacts of COVID-19 pandemic on the wastewater pathway into surface water: A review

Erick R. Bandala [a], Brittany R. Kruger [a], Ivana Cesarino [b], Alcides L. Leao [b], Buddhi Wijesiri [c], Ashantha Goonetilleke [c]

Source: Bandala et al., 2021

- Uses RNA and infective virus data interchangeably.
- Uses data from far more persistent pathogens (e.g., Giardia and HAV).
- Over represents risk to surface water and shellfish and suggests re-evaluating wastewater treatment.

Wildlife Risk Estimation

Source: Baillie, 2021 (Penn Today)

Marine Mammal Risk Estimation

Pandemic danger to the deep: The risk of marine mammals contracting SARS-CoV-2 from wastewater

Sabateeshan Mathavarajah [a], Amina K. Stoddart [b], Graham A. Gagnon [b], Graham Dellaire [a,c,*]

[a] *Department of Pathology, Faculty of Medicine, Dalhousie University, Halifax, Nova Scotia, Canada*
[b] *Department of Civil and Resource Engineering, Dalhousie University, Halifax, Nova Scotia, Canada*
[c] *Department of Biochemistry and Molecular Biology, Faculty of Medicine, Dalhousie University, Halifax, Nova Scotia, Canada*

Source: Mathavarajah et al., 2021

- 15 species of endangered marine mammals are predicted to be susceptible to SARS-CoV-2
- Restricted access and vaccination can limit COVID-19 risk to marine mammals.
- Uses RNA and infective virus data interchangeably
- Over represents risk to aquatic ecosystems from secondary wastewater treatment plants and lagoons in Alaska
- Wastewater is a conduit for reverse zoonotic transmission of SARS-CoV-2 to wildlife.

The Importance of *Letters to the Editor*

Letter to the Editor regarding Mathavarajah et al. (2020) Pandemic danger to the deep: The risk of marine mammals contracting SARS-CoV-2 from wastewater

Rasha Maal-Bared [a], Mark Sobsey [b], Kyle Bibby [c], Samendra P. Sherchan [d], Kari Brisolara Fitzmorris [e], Naoko Munakata [f], Charles Gerba [g], Scott Schaefer [h], Jay Swift [i], Lee Gary [j], Akin Babatola [k], Robert Bastian [l], Lola Olabode [m], Robert Reimers [n], Albert Rubin [o], Greg Kester [p], Leonard Casson [q]

Source: Maal-Bared et al., 2021

- We have yet to isolate infective virus from wastewater.
- Highlighted references that confirmed efficacy of wastewater treatment and lagoons given proper residence time.
- Using adenovirus as the reference organism for SARS-CoV-2 infectivity overestimates risk.
- More effective ways to protect marine mammals and protect Artic communities from SARS-CoV-2.

What data is available in the literature

This article is made available via the ACS COVID-19 subset for unrestricted RESEARCH re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for the duration of the World Health Organization (WHO) declaration of COVID-19 as a global pandemic.

Environmental Science & Technology Letters

pubs.acs.org/journal/estlcu

Letter

Persistence of SARS-CoV-2 in Water and Wastewater

Aaron Bivins,[#] Justin Greaves,[#] Robert Fischer,[#] Kwe Claude Yinda, Warish Ahmed, Masaaki Kitajima, Vincent J. Munster, and Kyle Bibby*

Cite This: *Environ. Sci. Technol. Lett.* 2020, 7, 937–942

Read Online

"SARS-CoV-2 RNA was found to be significantly more persistent than infectious SARS-CoV-2, indicating that the environmental detection of RNA alone does not substantiate risk of infection."

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Privacy Challenges for WBE

Federal aid expands North Dakota COVID-19 wastewater study, but some cities say no

JACK DURA Nov 21, 2020

Source: The Bismarck Tribune

North Dakota House flushes proposed wastewater testing ban

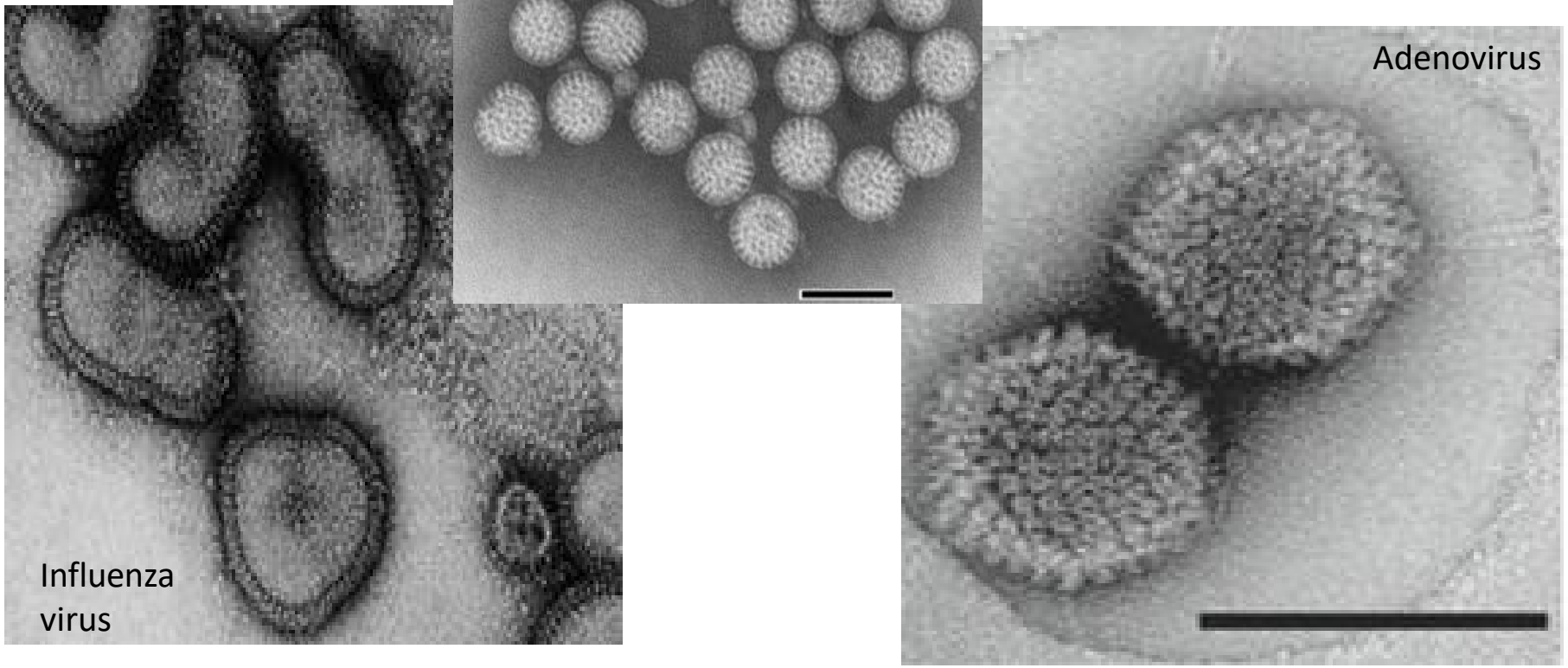
JACK DURA Feb 9, 2021

Source: The Bismarck Tribune

Privacy risk determined by

- Target identified
- Sample size
- Data impact in that context

COVID-19 is only the beginning



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WBE to monitor illicit drug use

Illicit Drugs in Municipal Sewage

Proposed New Nonintrusive Tool to Heighten Public Awareness of Societal Use of Illicit-Abused Drugs and Their Potential for Ecological Consequences

Christian G. Daughton

DOI: 10.1021/bk-2001-0791.ch020
Publication Date: July 30, 2001
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Pharmaceuticals and Care Products in the Environment
Chapter 20, pp 348-364

ACS Symposium Series, Vol. 791
ISBN13: 9780841237391 **eISBN:** 9780841218673
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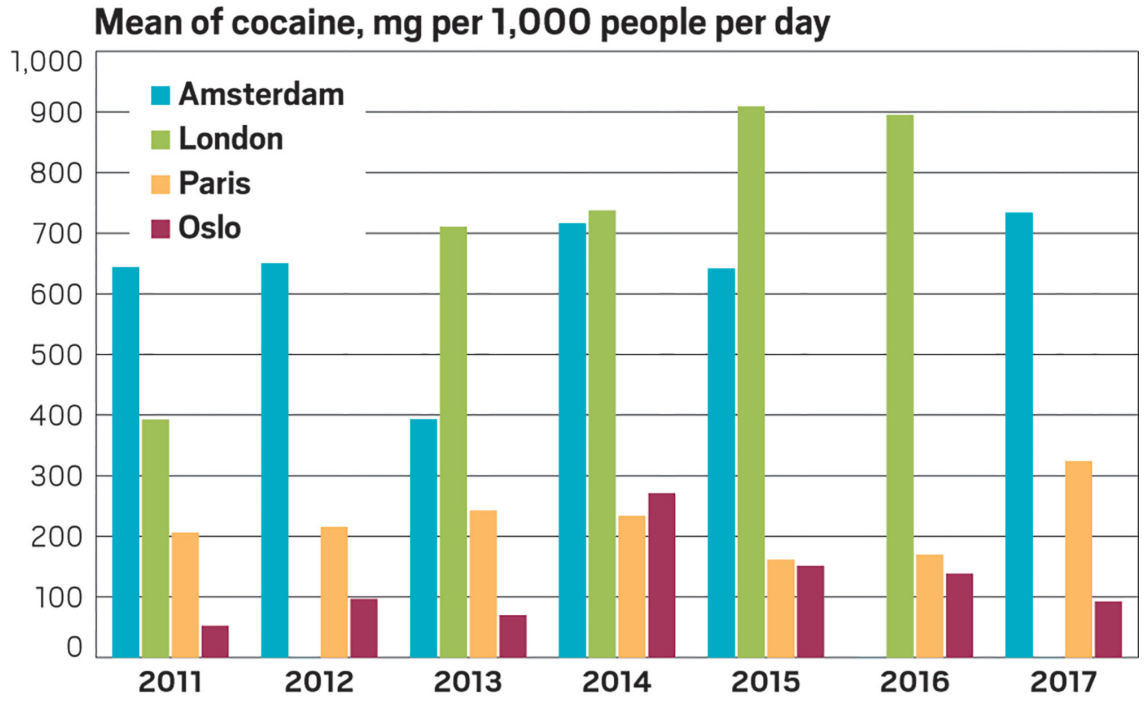
Health biomarkers

Environmental contaminants



Source: European Monitoring Centre for Drugs & Drug Addiction (EMCDDA)

