DATA ENTRY BEST PRACTICES COMPENDIUM:
EXAMPLES RELATED TO DATA ENTRY ISSUES FOR THE ADB Version 2

Letter Report for Cary McElhinney, EPA/OW/OWOW/AWPD/Monitoring Branch
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Introduction

This document is intended to provide best practice examples on how to make appropriate data entries for several tables in the Assessment Database version 2.0 (ADB v.2). This document will discuss five areas of data entry and give some examples of how a state could address several types of data entry concerns. These five areas are:

1. **Metadata:** The metadata that the ADB v.2 requires are simply what type of assessments were done and of what quality those assessments were. There are currently five types of assessments that can be entered into the database. Also, there are four levels of quality that can be associated with each of these types. This document will provide suggestions as to how to best populate the metadata for an assessment unit, and how best to make the available metadata choices correspond with a state's assessment methodology.

2. **Uses:** The ADB v.2 makes an effort to focus on specific designated uses as they appear in a state's water quality standards. A state's standards do not always specifically designate a Fish Consumption use. This document will suggest some ways in which a state can deal with this situation. Also, some state's have their designated uses broken up in classes. This document will give some suggestions as how a state should proceed if their uses are bundled in classes.

3. **Observed Effects:** Observed Effects are a new concept introduced with the ADB v.2, and because of that, they will require some discussion as how to best use them. This document will discuss scenarios of when to use Observed Effects, when not to use them, and how to tell the difference.

4. **Grouping:** The ADB v.2 also introduces the idea of being able to add impairment and source groups. This document will discuss how to use this feature to a state's best advantage.

5. **"Miscellaneous" Waters:** The 2002 Integrated Water Quality Monitoring and Assessment Report Guidance stresses the idea of having a comprehensive monitoring strategy, meaning that a state should be prepared to account for *ALL* of the waters in its jurisdiction. This does not mean that a state needs to monitor all of the waters in its jurisdiction for every reporting cycle, but it must be at least willing to say what is being monitored and what is not being monitored. This document will discuss ways in which a state can take what is not being monitored and create assessment units for these unmonitored, or "miscellaneous," waters.

Metadata

The assessment metadata entries in the ADB v.2 serve two main purposes:

1) To provide some background as to how the use support determination was made

2) To provide some level of confidence in that use determination.

The metadata choices in the database should reflect the decision logic in a state's assessment methodology document. Five types of assessment metadata are presently defined. Where a use attainment conclusion is entered in to database, it is assumed that the assessment conclusion draws on information from at least one of the following metadata categories:

Biological: A biological assessment can include any type of biological (bioassessment) indicators that were used (e.g., macroinvertebrate indicators, fish-IBIs, etc.).

Habitat: A habitat assessment can include habitat indicators or other types of geofluvial analyses related to such features as: riffle and pool analyses, substrate, bank stability, stream buffer zone plant cover analyses, and so forth.

Physical/Chemical: This is a broad category that can include any number of different types of analyses. Physical monitoring involves measures for such system properties as pH, turbidity or temperature that relate to important WQS use attainment criteria but are properties that generally lack CAS registry numbers. Chemical monitoring is typically performed for specific analytes (e.g., copper) that can be defined through reference to CAS registry numbers. If clearly defined in a state's assessment methodology document, this category could cover the xenobiotic chemical pollutants in tissue residues associated with fish or wildlife consumption advisories.

Toxicological: This category includes use attainment conclusions based on such methods as bioassays. These can include acute or chronic bioassays for ambient water or for interstitial pore water. Other types of monitoring information may be relevant depending on how toxicity concerns are addressed in a state's assessment methodology document. For instance, if clearly defined in a state's assessment methodology document, this category could cover the xenobiotic chemical pollutants (e.g., mercury/methyl-mercury) in tissue residues associated with fish or wildlife consumption advisories. This category would also be appropriate to document biogenic toxics concerns related to red tides, cyanobacteria toxins, toxins from Pfestieria, or other harmful algal blooms (HABs).

Pathogen Indicators (Microbials): This assessment type can include any standard pathogen (microbial) indicators. An example of a pathogen indicator would be *E. coli* counts. It can also include conclusions from screening test determinations for actual bacterial and viral pathogens (e.g., tests for *Crytosporidium*).

When making entries into the ADB, the user should be certain that a given metadata category is related to the specific use being assessed. For example, it probably wouldn't make sense to have a habitat assessment associated with a Primary Contact Recreation Use. The state assessment methodology document should document what types of assessment metadata categories can be associated with each WQS designated use.

