

# NIST-Boulder Drinking Water

NIST S 7301.05

Approval Date: 03/18/2024

Effective Date:<sup>1</sup> 03/18/2024

## 1. PURPOSE

This suborder establishes requirements and responsibilities for maintenance and monitoring of the drinking water systems at the NIST Boulder and WWV/WWVB sites.<sup>2</sup>

## 2. BACKGROUND

Drinking water is supplied to the NIST Boulder site by the City of Boulder Water Utilities Division, the agency that provides drinking water to the City of Boulder. The Boulder Water Utilities Division conducts a rigorous maintenance/monitoring program to ensure the drinking water meets the National Primary Drinking Water Regulations [40 Code of Federal Regulations (CFR) 141] promulgated by the U.S. Environmental Protection Agency (EPA) and the Colorado Department of public Health and Environment (CDPHE). NIST maintains an on-site system of water supply piping and appurtenances. It is NIST's responsibility to ensure that the on-site water supply system conveys the drinking water safely to the employees, associates, and visitors at the NIST Boulder site.

The NIST WWV/WWVB facility is supplied with drinking water by the East Larimer County Water District which also has an extensive sampling program covering its treatment and distribution systems to ensure that drinking water is provided to its customers in compliance with 5 CCR 1002-11.

As classified by the U.S. EPA (40 CFR 141) and CDPHE (5 CCR 1002-11), the NIST-Boulder drinking water system is considered a consecutive, non-transient, non-community system<sup>3</sup>. Other entities with this type of drinking water system include schools, factories, some federal facilities and office buildings.

<sup>1</sup> For revision history, see Appendix A.

<sup>2</sup> A separate suborder (NIST S 7301.04) addresses drinking water at the NIST-Gaithersburg site.

<sup>3</sup> Consecutive water systems are supplied all of their water by a public water agency, such as the Boulder Water Utilities Division or East Larimer County Water District. Non-transient, non-community water systems supply water to at least 25 of the same people for at least 6 months per year.

34 NIST WWV/WWVB is classified as a consecutive, transient, non-community system under 40 CFR  
35 141.2 5 CCR 1002-11.

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37 It is NIST policy to maintain the drinking water system at the NIST-Boulder and WWV/WWVB  
38 sites in accordance with the International Plumbing Code, and to monitor the quality of drinking  
39 water by annually sampling one third all of the drinking sources at the Boulder site so that all  
40 sources are sampled in a thirty-six-month period and all three sources at the WWV/WWVB site once  
41 every three years.

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### 44 **3. APPLICABILITY**

45 This program applies to the drinking water system at the NIST Boulder and NIST WWV/WWVB  
46 sites. Drinking water systems in the portions of the Department of Commerce Boulder Labs owned  
47 by the General Services Administration (GSA) and leased to the National Oceanic and Atmospheric  
48 Administration (NOAA) are the responsibility of GSA and not covered under this suborder.

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### 51 **4. REFERENCES**

- 52 a. 40 CFR Part 141, [National Primary Drinking Water Regulations](#)  
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54 b. Code of Colorado Regulations (CCR), 5 CCR 1002-11, [Colorado Primary Drinking Water](#)  
55 [Regulations](#)  
56  
57 c. International Plumbing Code, International Code Council, 2015  
58  
59 d. NFPA 25, Inspection, Testing, and Maintenance of Water Based Fire Protection Systems  
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61 e. NFPA 291, Recommended Practice for fire Flow Testing and Marking of Hydrants  
62  
63 f. Boulder Revised Code (BRC), Title 11, Chapter 1, [Water Utility](#)  
64  
65 g. Code of Larimer County, Chapter 10, Article III, [Plumbing Standards](#)  
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### 68 **5. APPLICABLE NIST ENVIRONMENTAL OR OTHER SUBORDERS**

- 69 a. [NIST S 7301.01, Environmental Management System](#)  
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**6. REQUIREMENTS**

a. Maintenance of the NIST Boulder and WWV/WWVB Drinking Water Systems

(1) Maintenance of the drinking water systems at NIST Boulder and WWV/WWVB shall be performed by the NIST Office of Facilities and Property Management (OFPM) in accordance with the International Plumbing Code.

