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FROM: CH2MHILL

DATE: January 13, 2014 (updated)

RE: Newtonsville WWTP and Collection System Project
Phase 1 – Planning and Conceptual Design
Newtonsville Area Stream Sampling and Analysis

Background and Purpose

Beginning in 1996, Clermont County began a comprehensive stream sampling and analytical program that had three objectives:

1. Characterize the surface water quality within Clermont County streams;
2. Investigate potential impacts associated with observed impairment of surface water quality through dry weather sampling (July and August) upstream and downstream of suspect discharges;
3. Monitor Shayler Run and Hall Run sample sites during wet weather to determine impacts associated with major rain events.

Data collected by the County through its Office of Environmental Quality provides a basis for tracking trends in water quality over time and providing support for planning and management programs. The Newtonsville area was included as part of the dry weather sampling program in 2007 due to suspected water quality impacts resulting from failed home sewage treatment systems (HSTS). Sampling of the Newtonsville area sites was recently completed by the County in August 2013.

The purpose of this memorandum is to integrate and summarize available water quality data collected by the County and the Ohio EPA for the Newtonsville area and to provide a basis for and support of the referenced project.

Previous Biological and Water Quality Surveys-Ohio EPA

The Village of Newtonsville is located in the East Fork Little Miami River basin. This location was last surveyed by Ohio EPA in 1998. Total Maximum Daily Load (TMDL) models have been prepared for the Upper Little Miami River (approved by USEPA in July 2002) and the Lower little Miami River (approved by USEPA in March 2011). A similar model is being prepared for the East Fork Little Miami River which is due to be released in 2015. To support this model, a water quality and biological survey was performed by Ohio EPA in this drainage basin during the summer of 2012. Draft conclusions drawn from this data suggest that there are non-attainment and partial attainment stream segments in and around Newtonsville (Attachment A)

The TMDL process, supported by the 2012 field survey, will identify impaired waters, verify beneficial use designations (and re-designate if necessary), gather sufficient data that will factor into the wasteload allocation and ascribe causes and sources of use impairment. The objectives of the process are to estimate pollutant loads from the various sources within the basin, define or characterize allowable loads to support beneficial uses and to allocate pollutant loads among different pollutant

sources through appropriate controls, such as NPDES permitting, storm water management, non-point source controls or other abatement strategies.

For the 2012 field survey, strategic sampling locations were developed to establish baseline water chemistry values under varying flow conditions. Two of those sample sites are located in the Newtonsville area: Stonelick Creek at SR 131 and an unnamed tributary (referred to herein as “Newtonsville Creek”) that crosses Cedarville Road (river mile 0.9). The results of this water quality and biological survey and the TMDL that follows will be of great interest to the County as planning for the Newtonsville collection system and proposed treatment facility evolves.

Prior to 2012, Ohio EPA performed limited biological field work in the Newtonsville area in August 2010 (Refer to Attachment B). Sample sites included two (2) locations on the unnamed tributary that extends through the Village of Newtonsville, one at Cedarville Road (river mile 0.9) and the other at SR 131 (river mile 2.0). The conclusions drawn based on limited biological sampling were: 1) each sample site was characteristic of a *Primary Headwater Habitat Stream* (PHWH) 2) additional sampling and analysis is needed to determine whether *Warmwater Habitat* (WWH) or PHWH classification is most appropriate for these stream segments and 3) based on fish collected at the Cedarville Road location, an index of biological integrity (IBI) score of 36 was determined which does not significantly depart from expected IBI scoring for WWH streams. The significance of stream classification is its bearing on permissible discharge loadings which can be restrictive for PHWH streams compared to larger streams.

Previous Water Quality Surveys-Clermont County

Historical sampling frequencies are presented in Exhibit 1 and Newtonsville area water quality sampling locations established by the Clermont County Office of Environmental Quality are shown in Exhibit 2.

