WaterSense®

Plumbing Fixtures Specification Review Webinar

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May 9, 2019

Housekeeping

- All attendees are muted to minimize background noise
- Please type questions into the Questions box in the GoToWebinar control panel. We will have a dedicated time for Q&A at the end of each section and at the end of the presentation as time allows
- This PowerPoint presentation and a meeting summary will be posted on the public website
- Submit written comments to: watersense-products@erg.com
- This meeting is meant to be an open discussion
- All questions, comments, and concerns are welcome!

Meeting Objective

- Present information EPA has collected as part of its specification review
- Summarize issues and considerations EPA must address if it decides to revise the scope, water efficiency criteria, and/or performance criteria of a specification
- Review public comments received to date on the *Notice of Specification Review,* as they relate to plumbing fixtures
- Solicit additional feedback and information from manufacturer stakeholders
- EPA does not intend to make a determination as to whether to move forward with a specification revision during this meeting

Agenda

- Tank-Type Toilets Specification Considerations
  - Water Efficiency Criteria
  - Performance Criteria
- Flushing Urinals Specification Considerations
  - Water Efficiency Criteria
  - Performance Criteria
  - Scope Expansion
- General Considerations
  - Declining Flows
  - Water Quality
  - Public Health
- Next Steps

Specification Review Process

Thru Mar 2019

Internal Research
- Update product information, analyze WaterSense product database, conduct industry research
- Issue *Notice of Specification Review* and hold first stakeholder meeting

Mar-Jun 2019

Stakeholder Engagement
- Hold meetings with individual partners, standards committees, industry experts, and utilities
- Review comments, conduct additional analysis based on in-house data
- Hold product type meetings with stakeholders to review information collected to date

We are here

Jun-Aug 2019

Analysis
- Compile additional comments received and post to website
- Review and analyze information collected
- Continue engagement with standard committees and industry as necessary

Aug-Dec 2019

Develop Recommendations and Announce to Stakeholders by 31 December 2019
- Develop recommendations and review with EPA Management
- By December, present recommendations, post material to website, host public meetings

