



## NOTICE OF DETERMINATION

APPLICATION FOR AQUATIC RESOURCE ALTERATION PERMIT

CITY OF FRANKLIN, INCREASED WATER WITHDRAWAL FROM THE HARPETH RIVER

NOVEMBER 2007

### **Proposed Action**

The City of Franklin in Williamson County has applied for an Aquatic Resource Alteration Permit (ARAP) under *The Tennessee Water Quality Control Act of 1977* to increase its withdrawal of water from the Harpeth River. This notice sets out the final determination of the Tennessee Department of Environment and Conservation, Division of Water Pollution Control, on that proposal.

The City of Franklin presently withdraws water from behind a low-head dam on the Harpeth River at a point in the river near the intersection of Carriage Park Drive and Lewisburg Pike. That water is used to fill an off-stream reservoir from which it is pumped to the treatment plant when needed. The proposal involves modification to the rate and volume of water withdrawn from the Harpeth River.

The present maximum rate of withdrawal is 11.1 cubic feet per second (cfs). The proposal includes an increase in the pump capacity to 17.4 cfs and would increase the present water treatment plant capacity from 2.1 million gallons per day (mgd) to 4.15 mgd. The city has also proposed that water would be withdrawn or pumped at a rate of no more than 20% of the flow in the river and the withdrawal would cease when the flow in the river is at or below 5 cfs. Prior to this application, the department had not yet established any specific limits or conditions on this withdrawal.

### **Background**

The city currently owns and operates a water treatment plant (WTP) with a capacity of 2.1 mgd. The raw water is withdrawn from the Harpeth River within the southern city limits and stored in an open earthen reservoir (110 million gallon design capacity as initially constructed) for later treatment. The city purchases the balance of its water from the Harpeth Valley Utility District. In 2005, the city saw an average daily demand of 6 mgd and a peak demand of 9.3 mgd in the water distribution system. The city is

evaluating alternatives to address present and future water demands and to comply with newly promulgated federal water regulations, including WTP expansion.

The original WTP was constructed in 1952 and was expanded and upgraded in 1968 and again in 1994. Because the WTP was constructed prior to the TDEC Aquatic Resource Alteration Permit rule promulgation, the withdrawal was not regulated under ARAP. However, to increase the withdrawal to the existing WTP facilities, an ARAP is now required.

A public notice that announced the application for a permit for the project was published on January 31, 2007. A public hearing was requested in response to the notice. The department held a hearing in Franklin on the evening of March 8, 2007. Comments were received from agencies and the public throughout this process. The comments are addressed in this document.

### **Comments**

- The increased withdrawal would reduce the amount of wetted streambed habitat during low flows, which would be harmful to fish and aquatic life.
- The increased withdrawal would remove water needed for assimilation of downstream wastewater discharges from sewage treatment plants. This would further degrade water quality, particularly dissolved oxygen.
- The City of Franklin presently purchases a significant proportion of their drinking water from the Harpeth Valley Utility District . The construction of a new water treatment plant together with increasing the withdrawal from the river is not justified economically. A better alternative is to purchase all of the water needed by the city from the HVUD.
- The increased withdrawal would reduce the amount of water necessary to allow or sustain recreational uses such as canoeing.
- Regardless of whether or not a permit is issued, the dam behind which the intake is located should be removed. This would improve water quality and be beneficial to fish and aquatic life by eliminating the barrier to the movement of aquatic life.
- Right now the city takes water out of the river with no limitations other than voluntary restrictions. Some restriction should be placed on all interim or post permit withdrawals.
- The data from United States Geological Survey (USGS) gage at highway 96 is influenced by the existing withdrawal just upstream from the gage. Therefore, if a permit is issued, the city should not rely on that gage to determine stream flows on which to base their withdrawal.
- The Harpeth River is listed as impaired. Additional degradation cannot be allowed.
- The raw water reservoir leaks which causes the withdrawal to be less efficient. This in turn necessitates the withdrawal of more water than would otherwise be necessary. The raw water reservoir should be repaired.

## **Final Action**

The division has determined that the proposed withdrawal rate at 20% of the flow in the river will not result in an impairment of the uses designated to the Harpeth River when it is coupled with an additional requirement that the withdrawal will not cause the flow to fall below 10 cfs. The division has issued a permit, dated November 28, 2007 that authorizes the withdrawal under these conditions.

## **Antidegradation - Alternatives Analysis**

Rule 1200-4-3.06<sup>1</sup> contains Tennessee's Antidegradation Statement. It requires that applicants submit alternatives analysis as part of the application process. It also states that new or additional degradation will be allowed only if the applicant has demonstrated to the department that reasonable alternatives to degradation are not feasible. Analysis of reasonable alternatives includes a discussion of the feasibility of all potential alternatives, plus the social and economic considerations and environmental consequences of each. The alternatives that were considered by the city all involved purchasing some or all of its water from the HVUD. Except for the scenario in which all of its water would be purchased, the remaining alternatives included pumping water from the river at some percentage of the total flow. Alternatives that included a low flow below which no pumping would occur were also examined.

