DATE: February 1, 2021

TO: Clean Water Services Advisory Commission Members
and Interested Parties

FROM: Mark Jockers, Chief of Staff

SUBJECT: **REMINDER AND INFORMATION FOR FEBRUARY 10, 2021, CWAC MEETING**

This is a reminder that a Clean Water Services Advisory Commission (CWAC) meeting is scheduled for **Wednesday, February 10, 2021.**

In support of best practices for preventing the spread of the coronavirus, CWS has adopted the following format for the February meeting:

- The meeting will be held virtually using the Webex platform.
  - Webex offers the option to connect to video, slides and audio via a device with internet access, or an audio-only connection through any telephone line.
  - CWAC members should watch for an email containing Webex connection details.
  - Interested parties should register for this meeting by February 9 by following the instructions on the website.
- The meeting will begin at 5:30 p.m. Please plan to establish your connection to the meeting 10-15 minutes before the start time to allow the meeting to begin promptly.
- Dinner will not be provided.

The CWAC meeting packet will be mailed to Commission members on Monday, February 1, and posted to the CWAC section of the Clean Water Services' website.

Please call or send an email to Stephanie Morrison (morrisons@cleanwaterservices.org; 503.681.5143) by February 9 to advise about your attendance at this meeting.

Enclosures in this packet include:

- February 10 Meeting Agenda and Materials
- January 13 Meeting Notes

Clean Water Services Advisory Commission

February 10, 2021

AGENDA

5:30 p.m. **Welcome & Introductions**

5:35 p.m. **Review/Approval of Meeting Notes of January 13, 2021.**

5:40 p.m. **Leaf Program Update**

Staff will provide a summary of the fall 2020 leaf season and the changes that were implemented. The summary will include 2020 data compared to past leaf seasons, lessons learned, and preliminary planning for fall 2021 leaf season.

- Ryan Sandhu, Field Operations Division Manager
- Shannon Huggins, Public Involvement Coordinator

Requested action: Informational

5:55 p.m. **Clean Water Services 2020 Customer Awareness & Satisfaction Survey Results**

Since 1988, Clean Water Services has conducted biennial customer awareness and satisfaction surveys. The research objectives are to determine, measure and track awareness and opinions of CWS; identify public expectations of CWS and determine how well CWS is meeting those expectations; and assess community values related to water resource management. The results help guide policy and program development and communication strategies.

- Karen DeBaker, Communications & Marketing Manager
- Adam Probolsky, Probolsky Research

Requested action: Informational

6:35 p.m. **Invitation for public comment**

6:40 p.m. **Announcements**

6:45 p.m. **Adjourn**

Next Meeting: March 10, 2021

CLEAN WATER SERVICES
2020 LEAF SEASON SUMMARY

February 10, 2021

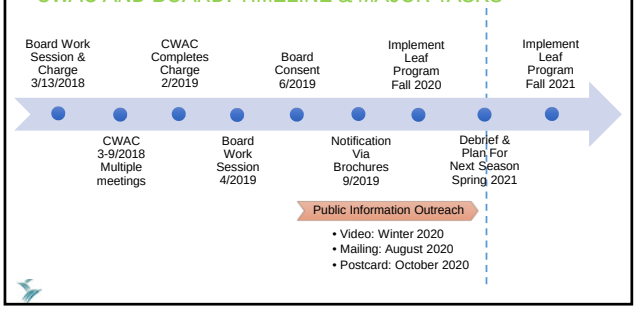
Clean Water Services Advisory Commission Meeting
Shannon Huggins / Communications & Community Engagement
Ryan Sandhu / Utility Operations & Services

50 | Clean Water Services 1970-2020

CLEAN WATER SERVICES 2020 LEAF SEASON SUMMARY

- Today's Purpose
  - Update the Clean Water Services Advisory Commission on the 2020 Leaf Program
- Desired Outcome
  - CWAC is aware of how Leaf Program changes impacted the 2020 leaf season

CWAC AND BOARD: TIMELINE & MAJOR TASKS



BOARD APPROVED CHANGES

- Discontinue District's curbside leaf pickup
- Promote use of yard debris bins
- Increase the number of leaf drop days and participating locations
- Continue enhanced storm patrol
- Continue routine street sweeping

FALL 2020 LEAF PROGRAM SUMMARY

- August: Sent letter to curbside customers
- October: Sent flyer with map and dates
- Prepared tiered response in case customers not adhering to program
- Prepped for increased call volume
- Coordinated with County Solid Waste on issues related to green bins
- October 31-December 12: Leaf drop-off events
- January 2021: Look back at the 2020 season

2020 LEAF PROGRAM SUMMARY: BY THE NUMBERS

	2020	2019-2016 (annual average)
Volume of Leaves in cubic yards (CY)	2,346	5,459
Labor Hours	1,646	3,032
Program Cost	$231k	$375k
# of Drop-Off Events	18	4
Curbside?	No	Yes

2020 LEAF PROGRAM SUMMARY: BY THE NUMBERS, PART 2

	2020	2019-2016 (Average)
CY of leaves collected per day	391	420
CY of leaves collected per day per site	130	210
Cost/CY collected	$99	$69

2020 LEAF SEASON SUMMARY: SURVEY RESULTS

- Link to survey results

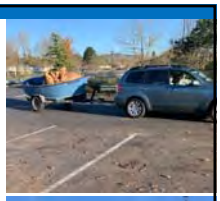
2020 LEAF SEASON SUMMARY: DONATIONS

- Estimated pounds of food in 2020: 7,700
- Average pounds of food from 2009-2019: 2,722

- Cash donations in 2020: $2,939
- Average annual cash donations (2016-2019): $875

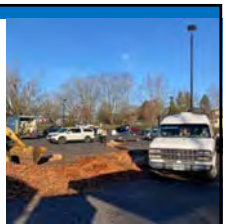
FALL 2020 LESSONS LEARNED

- Customers are aware of the increase in leaf drop days
- Curbside customers are aware that District no longer offers curbside pickup
- Most curbside customers have adjusted and did not leave leaves windrowed in the street
- Customer calls for service related to localized flooding caused by leaf-blocked catch basins were down compared to past years
- Washington County Solid Waste continues to support changes to our program, even though we are impacting their workload, especially related to yard debris bins
- Support from BSD and HSD was a major factor in expanding leaf-drop opportunities. Questions remain regarding fall 2021 and facility availability during non-COVID year



FALL 2020 LESSONS LEARNED

- CWS field crews easily adapted to the new, additional drop-off locations
- All outreach efforts are important as customers are informed through varying means (flyers, online, neighbors, sandwich boards, etc.)
- Customers do not distinguish between the trackless leaf pickup and street sweeping



THANK YOU/QUESTIONS?