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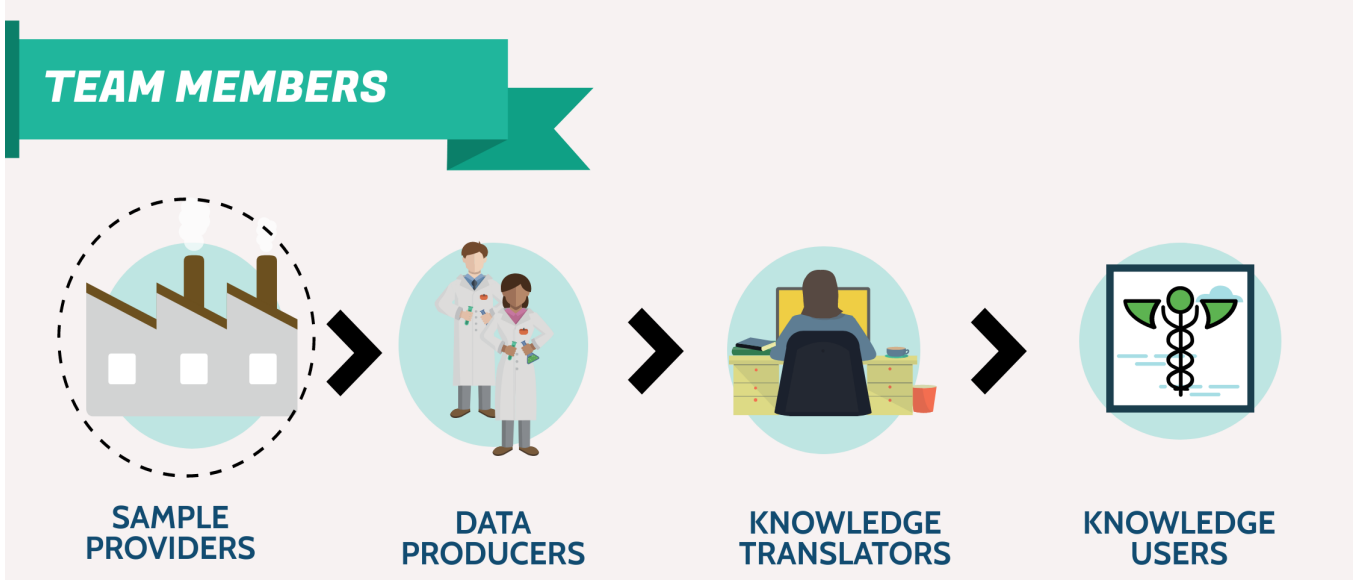
WBE Actionable Result Production



Number of infected individuals =

$$\frac{\text{Concentration (gene copies/L) x Wastewater Flow Rate (L/d)}}{\text{Feces production Rate (g/person.d) X Fecal Shedding Rate (gene copies/gram)}}$$

Take home messages

- WBE may rekindle the relationship between wastewater treatment and public health protection.
- There is still a lot we don't know about infective SARS-CoV-2 survival in wastewater but our current practices are still protective.
- Read the literature with caution and rely on expert opinions.
- WBE holds promise for supporting public health decision-making in many areas.
- When considering privacy risks factors to consider include: compound identified, population size and data impact.
- Producing actionable WBE data requires collaboration from multiple stakeholders.

POLL QUESTION: Involvement in Wastewater Surveillance

Nick Martorano

DIRECTOR, CALIFORNIA WATER QUALITY MONITORING COUNCIL

STATE WATER RESOURCES CONTROL BOARD

CASA CWEA

Nick Martorano
He/Him/His
Director, California Water Quality Monitoring Council
Office of Information Management and Analysis
State Water Resources Control Board
1001 I Street, Office 19-65A, Sacramento, CA 95814

Phone: Office: (916) 341-5514 Cell: (916) 956-9604
Email: nicholas.martorano@waterboards.ca.gov
Website: https://mywaterquality.ca.gov

New Strategy

- Vision:
  - A world class water quality and ecosystem monitoring network for California.

- Mission:
  - Enhance water and associated ecosystem health monitoring programs by providing a venue for coordination and developing guidance and recommendations to build a comprehensive statewide network for Californian

What is the Monitoring Council?

WATER QUALITY MONITORING COUNCIL

- Legislatively created to coordinate water quality monitoring.
- Collaboration between CalEPA and CNRA.
- Non-regulatory body intended to identify efficiencies, gaps, and provide recommendations.

CalEPA California Environmental Protection Agency

CALIFORNIA natural resources AGENCY

Who is the Monitoring Council?

WATER QUALITY MONITORING COUNCIL

- 10 member seats intended to represent all sectors collecting data.
- Includes regulatory agencies, the regulated communities, NGOs, the public, and scientific community.
- High level representation to provide guidance.

How?

- Establishing theme-specific workgroups of staff and stakeholders.
- Council member subcommittees.
- Leverage energy and common goals.
- Identify and support funding opportunities.

Why a WBE Subcommittee?

- WBE appears to be a useful addition for COVID-19 surveillance
  - early detection
  - Potentially more inclusive than case reporting
  - Upstream testing within sewersheds can be a useful adjunct
- WBE data are becoming more available in California
  - More than 50 wastewater facilities have measured SARS-CoV-2 RNA in their wastestream
- There is a lot of expertise in the State
  - California houses several national scientific leaders and is out in front nationally on this topic
- The WQMC may be able to help facilitate use of WBE
  - Primary committee goal is to identify what assistance may be of most value to Public Health

Subcommittee Membership

- Council members – regulatory, regulated, and scientific community
- Wastewater community – CASA, LACSD
- Public Health community – CDPH, SCVPH
- Research community – Stanford, UC Berkeley, SCCWRP

Subcommittee Focus Areas

- WBE as a tool to help determine trends and county-level risk tiers
  - Monitoring to look for outbreaks, detecting new cases, and following trends is a core to public health decision making.
- Upstream analysis to assess subwatershed hot-spots
  - Or to determine presence/absense in a select location, such as a nursing home or dormitory.
- Quantify the number and spatial distribution of COVID-19 mutations
  - Currently, only a subset of clinical patient specimens is being used on this topic.
- Map illustrating differences in prevalence across regions of the State
  - Potentially using WBE to fill in areas where testing is less available

Next Steps

- Focus Areas were endorsed by Council on 2/11/21.
- Subcommittee will begin to focus on working with public health to ensure the data being collected is useful and used in decision making.
- Data publication and integration are also priorities for the Council so the data can be leveraged to its fullest and support sustainable funding.

Thank you

- Recording of the discussion on February 11, 2021: https://youtu.be/ZMAHf2kJv4k?t=9662

- Future recordings will be available on the Monitoring Council Meeting Playlist on YouTube

- Checkout our webpages at: https://mywaterquality.ca.gov/index.html

POLL QUESTION: Continued Involvement in Wastewater Surveillance

CASA CWEA

Dr. Rose Nash

DIRECTOR OF RESEARCH AND DEVELOPMENT

GT MOLECULAR

Outline

- Introduce GT Molecular
- Wastewater Assay Performance
- Development and use of variant tracking in wastewater
- Examples of how this data has been used to inform public health and community members

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GT Molecular – Application of Advanced Tools for Wastewater

- Diagnostic developers and leaders in ultrasensitive cancer tests and pathogen detection technologies
- Developed COVID-19 diagnostic early in spring, adapted to wastewater
- Currently providing COVID-19 wastewater monitoring services municipalities, universi ties, and facilities around the country

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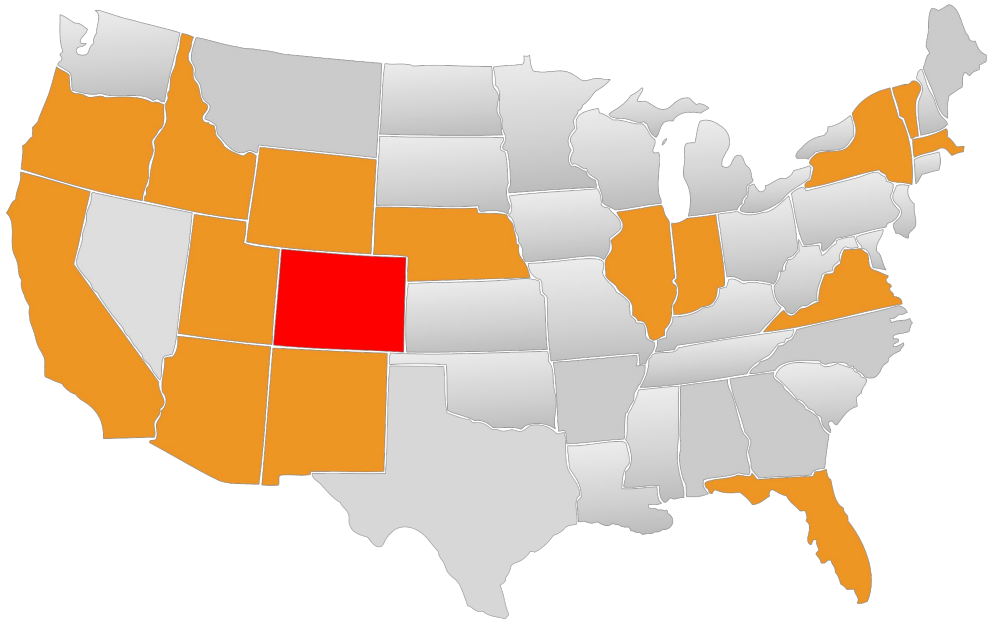
GT MOLECULAR™
Ground Truth in Molecular Diagnostics™

GT Molecular – Application of Advanced Tools for Wastewater



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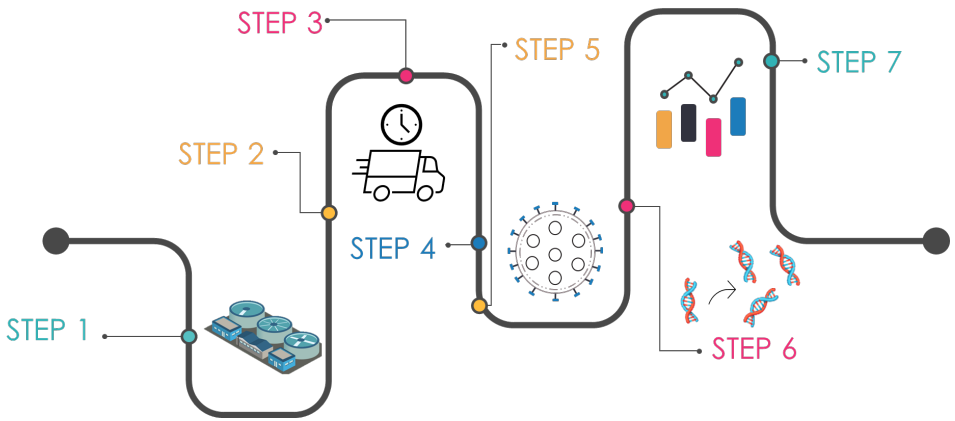
GT MOLECULAR™
Ground Truth in Molecular Diagnostics™

