

OHIO RIVER VALLEY WATER SANITATION COMMISSION

MINUTES

**216th Commission Meeting
Owensboro Convention Center
Owensboro, Kentucky
Thursday, October 6, 2016**

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Chairman Ronald Lovan, Presiding

Call to Order

Chairman Lovan called the 216th meeting of the Ohio River Valley Water Sanitation Commission to order at 9:00 A.M., Thursday, October 6, 2016.

Chairman Lovan invited Jerry Schulte, recently retired ORSANCO staff member, to lead the Pledge of Allegiance.

Quorum Call

Commissioner Potesta certified that a quorum was present (see Roster of Attendance, page 10).

Welcoming Comments

Chairman Lovan introduced Mr. Jeff Sanford, Owensboro Mayor Pro Tem. Chairman Lovan also informed the Commission that he had lived in Owensboro as a youth and still has family residing in the town.

Mr. Sanford welcomed the Commission to Owensboro and thanked Commissioners for selecting Owensboro as a meeting location. He talked about the history of Owensboro and focused on the town's revitalization efforts and the successful major riverfront development, which capitalized on the importance of the Ohio River in economic development. He thanked ORSANCO and its partners for the many years of good work to protect and improve water quality in the Ohio River which is extremely important to all river towns such as Owensboro.

Recognition of Service

Chairman Lovan thanked and recognized Commissioner Conroe for his service as Chairman during the recently completed fiscal year and presented him with a framed print and gavel.

Chairman Lovan then recognized Jerry Schulte for his recent retirement from ORSANCO after a distinguished 29 year career. Commissioner Potesta presented Jerry with a resolution from the Commission (Attachment 1) as well as a retirement gift.

Jerry then took the opportunity to speak to the Commission to convey his appreciation for the wonderful opportunity to spend his career with ORSANCO doing work he loved. Jerry also re-capped some of his experiences over the 29 years.

Report of the Chairman

Chairman Lovan began his report by reflecting on some of the historical perspectives reported on by previous Commission Chairmen and that his message would reflect on his personal history with the River. He hoped his message would prompt all Commissioners to reflect on their ties and links to the River. Chairman Lovan then presented a series of pictures capturing his, as well as his family's close ties and history with the Ohio River, using the movie "A River Runs Through It" as a theme. He also commented on the path of his professional career, beginning as a sanitary engineer for the State of Kentucky, his professional relationship with previous Commission Chairman Ralph Pickard, and now the full circle to chairing the Commission.

Chairman Lovan mentioned some of the great opportunities he has encountered with ORSANCO, such as electrofishing with Congressman Massey and working with a great staff. He feels privileged to be serving as the Commission's Chairman this year. He concluded by noting that both challenges and opportunities remain.

Report of the Executive Director

Executive Director Richard Harrison began by thanking Jerry Schulte for his support and wished him well in his retirement. He then recognized and thanked Commissioner Conroe for his patience and support the past year serving as Chairman.

Mr. Harrison called attention to the 2016 Annual Report provided in the meeting packet. He requested that Commissioners advise him or Tracey Edmonds if they would like to submit the Report to their respective Governor or the President on their behalf. He noted that the Report will not be released for general distribution until it has been distributed to the Governors and President.

He then thanked staff for their good work on the five-year financial forecast. Scenarios have been developed to provide options to move forward to meet the financial challenges ahead.

He concluded by mentioning organizational adjustments to re-align staffing due to Jerry Schulte's retirement. The changes were vetted with the Personnel Committee.

Action on Minutes

ACTION: Motion by Commissioner FitzGerald, second by Commissioner Elmaraghy and unanimously carried, that the minutes of the 215th meeting of the Commission, be adopted as presented.

Report of the Treasurer

Commissioner Potesta noted that a Treasurer's Report as of June 30, 2016 was provided in the agenda packet.

The report indicates a balance of \$720,125 in accounts receivable due the Commission as of June 30, 2016. The balance represents \$68,400 due from Signatory States, \$564,107 due from federal sources, and \$87,618 due from other sources.

Additionally, the report indicates receipts of \$3,759,684 plus carryover of \$1,684,061 totaling \$5,443,745 through the end of June 2016. Of that amount, \$3,550,955 was expended on programs, leaving \$1,892,790 available for the continuation of ORSANCO's programs.

Commissioner Potesta also noted that a Treasurer's Report through October would be provided with the Executive Director's monthly report.

Report of the Technical Committee

Commissioner Wilson, Committee Chairman, reported that the Technical Committee met on October 4-5. Six states, three federal agencies, and five advisory committees were represented.

Commissioner Wilson noted that for future Committee meetings, member updates will be presented earlier in the agenda to provide additional time and flexibility for these updates. He then provided the following summary of meeting outcomes.

2016 Summer Ohio River Water Quality Conditions

Multiple staff presented observations and analytical results of Ohio River water quality conditions during 2016. No atypical water quality or biological conditions were identified over the summer field season. Some slightly depressed dissolved oxygen levels occurred, primarily in the middle and lower portions of the river. As usual, bacteria criteria were exceeded at times but were generally good during normal pool and dry conditions. There were measured exceedances of the total mercury and iron water quality criteria also during 2016 in the lower river.

