
APPENDIX B

JUSTIFICATION FOR THE USE OF A 4B ALTERNATIVE

The main stem of Twin Creek (in assessment unit 05080002 030) was identified as impaired by total phosphorus during the field sampling in 2005; organic enrichment was later added to the list of causes upon further investigation in the summer of 2009. Upstream of the wastewater treatment plant (WWTP) in the City of Lewisburg, the stream was in attainment of its aquatic life use. Downstream of the treatment plant, the aquatic life in the stream was partially supporting the use. The City of Lewisburg wastewater treatment plant (WWTP) discharges to Twin Creek at river mile (RM) 35.2. No impairment to Twin Creek upstream of Lewisburg or downstream at RM 33.6 was found. The biological impairment is resulting from the Lewisburg WWTP effluent discharge. Ohio EPA proposes that this impairment be handled through a category 4B alternative instead of a total maximum daily load (TMDL). Further details are discussed below. Additional information is available in the main text of the TMDL and in the forthcoming biological and water quality study publication.

Identification of segment and statement of problem causing the impairment

An Invertebrate Community Index (ICI) of 38 was garnered at RM 34.9, which was below the Exceptional Warmwater Habitat (EWH) criterion. In 2005, excessive phosphorus due to either the Lewisburg WWTP, herbicide runoff from an upstream municipal park, or contaminated stormwater were considered potential contributors to this impairment. However, new information obtained during an inspection of the Lewisburg WWTP in September 2009 revealed that biological solids were being discharged directly into Twin Creek from the wastewater plant. Gray and brown sewage sludge was observed in Twin Creek from Lewisburg's outfall downstream to at least the Salem Road bridge, with thick algal mats coating the heaviest deposits. Black anoxic muck was also observed under many of the substrates. Because of these new findings, it is apparent that nutrient enrichment was a secondary cause of impairment to Twin Creek at RM 34.9. Organic enrichment attributable to improper solids management at the Lewisburg WWTP is now considered the primary cause of impairment to the macroinvertebrate community at RM 34.9.

Further information regarding the 2005 findings is available in the Biological and Water Quality Study of Twin Creek and Select Tributaries 2005, available on Ohio EPA web site (<http://www.epa.ohio.gov/portals/35/documents/TwinCreek2007TSD.pdf>). This report will be amended to reflect the 2009 observations.

Ohio EPA included nutrient enrichment for this assessment unit in the 2008 Integrated Report (303(d) list), available at (<http://www.epa.ohio.gov/dsw/tmdl/2008IntReport/2008OhioIntegratedReport.aspx>).

The 2010 Integrated Report will add organic enrichment as an impairment cause for this assessment unit.

The primary issue with the Lewisburg WWTP is that biological solids or sludge is making its way into the stream resulting in the stream conditions described above. Sludge in the creek will contribute nutrients (phosphorus) and bacteria as well as smothering the substrate. biological solids are largely made up of sewage treatment micro-organisms, living and dead. Micro-organisms contain phosphorus compounds (e.g., nucleic acids, ADP, ATP). Biosolids from wastewater treatment plants are frequently used as an agricultural soil amendment with some fertilizer value. Lewisburg's 2008 annual sewage sludge report included the following analyses results (on a dry weight basis): TKN = 35,000 mg/Kg; NH₃-N = 8590 mg/Kg; and phosphorus = 15,900 mg/Kg.

This information demonstrates there is a nutrient content to Lewisburg's sludge.

In September 2009 there appeared to be both structural and operational problems. Clarified water was overflowing only portions of the clarifier weirs; this may have been caused by the weirs not being level and sections of the weir being clogged with algae. The net result was that the clarifiers were being short circuited. Compounding the problem was the fact that Lewisburg was not wasting sufficient amounts of sludge from the clarifiers to the sludge digesters. This resulted in old sludge denitrifying and floating to the surface of the clarifiers, which was then discharged to Twin Creek. Plant operating logs also documented difficulty in balancing flow between the two clarifiers during rain, which compromised clarifier performance still further. The appearance of the aeration tanks indicated that the mixed liquor suspended solids were being maintained at higher levels than necessary and that the biological solids in the tank were old.

Description of pollution controls and how they will achieve water quality standards

The Village of Lewisburg operates a sewer collection system and a wastewater treatment facility that handles domestic and industrial sewage for a population of about 1,800. The Lewisburg WWTP holds a National Pollutant Discharge Elimination System (NPDES) permit (1PB00019*HD).

Lewisburg has been reporting substantial compliance with its NPDES effluent limits over the life of the current permit. Ohio EPA now believes that compositing effluent samples using multiple grab samples (as allowed by the NPDES permit) did not provide a true reflection of effluent quality. Recent inspections have also revealed quality control issues with the sampling and analyses, casting doubt on the reported effluent data.

Lewisburg has been required in inspection reports and Notices of Violation to take actions to eliminate the problems resulting in discharge of solids to Twin Creek. The Village has since utilized the assistance of Ohio EPA's Compliance Assistance Unit and has engaged an engineering firm that is reviewing plant operations. Lewisburg began implementing changes recommended by the Ohio EPA's Compliance Assistance Unit in November 2009.

Ohio EPA anticipates that the operational problems contributing to the discharge of solids, can be resolved well before the NPDES permit is renewed in April 2010. Ohio EPA NPDES permits staff from the Southwest District office will closely monitor operational changes.

