AquAeTer

optimizing environmental resources – water, air, earth

MEMORANDUM

TO: **Dorie Bolze, HRWA**
CC:
FROM: John Michael Corn, E.I.T. and Mike Corn, P.E.
DATE: October 26, 2006
JOB NO.: 061512
RE: **Responses to CTE Comments**

We will re-emphasize that the Harpeth River during low-flow summer-time temperatures that exist from June through October is a water-quality impaired stream. Therefore, under current State and Federal regulations, no water should be withdrawn, nor effluent discharged during these impaired periods. The Harpeth River does not have sufficient flow to handle current or projected waste loadings discharged from the three NPDES permittees discharging to the Harpeth River. The three NPDES dischargers are permitted for 4,224 lbs/day of oxygen demand. The City of Franklin is not currently permitted to withdraw water from the Harpeth River. The "grandfather" clause in the regulations only applies if the river is not significantly changed. Currently during low flow periods during summer months, the City of Franklin withdraws all of the water from the main stem of the Harpeth River. This method of operating does not follow the regulations for water withdrawal. This would constitute a significant change in the physical nature of the River and it also significantly affects the river's ability to reoxygenate itself through natural reaeration, which is flow related (higher the flow, higher the reaeration).

During these low flow periods, there are many instances when the River flow does not go over the low-head dam which means that this water is not available for assimilative capacity for the sewage treatments just downstream. The only water available in the River through downtown Franklin comes from five small tributaries coming into the River downstream from the low-head dam that backs up water for the Franklin water treatment plant to be able to withdraw water from the Harpeth. The amount of dissolved oxygen supplied by the background Harpeth River and its tributaries in the area of the three NPDES dischargers is insignificant compared to the dissolved oxygen loadings from the NPDES dischargers. The only significant dissolved oxygen in the River would be coming from the three treatment facilities for a total of 643 lbs/day of oxygen added to offset the 4,224 lbs/day of oxygen demand allocated to the three dischargers. This leaves the deficit to have to be made up from algae production and reaeration. The data show that the dissolved oxygen deficit is not made up by reaeration or algae production. TDEC, USEPA, HRWA and others have documented dissolved oxygen violations in the Harpeth River since 1987. CTE also documented these violations.

Even at 5 cubic feet per second or 3.23 million gallons per day (mgd), the total oxygen coming to the Franklin POTW is around 161.6 lbs/day if the DO in the River upstream is 6 mg/L. Based on DO data collected on the River, the DO coming to the Franklin POTW is rarely 5 mg/L during the summer months. During summer periods, any water withdrawn from the Harpeth River results in further degradation of the River. The Harpeth River does not meet water-quality standards for dissolved oxygen either upstream or downstream from the Franklin Publically Owned Treatment Works (POTW), upstream or downstream from the Lynwood Utility, nor upstream or downstream from the Cartwright Creek Utility discharges. Each of the three NPDES Permits has in their permits a requirement that they are responsible for meeting water quality standards in the Harpeth River. Furthermore, under the anti-degradation requirements, these dischargers cannot cause further degradation of the River if the River is not meeting water quality standards, which means they cannot discharge any effluent to the river when DO is not meeting the water quality standard upstream from the discharges. This applies to all three dischargers. Likewise, removing water from the River during these periods further aggravates the DO in the River because reaeration in the river is dependent on flow. Therefore, the water treatment plant cannot by law remove water from the River when the River is not meeting water quality standards nor when the DO is not being met downstream on the Harpeth.

It is also noted that the current Total Maximum Daily Load (TMDL) for the Harpeth River requires that the Franklin POTW meet an effluent BOD_5 of less than 1 mg/L. The only technologies that we know of that will allow the City to continue discharging to the Harpeth River is either activated carbon or reverse osmosis. This represents a significant cost to the citizens of Franklin.

The USEPA ran a dynamic model, the Water Analysis Simulation Program (WASP), with flows that were varied based on actual flows measured at the USGS gages upstream from the Franklin POTW, downstream from the Franklin POTW, and at Highway 100. Flows run by the USEPA were actual flows that occurred in the River during the modeling period. These flows ranged from 1 cfs to 13,811 cfs. The WASP model was artificially set at a minimum of 1 cfs during the allocation model runs because the WASP hydraulic driver, RIV1, was unstable when no water was in the River (0.3 cfs or the 7-day 10-year low flow or 7Q10). The USEPA DO curve projected by the model was stated to be from a date when the flow coming from the upstream portion of the River was 17 cfs. However, the DO curve projected by the USEPA appears to have occurred at a time when the River flow coming from the upstream portion of the River was 1 cfs. One must look at several time periods following the low flow critical event, since several days time of travel are represented by the critical condition presented. It is also noted that USEPA used a background DO coming to the Franklin POTW of 6 mg/L. As we have mentioned, this is not a frequent event during the summer months.