The database requires that a statement be made about the quality of the assessment, or the quality of the data used to make the assessment. By default, the database has defined four levels of quality on a scale of 1 to 4 with 1 being the lowest and 4 being the highest.

1. Low Quality
2. Fair Quality
3. Good Quality
4. Excellent Quality

How a state assigns these levels of quality should be explained in their documented assessment methodology. If a state's methodology defines less than four levels of quality for a particular metadata category when applied to a particular designated use, then it is up to the state to document how it makes the quality assignments based on these four levels. For example, if a state has a situation where they want only two quality levels (good and poor), then they may want to use 1 and 3 for their assessment levels (or they could use 2 and 4). The important thing is to be consistent, and to document what levels were used and why.

Uses

Many states use a classification system to define the designated uses for the waters within their jurisdiction. The ADB does not use classes, but rather has the classes broken out as designated uses as they appear in the Water Quality Standards Database (WQSDB). Assessments will need to be made on these broken out uses as opposed to being assessed by the classes. A state that uses classes for most routine tasks will want to make certain that these classes are correctly represented as uses in the WQSDB.

One use that warrants attention is the use often called "fish consumption." In many states, this concept of providing public health protection for population groups that eat various types of sports fish may be embedded in other uses. For example, a state may not have a use explicitly called fish consumption, but the WQS will contain language documenting that their aquatic life use covers both the ecological health of the aquatic communities but also the human health provisions for fish and wildlife consumption. In this situation, the aquatic life use can act as the surrogate for fish consumption. Another example may be if the fish consumption use could be applied to several uses, such as cold water fishery and warm water fishery. It is recommended that the assessment methodology document explicitly document if a use is acting as a surrogate for fish consumption.

Example:

In Tennessee's Water Quality Standards, there is not an explicit "fish consumption" use; however, human health protections regarding fish consumption are part of Tennessee's "recreation" use.

Recreation (excerpted from Tennessee's WQS)

...

(h) Toxic Substances - The waters shall not contain toxic substances, whether alone or in combination with other substances, that will render the waters unsafe or unsuitable for water contact activities including the capture and subsequent consumption of fish and shellfish, or will propose toxic conditions that will adversely affect man, animal, aquatic life, or wildlife. Human health criteria have been derived to protect the consumer from consumption of contaminated fish and water.

In this case, any statement about the use support of a water designated to support recreation is a statement about that water's ability to support fish consumption as well. Tennessee's recreation use also has provisions precluding degraded aesthetic amenity values or public nuisance conditions (e.g., low dissolved oxygen, offensive odors, unaesthetic debris/bottom deposits, excessive pathogen indicator levels, and so forth).

Observed Effects

An "observed effect" is a new concept, and some best practice examples are helpful to make sure this feature is applied in an appropriate fashion. The classic example of an observed effect would be a situation where a fish kill is reported for an assessment unit but where this information by itself would not be enough to conclude that their was a WQS impairment. The fish kill could be viewed as an undesired outcome, but further monitoring work would be needed to document a specific pollutant or other WQS criterion excursion that could be viewed as involving a pollution (or pollutant) impairment. The ADB allows "fish kill" to be declared an "observed effect" This information can then be entered into the database, but if the only documented problem is from observed effects, then the assessment unit will not appear in the CATEGORY 5 TMDL/303(d) list of waters impaired by pollutants.

Where observed effects are documented for an assessment unit, it would be expected that a state would keep an eye on the area and perform additional follow-up inspections to see if a specific pollutant could be identified. For instance, if there were a recurrence of the fish kill and additional monitoring data showed an impact from seasonal releases of a toxicant (e.g., zinc) in the discharge form a power plant, then the assessment unit could then be rated as showing a pollutant impairment. In a state's assessment methodology document, the correlation of an observed effect (fish kills) and evidence of a specific chemical toxin (elevated levels of zinc) could well figure into a weight of evidence argument to strengthen the credibility of the use attainment conclusion that there was non-attainment of an aquatic life use related to toxic pollutants.

Other observed effects might involve "nuisance algal growth" where the needed impairment signal would be documentation of excessive levels of nitrogen or phosphorus plant nutrients. Such general labels as "nutrient" or even "algae blooms" might also rate as observed effects. Where very general purpose language (e.g., various "free from ..." provisions) is contained in WQS documents where a state has not been able to define "translator" language to relate the WQS language to monitoring results, then such characteristics as "odor" or "color" might also be rated as observed effects.