Clean Water Services Advisory Commission Meeting Summary

Date: January 13, 2021

Location: The meeting was conducted on Webex

Attendance

Attending the meeting from CWAC:

- Tony Weller (Homebuilder-Developer), Commission Chair
- Mike McKillip (District 3/Rogers), Commission Vice Chair
- Andy Duyck (District 4/Willey)
- Art Larrance (At-Large/Harrington)
- Jan Wilson (Environmental)
- John Jackson (Agriculture)
- Lori Hennings (Environmental)
- Matt Wellner (Homebuilder-Developer)
- Stu Peterson (Business)
- Sherilyn Lombos (Cities/nonvoting)
- Joseph Gall (alternate Cities/nonvoting)
- Diane Taniguchi-Dennis (Clean Water Services Chief Executive Officer/nonvoting)

Absent:

- Molly Brown (District 2/Treece)
- Terry Song (Business)

Vacant:

- District 1/Fai
- Agriculture

Attending the meeting from Clean Water Services:

- Mark Jockers, Chief of Staff
- Gerald Linder, General Counsel
- Kathleen Leader, Chief Financial Officer
- Ken Williamson, Research & Innovation Director
- Scott Mansell, Senior Engineer
- Blythe Layton, Water Resources Program Manager
- Nate Cullen, Chief Operating Officer
- Stephanie Morrison, Office Manager
- Chris White, Public Involvement Coordinator
- Shannon Huggins, Public Involvement Coordinator
- Jody Newcomer, Technical Editor & Communications Specialist
- Dave Cebula, IT Enterprise Architect

Attending the meeting from the public:

- Alan Jesse, Forest Hills Farms, Tualatin Valley Irrigation District
- Dale Feik, Chair of Washington County Citizen Action Network and Project Director of Hillsboro Air & Water

1. CALL TO ORDER

Tony Weller called the meeting to order at 5:33 pm.

Ms. Morrison announced the meeting is being recorded and recognized all attendees.

2. REVIEW/APPROVAL OF MEETING NOTES

There were no comments regarding the notes from the meeting on Oct. 14, 2020. The notes were approved.

3. ELECTION OF CHAIR AND VICE CHAIR

The CWAC bylaws require an annual selection of a chair and vice chair. Tony Weller currently serves as Chair; Mike McKillip serves as Vice Chair.

Ms. Hennings nominated Mr. Weller as Chair. Mr. Peterson nominated Mr. McKillip as Vice Chair. Mr. Weller asked for additional nominations. There were none; nominations were closed. Mr. Weller was reelected as Chair. Mr. McKillip was reelected as Vice Chair.

4. CONFIRMATION OF BUDGET COMMITTEE MEMBERS

Clean Water Services' Budget Committee is made up of the five members of the Board of Directors and five representatives from CWAC who reside within Washington County. The CWAC representatives serve three-year, staggered terms. Lori Henning's term expired on September 30, 2020, and Dave Waffle, whose term expires on June 30, 2021, is no longer on CWAC. The other members of the Budget Committee are Tony Weller, Molly Brown and Mike McKillip. The Budget Committee is scheduled to meet on Friday, May 7, 2021.

Mr. Duyck moved to recommend Lori Hennings and Terry Song to the Board for appointment. Ms. Hennings made a friendly amendment to add Mr. Duyck as a third candidate. Motion passed.

Open terms	**District of Residence**	**Term Expires**	**First Appointed**
Position 1	tbd	09/30/2023	
Position 2	tbd	06/30/2024	
Continuing members			
Tony Weller	District 3	12/31/21	03/16/10
Mike McKillip	District 3	09/30/22	04/15/14
Molly Brown	District 2	10/31/22	04/01/08

5. UPDATE ON TRACKING CORONAVIRUS IN SEWAGE

- Dr. Scott Mansell, Senior Engineer
- Dr. Blythe Layton, Water Resources Program Manager
- Dr. Ken Williamson, Research & Innovation Director

Wastewater-based epidemiology allows researchers to assess an entire community in a single sample. People infected with SARS-CoV-2 excrete the virus, which enters the waste stream. Researchers sample influent at treatment plants and manholes, measure SARS-CoV-2, calculate the SARS-CoV-2 per capital load and compare to public health data. Wastewater-based epidemiology has been used to trace opioids and other viruses such as polio. It's sensitive and cost-effective, and researchers are studying whether it can be used as an early warning system.

Researchers around the world are studying wastewater for signs of the virus, but CWS was an early adopter and has developed a number of innovative applications.

CWS staff collects samples from manholes or treatment plants, then concentrates and homogenizes them. From there RNA and DNA are purified and analyzed using droplet digital RT-PCR and results are reported to health authorities. RT–PCR is a variation of PCR, or polymerase chain reaction, which is widely used in forensics, diagnostics and research.

CWS is involved in a number of COVID-19 monitoring projects:

- Washington County sewershed surveillance.
- TRACE (Team-based Rapid Assessment of Community-level coronavirus Epidemics) partnerships in Newport, Bend, Hermiston, Boardman and Corvallis.
- Lewis & Clark College dorm surveillance.
- OHSU study of four neighborhoods in northeast and southeast Portland and one neighborhood in Beaverton.
- Ongoing experiments include sample frequency, hospital effluents and disinfectants, solid and liquid virus concentrations.

Washington County sewershed surveillance

Sample collection in Washington County has been ongoing since April 2020 and includes samples collected from the treatment plants as well as strategic locations in the collection system.