(2) Maintenance of the drinking water system shall include the following:

- (a) Development and implementation of written drinking water system maintenance procedures for the following:
  - i. Flushing (e.g., unidirectional, conventional) of the NIST Boulder and WWV/WWVB systems;
  - ii. Testing and maintenance of backflow preventers;
  - iii. Valve and hydrant exercise and maintenance in accordance with NFPA 25 and 291 and NIST Boulder site requirements;
  - iv. Maintenance of a current water distribution map;
  - v. Appropriate disinfection of pipelines after maintenance work/new piping installation is performed; and
  - vi. Back flushing and maintenance of water filters installed by OFPM (e.g., whole building filters, drinking fountain filters) in accordance with manufacturers' requirements.

(b) Cross Connection Survey

- i. A cross-connection survey of the NIST Boulder and WWV/WWVB Drinking Water Systems shall be conducted and updated as changes are made to the system. The following shall be included in the survey:
  - (i) All end uses of the system shall be surveyed.
  - (ii) All cross-connections shall be documented and evaluated for elimination.

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115 (iii) If a cross-connection is required, an approved backflow preventer must be  
116 installed, inventoried, and maintained.

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118 (c) Backflow Prevention

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120 i. Non-potable water systems shall be isolated from the main potable water distribution  
121 system at the Boulder and WWV/WWVB sites by either eliminating a cross-  
122 connection or installing a backflow preventer.  
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124 ii. The selection of backflow preventers shall be based on the hazard levels described in  
125 Table 1 below.  
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127 iii. Any cross connection between the chilled water system and the potable water system  
128 at the NIST-Boulder and WWV/WWVB sites shall be considered “High Hazard” as  
129 described in Table 1.  
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131 iv. High-hazard back flow preventers shall be maintained on the water mains servicing  
132 the NIST-Boulder and WWV/WWVB sites. Annual test reports for these back-flow  
133 preventers shall be submitted to the City of Boulder Water Utilities Division or East  
134 Larimer County Water District as appropriate. Certification reports shall be submitted  
135 to the appropriate utility by June 30 of each year. Any failure of these back-flow  
136 preventers shall be reported to the NIST Boulder Safety, Health and Environment  
137 Division (BSHED) in the NIST Office of Safety Health and Environment (OSHE)  
138 and to the City of Boulder Water Utilities Division or East Larimer County Water  
139 District as applicable.

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**Table 1. Backflow Preventer Requirements**

	<b>Description</b>	<b>Types of Backflow Preventer Allowed</b>
Low Hazard (Non-Health Hazard)	A cross-connection or potential cross-connection involving any substance that generally would not be a health hazard but would constitute a nuisance or be aesthetically objectionable if introduced into the potable water supply. The substance must be non-toxic and non-bacterial in nature with no significant health effect.	Testable backflow preventers rated for low-hazard applications, such as double-check backflow assemblies, should be considered whenever possible. Non-testable backflow preventers are allowed but must be replaced or rebuilt every 5 years. Backflow preventers suitable for high-hazard applications may also be used.
High Hazard (Health Hazard)	A cross-connection or potential cross-connection involving any substance that could, if introduced into the potable water supply, cause death or illness, spread disease, or have a high probability of causing such effects. The substance may be toxic to humans either from a chemical, bacteriological, or radiological standpoint.	Air-gap-separation or testable reduced-pressure-principle backflow preventers should be considered whenever possible. Air gaps must be at least the width of the supply pipe above the flood level of the receiving container or a minimum of one (1) inch, whichever is greater. Testable backflow preventers specified in the 2015 International Plumbing Code rated for high-hazard applications are also acceptable.