Building a rapid, high throughput molecular workflow

Our molecular workflow needed to be…

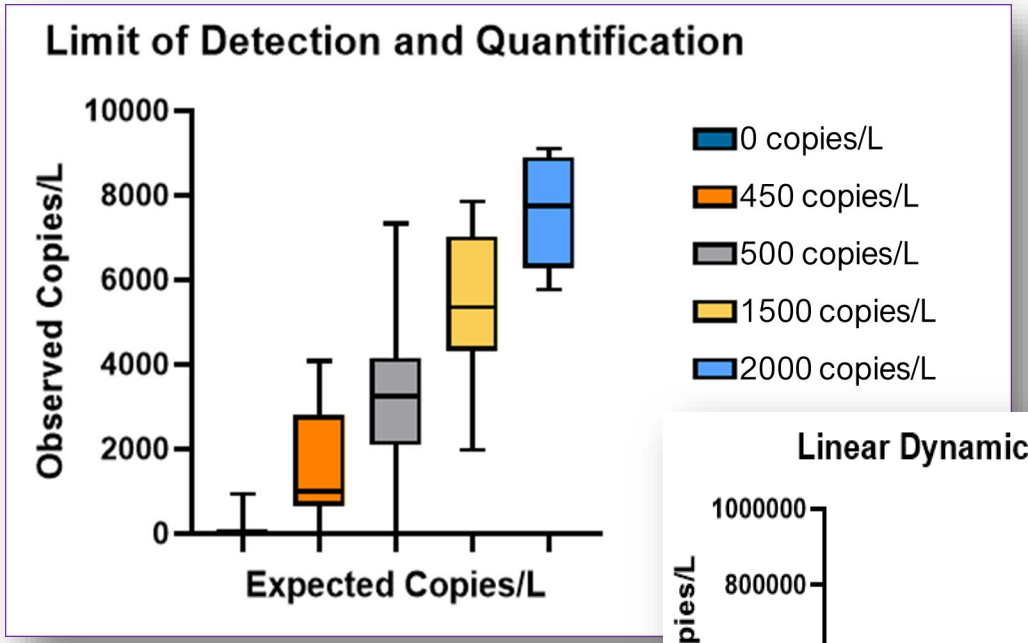
- ***HIGH THROUGHPUT*** to allow for testing the entire state on a twice weekly basis
- ***RAPID*** *to allow for a 24-hour turn-around time for actionable data reporting*
- ***RELIABLE*** *to allow for community leaders to use these data in making important decisions*
- ***ULTRA-SENSTIVE*** *for reliable baseline establishment and early detection*

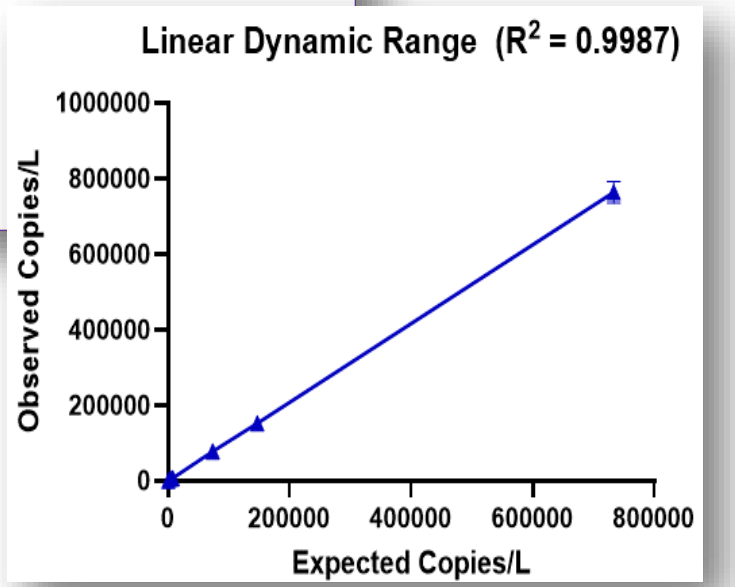


GT MOLECULAR™
Ground Truth in Molecular Diagnostics™

Performance of high throughput molecular workflow

- Limit of Detection = 500 copies/L
- Average viral recovery = 15%
- Average turnaround time over 2000 samples = 24 hours
- Average correlation coefficient of signal to clinical case data for 20 WWTP = 0.85

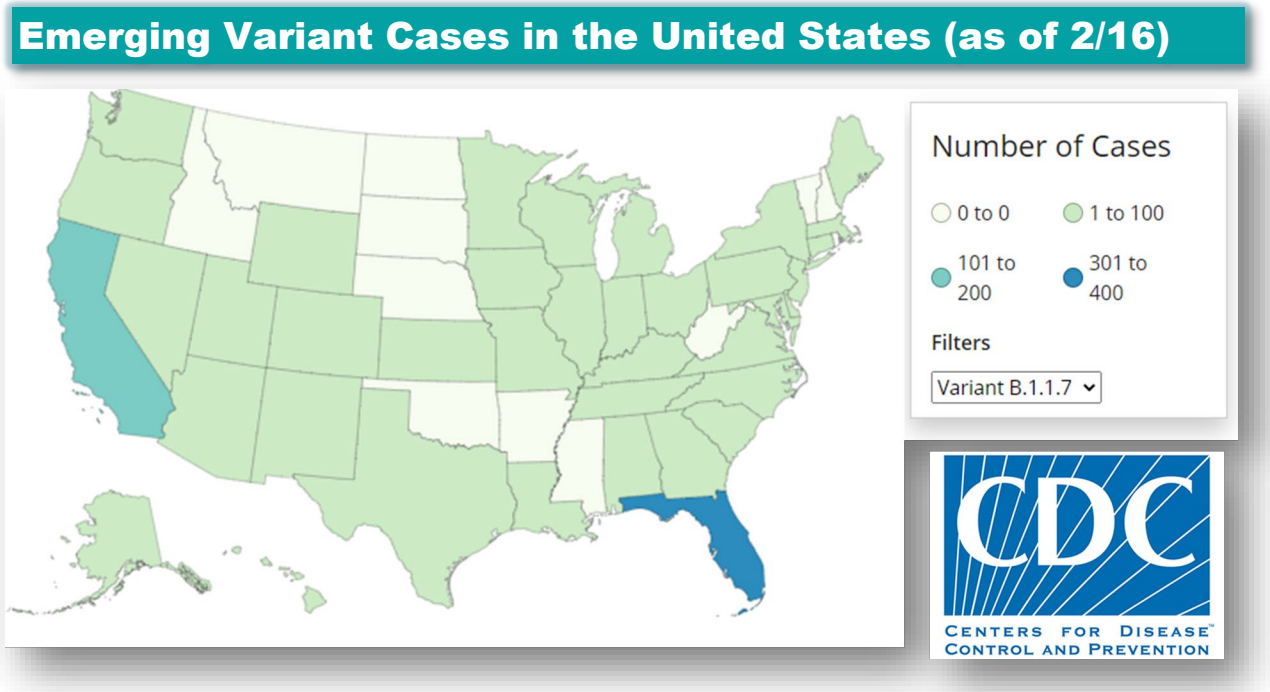




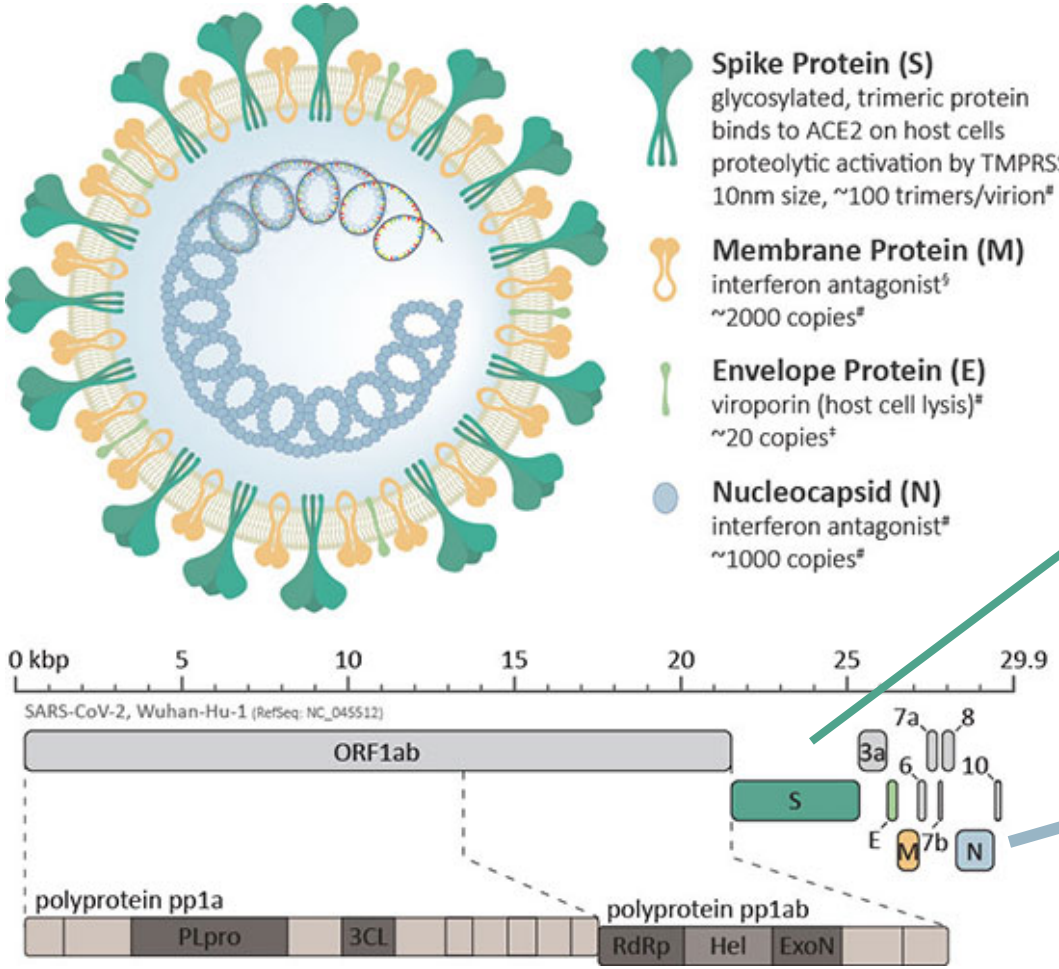
GT MOLECULAR™
Ground Truth in Molecular Diagnostics™

Adapting our wastewater testing program to hunt variants

- UK Variant first identified December, lead to widespread circulation and a country-wide lock down
- Three or more variants have been found in the United States
- The three variants (UK, South Africa, and Brazilian) appear to spread more easily potentially leading to increased transmission



Adapting our wastewater testing program to hunt variants



Spike gene – strong evolutionary pressure to mutate.
Protein interacts with host cells and is recognized by host immune system

N gene – weak evolutionary pressure to mutate.
Protein is located inside of virion.