Three (3) sample sites are on the mainstem of what is referred to as “Newtonsville Creek”:

- NEWTN2.5** (2.5 miles upstream of confluence with Stonelick Creek at SR 131);
- NEWTN1.9** (1.9 miles upstream of confluence with Stonelick Creek at Newtonsville Road);
- NEWTN0.9** (0.9 miles upstream of confluence with Stonelick Creek at Cedarville Road);

Three (3) sites are located on an unnamed tributary to Newtonsville Creek:

- NWTUTE.3** (east branch of unnamed tributary, 0.3 miles upstream of tributary fork)
- NWTUTW.2** (west branch of unnamed tributary, 0.2 miles upstream of tributary fork)
- NWTUTO.2** (below tributary fork 0.2 miles upstream of confluence with Newtonsville Creek)

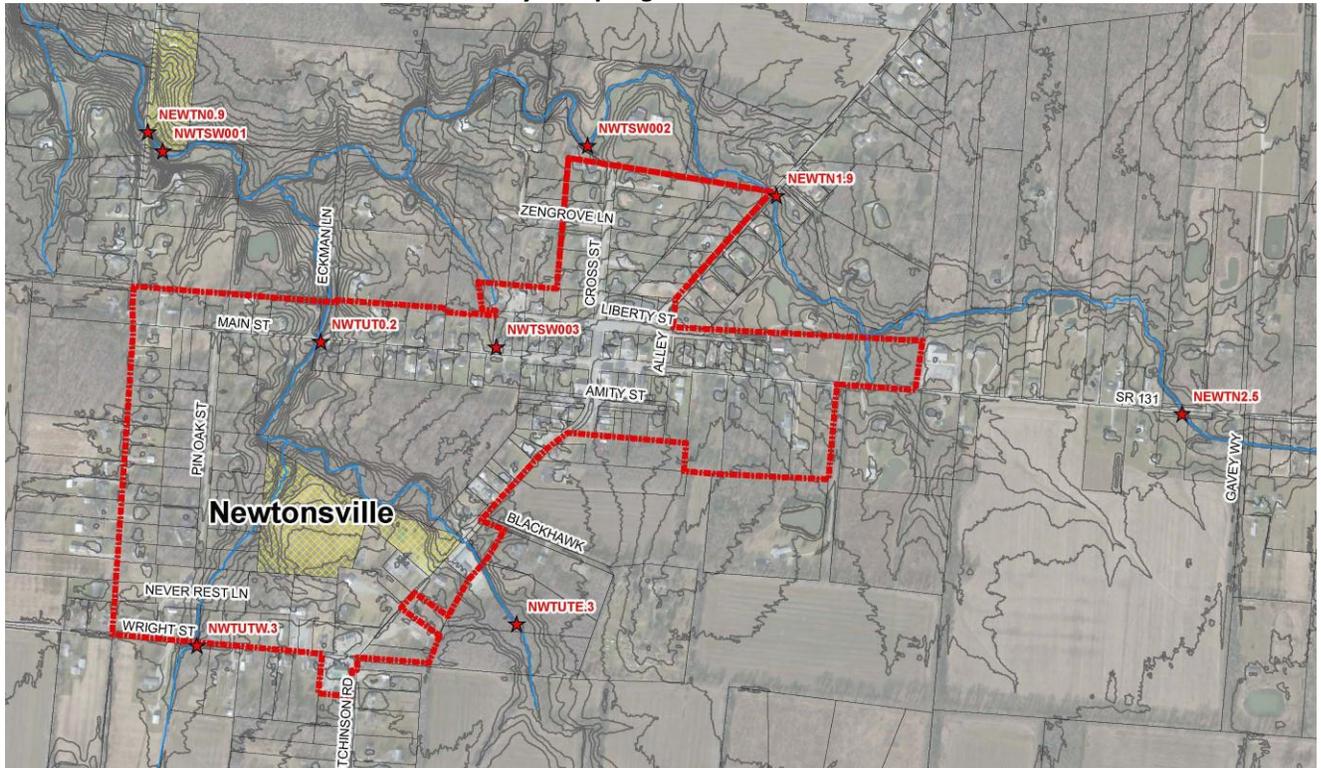
Three (3) additional sites on stormwater outfalls:

- NWTSW001** (stormwater outfall upstream of Cedarville Road)
- NWTSW002** (stormwater outfall located at the end of Cross Street)
- NWTSW003** (stormwater outfall located north of Main Street)

Exhibit 1 – Historical Newtonsville Area Sample Site Designations and Sample Frequencies

| YEAR | NEWTN2.5 | NEWTN1.9 | NEWTN0.9 | NWTWTE.3 | NWTUTW.2 | NWTUTO.2 | NWTSW001 | NWTSW002 | NWTSW003 |
|------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| 1997 | | | X | | | | | | |
| 1998 | | | X | | | | | | |
| 1999 | | | X | | | | | | |
| 2000 | | | X | | | | | | |
| 2001 | | | X | | | | | | |
| 2006 | X | X | X | X | X | X | X | X | X |
| 2007 | X | X | X | X | X | X | X | X | X |
| 2013 | X | X | X | X | X | X | X | X | X |

