

## WaterSense® Point-of-Use Reverse Osmosis (RO) Systems Draft Specification Public Meeting Summary

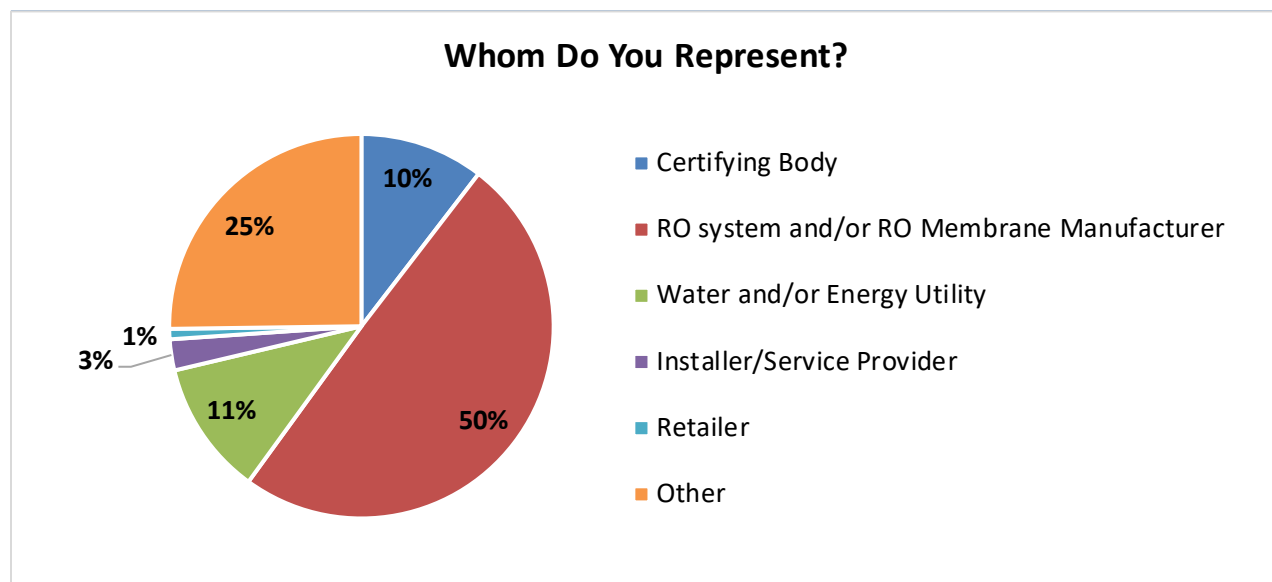
January 12, 2023, 2:00 to 4:00 p.m. Eastern, Webinar

### Meeting Summary

Stephanie Tanner, the U.S. Environmental Protection Agency (EPA) WaterSense program's Lead Engineer, welcomed everyone to the meeting, clarified how to use the webinar software, and reviewed the meeting agenda and purpose. She introduced fellow presenters Emma Hughes and Robert Pickering of Eastern Research Group, Inc. (ERG), who provide technical contract support to WaterSense.

The purpose of the webinar was to introduce a new group of stakeholders to the WaterSense program and review the *WaterSense Draft Specification for Point-of-Use Reverse Osmosis (RO) Systems*. The presentation slides can be reviewed on the WaterSense website at [www.epa.gov/watersense/point-use-reverse-osmosis-systems](http://www.epa.gov/watersense/point-use-reverse-osmosis-systems).

After reviewing the meeting agenda, Ms. Tanner polled attendees on what types of organizations they represent. The results are shown in Figure 1. A full list of the attendees and a list of presenters are provided in Appendix A.



**Figure 1. Poll Question**

The presentation discussion and participant questions and comments are summarized below.

### 1. Introduction to WaterSense

Ms. Tanner provided an overview of WaterSense, a voluntary program that labels water-efficient, high-performing products, including the program's history and the typical WaterSense

specification development process. WaterSense interacts with industry professionals and other stakeholders, such as standards committees and utilities, during this process. She noted the criteria the program uses for product evaluation and labeling and the benefits of becoming a WaterSense partner. Through sales of WaterSense labeled products, the program has helped save more than 6.4 trillion gallons of water since it was started in 2006 through 2021.

