

monetization method described above to calculate WTP values for the simulated water quality improvements for each model facility. Finally, we estimated and summed WTP values for other potentially regulated facilities of that model facility type to produce a national benefit estimate. (For more details of the methodology, see DCN 20141).

We expect to apply a similar water quality modeling and monetization approach for estimating water quality-related benefits. However, we expect that the final methodology will address certain limitations that we did not recognize at proposal. We will take advantage of refined estimates of facility loads. That is, we will improve the water quality-related benefits analysis using:

- Significantly improved facility-specific loadings estimates based on new data from the detailed surveys and new information on feed conversion ratios (FCRs). These improved loadings estimates help us evaluate contributions of specific facilities to improved water quality (see Section V.B).

- Site-specific water quality simulations using new information from the survey on the geographical distribution of facilities. EPA intends to use specific facility receiving water simulations when data are available, and model receiving water conditions when data are unavailable, for an individual site.

- A more refined method for selecting a subset of QUAL2E application sites from which we can develop a national benefits estimate. Sites will be selected based on the availability of data (e.g., water quality and discharge data) for model calibration. The sites should represent geographic regions and environmental conditions where most of the facilities are located. We expect to select between five to ten QUAL2E application sites.

- An improved method for calculating the WQI that better reflects water quality changes associated with CAAP discharges. The WQI that EPA used previously included four water quality parameters (WQI-4). EPA more recently developed a six-parameter WQI ("WQI-6") based on TSS, BOD, DO, FC, plus nitrate (NO₃) and phosphate (PO₄). The new index more completely reflects the type of water quality changes that will result from loading reductions for TSS, total nitrogen (TN), total phosphorus (TP), and BOD. We may present results from both the WQI-4 and WQI-6 indices in the final benefits analysis for the CAAP rule.

- An improved method for monetizing water quality benefits. We

based the water quality benefits monetization method we used for the proposed rule on results from a stated-preference survey conducted by Carson and Mitchell (1993) (DCN 20157). We divided household willingness-to-pay (WTP) values for changes in recreational water "use classes" by the number of WQI-4 points in each use class. We assigned a portion of the value for each unit change to achieving the whole step. Recently, EPA developed an alternative approach, also based on Mitchell and Carson's work. The authors also expressed their results as an equation relating a household's WTP for improved water quality to the change in the water quality index and household income. An important feature of this approach is that it is less sensitive to the baseline use of the water body. This approach is also consistent with economic theory in that it exhibits a declining marginal WTP for water quality. (See more information on this approach in DCNS 40138 and 40595.) Caution must be used in manipulating valuations derived from stated preference surveys, but this valuation function approach helps address some concerns about earlier applications of the water quality benefits monetization method. (See DCN 40595 for a more detailed discussion.)

2. Other Revisions to Benefits Analysis About Reductions in BOD, TN, TP, and TSS Loads

At proposal, EPA examined additional ways of characterizing environmental benefits from rule-related reductions in BOD, TN, TP, and TSS loads using the same QUAL2E modeling results from the proposal monetized benefits estimate. Specifically, we compared water quality in receiving streams simulated by QUAL2E modeling with national water quality criteria for DO, ammonia, TN, and TP. EPA discussed this comparison in light of the possibility for rule-related reductions in exceedences of these criteria. We did not monetize the results of that evaluation. They were intended to illustrate an alternate indicator of possible rule-related changes in water quality (Section 10.5.1., DCN 20141).

For the final benefits analysis, EPA may update this evaluation in several ways. First, we expect to use the improved site-specific water quality modeling results described in Section V.D.1. for the comparison with national water quality criteria. We are also evaluating the possibility of using an aquatic ecosystem model to further translate load reductions and water quality changes at a subset of facilities into other ecosystem changes (e.g.,

effects on benthic fauna, fish populations, and other ecosystem variables). The model, AQUATOX (<http://www.epa.gov/waterscience/models/aquatox/>), represents stream, river, lake, reservoir, and pond ecosystems by modeling:

- Periphyton.
- Moss.
- Macrophytes.
- Major guilds and taxonomic groups of invertebrates and fish, as well as phytoplankton.

The model can also simulate constant or time-varying discharges of BOD, nutrients, and TSS like those that might be discharged by a CAAP facility. Finally, we expect to update our discussions of research literature that describes water quality impacts. We will consider literature that we have compiled since the proposal as well as information from stakeholder comments (see Sections II.E and III.E). As at proposal, the purpose of these analyses is to provide supplemental information of possible rule-related benefits to receiving waters.

3. Other Revisions to Benefits Analysis

EPA concurs with one commenter's assertion that determining benefits of non-native species, pathogens, antibiotics, or chemical releases from facilities is complex and controversial. Ideally, an analysis of benefits from mandated reductions in such discharges would draw from an understanding of environmental impacts from each discharge; quantitative estimates of both baseline discharges and reductions in discharges under any regulatory regime; and the relationship between changes in discharges and environmental response. In some cases, economic valuation techniques can then be applied to monetize the environmental responses. In the case of water quality improvements due to reductions in TSS, BOD, and nutrients from flow-through and recirculating systems, this information is available for estimates of quantitative and monetized benefits of the rule.

In most other cases, EPA will not estimate monetized or even quantitative benefits. Rather, we will discuss qualitative benefit areas including:

- Possible benefits from reducing escapes of non-native species, recognizing existing State and other requirements for escapes and mitigation (see Section II.E.3), and
- Possible benefits from reducing inadvertent releases of applied chemicals (including therapeutic substances) from CAAP facilities (see Sections II.E.2 and III.C).