



**Response to Public Comments Received on the  
*WaterSense® Draft Specification for Spray  
Sprinkler Bodies***

**September 21, 2017**

## Background

This document provides WaterSense's responses to public comments received on the *WaterSense Draft Specification for Spray Sprinkler Bodies*. For purposes of this document, the comments are summarized. The verbatim comments can be viewed in their entirety [here](#).

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## I. Comments on Section 1.0: Scope and Objective

### Revision of Product Category Name

- a. One commenter requested that EPA change the title of the document to “WaterSense Draft Specification for Pressure-Regulated Spray Sprinkler Bodies” to avoid possible confusion with standard, non-pressure regulated heads. The commenter noted that this draft is for pressure-regulated sprays and that should be in the title.

*Response:* EPA has decided to leave the title more general as “Spray Sprinkler Bodies” to allow for additional water-saving features (e.g., flow reduction) to be added in future versions of the specification and to clarify that this specification does not apply to rotors.

### Use of the Term “Integral” Pressure Regulation

- a. One commenter requested the replacement of the word “integral” in the scope statement, “This specification is applicable to spray sprinkler bodies with integral pressure regulation.” The commenter noted that term integral is defined as “necessary to make a whole complete; essential or fundamental.” The commenter proposed changing the sentence to say “...applicable to sprinkler bodies with in-stem or internal pressure regulation.”

*Response:* EPA has decided to retain the word “integral” to maintain consistency with terminology included in *ASABE/ICC 802-2014: Landscape Irrigation Sprinkler and Emitter Standard*, the industry-accepted, consensus-based standard upon which this specification is based.

### Definition of the Term “Pressure Regulator”

- a. One commenter indicated that the term “pressure regulator” may be confusing. The commenter noted that the pressure regulation occurs within the inside or stem of the pop-up or spray body. The use of the term pressure regulator brings to mind a pressure-reducing valve to regulate pressure on a whole irrigation system.

*Response:* EPA has decided to retain the term “pressure regulator.” This term is defined and used in *ASABE/ICC 802-2014: Landscape Irrigation Sprinkler and Emitter Standard*, which is the industry-accepted, consensus-based standard upon which this specification is based.

### Clarification of the Term “Aftermarket Device”

- a. One commenter asked for clarification regarding the term “aftermarket device” and questioned whether it means an “add-on device.” The commenter asked for

an example, questioning if an aftermarket device would include something like a pressure-compensating disc in a nozzle.

*Response:* EPA acknowledges this point of confusion and is confirming that aftermarket device can mean “add-on device,” and that the specification does not apply to aftermarket or add-on devices. EPA has revised Section 1.0 of the specification to clarify this point.

### **Request to Expand Scope to Include In-Stem Flow Regulators**

- a. One commenter indicated that there are other ways to eliminate the deleterious effects of high pressure in sprinkler systems. The commenter noted that a pressure-regulating stems (PRS) unit, which is basically a spring-loaded device, is costly, not recommended for use where inlet pressures exceed 100 psi, and most often, after one or two years, loses its ability to maintain the pressure of 30 or 40 psi from when it was purchased. The commenter noted that most importantly, the PRS unit, which creates an obstruction in the water passageway, easily gets clogged by debris in the field due to its very small opening, which gets even smaller as the inlet pressure increases. Once debris gets caught up in the spring and/or at the plastic end that gets compressed with higher pressures, the commenter said, the water passageway is effectively closed off and the sprinkler is then useless and has to be replaced.

The commenter encouraged EPA to consider another type of product, which includes an in-stem flow regulator (IFR). The commenter said that the product has been on the market for the last 15 years and is extremely effective at not only controlling high pressure, but overriding it completely. This technology is the only sprinkler product on the commercial rebate list of a large utility in California, the commenter noted.

The commenter provided a list of advantages of a specific product model over stems used today by major manufacturers. For the full comment, please see comments from Ted Sirkin in [Comments: Draft Specification for Spray Sprinkler Bodies](#).

*Response:* EPA acknowledges that in-stem flow regulators, such as the one suggested by the commenter, are innovative products and a viable technology for certain applications. However, WaterSense is not considering these products for inclusion in the specification at this time for the following reasons:

- This type of product does not meet the definitions of “sprinkler body” or “pressure regulator” as defined in the industry developed consensus-based standard *ASABE/ICC 802-2014: Landscape Irrigation Sprinkler and Emitter Standard*, on which this specification is based. These products are not sprinkler bodies, but rather in-stem devices that are added to existing sprinkler bodies (e.g., aftermarket devices). Additionally, they do not regulate pressure, but flow.

- Though the product addresses situations of high pressure, it requires custom adjustment to maintain outlet pressure as the inlet pressure varies. Therefore, it does not maintain constant operating pressure downstream from the device (without adjustment) when inlet pressure varies. Accordingly, the product cannot be tested with the current test method because it requires adjustment at each pressure, while the test method only allows for calibration and adjustment at the initial pressure.
- This type of product, when not sold inside a sprinkler body, is an aftermarket device, which is excluded from the specification, as the intent of the specification is to recognize and label complete, fully functioning products that can provide the required efficiency and performance.

Additionally, this specification aims to label products that do not require the user to interact with the product any differently than one would with a traditional sprinkler body. WaterSense aims to reduce the impact of human behavior on water savings when possible. Because this device requires adjustment of each sprinkler depending on the inlet pressure, extra attention and interaction is required by the user, a requirement WaterSense seeks to minimize.

## II. Comments on Section 2.0: Water Efficiency and Performance Criteria

### Request to Create a Range of Criteria

- a. One commenter noted that it is imperative for EPA to have a set of ranges for a product to attain WaterSense certification.

*Response:* EPA thanks the commenter for the suggestion. The program is systematically set up to provide a single-tiered, easy to understand label that indicates whether a product meets the established criteria for water efficiency and performance. The label cannot currently be used to differentiate among WaterSense labeled products based on their efficiency or performance. A tiered approach, or set of ranges, is not in line with the current structure of the program.

### Request for Flow Rate Testing at High and Low Flow Rates

- a. One commenter requested that the test procedure also require testing at 0.5 gallons per minute (gpm) and 3.5 gpm to provide information on the pressure-regulating performance at the minimum and maximum flows for spray sprinkler bodies. The commenter does not recommend setting performance standards at these flows, but rather making the performance information available for the benefit of consumers.

The commenter explained that this will provide consumers with more information regarding performance at flows other than the 1.5 gpm level and provide rigorous testing of any new products that are brought to market.