### *Participant Questions*

Chris Wilker (Canature WaterGroup) asked if a cost estimate has been developed to get a point-of-use RO system certified to the WaterSense specification. Ms. Tanner responded that EPA will not develop a cost estimate. To the extent possible, EPA tries to keep the WaterSense specification requirements aligned with existing requirements in voluntary consensus-based standards because many products will already be tested and certified to the standards. This makes it easier for manufacturers to use existing testing data and certification information to get the label. EPA doesn't get involved in determining how much a certifying body charges for conducting the tests or maintaining the certification listing. There are multiple certifying bodies. Therefore, the process of certification is an open, competitive market. At this point, EPA is aware of multiple certifying bodies that certify RO systems: NSF International (NSF), International Association of Plumbing & Mechanical Officials (IAPMO), and Water Quality Association (WQA). [Note: As a result of feedback received during the webinar, CSA Group and ICC Evaluation Services (ICC-ES) were also identified as certifying bodies currently accredited to test RO systems to applicable standards]. EPA expects all of these certifying bodies to continue to provide certification moving forward. There may also be others.

Eric Yeggy (WQA) asked if EPA could share more detail on which states incentivize the sale of WaterSense products and how they do it. Ms. Tanner referred to the [rebate finder](#) on WaterSense's website.

## **2. RO Systems Background**

Emma Hughes (ERG) described how RO systems work and provided an overview of the types of RO systems on the market. She explained that RO systems generate a significant amount of water waste during operation, with the average system sending about five gallons of water down the drain for every gallon of treated water it produces. She also summarized the existing industry standards pertaining to RO systems, including NSF International (NSF)/American National Standard Institute (ANSI) 58 *Reverse Osmosis Drinking Water Treatment Systems* and ASSE International (ASSE) 1086 *Performance Requirements for Reverse Osmosis Water Efficiency—Drinking Water*.

### *Participant Questions*

Kate Schmidt (Orange County Planning [California]) asked if the concentrate needs to go down the drain or if it can be used in grey water systems. Ms. Hughes responded that it can be used in grey water systems in unique cases where consumers retrofit their RO systems or capture concentrate for reuse elsewhere in the home. However, it is very uncommon and normally a post-purchase modification. There are also some systems that recirculate concentrate and send it back through the RO system to reduce water waste.

Kate Schmidt asked if someone in California was working on saving this grey water. Mr. Pickering responded that there are some municipalities, generally in western U.S., that have robust water recycling programs. However, WaterSense generally encourages water efficiency at the point of use rather than ensuring that the wastewater is captured and re-used.

Peter Cartwright (Cartwright Consulting Co.) asked why the RO system diagram depicts a permeate pump and two pre-carbon filters. Ms. Hughes responded that the permeate pump is an accessory component that is not included in all systems but can be bought separately and added to a system. The permeate pump helps improve system efficiency. The pre-filters can vary among systems. Some have multiple carbon filters, some have just one. This was just a typical example.

Bill Kavey (Clack Corporation) asked why the carbon filters come before the pre-sediment filter in the diagram. Mr. Pickering explained that the diagram is just meant to show the general stages of the RO system and the placement and order of the pre-filters isn't relevant to the draft specification or the focus of the webinar.

Russel Patterson (Canature WaterGroup) asked if qualifying RO systems will have a consumer rebate program. Mr. Pickering explained that EPA does not offer rebates. Rebates are generally offered by water and energy utilities or municipalities based on their own regional necessity. Therefore, EPA cannot guarantee whether rebates will be offered for labeled RO systems.

Kate Schmidt asked if RO systems work on all incoming water sources, like untreated groundwater. Ms. Hughes responded that yes, RO systems can be used to treat groundwater from a home well.

### **3. RO Systems Draft Specification: Scope and General Requirements**

Ms. Hughes reviewed the definitions EPA prescribed for "RO system," "point-of-use RO system," "point-of-entry RO system," "shut-off device," and "waste-to-product ratio" in the draft specification. She summarized which systems are included and excluded from the scope of the specification.

Ms. Hughes listed the two general requirements of the specification, which state that all labeled systems must (1) conform to the applicable requirements in NSF/ ANSI 58, and (2) be equipped with a shut-off device.

