

Sensors QA Initiative workgroup of the Methods Board Meeting at EPA Region V

April 22-23, 2009

Chicago, IL, EPA Region V headquarters

Attendees:

State: Chuck Dvorsky, *Texas CEQ*

Private: Gayle Rominger and Rob Ellison, *YSI, Inc*; Cristina Windsor, *In-Situ*; Mike Sadar, *Hach Co.*; Jason Harrington, *Greenspan Analytical*

Federal: Janice Fulford, *USGS-HIF*; Kevin Richards, *USGS Wisconsin Water Science Center*; Chuck Spooner, *US EPA*; Dan Sullivan, *USGS*

Consultant: Revital Katznelson

Minutes: Revital and Dan

Wednesday morning, 8:30 a.m.

The group was welcomed by **Walt Kovalik, EPA Acting Deputy Regional Director**. He talked about barriers to implementing innovative technologies and the EPA's roles in the environmental technology marketplace. The Forum on Environmental Measurement has discussed that EPA has recognized that it is important that its regulatory requirements do not become a hindrance to the advancement of technology but rather a partner in that process.

The meeting started with Revital's introduction of topics related to language used in the four products of the group; this was followed by a discussion on the target audiences and the functions of each product.

Gayle: our objective is to help the users of these documents achieve data of known and acceptable quality with the means that are available to them.

The group then discussed future innovations in the use of sensors, including a wish-list of field capture and communication tools (PDAs, Blackberries, etc.)

The group agreed that the initial clients of these products are the field operators; Chuck S. added that the products should also help the agency person who needs to select bids and buy sensors and the group brainstormed about the possibilities of extending the products by adding performance and cost information at a later stage (i.e., as phase 2, not within the present scope).

The group discussed problems associated with the reliability of manufacturer's "specifications" for accuracy (Mike S: it is used for marketing, often without proof; Gayle: ISO are now requesting documentation that the specifications are true).

Janice discussed the future need for implementing uncertainty analysis into the way error is reported.

Rob E. introduced his outline for the group's product # 2, the Sensor Deployment Guide, on the first morning of the meeting. He then received feedback on further organization, as a flow-chart or a decision tree, for a discussion on the next day. The group discussed whether groundwater

should be included. Chuck S. referred the group to Public Law PL 111-11 and Subtitle F of the Omnibus Secure Water Act. The group concluded that groundwater deployments guidance is a totally separate document and will not be included in the current group's product. (We need to communicate this to the review board and why)

Chuck S. introduced the NSF WATER Network document on sensors which was published in April 2007. <http://www.watersnet.org/>

Group Product discussions:

(1) Guidance QA Matrix

An example of the Guidance QA Matrix (which includes recommended actions to *affect, check, record, and report* (ACRR) the quality of sensors' data) was submitted to the Review Board in March. Revital reported about the Review Board meeting and succinctly summarized their comments, most of which were incorporated into the current version of the Matrix. She then presented the handout hardcopies of the Matrix and the group shared their visions **of how these will be used**, including:

- laminated hardcopies for the field, each page with explanations and tips in the back;
- electronic files on a field computer (or on the internet), linked to the other three products, with rollover comments and glossary;
- as texts or tables for other guidance documents that folks will tailor to their needs (and here the group discussed how to protect the source);

Gayle: folks will need training on how to use the matrix (and other products). Revital agreed to teach a **workshop** during **NWQMC 2010** (next April) in Denver. The group agreed to prepare conference papers for NWQMC 2010 and **submit abstracts by Labor Day**. Chuck S. will organize a **special session** for these papers.

The QA Matrix contains a placeholder for compliance information if needed. Chuck S.: the QA Matrix can be later tailored to include information that regulators could use when listing the data quality documentation requirements associated with compliance monitoring.

The group then discussed specific cells of the QA Matrix; general topics that came up included, among others:

- the resolution and accuracy of NIST-certified thermometers;
- the accepted meaning of Instrument Maintenance (routine cleaning & calibration) vs Instrument Service (repair and parts replacements);
- the consistent ways to report accuracy and precisions; natural batching of data sets;

the naming and organizing of technologies (e.g., electrochemistry methods for dissolved oxygen include Polarographic and Galvanic, and they can be grouped for the QA Matrix, while the Optical methods need a separate set of cells in the QA Matrix, because the electrochemical methods are consumptive and because the frequency of calibrations and accuracy checks is different)

- the need for a guidance attachment that explains the various types of instruments and methods used for measuring turbidity.