The draft renewal of the Lewisburg WWTP NPDES permit, (scheduled for issuance April 1, 2010) contains additional requirements that will address the impairment in Twin Creek downstream of the WWTP discharge. Ohio EPA intends to revisit the Twin Creek sampling sites in Lewisburg in September 2011. If the operational improvements have been properly implemented and yet the ICI at RM 34.9 cannot be demonstrated to comply with EWH criteria due to organic enrichment from the wastewater treatment plant, Lewisburg will be required by a modification to its NPDES permit to comply with a schedule that leads to compliance with an initial total phosphorus limit of 1.0 mg/l by April 2015.

A complicating factor is that Preble County, at the request of the Village of Lewisburg, cleared bank vegetation and removed gravel bars and woody debris from the creek in the vicinity of RM 34.9 during the summer of 2009. This work was done to protect the Knapke Lane bridge pier and reduce bank erosion. It is unlikely that the target ICI score can be attained at that location unless the creek habitat is restored.

A loading analysis to address the organic enrichment impairment is not necessary given the scope of the operational problems at the Lewisburg WWTP and the ability of the facility to correct the problem. Although it is difficult to predict how much of the secondary nutrient enrichment problem is associated with the operational problems, a simple analysis of chemical data provides guidance on point source loading.

The 2005 data collected in Twin Creek by Ohio EPA show a significant change in total phosphorus concentration at the WWTP's entry into the stream. The median in-stream concentration of total phosphorus upstream of Lewisburg's outfall was 0.038 mg/l. The median in-stream concentration downstream of Lewisburg was 0.239 mg/l. The exceptional warmwater habitat (EWH) in-stream target from *Association Between Nutrients, Habitat, and the Aquatic Biota of Ohio Rivers and Streams* is 0.08 mg/l (http://www.epa.ohio.gov/portals/35/documents/assoc_load.pdf).

A simple loading analysis using the five sets of samples collected in 2005 yields the following total phosphorus loads:

Stream capacity (based on 0.08 mg/l target) = 1.303 kg/d
Margin of safety (5%) = 0.065 kg/d
Load allocation (from nonpoint sources) = 0.856 kg/d
Wasteload allocation (Lewisburg WWTP) = 0.382 kg/d

A wasteload allocation of 0.382 kg/d equates to an effluent concentration of 0.39 mg/l total phosphorus at the WWTP's design flow. The 95th percentile of effluent total phosphorus reported by Lewisburg over the current permit is 3.69 mg/l, although there is uncertainty because of concerns with laboratory practices.

Ohio EPA intends to apply an initial phosphorus limit of 1.0 mg/l that would be triggered if fixing the WWTP's operational problems fails to result in attainment of WQS. While the loading analysis results indicate that this limit will not meet the phosphorus target concentration, it does represent a significant (approximately 72%) reduction in phosphorus load from the Lewisburg WWTP. This limit should provide enough instream nutrient reduction to improve aquatic life while imposing achievable NPDES limits. Any further reduction in effluent limits should be evaluated after this limit is being attained and an evaluation of the biological condition of the stream has been completed.

An estimate or projection of the time when WQS will be met

The next NPDES permit for Lewisburg's WWTP will be issued in 2010. Ohio EPA anticipates that Lewisburg will be able to eliminate the discharge of biosolids to the creek before the permit is renewed. This will significantly reduce the solids and nutrient load to the creek. Ohio EPA expects that the stream will respond to improved operation within two years of making the changes.

Ohio EPA proposes to measure the ICI at RM 34.9 by September 2011. If the ICI does not comply with EWH criterion due to organic enrichment at that time Lewisburg will be given three years to come into compliance with a permit limit for TP of 1.0 mg/l (that is, by April 2015).

Schedule for implementing pollution controls

Any compliance schedule placed in the NPDES permit will allow three years (2012-2015) to implement new controls to reduce TP in effluent if the ICI score is not in attainment by September 2011. It is expected that operational improvements to reduce organic enrichment and, if needed, effluent controls to reduce TP, will sufficiently improve water quality within five years such that the macroinvertebrate community will be able to recover to full attainment.

Monitoring plan to track effectiveness of pollution controls

The City of Lewisburg WWTP is required to submit monthly Discharge Monitoring Reports for effluent quality from the WWTP and upstream and downstream of their discharge point.

The renewed permit will require 24 hour flow composited effluent sampling at Lewisburg, which will provide a much improved picture of effluent quality. The operations assistance provided by Ohio EPA to the WWTP will include attention to quality control issues so that concerns with past facility monitoring will be resolved.

Following Ohio EPA's Permit Guidance, at upstream and downstream stations, pH, dissolved oxygen and temperature will be monitored once per month year round. Total phosphorus, bacteria and ammonia-nitrogen will be added to both upstream and downstream stations at a frequency of once per month during the summer season.

The facility's monthly discharge monitoring reports are reviewed by permit staff in Ohio EPA's Southwest District Office. Ohio EPA staff will also conduct unannounced facility inspections at least twice annually until all identified operational and process changes have been completed.

After the Lewisburg operational improvements have been in place for at least one year, Ohio EPA will return to monitor Twin Creek at RM 34.9 by September 2011 to determine if progress toward meeting the Aquatic Life Use is being made. This work would follow Ohio EPA's protocol for sampling the aquatic biology and chemistry. If sufficient progress is not being made, Ohio EPA will evaluate the options available under NPDES authority, including additional operations assistance and enforcement.

Ohio EPA will report progress in its Integrated Report until the impairment has been eliminated.

Commitment to revise pollution controls, as necessary

The SWDO surface water manager will initiate a reexamination of the implementation strategy if significant progress is not being made by the end of the next NPDES permit cycle for Lewisburg.

Ohio EPA will report on the progress of any approved 4B in future 303(d) lists.