



National Water Quality Monitoring Council

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# WQX/STORET NUTRIENT DATA REVIEW

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# AGENDA

- The extent of the nutrient data in STORET/WQX
- Evaluation of why the data is being reported incorrectly
- Products for addressing QA issues
- Other QA workgroups
- What you should know

# NUTRIENT DATA IN THE PORTAL

- Over 33 million results for over 500K stations
- WQX/STORET contribute 19.5 million ~59%
- In the past 3 years, **Phosphorus** is the most commonly reported characteristic, followed by **Kjeldahl Nitrogen**, **Inorganic nitrogen**, **Orthophosphate**, and **Ammonia**

# THE DATA AMBIGUITIES FOR SECONDARY USERS

- “Total” is being used in WQX to represent **the sum of all forms and an unfiltered sample**
  - In the last 3 years “Total” is the most commonly reported sample fraction for nutrients representing ~2 million of the ~2.5 million reported sample fractions.
- Synonymous Characteristics
  - 5 different ways to capture “Total Nitrogen” (sum of all forms nitrogen)
- Incomplete nutrient records
  - ~30% of nutrients captured in the last 3 years are missing an essential metadata element needed to use the record for analyses
  - \*Complete record contains: Characteristic name, sample fraction, method, speciation, result value and unit, & analytical method
- Invalid characteristic/analytical method combinations
- Censored data not captured correctly
  - This is a product of users “getting around the rules” and submitting data with a “<”, “>” or some other character. When a user submits a “< 0.2” in the result value, they are not required to provide a detection limit type.

# WHY ARE THE AMBIGUITIES OCCURRING?

- WQX schema requirements
  - WQX did not require a sample fraction be reported for all nutrients
  - WQX did not require speciation for any nutrient (it does right now)
  - WQX had multiple versions of a characteristic for users to choose
- Data submitters are not likely scientists and people will force the data into the system to meet the WQX schema requirements
  - No incentive for submitting quality information ( but Coming Soon!)
- Lack of guidance for data submitters
- Communication with labs
  - Labs provide “Total” as a sample fraction

# NUTRIENT QA WORKGROUP

- ✓ Met once a month for a year
- ✓ Determined the issues with the data
- ✓ Determined why the issues were happening
- ✓ Created a best practices guide for helping users correctly submit data
  - ✓ Coordinated with many lab experts
  - ✓ Coordinated with state data managers to have a realistic implementation strategy
- ✓ Created WQX rules to be implemented in WQX 3.0

# BEST PRACTICES ADDRESSES

## 1. Correctly documenting censored data

- Guidance on the WQX schema rules about censored data
- Explain the value of censored data
- How to properly capture censored values while obeying the schema

<u>Characteristic Name</u>	<u>Result Detection Condition</u>	<u>Result Value</u>	<u>Result Unit</u>	<u>Result Detection/Quantitation Limit Type</u>	<u>Result Detection/Quantitation Limit Measure</u>	<u>Result Detection/Quantitation Limit Unit</u>
Nitrite		4.46 mg/l		Method Detection Level	0.001	mg/l
Nitrogen-15		11.3 mg/l				
Ammonia-nitrogen		0.8022 mg/l				
Nitrate		6.2 mg/l				
Nitrite	Present Below Quantification Limit			Lower Quantitation Limit	0.50	mg/l
Nitrogen-15		10.3 mg/l				
Ammonia-nitrogen		1.0022 mg/l				
Nitrate	Not Detected			Method Detection Level	0.001	mg/l
Nitrite		5.46 mg/l				
Nitrogen-15		12.3 mg/l				

**Table 1:** The above table shows the WQX rule for capturing censored data. Either the Result Detection Condition or Result Value may be provided, but not both. If a censored value is reported, the corresponding detection limit and metadata must be submitted.