Sampling at treatment plants: Crews collected 24-hour hourly composite samples at all four water resource recovery facilities weekly from March to October and twice a week since November.

Results show the temporal trends were generally consistent between the treatment plants; patterns affected the entire District rather than individual sewersheds. Generally, the highest concentrations of the virus were in Forest Grove and Hillsboro. Wastewater concentrations at all treatment plants correlate well with infections, though the concentrations are not a clear leading indicator.

Sampling manholes: In Phase 1, crews collected grab samples and 24-hour hourly composites at 19 manholes weekly from April to September. Phase 2 began in December 2020 and crews are collecting 24-hour 15-minute composites from 10 manholes.

Sample sites include likely hot spots and entities with available infection data such as hospitals and health centers, industries, retirement homes, jails. Where possible, the team chose sites that could be isolated for the targeted areas. The team chose a few residential sites to see if it could track for known variables such as income and race, and they also looked for sites for schools or community centers.

Results from Phase 1 manhole sampling show:

- Data correlates with reported outbreaks at Forest Grove food industries. The number of documented infections was not very high, but was still detectable in wastewater. Results show that wastewater monitoring, even on a small scale, can be used as a surrogate for testing.
- Some locations never had a positive detection. Virginia Garcia had no positive detection despite known incidents of infection. The four hospitals were almost all non-detects. The team is researching possible interferences and testing to determine the cause.
- Tech areas had lower detection rates than food industry areas.
- Higher poverty areas may be associated with higher virus concentrations.

Dr. Mansell shared a tracking research dashboard developed by CWS staff. It's used internally now, but might be rolled out to the public.

Ongoing Experiments

Sampling frequency study: The research team is studying sampling frequency at a Lewis & Clark College dorm that houses quarantined, infected students. The team conducted hourly, 24-hour composites and high-frequency, five-minute sampling for eight hours. Results underscore the importance of doing composite samples rather than grab samples.

Hospital effluent inhibition studies: The team is trying to understand why hospitals are reporting non-detects. Staff surveyed hospitals for products used and focused on quaternary ammonium compounds, which are potent disinfectant chemicals commonly found in cleaning products. The team is studying how hospital effluent affects nitrification and the effect of hospital effluent on detected virus concentration in known samples.

ripl

CWS is converting a facility in Forest Grove to space for water quality labs, research labs, entrepreneurial labs and teaching labs. The building is called ripl: Research, Innovation, Partners, Labs.

One corner of the building has been remodeled to be used for sewer surveillance work, which allows CWS staff to do its own analysis instead of contracting with Oregon State University. The space has a DNA/RNA extraction room; a PCR prep room, which is a "clean" room, to prepare mastermix; and a ddPCR room, which houses the droplet digital PCR system. The droplet digital PCR system is one of only a few in the Pacific Northwest. PCR in general is quite common and

most academic labs have a quantitative PCR system. It is uncommon and innovative to have a droplet digital PCR system.

The CWS team conducted an initial test at ripl and analyzed four samples from the water resource recovery facilities concurrently with the OSU lab. The results are almost indistinguishable.

Conclusions

- Wastewater monitoring gives an accurate picture of the viral burden in a community without having to test individuals
- High-resolution spatial and temporal sampling can pinpoint infection "hotspots" and outbreaks
- Tracking wastewater virus trends can inform public health response

Dr. Williamson said the COVID project is the first of many projects that will use molecular techniques to understand biological processes. Molecular technology is broad and will have applications far beyond COVID, though CWS is deeply involved in trying to understand the impacts of COVID in Washington County. Eventually, CWS will use molecular technology to optimize wastewater treatment plants.

QUESTIONS, COMMENTS

How unusual is it for an agency like CWS to have a lab like ripl?

It's uncommon. Dr. Layton said she knows of one other agency in the United States that has a lab similar to ripl — Hampton Roads Sanitation District in Virginia. (CWS collaborates with Hampton Roads.) Some iteration of molecular biology and PCR technology is becoming more common. In California, local water quality labs learn how to do QPCR, or quantitative PCR, for bacterial targets for coastal monitoring.

Ms. Taniguchi-Dennis said CWS is positioning itself to optimize biological processes and is one of the leading utilities in this area. CWS and Hampton Roads see the need for this work, in part to prepare for new standards that the EPA is beginning to develop. Dr. Williamson and his team work with the Water Research Foundation and other organizations to bring grants to CWS to help support research for the region. It allows CWS to be a "hub utility" for the other utilities in the state.

Dr. Williamson said he sees two important applications related to wastewater. In the next few years EPA will have a requirement to monitor viruses in discharges. Molecular technology will allow CWS to monitor at a much lower cost. Secondly, CWS plans to work with partners to advance water reuse in the basin and engage in large-scale irrigation projects, including food crops. CWS will be required to monitor viruses in reuse water.

Can you explain the disconnect with the hospitals? Why doesn't the data show known positive cases? What are the implications of further research?

Dr. Layton said there should be a high signal in the hospital samples and it's baffling that it's not there. What are the implications? If there's something in the hospital effluent that's destroying the genetic signal, does that affect downstream samples? Does it affect influent? It throws a big monkey wrench in our understanding of how our method is working. We're

trying to trace it. We're exploring possibilities and the quaternary cleanser option seems to be the most logical explanation at the moment. Other communities see similar results from hospitals.

Ms. Taniguchi-Dennis said the anomaly is both a blessing and a challenge. It's a challenge to the researchers who are trying to look at COVID in wastewater as predictive of what's happening in a community. It's a blessing from a source control perspective because we know hospital activity is deactivating our ability to measure COVID.

Ms. Lombos commented that there are limitations to predictability.

Dr. Mansell said the one positive sample we received from Westside Hospital was one hundred times higher than any concentration seen anywhere else. We don't know why this signal was detected when no others have been at hospitals, but if it's indication of what the signals should look like, it has a significant impact.

Can you talk about eDNA for environmental health?

