



## HARPETH RIVER WATERSHED ASSOCIATION

December 13, 2012

Robert Baker  
Permit Coordinator, Water Pollution Control  
TN Department of Environment and Conservation  
401 Church Street  
L & C Annex, 6<sup>th</sup> floor  
Nashville, TN 37243

VIA ELECTRONIC MAIL

RE: Comments on city of Franklin's ARAP application (NRS12.195) for a water withdrawal for drinking water plant on Harpeth River

Dear Mr. Baker:

HRWA would like to provide the following comments on the application by the City of Franklin for a new ARAP permit for water withdrawal on the Harpeth River for their drinking water plant. The application is to simply continue with the prior ARAP permit issued by TDEC on November 2007 that had a 5 year expiration date of November 2011. The prior ARAP permit was the first issued to the city for its water withdrawal operations that have been ongoing since the early 1950s. The permit application at that time was based on the city's proposal to increase its drinking water plant's current capacity of 2.1 MGD (million gallons per day) to 4 MGD. This related to an increase in pump capacity from 5,600 gpm to 7,800 gpm or 11.2 MGD. Since the permit's issues in 2007, the city has not increased the capacity of its drinking water plant nor increased the pump capacity from the river<sup>1</sup>. Just recently, the city approved a contract to design a new plant at the current 2.1 MGD capacity. The design is to accommodate a possible future expansion to 4 MGD if approved by the City Board of Mayor and Aldermen (BOMA). Earlier this year, BOMA did not approve an expansion in the drinking water plant's production capacity beyond its current size.

### **1. Adjusting the withdrawal percentage down from 20% to 10% of the river's flow based on new research**

The 2007 permit established several conditions for raw water withdrawals based on the proposed increased pump capacity. These conditions required that the withdraw rate be no more

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<sup>1</sup> See page 5-6 of Attachment B in city's application. Preliminary Design Memorandum by Beaver Creek Hydrology for the Harpeth River Lowhead Dam Removal and River Restoration Project. The Final Hydraulic Design Memo, signed and stamped by BCH, dated 1/12/12 is on HRWA's project web site:  
<http://www.sitemason.com/files/dIG6pa/Final%20Hydraulic%20and%20Hyrdological%20Analysis%20signed.pdf>.

than 20% of the river's flow at the intake and prohibited withdrawals once the river's flow was 10 cfs (cubic feet per second) or lower. HRWA was very involved in the work conducted by the city's engineering consultant to analyze various withdrawal regimes. The withdrawal regime in the permit was based on analysis using a Nature Conservancy hydrological model, work from the USGS, HRWA, the Nature Conservancy, and others. At the time, the focus was primarily on establishing the cutoff level since the city's first application proposal was to set it at 5 cfs. Analysis and review found that 10cfs was the more appropriate level. HRWA also funded our own water quality analysis and economic analysis of work done at the time as part of the anti-degradation review. All of that is in the permit record from 2007. We would like those comments dated March 19, 2007 and the attachments officially incorporated into the record for this permit application. More recently, HRWA has been involved as an expert as a member of the city's stakeholder group that provided advice for the city's Integrated Water Management Planning process.

Since the analysis work done in 2006 for the permit, research has increased and expanded on the important issue of determining the ecological and structural changes to rivers as hydrological conditions are changed from water withdrawals and how to establish water withdrawal management regimes that enable consumptive use while protecting legally required water quality and ecological conditions. The USGS has conducted analyses based on the concept of maintaining the wetted-width of the river as a method of establishing flow conditions to maintain. This was the approach used to establish the 10 cfs in this prior permit. USGS presented an expansion of their work in 2010 that provided a method of using the drainage basin size of the river at the withdrawal point to find a range of minimum flows that indicate an ecological stress threshold. At the city of Franklin's withdrawal point, the range for minimum flows is 10 cfs to 18 cfs based on this approach. Therefore, the current 10 cfs is at the bottom end of this range of what constitutes a likely threshold for ecological stress.<sup>2</sup> The USGS TN can be contacted to provide copies of the papers that have been produced from their work on characterizing river flows for ecological characteristics as part of their involvement with the TDEC Water Quantity Commission.