The different alternatives included:

1. No cut-off, 10% of flow withdrawn
2. No cut-off, 15% of flow withdrawn
3. No cut-off, 20% of flow withdrawn
4. 3 cfs cut-off, 15% to 30% of flow withdrawn
5. 5 cfs cut-off, 20% of flow withdrawn – this is the city's suggested alternative
6. 10 cfs cut-off, 20% of flow withdrawn – this is the authorized alternative

In conducting the antidegradation review, the department compared the anticipated impacts of purchasing all of its water from HVUD (no withdrawal alternative) and alternatives 5 and 6, which are considered the least degrading of the alternatives listed above. The department, with input from the Tennessee Wildlife Resources Agency, reviewed data provided by the city and determined, based on reasons explained in more detail below, Alternative 6 would result in less degradation than the Harpeth River currently experiences and would not impair the river's uses. Therefore the department has determined that neither alternative 6 nor purchasing all of the water from HVUD would cause new or additional degradation.

## **Social and Economic Considerations**

The department reviewed the economic information provided by both the city and Dr. William Wade to compare the economic aspects of purchasing all of the water from HVUD with alternative 6. The department conducted this evaluation to determine if

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<sup>1</sup> This citation refers to the rules applicable at the time of application.

either of the alternatives provides a significantly greater economic and/or social benefit to the community. The information reviewed is listed below.

1. Harpeth River Water Availability Study For Consideration of Modified Withdrawal For Treatment And Distribution at The City of Franklin WTP, CTE Draft Technical Memorandum, June 9, 2006
2. Comments On “Franklin Water Treatment Plant CTE Economic Analysis Revisited, By William W. Wade For HRWA,” CTE, September 19, 2006
3. Economic Criteria For Regional Water Supply Planning In Tennessee: Lessons Learned From Harpeth River ARAP, Presentation to TN AWRA, William W. Wade, Ph. D., Energy And Water Economics, April 18, 2007
4. The City of Franklin ARAP Application For Water Withdrawal, Presentation to TN AWRA, Scott Woodard, CTE, April 18, 2007.
5. Personal Correspondence From William W. Wade to Paul Davis, Robby Baker, Dorie Bolze and Pam Davee, October 25, 2007.

Based on our review, we do not believe that either of these 2 alternatives provides a significant economic advantage over the other. The city asserts there will be some cost savings and that a redundant/back-up source will provide a measure of security in its water supply. We believe that alternative 6 will result in no new or additional degradation, is economically equivalent to or perhaps as the city asserts, somewhat less expensive than the no-withdrawal alternative, and it provides the city with the benefit of having a redundant/back-up water source. Therefore, after consideration of the environmental consequences of the alternatives and the social and economic basis for the proposed activity, the department finds that authorization of the 10 cfs cut-off, 20% of flow withdrawn, alternative is justified.

### **Fish and Aquatic Life**

Data collected for the applicant<sup>2</sup> and previous fish and aquatic life surveys done by the TWRA indicate that the stream presently supports a poor to fair fish population. The department has previously determined that this segment of the Harpeth River does not currently support the designated use of fish and aquatic life. Sedimentation and low dissolved oxygen levels in the water during the summer are listed as the causes.

The small scale darter, *Etheostoma microlepidum*, is among the fishes found during that survey. This is a species listed as deemed in need of management by the department. Other darter species along with sunfishes and minnows are present.

The watershed of the Harpeth River above the intake is approximately 191 square miles. During winter and spring the watershed usually yields plenty of flow. However, the seasonal climate and geology in the watershed results in very low summer and fall flows. Maintaining the full range of natural variation of flow regimes is critical to sustaining native biodiversity and integrity in aquatic ecosystems. However, the low flows are of

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<sup>2</sup> Pennington and Associates, Inc. Fish and Macro-invertebrate Surveys Harpeth River, City of Franklin Williamson County, Tennessee

most concern here because of the significant consequence to available habitat that may result from a relatively small reduction in flow. When the stream bed, particularly the riffle area, is only marginally wetted a reduction in flow can result in a significant reduction in the amount of riffle that remains wet and remains as available habitat for aquatic life.

Riffles are some of the most biologically productive areas of a stream. Organisms that live in the riffles make up the bulk of the individuals and species inhabiting a stream or river. Also, the turbulence of the water through the riffles helps to re-aerate the water, adding dissolved oxygen. Therefore, maintaining flow in the riffles is critical to the protection of the primary ecological component of the river and also the greater diversity of the fish and aquatic life.

We considered the city's proposal to cease its withdrawal when the flow gets down to 5 cfs. Using flow data taken at the Highway 96 bridge downstream of the withdrawal, the city simulated several withdrawal scenarios, including ceasing withdrawal when the flow drops to 5 cfs and ceasing at 10 cfs.

We reviewed the data from the flow simulation model and the information and data regarding wetted width. The department consulted with TWRA regarding the habitat and flow needs of the fish and aquatic life. We concluded that it is necessary to conserve flows at 10 cfs or below to be protective of the fish and aquatic life use. We consider the 10 cfs cutoff to be the lowest flow that insures inundation of the riffles in this river reach at sufficient depths and velocities to preserve ecological functions, and that allowing withdrawal of 20% of available flow above that cut off would follow the natural hydrograph and not impair the multiple uses of the Harpeth River.

