



§401 Water Quality Certification
Aquatic Resource Alteration Permit
NRS23.228

Pursuant to the *Tennessee Water Quality Control Act of 1977* (T.C.A. §§ 69-3-101 et seq.) and supporting regulations, a permit is required to alter the properties of waters of the state. Also, pursuant to section 401 of the *Clean Water Act* (33 U.S.C. § 1341), an applicant for a federal license or permit which may result in a discharge into the waters of the U.S., shall provide the federal licensing or permitting agency a certification from the State in which the discharge will originate. Accordingly, the Division of Water Resources requires reasonable assurance that the activity will not violate provisions of the Tennessee Water Quality Control Act or provisions of sections 301, 302, 303, 306 or 307 of the Clean Water Act.

Subject to conformance with accepted plans, specifications, and other information submitted in support of the application, the state of Tennessee hereby certifies pursuant to 33 U.S.C. § 1341, and permits pursuant to T.C.A. § 69-3-108(b), the activity described below:

PERMITTEE Columbia Power and Water Systems
 201 Pickens Lane, P.O. Box 379
 Columbia, TN 38401

AUTHORIZED WORK: Withdrawal of water from the Duck River at an instantaneous rate of up to 13,900 gallons per minute to obtain up to 20 million gallons per day for public water supply from an existing intake structure located along the Duck River near river mile 134. Withdrawal from the existing intake is not authorized if the flow is below 100 cubic feet per second as measured at the USGS gage 03599500 at river mile 132.8.

Construction of a new intake and withdrawal of water from the Duck River at an instantaneous rate of up to 22,222 gallons per minute to obtain up to a combined total for the two intakes of 32 million gallons per day for public water supply from near river mile 100.

LOCATION: The activity is located in the Duck River in Maury County near river mile 134 and near river mile 100. Pursuant to T.C.A. § 10-7-504 and Rule 0400-01-01(4)(c)2, the precise locations are confidential. Therefore, the exact locations of the intake sites will not be disclosed in this permit or otherwise made available to the public.

EFFECTIVE DATE: March 15, 2024

EXPIRATION DATE: March 14, 2029

A handwritten signature in black ink, appearing to read "Jennifer Dodd", is written over a horizontal line.

for Jennifer Dodd, Director
Division of Water Resources

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PART I

Authorized Alterations

This permit authorizes aquatic alterations associated with the withdrawal of water from the Duck River at the instantaneous rate of up to 13,900 gallons per minute (GPM) to obtain up to 20 million gallons per day (MGD) for public water supply from an existing intake structure located along the Duck River near river mile 134. Of this amount, 13.95 MGD constitutes an existing water withdrawal as of July 25, 2000. Pursuant to Rule 0400-40-07-.02(4), this withdrawal amount is exempted from the requirements of this permit if it does not adversely alter or affect classified uses in the Duck River. Withdrawal of water from the Duck River at the existing intake at mile 134, including the grandfathered amount, is not authorized if the flow is below 100 cubic feet per second as measured at the USGS gage 03599500 at river mile 132.8.

Columbia Power and Water Services (CPWS) is requesting to increase the authorized withdrawal from the Duck River from 20 MGD to 32 MGD, divided between two separate intakes. CPWS water treatment plant has a rated capacity of 20 MGD. Raw water is currently supplied by an intake in the Duck River near river mile 134. CPWS has determined that the increased withdrawal is necessary to supply water to its water treatment facilities. The increase will require a new water intake near Duck River mile 100 with a maximum intake capacity of 32 MGD. Although CPWS will maintain the existing 20 MGD withdrawal near Duck River mile 134, the authorized maximum combined withdrawal rate for the two intakes will not exceed 32 MGD.

Special Conditions

1. The withdrawal rate near river mile 134 shall not exceed 13,900 GPM or 20 MGD.

2. The withdrawal rate near river mile 100 shall not exceed 22,222 GPM or 32 MGD.
3. Withdrawal at the existing intake near river mile 134 shall not cause the flow to be diminished below 100 cubic feet per second (CFS) gaged at the USGS gage 03599500 as measured as the 1-day average.
4. Raw water withdrawal volumes shall be monitored and recorded daily.
5. Withdrawal data shall be reported to the Division on the corresponding comprehensive monthly operations reports for the Public Water Supply ID TN0000128.
6. The permittee shall provide annual water loss reporting using the American Water Works Association M36 Water Audits and Loss Control Programs free water audit software v6 to determine the amount of potentially recoverable leakage, with a goal of achieving a 25% unavoidable annual real loss.
 - a. If the unavoidable annual real loss is greater than 25%, it shall develop and implement a plan to reduce water loss based on the potentially recoverable leakage.
 - b. A plan that details the process and timelines by which the permittee would achieve this reduction shall be submitted to the Division for review and approval not later than 24 months after the effective date of this permit.
 - c. The annual water loss reporting shall be submitted by October 31 of each year.
7. As reasonable and appropriate, the permittee shall provide, participate in or perform studies necessary to determine the presence and extent of threatened and endangered mussels and other fish and aquatic life in the downstream portion of the Duck River impacted by the permittee's withdrawals, to include assessment of the flow requirements necessary to sustain these populations. These studies will include, but not be limited to, an evaluation of the efficacy of tapering permittee's withdrawal rates gradually downward under drought conditions to reduce impacts on federally listed species.
8. The permittee shall comply with the provisions of the Duck River Agency's Duck River Regional Drought Management Plan, including revisions. The provisions include, but are not limited to:
 - a. triggers for drought restrictions
 - b. water use restrictions for drought stages, and
 - c. levels of enforcement for drought management stages.
9. The permittee shall develop a plan describing restricted and prohibited activities and enforcement mechanisms for drought management specific to the CPWS service area.
 - a. This plan shall be submitted to the Division for review and approval within 180 days of the effective date of this permit.
 - b. CPWS shall implement this plan independently or, if the plan is incorporated into the DRA's Duck River Regional Drought Management Plan, as part of compliance with item #8.