Exhibit 2 – Newtonsville Area Water Quality Sampling Locations



Analytical Results of Sampling

Grab samples were collected during the summer months of July or August at each sample location during dry weather conditions which is defined as no rainfall during the preceding 48 hours. The 2013 sampling period extended from August 26th through August 28th. Results of the surveys are presented in the following exhibits. Refer to Attachment C for a complete summary of data collected at each sample location.

The results for sample site NEWTN2.5 are presented in Exhibit 3. This sample station is located upstream of Newtonsville and data is limited for the parameters displayed prior to 2013. Data does not show significant bacterial contamination with a geometric mean (GM) of 31 colonies per 100mL. The Ohio Water Quality Standard for E. Coli. is 126 colonies per 100mL based on a GM of not less than five samples collected over a 30 day period. As well, the E. Coli. density cannot exceed 298 colonies per 100mL in ten percent of the samples .

Exhibit 3 – Sample Station NEWTN2.5, 2.5 miles upstream of confluence with Stonelick Creek

| Year | NH4-N mg/L | Conductivity µmho/cm | Diss Oxygen mg/L | GM E.Coli. #/100 mL | pH S.U. | Total P mg/L | Water Temp DegC |
|------|---------------|-------------------------|---------------------|------------------------|------------|-----------------|--------------------|
| 2006 | | | | | | | |
| Max | ---- | ---- | ---- | ---- | ---- | 0.73 | ---- |
| Min | ---- | ---- | ---- | ---- | ---- | 0.73 | ---- |
| Avg | ---- | ---- | ---- | ---- | ---- | 0.73 | ---- |
| 2007 | | | | | | | |
| Max | ---- | ---- | ---- | ---- | ---- | 1.54 | ---- |
| Min | ---- | ---- | ---- | ---- | ---- | 1.54 | ---- |
| Avg | ---- | ---- | ---- | ---- | ---- | 1.54 | ---- |
| 2013 | | | | | | | |
| Max | 0.00 | 1,154 | 13.73 | | 7.65 | 0.32 | 26.77 |
| Min | 0.00 | 1,069 | 3.00 | | 7.41 | 0.16 | 22.41 |
| Avg | 0.00 | 1,112 | 7.23 | 31 | 7.54 | 0.25 | 24.13 |

Ohio EPA has developed in-stream nutrient targets based on a technical report entitled, *Association Between Nutrients, Habitat and the Aquatic Biota in Ohio Rivers and Streams (1999)* that has concluded that in-stream nutrients such as phosphorus have a measurable impact on the health biological communities. These nutrient targets are not codified in Ohio's water quality standards; therefore, there is a degree of flexibility as to how they can be used in TMDL development. The in-stream target for total phosphorus in WWH streams is 0.08 mg/L. The sample results for 2006, 2007 and 2013 at sample site NEWTN2.5 consistently exceed this target value during dry flow conditions. This suggests the presence of some upstream discharge, point or non-point, which could be impacting in-stream phosphorus levels.

The results for sample site NEWTN0.9 are presented in Exhibit 4. This sample station is located downstream of Newtonsville and has been repeatedly sampled since 1997. Data shows significant bacterial contamination with a GM that is two orders of magnitude higher than sample site NEWTN2.5. The total phosphorus concentrations at this location exceed the in-stream target mentioned previously. These observations suggest that HSTs in the Newtonsville area may not be providing adequate treatment or are impaired to an extent that allows sewage to reach and impact local streams.

Exhibit 4 – Sample Station NEWTN0.9, 0.9 miles upstream of confluence with Stonelick Creek

