
**JUSTIFICATION FOR USE OF CATEGORY 4B ALTERNATIVE(S)
SCIOTO RIVER (UPPER) WATERSHED**

Problem causing the impairment

In 2009 Ohio EPA surveyed the upper Scioto River watershed to evaluate use attainment for aquatic life and recreation uses. In the 05060001 03 03 twelve-digit HUC (known as the City of Marion-Little Scioto River subwatershed), aquatic life uses were impaired at two sites along the Little Scioto River and one site on North Rock Swale Ditch that are all downstream from discharges from a combined sewer outfall (number 003) associated with the Marion WPC collection system. One of these sites is at river mile 0.55 on North Rock Swale Ditch, less than 0.1 river mile downstream from the 003 outfall, and is in non attainment of its aquatic life use designation with an IBI score of 22 (poor) and a narrative evaluation of very poor for the ICI (macroinvertebrate community). The macroinvertebrate evaluation is a substantial departure from the biological criteria applicable to its modified warm water habitat use designation. The causes of impairment for this site are organic enrichment and low dissolved oxygen with the source being discharges from combined sewer overflows (CSOs).

There were water quality violations for minimum dissolved oxygen concentrations (WQS = 4.0 mg/l) on three out of five sampling events on North Rockswale Ditch at river mile 0.55. Dissolved oxygen concentrations also fell below water quality standards on four out of five sampling events on the Little Scioto River downstream of its confluence with North Rockswale Ditch (and at a distance of a little over one river mile from the CSO outfall). These violations were primarily associated with low flow conditions. Another same-day sample comparison shows ammonia concentration nearly doubles from a site on North Rockswale Ditch upstream of the CSO (at river mile 2.55) to the site just down from the outfall (North Rockswale Ditch at river mile 0.55).