Markland Hydropower Water Quality Management Plan

ORSANCO staff has conducted an evaluation of Duke's Markland hydropower plant's water quality management plan relative to the Commission's 1988 policy on hydropower, as required under the FERC relicensing process. The full evaluation was contained in agenda materials. Staff's evaluation includes several recommendations relative to protecting dissolved oxygen levels under critical conditions. By action, the Committee recommended that ORSANCO's recommendations be submitted to IDEM during their public comment period for the state's water quality certification process. This action is supported by IDEM.

Harmful Algal Blooms

Staff reported on a number of small, isolated algal blooms which occurred in backwater areas of the Ohio River this summer. In addition, microcystis was visually observed in the Cincinnati area of the Ohio River; however, analyses of water samples indicated the absence of a HAB. Another algal bloom was reported in the lower river which could not be verified. In addition, new continuous monitoring equipment to analyze for the occurrence of HABs has been purchased and installed, which provides data in real-time. This equipment is very valuable as a HABs early warning tool. Thanks to OEPA for providing funding to purchase one of these units.

IDEM Biological Condition Gradient

Thanks to Stacey Sobat of IDEM staff for providing a report on IDEM's development of a biological condition gradient for evaluating fish community data. This useful tool can be deployed across the entire state and multiple ecoregions to evaluate the biological condition of the state's waters. Staff continues to evaluate its utility for the Ohio River.

ORSANCO Special Investigation of Submerged Aquatic Vegetation

In 2016, ORSANCO began conducting a special biological study in lieu of completing a fourth biological pool survey. The first of these special studies was to evaluate the potential impacts of submerged aquatic vegetation on Ohio River aquatic communities, and ORSANCO's biological survey results and corresponding biological indices which are used to evaluate the status of the aquatic life use. Staff presented a study approach and survey methodology that was employed in the Willow Island pool, which is significantly populated with SAVs. Results of the study will be presented at the February TEC meeting.

Nutrient Criteria Development

Staff presented an approach to nutrient criteria development for the Ohio River based on the possible effects of nutrients on dissolved oxygen levels and macroinvertebrate communities. They are in the process of analyzing three years of data from over 150 sampling sites to determine if nutrients are having any effect on water quality or macroinvertebrate communities and will report back to the Technical Committee in February after further analysis of the data.

Status of Ohio River Bacteria TMDL

USEPA is working on a bacteria TMDL for the Ohio River. Completion of a draft document for public review has been delayed, while various control scenarios regarding CSOs and stormwater continue to be evaluated.

Source Water Protection

Staff reported on several source water protection and emergency response meetings, as well as performance of the Organics Detection System. A ten year project to complete a system-wide renovation of the ODS has been completed, and a USEPA grant which funded the renovation is currently being closed out.

Bacteria Trends Assessment

Staff has been working on a trends assessment of twenty years of bacteria data for the Ohio River to determine if trends in bacteria conditions can be identified. Initial results of this work indicate that, in general, improving bacterial conditions in the Ohio River are present beginning around 2006 until the present. Work will continue on this project, which will culminate with a written report.

Mercury Studies

The Committee reviewed the background report, "A Summary of Mercury in the Ohio River," and by action, recognized the value of this report. A mercury study plan for a mercury mass balance project was also presented to the Committee which Commissioner Kupke will report on later. In addition, the Committee received an update on ORSANCO mercury surveys, and Rob Reash presented on an EPRI/AEP study to evaluate the bioavailability of mercury from selected wastewater discharges.

Report of the Pension Committee

Commissioner Harrison, Committee Chairman, reported that the Committee met via conference call in September to discuss the July 1, 2016 Actuarial Valuation Report, prepared by Troy Jaros of Buck Consultants. He also noted that Commissioners Harrison, Lovan, and staff member David Bailey comprise the current Pension Trust Committee.

Commissioner Harrison then noted that Commission By-Laws allow for additional Commissioners to be appointed to the Pension Committee. The Committee recommends the appointment of Commissioners Conroe and Hoopingarner to the Committee.

ACTION: Motion by Commissioner Bruny, second by Commissioner Frevert and unanimously carried, to appoint Commissioners Conroe and Hoopingarner to the Pension Committee.

Report of the Personnel Committee

Commissioner Elmaraghy, Committee Chairman, reported that The Personnel Committee met via conference call on September 20, 2016. The Committee discussed the proposed technical amendment to ORSANCO's Health Reimbursement Arrangement (HRA). The proposed

amendment proposes no change to current practice. The Plan needs to be amended prior to January 1, 2017 to maintain compliance with recent IRS guidance.

The amendment simply states that reimbursements can be made to only insured members and their covered dependents, which is currently an ORSANCO practice. The required adopting resolutions were provided in the meeting agenda packet.

The Personnel Committee recommends that the Commission adopt the Amendment Resolution and the Adopting Resolution approving the First Amendment to the Health Reimbursement Arrangement.

ACTION: Motion by Commissioner Fitzgerald, second by Commissioner Frevert and unanimously carried, to adopt the Amendment Resolution and the Adopting Resolution approving the First Amendment to the Health Reimbursement Arrangement.

Report of the Program & Finance Committee

Commissioner Bruny, Committee Chairman, reported that Committee held an interim meeting on Tuesday this week to follow-up on recommendations of Committee's April 2016 meeting. Staff was directed to develop scenarios to balance the potential gap between revenues and expenses for FY18 through FY21.