#### *Participant Questions*

One attendee asked if RO systems account for water age when water is stored in the holding tanks. Ms. Hughes responded that in cases where water in the storage tank sits long enough that the water age poses a health hazard, the user would probably be encouraged to empty the tank themselves and re-run the system. EPA is not aware of any systems that automatically cycle water out of the storage tank to account for water age.

Tina Donda (IAPMO) asked if the requirement is to just comply with NSF/ANSI 58 or to be certified to NSF/ANSI 58. Ms. Tanner responded that generally WaterSense requires certification to a base standard. That way most of the WaterSense criteria can be determined

through the testing for the certification. Mr. Pickering said that NSF/ANSI 58 certification is also typically required for a lot of the plumbing codes in the U.S., so most U.S.-based systems will have already received NSF/ANSI 58 the certification.

Steve Williams (Pluvial Solutions) asked why WaterSense is looking at RO systems now as they have been around for decades. Ms. Hughes explained that initially, WaterSense focused on creating specifications for plumbing products that are generally found in all homes, such as faucets, toilets, and showerheads. RO systems aren't necessarily going to be found in every household, and WaterSense didn't want to give the impression that they were promoting the purchase and installation of a water-using device. However, WaterSense recognizes that consumers who have water quality concerns might be set on purchasing an RO system and in these cases, EPA wants to give those buyers the option to opt for more water-efficient RO systems. Mr. Pickering added that in recent years, there has been some advancement in the RO industry to encourage greater water efficiency and WaterSense historically considers itself a market transformation program so the hope is by labeling these systems, they can encourage the market to move towards water efficiency.

Christopher Plantz (Elkay) asked if a product that uses an RO membrane but is not an RO system can be WaterSense certified (e.g., a public water fountain that uses an RO membrane). Mr. Pickering clarified that the WaterSense specification is meant as a point-of-purchase label, so if you were to just replace the RO membrane within a water fountain, WaterSense would not label that membrane. However, if you were to install a new water fountain that uses RO, that could be WaterSense labeled.

#### **4. RO Systems Draft Specification: Water Efficiency**

Ms. Hughes provided the definitions of recovery rating and efficiency rating and clarified the difference between the two terms. She presented the water efficiency criteria for existing industry standards, then explained the water efficiency criteria in the WaterSense draft specification. The specification calls for the recovery rating and efficiency rating (as applicable) to be tested in accordance with NSF/ANSI 58 and be a minimum of 30 percent. A 30 percent recovery or efficiency rating means that the system will send 2.3 gallons of water down the drain for every gallon of treated water it produces.

Ms. Hughes provided a brief overview of the potential water savings that could be achieved with these criteria. A WaterSense labeled system could reduce water use by approximately 3,180 gallons per household per year.

Ms. Hughes also addressed the difference between the ASSE 1086 criteria, which calls for a 40 percent recovery or efficiency rating, and the draft specification, which calls for a 30 percent recovery or efficiency rating. The Notice of Intent (NOI) initially proposed a 40 percent minimum for the specification; however, in response to comments received on the NOI, EPA decided to lower the efficiency rating criteria to balance improved efficiency with the ability of these systems to still treat for targeted contaminants. Ms. Hughes then summarized the work of an NSF Task Group that is considering revising the recovery rating procedures to account for an automatic flush feature in many tankless systems and potentially removing the term "recovery rating" altogether.

### *Participant Questions*

Tina Donda, Sean Caughron (Chester Paul Company), John Bantum (Kinetico, Inc.), and Ramon Epstein (Kinetico, Inc.) contributed to a question/discussion related to NSF/ANSI 58 and ASSE 1086 certification requirements. Mr. Pickering clarified that NSF/ANSI 58 is the base standard for RO systems; it has the technical requirements for determining recovery rating and efficiency rating as well as contaminant reduction claims. ASSE 1086 builds upon NSF/ANSI 58. It requires conformance with NSF/ANSI 58 but it also requires a 40 percent efficiency rating and prescribes a membrane life test. WaterSense is only requiring that labeled systems be certified to NSF/ANSI 58, not ASSE 1086. However, labeled systems must be tested according to the ASSE 1086 membrane life test.

Steve Williams asked why a storage tank is needed. Ms. Hughes responded that storage tanks are not a necessary component of RO systems. However, they're found in a lot of systems because they add convenience. The RO treatment process works slowly, so it would take the user a long time to fill their glass, pot, or water bottle if they had to wait for the system to treat the water in real time. The storage tank allows the user to draw already treated water from the tank to fill their vessel faster. Ms. Tanner clarified that the presence of a storage tank is not a WaterSense requirement. Systems without storage tanks can also receive the WaterSense label.