With regard to the percent withdrawal rate, the designer of The Nature Conservancy hydrological model used by the city's consultant in 2006 published results in 2011 analyzing implications of percentage withdrawals of river flow and what is needed to maintain or protect ecological conditions and river functions. The percentage withdrawals are coupled with low flow cutoffs to establish a management regime as has been done with the prior ARAP permit. Percentage withdrawal limits of 10% offer a high level of protection of ecological function, withdraws of 11%-20% offer a moderate level of protection but there will be measurable change in river structure though likely minimal affect on ecosystem functions, and withdrawals of 20% or more will likely result in moderate to major changes in river natural structure and ecological functions.<sup>3</sup>

HRWA recommends that this permit adjust down the percent withdraw to 10% from the current 20% withdraw that is combined with the current 10cfs cutoff. We recommend this based on the results of recent research that indicates that 20% withdrawal is at the upper end of the range that will maintain river ecosystem functions, even though there are still effects on the river at this

<sup>2</sup> Gain and Knight. "Stream Channels, Discharge Measurements, and Minimim Flows." American Water and Resources Association TN conference 2010.

<sup>3</sup> Richter, Davis, Apse, and Conrad. "Presumptive Standard for Environmental Flow Protection," River Research and Applications (2011).

level of withdrawal. The reduction in the percentage withdraw should also be considered as a means to build in some buffer into the withdrawal regime in light of the 10 cfs cutoff that is at the very bottom of the range of the minimum flows needed to stay above stress thresholds for fish and aquatic life. In August and September, which are part of the low-flow season for the Harpeth River in this area, natural flows below 10cfs are typical. The intent of the minimum flow cutoff is to not add further stress of additional days of very low flows during the summer season.

HRWA recommends this adjustment because the designated use of the Harpeth in this area is not fully supporting of its use for fish and aquatic life as noted in the public notice. This section of the Harpeth is listed on the 303(d) list for impairment for sedimentation and from nutrient enrichment and low dissolved oxygen. As is noted below in the section on the lowhead dam removal project, the finescale darter is found in this area of the Harpeth and is designated by TWRA as a species in Need of Management. It prefers the riffle habitat where the water is shallow to escape predators and because of good water quality. The removal of the lowhead dam has dramatically improved the habitat for this species in this area. Adjusting the withdrawal percentage down to 10% will maintain more river flow during the low flow season for improved water quality and habitat for these species. In our comments on the prior permit application in 2007, Attachment 10 is an email from Dr. Etnier, at the University of Tennessee Department of Ecology and Evolutionary Biology. He is the author of The Fishes of Tennessee and is an expert on darters. He noted in his email that the finescale and Tippecanoe darters (also found in the Harpeth downriver) are critically imperiled since they are now restricted to only the Harpeth and one or two other rivers.

## **2. Completion of the removal of the Lowhead dam—a permit condition no longer needed**

The prior permit also had special conditions that required a feasibility study for removing the lowhead dam associated with the intake and the removal of the structure if it was shown to be feasible<sup>4</sup>. As you know, since you are the TDEC representative on the Harpeth River Lowhead Dam Removal and Restoration Project's Steering Committee, the lowhead dam has been removed as of this past July and the entire restoration project is now essentially complete. This condition in the permit has been satisfied and can be removed from the new permit. The Harpeth River Lowhead Dam Removal and Restoration Project is a collaborative project among the HRWA, city of Franklin, TDEC, TWRA, US Fish and Wildlife Service, Southeast Aquatic Resources Partnership (SARP), US Geological Survey, TDOT, Beaver Creek Hydrology (design river restoration engineers), and several businesses such as Vulcan Materials and Waste Management (who sponsored much of the cost of the project's camera.) HRWA has served as the overall project team coordinator. HRWA prepared, secured and managed the \$350,000 grant to the project from the US FWS and SARP. TDEC conducted the actual removal of the lowhead dam

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<sup>4</sup> See Special condition 3(b) below. Final version of NRS06.332 with 3(b) was not included in this public notice (NRS12.195) nor in the version provided in the city's application as Attachment A. The entire Special Condition 3 is provided here that is missing in the application material and the public notice.