Staff presented a draft four year balanced budget forecast under both aggressive and moderate scenarios. Staff also presented a number of incremental program and benefit reductions for future consideration.

The Committee will continue to review the proposed incremental reductions and provide feedback to staff. The Committee also recommends vetting these reductions in consideration of state agency and other stakeholder interests.

The Committee also discussed potential state funding opportunities such as 106, SRF and 604-B funds identified in the moderate scenario. Members agreed that this will require additional consideration and collaboration among the states.

The Committee discussed the use of unencumbered program funds and the current level of restricted reserve funds. No specific recommendation on the appropriate level of restricted reserve funds was made.

Executive Director Harrison indicated that a combination of these incremental reductions, as well as the use of some unencumbered program funds, will be considered during FY18 budget development. No objection was raised regarding the use of unencumbered program funds to support the FY18 budget. The Committee anticipates another briefing to the Commission in February.

He concluded by thanking staff for the extensive amount of time and their diligent efforts preparing these balanced budget scenarios.

Report of the Research Committee

Commissioner Duritsa, Committee Chairman, reported that the Committee has completed a review of the Committee's functions, including ORSANCO's Bylaws relating to the Committee and its purpose. During a meeting on August 3, 2016, Committee members concluded that the

Committee is redundant to the activities of other committees. Staff also reached out to the Committee's scientific members for feedback. The Committee has concluded that the appropriate course of action is to recommend that the Research Standing Committee be dissolved by the Commission. The Committee is also recommending that a work group be authorized by the Commission to provide scientific support on an as needed basis to the Technical and/or Pollution Control Committees. The Committee believes such changes will assist ORSANCO committees to avoid duplicative efforts while still allowing for the appropriate review of ORSANCO studies and reports by the scientific community.

Commissioner Duritsa presented the following action:

ACTION: Motion by Commissioner Duritsa, second by Commissioner Frevert and unanimously carried, to authorize the Committee (i) to work with staff and counsel to prepare resolutions to be considered by the Commission at its February 9, 2017 meeting to dissolve the Research Committee by amending the ORSANCO Bylaws to delete Section XII,A,8 from the Bylaws and appropriately amend related and possibly conflicting provisions thereof; and (ii) propose the creation of a Scientific Work Group with specific functions spelled out as required by the last sentence of Section XII,A.

Report of the Ad Hoc Committee on Mercury Studies

Commissioner Kupke, Committee Chairman, provided the following report.

On behalf of the Ad Hoc Mercury Committee I'm pleased to bring you the results of our evaluation and our recommendation to the Commission. Past Chairman Thomas Easterly formed an Ad Hoc committee on mercury studies on June 30, 2015. The broad charge of this Committee is to evaluate what is known about the sources of mercury that impact fish in the Ohio River and to make recommendations to the Commission on the need for any additional information and proposed methods for obtaining such information.

Within your packet, you have a short summary entitled "Report and Recommendations of the Ad Hoc Committee on Mercury Studies". This report contains a listing of our committee members and efforts in helping to address the complex issue of mercury in the Ohio River. The Committee was well represented by seven (7) commissioners and other knowledgeable representatives from state and federal government, industry, and environmental policy interests. Parenthetically, I'd be remiss to not also mention the excellent support of ORSANCO staff and, specifically, Jason Heath and Jeff Thomas.

The central focus of the Committee was clearly that of trying to understand the science of the mercury situation in the Ohio River with the agreement that this needed to come before any management or policy considerations. The Committee initially conducted a comprehensive literature review of mercury. This was then used to prepare a report entitled "A Summary of Mercury in the Ohio River", which you have previously been provided and is also within your packet. The report summarizes key concepts associated with mercury in the environment globally, nationally, and within the Ohio River basin. It summarizes what we do and don't know about mercury.

The subject of mercury in aquatic environments is a complex issue which can't be completely summarized in a short report. However, the summary report fulfilled its intent, which was to provide a concise overview of mercury in aquatic environments broadly and specifically in the Ohio River and to promote a common understanding of the situation both for the Ad Hoc Committee members and the commissioners.

As the Committee systematically considered the potential value of addressing what we don't know about mercury in the Ohio River, a strong consensus developed for conducting a mercury mass balance/source apportionment on the main stem of the river. Alternative means to conduct such a study were considered, the intent being to much better quantify where and how mercury is entering the mainstem of the river and to link what mercury is entering the river with measured and computed in-stream mercury loadings.

Toward this end, a proposed plan of study has been developed and is included in your packet. The Committee believes the recommended plan of study, with its emphasis on maximum utilizations of recent past and ongoing ORSANCO mercury studies, clearly represents the greatest potential value in addressing what we don't know about mercury in the Ohio River.

The Ad Hoc Committee recommends that the Commission approve moving forward with the proposed plan of study to complete a mercury mass balance/source apportionment for the Ohio River. This plan of study relies primarily on existing studies and staff to complete the work, making this a cost-effective approach that meets the Committee's established charge.

ACTION: Motion by Peter Goodman, second by Bruno Pigott and unanimously carried, to approve moving forward with the proposed plan of study to complete a mercury mass balance/source apportionment for the Ohio River.