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(d) Backflow Preventer Testing and Maintenance

- i. All required backflow preventers shall be tested and certified as operational by an individual meeting the qualifications in Section 6a(2)(b) in accordance with the following schedule:
  - (i) High-Hazard Applications – Testable Backflow Preventers:
    1. At least annually;
    2. At installation;
    3. After repair, relocation, or replacement;
    4. Following any backflow incident;

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- 5. Prior to any reactivation of a water system after being out of service; and
  - 6. Repaired or replaced if failing annual inspection.
- (ii) Low-Hazard Applications – Testable Backflow Preventers: Follow same schedule as High-Hazard Applications.
  - (iii) Low-Hazard Applications – Non-Testable Backflow Preventers: Replace or rebuild and certify as operational every 5 years.
- ii. All backflow preventers shall be tagged with identification number and test date.
  - iii. As a recommended practice, personnel who test backflow preventers shall not test or certify backflow preventers that they have responsibility for installing and/or maintaining.
  - iv. A current inventory shall be maintained of all backflow preventers at the NIST Boulder and WWV/WWVB sites. The inventory shall include:
    - (i) The identification number, serial number, model number and location; and
    - (ii) A schedule for routine inspections, testing, and maintenance identified in the first bullet in Section 6.a(2)(b), (c) and (d) above. A preventative maintenance schedule in the MAXIMO Asset Management System may be used to meet this requirement.
- b. Monitoring of the NIST Boulder and WWV/WWVB Drinking Water
- (1) Routine monitoring of the quality of the drinking water at NIST Boulder and WWV/WWVB shall be performed by an OFPM-contracted testing laboratory certified in accordance with 40 CFR 141.23(k)(3), 141.24(f)(17), 141.24(f)(20), 141.24(h)(19), 141.28(a) and 141.705(a-c).
- (a) Monitoring Locations
    - Drinking water samples shall be collected and analyzed from the following locations on the NIST Boulder and WWV/WWVB sites:
      - i. Every drinking water fountain; and
      - ii. Every kitchen sink.

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(b) Monitoring Frequency

The frequency of drinking water monitoring shall meet the following:

- i. Drinking water from each location identified in (a) above shall be monitored no less than once in every consecutive 36-month period. <sup>4</sup>.

(c) Monitoring Parameters

Each drinking water sample shall be analyzed for the parameters listed in Table 2.

**Table 2. Annual Drinking Water Analyses**

Parameter	EPA Method <sup>5</sup>
Total Coliform Bacteria (If Total Coliform is positive, E. Coli will be sampled)	SM 9223B
Lead	EPA 200.8
Cadmium	EPA 200.8
Aluminum	EPA 200.8
Copper	EPA 200.8
Zinc	EPA 200.8 <sup>33</sup>

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(d) Sampling Protocol Requirements

- i. All drinking water sampling shall be performed in compliance with 5 CCR 1000-11 and applicable EPA protocols and methodologies.
- ii. Sampling location preparation and sample collection shall follow the EPA Guidance Document, “Quick Guide to Drinking Water Sample Collection” Second Edition Update, 2016 or a more recent EPA approved version.
- iii. Sample storage (holding times) shall follow the current EPA testing methods specifications.
- iv. Chains of custody shall be completed for all samples analyzed.

<sup>4</sup> Assuming the NIST Boulder Site has 78 sampling locations, each year 26 samples shall be collected and analyzed.

<sup>5</sup> Analysis shall be conducted by a CDPHE-certified (5 CCR 1000-11.46(12)-(14)) Drinking Water Laboratory that is specifically certified for the methods listed in Table 2. EPA-approved analytical methods other than those noted may be acceptable if approved by BSHED.

250 (2) Management of Drinking Water Analysis Results

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252 (a) The contractor performing the sampling shall report a summary of the analytical  
253 results in the form of a Consumer Confidence Report.

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255 (b) Analytical results from the contracted laboratory shall be provided by OFPM to  
256 BSHED upon receipt.

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258 (c) The analytical results shall be reviewed by BSHED.