A state should be consistent in how it uses impairments and observed effects, at least within a cycle. The ADB v.2 will enforce consistency, in that it will not allow a characteristic to be entered as an observed effect if it is also being used as an impairment in the same cycle. The opposite is also true, a characteristic cannot be entered as an impairment if it is being used as an observed effect in the same cycle. Observed effects are not intended to be a holding place for impairments until a state feels certain enough about an impairment to enter it as an impairment. For example, during an assessment of a lake, it is observed that there are certain signs of a nutrient problem in the lake, but is unclear as to exactly which nutrient is the problem. The manager of the lake is suspicious, however, that the problem is being caused by excessive amounts of phosphorous that is running off of a nearby field. Until further studies can be conducted, the state may not want to label phosphorous as the impairment of concern. To enter

this situation into the database, a state could enter 'nutrients' as an observed effect, or possibly what they observed which caused them to think nutrients was a problem (i.e. color, algae bloom, etc.). In the comment field for this assessment unit they could note that they suspected phosphorus to be the impairment, but until further studies can be conducted, they are uncertain as to the actual impairment.

Example:

Tennessee's Water Quality Standards has the following language concerning their Domestic Water Supply Use:

Domestic Water Supply

...

(vi) Taste or Odor - These waters shall not contain substances which will result in taste or odor that prevent the production of potable water by conventional water treatment processes.

Assume that the state feels it lacks good translator protocols to handle complaints on odors where this is based solely on a person reporting a bad smell. If this were the only information available, the situation could be treated as an observed effect. If additional monitoring data were available, for instance detections of elevated sulfides (hydrogen sulfide) released into a receiving water from a poorly plugged natural gas well, then this extra information would document a specific pollutant impairment. The reported bad odors would then strengthen a weight of evidence argument that there was an impairment of the domestic water supply use related to odors from hydrogen sulfide.

Grouping

The ADB v.2 allows a state to create their own summary groups of sources or impairments. The ADB comes pre-populated with a number of groups such as Nutrients, Metals, and Pathogens for impairments and Agriculture-Animal Feeding Operation and Resource Extraction for sources. A state, however, can create their own groups to meet their own needs as well as the needs of their respective public and government representatives.

Examples of Groupings:

The State governor and legislature decide that there are certain metals that are of particular concern to both them and the citizens of the state. They subsequently task the State's Department of Natural Resources (DNR) to provide them a list of

all the waters in the state that are being impaired by these metals. Since the DNR has entered all of their data into the ADB, they will be able to create a new impairment group called "The Governor's Metals". They will add to this group all of the metals that were requested by the Governor and Legislature. The DNR can then easily create reports, or better yet, create dynamic web pages that run directly off of the Oracle Server running the ADB to show the waters that have impairments falling into this new group. The DNR had to spend some time setting up the web pages, but creating the new group took less than five minutes. The advantage of creating the group becomes apparent, however, when the Legislature discovers that they inadvertently left copper off of the list of metals they were interested in. The Legislature sends this request to the DNR and within one minute, copper is added to the "The Governor's Metals" group, and without having to make changes to any of DNR's dynamic web pages, any water that is impaired by copper would be added to the dynamic web reports.

"Miscellaneous" Waters

A state should be prepared to make an account of all of the waters of the state. For many states, in order to accomplish this, they will need to expand what they consider their 305(b) waters. They will need to include not only waters with assessments, but also non-assessed waters that previously had not been explicitly included in their assessment database. A state's 305(b) assessments should also be based on the state's water quality standards. Because of this, and also thanks to some of the GIS tools that are now available, methods can be devised to extract a 305(b) coverage for these miscellaneous (generally non-assessed) waters based on the state's Water Quality Standards coverage.

In addressing this issue, there are three scenarios to consider:

1) A state has a 305(b) coverage indexed to the National Hydrography Dataset (NHD) *AND*
they also have a Water Quality Standards (WQS) coverage also indexed to NHD.

2) A state has a 305(b) coverage indexed to NHD *BUT* does *NOT HAVE* a WQS coverage indexed to NHD.

3) A state has neither a 305(b) coverage nor a WQS coverage indexed to NHD.

This document will deal with each of these three scenarios separately.

1. A state has a 305(b) coverage indexed to the National Hydrography Dataset (NHD) *AND* they also have a Water Quality Standards (WQS) coverage also indexed to NHD

If a state has both a WQS and a 305(b) coverage (see Figure 1), GIS tools can be used to overlay the two coverages and extract the waters from the WQS coverage that can be used to supplement the 305(b) coverage. The GIS tool would then be able to assign IDs to these added 305(b) waters.