Report of the Water Users Advisory Committee

Bruce Whitteberry, Committee Chairman, reported that the Committee met on September 21-22, 2016 in Bellevue, Kentucky. He was pleased to report that conditions on the River have been quiet recently, from a drinking water perspective, with no major spills or algae issues.

Staff provided a reports on ORSANCO's organizational changes, source water protection activities, biological monitoring programs, and the mercury work group. The Committee was informed that Sam Dinkins would be serving as staff liaison.

Bruce commented that this was Jerry Schulte's last official Committee meeting. Jerry presented an overview of his career and experiences at ORSANCO, including major spills and significant emergency response activities.

Bruce reported that Weirton Water has been experiencing erratic localized increased fluoride levels in the River over the past few years. However, it has not raised to the level of concern. It is believed that this is due to an upstream industrial facility. He also reported that Louisville Water has increased monitoring for PFOA, and Evansville mentioned they would be required to treat the affluent from its drinking water plant for mercury due to levels of mercury entering the plant from the River itself. Bromide continues to be a concern of utilities, and they are waiting on additional EPA research and guidance.

Finally, Bruce reported that Committee members Jack Wang and David Altman have retired and are moving on to other opportunities. He thanked them for their service to the Committee.

Report of the Public Information Advisory Committee

Betsy Mallison, Committee Chairman, reported that the Committee met at ORSANCO on Thursday, Sept. 29, 2016. The Committee discussed a number of communication strategies and initiatives, including the new media request policy. The policy assists in the tracking and monitoring of media requests.

The group also reviewed the organizational key messages that were prepared with a consultant. While the messages were appropriate, they were long and technical. The committee discussed issues with the public who may not understand even the simplified concepts used by ORSANCO, such as “water quality” or “non-detects.” The public uses terms like “clean.”

The Committee recommended simplifying the language of the key messages to be more relatable to the general public. For example, “The fish are back.” They also recommended creating a short, concise tag line from the existing key messages which can be used across all communication to promote branding and insert the concepts into the news release boiler plate – the message at the bottom that is consistent on all releases.

The committee discussed the benefits of creating communications after an uneventful algal bloom and recommended creating a positive communication about ORSANCO’s algal bloom monitoring efforts. The key message of this communication would be “We were ready,” and “We will be ready next year too.”

The committee discussed communication outreach vehicles and made several recommendations:

- Issue a short e-newsletter at a regular interval, rather than its current irregular timeframe.
- Track those who use the weekly water quality reports and add capability for new users to access the information via the website or emails.
- Make the scanned historic documents available on the website as a searchable database. The committee applauded Lisa’s efforts to get these historic documents scanned and suggested reaching out to Ohio River museums that might be interested in the historic content. Additionally, the committee encouraged staff to use the data to provide comparisons to today’s river information for news release or e-newsletter content.
- Issue a news release announcing the new website rollout that will include scrolled photos of staff, the aquarium, and the Ohio River.

Additionally, the committee discussed potential funding sources for the aquarium, including developing a “Friends of the Aquarium” program. They also brainstormed potential topics for future website videos to highlight ORSANCO staff work and Ohio River issues.

Report of the Watershed Organizations Advisory Committee (WOAC)

Judy Petersen, Committee Chairman, reported that mercury remains a key concern and appreciates that it is also a key concern of the Commission and Technical Committee as evidenced by the agenda discussions and the Ad Hoc Committee report.

Since the Commission delegated the mercury mixing zone permitting issue to the states, the Committee has been discussing how we can best track mixing zones that have been requested and/or approved, the permit limits, and how mercury reduction plans are being implemented. At the Technical Committee meeting, the Committee suggested that states be asked to report on this information as part of their regular report. The Committee also requested that ORSANCO consider dedicating a web page to providing this information. The Technical Committee Chairman asked staff to look into these issues and report back to the Committee in February 2017.

Ms. Petersen concluded by reminding the Commission that WOAC Committee members have a lot of information and skills that could be of use to a number of ORSANCO’s committees and would welcome the opportunity to serve on these committees at the Commission’s pleasure.

Comments

Chairman Lovan thanked the staff for all the work that goes into the meeting planning and logistics as well as the work involved in displaying the mobile aquarium in Owensboro.

Upcoming Meetings

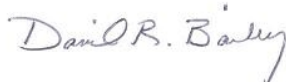
Chairman Lovan noted the following schedule for upcoming Commission meetings:

- February 7-9, 2017 Covington, Kentucky
- June 6-8, 2017 French Lick, Indiana


Adjournment

ACTION: Motion by Commissioner Conroe, second by Commissioner FitzGerald and carried unanimously, to adjourn the 216th meeting of the Commission at 10:40 A.M.