Dr. Layton said we want to replace the benthic invertebrate taxonomic assessments because they're expensive, labor intensive and time consuming. There's been a lot of research in the past few years that looks at using eDNA for an entire ecosystem. Everything that lives in nature sheds cells that end up in water. Researchers can take water samples and assess the birds, fish, microbiota, even plants. The idea is to develop an index of what species is indicative of a healthy ecosystem, a healthy watershed, and what species indicates more work is needed.

Is there a way to measure magnitude? Last I heard it was presence-absence.

Dr. Layton said she's not deep enough in the eDNA literature to answer that, but her understanding is it's presence-absence.

Ms. Hennings said typically with IBI, an Index of Biotic Integrity, you need the EPT index of magnitude, how many compared to others.

Dr. Layton thought it would be possible if you did an amplification-free eDNA sequencing method. Some people do PCR before they sequence to amplify the signal, but that can create bias and it's problematic if you're trying to do something quantitative. If you pick a sequencing platform that doesn't require amplification you could do quantitative assessments.

Dr. Williamson said some applications are using eDNA to quantify salmon species in Alaskan streams. Researchers can determine the species of salmon and an estimate of the number of salmon in the streams. It's much more problematic to quantify an entire ecosystem of organisms.

6. CWS ENERGY STRATEGY

- Nate Cullen, Chief Operating Officer

The mission statement for the energy program is:

> To further our commitment to environmental stewardship and to continuously improve our performance and control operating costs, we will improve energy management within our organization.

There are three components to how CWS manages energy:

1. Use less energy by making capital improvements that reduce energy use.
2. Use less energy by making operational changes to slow things down, turn things off and cycle operations.
3. Produce our own energy.

CWS spends about $3 million a year on electricity at the water resource recovery facilities, but that cost would be $5.4 million without an active energy management program. The impact of energy management is significant to the bottom line. CWS saves $1.4 million a year with cogeneration facilities and another $1 million a year through energy reduction initiatives.

CWS has steadily reduced the power purchased from PGE and increased the amount of cogeneration energy produced. CWS purchases 16% less today than in 2012; the Washington County population has grown about 11% in the same period. A lot of the energy used at CWS facilities is proportional to the amount of flow received, which is proportional to the population. In the same period, CWS has been required to treat water to higher levels, which takes more energy. The energy program helped keep energy use down in a period when it should've gone up.

Rock Creek is the largest CWS facility. There are two 500 kW engines that operate on digester gas and together meet about a third of the facility electricity needs. During the cogeneration process, electricity is recovered from the engines. CWS also uses the waste heat that cools the engines to heat some of the process units — digesters, struvite recovery facility — and heat some of the buildings.

Durham is the second largest facility, but a third smaller in flow than Rock Creek. Durham has two 848 kW cogeneration engines that operate on digester gas. Durham produces more power than Rock Creek because CWS feeds fats, oils and grease (FOG) to the digesters. FOG is a waste product that restaurants need to pay to dispose. It's also a high-energy waste product that roughly doubles energy production. CWS started charging a tipping fee to accept FOG in 2015 as a feed to the digesters. In 2020, CWS earned $600,000 in FOG revenue.

Durham meets about 60% of its plant electricity needs by self-generation of power and uses waste heat to heat digesters and several buildings. Durham aggressively pursued grant funding for projects and received more than $5 million in incentive funding from the Energy Trust of Oregon and the Oregon Department of Energy.

CWS also invests in solar energy and has projects at Rock Creek, Durham and the main administrative complex in Hillsboro. Solar City actively promoted power purchase agreements in 2012-13 in which Solar City owns the facilities and CWS purchases the power at a discounted rate. (Tesla has since purchased Solar City.)

CWS also controls energy costs by making energy efficiency part of the culture. Since 2011, CWS has received grant funding to help complete 84 capital projects that have saved nearly 12 million kilowatt hours per year in electricity. The average payback for projects is less than two years. Operational changes have generated about 2.5 million kilowatt hours per year. CWS has saved about $2.5 million in electricity per year through energy reduction measures. Operational changes to save energy come from staff — frontline operators, mechanics, electricians, technicians. The key to the program success is managing projects over time; the savings are cumulative. CWS has received numerous awards where energy management was a significant component.

Going forward CWS will continue to support staff groups called Green Teams that identify operational energy savings. The organization will continue to partner with the Energy Trust of Oregon and will conduct a feasibility study in 2021 for new solar projects.

CWS is planning to explore opportunities for renewable natural gas projects. RNG is natural gas that comes from a renewable source. CWS can clean digester gas to pipeline quality, a product NW Natural could inject into its pipeline and sell as green energy. RNG is worth about five to 10 times the commodity price of natural gas. The private sector is interested in investing in public-private partnerships where they provide the capital, do the design and construction, install facilities and share RNG dividends. It's a promising approach for CWS and could allow CWS to convert Rock Creek to RNG and decommission the two 500 kW generators. There's also an opportunity to produce RNG at Durham.

QUESTIONS, COMMENTS

It's great that you monitor energy production so you can quantify the results.

The Energy Trust of Oregon requires monitoring. The Trust audits us so that we deliver on what the project was supposed to do. It's great independent confirmation.

Are there any environmental tradeoffs with carbon from burning FOG?

FOG is considered a renewable energy source. FOG produces gas when it decomposes. If it goes to a landfill, it seeps out of the ground and becomes a methane source; it goes into the atmosphere and becomes a greenhouse gas. When we burn FOG, we use carbon and convert to it energy and CO_2. It's a better use of FOG than sending to a landfill. That's how CWS is able to get environmental credits.

Has the slowdown or shutdown of restaurant dining impacted FOG sources?

Yes. In March we saw a 10% reduction in the amount of FOG received. FOG intake recovered over the summer, but has since declined. Original projections before the pandemic were to receive more FOG than the previous year, but now we expect we'll hold steady.

7. PUBLIC COMMENT

Mr. Feik asked if technology is being developed in the new lab to analyze chemicals such as PFOS and PFOA. He also asked what kind of local limits are placed on landfills, airports and Intel.