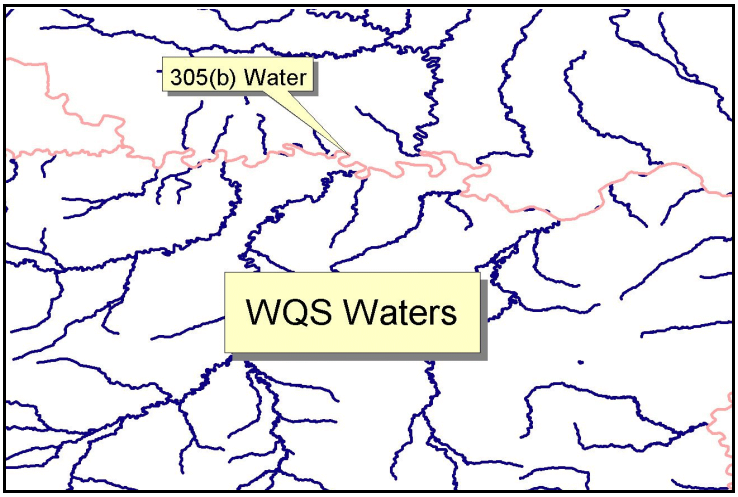

Figure 1. The Relationship between WQS waters and 305(b) waters

Ideally, it would assign them the same IDs as were used in the WQS coverage. By using the same IDs, the 'uses' for these added waters can easily be extracted from the WQS, thereby minimizing the amount of work required to get these waters added to the ADB. The GIS tool would also be able to provide sizes for these newly indexed waters so that those sizes could be entered into the ADB (see Figure 2).

The GIS tool would provide two water types: 1) River and 2) Lake. Acres sizes would be assigned to the 'Lake' water types and miles sizes would be assigned to the 'River' water type. Ideally, these miscellaneous assessment units would be at a scale no larger than an 8-digit HUC. Figure 3 shows an example of a miscellaneous water that would be at a scale of an 12-digit (6th level) subwatershed (formerly called a USDA HUC11 small watershed).

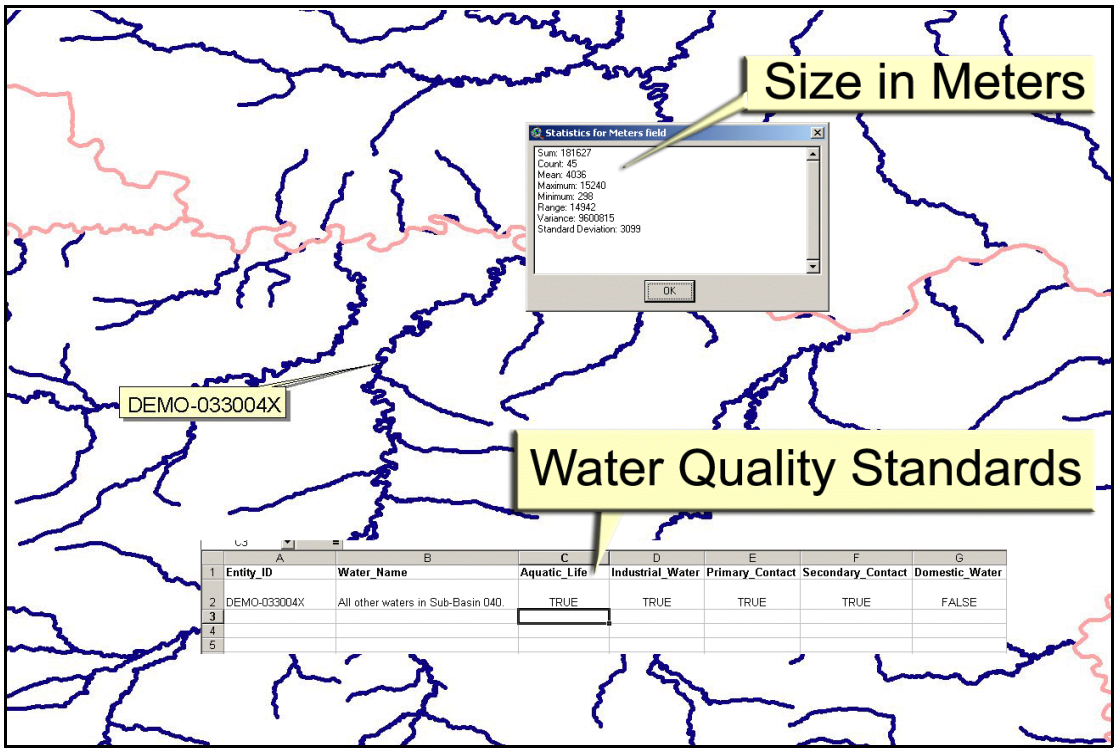

Figure 2. How WQS Information can be used for 305(b)