KEY TARGET OF MOST DIAGNOSTIC AND WASEWATER TESTS

GT MOLECULAR™
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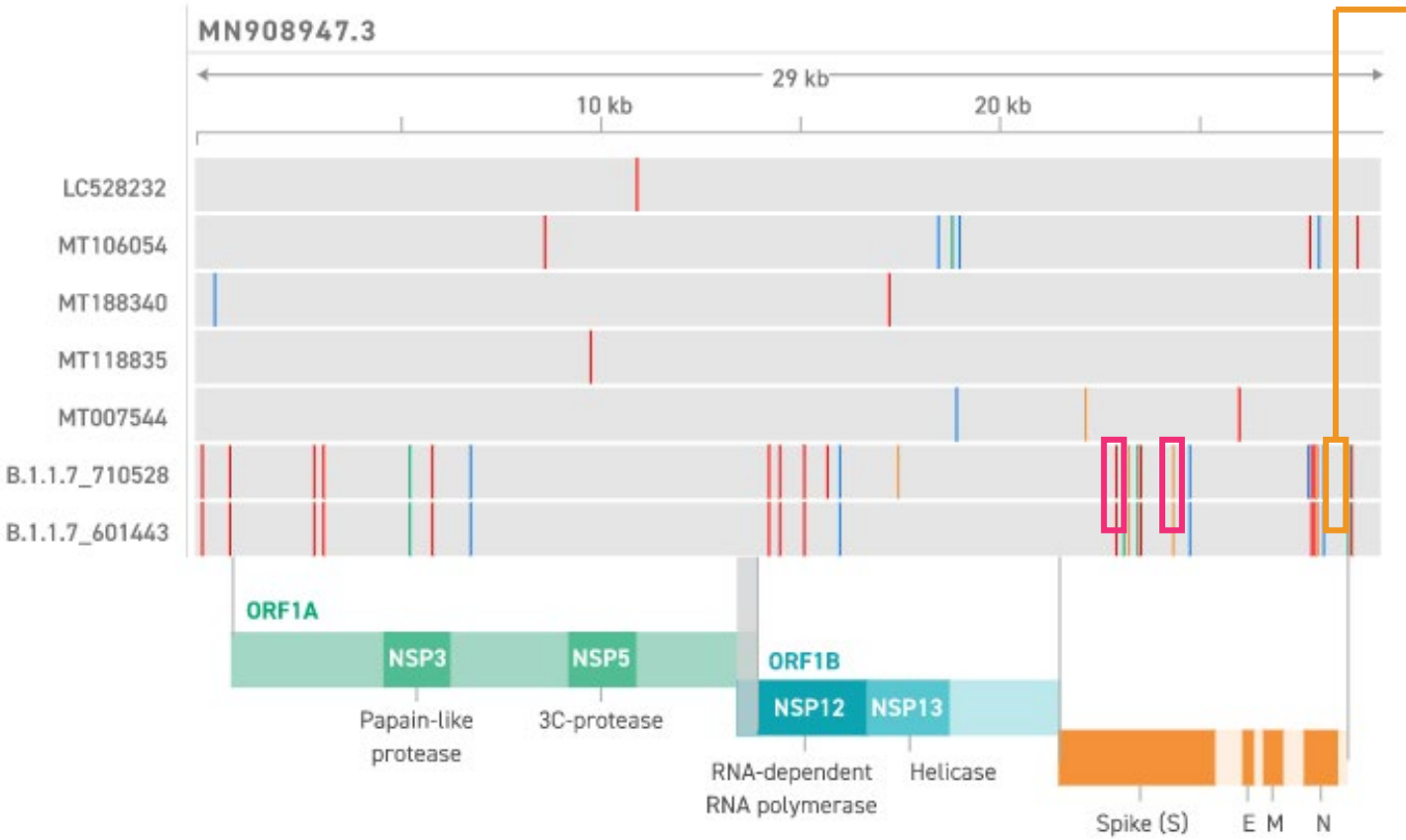
Mutations found in B.1.1.7 UK variants



GT Molecular standard wastewater test – quantifies N1 region, identical in all strains, does not differentiate

GT Molecular variant wastewater test – quantifies two regions in the spike gene containing 2 key mutations known to drive hyper-transmissibility

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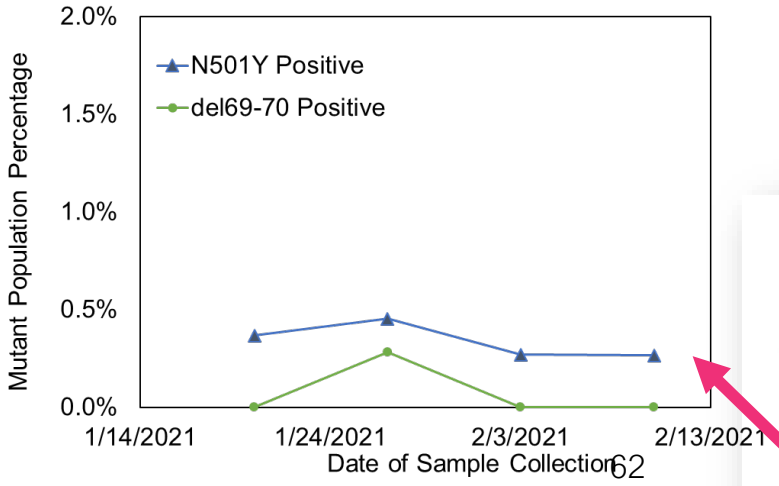
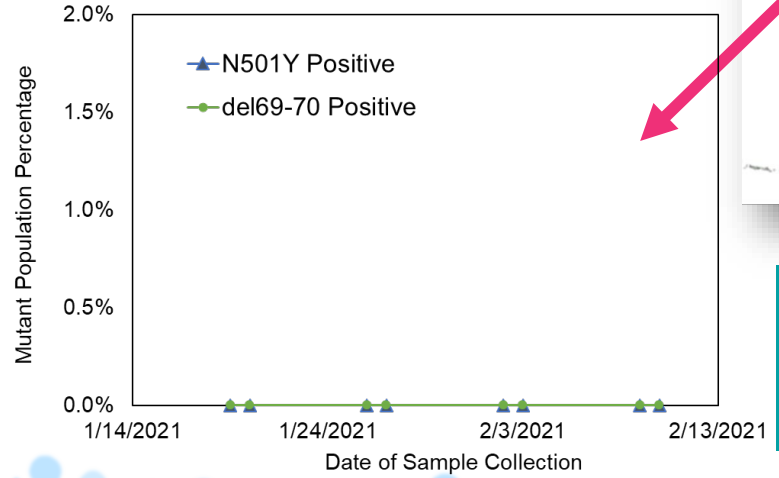
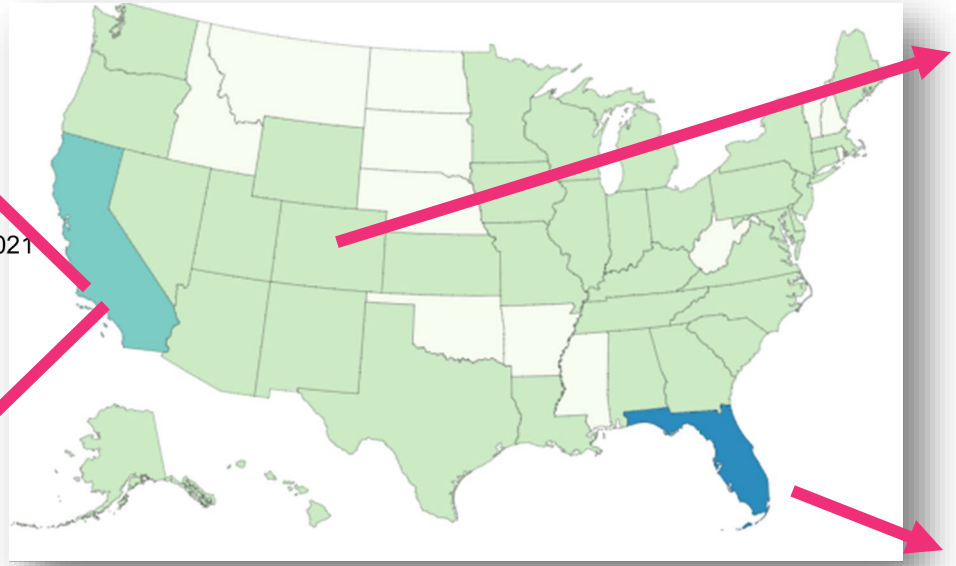
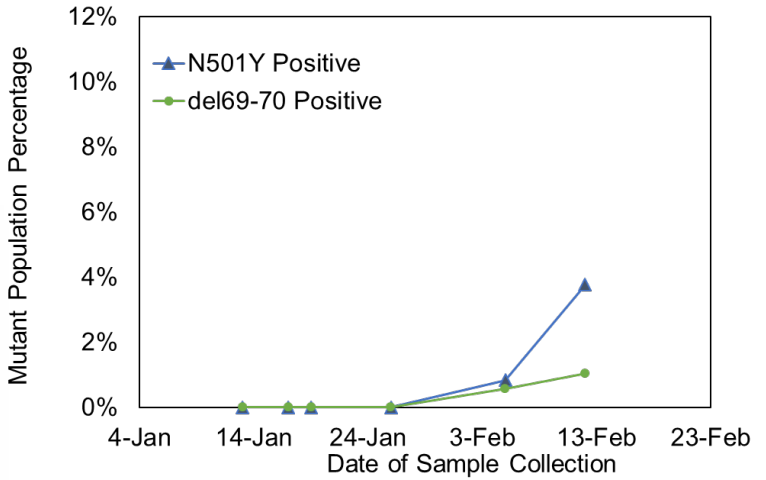
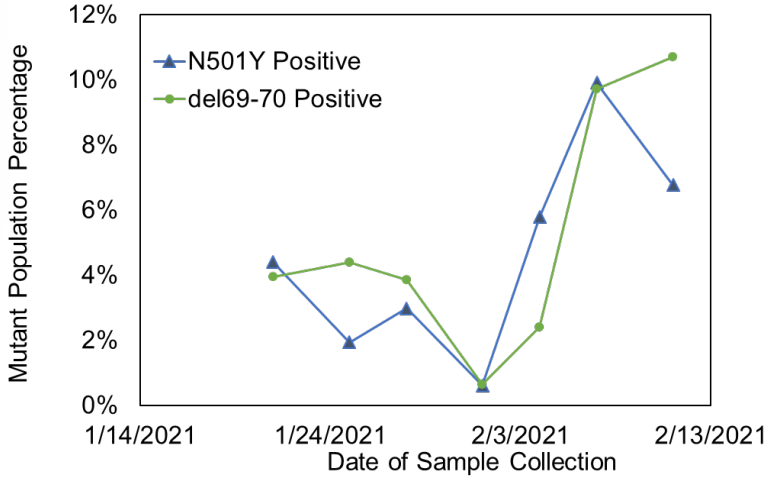
Tracking Variants in the Sewer











Sequencing project underway to confirm presumptive B.1.1.7 positive results

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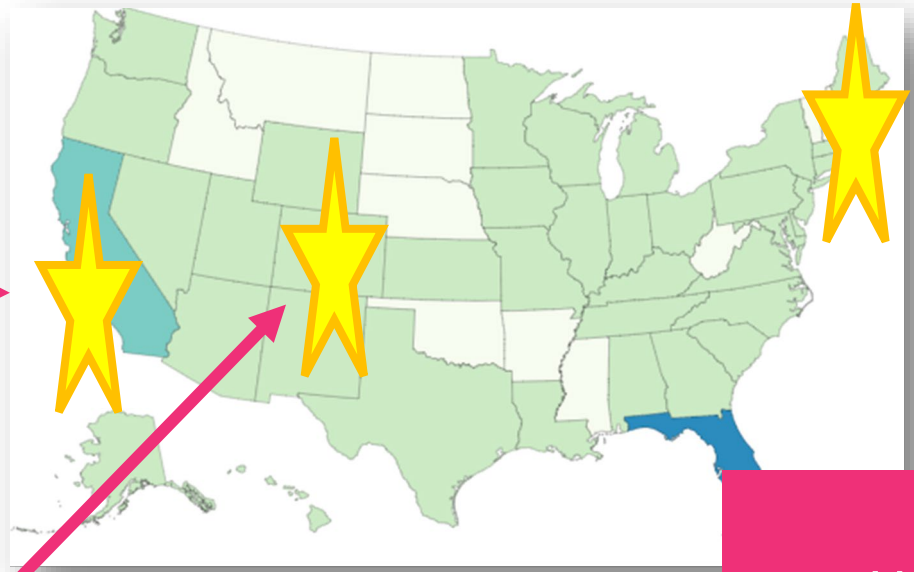
Wastewater Monitoring – Use Cases

Burlington, VT & GoAigua

Palm Springs



Colorado State-Wide Program

- *How the data were used*
- *Benefits provided to the community*

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City-wide Wastewater Monitoring – Palm Springs Use Case

- GT Molecular has been testing for the city of Palm Springs, CA since June
- Use as an “extra tool the city is voluntarily employing to track the disease”
- Samples are collected at the WWTP on a biweekly basis from a flow-based 24-hour composite autosampler.