Part 1

Tank-Type Toilets Specification Considerations

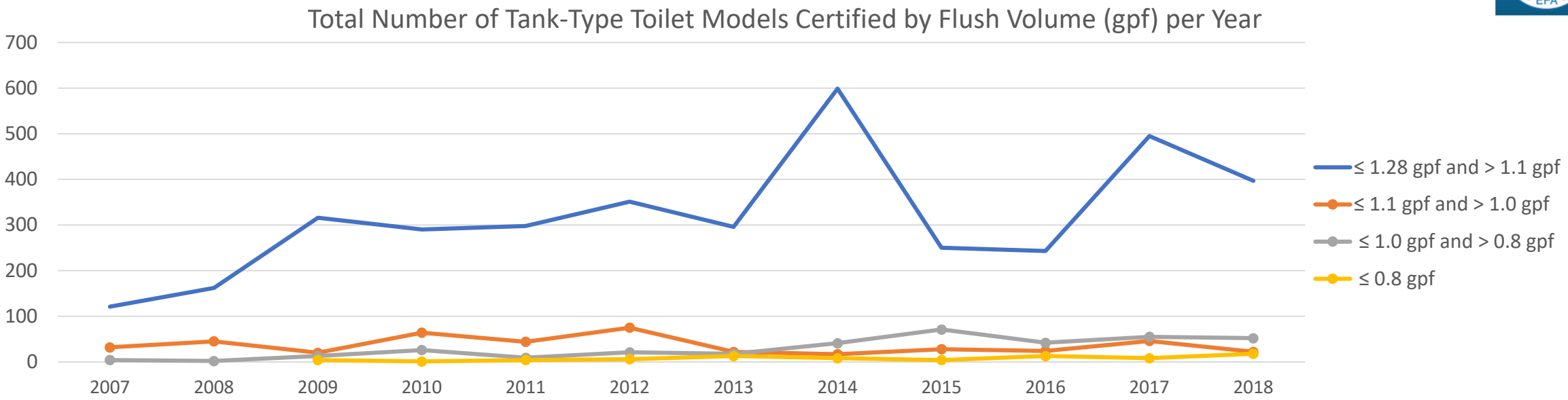
Specification for Tank-Type Toilets

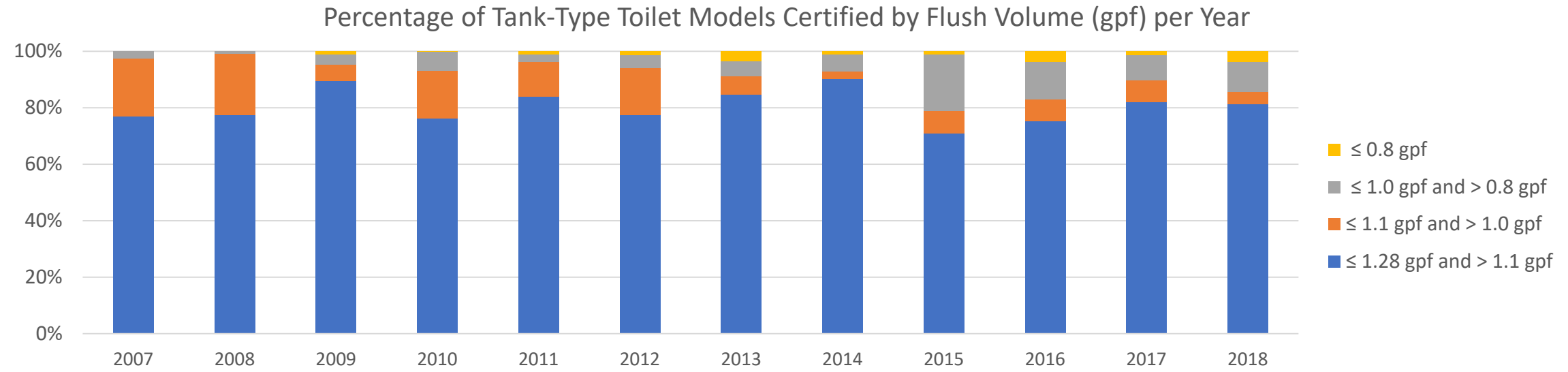
WaterSense Specification for Tank-Type Toilets

- Released January 24, 2007
- Last revised June 2, 2014 (Version 1.2)
- More than 140 manufacturer partners
- Number and percentage of WaterSense labeled tank-type toilets by flush volume:

Effective Flush Volume	≤ 1.28 gpf and > 1.1 gpf	≤ 1.1 gpf and > 1.0 gpf	≤ 1.0 gpf and > 0.8 gpf	≤ 0.8 gpf	Total
Single-Flush Models	1,887	36	166	58	2,147
Percentage of Single-Flush	87.9%	1.7%	7.7%	2.7%	-
Dual-Flush Models	703	391	107	11	1,212
Percentage of Dual-Flush	58.0%	32.3%	8.8%	0.9%	-
Total Models	2,590	427	273	69	3,359
Percentage of Total	77.1%	12.7%	8.1%	2.1%	-

Certification Trends





Specification for Tank-Type Toilets

Water Efficiency Requirements

- The **effective flush volume** shall not exceed 1.28 gallons (4.8 liters)
- Effective flush volume for dual-flush toilets calculated by averaging two reduced flushes and one full flush

Performance and Other Requirements

- Toilets shall pass **flush performance** criteria based on the waste extraction test protocol in ASME A112.19.2/CSA B45.1 *Ceramic Plumbing Fixtures* (i.e., flush toilet paper and 350 grams of miso paste)
- Toilets shall conform to **other applicable requirements** in ASME A112.19.2/CSA B45.1 and ASME A112.19.14 *Six-Liter Water Closets Equipped with a Dual Flushing Device* (for dual flush)
- Products shall be **marked** with the flush volume according to ASME A112.19.2/CSA B45.1

Water Efficiency Considerations

Reduce the maximum effective flush volume criteria below 1.28 gpf

Background

- Five states and multiple municipalities have adopted regulations mandating that tank-type toilets have a maximum effective flush volume 1.28 gpf or less, consistent with the WaterSense water efficiency criteria

Industry Research

Plumbing Efficiency Research Coalition (PERC). The Drainline Transport of Solid Waste in Buildings – Phase 2.0

- Study to assess drainline transport of solid waste in commercial drainlines.
- PERC does not recommend the use of 1.0 gpf (or less) toilets in commercial applications that have long horizontal drainlines and that do not provide additional long duration flows from other sources
- This recommendation "does not apply to residential applications"
- "Noted that residential toilet models that consume as little as 0.8 gpf are already installed in significant numbers in North America and there have been no confirmed reports of drainline blockages or other problems with those fixtures."