Prepared by:


_____ Date: October 13, 2016
David Bailey
Director of Administration

Approved by:


_____ Date: October 24, 2016
Ronald Potesta
Secretary/Treasurer

ROSTER OF ATTENDANCE
216th Commission Meeting
October 6, 2016

Commissioners

| | |
|---------------|---|
| Illinois | Toby Frevert Bob Mosher (PROXY for Director Alec Messina) |
| Indiana | Bruno Pigott (PROXY for Carol Comer) John Kupke Joseph Harrison, Jr. |
| Kentucky | Ron Lovan Peter Goodmann (PROXY for Lt. Governor Hampton) Bruce Scott (PROXY for Secretary Charles Snavely) |
| New York | Douglas Conroe Mike Wilson |
| Ohio | Craig Butler John Hoopingarner Stuart Bruny |
| Pennsylvania | Charles Duritsa Kelly Heffner (PROXY for Acting Secretary Patrick McDonnell) |
| West Virginia | David Flannery Ron Potesta Scott Mandirola (PROXY for Secretary Randy Huffman) |
| Federal | Tom FitzGerald George Elmaraghy |
| Legal Counsel | Ross Wales |

Executive Director

Richard Harrison

Guests

Betsy Mallison Bialosky – PIACO; Bruce Whitteberry – WUAC; Erich Emery – USACE; Judy Peterson – KWA/WOAC; Jeff Sanford – City of Owensboro; Susan Lovan; Kenny Akins – Westlake/Axiall; Adam Rissien – Ohio Environmental Council; Tiffani Kavalec – Ohio EPA; Jerry Schulte; Betsy Schulte; Bijaya Shrestha – KWA; Don Bialosky

Staff

David Bailey, Jason Heath, Sam Dinkins, Jerry Schulte, Jeff Thomas, Joe Gilligan, Lisa Cochran

RESOLUTION 6-16

RECOGNITION OF SERVICE

Gerald G. Schulte

WHEREAS, Jerry Schulte has provided dedicated service from September 21, 1987 to September 30, 2016 to the Ohio River Valley Water Sanitation Commission, and

WHEREAS, it is the intention of the Commission to recognize Jerry Schulte for his distinguished record of service and his effective use of knowledge and experience to commendably and to the very best of his ability serve the Commission, its partners and citizens of the Ohio River Basin, and

WHEREAS, during his 29-year career, Jerry contributed greatly to many programs and initiatives including, but not limited to: Enhancing the nature and scope of biological programs; Serving as a Champion for ORSANCO's Organics Detection System; Providing tireless and dedicated service to help protect the drinking water supply to over 5 million citizens who use the Ohio River as their drinking water source; and Broadening the scope of Ohio River source water protection and emergency response program activities, and

WHEREAS, Jerry has earned the esteem and friendship of Commissioners, numerous committee members, and his fellow staff members, and

Now therefore be it resolved, that the Commissioners of the Ohio River Valley Water Sanitation Commission express their heartfelt gratitude to Jerry Schulte for his dedicated service, and extends best wishes to Jerry for success in all his future endeavors.

REPORT AND RECOMMENDATIONS OF THE AD HOC COMMITTEE ON MERCURY STUDIES

I. Introduction

Past Chairman Thomas Easterly formed an Ad Hoc Committee on Mercury Studies on June 30, 2015 pursuant to Section XII.B of ORSANCO's bylaws as revised in June, 2013.

II. Committee Members

Commissioners

| | |
|------------------|------------------------------------|
| Stuart Bruny | Ohio |
| George Elmaraghy | Federal |
| Tom FitzGerald | Federal |
| Toby Frevert | Illinois |
| John Kupke | Indiana, Ad Hoc Committee Chairman |
| Ron Potesta | West Virginia |
| Mike Wilson | New York |

Non-Commissioners

| | |
|--------------------|--|
| Erich Emery | US Army Corps of Engineers |
| Madeline Fleischer | Environmental Law & Policy Center |
| Tim Henry | US Environmental Protection Agency |
| Paul Novak | Indiana Department of Environmental Management |
| Eric Nygaard | Ohio Environmental Protection Agency |
| Rob Reash | Power Industry Advisory Committee |
| Martin Risch | US Geological Survey (Indiana Science Center) |

Additional Participants

| | |
|----------------|--|
| Doug Conroe | New York Commissioner |
| Jessica Dexter | Environmental Law & Policy Center |
| Eileen Hack | Indiana Department of Environmental Management |
| Ron Lovan | Commission Chairman, Kentucky Commissioner |

III. Committee Charge

The broad charge of this committee is to evaluate what is known about the sources of mercury that impact fish in the Ohio River and to make recommendations to the Commission on the need for any additional information and proposed methods for obtaining such information. Steps in the process include:

- Gathering and evaluating what is currently know about the sources of mercury that impact fish in the Ohio River.
- Identifying what we know and do not know about the sources of mercury that impact fish in the Ohio River.
- Identifying the potential value of addressing what we do not know about this issue and alternative methods for dealing with the missing information.
- Making recommendations to the Commission.

IV. Meetings

The committee met by conference call on September 21, 2015, November 4, 2015, January 11, 2016, April 20, 2016, and May 16, 2016. The committee then met in person at ORSANCO's headquarters on August 3, 2016. This full-day meeting focused on developing a recommendation to the commission for needed studies.

V. Overview of Work of the Committee

The committee completed a comprehensive literature search on mercury as relating to the Ohio River, and using that information, developed a background briefing paper on mercury, which summarizes many of the important concepts regarding mercury in the environment and the Ohio River. An inventory of available mercury data and information in the Ohio Basin has been compiled. The committee has also developed a set of information needs regarding Ohio River mercury. The background report also summarizes all of ORSANCO's mercury projects to date.

The committee identified development of a mercury mass balance/source apportionment as ORSANCO's first priority information need. The committee then considered several approaches to developing a mercury mass balance for the Ohio River and agreed on a general approach at their August 3 meeting. The committee has undertaken the first three elements of its charge and at this time is making a recommendation to fulfill the remainder of its charge.