General Conditions

1. It is the responsibility of the permittee to convey all terms and conditions of this permit to all contractors. A copy of this permit, approved plans, and any other documentation pertinent to the activities authorized by this permit shall be maintained on site at all times during periods of construction activity.
2. All activities must be accomplished in conformance with the approved plans, specifications, data, and other information submitted in support of the ARAP application and the limitations, requirements, and conditions set forth herein. Failure to comply with the terms and conditions of this permit is a violation of the Act.
3. The permittee is responsible for obtaining the federal section 404 permit from the U. S. Army Corps of Engineers and section 26a permit from the Tennessee Valley Authority where necessary.
4. The permittee is responsible for obtaining coverage under the National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges from Construction Activities where clearing, grading or excavation results in an area of disturbance of one or more acres, or activities that result in the disturbance of less than one acre if it is part of a larger common plan of development or sale.
5. All work shall be carried out in such a manner as will prevent violations of water quality criteria established in Rule 0400-40-03-.03. This consists of, but is not limited to, the prevention of any discharge that causes a condition in which visible solids, bottom deposits, or turbidity impairs the usefulness of waters of the state for any of the uses designated by Rule Chapter 0400-40-04. These uses include fish and aquatic life (including trout streams and naturally reproducing trout streams), livestock watering and wildlife, recreation, irrigation, industrial water supply, domestic water supply, and navigation.
6. Impacts to waters of the state other than those specifically addressed in the plans and this permit are prohibited. All streams, springs, and wetlands shall be fully protected prior, during, and after construction until the area is stabilized. Any questions, problems or concerns that arise regarding any stream, spring, or wetland either before or during construction shall be addressed to the Division of Water Resource's Columbia Environmental Field Office - 1421 Hampshire Pike, Columbia, TN 38401 931-380-3371 or the permit coordinator in the Division's Natural Resources Unit – 615-532-0710.
7. Adverse impact to formally listed state or federal threatened or endangered species or their critical habitat is prohibited.
8. This permit does not authorize adverse impacts to cultural, historical, or archeological features or sites.
9. Clearing, grubbing, and other disturbance to riparian vegetation shall be kept at the minimum necessary for slope construction and equipment operations. Unnecessary native riparian vegetation removal, including tree removal, is prohibited. Native riparian vegetation must be reestablished in all areas of disturbance outside of any permanent authorized structures after work is completed. Coverage under this permit does not serve to waive any local riparian buffer protection requirement, and permittees are responsible for obtaining any necessary local approval.
10. To minimize wildlife entanglement and plastic debris pollution, temporary erosion and sediment control products that either do not contain netting, or that contain netting manufactured from 100 percent biodegradable non-plastic materials such as jute, sisal, or coir fiber shall be specified. Netting

used in these products should have a loose-weave wildlife-safe design with movable joints between the horizontal and vertical twines, allowing the twines to move independently. Degradable, photodegradable, UV-degradable, oxo-degradable, or oxo-biodegradable plastic netting (including polypropylene, nylon, polyethylene, and polyester) are not acceptable alternatives.

11. Appropriate steps shall be taken to ensure that petroleum products or other chemical pollutants are prevented from entering waters of the state. Any equipment proposed to be used in-stream shall be free of noticeable leaks of fluids, e.g., hydraulic, transmission, crankcase, and engine coolant fluids and oils. All spills must be reported to the appropriate emergency management agency, and measures shall be taken immediately to prevent the pollution of waters of the state, including groundwater, should a spill occur.
12. This permit shall not be used incrementally to combine with other activities resulting in an appreciable permanent loss of water resource values.
13. This activity may not result in a disruption or barrier to the movement of fish or other aquatic life. The completed activities may not disrupt or impound stream flow.
14. The activity may not result in the discharge of waste or other substances that may be harmful to humans or wildlife.
15. This permit does not authorize access to public or private property. Arrangements concerning the use of public or private property shall be made with the landowner. The permittee is responsible for obtaining any additional permitting or maintenance agreements with other government or public agencies or lands.

PART II

Mitigation Requirements and Monitoring Procedures

Required Mitigation Activities

There are no mitigation requirements.

Monitoring Requirements and Procedures

The permittee shall submit the annual project report as described in Special Condition 6.c. by October 31 of each year.

Submission of Monitoring Results

All reports must be submitted in report form to the Division of Water Resources, Natural Resources Unit, Division of Water Resources, Davy Crockett Tower, 9th Floor, 500 James Robertson Parkway, Nashville, Tennessee 37243, or via email at water.permits@tn.gov. Please be sure to indicate the ARAP permit number on your submittal.