The precision or accuracy that someone puts on the model is important, but the model predicts what is actually happening in the Harpeth River; that is, there are DO standard violations in the River every summer and for many miles downstream from Franklin This has been documented by the USEPA, TDEC, HRWA, and Sulkin for the last 6? years and we are assuming by CTE who also reported low DO readings below state standards in the downtown Franklin section in their June 2006 report.

The model is a tool that is used to set the allocations, and at this time, the USEPA TMDL is the allocation that has to be met, since their report was issued in September 2004. The water quality data from the River still remain the single strongest source to base an assessment of the River's water quality health. In this regard, the River remains a water-quality impaired stream that should not receive effluent discharges during the summer months, nor should water be withdrawn from the River. The River is totally effluent dominated during the time period from July through early November. There are only three months when the River has sufficient flow to continuously be River-dominated flow versus effluent dominated at current permit loadings. There are no data to indicate that the River can handle on a continuous basis the allocated wasteloads during the summer months.

We have prepared an analysis of the waste loadings permitted for the Harpeth River versus the DO resources in the River. We don't think it should be a surprise to anyone that the Franklin POTW dominates this analysis. Our rule of thumb of 10 cfs background flow for each 1 cfs of effluent flow discharged to the Harpeth River is still a valid number, as presented in the oxygen balance calculations we provided to you under separate cover. It is also important to note that oxygen addition to the River would require oxygen addition over about 60 miles of the River from just upstream from the Franklin POTW to about the narrows on the Harpeth River. To offset the oxygen demand of 4,234 lbs/day allocated to the three dischargers, a total of 141,133 lbs of air would have to be injected into the River at intervals through this 60-mile impaired stretch of River. This assumes that air contains 21 percent oxygen and that the oxygen transfer efficiency is around 3 percent (per Wes Eckenfelder for shallow streams). About 93 percent of this allocation would fall on Franklin, 5 percent on Lynwood, and 2 percent on Cartwright Creek, based upon the current NPDES permit allocations.

It is also very important to remember that none of the dischargers can legally discharge to the River if the River is not meeting water quality standards regardless of whether TDEC or the USEPA is watching. This also means that the water treatment plant cannot withdraw water from the River when the River is not meeting water quality standards, since the River needs all the water to not further degrade the River water quality. The DO in the stream improves due to increased reaeration as flow increases.

We realize that the current water treatment plant at times withdraws all water from the Harpeth River (no flow coming over the low-head dam downstream from the water treatment plant) and that setting a limit on flow withdrawals is an improvement. The River requires somewhere around 100 cfs of flow to meet water quality standards on a continuous basis, without depending upon alternative means such as oxygen additions or meeting draconian effluent limits (e.g., carbon treatment). This means that no water should be withdrawn from the River during the summer season. There is plenty of water in the River during the winter months to store enough water for the City to meet its water demands. The City still has to either add treatment (e.g., carbon) or not discharge to the River during the summer months.

We have requested that the USEPA re-run their model at several scenarios that will give a better understanding of the flow that is required to meet water quality standards and therefore give the City of Franklin a firmer foundation to base water withdrawals and time of year when they can legally withdraw water without further impairing the Harpeth River DO standard.. At the present time, we have data over the last 6 years that demonstrate that the Harpeth River is

water-quality impaired for DO, but the current TMDL report does not specify how much flow needs to be in the River to meet the current NPDES permitted discharge loadings to the Harpeth River. Until these model runs are completed, there is no basis for the 5 cfs or 10 cfs withdrawal values suggested by CTE, and certainly no legal argument to defend the current practice of withdrawing all water from the River during certain low-flow periods.

We will reiterate that any water withdrawals during periods when the River is not meeting water quality standards, i.e., summer months, results in a further degradation of the River. This is legally not allowed by either Tennessee or federal regulations. If the City can meet the background conditions during the USEPA TMDL studies of < 1 mg/L $CBOD_u$ (less than about 0.2 mg/L BOD_5) and a total kjeldahl nitrogen limit of about 0.4 mg/L, then I believe that the City and the other three utilities should be allowed to discharge to the River. However, the water withdrawal plant would still be limited to withdrawing only when the DO in the River was above water quality standards.

I have stated to both Franklin and Williamson County officials that a Regional water treatment plant and a Regional wastewater treatment facility should be considered for the county and Franklin. The only source for water that can supply the current and potential future water supply demands and the subsequent discharge of resultant treated wastewater is the Cumberland River. Many towns across the U.S. including many southern towns including Nashville, Brentwood, Greenville, S.C., and Atlanta, Georgia have installed facilities that manage their water needs and their wastewater treatment needs from river systems from afar (Brentwood and Nashville already use the Cumberland River). Building a new water treatment plant in Franklin will not meet the water needs or the assimilative capacity requirements for the returned water. It appears to me that this action is short-sighted and will not meet the water supply and assimilative capacity needs of either Franklin or the County for the foreseeable future or for even the next 20 years of potential growth in Franklin and in the County.

If you should have questions or comments concerning our assessment, please call us at (615) 373-8532 or by FAX at (615) 373-8512 or by e-mail at jmcorn@aquaeter.com or mcorn@aquaeter.com.