In summary, the commenter recommends repeating the test method at 0.5 GPM and 3.5 GPM flow rates.

- b. Another commenter suggested testing at 1.5 gpm and 3.5 gpm. The commenter noted that using two different flow rates to verify consistent performance of the pressure-regulating device adds confidence in the product. Half-circle nozzles represent the vast majority of spray body sprinklers being used in small landscaped areas, but the full-circle nozzle represents the typical maximum flow that the device must be able to regulate for proper flow. Data from the [Pressure Regulating Spray Sprinkler Body Final Test Report](#) seem to indicate that there are some differences in performance between high and low flow rates for some products.

*Response:* At this time, WaterSense is retaining testing at only the 1.5 gpm flow rate. The data included in the [Pressure Regulating Spray Sprinkler Body Final Test Report](#) may have slight variations in results between, and within, the flow rates of 1.5 and 3.5 gpm, but EPA determined the variations are not significant enough to warrant testing at multiple flow rates, which could significantly increase the cost of testing.

EPA has also decided not to require testing and publication of performance results at additional flow rates (0.5 gpm and 3.5 gpm), even if the specification does not establish criteria at those flow rates. EPA cannot require testing to produce data it will not use in determining whether the product meets the efficiency and performance criteria. However, this does not prevent other agencies from collecting additional performance data for their own purposes, which, if made available, EPA could consider in future versions of the specification.

### **Request to Revise the Flow Rate at Maximum Operating Pressure to be the Maximum Flow Rate at Any Pressure**

- a. Two commenters explained that the flow rate at the maximum operating pressure is not necessarily the maximum flow rate across the test range. This is demonstrated in tests that show the flow rate at the maximum operating pressure below the average and, in one instance, below the calibration flow rate. One commenter asked EPA to consider if the flow at the maximum operating pressure is the right measure, or if limiting the maximum flow across the full range is more desirable.

The commenter continued to explain that in an extreme case, a pressure regulation device could hold very steady at most points but exceed calibration flow by 25 percent at a mid-point in the testing. This point would not be subject to the flow rate at maximum operating pressure criteria (since it is at a mid-range test point), and the average across all test points could still be below the 10 percent threshold.

The commenter suggested the following edits to Section 2.1.1:

~~“**Maximum** Flow rate **at the maximum operating pressure**—The percent difference between the initial calibration flow rate (as described in Appendix B) and the maximum flow rate at **any the** tested pressure level **of 70 psi (or the maximum operating pressure, as specified by the manufacturer, whichever is greater)**, averaged for the selected samples **at that pressure**, shall be within +/- 15.0 percent.”~~

*Response:* EPA agrees with this recommendation and has revised Section 2.1.1 to reflect this change. Based on the test results in [Pressure Regulating Spray Sprinkler Body Final Test Report](#), EPA acknowledges that the maximum flow may occur at test pressures other than the maximum operating pressure. This observation was typically a small increase at other pressures and/or isolated to one sprinkler sample; however, the test is more stringent when selecting maximum flow deviation regardless of pressure.

### Request for Relative Minimum Outlet Pressure

- a. One commenter stated that a minimum outlet pressure of 20 psi may be appropriate for pressure-regulating bodies that are meant to regulate to 30 psi. However, pressure-regulating bodies that regulate at higher pressure (i.e., 45 psi) are designed to operate with products that are optimized for higher pressures.

The commenter continued to explain that pressure-regulating bodies that are designed to regulate to a higher outlet pressure (i.e., 45 psi) commonly operate with a different style of nozzles, multi-stream multi-trajectory (MSMT). These nozzles may not operate most efficiently if outlet pressure is allowed to drop to 20 psi. The commenter suggested that the minimum outlet pressure allowed should be relative to the designed regulating pressure.

The commenter suggested the following edits to Section 2.1.3:

~~“Minimum outlet pressure—The average outlet pressure at the initial calibration point (as described in Appendix B) of the selected samples shall not be less than **20.0 psi the advertised regulation pressure less 10.0 psi.**”~~

*Response:* EPA agrees with this comment, as products available on the market have minimum operating pressures relative to the regulation pressure. EPA has revised the specification to reflect this change, creating a minimum outlet pressure relative to the regulation pressure:

“The average outlet pressure at the initial calibration point (as described in Appendix B) of the selected samples shall not be less than two-thirds (67 percent) of the regulation pressure.”

This change does not change the minimum outlet pressure criterion from the draft to final specification for a spray sprinkler body with a regulation pressure of



30 psi (two-thirds of 30 psi equals 20 psi). This change raises the minimum outlet pressure criterion for those products with regulation pressures above 30 psi. For example, a spray sprinkler body with a regulation pressure of 45 psi will have a minimum outlet pressure criterion of 30 psi. As noted by the commenter, many products on the market operating at 45 psi commonly operate with a different style of nozzle that requires a minimum pressure greater than 20 psi (the criterion included in the draft specification) to function properly (e.g., to rotate). Changing this requirement to a threshold that is relative to the regulation pressure ensures performance for a range of products with varying regulation pressures.

**Request for More Stringent Water Efficiency Criteria**

- a. One commenter requested that EPA tighten the water efficiency and performance criteria. The commenter provided the following information to justify doing so:

Based on the University of Florida test data used by WaterSense to set the performance metric, the allowable flow difference (+/- 15 percent) at the maximum test pressure appears overly generous, apparently influenced by one brand (out of seven tested) that significantly underperformed on this metric. The data would seem to support a stronger standard (+/- 12 percent difference rather than +/- 15 percent difference), or perhaps a two-stage requirement, where the proposal is Stage 1 and a more stringent level takes effect as Stage 2 a year or two later.