Ms. Taniguchi-Dennis said Bob Baumgartner and the lab team are looking at what we need to do to analyze PFOS/PFOA and other emerging contaminants of concern in our labs. EPA considers this an area it wants to regulate, primarily for drinking water. There are no discharge requirements yet for treatment plants, but CWS wants to be proactive and ready to respond to new regulations. EPA is concerned about PFOS/PFOA in biosolids as well as effluent. The CWS team worked with the Port of Portland to monitor airports, where a primary source of PFOS/PFOA is from firefighting foams.

8. ANNOUNCEMENTS

- Nafisa Fai was sworn in as the District 1 director on Jan. 5, 2021, which created a vacancy on CWAC for the District 1 position. CWS is recruiting for that position and continues to recruit for the open agriculture position. The goal is to bring new CWAC members on in late March or April.
- The next meeting is scheduled for February 10, 2021.

QUESTIONS, COMMENTS

Can you talk briefly, Mark, about your new role as Chief of Staff?

Ms. Taniguchi-Dennis created two new positions – Chief Operating Officer and Chief of Staff – to start preparing for a generational change and developing a succession plan.

The Chief of Staff will provide a direct connection with the Board and oversee continuity of internal and external communications. Mr. Jockers' team continues to work in legislative affairs, public affairs and communication with our partners.

As COO, Mr. Cullen will work on aligning the operational and technical programs – Water Resource Recovery Operations & Services, Utility Operations & Services (Conveyance Engineering, Field Operations), Regulatory Affairs and Natural Systems Enhancement & Stewardship. The goal is to optimize how we're making operating and capital investments.

Ms. Taniguchi-Dennis is also creating a new position with the working title Chief of Utility Relations to work on development, economic development planning, and relationships with cities through intergovernmental agreements. The person in this new position will help advance conversations with the large cities that want more autonomy and provide continued support to the cities where we provide full retail services.

We're focusing on developing our staff for the long term.

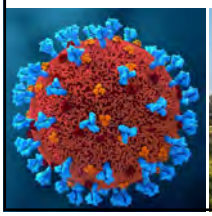
9. ADJOURNMENT

Mr. Weller adjourned the meeting at 7:28 p.m.

SEWER SURVEILLANCE OF COVID-19

Blythe Layton, Ph.D. & Scott Mansell, Ph.D., PE

CWAC
January 13, 2021

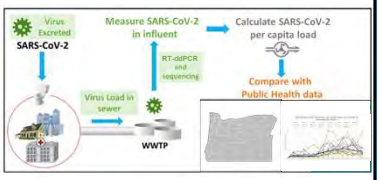


OUTLINE

- Background
- Methods
  - Biomolecular analysis
  - Sample collection
- Washington County results
- Next steps at CWS
- New lab preview!

WHY MEASURE SARS-COV-2 IN WASTEWATER?

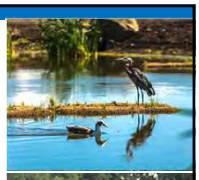
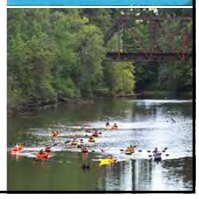
- "Wastewater-based epidemiology" (WBE)
- Assess entire community in a single sample
- Cost-effective
- Sensitive
- Early warning system?



Adapted from Ahmed et al. 2020, doi: 10.1016/j.scitotenv.2020.138764

GLOBAL EFFORT

- ~2,750 results in Google Scholar for "SARS-CoV-2 wastewater"
- Water quality, virology, wastewater; academia, public, private
- Uniquely focused research effort and collaboration
- CWS an early adopter and innovative applications

METHODS


Sample collection


Concentration

Homogenization

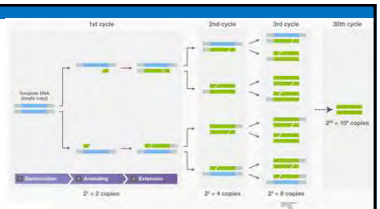
Automated RNA purification

Droplet digital RT-PCR
Report to authorities

Images (from left): Google Earth, https://www.dpaq.com/, https://www.sonicsupply.com/, https://www.omni-inc.com/, https://www.thermofisher.com/, https://www.bioradiations.com/

PCR ANALYSIS

- Widely used in forensics, diagnostics, research
- Robust and reliable method developed for SARS-CoV-2
- Using 3 targets
  - N1: Section of virus genome
  - N2: Section of virus genome
  - RP: Quality control
- Each sample analyzed in duplicate



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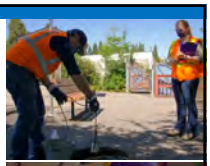
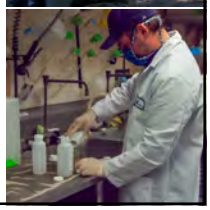
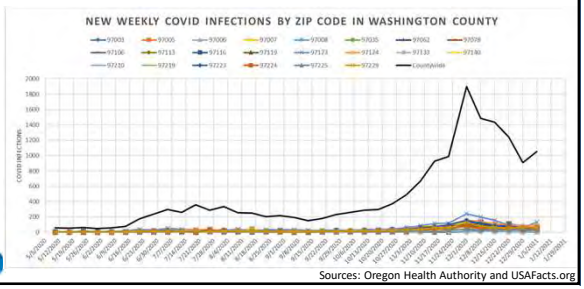
ONGOING COVID-19 MONITORING PROJECTS

- **Washington County sewershed surveillance**
- TRACE (Team-based Rapid Assessment of Community-level coronavirus Epidemics) partnerships
  - Newport, Bend, Hermiston/Boardman, Corvallis
- Lewis & Clark dorm surveillance
- OHSU study
  - 4 NE/SE Portland neighborhoods
  - 1 Beaverton neighborhood