“3) The permittee shall investigate and report the feasibility of removing the low-head dam associated with the existing intake. The purpose of the feasibility study is to evaluate the costs and benefits for the restoration of water quality and fisheries ecosystem in the Harpeth River.

a) The feasibility study shall be coordinated with the department to allow stakeholder participation,

b) If the study shows that removal of the dam is feasible, then the city shall remove the dam in association with construction of the upgraded intake.

structure, and the City of Franklin provided the remaining funds, handled the bids and managed the construction contract. The USFWS and TWRA have conducted fish and mussel surveys in the project area.

The project has been a great success for all partners, and was recognized this past May as the sole Rivers Initiative project for TN as part of President Obama's national launch of the America's Great Outdoor's Rivers Initiative. Secretary of Interior, Ken Salazar, made the announcement in Nashville in late May and HRWA coordinated with the City of Franklin to host a site visit for Will Shafroth, Counselor to the Secretary for the AGO program. See press and photographs on the HRWA project website.

The entire project not only removed the lowhead dam but involved significant restoration to address unstable river banks both on the mainstem and in two tributaries in order to reduce sedimentation from this area, improved fish habitat, provide a much-improved public paddling and fishing access, and reforest the floodplain with native species. Details of the components of the project were provided in the City's application (Attachment B) and are on HRWA's web site<sup>5</sup>. One of the primary purposes of the project with the USFWS funds was to improve fish habitat and restore connectivity for the entire river. The Harpeth is now one of the few completely free-flowing rivers in the state. The project has restored the riffle/run/pool habitat by removing the 1.7 river mile impoundment that was created by the lowhead dam. The restored habitat is important to the finescale darter (*Etheostoma microlepidum*) a species designated by TWRA as in Need of Management that has been found in this area of the Harpeth in several fish surveys. TWRA's fish survey work prior to the commencement of the project has now found 54 different species of fish just in this area of the Harpeth, including the finescale darter.<sup>6</sup>

### **3. Measuring the River's Flow at the withdrawal point, providing data on river flow and pump intake rates real time to the public, and requiring reporting on monthly withdrawals—a condition for the permit**

With all of the work that the city of Franklin has invested in removing the lowhead dam and long-term water and sewer planning (the Integrated Water Management Planning process), what remains is to upgrade how the river's flow is measured and how the withdrawal system is mechanized to facilitate compliance with the permit withdrawal conditions. The rest of the ARAP permit special conditions required plans for the upgraded intake to be submitted for approval to TDEC and that these plans are to include the mechanism for meeting the 20% withdrawal rate and accurately measuring the river's flow. USGS staff has been to the lowhead dam project site recently to review the conditions at the current 96 bridge USGS gage and the conditions at the city water intake. A new, low-profile double cross vane has been installed in the Harpeth as part of the lowhead dam removal and river restoration project. Its elevation was specifically designed with the 10 cfs withdrawal limit while enabling fish passage and to foster stream bank stabilization. The double cross vane has restored the river to its natural hydrology and created a naturally connected pool at the site of the city's intake. Thus, the cross vane provides a much more stable area in the river from which to measure river stage (elevation) to discharge relationships that are needed for the USGS flow gages. Similar situations are natural rock ledges, for example.

<sup>5</sup> [http://www.harpethriver.org/program/lowhead\\_dam](http://www.harpethriver.org/program/lowhead_dam). The web site has several pages to provide photos and explanations of the various restoration components and highlight fish and wildlife data and information.

<sup>66</sup> TWRA fish survey is on the Harpeth River lowhead dam removal project page.  
P.O. Box 1127 ■ Franklin, Tennessee 37065 ■ Phone: 615-790-9767 ■ Facsimile: 615-790-9767 ■ [www.harpethriver.org](http://www.harpethriver.org)

The USGS flow gage in the 96W bridge is about 1 river mile downstream and collects woody debris fairly frequently. The debris can block the river, raising the river level in that area, which creates error in the gage readings that can be significant at low flows. USGS has a regular process of correctly for these types of errors in the data. However, for the ARAP permit conditions to be met, it is important to gage the river's flow in an area that is not prone to such error at the low flow end since the city's pumps are adjusted based on real time information from the gage. Installing a USGS gage at the city's intake will solve that problem and improve measurements of the river's low flows that are needed for the permit. A USGS gage can be installed on the top of the current pump house structures and would work well in this location. The city also would be responsible for removing any downed trees or other barriers that might occur occasionally on the double cross vane that would raise the river's elevation above that established by the cross vane.