| Year | | NH4-N mg/L | Conductivity µmho/cm | Diss Oxygen mg/L | GM E. Coli #/100 mL | pH S.U. | Total P mg/L | Water Temp DegC |
|------|-----|---------------|-------------------------|---------------------|------------------------|------------|-----------------|--------------------|
| 1997 | Max | 0.00 | 1,270 | 7.6 | ----- | 8.00 | 0.34 | 22.80 |
| | Min | 0.00 | 123 | 4.1 | ----- | 7.70 | 0.07 | 17.30 |
| | Avg | 0.00 | 882 | 6.1 | ----- | 7.84 | 0.16 | 20.48 |
| 1998 | Max | 0.12 | 840 | 7.4 | | 8.00 | 0.19 | 22.90 |
| | Min | 0.00 | 550 | 4.6 | | 7.60 | 0.06 | 19.80 |
| | Avg | 0.03 | 637 | 6.0 | 104 | 7.83 | 0.15 | 21.08 |
| 1999 | Max | 0.00 | 1,290 | 5.2 | | 7.80 | 0.24 | 18.60 |
| | Min | 0.00 | 997 | 2.8 | | 7.70 | 0.15 | 18.30 |
| | Avg | 0.00 | 1,144 | 4.0 | 306 | 7.75 | 0.19 | 18.45 |
| 2000 | Max | 0.42 | 836 | 7.4 | | 7.70 | 0.57 | 22.50 |
| | Min | 0.00 | 417 | 2.3 | | 7.40 | 0.20 | 20.30 |
| | Avg | 0.13 | 620 | 5.5 | 2,307 | 7.55 | 0.39 | 21.18 |
| 2001 | Max | 0.14 | 1,050 | 7.7 | | 7.90 | 0.44 | 24.00 |
| | Min | 0.00 | 469 | 4.6 | | 7.50 | 0.23 | 18.80 |
| | Avg | 0.06 | 776 | 5.8 | 382 | 7.70 | 0.33 | 21.45 |
| 2006 | Max | ----- | ----- | ----- | | ----- | 0.18 | ----- |
| | Min | ----- | ----- | ----- | | ----- | 0.18 | ----- |
| | Avg | ----- | ----- | ----- | ----- | ----- | 0.18 | ----- |
| 2007 | Max | ----- | ----- | ----- | | | 1.15 | ----- |
| | Min | ----- | ----- | ----- | | | 0.74 | ----- |
| | Avg | ----- | ----- | ----- | 1,442 | | 0.95 | ----- |
| 2013 | Max | 0.00 | 994 | 6.6 | | 7.51 | 0.14 | 22.13 |
| | Min | 0.00 | 953 | 4.8 | | 7.40 | 0.10 | 19.76 |
| | Avg | 0.00 | 972 | 5.7 | 115 | 7.44 | 0.12 | 20.91 |

The results from sampling the unnamed tributary that flows north through the Village of Newtonsville and joins “Newtonsville Creek” is summarized in Exhibits 5, 6 and 7.

Exhibit 5 – Sample Station NWTUTE.3, east branch of unnamed tributary 0.3 miles upstream of fork

| Year | NH4-N mg/L | Conductivity µmho/cm | Diss Oxygen mg/L | GM E. Coli #/100 mL | pH S.U. | Total P mg/L | Water Temp DegC |
|------|---------------|-------------------------|---------------------|------------------------|------------|-----------------|--------------------|
| 2006 | | | | | | | |
| Max | ---- | ---- | ---- | ---- | ---- | 0.19 | ---- |
| Min | ---- | ---- | ---- | ---- | ---- | 0.19 | ---- |
| Avg | ---- | ---- | ---- | ---- | ---- | 0.19 | ---- |
| 2007 | | | | | | | |
| Max | ---- | ---- | ---- | ---- | ---- | 0.14 | ---- |
| Min | ---- | ---- | ---- | ---- | ---- | 0.04 | ---- |
| Avg | ---- | ---- | ---- | 4 | ---- | 0.09 | ---- |
| 2013 | | | | | | | |
| Max | 0.33 | 1,081 | 3.1 | | 7.26 | 0.41 | 22.01 |
| Min | 0.00 | 1,021 | 1.8 | | 7.21 | 0.21 | 21.02 |
| Avg | 0.19 | 1,042 | 2.7 | 931 | 7.24 | 0.32 | 21.39 |