Kyle Thompson (Plumbing Manufacturers International [PMI]) asked if WaterSense is concerned about applying a water efficiency label to a system that sends about 2.3 gallons of water down the drain for every gallon of treated water it produces. He suggested that this may give consumers the wrong idea about water efficiency. Ms. Hughes clarified that, while there are some water treatment systems, such as filters, that don't waste any water, WaterSense recognizes that RO systems are growing in popularity and many consumers feel more assurance that their water has been adequately treated if they have an RO system. WaterSense hopes that the label can capture an audience of consumers who already intend to purchase an RO system and would have purchased a system that sent closer to 5 gallons of water down the drain rather than 2.3.

Rebecca Tallon (A.O. Smith Corporation) asked, if ASSE 1086 requires a 40 percent efficiency, how can ASSE 1086 be a requirement for a WaterSense standard that only requires a 30 percent efficiency. Mr. Pickering clarified that WaterSense is not proposing requiring certification to ASSE 1086 for this reason. The specification merely requires the system to be tested according to the membrane life test procedures prescribed by ASSE 1086. This was discussed in further detail later in the meeting.

Adrian Cavlan (Quality Water of Aptos) asked if a standard pressure will be established to ensure all systems are tested under the same conditions. Mr. Pickering responded yes, the test methods for establishing the efficiency rating and recovery rating of RO systems are included within NSF/ANSI 58.

Steve Williams asked where the 40 percent came from. Ms. Hughes clarified that the 40 percent efficiency rating is a requirement in ASSE 1086. However, it is not a requirement in the WaterSense specification. The draft specification requires all systems to have a minimum 30 percent recovery or efficiency rating, as applicable.

Sean Caughron said he does not think manufacturers can ask for a modified version of testing during an NSF/ANSI 58 standard test. They will need to do both NSF/ANSI 58 and ASSE 1086 or just ASSE 1086. Mr. Pickering clarified that WaterSense is not requesting any modifications to NSF/ANSI 58 tests. The specification requires systems to be certified to NSF/ANSI 58 as it is written, and they will need to be tested according to the ASSE 1086 membrane life test.

Hayley Tompkins (City of Guelph [Ontario]) asked which contaminants an RO system might be better at removing compared to a filter. Ms. Hughes mentioned that RO systems are commonly used by consumers and small treatment water systems to remove nitrates and arsenic. RO systems have also been shown to be effective at removing Per- and Polyfluorinated Substances (PFAS).

Kent Sovocool (Southern Nevada Water Authority) asked if the storage tank purges after some period of time if the water is not consumed. Assuming yes, has the volume or frequency of purge been considered? Ms. Hughes responded that RO systems generally do not have an automated purge system. If a system has an automatic purge system or the user needs to empty the tank for any reason, EPA has not taken this into account in prescribing efficiency criteria. The WaterSense specification focuses on the amount of water wasted during the treatment process, not on how much of the permeate is used after it has been produced. Mr. Pickering mentioned that some systems have an automatic flushing feature that occurs prior to treatment and the NSF task group mentioned earlier in the presentation is looking into revising the NSF/ANSI 58 efficiency rating and recovery rating procedures to account for this flushing feature.

Emily Xu (Zhongshan FilterPro Environmental Protection Technology, LLC) asked why the efficiency criteria was set at 30 percent. Ms. Hughes responded that EPA initially proposed a 40 percent threshold in the NOI to align with the ASSE 1086 standard. However, comments from the NOI and data from certification bodies suggested that the 40 percent efficiency rating would be difficult for many systems to meet and would significantly compromise membrane life and in some cases contaminant removal rates. Therefore, EPA lowered the criteria to 30 percent as it is a more achievable threshold that is still high enough to drive the market towards greater efficiency.

Carla Long (Watts Regulator Co.) asked how efficiency is calculated on a tankless RO system. Mr. Pickering responded that NSF/ANSI 58 establishes the test method for both tankless and tanked RO systems. The procedures are slightly different for the different types of systems.