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260 c. Corrective Actions

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262 (1) If it is determined by BSHED that drinking water analysis results do not meet National Primary  
263 Drinking Water Standards, OFPM and BSHED shall take the following actions:

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265 (a) Ensure that signs are posted immediately at the impacted fountains and sinks to indicate that  
266 they are “out of service”. (OFPM)

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268 (b) Communicate the findings to NIST management, the Public Affairs Office, and potentially  
269 affected NIST employees, associates, and visitors. (BSHED in consultation with OFPM)

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271 (c) Resample the affected drinking water source(s) and analyze for the contaminant(s) of  
272 concern. (OFPM)

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274 (d) Provide bottled water to affected NIST employees, associates, and visitors if necessary (see  
275 Section (5) below). (OFPM)

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277 (e) Investigate the drinking water non-compliance immediately to identify the root cause and  
278 necessary corrective actions, e.g., equipment repairs; cleaning/disinfection of affected pipes,  
279 valves, and other appurtenances; flushing the affected systems. (OFPM in consultation with  
280 BSHED)

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282 (f) After corrective actions have been implemented, re-sample the drinking water and analyze  
283 for the contaminants of concern. (BSHED)

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285 (g) If the sampling results do not confirm the success of the corrective actions in addressing the  
286 drinking water non-compliance, start the above actions again.

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288 (h) If the sampling results do confirm the success of the corrective actions, place the drinking  
289 water system back in service. (OFPM)



290 (i) If the sampling results confirm the success of the corrective actions, issue follow-up  
291 communications to NIST management, the Public Affairs Office, and potentially affected  
292 NIST employees, associates, and visitors. (BSHED in consultation with OFPM and NIST  
293 management)

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295 (2) For any analytical results indicating contaminant concentrations greater than one half  
296 of the Primary Drinking Water Standard or suspected to originate from NIST Boulder  
297 or WWV/WWVB activities, the Chief Facilities Management Officer and the Chief  
298 Safety Officer shall be consulted and potential corrective actions shall be considered.  
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300 d. Purchase of Bottled Drinking Water Using Appropriated Funds

301 In accordance with U.S. Comptroller General Decision B-247871 on the Purchase of Bottled  
302 Drinking Water (1992), appropriated funds may be used to purchase bottled drinking water only  
303 upon a showing of necessity. Necessity shall be established prior to any purchase of bottled water  
304 using appropriated funds, in consultation with BSHED. All purchases of bottled water shall be  
305 approved by the NIST Office Acquisitions and Agreements Management. Necessity is established,  
306 for example, where the available drinking water has been analyzed by appropriate authorities and  
307 found to pose a health risk. Practically this translates to any exceedance of a Primary Drinking Water  
308 Standard.  
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310 e. Safe Drinking Water Considerations in Design and Construction

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312 (1) Design and construction projects involving potable and non-potable water systems shall be  
313 carried out in accordance with the International Plumbing Code and BRC 11-1 or Code of  
314 Larimer County, Chapter 10, Article III as applicable.  
315

316 (2) Drinking water treatment/filtration systems shall not be installed by OFPM unless they will be  
317 maintained by OFPM and added to the OFPM maintenance database. Improperly maintained  
318 treatment/filtration systems can become a source of drinking water contamination.  
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320 (3) Non-OFPM staff are prohibited from adding water treatment/filtration systems without prior  
321 coordination with OFPM.  
322

323 f. Communications

324  
325 (1) All drinking water monitoring results and corrective actions will be made readily available to  
326 NIST management and staff by BSHED.  
327