As the need to provide special bits of additional information for certain cells of the Matrix became apparent (e.g., something to pay attention to when calibrating), the group suggested adding an attachment with **Tips** that are called by specific identifiers in the Matrix.

Chuck S.: create a list of features (such as response time, power drain, resolution, etc.) that will help during the process of instrument selection. Revital: the set of tables that she compiled for the five ‘vital signs’ characteristics, each with a list of different types of instruments and the attainable data quality they can deliver. The QA Matrix can be expanded in the future to include similar type of information about sensors in support of instrument selection guidance.

ACTION: Revital will update the QA Matrix per the group’s input, create the draft Tips Attachment on a spreadsheet in the same file, and send the revised file to the group.

ACTION: Mike Sadar will prepare a short draft of a Turbidity methodology attachment and send to Revital for inclusion in the QA Matrix package.

(2) Sensor field deployment guide

After the first day’s discussion, Rob prepared a tabular format [will be posted on internal website], with rows for the different types of water-bodies, and columns for the various biological, hydrological, and other factors that need to be considered when selecting a spot in the channel to conduct attended monitoring or to deploy a sensor for unattended monitoring. Some of these factors relate to effects on the measurement system (e.g. fouling potential), or to safety issues, while others relate to the representativeness of the data (i.e., how well the deployment location represents the entire cross-section).

Rob has also compiled a list of guidance documents that provide detailed instructions on sensor deployment and construction of various permanent installations for sensors.

Sub-team that will take the lead on product #2: Rob Ellison, Chuck Dvorsky, Dan Sullivan, and Mike Cook.

The group provided feedback and suggested adding an attachment with “Field Tips” that are called by specific identifiers in the table.

The deployment guide will be included in the sensors session/workshop at the Conference in April, 2010.

ACTION: Rob will update the Deployment Guide per the group’s input, create a draft Tips Attachment, and send both to the group, in addition to the document list.

ACTION: Group members will review the document list and send Rob references to additional guidance documents they are aware of.

ACTION: Rob will advise Andy Ziegler of the groups’ efforts when the Value Engineering team meets with him in Kansas

ACTION: Have a prototype/draft to present at Council meeting in July.

(3) Metadata Elements List

Chuck S. introduced the concept of the minimum information that needs to be provided with the data to enable the use of sensors’ data and assure data comparability and provided the historical context of the Water Quality Data Elements (WQDE) list.

- First list (chem., micro) approved by ACWI in 2001
- Tox and bio pop/comm. added in 2003
- PHab approved 2008

- EPA adoption of data elements:
 - ESAR: long list, influenced by WQDE and contains some aspects.
 - WQX now represents the “working version” of the ACWI data elements.

Revital showed the organization of various lists (WQDE, ESAR, WQX, and her old list) and explained the different options the group can choose from when compiling a list of elements specific to sensors data.

The group opted for creating a comprehensive list (i.e., a list that includes everything that the Project personnel and the data user will need to see), and for organizing the sensors metadata independently of other lists (rather than trying to integrate it into existing lists).

Chuck S.: consider the XML schema and future database needs when making the list.

The sensor manufacturers in the room agreed that most of the required metadata can be captured automatically using the instrument’s software.

The group discussed existing international metadata standards, e.g., that are in use in the pharmaceutical industry, and in monitoring by industrial facility. Gayle and Rob commented that these standards are extremely stringent by nature, and that required metadata related to work with sensors can be more relaxed. Kevin: The issue of metadata requirements will become very relevant when sensors are used for compliance monitoring.

Mike: challenge is to identify the elements and how to limit. Chuck: this could be part of a Value Engineering exercise #2.

Gayle: include Andy Ziegler (USGS-KS) and Brad Garner (USGS-MD) at an early stage of the process, to coordinate with current work on a new metadata format

ACTION: Revital will compile a draft list of data elements associated with field measurements by sensors, including data logging and telemetry, and will send to the group for review.