Additionally, the proposal sets the maximum of +/- 15 percent tolerance on variation between the flow rate at the recommended inlet water pressure (such as 30 psi) compared to the highest tested inlet pressure (typically 70 psi). However, data from the University of Florida tests ([Pressure Regulating Spray Sprinkler Body Final Test Report](#)) indicate that the maximum flow rate can occur at pressures below the maximum test pressure (see Figure 9A for test runs at 1.5 gpm and Figures 6A and 10A for test runs at 3.5 gpm, for example). Looking at the data tables behind the figures, the commenter provided a table of the test runs for Brand A Test Sample 2, which illustrates this phenomenon as well:

**Brand A Pressure Regulation Test Sample #2 [pressure regulated at 30 psi]  
(data provided by WaterSense)**

Inlet Pressure (psi)	Inlet Pressure (psi)		Outlet Pressure (psi)	Flow Rate (gpm)
	Avg		Avg	Avg
	Nominal flow rate of 1.5 gpm			
30	30.2		26.9	1.53
40	40.1		35.8	1.67
60	59.8		33.5	1.60
70	69.6		32.0	1.59

60	59.4	31.0	1.60
40	40.2	29.2	1.56
<b>Nominal flow rate of 3.5 gpm</b>			
30	30.3	19.8	3.44
40	40.4	26.3	3.96
60	60.3	28.7	4.10
70	70.7	27.5	4.01
60	60.1	27.9	4.07
40	40.5	26.5	3.94

The commenter requested that WaterSense consider applying the maximum flow rate limit to the flow measured at any inlet pressure, because the maximum flow rate can occur below the maximum operating pressure. This change would not require any change in the test set-up or run time.

*Response:* Regarding the commenter’s request to lower the maximum deviation in Section 2.1.1, EPA agrees that this threshold can be tightened based on the data included in the [Pressure Regulating Spray Sprinkler Body Final Test Report](#). EPA has revised the criterion accordingly to lower the maximum deviation from 15 percent to 12 percent. EPA made this change to the specification to increase the stringency for any new products coming on the market, and most importantly, to keep the specification relevant in the marketplace for a longer period of time, a goal that has been expressed by interested stakeholders.

As a component of the comment, the commenter requested that WaterSense consider applying the maximum flow rate limit to the flow measured at any inlet pressure, because the maximum flow rate can occur below the maximum operating pressure. Please see the response to the comment under Section II above under “Request to Revise the Flow Rate at Maximum Operating Pressure to be the Maximum Flow Rate at Any Pressure” regarding the request to revise the flow rate at the maximum operating pressure to be the maximum flow rate at any pressure. EPA accepted this recommendation and has revised the specification accordingly.

### III. Comments on Section 3.0: General Sprinkler Body Requirements

No comments were received on this section.

## IV. Comments on Section 4.0: Product Marking Requirements

### Revision of Language Regarding the Sprinkler Body and Associated Packaging (Section 4.1)

- a. One commenter explained that the language used in Section 4.1, “The sprinkler body and associated packaging shall be marked according to all applicable sections of Section 304.1 of ASABE/ICC 802-2014, Sprinkler and Bubbler Product Marking, General,” could be confusing and be interpreted as requiring all elements to be marked on both the body and packaging. The commenter noted that ASABE/ICC does not require this in all cases.

The commenter suggested the following in Section 4.1:

“The sprinkler body and ~~associated~~ packaging markings shall ~~be marked according to conform to~~ all applicable sections of Section 304.1 of ASABE/ICC 802-2014, Sprinkler and Bubbler Product Marking, General.”

*Response:* EPA does not intend for all elements to be included on both the body and packaging, but for the marking requirements to conform with the standard. EPA agrees that the language in Section 4.1 should be clearer and has revised the language to reflect this recommendation.

### Revision of Language Related to “Recommended” and “Maximum Operating Pressures” (Section 4.2)

- a. One commenter suggested replacing “regulation pressure” with “pressure regulation” and recommended the following language:

“The product and/or its associated packaging or documentation shall identify the recommended operating pressure (hereafter referred to as ~~regulation pressure~~ *pressure regulation*) and the maximum operating pressure.

Regarding the term “maximum operating pressure,” the commenter emphasized the importance of publishing the maximum dynamic pressure of an irrigation system at which the pressure-regulated spray body can maintain the recommended operating pressure (e.g., 30 psi, 40 or 45 psi).

- b. One commenter stated that Section 4.2 calls out a “recommended operating pressure” and that spray bodies do not typically have a recommended operating pressure. The recommended operating pressure varies for the discharge device/ nozzle that is attached. The commenter explained that operating pressure generally refers to the pressure at the “inlet” of the device. A recommended inlet operating pressure should not be specified for a spray body, although a maximum inlet operating pressure should be specified to protect against over pressuring the body.

The commenter suggested that the “recommended operating pressure” be replaced by a “regulated outlet pressure” and offered the following revisions for Section 4.2:

“The product and/or its associated packaging or documentation shall identify the ~~recommended operating~~ regulated outlet pressure (hereafter referred to as regulation pressure) and the maximum operating pressure at the inlet.”

*Response:* EPA agrees that the language in Section 4.2 should be revised to remove the term “recommended operating pressure,” as it is not typically associated with spray bodies. EPA has revised Section 4.2 language to be clear that the regulation pressure specified by the manufacturer is associated with the outlet, and that the maximum operating pressure is associated with the inlet. EPA also added a definition for “regulation pressure—outlet pressure the product aims to achieve regardless of higher inlet pressure, as stated by the manufacturer,” as it is not defined in *ASABE/ICC 802-2014 Landscape Irrigation Sprinkler and Emitter Standard*, though used extensively in relation to the term “manufacturer’s stated regulation pressure.”

## V. Comments on Section 7.0: Definitions

No comments were received on this section.

## VI. Comments on the Test Method Included in Appendix B

### Support for the Use and Modification of ASABE/ICC 802-2014

- a. One commenter noted their support for EPA's proposed modifications to the *ASABE/ICC 802-2014 Landscape Irrigation Sprinkler and Emitter Standard* to improve the repeatability and reliability of the test procedure. Specifically, the commenter supports EPA's proposal to modify the test procedure to:
  - Incorporate a test configuration diagram as shown in Figure 1 of Appendix B to specify the test setup and eliminate variations that would affect test results.
  - Specify minimum accuracy and resolution for the test equipment measurement devices.
  - Require the use of a needle valve to ensure performance of the pressure regulation device will be reliably measured.
  - Provide rest periods between consecutive pressure levels to eliminate test hysteresis.
  - Eliminate test points within the falling limb of the pressure test level curve to reduce test burden.
  - Measure water flow as a direct means of validating water savings.
  - Establish the percent difference between the water flow at the regulated pressure and the test pressures as the performance metric to measure the effectiveness of pressure regulation.

*Response:* EPA thanks the commenter for their support and use of a test method developed by a standard-setting body that included input from various stakeholders, including industry and utilities.

### **Request for Additional Information on the Adapter Installed Between the Needle Valve and Spray Sprinkler Body**

- a. The commenter requested that EPA provide a description of the critical characteristics for the adapter between the needle valve and spray sprinkler body. Critical characteristics may include a minimum or maximum length, inner diameter, internal radius, or other characteristics that may introduce variations in the test results if allowed to vary without controls.