- 328 (2) The following actions will be performed annually by BSHED:  
329
- 330 (a) Obtain the City of Boulder Water Utilities Division and East Larimer County Water District  
331 annual reports;
  - 332
  - 333 (b) Review the reports to determine if any water quality deterioration is occurring;  
334
  - 335 (c) Amend the reports with information on testing conducted at NIST Boulder and  
336 WWV/WWVB; and  
337
  - 338 (d) Post the reports on the [NIST-Boulder Drinking Water Program](#) web page.  
339
- 340 (3) Communications of monitoring results and amended City of Boulder Drinking Water Quality  
341 Report and Larimer County Annual Water Quality Report shall encourage the NIST staff to  
342 report drinking water concerns to OFPM.  
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- 344 g. Internal Compliance Assessments  
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- 346 (1) Internal compliance assessments shall be conducted by BSHED at least once per calendar year to  
347 verify ongoing compliance with the requirements of this suborder.  
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  - 349 (2) Internal compliance assessments shall include:  
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    - 351 (a) A review of the drinking water system maintenance procedures and records for cross-  
352 connection control, backflow prevention, valve exercise, hydrant flushing, and disinfection  
353 practices during all water main repairs; and  
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    - 355 (b) A review of water quality monitoring results, including any non-compliances and corrective  
356 actions.  
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- 358 h. Records  
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- 360 (1) The following records shall be maintained by OFPM for the periods of time indicated and shall  
361 be made available upon request:  
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    - 363 (a) Cross-connection inspection records – 5 years  
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    - 365 (b) Backflow preventer testing and maintenance records – 10 years  
366
- 367 (2) The following records shall be maintained by BSHED for the periods of time indicated:

- 368 (a) Bacteriological monitoring results – 5 years
- 369
- 370 (b) Aluminum, lead, copper, cadmium, and zinc testing results – 12 years
- 371
- 372 (c) All other chemical monitoring results – 10 years
- 373
- 374 (d) Actions taken to correct non-compliances – 3 years after the actions have been completed
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- 376 (e) Consumer confidence reports – 5 years
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- 378 (f) Internal compliance assessments – 5 years
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## 381 7. DEFINITIONS

- 382 a. Air Gap – The unobstructed vertical distance through free atmosphere between the lowest effective
- 383 opening from any pipe or faucet conveying water or waste to a tank, plumbing fixture, receptor, or
- 384 other assembly and the flood level rim of the receptacle. These vertical, physical separations must be
- 385 at least twice the effective opening of the water supply outlet, never less than 1 inch above the
- 386 receiving vessel flood rim.
- 387
- 388 b. Annual Water Quality Report – An annual report that provides drinking water quality information.
- 389 The report must contain certain mandatory information and be delivered to customers annually by
- 390 July 1. This deadline applies to the East Larimer County Water District, as the public water utility
- 391 supplying WWV/WWVB.
- 392
- 393 c. Backflow – An unwanted flow of potable water in the reverse direction, often caused by siphonage
- 394 or backpressure of water due to a water main break or loss of pressure.
- 395
- 396 d. Backflow Preventer – A device used to protect potable water distribution lines from contamination
- 397 due to backflow.
- 398
- 399 e. Backpressure – A pressure, higher than the supply pressure, caused by a pump, elevated tank, boiler,
- 400 air/steam pressure, or any other means, which may cause backflow.
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- 402 f. City of Boulder Water Utilities Division – The local water utility that supplies potable water to NIST
- 403 Boulder.
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- 405 g. Community Water System – A community water system is a public water system that serves at least
- 406 15 service connections used by year-round residents, or regularly serves at least 25 year-round
- 407 residents.