Sean Caughron commented that the NSF/ANSI 58 standard has a 7-day test and the ASSE 1086 standard has a 20-day test and the water quality is different. He said the certification requirements need to be clarified better. Ms. Tanner responded that this would be a good written requirement and suggested that this issue be explained in detail in a written comment for EPA to consider.

## **5. RO Systems Draft Specification: Performance Criteria**

Ms. Hughes presented performance criteria of the draft specification. The first criterium pertains to membrane life. In response to the NOI, manufacturers expressed concern that higher efficiency systems cause the RO membrane to foul more quickly and therefore require more

frequent replacement. To ensure membrane lifespan, WaterSense is adopting the ASSE 1086 membrane life test (with modified efficiency requirements). The second performance criterium pertains to contaminant reduction. It requires manufacturers to verify any reduction claims through testing according to the procedures in NSF/ANSI 58.

## 6. RO Systems Draft Specification: Packaging and Documentation

Ms. Hughes presented the packaging and documentation requirements included in the draft specification. She explained that all labeled systems must conform to applicable instruction and information requirements in NSF/ANSI 58 and clearly state the water efficiency of the system as both a percentage and a ratio. She introduced the five priority drinking water contaminants that the EPA Office of Ground Water and Drinking Water recommended as most important to consumers looking to purchase an RO system. Ms. Hughes walked through the water efficiency and performance label, which requires the removal rates for the five priority contaminants to be displayed on product packaging and point of purchase documentation.

The specification further requires that if a system needs specific components or companion products (e.g., a permeate pump) to meet the specification criteria, those components and/or companion products must be packaged and sold along with the system. Additionally, the instruction manual must provide information about the replacement parts and their recommended replacement frequencies. Finally, instructions shall not direct the user to make any changes that could override the system's efficiency.

### *Participant Questions*

Hemang Patel (The 3M Company) said the added language requirements in the WaterSense RO label stating that "this system sends XX gallons down the drain" dampens the message and may project the opposite sentiment. Ms. Hughes responded that in researching the RO system market for the development of the draft specification, EPA noticed that many products have a significantly higher advertised water efficiency than their actual water efficiency. Many RO systems are advertised to have a 1:1 "pure-to-waste" ratio or a 50 percent recovery rating, when in fact they have much a lower efficiency rating and send much more water down the drain than advertised. EPA hopes that this specification, in addition to any changes resulting from the NSF task group, will help drive the industry towards more transparent and accurate advertising of water efficiency. Additionally, EPA hopes that consumers will recognize the WaterSense label as a trustworthy indicator of water efficiency and understand that labeled RO systems represent water efficient options within the market. Ms. Tanner added that making this performance and efficiency label consistent across all labeled products will help consumers easily compare systems when they are deciding which system to purchase.

Andrew Marschner (Pentair) asked if WaterSense will require a system to make a performance claim beyond TDS reduction. Ms. Hughes responded no; the TDS reduction is the only required performance claim that all labeled systems must meet. Beyond that, the only requirement pertaining to contaminant reduction is that manufacturers must verify any additional performance claims through NSF/ANSI 58 testing.

Chris McDonald (Fortune Brands Water Innovations) asked if EPA will specify a minimum size or text for the water efficiency and performance label. Mr. Pickering said that this is a good

question and recommended that it be submitted as a written comment. He said that right now, there are no minimum size or text requirements. Within the [WaterSense Program Mark Guidelines](#), there are requirements pertaining to the size and readability of the WaterSense label, but not additional labels such as this one. RO systems tend to be large, so EPA is hoping that translates to more space on product packaging and in product documentation to include this information. EPA welcomes any comments related to standardized language or sizing for the water efficiency and performance label.

Tina Donda said NSF/ANSI 58 does not have percent reduction requirements for contaminants. She suggested specifying the maximum allowable concentration instead. Ms. Hughes responded that EPA calculated the percent reduction requirements based on the required influent and effluent concentrations specified in NSF/ANSI 58. Ms. Donda later commented that the influent concentration is a range, not exact. Mr. Pickering responded that this is helpful and suggested it be submitted as a written comment.