The commenter continued to explain that the adapter may influence the flow during the test, and that by documenting any critical characteristics, the variation in test results from different test setups can be minimized. The commenter requested the language be changed to indicate that the adapter shall be fabricated to the dimensions shown in the adapter figure.

*Response:* EPA has revised the test method to include additional information and a more detailed diagram of the adapter. Note that exact dimensions may vary depending on the model of sprinkler body, so EPA included the following text, “The adapter shall be no less than 0.6-inch inner diameter and connections shall minimize flow disturbance.” EPA also clarified in the test method that the manufacturer will provide the adapter to the licensed certifying body (LCB). The specification states “The manufacturer shall supply for testing a connection to their product’s stem that allows connection to standard piping.”

### **Request for Inclusion of Equations Used to Evaluate Test Data**

- a. One commenter requested that EPA provide explicit equations for calculating the percent difference and average flow rate. As an example, the commenter provided definitions for percent difference that are widely used.

Definition 1: Percent Difference =  $(Q_{\text{max}} - Q_{\text{initial}}) / (1/2(Q_{\text{initial}} + Q_{\text{max}})) \times 100$

Definition 2: Percent Difference =  $(Q_{\text{max}} - Q_{\text{initial}}) / (Q_{\text{initial}} + ) \times 100$

The commenter noted that providing equations will reduce ambiguity or misinterpretation of requirements.

*Response:* EPA revised the test method to include the following equation:

$$\text{Percent Difference} = 100 * (Q_{\text{max}} - Q_{\text{initial}}) / Q_{\text{initial}}$$

Where:  $Q_{\text{max}}$  = measured flow rate at any tested pressure level  
 $Q_{\text{initial}}$  = measured flow rate at the initial calibration point

EPA also provided a spreadsheet to the LCBs that will streamline the data entry, as well as improve the consistency and quality of the data and results generation.

### **Request to Revise Flow Meter and Pressure Transducer Accuracy and Resolution**

- a. One commenter requested that EPA update the required flow meter and pressure transducer accuracy and resolution to ensure readings indicate performance without concerns for measurement uncertainty. The commenter explained that gauge accuracy and resolution need to provide readings that will indicate performance meeting the criteria of the specification. Gauges with high accuracy and resolution should be specified to reduce measurement uncertainty without imposing significant additional test burden, the commenter said.

The commenter suggested the following language:

“Flow meter with a minimum resolution 0.01 gpm and accuracy of +/-1 percent plus 0.005 gpm across rated range. Pressure transducer with a minimum resolution of 0.0035 percent full scale and accuracy of +/-0.1 percent full scale range.”

*Response:* EPA acknowledges the commenter’s request to tighten the accuracy and resolution of the equipment, but has decided not to make such a change that will likely increase the cost of equipment, when the test method doesn’t require measurements to this level of accuracy. EPA is confident the equipment specifications included in the test method are appropriate for the measurements required. For example, a flow meter with 1 percent accuracy plus 0.005 gpm versus a flow meter with 1.5 percent accuracy results in a difference of 0.0025 gpm, which is a quantity below the resolution (0.01 gpm) of the more accurate flowmeter. Regarding the pressure transducers, the range of variation in outlet pressure for most spray sprinkler body models tested ranged between 1.5 and 2.0 psi across the rising limb test, making a transducer with 0.5 psi maximum accuracy adequate. Also note that 0.5 psi error at 30 psi is approximately 1.7 percent, which is similar to the flow rate accuracy of 1.5 percent. However, EPA revised the language to specify accuracy, “0.5 psi across the range” to reflect how pressure transducers are specified, which is a percentage of full scale, not as a fraction of psi across a range. The new language states, “Accuracy (including linearity, hysteresis, and repeatability) shall be within 0.3% full scale output.” Additionally, stakeholders can be assured that proper instrumentation is used because LCBs must comply with *ISO/IEC 17025:2005 General requirements for the competence of testing and calibration laboratories*, which requires in Section 5.5 that equipment be capable of achieving the accuracy required for the test method.

### **Request to Revise Product Sampling and Selection Regime**

- a. Two commenters requested more samples be tested that come from at least three different manufacturing lots or date codes. While *ASABE/ICC 802-2014*

only requires five samples selected from a lot of 25 units, the commenters stated that this is insufficient for a labeling program.

One of the commenters explained that in the manufacturing process, products are made at different times with different molds and machines. Five samples from a lot of 25 could likely all come from the same machine and mold and may be manufactured on the same date. Requiring more samples from different manufacturing lots or date codes would provide a better representation of how well the products perform overall, the commenter said. Additionally, since the number of test pressures are significantly less than *ASABE/ICC 802-2014*, the commenter said, testing additional sprinklers should not be that much more expensive. Further, testing the sprinklers in groups and using an average flow rate will also shorten the testing time in the lab. Results from each test lot or manufacturing date code could identify potential variation in manufacturing, the commenter suggested.

The commenter suggested the following language:

1. Product Sampling and Selection

(a) Products shall be sampled and selected for testing in accordance with Section 303.1.1 of *ASABE/ICC 802-2014* (i.e., ~~a minimum of five samples, selected at random from a lot of at least 25 units~~ five samples selected at random from three different lots of 25 for 15 samples to be tested).

*Response:* EPA based the sampling scheme on *ASABE/ICC 802-2014 Landscape Irrigation Sprinkler and Emitter Standard*, a consensus-based standard that included committee members from industry, utilities, and other stakeholder groups. EPA has decided not to require testing across lots, or require more than five samples for testing, as this would be unduly burdensome. EPA addresses the variation in manufacturing through the [WaterSense Product Certification System](#), which includes an initial production inspection and ongoing compliance testing (i.e., product retesting). These requirements allow EPA to assess the ability of a manufacturer to continuously manufacture a quality product.

## Test Conditions

- a. Two commenters requested that the test method include an additional step before testing the products to condition the samples with pressurized water. The commenters explained that often, the devices are assembled without being water-tested in the factory, and then the pressure-regulating devices could have been sitting in boxes for an extended period. By conditioning the samples before testing, the commenters said, the pressure-regulating device will be exercised and operational prior to the testing.

One commenter suggested adding the following language to Section 2 of Appendix B:

"2. Test conditions.

(c) All units shall be conditioned by running water through the sprinklers including an appropriate nozzle and screen at two different operating pressures of 10 psi and 20 psi above rated pressure regulation for two minutes for each pressure setting prior to testing."