Records Retention

All records and information resulting from the monitoring activities required by this permit including all records of analyses performed and calibration and maintenance of instrumentation shall be retained for a minimum of five years, or longer, if requested by the Division.

Falsifying Results and/or Reports

Knowingly making any false statement on any report required by this permit or falsifying any result may result in the imposition of criminal penalties as provided for in Section 309 of the Federal Water Pollution Control Act, as amended, and in Section 69-3-115 of the Tennessee Water Quality Control Act.

PART III

Duty to Reapply

The withdrawal of water from the Duck River beyond the expiration date of this permit is not authorized. If the permittee chooses to continue this activity, it must submit a complete application to the Division not later than 90 days prior to the expiration of the permit.

Property Rights

The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of federal, state, or local laws or regulations.

Water Rights

The waters of Tennessee are the property of the state and are held in public trust for the use of the people of the state. This permit does not grant or convey any prescriptive rights, appropriation, or allocation of water, nor does it authorize any injury to the riparian rights of others.

Other Permits

This permit does not preclude requirements of other federal, state, or local laws. This permit serves as both a section 401 certification and as a state of Tennessee aquatic resource alteration permit (ARAP) pursuant to the Tennessee Water Quality Control Act of 1977 (T.C.A. § 69-3-101 to -148).

Other Information

If the permittee becomes aware that it failed to submit any relevant facts in a permit application or submitted incorrect information in a permit application or in any report to the Director, then it shall promptly submit such facts or information.

Changes Affecting the Permit Transfer/Change of Ownership

This permit may be transferred to another party, provided:

1. There are no activity or project modifications, no pending enforcement actions, or any other changes which might affect the permit conditions contained in the permit.
2. The permittee notifies the Director of the proposed transfer at least 30 days in advance of the proposed transfer date.
 - a. The notice consists of a written agreement between the existing and new permittees containing a specified date for transfer of permit responsibility, coverage, and contractual liability between them; and

- b. The Director does not notify the current permittee and the new permittee, within 30 days of his or her intent to modify, revoke, reissue, or terminate the permit, or require that a new application be filed rather than agreeing to the transfer of the permit.
3. The permittee must provide the following information to the Division in its formal notice of intent to transfer ownership:
 - a. the permit number of the subject permit,
 - b. the effective date of the proposed transfer,
 - c. the name and address of the transferor,
 - d. the name and address of the transferee,
 - e. the names of the responsible parties for both the transferor and transferee,
 - f. a statement that the transferee assumes responsibility for the subject permit,
 - g. a statement that the transferor relinquishes responsibility for the subject permit,
 - h. the signatures of the responsible parties for both the transferor and transferee, and
 - i. a statement regarding any proposed modifications to the permitted activities or project, its operations, or any other changes which might affect the permit conditions contained in the permit.

Change of Mailing Address

The permittee shall promptly provide to the Director written notice of any change of mailing address. In the absence of such notice the original address of the permittee will be assumed to be correct.

Noncompliance

Effect of Noncompliance

All withdrawals shall be consistent with the terms and conditions of this permit. Any permit noncompliance constitutes a violation of applicable state and federal laws and is grounds for enforcement action, permit termination, permit modification, or denial of permit reissuance.

Reporting of Noncompliance

24-Hour Reporting

In the case of any noncompliance which could cause a threat to public drinking supplies, or any other withdrawal which could constitute a threat to human health or the environment, the required notice of non-compliance shall be provided to the Division of Water Resources in the appropriate Environmental Field Office within 24-hours from the time the permittee becomes aware of the circumstances. (The Environmental Field Office should be contacted for names and phone numbers of environmental response personnel).

1. A written submission must be provided within five days of the time the permittee becomes aware of the circumstances unless this requirement is waived by the Director on a case-by-case basis. The permittee shall provide the Director with the following information:
 - a. a description of the withdrawal and cause of noncompliance;
 - b. the period of noncompliance, including exact dates and times or, if not corrected, the anticipated time the noncompliance is expected to continue; and

- c. the steps being taken to reduce, eliminate, and prevent recurrence of the non-complying withdrawal.

Scheduled Reporting

For instances of noncompliance which are not reported under subparagraph a. above, the permittee shall report the noncompliance by contacting the permit coordinator and provide all information concerning the steps taken or planned to reduce, eliminate, and prevent recurrence of the violation and the anticipated time the violation is expected to continue.

Adverse Impact

The permittee shall take all reasonable steps to minimize any adverse impact to the waters of Tennessee resulting from noncompliance with this permit, including but not limited to, accelerated or additional monitoring as necessary to determine the nature and impact of the noncompliance. It shall not be a defense for the permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity to maintain compliance with the conditions of this permit.

Liabilities

Civil and Criminal Liability

Nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance. Notwithstanding this permit, the permittee shall remain liable for any damages sustained by the state of Tennessee, including but not limited to fish kills and losses of aquatic life and/or wildlife, as a result of the withdrawal from any surface waters. Additionally, notwithstanding this permit, it shall be the responsibility of the permittee to conduct its withdrawal activities in a manner such that public or private nuisances or health hazards will not be created.

Liability under State Law

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable state law or the Federal Water Pollution Control Act, as amended.