Maribel Campos (ICC-ES) commented that EPA should state the product must comply with NSF/ANSI 58 as well as the other requirements in the WaterSense specification. This way, products that have already been certified to NSF/ANSI 58 do not need to be tested again. If the manufacturer does not have an existing certification, then the product would need to be tested for compliance with NSF/ANSI 58. Mr. Pickering clarified that products that already have an NSF/ANSI 58 certification do not need to be tested again to meet the WaterSense criteria. Any product that already holds an NSF/ANSI 58 certification has achieved the general WaterSense requirement that all products conform to NSF/ANSI 58.

Mark Shell (DSI a Headwater Company) asked if any RO systems are currently meeting the NSF/ANSI 58 PFOA/PFOS requirements? Ms. Tanner and Mr. Pickering confirmed that they have seen some products on various certification listings that advertise PFOS/PFOA reduction.

Emily Xu asked if WaterSense will consider the water wasted during the flush time when the system is first installed. Mr. Pickering responded that WaterSense will not be considering this.

Rebecca Tallon asked if packaging and labeling requirements are only required for retail and consumer-facing products, or for online products as well. Ms. Hughes responded yes, the information must be made available to anyone interested in purchasing a WaterSense labeled product, inclusive of products sold online. Mr. Pickering clarified that this information can be displayed on a specification sheet or on the product webpage, or anywhere it can be easily accessible to potential purchasers.

Justin Mest (Master Water Conditioning) commented that EPA may want to consider allowing a truncated version of the performance label on external packaging and only requiring the full details in the product support documentation.

Tina Donda commented that the NSF standards committee is considering replacing much of the information on product literature to be accessible online instead of on the product. Ms. Donda asked if these label items will be required to be on the physical product or if they can be accessible via a QR code, as is being discussed in the joint committee. Mr. Pickering responded that EPA intends for the label to be required on the physical packaging in cases where the product is sold at retail.



Hemang Patel asked how often a WaterSense labeled product would need to be recertified to maintain compliance with the specification. Mr. Pickering responded that WaterSense has a continuous compliance process that requires each certifying body to re-test 15 percent of its list of certified products for each product category each year. There are some criteria that influence how the 15 percent is selected each year. For example, a product that has been tested or certified within the past 2 years cannot be selected for re-certification. Additionally, products within a product family that has been tested or certified within the past 2 years are also not eligible for re-certification.

Kyle Postmus (NSF) commented that Section 8 of NSF/ANSI 58 defines how to calculate and report a percent reduction.

One attendee asked if there are plans to include WaterSense labeled RO systems within the U.S. Green Building Council's (USGBC) LEED rating system for buildings. Mr. Pickering responded that WaterSense does not operate the LEED or USGBC program. USGBC is an independent organization that maintains the green building rating system. Historically, they have required that all new construction buildings include WaterSense labeled plumbing products. Therefore, it's possible that would be a development established down the road, but EPA is not involved in that decision-making.

Mark Unger (The LeverEdge) asked how WaterSense addresses contaminant claims that come from NSF/ANSI 53 *Drinking Water Treatment Units - Health Effects*. For example, many certified RO systems have PFOA/PFOS or lead reduction claims from certified post-filters. Mr. Pickering responded that EPA allows systems to be tested according to the treatment train requirements specified in NSF/ANSI 58, which accounts for systems that combine a variety of different treatment technologies (e.g., RO, filtration, ultraviolet disinfection). Mr. Pickering said EPA will likely need to discuss this with certifying bodies to understand how the treatment train procedures are being applied and how they might affect conformance with the specification.

Tim Bealle (Topper Manufacturing) asked what the difference is between a water-on-water (WOW) system and a permeate pump. Ms. Hughes responded that a WOW system is an entire system that uses a more efficient tank and design to improve water efficiency whereas a permeate pump is a single component that can be added to an existing system to improve water efficiency.

Josh Wales (Delta Faucet Company) commented that Mr. Pickering might have misrepresented how the treatment train works in the NSF/ANSI 58 standard and suggested making this a key clarification. Ms. Tanner asked attendees to please submit comments on this topic if they have any.

## 7. WaterSense Product Certification

Ms. Tanner provided an overview of the WaterSense product certification process and mentioned the [WaterSense Product Certification System](#) guidance document. She explained that any manufacturers that wish to have their products certified must become WaterSense partners. Ms. Tanner provided an overview of the requirements for becoming a manufacturer partner.