*Response:* EPA decided not to add further conditioning requirements to the test method included in Appendix B of the specification. While conditioning, as described by the commenters, is not called out specifically in the test method, it is conducted in the first step of testing when the test samples are conditioned during stabilization at regulation pressure. Additionally, the results in the [Pressure Regulating Spray Sprinkler Body Final Test Report](#) showed no difference between the first and last test data points, indicating that further conditioning was not required on the test samples. Further, both *ASABE/ICC 802-2014 Landscape Irrigation Sprinkler and Emitter Standard* (Section 303.1.2) and the test method included in Appendix B of the specification (Section 2.b. under "Test Conditions") specify conditioning of the product such that "test samples shall be stored at ambient laboratory conditions for a minimum of 12 hours prior to testing. Test samples shall be flushed prior to testing."

### **Request to Test with Nozzles and Screens, Test at Two Flow Rates, and Test as Products Are Used in the Field**

- a. One commenter requested that the test method use nozzles and screens instead of a needle valve to test performance of the pressure-regulating device to control flow. The commenter noted that using two different flow rates to verify consistent performance of the pressure-regulating device adds confidence in the product. Half-circle nozzles represent the vast majority of spray body sprinklers being used in small landscaped areas, but the full-circle nozzle represents the typical maximum flow that the device must be able to regulate for proper flow. Data from the [Pressure Regulating Spray Sprinkler Body Final Test Report](#) seem to indicate that there are some differences in performance between high and low flow rates for some products.

The commenter further stated that sprinklers should be tested as they are used in the field with the appropriate nozzle, screen, and in a vertical position. Instead of using a pressure transducer on the downstream side of the nozzle location, the effectiveness of the internal pressure-regulating device can be determined by measuring flow. Flow could be measured either with a flow sensor or by collecting the water and measuring the total volume for a specific test. If collecting the water, then accurate timing would be necessary to establish a flow rate. The commenter said to compare flow rates of a sprinkler without pressure regulation but with the exact same nozzle and screen to generate performance curves and comparisons. Testing multiple sprinklers at the same time and determining an average flow could shorten test time and allow for more units to be tested. This would actually be representative of how products are used in the field with multiple sprinklers operating at the same time in a zone.



The commenter explained that for some of the products to perform correctly, the nozzle and associated screen are an integral part of how the sprinkler works, especially if there is a feature with flow stop or flow restriction when the nozzle is missing. Testing in the vertical orientation represents how the product is used in the field and removes the possibility that a horizontal orientation would impede the sprinkler from popping up the stem fully or impeding the stem from retracting completely as would be expected in the vertical position, the commenter said. In the field, sprinklers are installed in an almost vertical position. As such, the commenter recommended the products be tested in their normal operating field position.

The commenter proposed the following revision to Section 3 under “Test Procedure” in Appendix B of the specification:

### 3. Performance Test

- (a) Select a sufficient number of nozzles as indicated below to be used on a non-pressure regulated sprinkler to establish base flow rate at the declared pressure regulation. The same nozzle shall be used on a sprinkler body with pressure regulation for the various steps of increased inlet pressure as delineated in step (b) to measure flow rate of the pressure-regulating device.

Low-flow nozzles shall have the following characteristics:

- Spray nozzles of a fixed arc shall have a flow rate between 1.00-1.40 gpm at 30 psi operating pressure. (Similar to a 12-foot, 180-degree fixed-arc spray nozzle.)

High-flow nozzles shall have the following characteristics:

- Spray nozzles shall have a flow rate between 3.00-4.00 gpm at preferred operating pressure and have a radius of throw of 15 feet. (Similar to a 15-foot, 360-degree fixed-arc spray nozzle.)

- (b) Follow test procedure as currently specified, testing multiple sprinklers at once.
1. Five non-pressure-regulated sprinklers, nozzles and screens shall be tested at the inlet pressure, matching the declared pressure regulation of the sprinkler body at the same time and recording total flow. Divide the total flow by the number of units to obtain an average flow rate.
  2. Using the same nozzles and screens from #1 above, install five pressure-regulated sprinkler bodies. Test at the various inlet pressures as currently outlined in the test specification. Divide the total flow by the number of units to obtain an average flow rate for each inlet pressure.

*Response:* EPA acknowledges that the test method included in the draft specification does not test products as they are used in the field. The test method presented in the draft specification was adopted from a consensus-based standard that aims to specifically test the pressure-regulating performance of spray sprinkler bodies via flow rate variation relative to the initial flow rate and regulation pressure. The committee that developed the *ASABE/ICC 802-2014 Landscape Irrigation Sprinkler and Emitter Standard* was comprised of several stakeholder groups, including industry (e.g.,

manufacturers) and utilities, and underwent public comment. Whenever possible, EPA adopts test methods from consensus-based standards (sometimes with modifications, as in this instance). This benefits all stakeholders because it results in an agreed-upon test method developed by committee members with various points of view.

Additionally, WaterSense conducted extensive testing with multiple laboratories to validate the test method (i.e., ensure it was repeatable among laboratories and produced consistent results) and generate a set of performance data. WaterSense worked with three independent laboratories to conduct testing on several spray sprinkler bodies with and without pressure regulation, using a modified version of the test method included in *ASABE/ICC 802-2014*. These modifications were based on either public comment from the Notice of Intent (NOI) phase or suggestions by the laboratories.

The three laboratories conducted performance testing using the revised test method between April 2015 and April 2016. Each laboratory tested three models of spray sprinkler bodies with pressure regulation (from three separate brands) and three models of spray sprinkler bodies without pressure regulation of the same brands, with three samples of each model. Results from the performance testing demonstrated that the products perform as intended, though results were inconsistent among laboratories, indicating that the test method needed to be clarified in several areas. Specifically, the various methods the laboratories used to control flow (i.e., variable arc nozzles, gate valve, and needle valve) appeared to impact results. The laboratory using the variable arc nozzles stressed the difficulty of controlling flow to the specifications provided in the test method, and the gate valve also did not provide for consistent flow control. The needle valve provided the most consistent results from test to test. Therefore, WaterSense revised the test method to specify that a needle valve shall be used to control flow. Additionally, WaterSense revised the method to introduce a reduction to 0 psi between each pressure level to address hysteresis found in initial results. For additional information on the independent laboratory performance testing and subsequent test method revisions, please review [Landscape Irrigation Sprinklers: WaterSense Specification Update](#), published in November 2015.