Ramon Lopez, Lead Operator & Lab Supervisor collects samples at the City’s wastewater treatment plant and sends it on dry ice for testing at GT Molecular in Fort Collins, Colorado.

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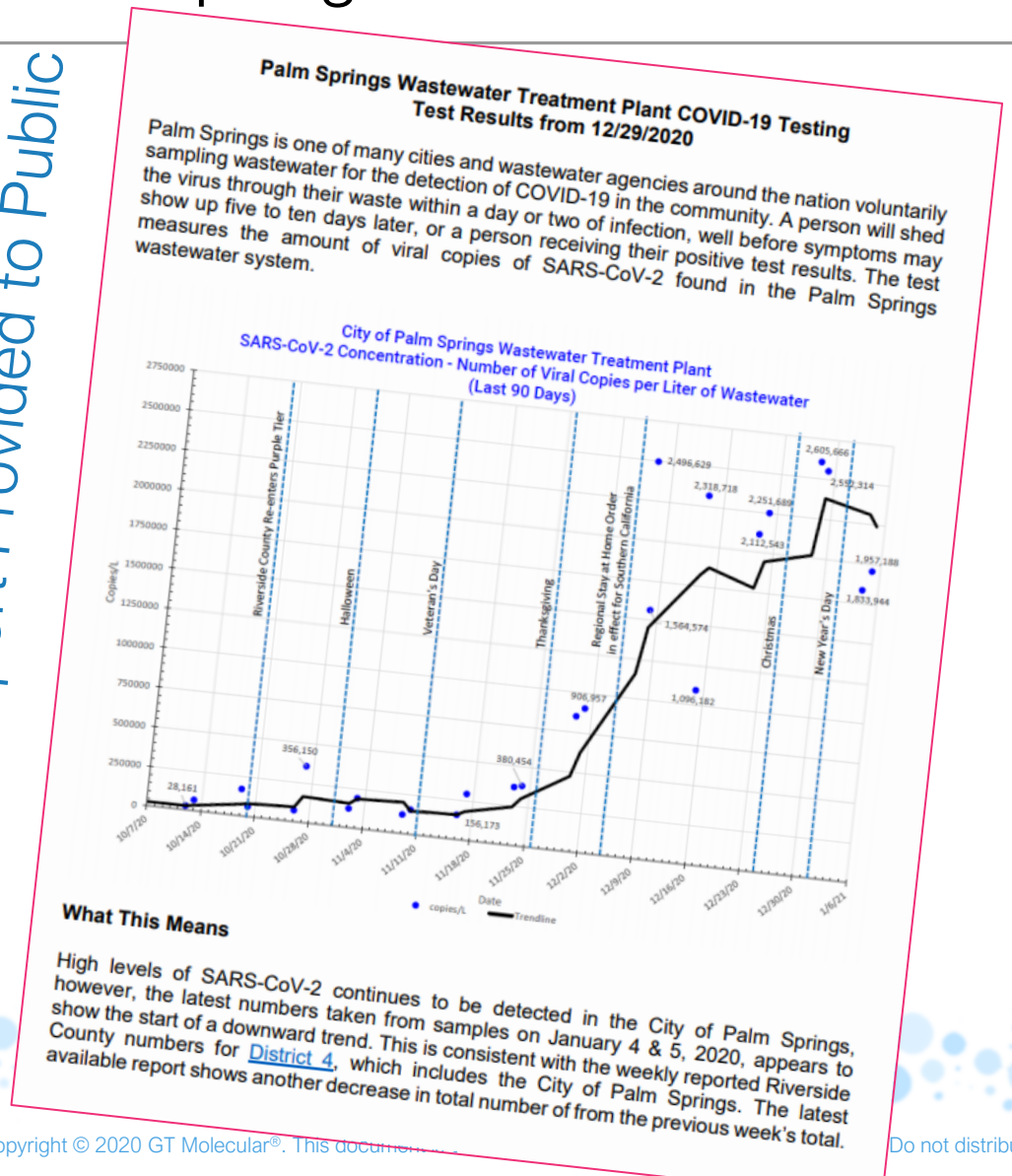
Palm Springs: How the Data is Used

Weekly Report Provided to Public



Palm Springs Wastewater Treatment Plant COVID-19 Testing
Test Results from 12/29/2020

Palm Springs is one of many cities and wastewater agencies around the nation voluntarily sampling wastewater for the detection of COVID-19 in the community. A person will shed the virus through their waste within a day or two of infection, well before symptoms may show up five to ten days later, or a person receiving their positive test results. The test measures the amount of viral copies of SARS-CoV-2 found in the Palm Springs wastewater system.

City of Palm Springs Wastewater Treatment Plant
SARS-CoV-2 Concentration - Number of Viral Copies per Liter of Wastewater
(Last 90 Days)

What This Means

High levels of SARS-CoV-2 continues to be detected in the City of Palm Springs, however, the latest numbers taken from samples on January 4 & 5, 2020, appears to show the start of a downward trend. This is consistent with the weekly reported Riverside County numbers for District 4, which includes the City of Palm Springs. The latest available report shows another decrease in total number of from the previous week's total.

Wastewater data is used as an additional means to inform the community on the levels of COVID-19 in their community.

1. Each time we provide data to Palm Springs, a report is generated and posted to PalmSprings.gov
2. City officials show data in the context of holidays and dates of importance
3. City officials provide an interpretation of the data in the a “What This Means” section of the report.

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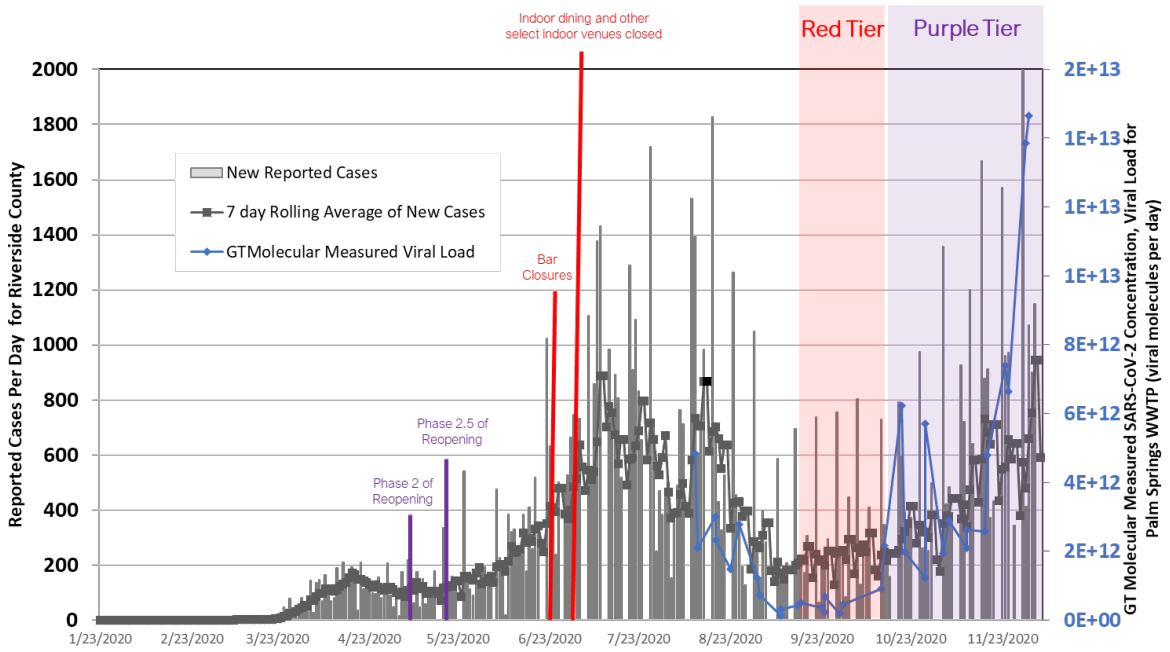
Palm Springs: How the Data is Used



Data is also used to better understand the social and environmental effects on COVID-19 spread within the community.