Water Savings Studies & Analysis

The EPA examined the following resources to evaluate the water savings potential of a lower maximum flush volume:

Water Research Foundation (WRF) Residential End Uses of Water (REU) Study (2016)

- Average household toilet use in 2016 was 33.1 gallons per household per day (gphd), down 27 percent from 1999
- Average household flush volume reduced from 3.65 gpf to 2.6 gpf
- Occupants continue to flush an average of 5 times per day
- EPAct and WaterSense are working to shift the market

Preliminary Water Savings Potential

- Lowering the flush volume maximum to:
  - 1.1 gpf would represent an additional 14% increase in efficiency over the current WaterSense specification and 31% increase over the national standard
  - 1.0 gpf would represent an additional 22% increase in efficiency over the current WaterSense specification and 38% increase over the national standard

Gallons Per Flush (gpf)	Potential Annual Savings Beyond 1.28 gpf for New Tank-Type Toilets (billion gallons)	Potential Annual Savings Beyond 1.28 gpf for Existing Tank-Type Toilets (billion gallons)	Total Savings Assuming 10% Market Share (billion gallons)
1.1 gpf	0.9	71.9	7.3
1.0 gpf	1.4	111.8	11.3
0.8 gpf	2.5	191.7	19.4

Water Efficiency Considerations

Set maximum flush volume at 1.28 gpf for dual-flush toilets

Background

- Specification requires maximum *effective* flush volume of 1.28 gpf, calculated using average of two reduced flushes and one full flush
- Requirements for dual-flush toilets are included in ASME A112.19.14 *Six-Liter Water Closets Equipped With a Dual Flushing Device*
  - Full-flush volume tested in accordance with ASME A112.19.2/CSA B45.1 and cannot exceed 1.6 gpf (6 Lpf)
  - Reduced flush shall not exceed 1.1 gpf (4.1 Lpf)
  - WaterSense specification does not provide any water savings when compared to this national standard
- The U.S. Department of Energy (DOE) prohibits the use of the effective flush volume for marketing
- *WaterSense Specification for Flushometer-Valve Water Closets* requires full-flush mode of a dual-flush toilet to meet the maximum flush volume criteria

Dual-Flush Considerations

- Many utilities have expressed that they want to eliminate dual-flush toilet eligibility or require full-flush mode to meet maximum flush volume requirements, as expected water savings may not be achieved
- ASHRAE 189.1-2017 *Standard for the Design of High-Performance Green Buildings* establishes a maximum flush volume of 1.28 gpf for the full-flush of both tank-type and flushometer-valve dual-flush toilets
- MaP PREMIUM sets 1:1 ratio for effective flush calculation and sets the full-flush maximum at 1.28 gpf
- City of Vancouver, Canada similarly now requires all toilets to have a maximum flush volume of 1.28 gpf, regardless of whether it is dual-flush
- However, either directly or through reference to WaterSense, California, Colorado, Georgia, and Texas codify effective flush volume calculation

Existing Dual-Flush Studies

Report	Authors	Toilet Type	Reduced : Full Ratio
Seattle Home Water Conservation Study (2000)	Peter Mayer et al. (Aquacraft, Inc.)	Tank-Type	0.77 : 1
Canada Mortgage and Housing Corporation Dual-flush Toilet Project (2002)	Veritec Consulting	Tank-Type	1.6 : 1 (single-family) 1.1 : 1 (office male) 2.7 : 1 (office female) 1.7 : 1 (office overall) 1.3 : 1 (coffee shop)
Residential Ultra-Low-Flush Toilet Replacement Program (2003)	Paula Mohadjer, Jordan Valley Water Conservancy District	Tank-Type	1.48 : 1
Residential Indoor Water Conservation Study: Evaluation of High Efficiency Indoor Plumbing Fixture Retrofits in Single-Family Homes in the East Bay Municipal Utility District Service Area (2003)	Peter Mayer et al. (Aquacraft, Inc.)	Tank-Type	0.48 : 1