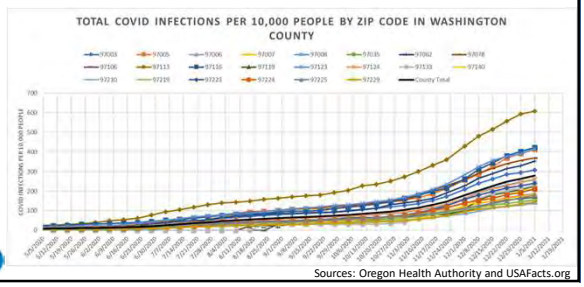


COVID-19 IN WASHINGTON COUNTY



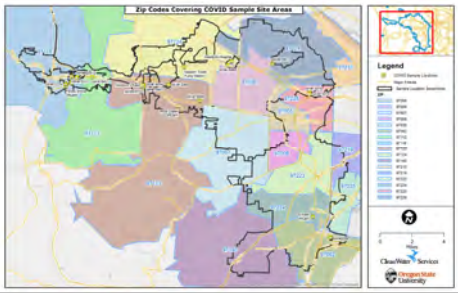
Sources: Oregon Health Authority and USAFacts.org

COVID-19 IN WASHINGTON COUNTY BY ZIP CODE



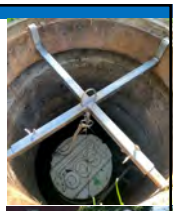
Sources: Oregon Health Authority and USAFacts.org

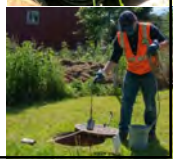
COVID-19 IN WASHINGTON COUNTY BY ZIP CODE



SAMPLE COLLECTION

- All 4 WWTPs
  - Mar-Oct: Weekly
  - Since Nov: 2x/week
  - 24-hr hourly composites
- Phase 1: 19 manholes
  - April-Sept: Weekly
  - Grabs then 24-hr hourly composites
- Phase 2: 10 manholes
  - Since Dec 2020
  - 24-hr 15-min Composites
- Experiments
  - Sample frequency
  - Hospital effluents and disinfectants
  - Solid/liquid virus concentrations



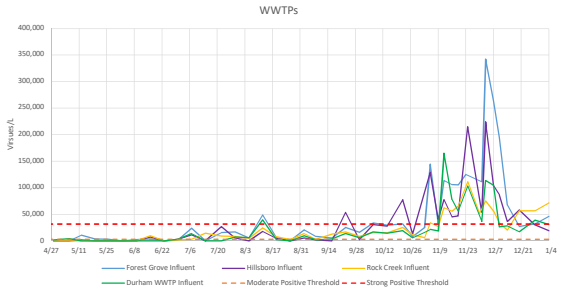


SITE SELECTION

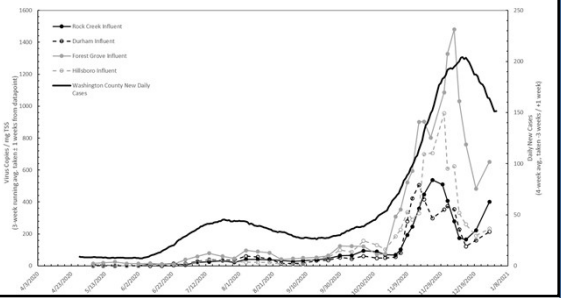
- Likely "hot spots" and entities with available infection data:
  - Hospitals and health centers
  - Industries
  - Retirement homes
  - Jails
  - Isolated when possible
- Known variables influencing community infections
  - Income demographics
  - Racial demographics
- Other potential influences
  - Schools
  - Community centers

RESULTS
TREATMENT PLANT EFFLUENTS

RESULTS – INFLUENT CONCENTRATIONS

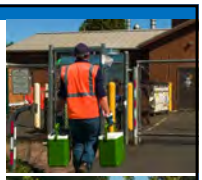


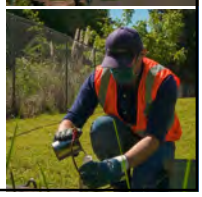
CWS INFLUENT DATA VS. REPORTED CASES



SUMMARY OF FINDINGS FROM WWTP SAMPLING

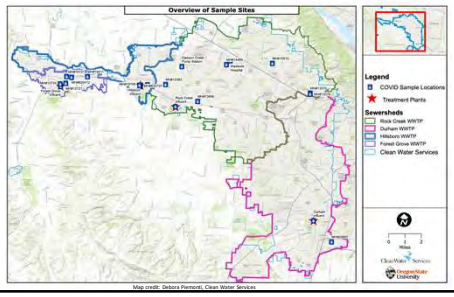
- Treatment plants tend to be quite similar, temporally
- Forest Grove/Hillsboro generally highest concentrations
- All treatment plants correlate well with infection cases, but not a clear leading indicator