Ms. Tanner then discussed the requirements for licensed certifying bodies to be accredited for testing and verifying WaterSense labeled systems. She explained that all certified systems will be posted to the product listing on the WaterSense website based on information that manufacturers provide via the Product Notification Template (PNT). The draft PNT is listed on the WaterSense RO systems webpage and available for public comment.

## **8. Next Steps**

Ms. Tanner informed attendees that they can view the draft specification, the supporting statement, and the draft product notification template on the WaterSense website for RO systems ([www.epa.gov/watersense/point-use-reverse-osmosis-systems](http://www.epa.gov/watersense/point-use-reverse-osmosis-systems)). She requested that those attending the webinar submit their comments to [watersense-products@erg.com](mailto:watersense-products@erg.com) by February 3, 2023. EPA will review comments and data submissions to determine next steps for developing a draft specification. EPA is targeting a final specification for later in 2023.

### *Participant Questions*

Steve Williams asked how pumps make RO systems more efficient. Ms. Hughes responded that systems with a built-in electric pump tend to operate more efficiently because there is greater pressure forcing the water through the RO membrane. The permeate pump helps to reduce back pressure from the storage tank, thereby increasing system efficiency.

Ramon Epstein asked when the final specification will be in effect. Mr. Pickering responded that because WaterSense is a voluntary program, it will be in effect immediately following its release. On the day the specification is released, manufacturers can start reaching out to certifying bodies to get their systems certified. Ms. Tanner clarified that this doesn't mean the specification will be included in codes and standards right away. That tends to lag after the release of the specification and is out of EPA's control.

Ms. Tanner made one last request that anybody with comments please write them up and submit them to [watersense-products@erg.com](mailto:watersense-products@erg.com).

With no additional questions submitted, Ms. Tanner thanked the attendees for their time and adjourned the meeting.

## Appendix A: Meeting Participants

<b>Attendee</b>	<b>Organization</b>
Todd Alexander	Kraus USA
Mdgouhs Ali	City of Buckeye Water Resources Department (Arizona)
Doug Anderson	Culligan International
John Bantum	Kinetico, Inc.
Timothy Beall	Topper Manufacturing
Margaret Bicking	EcoWater Systems
Rachel Bishop	Kinetico, Inc.
Veronica Blette	EPA
Frank A. Brigano	Brigano Consulting, LLC
Mark Brotman	Kinetico, Inc.
Tom Bruursema	Water Quality Association (WQA)
Geri Buhl	Brondell
Charles Bulger	Pentair
Debra Burden	Citrus County Utilities (Florida)
Steve Cadorette	Falmouth Department of Public Works (Massachusetts)
Dawn Calciano	City of Davis, California
Maribel Campos	ICC Evaluation Service
Adam Carpenter	American Water Works Association (AWWA)
Peter Cartwright	Cartwright Consulting Co.
George Cary	Quench USA
Sean Caughron	Chester Paul Company
Adrian Cavlan	Quality Water of Aptos
Alejandro Cepeda	Texas Gas Service
Gregory Chernov	GE Appliances
Andi Couet-Pascoe	City of Tempe (Arizona)
Julia Cronin	WQA
Bibha Dahal	Culligan International
Helen Davis	Energy Solutions
Shirley Dewi	IAPMO R&T
Tina Donda	IAPMO
Michael Dragoo	Clack
Julius Duncan	MAD Scientist Associates, LLC
Jaydeep Durve	KX Technologies, LLC
Ramon Epstein	Kinetico, Inc.
Mark Fasel	ICC
Kathryn Fisher	A. O. Smith

<b>Attendee</b>	<b>Organization</b>
Danielle Gallo	Pentair
Sandy Games	NSF International
Dr. Sheeba Ganesan	The University of Trans-disciplinary Health Sciences and Technology
Jeffrey Gerbick	Delta Faucet Company
Tom Gessner	Ecowater
Mark Gibeault	Kohler Co.
Justine Gilholm	Excalibur Water Systems
Evie Gill	Culligan International
Zachary Gleason	WQA
Rosa Gonzalez	Culligan International
Chris Harris	Culligan International
Brook Hatton	CSA Group
Monica Hernandez	City of Turlock (California)
Ileana Hernandez	City of Tampa (Florida)
Ali Hibbard	Connecticut Department of Energy and Environmental Protection
Sabrina Hookstead	Pentair
John Horns	The 3M Company
Richard Hughes	Navien, Inc.
John Imming	Watts Water Quality
Brian Inami	Brondell, Inc.
Lori Jansen	Minnesota Water Quality Association
Jeff Johnson	Washington Department of Health Office of Drinking Water
Keith Johnson	EcoWater Systems
Bill Kavey	Clack Corporation
John Kij	American Water
Ed Kowalski	The 3M Company
Shayna Kriss	The LeverEdge
Scott Kuykendall	McHenry County Water Resources (Illinois)
Amy Kwon	Navien, Inc.
Yilun L.	APEC Water Systems
Betty Lee	Brondell
Cathy Lee	APEC Water Systems
Ernie Lee	Navien, Inc.
Rob LeForte	First Lake Solutions
Cang Li	Kinetico, Inc.
Jason Liu	APEC water
Carla Long	Watts Regulator Co.