Existing Dual-Flush Studies

Report	Authors	Toilet Type	Reduced : Full Ratio
Flush: Examining the Efficacy of Water Conservation in Dual Flush Toilets (2010)	Masaye Harrison	Flushometer-Valve	1.6 : 1
Behavioral Economics and the Design of a Dual-Flush Toilet (2012)	Jade Arocha and Laura McCann	Flushometer-Valve (women's restroom only)	0.35 : 1 (before signage) 0.63 : 1 (after signage)

Potential Product Certification Impacts

- Number and percentage of WaterSense labeled dual-flush tank-type toilets by full-flush volume:

Full-Flush Volume	≤ 1.6 gpf and > 1.28 gpf	≤ 1.28 gpf	Total
Dual-Flush Models	1,001	211	1,212
Percentage of Total	82.6%	17.4%	-

- 2,147 single-flush WaterSense labeled toilet models would not be impacted

Performance Considerations

Increase quantity of waste media and/or toilet paper that must be removed from toilet during waste extraction testing

- Current Requirement
  - Toilet must clear 350 grams of cased or uncased media and 4 balls of crumpled, single-ply toilet paper in four of five tests

- Background
  - 350 gram threshold derived from results of multiple medical studies, representing the 99th percentile of waste events
  - Toilets that can extract greater quantities are widely available
    - 1,591 of 1,644 (97%) WaterSense labeled models tested for maximum performance on MaP database can extract 600 grams or greater
    - 2,090 additional WaterSense labeled models have not been tested for MaP Flush Performance Score
  - Poor performance or need for “double flushing” can result in water waste

Performance Considerations

Include new test criteria to better assess bowl cleansability

- Current Requirement
  - ASME A112.19.2/CSA B45.1 includes a surface wash test meant to ensure toilets provide adequate surface wash
  - Requirement included in WaterSense specification by reference to standard

- Background
  - Manufacturers indicated that when flush volume is lowered or waste extraction requirements are increased, water used for bowl cleansing or surface wash is reduced
  - Current performance test may not adequately address performance element
  - Manufacturers perform in-house testing using additional test media placed around the bowl, above the water line
  - No standardized or industry accepted tests exist beyond what is included in ASME A112.19.2/CSA B45.1

Public Comments Received to Date

City of Vancouver, Canada

- Absence of evidence supporting assumption behind effective flush calculation
- As of January 1, 2019, City of Vancouver requires all new toilets to operate at a maximum of 1.28 gpf
- EPA should consider available independent literature on this topic and consider harmonizing the flush requirements with the *WaterSense Specification for Flushometer-Valve Water Closets* (i.e., set maximum flush volume at 1.28 gpf across all toilet types and flush modes)

Giese Construction and Renovation

- Require silicone seals, gaskets, and bushings to make toilets leak free for the life of the product
- Rubber seals and bushings leak or drip after about 10 years

Public Comments Received to Date

Plumbing Manufacturers International

- Recommends that no changes be made to the tank-type toilets specification
- Referenced two EPA funded studies looking into the impact of water efficiency on public health
- Refenced the CUWA white paper regarding declining flows

Culver Van Der Jagt

- EPA should consider a specification for toilet-top sinks
- Devices do not use any water for handwashing, since the water fills the toilet tank
- Technology has been successful in Japan and in correctional facilities

Public Comments Received to Date

Denver Water

- Consider moving to lower gallons per flush as many markets have shifted to 1.28 gpf as baseline
- Consider reviewing criteria such as MaP scores and dual-flush eligibility
- Dual flush models may not save as much as stated due to user confusion
- Lower water use could cause aging of water in service lines and potential drain line carry issues in older plumbing – could be part of new home criteria. The occurrence of pathogens in premise plumbing (e.g., Legionella) has become a high visibility topic and lower water use combined with the potential of using alternative water sources may exacerbate this concern

Public Comments Received to Date

Metropolitan North Georgia Water District

- Consider better performance in terms of waste clearance
- Consider a flush volume of 1.1 gpf or less
- Provided EPA satisfactorily analyzes and address any potential adverse impacts on solids transport, water age, and corrosion in sewer collection systems

Outstanding Questions

- Are there additional studies on the water efficiency and/or performance of tank-type toilets of which WaterSense should be aware?
- Are there additional studies on user behavior related to dual-flush toilets of which WaterSense should be aware?
- Is there anything else about water efficiency or performance that WaterSense should consider during its review process?

