

Request for Renewal of Funding for Operation of the Tributary Loading Station on the Scioto River and Interpretation of Water Quality Data

Submitted to
Dr. Fang Cheng and Mr. John G. Newsome
Department of Public Utilities
Division of Sewerage and Drainage
The City of Columbus, Ohio

by
Laura T. Johnson, Ph.D., Director

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Period Covered by this Request: 1 January 2017 through 31 December 2021

Work to be Accomplished:

We request that the City of Columbus provide funds to support the operation of water quality monitoring stations on the Scioto River- one at Chillicothe and one near Piketon, which would be conducted in collaboration with the Division of Sewerage and Drainage (DOSD). The water quality information produced by our operation of this station and our analysis of NPDES data in the Scioto watershed through our prior agreements has proven to be highly valuable to DOSD.

For 2017, we request a total amount not to exceed \$128,400. The amounts anticipated for subsequent years 2018 through 2021 (years 2 through 5) are shown in the proposed budget table on page 4 of this proposal. This level of funding will permit us to do the following:

- (1) Continue to produce water quality data through our intensive sampling protocol, analysis of suspended sediments and nutrients (including forms of phosphorus and nitrogen), computation and characterization of nutrient and suspended sediment concentrations and loads from the Scioto River to the Ohio River as calculated from the Chillicothe station;
- (2) Construct and operate an additional station at Piketon, and possibly elsewhere, to further characterize watershed variability in nutrient export;
- (3) Upload the Scioto River data to our public data download website and interpret the data as part of an omnibus comparative report on all of the Ohio River and Lake Erie tributaries that comprise the Heidelberg Tributary Loading Program (HTLP);
- (4) Analyze total dissolved solids, alkalinity and hardness in a subset of samples collected at the Chillicothe station during both base flow and storm runoff events as coordinated with DOSD personnel;
- (5) Assist OEPA in calculations that compare point-source and nonpoint-source loads of total phosphorus and other nutrients of interest to DOSD upstream of the sampling station at Chillicothe.

- (6) Plan and develop a watershed-scale model to assess sources of nutrients to the Scioto River and how different management schemes will influence nutrient export.

Progress to Date:

During the three years of the prior agreement between City of Columbus and NCWQR (calendar years 2014-2016), we have accomplished the following:

(1) The suspended sediment and nutrient data generated from 1 January 2014 through 30 June 2016 have been uploaded onto the NCWQR data download web site. Data for the period July – September 2016 will be posted to the site in November 2016, and the data for the fourth quarter will be posted in February 2017. A comparative report on our Scioto River results in relation to the other tributaries in our program is presently in an advanced draft stage and will be submitted to you in January 2017.

(2) Our chemical laboratory staff coordinated with Melodi Clark in the DOSD Surveillance Laboratory regarding the analytical methods the NCWQR has used to analyze total dissolved solids, alkalinity and hardness. Also, in coordination with Dr. Fang Cheng of DOSD, we developed a schedule for collecting those samples in 2016.

(3) NCWQR staff member Dr. Rem Confesor has worked closely with Ohio EPA to develop a mass balance of nutrients for the Scioto River watershed (along with other HTLP stations). That research is largely completed and the results have been shared with interested parties. The report should be out shortly, likely by early next year.

Rationale

Measurements of pollutant export from watersheds are used to compare the amounts of pollutants derived from diffuse *nonpoint* sources, such as agricultural and urban storm runoff, with contributions from *point* sources, such as publicly owned wastewater treatment plants and industrial facilities. The two City of Columbus wastewater treatment plants (Southerly and Jackson Pike) are the two largest point source dischargers into the Scioto River watershed. Accordingly, collecting pollutant monitoring data in the Scioto watershed to enable the comparison of Columbus discharges with other pollutant sources is of significant interest to the City. Detailed knowledge of concentrations and loads of nutrients and sediments exported through tributaries (e.g., the Scioto River) to downstream receiving waters such as the Ohio River and ultimately the Mississippi River to the Gulf of Mexico has added greatly to understanding the impacts of rural, largely agricultural land management practices on stream water quality. This information has also permitted detection of trends in water quality, especially changes in dissolved phosphorus loads. Dissolved phosphorus and inorganic forms of nitrogen greatly influence the development of harmful algal blooms (HABs) in receiving waters; for example the Ohio River, which recently experienced significant HABs. Forms of nitrogen along with phosphorus have a particularly large impact on the growth of algae and the yearly development of an oxygen-devoid “dead zone” in the Gulf of Mexico. Heidelberg’s data, as collected through the HTLP, enable direct assessment and evaluation of the watershed-scale effectiveness of BMP implementation programs aimed at nutrient load reductions from Ohio watersheds to receiving waters including the Ohio River. Scientists at numerous universities who are developing land use-water quality models for Lake Erie rely heavily on HTLP data to calibrate and validate their models. The availability of this Scioto River sampling data will likewise enable development of similar land use-water quality models for the Scioto River watershed.

Work Plan

Our work plan for 2017-2021 is as follows:

1. We will maintain one refrigerated automated ISCO sampler inside the monitoring building at Chillicothe. The sampler will collect one discrete sample every eight hours year-round. Samples will be shipped to us by our cooperator at the Ross County Soil and Water Conservation District

weekly (except the last week in December). Heidelberg technicians will visit the site as needed, usually one to two times a year, to perform required maintenance and repairs. We have an excellent rapport with the Ross SWCD, and they occasionally volunteer in ensuring that the station is operational and has minimal “down time”.