The USGS gage at 96W bridge is also downstream from several tributaries that enter between the intake and the gage. Also there is still some leakage from the city's reservoir that migrates back to the river via the nearby MaGavock Creek which flows in just downstream of the intake. Measuring the river's flow at the intake will eliminate these influences from the measurement of the river's flow at the intake. Since the ARAP permit conditions are at the low flows of 10 cfs and above, it is important to have accurate river flow measurements to maintain the river's natural hydrology during the low flow season that the permit is designed to protect.

To determine the water withdrawals and whether the conditions of the permit are being met, all that is needed is the river's flow at the intake and the city's pump intake rates. Such information needs to be provided real-time to the public and should be archived as well. A USGS gage at the city's intake would accomplish this. It would not be a permanent record site, only a "partial" gage in terms of the USGS. The cost would be less than a permanent record site (\$8000-\$10,000 a year) since the focus would be on maintaining rating curves for accuracy only at the low flows. This cost is less than 0.1% of the annual operation costs provided in the city's application. In this situation, the flows of interest are from zero to 85 to 100 cfs. At 85 cfs in the river, the maximum pumpage rate of 11.2 mgd (or 17.02 cfs) is at 20% of the river's flow. The city could provide their pump rates to the public on the city's web page on a daily basis. Both TVA and the Army Corp of Engineers have their pump intake rates posted on their web site for public access from what I understand. These entities are cooperators with USGS on gages just like the city of Franklin.

The ARAP permit needs a condition that specifies that the river's flow will be measured at the intake with data provided in real-time for public viewing and archiving and that the city will remove obstructions in the area of the gage. The ARAP permit also needs a condition that specifies that the city's pump intake rates are provided real-time for public viewing and archiving. These conditions can be met as soon as the permit is issued. It would take USGS a month or less to install a gage and the city can be posting pump intake rates on their website sooner than that. Publicly available data is important since the flow conditions involve a percent reduction in flow and not a simple cutoff. The ARAP permit also needs a condition for reporting on the withdrawal rates similar to the DMRs for NPDES sewer plants permits. The monthly report would include the river flow rate off the gage, the city pump intake, and the percent withdrawal at 15 minute intervals. The 15 minute interval is derived from the intervals that data from USGS gages are updated on the web. During low flow conditions especially near the 10 cfs or higher cutoff, monitoring the river flow at 15 minute intervals is necessary.

The ARAP permit should also maintain the special conditions of 4 a) and c) which involve the city submitting plans for the upgraded intake and water withdrawal mechanism to meet the 20% restriction and 10 cfs cutoff to TDEC for approval. The technology is readily available between radio, satellite, and cellphone to link controls to the pumps with information for the river's flow gage data to provide as much automation as needed for the management of the pumps to ensure that the permit conditions are met. The engineering firm handling the city drinking water plant upgrade can incorporate these permit special conditions into their work. The city needs to provide TDEC staff involved with compliance with the ARAP permit the current mechanism the city uses, if that has not already been done, and provide updates with changes. TDEC will need to ensure that staff involved with compliance with the ARAP permit and staff involved in water supply coordinate so the ARAP permit conditions are incorporated into discussions of plant and pump design and the distribution system the relate to the ARAP water withdrawal permit.

#### **4. Brief Comments on the city's efforts to upgrade Drinking Water System—two memos in the city's application**

There are two memos in the city of Franklin application relevant to analysis of construction costs for various treatment designs for the existing 2.1 MGD or a 4 MGD drinking water plant and the upgrades to the drinking water distribution system and of whether these meet two important regulatory requirements related to drinking water safety. Both are now required for the city to meet as of October 2012. One is the Long Term 2 Enhanced Surface Water Treatment Rule that requires more stringent treatment to remove *Cryptosporidium* that has been found in the Harpeth River in the raw water supply. The other is the new Stage 2 Disinfectant and Disinfection Byproducts Rules to maintain finished drinking water at the tap below required levels for disinfectant byproducts. As you know from the material and work on the previous ARAP permit, the city's main source of drinking water on an annual basis is purchased water from the Harpeth Valley Utility District. The drinking water produced by the city from the Harpeth is a secondary source and provides little during the low flow summer season. HVUD is the sole source of drinking water in the city's system during periods in the summer, especially during drought years. Also, the city of Franklin's drinking water distribution system is only one of 5 different drinking water utility systems that provide water to the citizens of Franklin as distribution systems of water produced by HVUD.