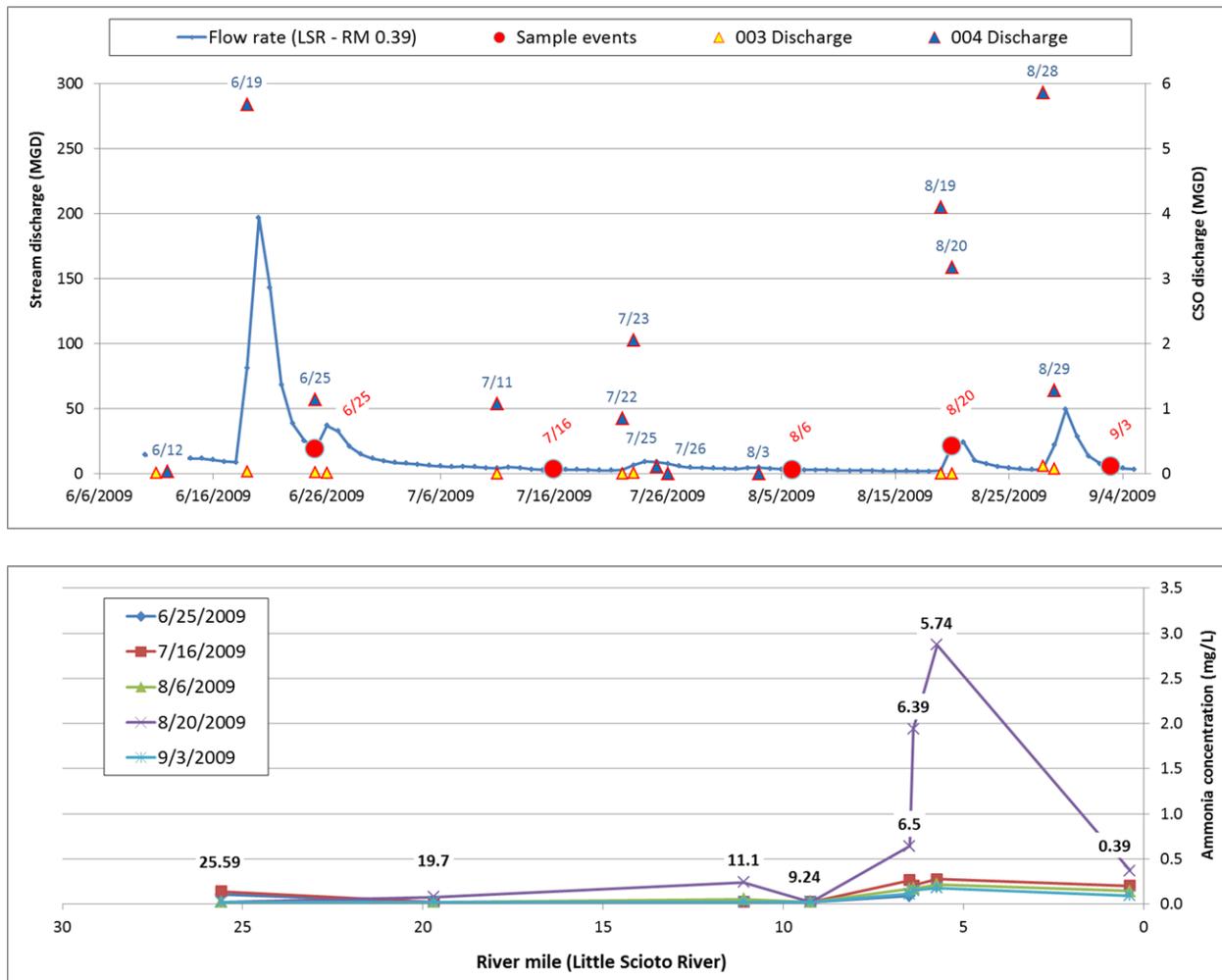
In the 05060001 03 04 twelve-digit HUC (known as the Honey Creek-Little Scioto River subwatershed), aquatic life uses were impaired at one site along the Little Scioto River at river mile 0.39. Both an insufficient macroinvertebrate evaluation (i.e., low-fair) and a considerably low score of 3.98 for the modified index of well-being (MiWB) were the reasons that the aquatic life uses are considered to be in non-attainment. Elevated ammonia concentrations in the stream emanating from CSO discharges from the Marion WPC collection system are listed as the source. This site is downstream from both the 003 outfall which discharges to North Rockswale Ditch and the 004 outfall which discharges to Columbia Ditch, a tributary to Rockswale Ditch which conflues with the Little Scioto River at river mile 2.89. The stream distance between the 004 CSO outfall and the survey site on the Little Scioto River at river mile 0.39 is about 5.6 miles.

There is no data regarding ammonia concentrations in the CSO discharge; however, within the stream, ammonia concentrations increase in the Little Scioto River down from its confluence with North Rockswale Ditch (and downstream of the 003 CSO outfall). This is indicated by the mean concentration (mean = 0.06; Stdev = 0.06) of all of the samples upstream of the confluence being significantly lower ($T = -2.25$; $p\text{-value} = 0.037$; $df = 5$) than the mean at the first site downstream when all samples were taken on the same day (mean = 0.25; Stdev = 0.20). Likewise a paired T-test of the sites immediately upstream and downstream of the North Rockswale confluence showed this same type of statistically significant increase.

The figure below shows that the same day sampling along the length of the Little Scioto River where the tendency to increase ammonia concentrations down from the CSO outfalls is evident. In particular, on August 20th, samples were collected earlier in a storm event capturing more of

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the first flush of pollutants as well as coinciding with discharges from both CSO outfalls. The increase in ammonia concentration on this day is the most pronounced of all of the same day



sampling events.

Figure-1. Graph above: Flow conditions of the Little Scioto River (river mile 0.39) based on unit area hydrograph that is derived from the USGS gage on the Scioto River at Prospect, Ohio; and stream water quality sample dates (red font); and CSO discharge rates (dates for the 004 discharges in blue font). Graph below: Ammonia concentrations taken on the same day along the length of the Little Scioto River. Data points are labeled by their river miles.