Questions and Discussion

Poll Question

Question: Based on what has been presented, does WaterSense have enough information to determine whether to revise its specification for tank-type toilets?

- Yes
- No

Poll Question

Question: In your opinion, should EPA revise the water efficiency criteria of the *WaterSense Specification for Tank-Type Toilets*?

- Yes
- No
- Need more information

Poll Question

Question: In your opinion, should WaterSense eliminate the effective flush calculation for dual-flush toilets?

- Yes
- No
- Need more information

Poll Question

Question: In your opinion, should EPA revise the performance criteria of the *WaterSense Specification for Tank-Type Toilets*?

- Yes
- No
- Need more information

Part 2

Flushing Urinal Specification Considerations

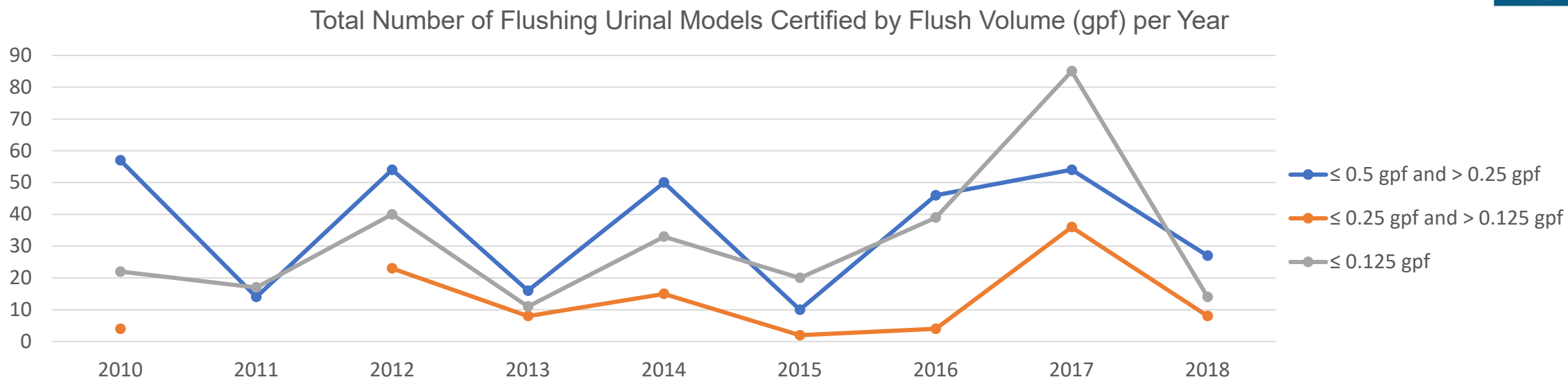
Specification for Flushing Urinals

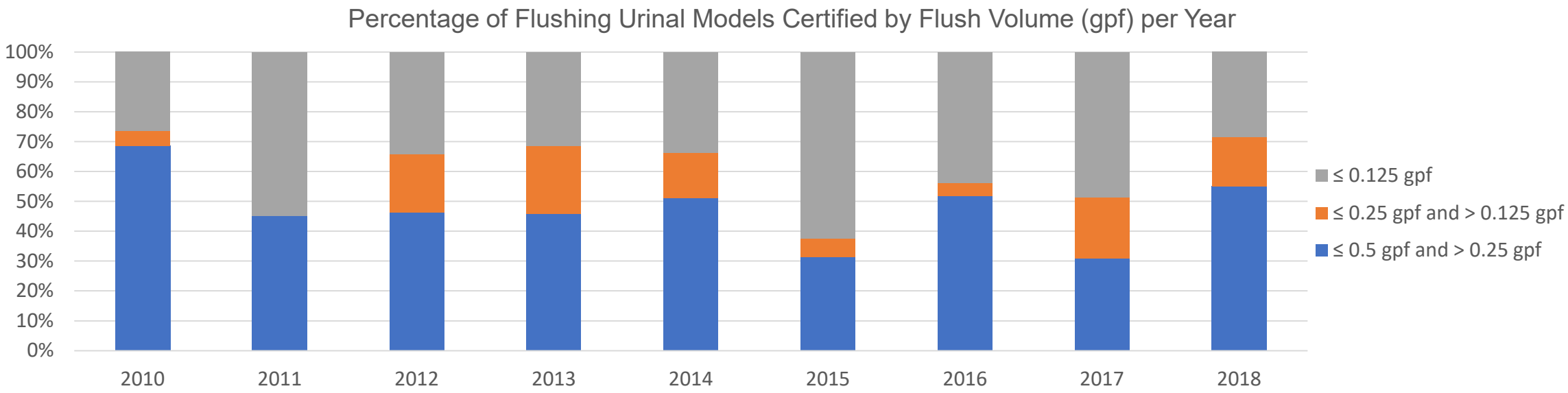
WaterSense Specification for Flushing Urinals