VI. Background Paper on Mercury

The background paper developed by the committee, *A Summary of Mercury in the Ohio River, June 2016*, is included with this report as Attachment I. As an extension of the mercury literature review, the Ad Hoc Committee prepared a concise overview of mercury in aquatic environments, generally, and in the Ohio River basin, specifically. The overview was entitled, *A Summary of Mercury in the Ohio River* (See Attachment 1). This report began by emphasizing mercury contamination of aquatic systems and its effects on human and wildlife are very complex issues. Hence the summary mercury report was intended to present ORSANCO commissioners and members of the Ad Hoc mercury committee with a common understanding of the issues surrounding mercury contamination in the Ohio River. In this vein it was further intended to assist with the formulation of a consensual recommendation by the Ad Hoc committee with respect to actions the Commission should undertake in regard to identified mercury concerns. Additionally, the report identifies the set of information needs as determined by the committee, and it summarizes all of ORSANCO's past and current mercury projects.

The following are important sentences extracted from the "summary report" that collectively help to define the key issues associated with understanding and addressing mercury contamination in the Ohio River. Each extracted sentence is preceded by a several word issue topic, which is shown in bold type. The italicized extractions include footnoted references in the report (attached).

- **Mercury is a widespread contaminant**
Although mercury is a natural trace element found everywhere in the Earth's air, land, and water, it is also a widespread environmental contaminant that can accumulate to harmful concentrations in aquatic ecosystems and has documented toxicological risks to humans and wildlife.

- **Methylmercury concentrated in fish presents the greatest Hg health hazard**
Due to the ability of methylmercury to accumulate to levels exceeding various established thresholds in fish, as of 2011 all 50 U.S. states had fish consumption advisories in place for mercury. Mercury accounted for all or part of 81 percent of all advisories.
- **Mercury is a global pollutant**
Mercury can be transported tens of thousands of kilometers on average in the atmosphere and is therefore accurately considered to be a global pollutant, continuously moving in gaseous and reactive forms between the air, land, and water of the Earth, as part of a natural mercury cycle. It is emitted to the atmosphere from three sources:
 - *Primary Natural or Geogenic (Volcanic eruptions, geothermal emissions).*
 - *Primary Anthropogenic or Man-made (coal combustion, precious metal extraction, commercial products such as batteries, electric switches, and paint).*
 - *Re-emissions or Secondary sources (portions of previous natural and anthropogenic mercury emitted that has been deposited back to the land, vegetation, and waters is transferred in gaseous form back to the atmosphere; This can also be referred to as “legacy” mercury).*
- **The atmosphere is generally the greatest source of mercury entering water environments.**
Deposition from the atmosphere has been found by many researchers to be the primary source of Hg in aquatic systems, although direct point sources can also contribute significantly. Atmospheric deposition (wet plus dry) is the predominant pathway of anthropogenic mercury to most aquatic ecosystems in the U.S.
- **To be bioavailable, inorganic mercury is converted to methylmercury**
Upon transport to a river or stream, inorganic mercury must first be methylated in order to be bioavailable. Methylation of inorganic mercury is typically conducted by microbial actions and has been shown to be correlated with warmer temperatures, limited dissolved oxygen, abundant organic matter, increased sulfates, and the presence of sulfides in the sediment among other factors. Due primarily to combinations of these characteristics, ratios of methylmercury to total mercury within streams have been found to be low, and Brigham et al. concluded that “benthic, in channel production of methylmercury is not important to the mass balance of methylmercury within the studied stream basins. Likewise, methylation is thought to be as low (or lower) in the Ohio River mainstem.
- **Methylmercury bioaccumulates in the food chain**
Algae are thought to be the major contributors of methylmercury to the food chain, as they can concentrate the contaminant from the aqueous phase at a rate of 100-10,000+ times and are fed on by zooplankton, crayfish, some fish, and other herbivores or omnivores. Overall, aquatic organisms may bioaccumulate environmental contaminants to more than 1,000,000 times the concentrations detected in the water column.
- **USEPA has a fish tissue criterion of 0.3 ppm**
ORSANCO has adopted the 0.3 ppm recommendation as a fish tissue criterion for determining attainment of the fish consumption use of the Ohio River for mercury using a trophic-weighted calculation. While this is the most commonly used value by many other U.S. agencies, the criteria used range from 0.04-0.5 ppm.

- **Mercury emissions over the last 40 years+ is notably dropping in developed countries, while increasing today in less developed regions**

Since the 1970's developed countries (e.g. U.S. and Europe) have significantly decreased mercury emission through air and water pollution awareness, regulations, and enhanced technology. Off-setting this desirable trend, however, has been significant increases in mercury emissions from developing areas such as China, India, and parts of Africa.

VII. Recommendation to the Commission

The committee is recommending that the Commission undertake a project to develop a mass balance/source apportionment of total mercury for the Ohio River. The mass balance/source apportionment would entail determining the quantity of mercury entering the Ohio River from mainstem point sources, tributaries, tributary point sources, to the possible estimating atmospheric deposition within each watershed, and determining the total amount of mercury flowing in the Ohio River. From this information, the portion of the total amount of mercury in the Ohio River from each identified source will be determined. A main benefit of the study is to understand how future management activities can be most effective at controlling levels of mercury in the Ohio River.