Since the city's first ARAP permit application in 2003 there has been much more clarity on the city's drinking water system with the public and city leadership and significant effort and funding by the city to upgrade the drinking water distribution system. The city's system can be and has been entirely supplied by HVUD. The production of drinking water from the Harpeth is not necessary for the functioning of the distribution system. This does not mean that the current components of the drinking water plant are not still important as part of the distribution system to maintain pressure and retreated finished water or other purposes in the system. It is simply that the city does not have to make drinking water from the Harpeth River. It is important to note this distinction with regard to the memo from January 2012 on the Distribution System Improvements (Attachment E).

Much effort has gone into analysis since the city's first ARAP permit application in 2003 regarding the economic comparisons between maintaining a 2.1 MGD drinking plant, increasing the production to 4 MGD, or shutting down production at different river base flow levels. HRWA funded on economic analysis that fixed errors in prior cost comparison work initially done for the

2006 permit application. At that time, two different engineering firms found that expanding to 4 mgd was uneconomical if the river's base flow for the permit was set above 5 cfs. When the permit established the base flow of 10 cfs within several months new cost figures were produced showing a 4 MGD drinking water plant to be economical in comparison to purchasing all drinking water from HVUD. At that point, the mayor put a decision to put the drinking water plant on hold and launched the IWRP to analyze and plan for the entire sewer and water system in a more integrated fashion. At the beginning of this year the recommendation from the consultants was a suite of options that included a 4 MGD drinking water plant with a proposed sewer plant 3 river upstream to discharge treated effluent that would augment the river's flow during the summer. This was not accepted by the BOMA, which recommended an option that has all the increased sewer capacity staying at the current sewer plant location 7 rivers downstream of the drinking water intake. Essentially, the latest attempt to make an expanded 4 MGD drinking water plant economically viable involved "adding" water to the Harpeth during the low flow period by adding treated effluent to the river and therefore to the drinking water system.

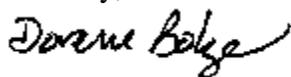
## 5. Summary

In summary, the 2007 ARAP permit special conditions need to be updated in consideration of more recent research on water withdrawals and their effects on river ecosystems and in consideration of the completion of the lowhead dam removal project, other investments by the city in their drinking water distribution system, and the city's long term water and sewer planning. The withdrawal limit should be adjusted down to 10% of the river's flow from the current 20% with the current 10 cfs cutoff. The conditions related to studying the feasibility of the lowhead removal and for removing it are now met and no longer relevant, since the structure has been removed.

Clarifications of the prior conditions on measuring the river's flow and to provide the mechanism used to meet the withdrawal conditions are needed. Specifically the permit needs to require that the river's flow is measured at the intake and that both data on the river's flow measurements and the city's pump intake rates be provided in real-time for public viewing and archiving. The city's mechanism for managing the pump intake needs to be provided to TDEC for approval as do any changes over the time of the active permit. The permit conditions also need to include regular reporting of water withdrawals similar to the monthly DMRs required by sewage treatment plants.

Please do not hesitate to contact me with questions on these comments. It is great to go visit the former lowhead dam site and see the incredible results of everyone's efforts. It has been very rewarding to work with TDEC, City of Franklin, USFWS, TWRA, USGS, Beaver Creek Hydrology, SARP, EME (TDEC's contractor for the lowhead dam removal), US Army Corp of Engineers, and others to make this national demonstration river restoration project come together.

Sincerely,



Dorie Bolze  
Executive Director

cc. Shari Megrehblian, TDEC Deputy Director, Bureau of Environment  
Sandra Dudley, TDEC Director of Water Pollution Control  
Eric Stuckey, City of Franklin administrator  
Mark Hilty, City Director of Water Management