Reopener Clause

This permit may be modified, suspended, or revoked for cause, including:

1. Violation of any of the terms or conditions of this permit or of T.C.A §§ 69-3-101 to -148,
2. Obtaining the permit by misrepresentation or failing to disclose fully all relevant facts, or
3. A change in any condition that requires either a temporary or permanent change in the conditions of this permit.

Appeal

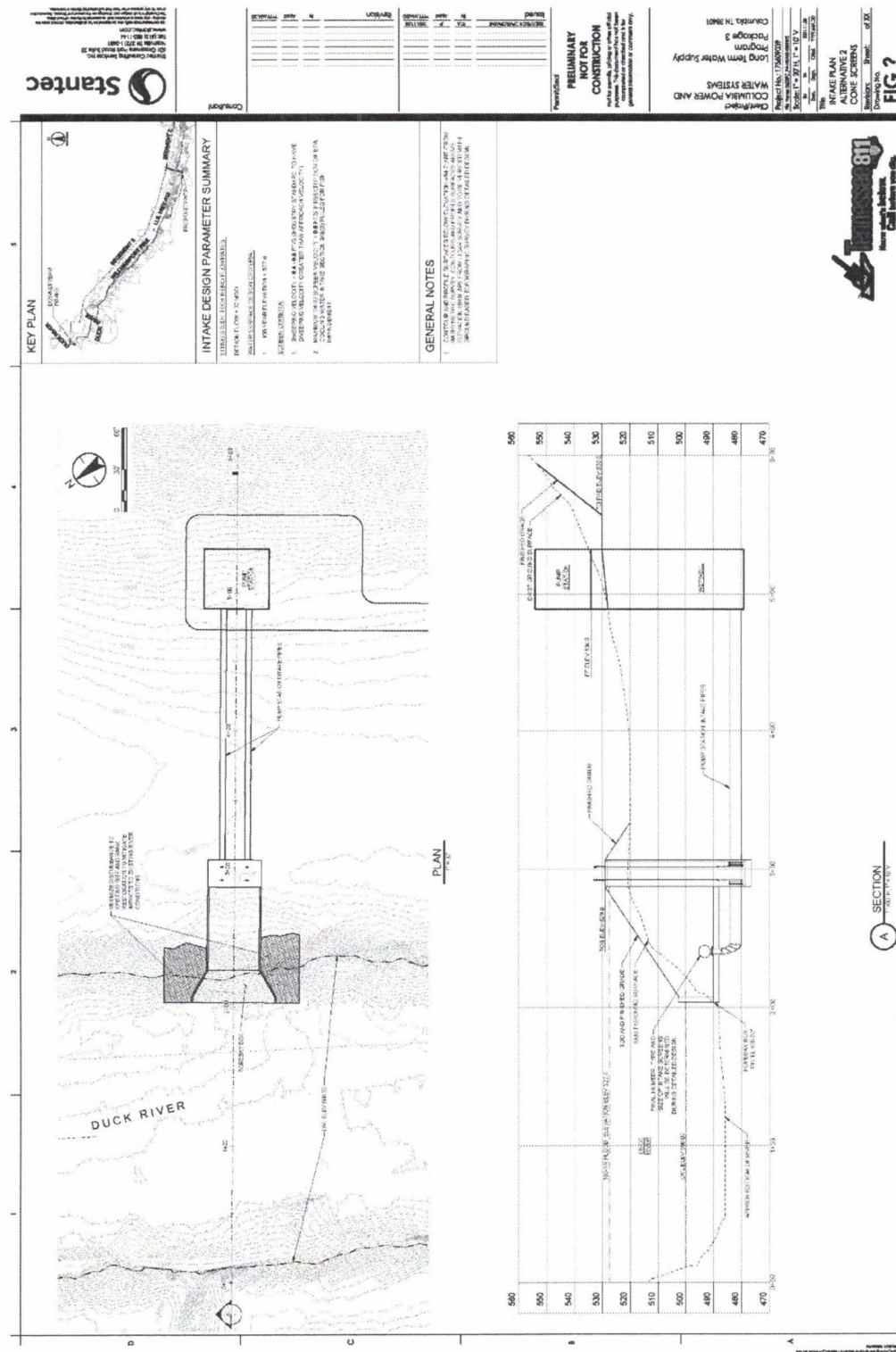
An appeal of this action may be made as provided in T.C.A. § 69-3-105(i) and Rule 0400-40-07-.04(9) by submitting a petition for appeal:

1. The petition must be filed within 30 days after notification of the issuance of the permit.
2. The petition must specify the basis for the appeal and state a claim for relief based on an alleged violation of the Tennessee Water Quality Control Act or the rules promulgated thereunder. Third

parties shall specify facts sufficient to establish that they have satisfied the statutory and regulatory preconditions and otherwise have standing to appeal.

3. The petition should be addressed to the technical secretary of the Tennessee Board of Water Quality, Oil, and Gas at the following address: Jennifer Dodd, Director, Division of Water Resources, William R. Snodgrass - Tennessee Tower, 312 Rosa L. Parks Avenue, Nashville, Tennessee 37243-1102, or you may submit such petition electronically to TDEC.Appeals@tn.gov. Any hearing would be in accordance with T.C.A. §§ 69-3-110 and 4-5-301 et seq.