Link between the source of the problem and the specific listed impairment

The 003 outfall for the Marion WPC collection system discharges to North Rockswale Ditch at approximately river mile 0.6, which is upstream of three monitoring stations where aquatic life uses were found to be impaired. Based on self-monitoring data for the 003 CSO outfall, there have been over 720 discharge events between January 2004 and April 2014 for a total of 6,330 hours (or 264 days) of discharge. On average there are 26 full days of discharge per year (seven percent) resulting from an average of 72 discharge events per year.

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The total volume of CSO discharge from January 2004 to April 2014 is about 855 million gallons, which approximates to be 1.4 percent of the stream flow volume over that period at river mile 0.55 on North Rockswale Ditch. The majority of the CSO discharge volume (87 percent) coincides with stream flow rates that are of the highest 40 percent (i.e., 60th percentile and above) and where the top five percent received about one third of the overall CSO discharge. Over the 2004 through April of 2014 time period nearly half of the CSO volume was discharged in four months of the year which are, in descending order by discharge volume, May, June, December, and September. CSO loading in May, June and September is more likely to result in greater stress on the aquatic community since residual pollutants in the system at these times coincide with when stream temperatures are warmer, facilitating higher rates of bacterial growth and greater consumption of dissolved oxygen.

Organic-based, oxygen demanding substances as indicated with the water quality parameter 5-day carbonaceous biological oxygen demand (CBOD5) are monitored at the CSO outfalls for Marion's waste water treatment system. The average estimated annual load is nearly 6,300 kilograms (over seven English tons) with a mean concentration of 24 mg/l CBOD5 for the CSO discharges. Over half of the CBOD5 load was discharged in four months of the year which are, in descending order by mass, June, May, April, and March. Again, CSO loading in these months generally causes greater stress on the aquatic community since residual organic material persisting through the summer months facilitate higher rates of bacterial growth and greater consumption of dissolved oxygen (respiration of the system).

The 004 outfall for the Marion WPC collection system discharges to Columbia Ditch which is tributary to Rockswale Ditch and then the Little Scioto River at river mile 2.89. Discharges from the 004 CSO outfall are upstream of a monitoring station where aquatic life use was found to be impaired (Little Scioto River at river mile 0.39), and there are no other monitoring stations downstream of this source before reaching the mainstem of the Scioto River.

Based on self-monitoring data for the 004 CSO outfall, there have been over 973 discharge events between January 2004 and April 2014 for a total of 6,034 hours (or 251 days) of discharge. On average there are 24.9 full days of discharge per year (seven percent) resulting from an average of 97 discharge events per year.

The total volume of CSO discharged from January 2004 to April 2014 is about 1,149 million gallons, which approximates to be 0.4 percent of the stream flow volume over that period at river mile 0.39 on Little Scioto River. The combination of the 003 and 004 discharge passing through river mile 0.39 on the Little Scioto River represents approximately 0.67 percent of the stream flow volume for the period stated above.

The majority of the 004 CSO discharge volume (81 percent) coincides with stream flow rates that are of the highest 40 percent (i.e., 60th percentile and above) and where the top five percent received about 40 percent of the overall CSO discharge. Over the 2004 through April of 2014 time period nearly half of the CSO volume was discharged in four months of the year which are, in descending order by discharge volume, January, May, June, and March.

Controls and how they will achieve water quality standards

Ohio EPA has been working with the City of Marion regarding their combined sewer system. On December 1, 2000, the City of Marion submitted a Long-Term Control Plan (LTCP) and a