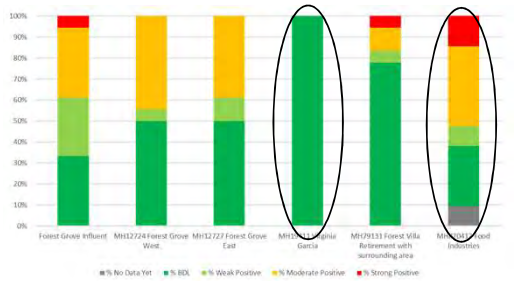


RESULTS
PHASE 1 SAMPLING

PHASE 1 SEWER SURVEILLANCE SITES

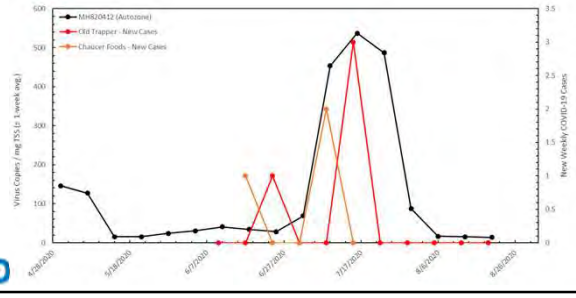


PERCENT POSITIVITY AT FOREST GROVE MANHOLES

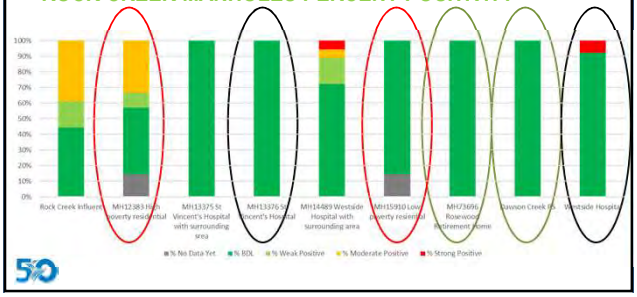


FOREST GROVE FOOD INDUSTRIES SAMPLE SITE

KNOWN OUTBREAK AT FOREST GROVE FOOD INDUSTRIES



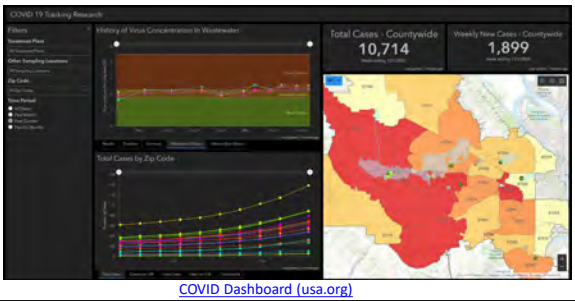
ROCK CREEK MANHOLES PERCENT POSITIVITY



SUMMARY OF FINDINGS FROM PHASE 1 SAMPLING

- Able to detect at least one outbreak
  - Food industry site high/frequent detections
- Hospitals tend to have non-detects when they shouldn't
- Tech industry areas lower detection rates than food industry areas
- Higher poverty areas may be associated with higher virus concentrations

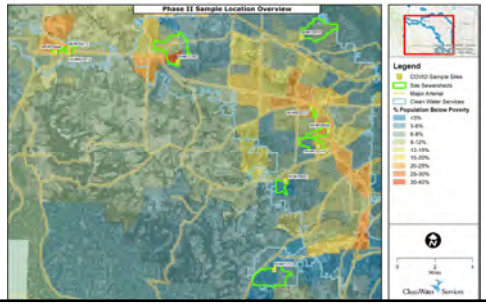
COVID-19 DASHBOARD



COVID Dashboard (usa.org)

ONGOING
PHASE 2 SAMPLING

PHASE 2 SEWER SURVEILLANCE SITES



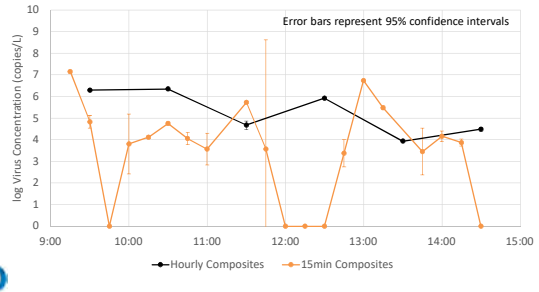
ONGOING EXPERIMENTS

SAMPLING FREQUENCY STUDY

- Dorm that included quarantined, infected students
  - Hourly, 24-hr composite
  - High-frequency 5-min sampling for 8 hours

https://college.lclark.edu/student_life/campus_living/residence_halls/hartzfeld/

SAMPLING FREQUENCY EXPERIMENT RESULTS



HOSPITAL EFFLUENT INHIBITION STUDIES

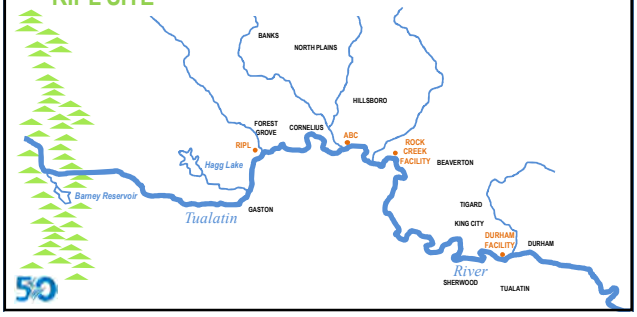
- Survey hospitals for products used
- Quaternary ammonium compounds
- Hospital effluent effect on nitrification
- Hospital effluent effect on detected virus concentration in known samples

DEVELOPMENT OF MOLECULAR BIOLOGY LAB AT CWS

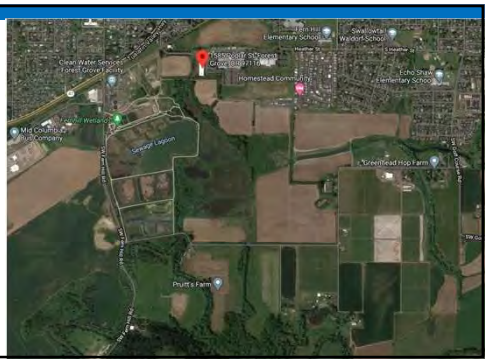
WHAT IS RIPL?

- Research
- Innovation
- Partners
- Labs
  - Water Quality labs
  - Research labs
  - Entrepreneurial labs
  - Teaching labs (?)

RIPL SITE



RIPL SITE

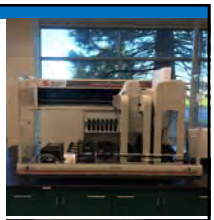


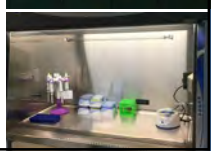
NEW MOLECULAR LAB

- Measurement of SARS-CoV-2 in influent & manholes
- Measurement of viruses in effluent (RC & DM)
- Quantification of key metabolic genes in BPR
- eDNA for watershed health

DNA/RNA EXTRACTION ROOM

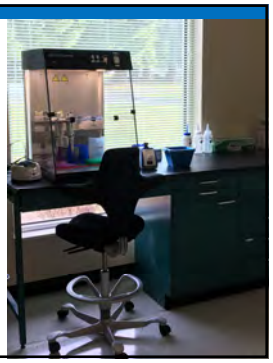
- DNA/RNA extraction, quantification, and storage
- Automated nucleic acid purification on the Biomek FxP liquid handler
- -80°C freezer (RNA storage)
- Biosafety cabinet with UV





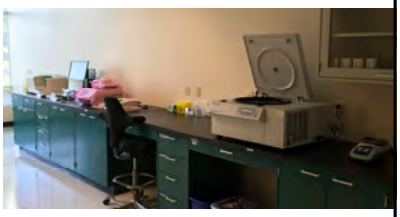
PCR PREP ROOM

- "PCR Clean" room – no samples or nucleic acids
- One task: PCR mastermix preparation
- UV cabinet workstation
- Ice machine