Site Maps and Design Drawings



APPENDIX

Rationale

Columbia Power and Water Services
201 Pickens Lane, P.O. Box 379
Columbia, TN 38401
September 12, 2023
Permit Writer: Robert Baker

Summary

Permittee: Columbia Power and Water Services

Contact: Jonathan Hardin, President / CEO
Telephone #: 931-388-4833

Activity Location: The existing withdrawal is located in the Duck River in Maury County near river mile 134. The authorized location for the new intake is near river mile 100. Pursuant to T.C.A. § 10-7-504 and Rule 0400-01-01(4)(c)2, the precise location is confidential. Therefore, the exact location of the intake site will not be disclosed in this permit or otherwise made available to the public.

Authorized Activity: The existing authorized alteration to waters is withdrawal of water from the Duck River at the instantaneous rate of up to 13,900 gallons per minute to obtain up to 20 million gallons per day. The purpose of the withdrawal is for public water supply. The authorized increased withdrawal includes construction of a new intake near river mile 100 for additional water withdrawal. The total combined withdrawal from both intakes would be up to 32 million gallons per day.

Waterbody Name / ID: Duck River /TN06040003016_1000 Duck River /
TN06040003026_2000

Permit Status

Permit Type: ARAP

Effective Date: March 15, 2024

Expiration Date: March 14, 2029

Status of Affected Waters

Duck River – ID TN06040003026_2000

Duck River from Little Bigby Creek to Iron Bridge Road (upstream of Bear Creek).

Ecoregion - Outer Nashville Basin, 71h, Maury County

Hydrologic Unit Code - HUC_8 - 06040003 Lower Duck River

Assessment Date - September 13, 2021

Designated Use	Use Support	Causes	Sources
livestock watering & wildlife	fully supporting		
irrigation	fully supporting		
recreation	not assessed		
fish and aquatic life	fully supporting		
industrial water supply	fully supporting		
domestic water supply	fully supporting		

Duck River – ID TN06040003016_1000

Duck River from Lick Creek to Big Bigby Creek

Ecoregion - Outer Nashville Basin, 71h, Maury County

Hydrologic Unit Code - HUC_8 - 06040003 Lower Duck River

Assessment Date - NA

Designated Use	Use Support	Causes	Sources
livestock watering & wildlife	not assessed		
irrigation	not assessed		
recreation	not assessed		
fish and aquatic life	not assessed		
industrial water supply	not assessed		
domestic water supply	not assessed		

The affected waters have been determined to have available water withdrawal parameters.

This segment of the Duck River from the Tennessee River (Kentucky Lake) to River Mile 137.7 is Exceptional Tennessee Waters. The basis for inclusion is critical habitat under the Federal *Endangered Species Act* for Fluted Kidneyshell (*Ptychobranthus subtentum*) and Slabside Pearlymussel (*Pleuroaia dolabelloides*), Purple Bean, Cumberlandian Combshell, Clubshell, Pygmy Madtom, Birdwing Pearlymussel, Oyster Mussel, and state threatened Coppercheek Darter and Water Stitchwort. Also, portions of the river that are within the Natchez Trace Parkway National Park, the Hugh Link Farm State Archeological Area, and the Tennessee National Wildlife Refuge.

Authorized Alterations

Columbia Power and Water Services' (CPWS) water treatment plant has a rated capacity of 20 MGD. Raw water is currently supplied by an intake in the Duck River near river mile 134. Of this amount, 13.95 MGD constitutes an existing water withdrawal as of July 25, 2000. Pursuant to Rule 0400-40-07-.02(4), this withdrawal amount is exempted from the requirements of this permit if it does not adversely alter or affect classified uses in the Duck River. CPWS supplies finished water to retail customers and two primary wholesale customers, Maury County Water System and the City of Spring Hill.

CPWS is requesting modification of this permit to increase the authorized withdrawal from the Duck River from 20 MGD to 32 MGD. CPWS states that the increased withdrawal is necessary to supply water to its water treatment facilities.

The authorized increase would require a new water intake that is authorized near Duck River mile 100 with a maximum intake capacity of 32 MGD. Although CPWS would maintain the existing 20 MGD withdrawal at approximate Duck River mile 134, the authorized maximum combined withdrawal rate would not exceed 32 MGD.

Alternatives Analysis and Selection of Least Impactful Practicable Alternative¹

The stated purpose of the authorized alterations to state water resources is to provide public water supply. The applicant has submitted an analysis of potentially practicable alternatives to the authorized activity and provided the following discussion of those alternatives:

2.1 Non-Viable Alternatives

Hazen conducted an initial evaluation of the alternatives listed above as well as the alternative to raise the elevation of Normandy Dam. The purpose of the initial evaluation was to eliminate those alternatives that would not meet the purposes of the project. Through this effort, Hazen determined that the following alternatives would not meet project objectives:

- *Water conservation (including pricing structure). Water conservation is already practiced by CPWS measures such as the inclining block pricing structure and public education messaging to encourage wise water use. Additionally, CPWS has an effective water loss prevention program that typically results in a rolling average annual water loss that ranges between 10 and 15 %. Though CPWS can expect to increase the efficiency of their system, that alone will not impact the projected 20-year water demand.*
- *Reuse/recycling, connection to another water supply. Large scale water reuse involves using reclaimed water from a wastewater treatment system. Although technologically, water reuse is entirely possible, widespread public acceptance is essential for a successful reuse program. To be used for residential irrigation, the reclaimed water must be treated to a higher level than what is typically required for direct discharge. A dedicated distribution system is also necessary for large scale water reuse. However, there are limitations to the amount of demand that can be offset by beneficial reuse. The additional treatment along with the distribution system would require a large capital investment. In this case, a different utility, the City of Columbia, is responsible for the collection and treatment of wastewater. This alternative may not fully offset growth-based demand and presents both logistical and financial barriers. In addition, many of CPWS customers are on septic systems or other decentralized systems so that the demand for water is greater than the amount able to be reclaimed from the City's wastewater.*

¹ It should be noted the cost estimates for the alternatives were developed in 2021.

- Withdrawing from a larger body of water (Tim's Ford Reservoir). This alternative was addressed in TVA's 2001 Columbia Water Supply Final EIS and included construction of a pipeline to transfer water from Tim's Ford Reservoir across the divide and discharge into the Duck River near Shelbyville. The pipeline would be able to provide up to 22 cfs (14 mgd) of additional flow into the Duck River during drought conditions. This alternative would not meet the project objectives for supply capacity. Further, the estimated cost for this alternative is greater than \$300 million.

- Use of groundwater. In 1993, the USGS evaluated groundwater availability in the Upper Duck River Basin⁴. The study's statistical analyses suggested that it would be unlikely that a well located in Maury County would have a yield even as large as 100 gal/min, which would be approximately 1% of the projected demand. More recently, TVA's 2001 Columbia Water Supply Final EIS stated, "To summarize, in this project area groundwater is used predominately for individual home and agricultural purposes. Most wells provide low yields, generally less than 10 gpm, and very few wells produce more than 20 gpm...While sufficient groundwater seems to be present to supply individual residences, there is very little likelihood of drilling wells that could produce enough high-quality groundwater to supply large communities."

- Raising Normandy Dam. This alternative was first considered in TVA's 2001 EIS, which predicted that raising the elevation of Normandy Dam by 5 feet would only increase Duck River flow by 10 mgd. In addition to not providing adequate flow to meet the predicted demand, this alternative has potentially significant environmental impacts including inundation of habitat for a rare plant species.

Hazen identified three viable alternatives that could provide an adequate quantity of water to both the existing and future Columbia water treatment plants and would also facilitate regionalization:

1. Off-Stream Impoundment at Fountain Creek. This alternative was identified and evaluated in TVA's 2001 EIS as a potential future water source for the Columbia area. This alternative included construction of a dam on Fountain Creek at its confluence with the Duck River to create an impoundment in the Fountain Creek Drainage. The alternative would take advantage of property within the drainage that TVA purchased as part of the abandoned Columbia Dam project. The Fountain Creek impoundment would require acquisition of approximately 800 additional acres of land and would affect 3,600 total acres of land. The TVA EIS concluded that this alternative would be able to provide an estimated 74 cfs (48 mgd) during drought conditions. Hazen included this alternative in its analysis since it would provide adequate flow to meet the project objectives.

Although the project as described in the TVA EIS would be operated to always discharge the natural minimum low flow of 10 cfs, significant environmental impacts would be expected with this alternative. Impounding Fountain Creek would result in permanent loss of aquatic and terrestrial habitat including that of endangered and threatened species and their critical habitats. In fact, Fountain Creek is designated as an Exceptional Tennessee Water (ETW) due to the presence of the state threatened Coppercheek Darter. In addition, this alternative would be subject to the antidegradation requirements applicable to ETWs which prohibit degradation if less degrading practicable alternatives exist. In this case, the two Duck River withdrawal alternatives would result in significantly less degradation.

This alternative includes construction of the Fountain Creek Dam, additional land purchase and easements, new intake structure and an 8-mile transmission line to CPWS's existing treatment plant. The Class V OPCC of this alternative is \$146,950,000

2. Water Harvesting near RM 100 to a Constructed Storage Reservoir. Water harvesting is the practice of withdrawing water when flows in the source river are above a specified threshold. This alternative would

include an intake and raw water pump station to pump water to large storage reservoir. Raw water would then be pumped from the reservoir to the WTPs. For this alternative, three main variables must be considered: the flow threshold for making diversions from the river, the size of the intake and the reservoir storage. First, a flow threshold at the 25th percentile was selected which means that withdrawal would occur when stream flow is at or above 360 cfs. The amount withdrawn would need to supply the new WTP, the existing WTP and the storage reservoir and is estimated to be between 40 and 50 mgd. Historical flows at the Columbia USGS gage 03599500 were used to approximate historical flows at the Shady Grove USGS gage. An analysis of historical flows and proposed withdrawals determined that a 1500 MG basin would be necessary to ensure an adequate supply of water.

The proposed storage reservoir has a large footprint with the potential to impact wetlands and waters. The national wetlands mapper⁷ identifies two ponds and surface drainages that would need to be evaluated to determine if they are considered jurisdictional wetlands or streams as defined by the Tennessee Water Quality Control Act. Other site reviews would include an evaluation for potential archeological impacts as well as an evaluation of threatened and endangered species.