1. Evaluated the correlation between containment policies on spread

2. Evaluated the correlation between weather and spread (weather affects tourism)

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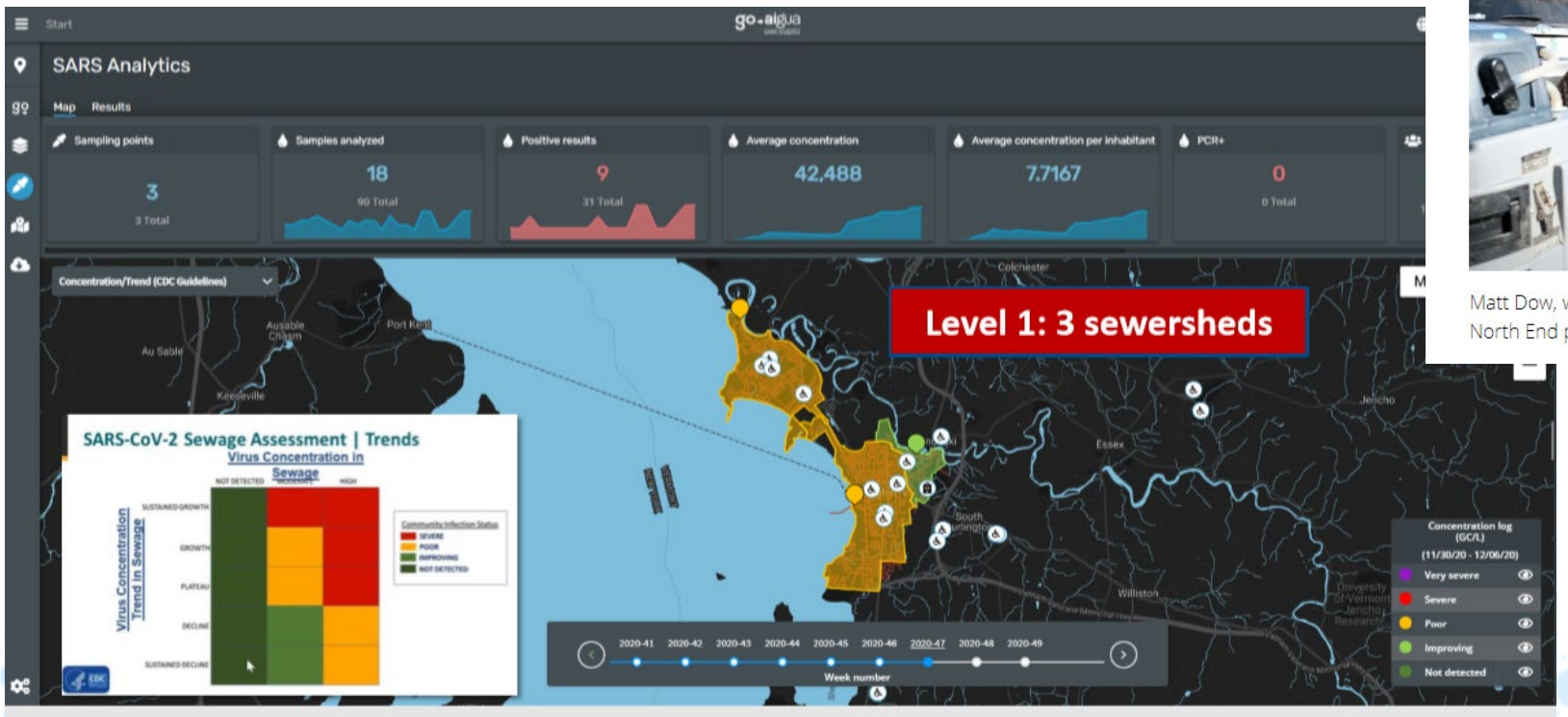
City-wide Wastewater Monitoring – Burlington, VT Use Case

- GT Molecular has been testing for the city of Burlington, VT for the last several months in a partnership with data and water science company, GoAigua.



Matt Dow, wastewater facilities manager, samples wastewater for Covid at the New North End plant last month. Photo by Katya Schwenk/VTDigger

THE CITY OF BURLINGTON

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Burlington, VT: How the Data is Used (Public Awareness)

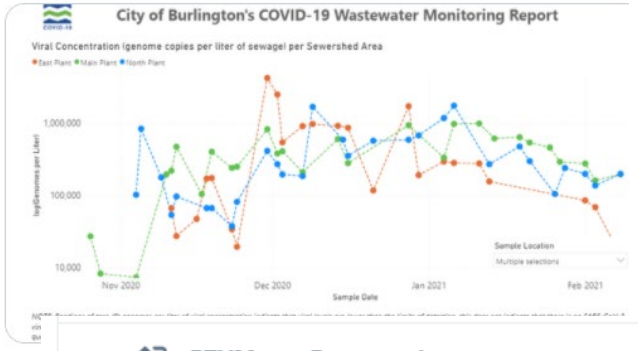
1. Public signs in areas of high SARS-CoV-2

2. Virtual WBE Townhall Meetings

3. Press Releases and Social Media Posts

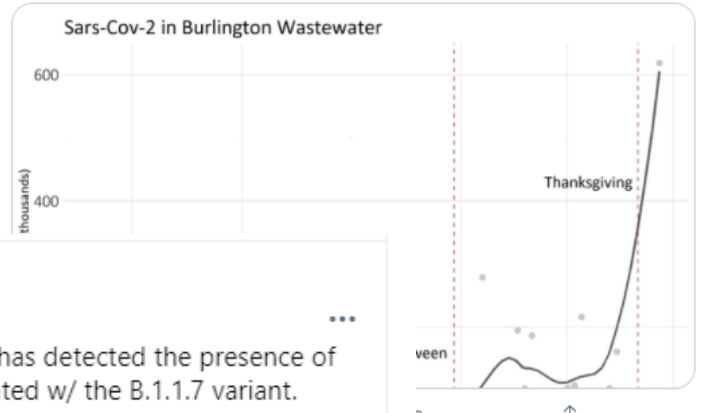
BTVMayor @BTVMayor · Feb 11

As we have anticipated would happen, the City has detected mutations associated with the Covid-19 variant that first originated in the U.K. This information serves as an alert for Burlingtonians to exercise extra caution. Learn more: burlingtonvt.gov/Press/city-of-...



BTVMayor @BTVMayor · Dec 3, 2020

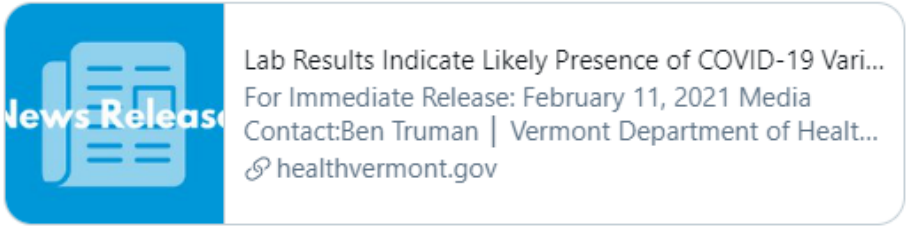
The City's latest Covid-19 wastewater readings are back, and they show a major increase across the city. "I hope all Burlingtonians will look at this graph and see what I see: a call to action." - Miro
burlingtonvt.gov/Press/mayor-mi...



BTVMayor Retweeted

VT Dept of Health @healthvermont · Feb 11

The City of Burlington's testing of wastewater has detected the presence of two COVID-19 virus mutations that are associated w/ the B.1.1.7 variant. Detection of these 2 mutations is a strong indicator that the B.1.1.7 variant is present in the community.



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THE CITY OF BURLINGTON

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Burlington, VT: How the Data is Used (Directed Popup Testing)

4. Pop-up testing in areas with highest wastewater signal

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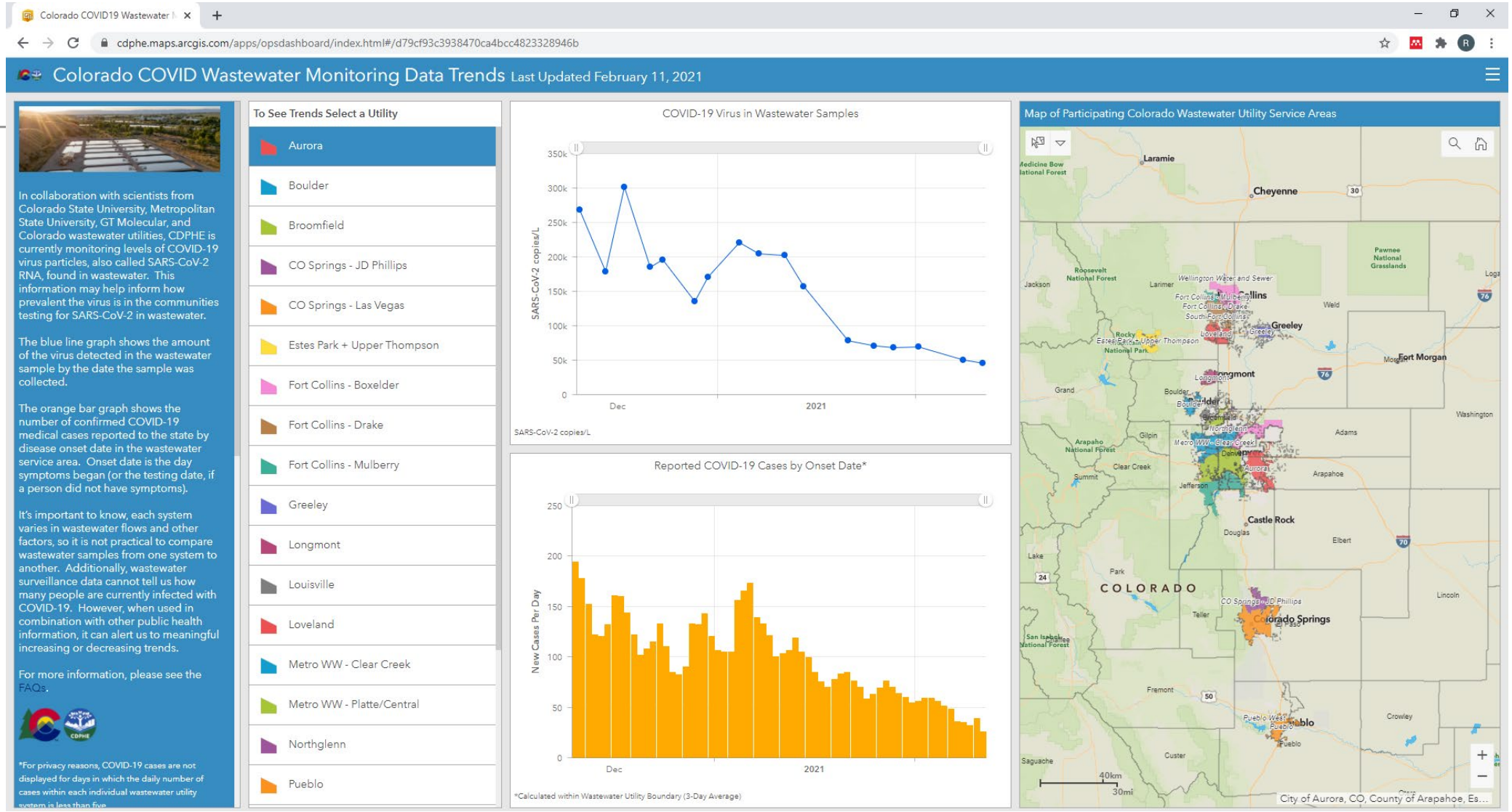
Colorado