- Released October 8, 2009
- 25 manufacturer partners
- Number and percentage of WaterSense labeled flushing urinals by flush volume:

Flush Volume	≤ 0.5 gpf and > 0.25 gpf	≤ 0.25 gpf and > 0.125 gpf	≤ 0.125 gpf	Total
Number of Fixture Models	81	13	55	149
Percentage	54.3%	8.7%	36.9%	-
Number of Flush Valve Models	177	35	128	340
Percentage	52.1%	10.3%	37.6%	-
Number of Systems	54	46	102	202
Percentage	26.7%	22.8%	50.5%	-

Certification Trends





Specification for Flushing Urinals

Water Efficiency Requirements

- The **average maximum flush volume** must not exceed 0.5 gpf (1.9 Lpf)

Performance Requirements

- Fixture must **conform to the applicable ANSI standards,** when tested with a flushing device with the same rated flush volume
- Pressurized flushing devices must **conform to ASSE Standard 1037**
- The flushing device must not contain a **flush volume adjustment** that allows the flush volume to vary more than ± 0.1 gpf and may not be packaged, marked, or provided with instructions directing a user to an alternative flush volume setting
- The urinal fixture and flushing device product/packaging must be **marked with the rated flush volume**

Scope Considerations

Current Specification Scope

- Includes flushing urinals, including:
  - Urinal fixtures that use water to convey waste
  - Flushing devices (valves and tanks)

Scope does not include:

- Non-water urinals
- Non-water urinals with drain-cleansing action (hybrid urinals)

Non-Water and Hybrid Urinals

Background

- Not currently included in the *WaterSense Specification for Flushing Urinals*
- Covered under ASME A112.19.19 *Vitreous China Nonwater Urinals*
- MaP Testing maintains a list of 60 different non-water and hybrid urinal models from 15 different manufacturers
- WaterSense previously issued guidance on the inclusion on non-water using urinals in incentive programs, stating that these products are inherently water-efficient

Water Efficiency Considerations

Reduce the maximum flush volume criteria below 0.5 gpf

Background

- At least five states and multiple municipalities have adopted regulations mandating urinals have a flush volume of ≤ 0.5 gpf, consistent with the WaterSense water efficiency criteria
- As of 2016, the California Appliance Efficiency Regulations require wall-mounted urinals sold in California to flush at 0.125 gpf or less

Preliminary Water Savings Potential

- Lowering the flush volume maximum to:
  - 0.25 gpf would represent an additional 50 percent increase in efficiency over the current WaterSense specification and 75 percent increase over the national standard
  - 0.125 gpf would represent an additional 75 percent increase in efficiency over the current WaterSense specification and 88 percent increase over the national standard

Gallons Per Flush (gpf)	Potential Annual Savings Beyond 0.5 gpf for New Urinals (billion gallons)*	Potential Annual Savings Beyond 0.5 gpf for Existing Urinals (billion gallons)*	Total Savings Assuming 10% Market Share (billion gallons)*
0.25 gpf	0.2	17.2	1.7
0.125 gpf	0.3	25.7	2.6

*Excludes savings from California

Performance Considerations

- EPA does not have any indication of performance issues associated with current specification
- During development of the specification, concerns were raised related drainline issues and struvite build-up with 0.125 gpf and non-water urinals
- Anecdotally, non-water and 0.125 gpf urinals have been installed successfully in the years since the specification was released

Performance Studies

Field Report, University of Southern California, Zurn Z5798 The Pint Urinal (2007)

- USC observed build-up of uric acids in traps and drainlines behind non-water urinals
- Installed 0.125 gpf urinals at maintenance facility to test efficacy
- After six months, there was no observed build-up or crystallization within the trap or drainline