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revised LTCP was submitted on August 25, 2004. The CSO LTCP includes eliminating the remaining two CSOs (stations 2PD00011003 and 2PD00011004) and installing separate storm sewers. The implementation schedule extends to the year 2020. The most recent NPDES permit for the Marion Water Pollution Control (WPC) facility (effective date is November 1, 2013) includes a compliance schedule of projects that will begin during the term of the permit (per NPDES permit [factsheet](#)). Key among the implementation actions is the construction of storage basins immediately upstream of the two CSO outfalls, 003 and 004, which discharge to North Rockswale Ditch and Columbia Ditch, respectively. The storage capacity of each basin is three million gallons, which is well over twice the volume of the average 1.3 million gallons per CSO discharge event. The compliance schedule of the NPDES permit is enforceable, providing assurance that these actions will be implemented. Excerpts of the NPDES relevant to the CSO system are included below:

3. Construction Schedule for Storm Water Storage Basins

The collection system to the City of Marion WPCF contains two CSO sites which are included in the permit as Outfall 003 and Outfall 004. In order to minimize overflows from CSOs Outfall 003 and 004, the permittee shall construct storage basins directly upstream of the outfalls to collect and contain storm water until the treatment plant can accept and fully treat the flow. Each storage basin shall have a minimum effective storage volume of 3 Million Gallons of sewer overflow. Including this implementation schedule in this NPDES permit shall in no way be construed as acceptance or approval of detailed plans. The sizing and location and need for these storage basins as well as construction schedule may be modified under Part C.2.e.

Loadings that will achieve water quality standards

Ohio does not have ambient water quality standards associated with oxygen demand based parameters (e.g., 5-day CBOD, 20-day CBOD). Ohio EPA typically follows the presumptive approach for CSO control as provided through the U.S. EPA guidance document titled "[Combined Sewer Overflow Guidance For Long-Term Control Plan](#)" (1995). An excerpt from that guidance (page 3-7) that describes the presumptive approach is as follows:

... The presumption approach is based on the assumption that an LTCP that meets certain minimum defined performance criteria "...would be presumed to provide an adequate level of control to meet the water quality-based requirements of the CWA, provided the permitting authority determines that such presumption is reasonable in light of the data and analysis conducted in the characterization, monitoring, and modeling of the system and the consideration of sensitive areas..." (11.C.4.a).

Under the presumption approach, controls adopted in the LTCP should be required to meet one of the following criteria (11.C.4.a)

- i. No more than an average of four overflow events per year, provided that the permitting authority may allow up to two additional overflow events per year. For the purpose of this criterion, an overflow event is one or more overflows from a CSS as the result of a precipitation event that does not receive the minimum treatment specified ...[see definition of minimum treatment, below]; or*
 - ii. The elimination or the capture for treatment of no less than 85% by volume of the combined sewage collected in the CSS during precipitation events on a system-wide annual average basis; or*
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iii. The elimination or removal of no less than the mass of the pollutants identified as causing water quality impairment through the sewer system characterization, monitoring, and modeling effort for the volumes that would be eliminated or captured for treatment under paragraph ii above.

In consideration of the minimum performance criteria in the excerpt above, the construction and use of the storage basin (3.0 million gallon capacity) upstream of the 003 and 004 CSO outfalls would contain the majority of the CSO discharges. For the 003 CSO, the overall mean discharge per discharge event is 1.3 million gallons and the median value is 0.15 million gallons, representing 43 percent and five percent of the storage capacity, respectively. The corresponding values for the 004 outfall are 1.53 and 0.26 million gallons for the mean and median, respectively, associated with 51 and nine percent of the capacity of the storage basin. Likewise it is up to the 89th and 88th percentiles of the CSO discharge volumes per event before the 3.0 million gallon capacity is reached for outfalls 003 and 004, respectively. These values are similar when considering only the more critical times of the year for causing negative aquatic life impacts (i.e., spring summer and early fall months), where discharges occurring between April 1st and October 31st (from 2004 through 2013) had a mean of 1.24 million gallons and a median and 90th percentile, respectively, at 0.13 million gallons and 2.84 million gallons. These flows should be contained in the storage basins and later released to the treatment works before being discharged to the stream system.