Public Facing Dashboard



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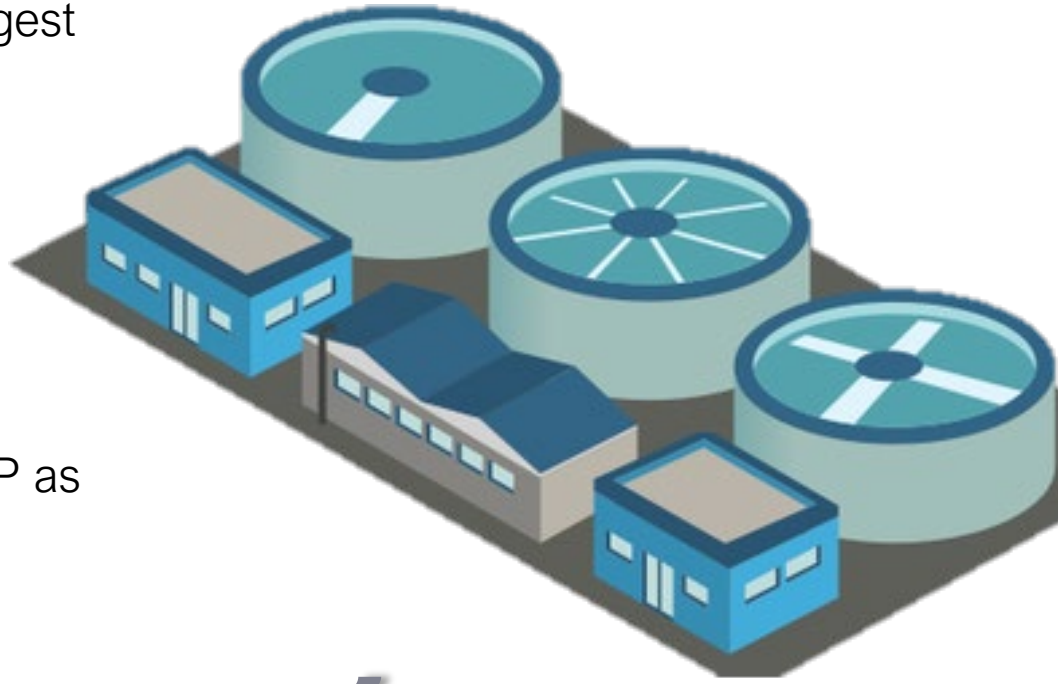
- For monitoring solutions to make the largest impact on public health they must be:
  - Rapid
  - Ultra-sensitive
  - Cost-effective
  - Adaptable to viral evolution
  - Communicated to the public



- The new and changing role of the WWTP as a front-line defender of public health

Outbreak Analytics

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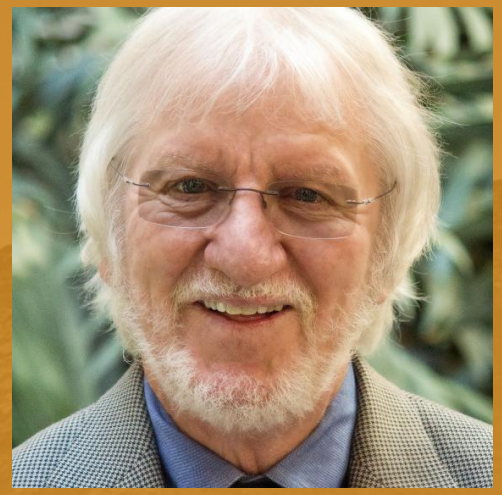


Dr. Ian Pepper

DIRECTOR, WEST CENTER AND PROFESSOR, ENVIRONMENTAL SCIENCE

UNIVERSITY OF ARIZONA

CWEA-CASA WEBINAR
February 17, 2021

Ian Pepper

THE UNIVERSITY OF ARIZONA
WEST CENTER
WATER & ENERGY SUSTAINABLE TECHNOLOGY

WEST CENTER MONITORING OF COVID IN SEWAGE FROM WASTEWATER TREATMENT PLANTS

- WEST WEBSITE (March 2020): offer to test samples nationwide for a fee
- March → August 2020, over 300 samples analysed
- Samples from all over U.S. including Los Angeles, New York, Seattle Jacksonville (FL)
- Raw wastewater samples often +ve
- Always –ve after 2° treatment and disinfection

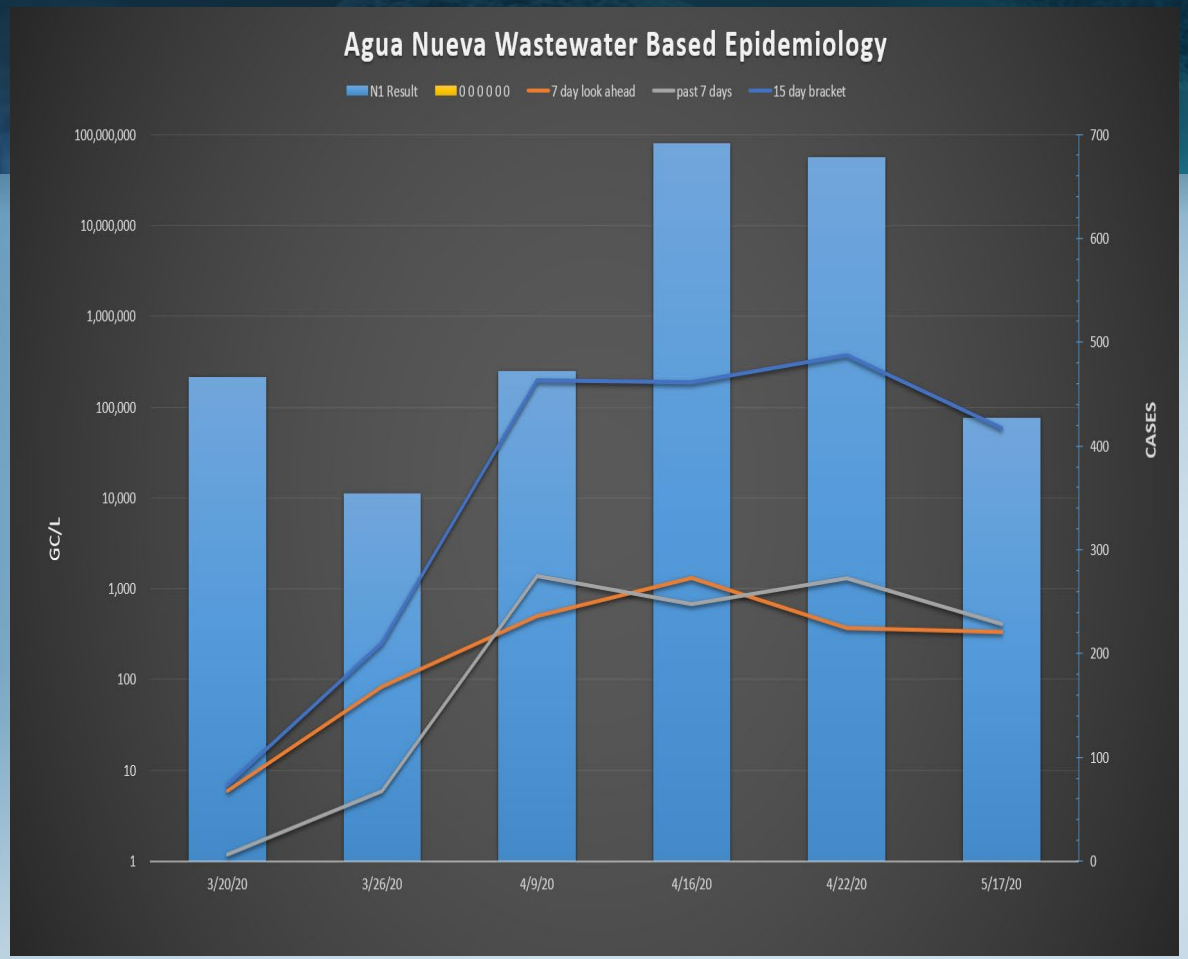


Figure 1. Sewage concentrations of RNA target N1 versus number of cases. Note that RNA target N2 was not detected during this time (3/20/20 - 6/17/20).

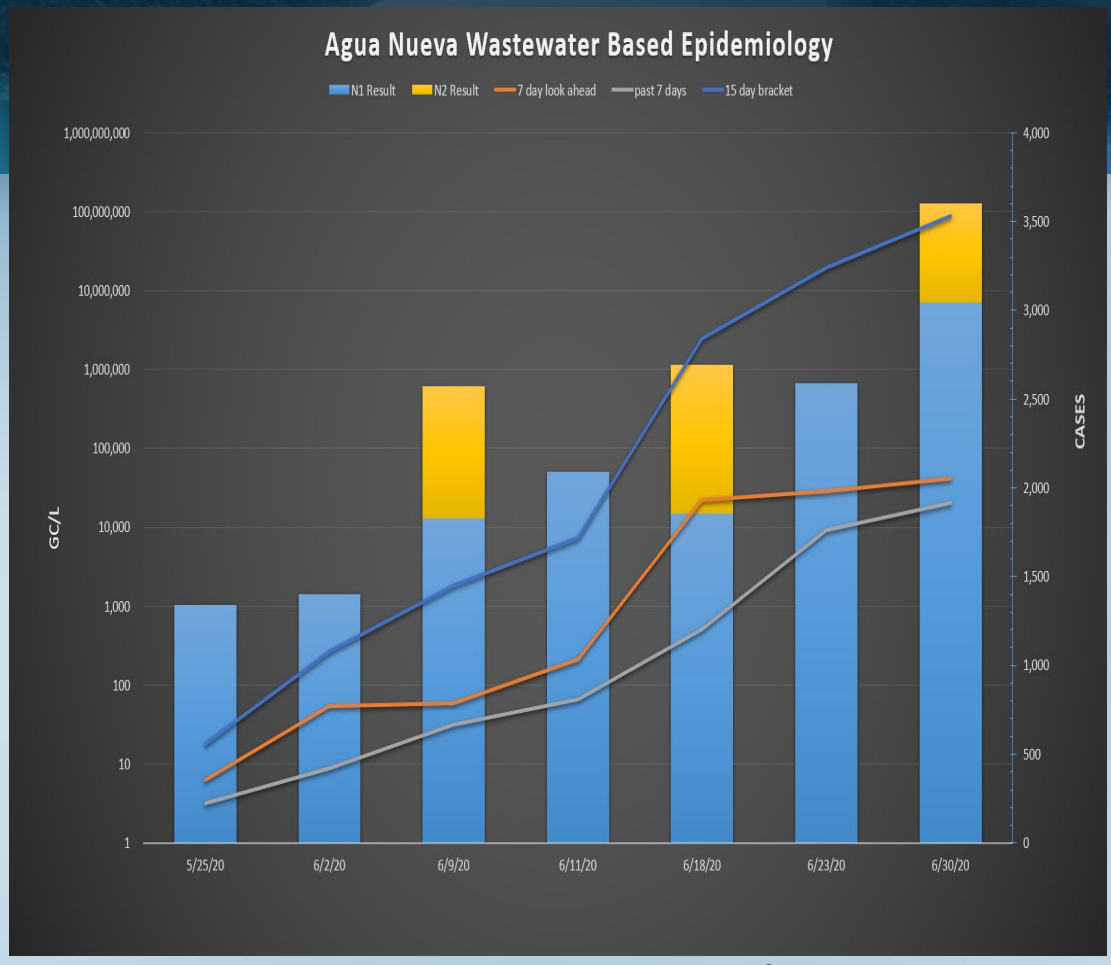


Figure 2. Sewage concentrations of RNA target ZN1 and N2 versus number of cases. Note that RNA target N2 was detected during this time (5/25/20 – 6/30/20).

SENSITIVITY OF WBE: AGUA NUEVA WWTP

- “Stay at home” order in Arizona
  - Approximately 2-4 weeks later, virus concentrations and case count decrease

- “Re-open economy” order in Arizona
  - Approximately 7 days later virus concentrations increase
  - Approximately 2 weeks later, case count increases

- Memorial Day, Independence Day, Labor Day, Halloween, Thanksgiving, Christmas
  - Approximately 1 week after each holiday virus concentrations increase
  - Approximately 2 weeks after each holiday case count increases
  - Superbowl?