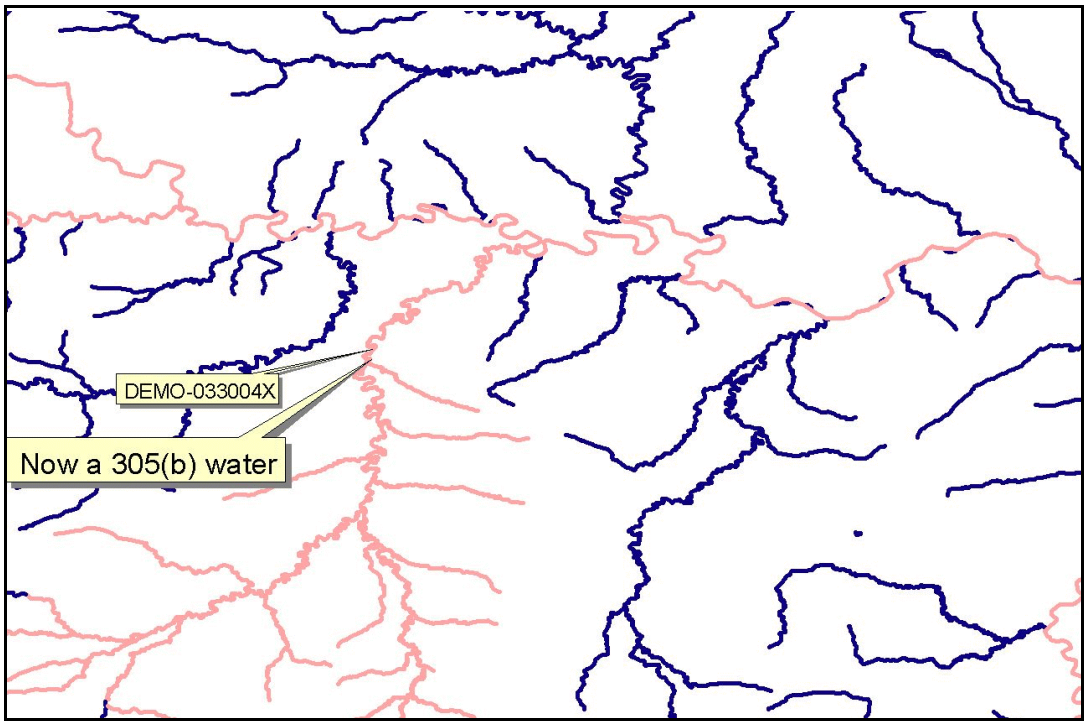

Figure 3. WQS water becomes a 305(b) Assessment Unit

2. **A**

state has a 305(b) coverage indexed to NHD *BUT* does *NOT HAVE* a WQS coverage indexed to NHD

The first step in this scenario is for a state to determine at what scale they want to define these miscellaneous assessment units. The scale that they choose would generally be no larger than an 8-digit HUC. A GIS tool could be used to then index all of the waters that are not a part of the 305(b) coverage. IDs would be assigned based on the scale that the state chose. Sizes could be obtained from this indexing, but uses, however, would have to be manually entered into the database or a default set of uses could be used.

[NOTE: What should these default uses be???? Should they be something like "assumed rebuttable generic fishable and swimmable?" Or maybe just a small number of "major uses" that actually occur in the state's WQS document?]

3. A state has neither a 305(b) coverage nor a WQS coverage indexed to NHD.

For this scenario, a state must again determine at what scale they want to assign IDs, again the scale should be no larger than an 8-digit HUC. This scenario would assume that the state could develop a table showing which assessment units fall within which HUCs. A state would also have to determine the location of the currently defined assessment units (i.e. which 8-digit HUC). The sizes for the defined assessment units within a HUC would then be subtracted from the total size of the waters in that same HUC. This total size would be obtained through Total Waters. An assessment unit would then be assigned to account for the remainder of these unassigned waters within that HUC. As in scenario 2, a set of "default" uses may be needed to handle the "miscellaneous waters" within each HUC.

[NOTE: Once again, What should these default uses be???? Should they be something like "assumed rebuttable generic fishable and swimmable?" Or maybe just a small number of "major uses" that actually occur in the state's WQS document?]