Performance Studies

Long Term Field Evaluation of High Efficiency Urinals at University of Washington (2011)

- Assessed long term maintenance costs of non-water, 0.5 gpf, and 0.125 gpf urinals in a college dormitory
- Non-water urinals experienced regular clogging events, significant pipe deposits, and/or slowdowns requiring frequent service. UW staff decided to no longer install non-water urinals
- 0.125 gpf urinals showed significant deposits after 3.5 years; UW similarly chose not to pursue 0.125 gpf urinals further
- 0.5 gpf urinals showed significantly less or no deposits after 3.5 years

Performance Studies

An Assessment of Long-Term Performance of Non-Water Urinals in Relation to Drain Line Buildup (2008) By Falcon and Sloan Companies.

- Refuted some of the findings from UW study, suggesting that the non-water urinals were not installed according to manufacturer's instructions
- Acknowledged that routine maintenance (including cartridge replacement and drainline flushing) is important to maintain plumbing system
- Provided examples of ten facilities that had successfully installed non-water urinals in place of flushing urinals

Public Comments Received to Date

Plumbing Manufacturers International (PMI)

- Recommends that no changes be made to the urinals specification
- Referenced two EPA funded studies looking into the impact of water efficiency on public health
- Refenced the CUWA white paper regarding declining flows

Metropolitan North Georgia Water District

- Suggested revising the specification to require a flush volume of 0.125 gpf or less
- Provided EPA satisfactorily analyzes and address any potential adverse impacts on premise plumbing systems (i.e., struvite build-up, increased water age)

Denver Water

- Consider criteria for non-water urinals as a separate specification

Outstanding Questions

- Are there existing studies on the water efficiency and/or performance of flushing urinals at various flush volumes or non-water urinals of which WaterSense should be aware?
- Is there anything else about water efficiency or performance that WaterSense should consider during its review process?

Questions and Discussion

Poll Question

Question: Based on what has been presented, does WaterSense have enough information to determine whether to revise its specification for flushing urinals?

- Yes
- No

Poll Question

Question: In your opinion, should EPA revise the water efficiency criteria of the *WaterSense Specification for Flushing Urinals*?

- Yes
- No
- Need more information

Poll Question

Question: If WaterSense expands the scope of the urinals specification, which product categories should WaterSense expand the scope to include?

- Both non-water urinals and urinals with drain cleansing action
- Only non-water urinals
- Only urinals with drain cleansing action
- Neither, leave the specification scope as is
- Need more information

Part 3

General Water Efficiency Considerations

General Considerations

In its public comments, PMI referenced three reports for EPA's consideration

California Urban Water Agencies (CUWA), "Adapting to Change: Utility Systems and Declining Flows", November 2017

- Study aimed at understanding the impacts of declining flows resulting from substantial reductions in indoor water use and how utilities are adapting
- 50% of the utilities experienced impact on water/wastewater infrastructure
- Strategies do not suggest abandoning conservation, but recommend:
  - Taking a holistic approach to policy to account for lower flows in planning and allow more flexibility for utilities
  - Distinguishing between short term (emergency response for demand reductions during drought) and long term (water use efficiency for sustained demand management) initiatives, as short term initiatives may not be suitable for long term implementation
  - Not solely relying on water use efficiency to manage future water demands

General Considerations

Water Conservation and Water Quality: Understanding the Impacts of New Technologies and New Operational Strategies

- Funded under EPA grant funded
- Study being conducted by Drexel University, Penn State, and UC Boulder
- Objective: The project will combine literature information with novel experimental results to develop and validate predictive models of the risk of failing to meet water quality goals for premise plumbing. The models will be encoded in a web-based decision support tool usable by facilities managers and utility personnel to identify high risk conditions for premise plumbing water quality and potential remedial actions
- Hypothesis: Decreases in water consumption result in lower flows of water through water system pipes that were designed to manage higher flows, which may negatively impact water quality
- Project funded through September 2019