WaterSense then contracted with the University of Florida to conduct a final round of performance testing on nine spray sprinkler bodies with and three spray sprinkler bodies without pressure regulation using the revised test method. This testing was conducted to determine a range of spray sprinkler body performance, as well as to determine the water savings of these products when compared to their standard counterparts (i.e., spray sprinkler bodies without pressure regulation). The data from the University of Florida performance testing formed the basis of the water savings calculations included in WaterSense outreach materials, as well as the performance criteria included in the specification. These data are available in the final report, [Pressure Regulating Spray Sprinkler Body Final Test Report](#).

To date, EPA does not have data indicating the test method recommended by the commenter is more appropriate than the test method proposed in the draft specification. Because EPA does not have sufficient data to warrant a modification to the test method as proposed, EPA has retained the test method proposed in the draft specification. If test

data using the commenter's recommended test method are generated and indicate changes need to be made to the current test method, EPA will consider those changes in future versions of the specification.

Regarding the commenter's specific points, please see the response to the recommendation to test at a high and low flow rate under Section II under "Request to Revise the Flow Rate at Maximum Operating Pressure to be the Maximum Flow Rate at Any Pressure." Regarding the request to test in a vertical orientation, the assembly used during performance testing was supported such that the stem of the spray sprinkler body was horizontal and the pressure was sufficient to activate the stem. Regarding the comment on products with flow stop or flow reduction, EPA has worked with manufacturers of these products to ensure their products can be accurately tested using the test method presented in the specification. Additionally, EPA is concerned with the proposal of testing multiple sprinklers at once because it does not allow for the measurement of sample to sample variability, eliminating replication from the test method.

Finally, EPA would like to emphasize that the test method developed by ASABE/ICC committee and adopted (with modification) by WaterSense aimed to isolate the product's ability to regulate outlet flow at a range of inlet pressures. While EPA understands the commenter's desire to test spray sprinkler bodies with nozzles, doing so introduces several levels of variability in the test. For example, if a nozzle impacts performance, then testing with different nozzles will produce variable results. Additionally, it is not clear which brand and model of nozzle or how many different nozzles the spray sprinkler body would be tested with, which then impacts the certification and labeling of the spray sprinkler body and its nozzle as a set.

### **Calibration of Test Instruments**

- a. One commenter noted that the specification is silent on the calibration of test instruments. The commenter said that calibration should be addressed with as much specificity as practical, because testing with equipment that is not calibrated will not necessarily produce the same results as equipment that is calibrated. The commenter noted that perhaps the ISO standards are available that can be incorporated by reference.

*Response:* In accordance with the [WaterSense Product Certification System](#), testing must be conducted by a laboratory that is accredited or has been assessed for compliance with *ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories*. Section 5 of ISO/IEC 17025 specifies the general requirements for laboratory equipment, calibration, and maintenance.

### **Revision to Equipment List**

- a. One commenter noted that the diagram of the test setup includes a needle valve and two pressure gauges that are not listed and described in the Equipment List.

*Response:* EPA has revised the Equipment List in the test method to include these pieces of equipment.

## VII. General Comments on the Specification

### General Specification Support

- a. One commenter said they support the adoption of a WaterSense specification for these products and is encouraged by the progress that has been made up to this point.
- b. One commenter who said they support developing a specification for this product category noted that their state is emerging from severe drought conditions and continues to focus on ways to conserve its limited water supply. The commenter said they are pleased that EPA's specification proposes to utilize the pressure regulation technology as a means to eliminate water waste in situations where the water supply pressure exceeds the recommended spray sprinkler nozzle operating pressure. The specification has the potential to encourage consumers to choose spray sprinkler bodies that can save what EPA estimates to be billions of gallons of water across the country.

The commenter said the test results provided by EPA have the hallmarks of a strong test procedure, as they show a clear differentiation in product performance and reduction in flow between those products with pressure regulation and those without pressure regulation.

The commenter urges the EPA to finalize the WaterSense specification as soon as possible so that consumers will be able to use the WaterSense label to identify water-saving spray sprinkler bodies.

- c. One commenter said that sprays (sic) should be pressure-regulated and applauded EPA's efforts.

*Response:* EPA thanks the commenters for their support of this specification.

### Concern Over Replacement, Product Marking and System Performance

- a. One commenter stated that the specification, though data driven, ignores important real-world factors, including the following language (which is not EPA's):
  - 1) The specification is based on data relating to pressure; it ignores two important data sets—actual impact on system performance and consumer behavior.

- 2) If this is mandated for new systems, homeowners will invariably replace them with widely-available, non-pressure-regulating spray bodies from time to time; how does this impact system performance?
- 3) For existing systems, all spray bodies in a zone must be replaced or we would expect system performance to go down and watering times to go up; this should be studied.
- 4) Marking a spray body cap with PRS or "Pressure-regulating" is meaningless to most homeowners; how will the fact that a zone has pressure-regulating spray bodies be clearly communicated to the customer?
- 5) Pressure-regulating heads are expensive and uncommon in retail; what is the standard for retail packaging that will help customers distinguish among pressure-regulating and non-pressure-regulating spray bodies?
- 6) The specification, as drafted, will create tremendous confusion in retail channels and among homeowners, and will likely fail to produce true water conservation.

The commenter suggested including an up-front disclaimer, such as:  
"Note: Pressure-regulating spray bodies can conserve water when ALL sprinklers in a zone incorporate pressure-regulating spray bodies. For new systems in which pressure-regulating spray bodies are used in the initial system installation, each zone should be marked at the controller as such and a notice affixed to the controller alerting the site manager or homeowner that replacement of any spray body should be with an equivalent pressure-regulating spray body. For existing systems composed of non-pressure-regulating spray bodies, ALL spray bodies in a zone must be replaced with pressure-regulating spray bodies in order to maintain system performance and achieve conservation."

The commenter noted that even that last sentence is a bit of a stretch. Homeowners do curious things to their existing systems to compensate for dry spots (poor uniformity) and plant maturation, including moving/adding heads and changing nozzles, the commenter said, so it is questionable whether simple replacement with pressure-regulating spray bodies will demonstrably improve uniformity. In the real world, the commenter said, it is equally likely they will impair it. The commenter noted that the Southern Nevada Water Authority can provide data from their rotating nozzle experiment at 200-plus sites, which supports this point.

The commenter noted that he raised these concerns with Brent Mecham (IA) and encourages EPA to add their voice in support of bringing consumer focus and further in-field study to the spray head specification.