It was assumed this alternative would have less of an impact on flows in the Duck River than a continuously operating withdrawal since these withdrawals would only occur during high flows. However, the evaluation of impacts for the continuously operating withdrawal suggests that there would not be a significant difference in Duck River ecology associated with the water harvesting alternative.

The estimated cost of this alternative included the land cost and a Class V OPCC estimate of the construction cost of the intake, transmission lines and a 1500 MG storage reservoir. The cost estimate for this alternative is \$150,935,000.

3. Continuous Withdrawal near RM 100 of Duck River (proposed modification). This alternative would implement one of the primary action items in the Duck River Comprehensive Regional Water Supply Plan and consists of a new intake located approximately at RM 100 of the Duck River with a continuous withdrawal capacity of 32 mgd. As previously stated, this intake would have the capability of serving both CPWS's new and existing WTPs. The operation regime would range from 12 mgd to 32 mgd, depending on the amount withdrawn near RM 134. However, the combined withdrawals from RM 100 and 134 would not exceed 32 mgd. This flexibility is key to ensuring adequate water for all users during periods of low flow.

A reduction in stream flow would be the primary cause of potential environmental impacts with a continuous withdrawal at RM 100. Hazen conducted OASIS modeling and Ecological Flows Modeling to evaluate flow and ecological impacts at both RMs 100 and 134 using the following operating regimes:

- Option 1 – 20 mgd withdrawal from the existing intake at RM 134 (existing, baseline)
- Option 2 – 36 mgd withdrawal from the proposed intake at RM 100
- Option 3 – 16 mgd withdrawal from RM134 and 20 mgd withdrawal from RM 100
- Option 4 – 20 mgd withdrawal from RM134 and 16 mgd withdrawal from RM 100

Option 1 is the baseline condition and is used as the basis for comparison against the other 3 operating regimes. The use of the 2050 predicted demand of 36 mgd, which is larger than the currently requested withdrawal of 32 mgd adds an additional layer of conservatism to the evaluation.

At RM 134, Options 2 and 3 represent departures from the baseline with Option 2 providing the greatest flow benefit at RM 134. Option 3 would provide a small increase in flow probability over the baseline

condition while Option 4 is equivalent to the baseline condition. In all scenarios, the probability of the stream flow at RM 134 to fall below 100 cfs is nearly zero. At RM 100, the departure from the baseline condition (Option 1) is essentially the same for Options 2, 3 and 4.

The estimated cost of this alternative included the land cost and a Class V OPCC estimate of the construction cost of the intake and transmission lines and is \$89,357,000.

Based on the available information, the Division has determined that the authorized modification represents the least impactful practicable alternative to accomplish the project's purpose and goals. *See Rules 0400-40-03-.06(4)(c)2 and 0400-40-07-.04(5)(b).*

Existing Conditions/Authorized Loss of Resource Values

The Duck River in this segment is considered fully supporting of its classified uses. Over 50 freshwater mussel species are extant in this reach of the Duck River including the federally endangered Birdwing Pearlymussel, Cumberland Monkeyface, Fanshell, Duck River Dartersnapper, Cumberland Combshell, Catspaw, Snuffbox, Pink Mucket, Slabside Pearlymussel, Fluted Kidneyshell, and Pale Liliput as well as the federally threatened Rabbitsfoot. This reach of the Duck River specifically harbors the only viable populations of the Birdwing Pearlymussel, Cumberland Monkeyface, and Duck River Dartersnapper throughout their global range.

The applicant conducted flow modeling using the Operational Analysis and Simulation of Integrated Systems (OASIS) modeling program for the Duck River. The river model for this region utilizes approximately 95 years of United States Geological Survey (USGS) gage readings to develop simulated flows within the system. The simulation begins above Normandy Dam within the reservoir and extends through Centerville, TN, at approximate river mile 72. OASIS models the controlled dam release established by the Tennessee Valley Authority (TVA) and takes into consideration tributary inflow, return flows and other water withdrawals.

Impacts to fish species richness were also quantified in the applicant's analysis. The results are computed using Ecological Limit Functions for fish groups developed by the USGS. At RM 100, with the higher baseflows and lesser net withdrawal impacts noted previously, no changes in species richness across the options were predicted. At RM 133, there are some reductions in species richness when the amount of water withdrawn is reduced. This is due to some species being dependent upon the constancy metric and is likely due to the Duck being a regulated river. The USGS² found that for these rivers the % gains in species richness associated with increased withdrawals and the % losses associated with decreased withdrawals are considered mathematical artifacts and not an indication of fish health. This leads to the conclusion [by the applicant] that none of the evaluated options are predicted to result in negative ecological impacts at either location.

Based upon the applicant's OASIS and Ecological Limit Function model outputs, the Division has determined that the activity will not result in an appreciable permanent loss of resource values. The existing withdrawal, including the grandfathered amount, is limited to its current authorization and must be ceased at 100 CFS low flow. The new withdrawal is from a portion of the Duck River with significantly more flow than the existing location. Moreover, during low flows the total water production will be withdrawn at the

² Species-Richness Responses to WaterWithdrawal Scenarios and Minimum Flow Levels: Evaluating Presumptive Standards in the Tennessee and Cumberland River Basins. Water 2020, 12, 1334 (Driver, L.J.; Cartwright, J.M.; Knight, R.R.; Wolfe, W.J)

downstream location, leaving the former volume withdrawn at the upstream location in the river. A significant portion of the withdrawn water at river mile 100 will be discharged back to the Duck River as treated effluent at river mile 130, with the benefit of adding flow at upstream river segment.