A plan of study to conduct a mercury mass balance/source apportionment is included with this report as Attachment 2. The study relies heavily on data and information from existing studies, including data and information from existing or ongoing activities of ORSANCO and the states. It does not require any new monitoring projects be undertaken, and it will be completed utilizing existing staff over an 18 month timeframe. In essence, the study will largely be completed utilizing existing resources.

Development of a Mercury Mass Balance for the Ohio River Mainstem

Plan of Study



INTRODUCTION

The Commission established an Ad Hoc Committee on Mercury Studies in June, 2015, to begin addressing concerns about mercury in the Ohio River. The basic charge of the committee is to evaluate what is known about the sources of mercury that impact the bioaccumulation of mercury in fish in the Ohio River and to make recommendations to the Commission on the need for any additional information and proposed methods for obtaining such information. Steps in the process include:

- Gathering and evaluating what is currently known about the sources of mercury that impact fish in the Ohio River.
- Identifying what we know and do not know about the sources of mercury that impact fish in the Ohio River.
- Identifying the potential value of addressing what we do not know about this issue and alternative methods for dealing with the missing information.
- Making recommendations to the Commission.

The committee, via five conference calls, a full day in-person meeting, and development of several significant work products, has initially addressed steps 1-3 above. A number of important information needs and gaps were identified as contained in the report, *A Summary of Mercury in the Ohio River*, and the committee has developed a recommendation for a project to develop a mass balance/source apportionment of mercury for the Ohio River. This recommendation and the accompanying study plan fulfills step 4 in the process, which will be presented to the Commission at its October, 2016 meeting.

PROJECT OBJECTIVE

The object of the project is to develop a mass balance/source apportionment for mercury for the mainstem of the Ohio River using existing data and information, and extrapolating such existing information, when appropriate, where data is lacking. The total mercury loading in the Ohio River will be estimated in conjunction with the mercury loading from all sources where estimates are possible using existing information or extrapolation from existing information. In essence, the mass balance will include an estimation of the mass input of mercury to the Ohio River from all identified sources including major tributaries, and an estimation of the total mass of mercury in the Ohio River, and an estimation of the atmospheric contribution of mercury to tributary watersheds. The source apportionment will involve determining how much mercury from each individual source contributes to the total mass of mercury in the Ohio River, ie. source *X* contributes *Y* percent of the mercury found in the Ohio River. The mass balance and source apportionment will be done for total mercury, and where possible, also for methyl mercury.

Development of a mass balance may be considered a first step towards generating the necessary information on mercury for the Ohio River. Future studies building upon the mass balance project might include a project to make detailed estimates of atmospheric deposition of mercury, as well as water quality modeling to estimate the transport, bioavailability, and fate of mercury in the river.

WORKPLAN

Task #1A -- Calculation of Ohio River Mercury Mass Loads at Mainstem BAF (Bioaccumulation Factor) Project Sites

Annual mercury loads will be calculated at all BAF project sites. BAF sites are located at Hannibal L&D (ORM 126), RC Byrd L&D (ORM 279), Newburgh L&D (ORM 754), and a to-be-determined site further downstream, beginning October, 2016. Mercury will be regressed against daily flow values and a correlation developed, quantified, and characterized. This relationship will then be used to calculate an annual mercury load. This has already been

completed for the Hannibal BAF project. Two additional BAF surveys, at RC Byrd Dam (ORM 279.2) and Newburgh Dam (ORM 776.1), have been completed and will have annual mercury loads calculated by October, 2016. A final BAF survey in the lowest section of the Ohio River is scheduled to begin October, 2016, and be completed September, 2017. A mercury load for the Ohio River outlet will then be calculated by January, 2017. BAF studies are either completed, ongoing, or to begin shortly, and have their own independent budgets separate from this project.
Completion Date: March, 2017.

Task 1B – Calculation of Ohio River Mass Loads at Mainstem Clean Metals Sites

In addition, at clean metals monitoring sites located at 15 Ohio River dams, mercury loads will be calculated if a good relationship exists between flow and total mercury. Clean metals stations at Cannelton Dam (ORM 720.7) and Markland Dam (ORM 531.5) have good relationships with flow and therefore mercury loads will be calculated. Clean metals sampling is a long-term, ongoing program with its own independent, already established budget, separate from this project, involving the collection of bimonthly samples from 15 mainstem locations.

Completion Date: June, 2017.

¹ Tasks 1A-C involves utilizing data and information from completed or ongoing projects.

Task #1C -- Calculation of Ohio River Mercury Mass Loads for 15 Tributaries

A one year project of monthly sampling for mercury on the 15 largest tributaries of the Ohio River will be completed in November, 2016. Mercury loads will be calculated for each tributary. These tributaries combined account for approximately 85% of the total flow of water in the Ohio River, and consequently, might be expected to contribute a significant portion of the total Ohio River mercury load. Sources of mercury within these watersheds include atmospheric deposition, storm water, point sources, and abandoned mine drainage. The tributary mercury sampling project has its own, independent budget, separate from this project, and involves monthly sampling on 15 tributaries.

Completion Date: March, 2017.

Task #2 – Utilize Available Data Bases to Estimate Point Source Loads In Each Tributary Watershed

All readily available data bases will be identified and accessed, utilizing existing data to calculate point source loads of mercury for each tributary watershed.