*Response:* WaterSense is a voluntary program that aims to make it simpler to find water-efficient products. EPA agrees that real-world factors (e.g., consumer behavior) play a role in potential water savings from labeled spray sprinkler bodies, and other labeled products as well (e.g., weather-based irrigation controllers). EPA developed the specification test method and criteria to objectively assess, in a repeatable manner across laboratories, whether the

products perform as they are intended (e.g., does the pressure-regulating device adequately regulate pressure and flow?). EPA is not able to reliably test the products in field settings that incorporate subjective human behavior. However, EPA aims to address the human behavior aspect through marketing and education. For this specific product category, marketing efforts related to replacement in systems with labeled spray sprinkler bodies will encourage replacement with the same product. Marketing efforts will also focus on replacing an entire zone if a consumer is upgrading an existing system that does not include labeled spray sprinkler bodies. EPA aims to educate consumers on purchasing and using labeled products in a way that will result in the intended savings. Further, EPA partners with retailers and distributors to provide educational material to consumers about making smart choices.

EPA appreciates the suggestion for disclaimer text and will be communicating similar points in marketing materials associated with the labeled products. WaterSense will work with irrigation professionals, as well as manufacturer, retailer, distributor, and utility partners to educate consumers on these issues.

Regarding product packaging and consumer confusion, the label, which is required to be on product packaging, will help consumers identify high-efficiency products over their standard counterparts. The label is meant to convey the product's efficiency and performance without the need for consumers to be experts on a product (i.e., understand pressure regulation or how it saves water).

Regarding the concern over water savings and uniformity, please see the savings calculations in the [Specification for Spray Sprinkler Bodies Supporting Statement](#). These are only associated with a reduction in flow, not an improvement in uniformity. If uniformity of a system improves, those savings would be in addition to the water savings described in Appendix A.

### **Concern About Systems with Low Pressure**

- b. One commenter agrees with the concept of pressure regulation, but explained that it's not always needed because sometimes the system pressure is already too low for various, uncontrollable reasons.

The commenter requested that EPA not make it mandatory to have pressure regulation in sprinkler bodies, suggesting alternatively to educate the people that are handling the systems. The commenter said it could be done by way of labeling with quick info/warning label and weblink for more info, and by educating the irrigation techs/gardeners/landscapers. The commenter noted that awareness is currently minimal and that irrigation professionals educate the public constantly about these types of issues one household at a time.

*Response:* WaterSense labeled spray sprinkler bodies do not lower outlet pressure until the system pressure is above the regulation pressure (i.e., at low pressures the device does not engage). Therefore, they do not create issues for

systems with low pressure. Additionally, WaterSense is a voluntary program, and these products will not be mandatory in all systems. EPA will communicate that systems with higher pressure will save more water than those operating under low pressures. Further, to account for the varying levels of savings expected, EPA accounted for the range of system pressures found across irrigation systems in the savings calculations provided in the [Specification for Spray Sprinkler Bodies Supporting Statement](#).

### **Suggestions for Additional Measures for Outdoor Water Use Reduction**

- a. One commenter noted that code enforcement efforts need to improve to ensure irrigation systems are installed properly. For example, rain sensors should be installed in open areas and inspected for proper operation, proper irrigation schedules should be used, etc.
- b. One commenter noted that changing codes and zoning to require xeriscaping, instead of irrigation of plants that do not belong in some climates, makes vastly more sense.

*Response:* EPA recognizes that codes may be an important tool in ensuring water conservation. However, WaterSense is voluntary and does not develop or enforce codes. The program does promote outdoor water efficiency by encouraging the adoption of WaterSense labeled products, promoting professional certification, and developing marketing and outreach materials and other tools for consumers and promotional partners.

### **Request to Require Drain Check Valves in a Future WaterSense Specification**

- a. One commenter said they are studying sprinkler bodies to understand what additional water savings opportunities may be available. The commenter said the drain check valve, an optional component internal to the spray sprinkler body that prevents system drainage during periods of non-operation, will provide additional savings. The commenter requested that EPA study drain check valves for incorporation into a future specification for spray sprinkler bodies, explaining that drain check valves are another widespread irrigation industry approach to reduce unnecessary water use.

In summary, the commenter requested EPA specify a test method and performance level for drain check valve performance in a future version of the spray sprinkler body specification.

*Response:* EPA thanks the commenter for the recommendation and will consider drain check valves in future versions of the specification.

## Expand Scope of a Future WaterSense Specification to Include Additional Sprinkler Body Types

- a. One commenter said they are aware of other sprinkler bodies outside the scope of the proposed WaterSense specification where manufacturers offer pressure regulation, such as the impact driven sprinklers. The commenter indicated that they would support efforts to research test methods and performance levels of these additional sprinkler bodies to expand the scope of a future version of the WaterSense specification.

The commenter provided support for this work by explaining that pressure regulation may benefit other sprinkler types outside the current scope of the specification and suggested that in a future version of the sprinkler body specification, EPA specify a test method and performance level for pressure regulation for sprinkler bodies outside the current scope of the proposed regulation.

*Response:* EPA thanks the commenter for the recommendation and will consider additional sprinkler body types in future versions of the specification if test methods are available.

## VIII. Comments on the Specification Supporting Documentation

### Comments on Savings Calculations (Appendix A)

- a. One commenter asked two questions regarding the savings calculations included in the appendix of the supporting statement: 1) Where is the \$10.09 per 1,000 gallons water cost figure coming from in Equation 5? 2) In Equation 11 is the assumption that a resident purchases and installs the new heads themselves at retail cost? If the assumption is contractor-installed, EPA would need to also include assumed per-head labor, markup and profit costs to derive a more realistic return on investment (ROI).

*Response:* Regarding the first question, EPA obtained the \$10.09 per 1,000 gallons water cost value from an American Water Works Association (AWWA) rate survey (Raftelis Financial Consulting. Water and Wastewater Rate Survey. American Water Works Association. 2014) for the *Draft Specification for Spray Sprinkler Bodies Supporting Statement*. EPA revised the rate to \$11.02 per 1,000 gallons to reflect the updated AWWA rate survey (Raftelis Financial Consulting. Water and Wastewater Rate Survey. American Water Works Association. 2016) in the final [Specification for Spray Sprinkler Bodies Supporting Statement](#). Regarding the second question, the price quoted to EPA was the contractor price. EPA did not include labor cost because the labor occurs regardless of whether the product is labeled or a standard spray body, cancelling out the need to include the cost. For example, in Equation 10, labor would occur in both cases



(labeled spray sprinkler body vs. a standard spray body), so a cost differential between the two does not exist. In Equation 11, the replacement cost assumes the replacement comes at the end of a standard spray body's life, so the labor cost would exist whether another standard product was installed or a labeled spray sprinkler body was installed, cancelling out the need to include the cost.