### **Recreation**

Canoeing and other recreational uses have varied and uncertain flow needs. The Harpeth is marginally suitable for canoeing at flows in the range of 20 cfs and most paddlers would only canoe when flows are well above that. We determined that canoeing was likely to occur at flows above 20 cfs at the highway 96 gauge. When flows are in the range that is normally used for canoeing, the amount of the withdrawal should not interrupt that use. For other recreational uses such as wading or swimming, we didn't determine a lower cut-off, but we do not believe that there will be any loss of use for wading or swimming caused by the withdrawal. We have determined that the permit as we have conditioned it is broadly protective of the recreational uses of the river.

### **Assimilative Capacity**

In order to evaluate the potential impact of the withdrawal on the assimilative capacity we used river flows recorded at the gauging station located between the intake and the wastewater discharge point, historical withdrawal data, upstream carbonaceous biochemical oxygen demand (CBOD) data from Franklin's stream monitoring program, Franklin's current effluent CBOD limit (6 mg/l) and the effluent CBOD limit (4 mg/l) recommended for Franklin in the Total Maximum Daily Load (TMDL) done by EPA .

Using those inputs, we were able to predict the relationship between withdrawal rates, waste water treatment plant effluent CBOD concentration and the resultant CBOD concentration in the river at worst case flows. This can be assumed to approximate the potential change in assimilative capacity.

We considered 4 different scenarios (all of which assumed Franklin at its full design capacity of 12 MGD):

1. Franklin at 12 MGD, 6 mg/l CBOD and the proposed withdrawal plan.
2. Franklin at 12 MGD, 6 mg/l CBOD and no withdrawal (neither current nor proposed).
3. Franklin at 12 MGD, 4 mg/l CBOD and the proposed withdrawal plan.
4. Franklin at 12 MGD, 4 mg/l CBOD and no withdrawal (neither current nor proposed).

The proposed withdrawal plan with the 5 cfs cutoff, when compared with no withdrawal, results in an increase in downstream CBOD of approximately 6 % for an effluent CBOD concentration of 6 mg/l and 5 % for an effluent CBOD concentration of 4 mg/l. At normal or higher flows, the difference would be less than this.

Our decision to increase the cutoff limit to 10 cfs would be more protective of dissolved oxygen concentrations in the Harpeth River. The department has determined that the withdrawal as permitted would not significantly affect instream assimilative capacity or worsen the dissolved oxygen characteristics.

### **Existing Dam**

In principle, removal of the dam will benefit water quality by reducing stagnation and benefit stream ecology by eliminating the barrier to upstream and downstream movement of aquatic life.

The process of removing a dam, though, should not be over-simplified. Over the years, several feet of sediment has been deposited throughout the reach that is impounded behind the dam. That sediment would have to be excavated before the dam is removed. Otherwise, when the dam is removed, all of the sediment that is there would be flushed downstream. Before removing the sediment, however, we must know how much sediment there is and whether or not it is contaminated so that it can be properly handled and disposed.

We are requiring the city to investigate the feasibility of removing the dam. The purpose of the feasibility study is to evaluate the costs and benefits associated with the restoration of water quality and fisheries ecosystem in the Harpeth River. The feasibility study is to be coordinated through the department and allow stakeholder participation.

### **Existing Withdrawal**

At present the city takes water out of the river with no limitations other than voluntary restrictions. As of this action, the city now holds a permit to withdraw water from the Harpeth River. The issued permit explicitly prohibits withdrawal of water when the flow

is below 10 cfs. Our position is that this permit condition governs withdrawal from this point forward, whether or not the city expands pumping capacity.

### **Existing Raw Water Reservoir**

Production of treated water is managed according to volume or levels of raw water in the reservoir. The raw water reservoir was initially designed and constructed for 110 million gallon capacity. However, based on more recent surveys of the reservoir the reported maximum capacity of the reservoir is 95 million gallons. The total raw water storage volume is reportedly being evaluated under a separate study. Also, the reservoir is reported to lose water because of leakage. Our understanding is that the city has repaired some of the leakage while the reservoir has been drawn down during the recent drought.

An increase in raw water storage could impact and improve the number of days per year that water can be produced and result in more efficient harvesting of water from the river. However, whether or not the city repairs the leakage or restores the capacity, we do not perceive additional protection of the river when considering the protective measures of the permit.

### **Highway 96 USGS flow gage**

The USGS flow gage at highway 96 is downstream of the existing or proposed intake, and is therefore influenced by any withdrawal. For that reason, we have conditioned the permit to require the city to develop plans for a flow measurement system that will compensate for the water withdrawal. This may include working with the USGS to calibrate flow at the intake with the existing highway 96 gage by updating all relevant data. Other options may include funding an additional USGS gage or construction of an intake weir that physically by-passes the base flow of 10 cfs.

### **Prepared by**

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