From January 2004 through May of 2014, the number of events that exceed the three million gallon storage capacity is 72 out of 657 events (an 89 percent reduction in frequency) for the 003 outfall and 92 out of 753 events (an 88 percent reduction in frequency) for the 004 outfall. This corresponds to a flow volume reduction of 53 and 54 percent, respectively for the 003 and 004 outfalls. The reduction in CSO discharge volume due to storage in the basins and subsequent treatment through the wastewater treatment plant is of lower magnitude than the reductions in the discharge frequency since the most extreme discharge events are occur when volumes are large. However, other efforts carried out by the City of Marion are intended to reduce the volume sent through the CSO such as improved storage elsewhere in the collection system and diversion of non-sewage influent (such as I&I).

Time needed to achieve water quality standards

Progressive improvements are expected in terms of abating the deleterious impacts of the CSO discharges to the quality of the receiving waters. Namely, implementation of the nine minimum controls measures and the associated increased capacity of the system, greater collection efficiencies (i.e., more CSO volume routed through the treatment works) and reduced pollutant loading in the CSO discharge due to enhanced pretreatment practices. However, completion of the two storage basins (three million gallon capacity) will result in substantially reduced CSO discharge and will likely create the most profound improvements. Based on the compliance schedule in the NPDES permit issued on September 30, 2013 (NPDES number = 2PD00011*ND), the construction of these basins is to be completed within 78 months of the effective date. The permit became effective on November 1, 2013, meaning that the basins are to be completed by May 1, 2019. Absent the chronic CSO loading following the construction and use of the storage basins, the aquatic community should recover quickly, perhaps only needing one growing season before fully meeting applicable water quality standards (i.e., the biocriteria).

Schedule for implementing the necessary pollution controls

The compliance schedule on pages 17 through 26 in the current NPDES permit ([2PD00011*ND](#)) describe the maximum allowable time to complete various milestones of abating the CSO discharges. A primary deadline for the abatement of the CSO discharges is the construction of the storage basins, which is to be completed within 78 months from the effective date of the current individual NPDES permit (i.e., May 1st, 2019).

This permit will expire on July 31, 2017, which is before the completion date for the latest milestones. Ohio EPA will, therefore, renew the permit prior to its expiration, retaining the current compliance schedule language.

Monitoring plan to track effectiveness and analysis of the results

As a part of their [NPDES permit](#) (pages four and five), the Marion WPC is to monitor all CSO discharges and provide for a monthly report (regardless if any discharges occurred in that month) of the number of discharge events, the duration of flow for each event, the discharge rate, and concentrations of both CBOD5 and TSS. The facility's monthly discharge monitoring reports are reviewed by permit staff in Ohio EPA's Northwest District Office. Ohio EPA staff will also conduct facility inspections approximately annually.

The upper Scioto River watershed area is scheduled to have a comprehensive survey in 2024. At this time Ohio EPA will collect data for aquatic life (fish and macroinvertebrates), habitat, stream chemistry, and bacteria concentrations on the North Rockswale Ditch and the Little Scioto River in the areas that have been degraded by the CSO discharges. Aquatic life uses will be evaluated for attainment of water quality standards. Likewise, Ohio EPA will report progress in its Integrated Report every two years until the impairment has been eliminated.

Ohio EPA staff from the Northwest District Office (NWDO), Water Quality Program and Ecological Assessment Section (EAS) staff will do the monitoring for the 2024 survey. Estimates for this work include:

- Water chemistry = five work days for two people to sample (standard lab costs for chemistry samples)
- Aquatic life = 4 work days for two people (standard EAS costs)

Staff in the water quality program in the NWDO will examine both the data generated by Marion WPC and those from the Ohio EPA sampling and carry out the reporting for these findings in ongoing 303(d) lists.

Revision of the implementation strategy and corresponding pollution controls

Paul Novak, manager of the NPDES program at Ohio EPA, Division of Surface Water, Central Office will be advised of failures to meet water quality standards after adequate time has been allotted for recovery. Mr. Novak will then evaluate further alternatives for achieving water quality standards and take the necessary steps to meeting those goals.