Exhibit 6– Sample Station NWTUTW.2,, west branch on unnamed tributary 0.2 miles upstream of fork

| Year | NH4-N mg/L | Conductivity µmho/cm | Diss Oxygen mg/L | GM E. Coli #/100 mL | pH S.U. | Total P mg/L | Water Temp DegC |
|------|---------------|-------------------------|---------------------|------------------------|------------|-----------------|--------------------|
| 2006 | | | | | | | |
| Max | ---- | ---- | ---- | ---- | ---- | 0.60 | ---- |
| Min | ---- | ---- | ---- | ---- | ---- | 0.60 | ---- |
| Avg | ---- | ---- | ---- | ---- | ---- | 0.60 | ---- |
| 2007 | | | | | | | |
| Max | ---- | ---- | ---- | ---- | ---- | 1.59 | ---- |
| Min | ---- | ---- | ---- | ---- | ---- | 0.04 | ---- |
| Avg | ---- | ---- | ---- | 1,925 | ---- | 1.02 | ---- |
| 2013 | | | | | | | |
| Max | 0.14 | 1,978 | 4.3 | | 7.52 | 0.88 | 21.85 |
| Min | 0.00 | 1,278 | 3.8 | | 7.46 | 0.21 | 20.73 |
| Avg | 0.09 | 1,717 | 4.1 | 570 | 7.49 | 0.63 | 21.19 |

Exhibit 7– Sample Station NEWTUTO.2, unnamed tributary below confluence of east and west branch

| Year | NH4-N mg/L | Conductivity µmho/cm | Diss Oxygen mg/L | GM E. Coli #/100 mL | pH S.U. | Total P mg/L | Water Temp DegC |
|------|---------------|-------------------------|---------------------|------------------------|------------|-----------------|--------------------|
| 2006 | | | | | | | |
| Max | ---- | ---- | ---- | ---- | ---- | 1.11 | ---- |
| Min | ---- | ---- | ---- | ---- | ---- | 1.11 | ---- |
| Avg | ---- | ---- | ---- | ---- | ---- | 1.11 | ---- |
| 2007 | | | | | | | |
| Max | ---- | ---- | ---- | ---- | ---- | 2.42 | ---- |
| Min | ---- | ---- | ---- | ---- | ---- | 1.59 | ---- |
| Avg | ---- | ---- | ---- | 23,398 | ---- | 2.01 | ---- |
| 2013 | | | | | | | |
| Max | 15.00 | 1,144 | 2.0 | | 7.42 | 2.90 | 22.18 |
| Min | 7.18 | 1,075 | 0.9 | | 7.36 | 1.54 | 20.70 |
| Avg | 11.59 | 1,110 | 1.6 | 74,904 | 7.38 | 2.27 | 21.37 |

The preponderance of data from these three sites suggests that there are impacts from HSTs in the vicinity. The results from sample site NEWTUTO.2 indicate very high levels of E.Coli.bacteria, ammonia

and total phosphorus and suppressed levels of dissolved oxygen. E. Coli. density measured at this location in 2007 and again in 2013 is consistent at two orders of magnitude beyond the primary contact state bacterial standard. This observation poses a significant health risk to local residents as this stream flows through the Village of Newtonsville.

Conclusions and Future Directions

The recent sampling and analytical survey performed by Clermont County in August 2013 serves as a water quality baseline and confirms prior sampling results that points to known water quality impacts in the Newtonsville area. Stream sampling and analysis should continue into the future at the locations presented to document anticipated water quality and biological quality improvements associated with proposed centralized wastewater collection and treatment facilities.

To further support the water quality data, the recent survey of HSTSs in Newtonsville by the Clermont County Health District in 2011 indicated that of the 171 systems surveyed, 53 had failed. There were 21 system assessments that were canceled at the property owner's request; therefore, the percentage of failed systems actually surveyed was 35 percent but the failure rate is likely in the range of 35-43 percent considering the cancelled assessments. The proportion of HSTS failures is approximately five times higher in Newtonsville than the current County average, estimated to be 8 percent. Failing on-site systems that are not properly operated or simply do not function as intended, become chronic contributors to pollutant loading in local streams, specifically in Newtonsville.

The data presented herein for the Newtonsville area supports planning efforts for a wastewater collection system to serve the Village of Newtonsville and a proposed wastewater treatment facility as called for in Clermont County's current 5-Year Wastewater Capital Improvement Plan (2013-2017). This project if approved by the County and regulatory authority will benefit the Village and significantly improve local water quality and public health by removing the impacts associated with failed HSTSs and consequently reducing the level of pathogenic bacteria and nutrient loading in local streams.

Attachment A
Ohio EPA 2012 Field Biological Survey
Draft Conclusions on Attainment
Newtonsville Area Results

Attachment B
Ohio EPA 2010 Field Biological Survey
Newtonsville Area Results

Attachment C
Newtonsville Area Sampling Results
Complete Data Record