<b>Attendee</b>	<b>Organization</b>
Demetrius Lytle	Kinetico, Inc.
Anna Mack	City of Bozeman (Montana)
Robert Maisner	Paragon Water Systems, Inc.
Rebecca Maric	Kraus USA
Andrew Marschner	Pentair
Chris McDonald	Fortune Brands Water Innovations
Cary McElhinney	EPA Region 5
Charlene McHendry	City of Lacey (Washington)
Cambria McLeod	Kohler Co.
Emily Melhorn	City of Flagstaff Water Services (Arizona)
Qiaoli Meng	ICC Evaluation Service
Justin Mest	Master Water Conditioning
Bryan Miller	Elkay Manufacturing
Claire Miziolek	Energy Solutions
Joseph Montemurno	Orlando Utilities Commission (Florida)
Shannon Murphy	Consultant
Patty Musil	Culligan International
Sarah Neufcourt	Navien, Inc.
Oluwaseun Ogungbenle	City of Rio Rancho Utilities Department (New Mexico)
Stefan Orenda	Mandalay Homes
Tom Palkon	IAPMO
Cathie Pare	City of Santa Barbara (California)
Hemang Patel	The 3M Company
Arvind Patil	Protect Plus /Ricura Technologies
Russell Patterson	Canature WaterGroup
Shelley Peters	Canadian Water Quality Association
Kenneth Peterson	A.O. Smith
Christopher Plantz	Elkay
Bryanna Poczatek	WQA
Ada Poon	Delta Faucet Company
Kyle Postmus	NSF International
Monica Preston	Watts Water
Ryan Prince	Paragon Water Systems, Inc.
Chris Putka	Kinetico, Inc.
Michelle R.	Pentair
Lisa Reiheld	ICC
Justin Richter	Charger Water Treatment
Mark Sachs	Crystal IS (Ashai Kasei America, Inc.)

<b>Attendee</b>	<b>Organization</b>
Harkirat Sahni	Paragon Water Systems, Inc.
Jon Sandomirsky	Canature WaterGroup
Kate Schmidt	Orange County Planning (California)
Tedd Schneidewend	Culligan International
Tim Sewell	Culligan International
Mark Shell	DSI a Headwater Company
Breanna Smith	Great Lakes International
Kent Sovocool	Southern Nevada Water Authority
Ryan Sowa	Great Lakes International
Adam Strube	Fulton Homes
Zoie Sutherland	First Lake Solutions
Jerry Szpotek	The 3M Company
Vikas T.	Envirogard Products Limited
Rebecca Tallon	A.O. Smith
Juan Tejada	City of Turlock (California)
Kyle Thompson	Plumbing Manufacturers International (PMI)
Patrick Tinker	Kohler Co.
Hayley Tompkins	City of Guelph (Ontario)
Mark Unger	The LeverEdge
Walter Vance	Kinetico, Inc.
Daniela Vargas	WQA
Alexandra Wahlstrom	Acton Water District (Massachusetts)
Josh Wales	Delta Faucet Company
Deonna Warren	Paragon Water Systems, Inc.
John Watson	IAPMO
Kyle Whalen	WQA
Chris Wilker	Canature WaterGroup
Steve Williams	Pluvial Solutions
Abby Williams	Kearns Improvement District
Jeff Wilson	Culligan Ultrapure
Christopher Wochos	WQA
Jodie Wollnik	Kane County (Illinois)
Jessica Woods	City of Round Rock (Texas)
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