# BEST PRACTICES ADDRESSES

## 2. Consistent use of characteristics

- Guidance on how to determine what your organization has submitted before
- Retirement of synonyms to one naming convention

Preferred WQX Characteristic Name	Former WQX Characteristic Name(s) (Synonyms)
<b>Ammonia</b>	<ul style="list-style-type: none"><li>○ Ammonia Nitrogen</li><li>○ Nitrogen, ammonia (NH<sub>3</sub>)</li></ul>

# BEST PRACTICES ADDRESSES

## 3. Documenting method speciation and sample fraction

- Guidance on why speciation and sample fractions are important
- How to find and report the proper speciation and sample fraction

$$45\text{mg/L Nitrate as NO}_3 \times 0.255 = 10\text{ mg/L Nitrate as N}$$

*For example, many environmental labs report nutrient data as:*

***Nitrate or***

***Nitrate as N***

*By reporting “Nitrate,” they usually mean they are reporting the molecular form, or “Nitrate as NO<sub>3</sub>.” They find it redundant to report “Nitrate as Nitrate.” However, data users cannot be sure of the meaning unless it is documented. What if the results were really reported as “Nitrate as N?” If speciation is not clear, the data cannot be used with confidence.*

Preferred WQX Characteristic Name	Former WQX Characteristic Name(s) (Synonyms)	Method Speciation	Result Sample Fraction	Top-Reported Methods
Ammonia	<ul style="list-style-type: none"> <li>o Ammonia Nitrogen</li> <li>o Nitrogen, ammonia (NH<sub>3</sub>)</li> </ul>	as N or as NH <sub>3</sub>	<ul style="list-style-type: none"> <li>o Filtered, Lab</li> <li>o Filtered, Field</li> <li>o Unfiltered</li> <li>o Non-Filterable (Particle)</li> <li>o Suspended</li> </ul>	USEPA: 350.1 APHA: 4500-NH <sub>3</sub> (C), 4500-NH <sub>3</sub> (E) HACH: 8155, 10023 ASTM: D6919-03, D6919-09 LACHAT: 10-107-06-3-D

# BEST PRACTICES ADDRESSES

## 4. Correctly documenting a complete nutrient record

- Guidance on what metadata elements are needed to use nutrient data
- Helping users determine the correct metadata value for their data

Media	Characteristic	Method Speciation	Result Value	Result Unit	Result Sample Fraction	Analytical Method
Water	Total Nitrogen, mixed forms	as N	2.0	mg/L	Filtered	USEPA 351.1

**Table 3:** The table represents a complete nutrient that can be used for secondary analyses.

# WQX 3.0 PROPOSED CHANGES

- Require sample fraction and method speciation be submitted with every nutrient record
- Only allow sample fractions from table to be submitted with a nutrient. Do not allow “Total”
- Retire duplicative characteristics.
- Enforce only correct method speciations with each nutrient (i.e. Nitrogen cannot have “as P”)
- Do not allow any special character in the result value field (i.e. “<”, “>”, “\*”, etc.)

# OTHER WQX QA WORKGROUPS

## QA reports on data upload and data retrieval

- Workgroup will develop requirements for QA reports so the user is aware when uploading the data and the end user knows the quality of the data upon download.

## Biological Workgroup

- Workgroup is creating guidance for each biological data type.

## WQX 3.0 simplification

- Workgroup will look at the data model and data already submitted in WQX to see how data elements are being used. Then reflect on the value added and the possibility of streamlining the schema.

# WHAT YOU SHOULD KNOW

## We're working on it

- We have the best practices
- We are addressing it with rules for WQX 3.0 We do not want to shock people with these changes without a new schema release
- We have other QA workgroups running to address more QA issues

## Not all the data in WQX/STORET is ambiguous.

- 70% of the nutrient data in the last 3 years was complete (but may have had the word "Total")
- This issue was unique to nutrient data. We will look more into other physical/chemical data

## The data is good data, it was just missing essential metadata

- Data in the system could be updated but most agencies do not want to correct all the data in the system – Thoughts?

## The changes to WQX are compatible with existing nodes!

- The changes to the schema in 2018 will only require a user to submit values they may not have submitted before but their nodes should contain those data elements for them to submit.

# WHAT WE WOULD LIKE FROM YOU

- Additional suggestions for adoption of best practices?
- What is your advice for data in the system?
- How should we work with labs?