Completion Date: December, 2017.

Task #3 – Calculation of Mercury Mass Load from Direct Ohio River Point Sources

Ohio River direct point source mercury loads will be calculated for all point sources having readily available data in existing data bases. Then, for all Ohio River point sources categorically known to be regular sources of mercury, but where mercury discharge data does not exist, extrapolation methods will be utilized to estimate a mercury loading. Various extrapolation methods will be utilized: e.g. (1) assigning literature values to certain categories of sources, and (2) applying existing data from Ohio River point sources to sources in the same industry category. ORSANCO staff will work with the NPDES Subcommittee to identify all known mercury source categories. NPDES permit applications will also be reviewed for the existence of mercury data.

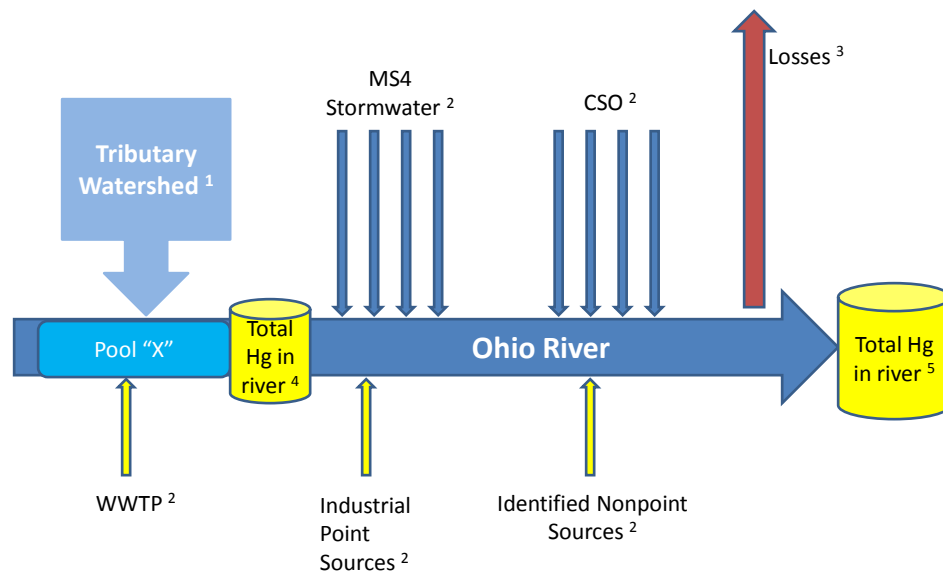
Completion Date: March, 2018.

Task #4 – Putting the Mass Balance Together

Instream annual mercury loads (Ohio River and tributaries) will be calculated for a consistent timeframe. Point source loads will be calculated over the same timeframe to the extent possible. All loads will be put together such that tributary loads and Ohio River point source loads collectively can be compared against the Ohio River outlet load (Figure 1). In addition, point sources will be evaluated to assess their impact on individual pools of the Ohio River where available data supports such an assessment.

Completion Date: June, 2018.

Mercury Mass Balance



- 1 Tributaries account for approx. 85% of inflow to Ohio River. Mercury load calculated for tribs will include all sources combined including atmospheric sources.
- 2 Direct sources to Ohio River.
- 3 Losses will not be accounted for, which include deposition, atmospheric re-emissions, photo-degradation, etc.
- 4 Load calculation for individual pools based on clean metals monitoring program data.
- 5 Load calculation for Ohio River based on BAF project data.

Figure 1. Diagram of Ohio River Mercury Mass Balance

SCHEDULE

This project will be fully completed 18 months from its starting date. A lower Ohio River monitoring site needed for a downstream mercury mass loading calculation requires 12 months to complete beginning in October/November, 2016, ending Nov. 2017. Several months will be needed to receive data from the lab, QA the data, and calculate loads.

| Mercury Project Timeline | | 2017 | | | | 2018 | |
|--------------------------|--|------|----|----|----|------|----|
| Task # | Task Description | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 |
| 1A | Calc Hg Mass Load at Mainstem BAF Sites | | | | | | |
| 1B | Calc Hg Mass Load at Mainstem Clean Meals Sites | | | | | | |
| 1C | Calc Hg Mass Load for Tributaries | | | | | | |
| 2 | Calc Point Source Hg Mass Load for Trib Watersheds | | | | | | |
| 3 | Calc Mainstem Point Source Loads | | | | | | |
| 4 | Report Development | | | | | | |

Figure 2. Project Timeline By Task

COST

This project will be completed utilizing substantially existing resources and staffing. ORSANCO has ongoing studies of mercury with existing budgetary commitments. These studies will be utilized to substantially complete a large part of this project. The majority of the project cost will be associated with the utilization of existing staff. An estimate of 1 FTE (equivalent) spread through multiple staff members will be required; however this will be accomplished by realigning existing staff under the current budget. No new monitoring projects are necessary to complete this effort and travel costs should be minimal. Travel may be required to state offices to gather information on point source discharges of mercury, or for project review and oversight. Such travel requirements are yet undefined, but are expected to be less than \$10,000 total. In addition, there may be benefits to utilization of outside consultation, which might fall in the range of \$10,000, and which may be considered in the future.