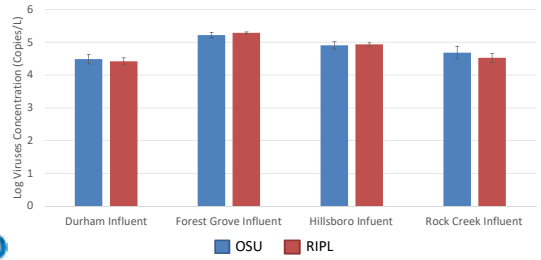
DDPCR ROOM

- Droplet digital PCR system: droplet generator, plate sealer, thermal cycler, droplet reader



INITIAL RIPL TEST

Analyzed four WWTP samples concurrently with OSU lab



CONCLUSIONS

- Wastewater monitoring gives an accurate picture of the viral burden in a community without having to test individuals
- High-resolution spatial and temporal sampling can pinpoint infection "hotspots" and outbreaks
- Tracking wastewater virus trends can inform public health response

THANK YOU!

Special thanks to CWS staff, the OSU team, and the CGRB:

Kestrel Bailey, Katie Carter, Jason Cook, Cindy Covey, Benjamin Dalziel, Jacob DeMartino, Andrea George, Anne-Marie Girard-Pohjanpelto, **Devrim Kaya**, **Christine Kelly**, Debora Piemonti, Steve Thompson, Brett Tyler, **Tyler Radniecki**, **Ken Williamson**

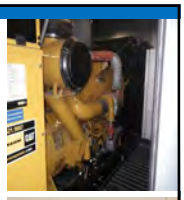
CLEAN WATER SERVICES ENERGY MANAGEMENT UPDATE

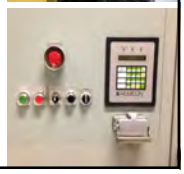
January 13, 2021

CWAC Meeting
Nate Cullen
Managing Director, Water Resource Recovery Operations and Services

ENERGY PROGRAM MISSION

To further our commitment to environmental stewardship and to continuously improve our performance and control operating costs, we will improve energy management within our organization.

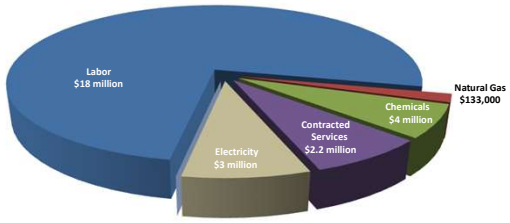




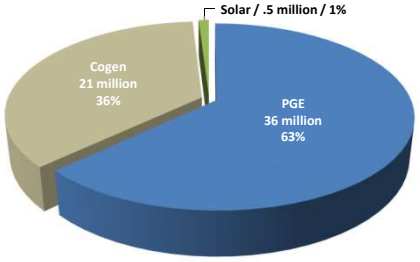
ENERGY MANAGEMENT COMPONENTS

- Capital improvements that reduce energy use
- Operational changes that reduce energy use
- Onsite energy generation

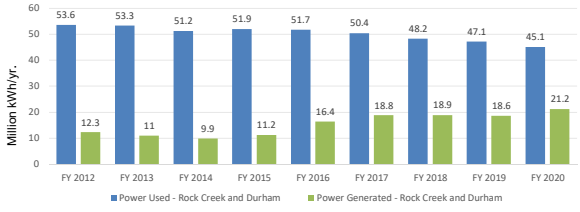
ENERGY IS A MAJOR WRRD OPERATING COST



ANNUAL WRRD POWER USAGE (kWh)



POWER USED VS. POWER GENERATED



2012-2020 Washington County Population Growth: 11.3%

50 Million kWh = 5000 homes

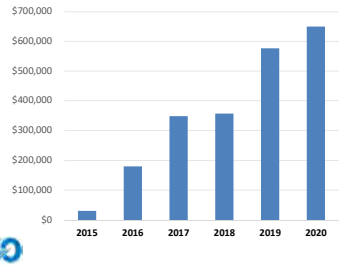
ROCK CREEK COGENERATION SYSTEM

- Consists of two 500 kW engines that operate on digester gas
- Meets 32% of plant electricity needs
- Provides heat to digesters, struvite recovery facility and buildings

DURHAM COGENERATION SYSTEM

- Consists of two 848 kW cogeneration engines that operate on digester gas
- Uses fats, oils and grease (FOG) to double energy production
- Meets 60% of plant electricity needs
- Provides heat to digesters, buildings and tunnels
- Over $5 million in incentive funding for construction

FOG REVENUE



SOLAR PROJECTS

- Rock Creek WWTP: 65 kW (2012)
- Main Office: 9 kW (2012)
- Durham WWTP: 400 kW (2013)

ENERGY EFFICIENCY SINCE 2011

Capital Projects:

- Number of projects: 84
- Energy savings: 11.9 million kWh/year
- Grant funding received: $2.4 million
  (does not include grants for energy generation)

Operational Changes:

- Number of projects: 96
- Energy savings: 2.5 million kWh/year
- Grant funding received: $76,000

ENERGY EFFICIENCY – OPERATIONAL CHANGES

- Industrial Energy Improvement Program (IEI) (2012)
- Process, Innovation and Efficiency Team (PIE) (2013)
- Strategic Energy Management Program (SEM) (2016)
- Green Energy Teams at Rock Creek and Durham (2017)

ENERGY MANAGEMENT AWARDS

- Utility of the Future (2016, 2018)
- Intelligent Water System (2018)
- Leading Utility of the World (2019)

ENERGY STRATEGY: 2020 - 2025

- Continue Green Team efforts to achieve operational energy savings
- Continue to partner with the Energy Trust of Oregon on capital project energy savings opportunities
- Explore renewable natural gas (RNG) project opportunities
- Conduct a feasibility study of solar project opportunities

RENEWABLE NATURAL GAS OPPORTUNITY

- RFI issued for possible public-private partnership
- Will inform Board of results and recommended procurement strategy in February

QUESTIONS?