

# On Developing a Fourth Edition of the NWRI UV Guidelines

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The National Water Research Institute (NWRI) is in the process of determining whether a revision of the third edition of the NWRI UV Guidelines, published in 2012, is needed. The purpose of this brief review is to summarize work accomplished as of September 2018 and to outline the necessary next steps, assuming the guidelines are to be updated. A brief review of the development of the NWRI UV Guidelines is presented for a historical perspective.

## Evolution of the NWRI UV Guidelines

The NWRI UV Guidelines evolved several times over the last 25 years. The original document was published in 1993 “to provide guidance to the regulatory staffs of the State of California Regional Water Quality Control Boards and the Department of Health Services in reviewing applications for the use of ultraviolet (UV) disinfection systems in wastewater reclamation and reuse applications” (NWRI, 1993). It is important to note that the 1993 guidelines were written to address only wastewater reclamation applications in the state of California.

In January 2000, NWRI and its corporate associates convened at the UV 2000-A Technical Symposium to address changes that had occurred since the publication of the 1993 guidelines, including significant progress in UV reactor design, control and performance validation. A primary outcome of that meeting was that a new UV guidelines document should be prepared to include the application of UV disinfection in both reclaimed water and drinking water purification processes. In December 2000, NWRI published Ultraviolet Disinfection Guidelines for Drinking Water and Water Reuse (NWRI, 2000).

By mid-2002 it became evident, based on the experience gained from the application of the 2000 UV Guidelines, that revisions were needed. The second edition of the UV guidelines was published by NWRI in 2003; in the foreword, it was noted that the guidelines were “intended to provide guidance to state and federal regulatory agencies who review application for the use of UV disinfection systems in potable (drinkable) water and water reuse and to utilities who are interested in using UV for disinfection purposes” (NWRI,



2003). Apart from technical considerations, the major difference between the 1993 UV guidelines and the 2000 and 2003 revisions is the inclusion of potable water in the latter two editions.

The third edition of the NWRI UV Guidelines was published in 2012 (2012 UV Guidelines); the purpose of this revision was to incorporate new recommendations and to “(1) document the current practice of spot-checking performance bioassays for validation of full-scale performance in lieu of conducting velocity profiles, and (2) standardize the assignment UV dose when conducting MS-2-based viral assays by making use of a standardized dose-response relationship.” An appendix was added to the third edition to illustrate the computations presented in Chapter 3 of the guidelines. The foreword of the third edition contained the same language as noted previously for the second edition. One important outcome from the publishing and implementation of the recommendations in the 2012 UV Guidelines has been the successful installation of a larger number of water reuse UV projects in which the performance of the installed systems was tested and demonstrated to meet the design (and regulatory) targets. The third edition UV Guidelines may be viewed and downloaded from the NWRI web page at [www.nwri-usa.org](http://www.nwri-usa.org).

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## The revision process

Over the past few years, several stakeholders have expressed interest in updating the third edition to reflect current best practices and policies. To best capture a broad set of perspectives in the revised document and to encourage transparency, NWRI developed a stakeholder questionnaire to solicit input from organizations that use or will use the UV guidelines. The questionnaire was sent to individuals, consulting organizations, regulatory agencies, manufacturers, professional organizations and other interested parties and contained the following broad questions along with related sub-questions:

- Interest in the NWRI UV Guidelines
- Concerns with the existing NWRI UV Guidelines
- Additions to technical content of the third edition NWRI UV Guidelines
- Stakeholder engagement and transparency
- Open comments

The questionnaire was distributed in July 2018. The stakeholders were asked to submit the completed questionnaire along with relevant attachments to NWRI by Aug. 15, 2018; approximately 20 responses were received. NWRI and the authors of this paper convened on Aug. 21, 2018, to review the comments. NWRI is organizing the comments, which will be shared with all responders and posted on the NWRI web page.

## Some preliminary observations

As would be expected, there were areas of consensus as well as areas of disagreement in the responses to the questions. Also, the Division of Drinking Water (DDW) had some specific requests for the revision. It should be noted that the Drinking Water Program (DWP) was transferred from the Department of Public Health (DPH) to the State Water Resources Control Board on July 1, 2014. Essentially, the same DPH staff that pertain to water in California are now DDW staff.

Some areas of general agreement were:

- The section on drinking water should be dropped. It is well covered in other EPA documents.
- The new edition should only focus on water reuse applications.
- A future (and separate) guideline document could focus on UV advanced oxidation for potable water reuse.
- The discussion of UV system hydraulics, including peak and instantaneous flow, needs to be clarified.
- Sensor placement and accuracy need to be addressed and defined.

Areas of disagreement included:

- Defining and calculating the UV dose

- Using the standardized dose-response curve
- Requiring checkpoint bioassays for small systems
- Analyzing data, including the proper approach for dealing with outliers
- Defining characteristics of a small system
- Determining what responsible party should conduct UV testing validations
- Prescribing the qualifications and training for those who conduct validations

Concepts from the third edition that DDW would like to retain for a potential fourth edition are:

- Standardized dose-response curve, as now required by the State of California (CSWRCB, 2015).
- Statistical approach should be maintained, but it needs to be clarified.
- Checkpoint bioassay should be maintained, except for very small systems (to be defined) that can demonstrate ability to apply a significantly protective safety factor. DDW feels confident that the bioassay requirement continues to provide appropriate protection of public health and design and operational confidence.

## The next steps

As noted, NWRI will summarize and share the questionnaire responses with the stakeholders and post the responses (anonymously) on the NWRI webpage. Simultaneously, an ad hoc committee, composed of the authors of this article, will develop additional specific questions for the stakeholders based on the responses to the original questionnaire. The purpose of the specific questions is to develop more insight into how to proceed with developing the revisions. At the same time, NWRI is working to obtain funding for the stakeholder workshop and the effort to complete and publish a revised fourth edition. ■

## References

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