- b. One commenter noted that the idea behind the draft specification is to encourage homeowners and contractors to replace the 100 or so million existing sprinklers in the United States. with sprinklers that provide in-stem, in-head, or in-body pressure regulation. The commenter said they believe that the cost in materials and labor for replacing all those existing sprinkler bodies is simply out of the question, and they find the cost effectiveness in the first paragraph on page 11 irrelevant, if not misleading.

The commenter noted that the cost of replacing the pop-up stem is much lower than the cost EPA included in the Supporting Statement, and being able to inexpensively change out existing above-grade sprinklers with an in-stem flow-regulating part will accelerate EPA's desire to promote the idea of pressure regulation to the public.

*Response:* EPA's goal with this specification is to encourage the use of labeled spray sprinkler bodies in new installations and when homeowners and businesses are replacing old products (i.e., natural replacement) as described in the [Specification for Spray Sprinkler Bodies Supporting Statement](#).

- c. One commenter noted that the section "Calculations and Key Assumptions" contains several assumptions that serve to understate the potential savings resulting from adoption of the specification. The commenter said these include:
- 13.5 million households with in-ground irrigation systems is attributed to the 2005 Residential Energy Consumption Survey (RECS) survey. It is not clear (and should be clarified) whether 13.5 million was the actual Residential RECS count in 2005, or whether some lower number was recorded in 2005 and that total increased by new landscapes installed since then, which the cover letter asserts to consist of one third of all new homes each year. Is 13.5 million the number of systems in 2005 or the number of systems in 2016? Either way, if it is based on RECS, it does not include any commercial landscape irrigation, which would add to the savings.
  - The average residential outdoor use of 50,500 gallons per year is attributed to *Residential End Uses of Water, Version 2* (REUWS V2). However, this figure is for all households, not just those with automatic irrigation systems. Residences with in-ground systems are likely to cluster in the highest quartile of water use, not the middle.
  - The analysis assumes that an average landscape has 50 percent irrigated turf. This seems like a reasonable method to determine the fraction of all landscaped area with turf, including homes with no turf, but not for determining the fraction of turf at a home with in-ground irrigation systems.

The commenter urged EPA to revisit the savings analysis with more plausible assumptions about the market for spray sprinkler bodies.

*Response:* Regarding the 13.5 million households, this is the number of systems at the time of publication of RECS data. EPA acknowledges that RECS doesn't include any commercial systems and, as such, is claiming residential savings only for the purpose of this savings analysis. EPA agrees that these products will be used in commercial settings, but does not have data available to calculate savings from this sector; and thus, the savings presented are conservative in nature.

Regarding the average residential outdoor water use value from REUWS V2, EPA acknowledges its limitations as pointed out by the commenter, but is using this value as a conservative estimate so as to not overestimate water savings.

Regarding the 50 percent irrigated turf concern, EPA did not characterize the 50 percent as turf, but as spray irrigation.

### **Aerosol Evaporation**

- a. One commenter noted that the following statement appears on page 20: "Flow rate reduction = potential water savings." The commenter explained that this is a scientifically indefensible statement, because aerosol evaporation occurs when the drop spectrum from a sprinkler produces aerosol of a size from 0.3 to 100  $\mu\text{m}$ . The commenter noted that these particles evaporate before they hit the ground; and further, it can be argued that this evaporation cools the plant's atmosphere and actually substitutes for water that would be taken in through the plant roots. To reach any quantifying conclusions on water savings, it would require the measurement of the drop spectrum.

*Response:* EPA thanks the commenter for this supplemental information.

### **Additional Data on Operating Pressures**

- a. One commenter noted that the *Draft Specification for Spray Sprinkler Bodies Supporting Statement* (pages 2-4) draws upon two datasets of irrigation site evaluations to conclude that 63 percent of systems receive water at more than 30 psi, leaving 37 percent that get water at 30 psi or less. The commenter said this latter cohort would obviously not contribute any water savings at all to the total. The commenter agrees with the Supporting Statement's recognition that the datasets of utility water pressure used in the savings analysis may not be representative. Water pressure is commonly above the levels suggested by this data. As an additional source for consideration, the commenter encouraged WaterSense to consider the pool of available validated water audit data compiled

into a single dataset of 246 utilities by George Kunkel<sup>1</sup>. This data was compiled to form a basis of comparison with water systems in Pennsylvania that prepared standardized water audits and was published in a recent report. Kunkel found the following values for average system pressure in this large dataset: median, 70 psi; 90th percentile, 105.75 psi; maximum, 170 psi. Notably, the lowest average system pressure reported by any utility in the dataset was 42 psi.

*Response:* EPA appreciates the commenter's submission of additional data. While it has not included these data in the dataset used to calculate water savings (those data were generated from irrigation system pressures measured during audits), EPA has included this information in narrative form in the [Specification for Spray Sprinkler Bodies Supporting Statement](#) to illustrate the additional possibility of high system pressure in other parts of the country.

## IX. Comments on the Cover Letter

### Request for Information Regarding Statement in Cover Letter

- a. One commenter requested additional information on an assertion in the cover letter that does not seem to appear anywhere else in the specification or its supporting material. The commenter explained that the second paragraph states that "an estimated one-third of new homes constructed each year include an irrigation system." The commenter noted that this bears directly on the potential water savings attributable to the specification, but is without documentation, and noted that it would be helpful to provide the documentation for this figure along with an indication of how it may have been used in the savings calculations in the Supporting Statement.

*Response:* The statement that one-third of new homes being constructed each year will include an irrigation system is based on the RECS 2005 data. However, EPA notes that this statement was included only to provide additional information on the potential number of systems that could be impacted by the specification. EPA did not use this information in its calculation of water savings included in the [Specification for Spray Sprinkler Bodies Supporting Statement](#). EPA only used the existing stock (13.5 million) in its national water savings calculations. Additional savings could be seen if all new homes with an irrigation system were to install WaterSense labeled spray sprinkler bodies.

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<sup>1</sup> Kunkel Water Efficiency Consulting, Report on the Evaluation of Water Audit Data for Pennsylvania Water Utilities, February 2017, pp. 20-22. <<https://www.nrdc.org/sites/default/files/pa-utilities-water-audit-data-evaluation-20170215.pdf>>.