2. We will construct a sampling station near Piketon, Ohio with equivalent functionality, appropriate sampling and ancillary equipment, and suitable protective structure as used for the Chillicothe or other HTLP sampling stations.
3. For year 1 (2017), we will sample at a bridge crossing near Piketon, Ohio using a cooperator in the region. The cooperator will collect one sample a day for a minimum of 5 days a week and then ship the sample to us weekly. We are currently working with Ross SWCD to identify a possible cooperator. After the Piketon sampling station is constructed and placed into operation, anticipated to be for the second through fifth years (2018-2021), we will maintain and operate it in a manner equivalent to that described in item #1.
4. As we have done since 1996, we will analyze approximately 500 (\pm about 50) samples each year for the Chillicothe station, the exact number dependent on the number and duration of storm runoff events during the year. We analyzed 516 samples in FY 2015 and 502 samples in FY 2016. We will analyze daily samples and additional samples as needed to accurately characterize storm runoff loads of the analyzed compounds. For the Piketon station during 2017, we will analyze the samples collected daily, anticipated to be between 260-365 samples. After the Piketon sampling station is constructed and placed into operation, anticipated to be for the second through fifth years (2018-2021), we will analyze approximately 500 (\pm about 50) samples each year, with the exact number dependent on the number and duration of storm runoff events during the year. All analyses conform to methods specified in our U.S. EPA-approved QAPP and are certified by Ohio EPA at level 3J. Several of our laboratory technicians (J. Kramer, E. Ewing, B. Merryfield) and research scientists (A. Roerdink, L. Johnson) are certified by Ohio EPA as Level 3 Qualified Data Collectors for chemical water quality assessment. We will analyze all water samples for specific conductance and the concentrations of total phosphorus, dissolved (soluble) reactive phosphorus, nitrate nitrogen, nitrite nitrogen, total Kjeldahl nitrogen, ammonia, chloride, sulfate, dissolved silica, and total suspended solids.
5. We will continue to upload our concentration data and the corresponding flow data (provided by USGS) for each analyzed sample on our tributary data download website on a quarterly basis following QA/QC analysis, and we will make the data available more frequently upon special request. After the end of each water year (30 September), we will calculate the annual loads, unit area loads, flow-weighted mean concentrations and time-weighted mean concentrations for each parameter. We will provide an interpretive summary of those results, with comparison to other stations in the HTLP, early in each subsequent calendar year as part of our omnibus report on all of the stations in our water quality network.
6. We will continue to collaborate with Ohio EPA and DOSD personnel in analyzing NPDES data and developing appropriate summaries and interpretive reports of the information.
7. As an optional service, if authorized by the DOSD project manager, we will analyze a subset of samples collected at the Chillicothe station during each sampling year for total dissolved solids, alkalinity and hardness. The number of samples, the timing of sample collections, and the specific analytical methods will be mutually agreed upon by NCWQR and DOSD as before.
8. As an optional service, if authorized by the DOSD project manager, we will begin to develop watershed scale model simulations to determine the most effective methods to reduce nutrient export from the Scioto watershed and even test the possible effect of climate change on runoff in

future scenarios. The simulation computer model expected to be used is Soil & Water Assessment Tool (SWAT).

9. As an optional service, if authorized by the DOSD project manager, we will locate a suitable site and construct an additional sampling station with equivalent functionality, appropriate sampling and ancillary equipment, and suitable protective structure as used for the Chillicothe, Piketon or other HTLP sampling stations.

Budget

The operational costs to monitor water quality at the Chillicothe station, the new Piketon station, as well as a possible additional station per year for five years are shown below along with one-time station construction costs. Also included are the estimated costs for other chemical analyses including total dissolved solids, alkalinity, and hardness as well as funds for the development of a watershed model (SWAT). Operational costs for the program have a built-in 1% increase each year to cover the potential for inflation. The details are as follows:

Heidelberg proposed budget						
<i>Calendar years 2017-2021</i>						
	Year 1	Year 2	Year 3	Year 4	Year 5	Subtotal
<i>Station operation</i>						\$ 476,434
Chillicothe	\$ 46,700	\$ 47,167	\$ 47,639	\$ 48,115	\$ 48,596	
Piketon	\$ 46,700	\$ 47,167	\$ 47,639	\$ 48,115	\$ 48,596	
<i>Station construction</i>						\$ 25,000
Piketon	\$ 25,000	\$ -	\$ -	\$ -	\$ -	
<i>Optional services (if authorized by DOSD)</i>						\$ 260,761
Other chemical analyses	\$ 5,000	\$ 5,050	\$ 5,101	\$ 5,152	\$ 5,203	
Water quality modelling	\$ 5,000	\$ 15,000	\$ 15,150	\$ 15,302	\$ 15,455	
Additional station operation	\$ -	\$ -	\$ 47,639	\$ 48,115	\$ 48,596	
Additional station construction	\$ -	\$ 25,000	\$ -	\$ -	\$ -	
Subtotal	\$ 128,400	\$ 139,384	\$ 163,167	\$ 164,798	\$ 166,446	
Total Request to City of Columbus, not to exceed						\$ 762,195

Budget Notes

1. The costs quoted in station operation do not include any part of USGS program costs. The USGS operates and maintains the hydrological instrumentation that measures river stage and discharge. NCWQR does pay all electrical bills for the station, currently approximately \$100 per month.
2. For the total request, we have quoted a “not to exceed” total dollar amount, as the number of samples to be analyzed is not exactly known at this time.

We look forward to further collaboration with you as we continue to address important water quality issues in the Scioto River.



Laura T. Johnson
Director