UNIVERSITY OF ARIZONA CAMPUS RE-ENTRY PLANS FOR FALL 2020

7 teams established:

- COVID-19 testing of humans (RT PCR)
- Antibody testing (Elisa IgG Antibody Test)
- Contact tracing (In person and app. Based)
- Isolation (segregated dorms or hotels
- Health Data Management and Communication (HIPAA and FERPA compliant data management)
- Thermometry (temperature measurement of individuals)
- **WBE: US! (Dormitory testing for early detection of in-house infections)**

Collecting Wastewater from Dorms

Level of Concern	Wastewater Virus Concentration (gene copies/L)	Action Item
0	Non-detect	No action item
1	$10^1 – 10^2$	Enhanced awareness and disinfection
2	$10^3 – 10^4$	20% random testing
3	$10^5 – 10^6$	40% random testing
4	10^7	All residents tested

FALL CAMPUS RE-ENTRY BEGINS AUGUST 2020

- **Aug 18-24** Students begin returning
- **Aug 24** Fall semester begins
- **Aug 25** Wastewater positive from Likins Hall

All hell breaks loose

- **Aug 25** - 6:00pm results reported
  - 11:00pm Dr. Pepper awoken by President Robbins phone call
- Decisions made to retest wastewater and clinically test all students for COVID-19
- **Aug 26**
- 5 wastewater samples collected – all positive
- Clinical COVID tests identify two asymptomatic, but infected students

HOW WBE REDUCED EXPONENTIAL SPREAD OF COVID-19

- The two infected students were asymptomatic
- Without WBE detection and isolation, they would have spread COVID-19 to other students
- This scenario has been repeated $\simeq 80$ times
- University has successfully remained open
- Influence of “Shelter in Place” reflected in wastewater virus concentrations

NATIONAL HEADLINES

The University of Arizona says it caught a dorm's covid-19 outbreak before it started. Its secret weapon: Poop.

University Of Arizona Prevented Coronavirus Outbreak On Campus By Testing Wastewater

How the University of Arizona used No. 2 to solve its No. 1 problem: The coronavirus

Poop tests stop COVID-19 outbreak at University of Arizona

University of Arizona's wastewater testing halts potential surge in COVID-19 cases at dorm

UA wastewater testing finds COVID-19 cases in dorm

University of Arizona wastewater testing finds virus at dorm, prevents outbreak

Researchers at the University of Arizona say they stopped a coronavirus outbreak before it spread by testing students' poop

Wastewater helps find positive COVID-19 cases at UA dorm

University of Arizona catches asymptomatic coronavirus cases through wastewater testing

WBE accuracy as an early-warning diagnostic for new cases of COVID-19

			Clinical Results	
			Positive	Negative
Wastewater Results		Positive	91	20
		Negative	23	185

Sensitivity (79.8%)
Specificity (90.2%)
Positive predictive value (82.0%)
Negative predictive value (88.9%)

ESTIMATION OF # OF ASYMPTOMATIC CASES

$$\text{Estimated \# Infections} = \frac{\text{Sewage concentration x Wastewater flow rate}}{\text{Amount of feces x fecal shedding rate}}$$

Big unknown: fecal shedding rate

BUT from Student Dorm Study

- # cases known (clinical tests)
- Back calculate shedding rate
- Use equation to predict total # cases
- Limitation = issues with clinical testing

Equation used to predict total # infections

Predicted # infections minus actual reported cases =

Asymptomatic cases

- We are writing this up for publication now
- % asymptomatic cases is a BIG number

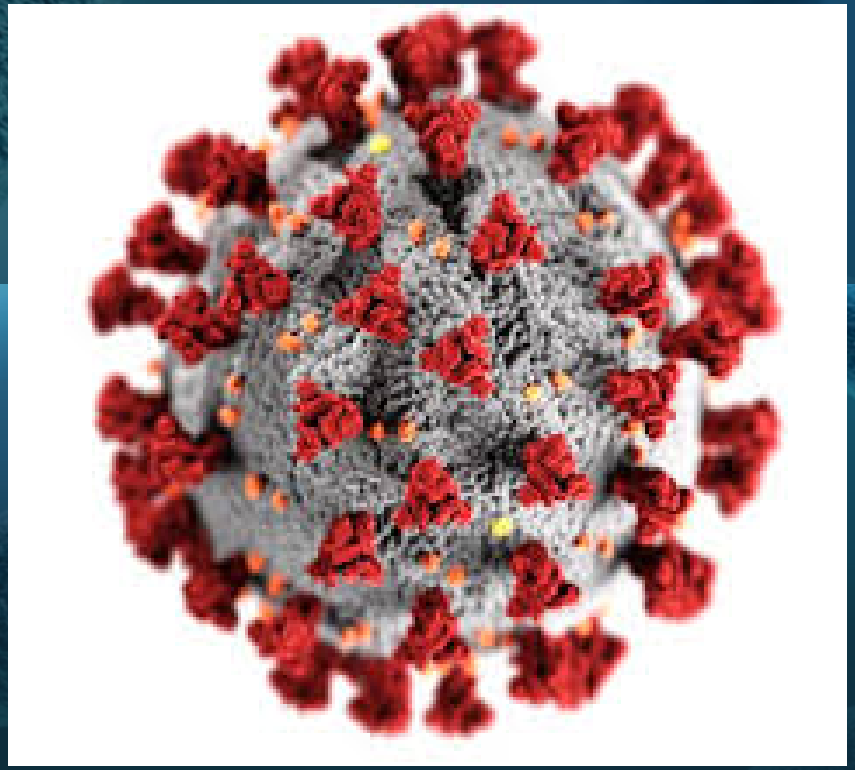
Wastewater-Based Epidemiology: Yuma

Issues

- Farm migrant workers
- Snowbirds
- Military base

- WEST helps Paul Brierley (Director, Yuma Center of Excellence for Desert Agriculture) establish COVID-19 Lab
  - Yuma Board of Supervisors give $250K
  - Governor Ducey gives $500,000

Coronavirus



Outcomes

- WBE established to monitor the city of Yuma
  - 13 regions identified
  - Key high risk buildings within each region identified
  - Wastewater from manholes monitored
  - Hot spots identified
  - County health officials notified in advance of enhanced case count
  - Used to maximize resources

WASTEWATER-BASED EPIDEMIOLOGY

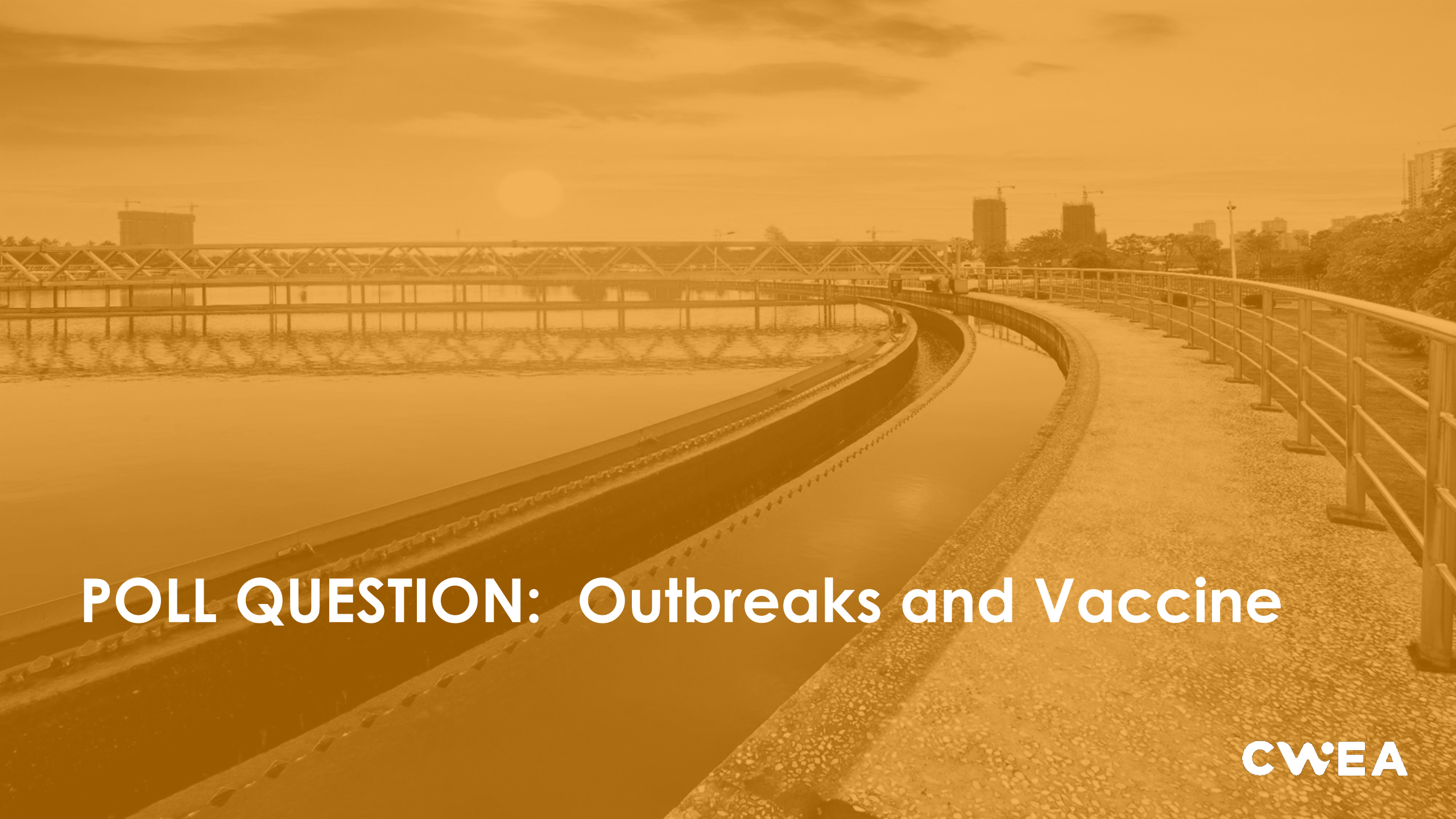
POOP NEVER LIES!

University of Arizona

Eileen White

MODERATOR
DIRECTOR OF WASTEWATER
EAST BAY MUNICIPAL UTILITY DISTRICT


Q&A



POLL QUESTION: Outbreaks and Vaccine

Process for Claiming Contact Hours for this Webinar

1. Log in to https://owen.cwea.org/ the Online Wastewater Education Network (OWEN) with your mycwea.org account info and find this program in "Your Dashboard".

2. Enter the attention codes as 1st attention check code – 2nd attention check code (XXXX-XXXX) in the "Attention Check Code" component under the "Contents" tab within 48 hours of the live webinar.

3. Your contact hours will be reflected in your mycwea.org account within 2-3 weeks following completion.

Thank You!

Next COVID-19 Update Webinar

on Wednesday, March 24, 2021 from 11 am – 12:30 pm