Future task: Talk to NPDES lawyers about permitting process and what are the data requirements.

(4) Glossary of Relevant Terms

The group reviewed part of the Glossary Phase 2 (the version Revital has prepared in February, after the first round of review and votes by six workgroup members). In some situations where the Glossary contains several definitions of the same Term, the group achieved a consensus on which definition to use.

The group started the process of ‘culling’ non-essential term from the Glossary, with the objective of reducing the 400-odd terms to no more than 100, preferably less.

It was agreed that some terms that are totally specific to a given turbidity method or technology will be defined in the attachment that explains the various types of instruments and methods used for measuring turbidity (see Product #1 above).

ACTION: Revital will continue the culling of the Glossary and send the turbidity-specific terms to Mike S. for inclusion in his attachment.

Thursday, 1:00 p.m. Meeting with EPA Region V

Attendees from Region V: **Andy Tschampa**, Deputy Branch Chief, WQ Branch R.5; **Carol Braverman**, OST; **Glenn Warren**, GLNPO; **Bill Franz**, ORD.

Dan and Chuck described the overall mission of the Council and the Board.

Chuck Dvorsky gave background on applications of continuous monitoring in Texas.

Revital Katznelson described the work of the sensors workgroup.

Andy Tschampa then gave the EPA perspective from the **Forum on Environmental Measurement (FEM)**, a group that has been resurrected. Walt Kovalik, the Acting Regional Director is a member but could not be here for this meeting (he did address the sensors group at the beginning of day 1).

- FEM is interested in sensors in part because of the realization that many agencies are involved in continuous monitoring and the use grows every day.
- EPA-approved methods: FEM wants to ensure that the use and development of new technologies are not impeded by barriers created by EPA requirements that dictate prescribed methods for monitoring.
- FEM is thus interested in looking at new technologies that can be approved for compliance monitoring.
 - Wireless technologies
 - Handout on EPA issues
- In Midwest, regulations don't require technology
- In Midwest, water-rich so continuous monitoring is a lower priority

Glenn Warren

- **Long-term monitoring of Great Lakes** since 1983.
- Use technology now and will increase in the future
- FY10 budget has increased \$\$ for Great Lakes, which will include sensed buoys in near-shore areas. Working w/ NOAA. Buoys send data via telemetry.
- Pilot study of towed sensor array (L. Mich & Erie).
 - Phyto-flash; fluorometer (algae); nitrate (UV-vis spec); cond, turb (transmissivity); D.O.; pH; plankton counters
- Wish list:
 - Fiber optic D.O. probes to monitor L. Erie dead zone;
 - Ion-selective electrodes for variety of parameters

Bill Franz

- **Miss. R. program** is an "immature" program. Little in the way of technologies or continuous monitoring presently
- Two "houses" of work on river: biology (restoration) and QW
- Of the states, only Illinois monitors the Mississippi River
- USGS & Corps have long-term monitoring
- Numerous cities use the river as their drinking-water supply
- Mussel program: working with YSI. "canary in the coal mine". 37 of 43 mussel species in the river are threatened or endangered
- Working w/ universities (ex: U. of Iowa has some buoys)
- Gulf of Mexico hypoxia issue:
 - Tile fields an example of something that models say, if plugged, reduce N transport from fields up to 70%.

- **UMiss River Basin Association (UMRBA)** – in the future this group may resemble ORSANCO. 604b may be a source of funding.
- Envisions sensors mounted on buoys at intervals along the mainstem Mississippi

Toxicity tests for endocrine disruptors

- ORD- Cincinnati
- Expose fish to contaminants, analyze body parts for concentrations
- Seems to be providing answers
- Will use wild fish this year
- Rather than look for 3,000 chemicals in the water column, focus on the effects

Technology transfer

- Application of Value Engineering studies

SWiMS – annual meeting, may be revised so that alternating years are webinars and in-person meetings, respectively. Would be great if the Board could participate at future meeting.

Future workgroup meetings

Conference calls as needed.

Presentation at July Council meeting, left open possibility of the workgroup meeting there as well but would need to decide relatively soon if this is going to happen.