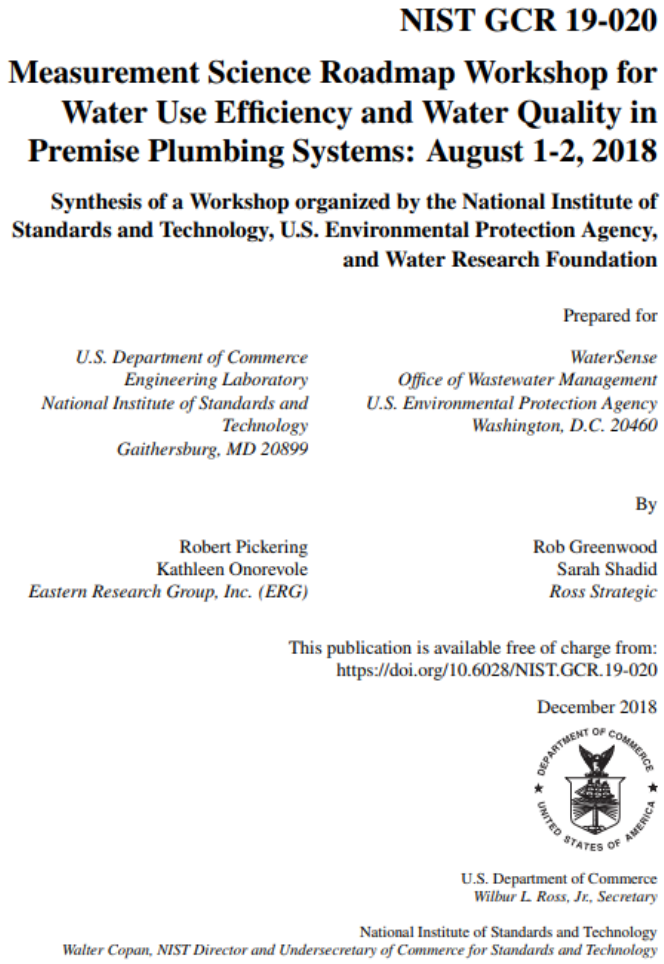
General Considerations

Right Sizing Tomorrow's Water Systems for Efficiency, Sustainability, and Public Health

- Funded under EPA grant funded
- Study being conducted by Purdue, Michigan State, San Jose State, and Tulane
- Objective: The project goal is to better understand and predict water quality and health risks posed by declining water usage and low flows
- One case study of a newly plumbed residential green building which did find:
  - An increased organic carbon, bacteria, and heavy metal levels
  - Different fixture use patterns resulted in disparate water quality within a single-family home
  - The greatest drinking water quality changes were detected at the least frequently used fixture
- Project funded through March 2021

Premise Plumbing Research

- WaterSense collaborated with NIST and the Water Research Foundation (WRF) to organize a workshop in August 2018 focused on research needs to inform premise plumbing design, installation, and maintenance.
- Workshop synthesis report released in December 2018 - https://nvlpubs.nist.gov/nistpubs/gcr/2019/NIST.GCR.19-020.pdf



NIST GCR 19-020

Measurement Science Roadmap Workshop for Water Use Efficiency and Water Quality in Premise Plumbing Systems: August 1-2, 2018

Synthesis of a Workshop organized by the National Institute of Standards and Technology, U.S. Environmental Protection Agency, and Water Research Foundation

Prepared for

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December 2018

U.S. Department of Commerce
Wilbur L. Ross, Jr., Secretary

National Institute of Standards and Technology
Walter Copan, NIST Director and Undersecretary of Commerce for Standards and Technology

Part 4

Future Stakeholder Meetings and Next Steps

Future Industry Webinars

WaterSense will continue to hold industry meetings on specific product categories to discuss information received as a result of the *Notice of Specification Review*

- **Webinar for Weather-based Irrigation Controllers Manufacturers:** May 16, 2019
- **Webinar for Utilities and Promotional Partners:** June 5, 2019

Register at: www.epa.gov/watersense/product-specification-review#webinars

Next Steps

- Pertinent information and comments can still be submitted to watersense-products@erg.com
- WaterSense will summarize information collected and issue a decision on whether it intends to move forward with a specification revision for each product category by **the end of 2019**
- If a specification revision is needed, WaterSense will:
  - Identify existing data gaps, concerns, and next steps (as applicable) related to development of a draft specification
  - Provide opportunity for public comments prior to and following the development of the draft specification
  - Hold additional stakeholder meetings, as appropriate, before issuing a final specification

Questions and Discussion

Contact Us

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