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409 h. Consecutive Public Water System – A water system that has no water production or source facility  
410 of its own, obtains all of its water from another water system, and meets the definition of a public  
411 water system.  
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- 413 i. Consecutive, Transient, Non-Community Water System – A non-community water system that has  
414 no water production and serves a population of at least 25 people for at least 60 days per year and is  
415 not a non-transient, non-community water system or a community water system.  
416
- 417 j. Consecutive Water System – A water system that obtains some or all of its water from another water  
418 system. Often a consecutive water system has no water production or source facility of its own.  
419 NIST Boulder is classified as a consecutive water system.  
420
- 421 k. Cross-Connection – A connection or potential connection between any part of a potable water  
422 system and any other environment containing other substances in a manner that, under any  
423 circumstances, would allow such substances to enter the potable water system. Other substances may  
424 be gases, liquids, or solids, such as chemicals, water products, steam, water from other sources  
425 (potable or non-potable), or any matter that may change the color of or add odor to the water. Bypass  
426 arrangements, jumper connections, removable sections, swivel or changeover assemblies, or any  
427 other temporary or permanent connecting arrangement through which backflow may occur are  
428 considered to be cross-connections.  
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- 430 l. Drinking Water Quality Report – An annual report that provides drinking water quality information.  
431 The report must contain certain mandatory information and be delivered to customers annually by  
432 July 1. This deadline applies to the City of Boulder Water Utilities Division, as the public water  
433 utility supplying NIST-Boulder.  
434
- 435 m. East Larimer County Water District – The local water utility that supplies potable water to NIST  
436 WWV/WWVB.  
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- 438 n. NIST Boulder Drinking Water Program Manager – An BSHED staff member appointed by the Chief  
439 Safety Officer who carries out OSHE’s assigned roles and responsibilities for the Drinking Water  
440 Program at NIST Boulder.  
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- 442 o. Non-Transient, Non-Community Water System – A public water system that is not a community  
443 water system and that regularly serves at least 25 of the same persons over 6 months per year.  
444 Examples of entities having such systems include schools, factories, office buildings, and hospitals.  
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- 446 p. Public Water System – A system for the provision of water for human consumption through pipes or  
447 other constructed conveyances, if such system has at least 15 service connections or regularly serves  
448 an average of at least 25 individuals at least 60 days out of the year.  
449 q. Service Connection – A service connection is the opening, including all fittings and appurtenances,  
450 at the water main through which water is supplied to the user.

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## 453 **8. ACRONYMS**

- 454 a. BSHED – NIST Boulder Safety, Health and Environment Division  
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456 b. CDPHE – Colorado Department of Public Health and Environment  
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458 c. CCR – Code of Colorado Regulations  
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460 d. CFR – Code of Federal Regulations  
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462 e. EPA – U.S. Environmental Protection Agency  
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464 f. OFPM – NIST Office of Facilities and Property Management  
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466 g. OSHE – Office of Safety, Health, and Environment  
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468 h. OU – Operational Unit  
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470 i. WWV/WWVB – NIST broadcast facility located near Fort Collins, Colorado

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## 473 **9. RESPONSIBILITIES**

474 The roles and responsibilities specific to this suborder are as follows:

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### 476 a. Chief Facilities Management Officer:

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478 (1) Ensuring the requirements applicable to OFPM in Section 6 of this suborder are met.

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480 (2) Ensuring cross connection surveys are performed and records maintained;

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482 (3) Ensuring an inventory of backflow prevention devices is developed and maintained;

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484 (4) Ensuring backflow prevention testing and maintenance is performed; and

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486 (5) Ensuring sampling and monitoring are performed and results are distributed in Consumer  
487 Confidence Reports.

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490 f. BSHED Drinking Water Program Manager:

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492 (1) Ensuring the requirements applicable to BSHED in Section 6 of this suborder are met;

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494 (2) Serving as NIST's principal point of contact with East Larimer County Water District, City of  
495 Boulder Water Utilities Division, CDPHE, and EPA regarding drinking water issues, or  
496 designating another member of BSHED to do so; and

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498 (3) Ensuring BSHED and OSHE management are kept up on regulatory or other compliance  
499 requirements through periodic updates.

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## 503 **10. AUTHORITIES**

504 None

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## 507 **11. DIRECTIVE OWNER**

508 Chief Safety Officer

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## 511 **12. APPENDICES**

512 A. Revision History

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### Appendix A. Revision History

Revision No.	Approval Date	Effective Date	Brief Description of Change; Rationale
1	11/30/2022		None – Initial Document
2	03/18/2024		Small edits to sampling frequency

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