Antidegradation

Antidegradation review applies to new or increased withdrawals. The Department's rules state a single water withdrawal will be considered *de minimis* if it removes less than five percent of the minimum 7-day average streamflow with a 10-year recurrence interval (7Q10) flow of the stream. If more than one withdrawal has been authorized or proposed in a segment and the total of the authorized and proposed withdrawals uses no more than 10% of the 7Q10 low flow, they are presumed to be *de minimis*.

In waters identified as Exceptional Tennessee Waters, new or increased water withdrawals that would cause degradation of any available parameter above the level of *de minimis* will only be authorized if the applicant has demonstrated to the Department that there are no practicable alternatives to prevent or lessen degradation associated with the proposed activity and the degradation is necessary to accommodate important economic or social development in the area and will not violate the water quality criteria for uses existing in the receiving waters.

The existing 20 MGD withdrawal near river mile 134 is in river segment ID TN06040003026_2000. The calculated 7Q10, using the USGS Hydrologic Toolbox 1.0.0 for the period of record from April 1, 1991 - March 31, 2023, at the USGS Gage 03599500 DUCK RIVER AT COLUMBIA, TN in this river segment is 132.59 CFS. The maximum authorized withdrawal accounts for 23.53% of the 7Q10 at that location, which constitutes greater than *de minimis* degradation. However, it is not subject to antidegradation review at this time because it is an existing permitted withdrawal.

The authorized new withdrawal near river mile 100 is in river segment ID TN06040003016_1000 and is subject to antidegradation review. The calculated 7Q10, using the USGS Hydrologic Toolbox 1.0.0 for the period of record from April 1, 2016 – March 31, 2023, at the USGS Gage 03601600 DUCK RIVER NEAR SHADY GROVE, TN. in this river segment is 202.90 CFS.

The withdrawal rate authorized by this permit is 22,222 GPM or 49.51 CFS. The maximum withdrawal is 24.40% of the 7Q10 flow. As defined in rule 0400-40-03-.04(4) the authorized withdrawal is greater than *de minimis* degradation of water quality parameters.

The applicant has provided the following written justification to demonstrate that greater than *de minimis* degradation is necessary to accommodate important social or economic development in the area in which the waters are located:

The CPWS service area MDD for water is projected to outstrip the capacity of the current WTP by 2022. The ADD for the CPWS service area is forecasted to exceed current capacity in 2033. An adequate and reliable supply of water of potable water is critical to a jurisdiction's economic growth. Without a sufficient water supply, restrictions on new residential development or business permits would need to be imposed in the service area. Even organic growth could be constrained because business expansions and increases in natural population growth (i.e., nonmigratory growth) would eventually stress the current water supply capacity. Issuance of water restrictions, especially water uses for discretionary purposes such as landscaping would become more frequent and more stringent over time and degrade the overall wellbeing of the service area population.

To quantify these impacts, the economic benefits analysis evaluates Maury County economic conditions from 2024 to 2040 under two Scenarios:

- *Unconstrained Water Supply Scenario*
- *Constrained Water Supply Scenario*

Under the “Unconstrained Water Supply Scenario”, CPWS would build the proposed infrastructure and the service area would receive the necessary water to supply the projected population growth and associated economic development. Economic growth would continue unimpeded by the water supply constraint. Under the “Water Supply Constrained Scenario”, CPWS would not build the proposed water supply infrastructure, which would result in diminished economic output compared to the unconstrained water supply scenario. The year 2024 is used as the first year of the impact evaluation, because this is the year in which the projected water supply deficit becomes significant compared to the projected MDD. Impacts are quantified through 2040, the last year of CPWS water demand projections.

The IMPLAN regional economic model was used to quantify the projected economic losses that would be attributable to a water supply constraint. IMPLAN is an economic input-output model that is used to measure the direct, indirect, and induced effects of a public or private sector policy or activity on a regional economy.

The projected number of households combined with their average annual household income were input into the IMPLAN Model to calculate the annual “induced impacts” of these future households on the County’s economy. If the number of households are reduced because of permit restrictions, then the magnitude of household spending is reduced proportionately, depending on the income of those households. Under the unconstrained water supply scenario, there would be an additional 9,966 households between 2020 and 2040 with an average income of \$85,000 (in 2020 dollars).

The residential construction sector in Maury County has undergone relatively robust growth over the past decade to accommodate the needs of a growing population. The residential construction sector includes three subsectors including: (1) Single family Residential (SFR) Construction; (2); Multifamily Residential (MFR) Construction; (3) Other Residential Construction. Other Residential Construction includes construction of group homes, assisted living facilities, residential additions, and remodeling. SFR Construction is the largest of the three subsectors producing structures with a total County output valued at \$67.4 million. Construction of Other Residential Structures topped \$61 million, and Multi-family Residences accounted for an additional \$15.3 million in economic output. The total economic output for the residential construction sector was \$145.9 million in 2018 (2020 dollars). To put these values into perspective the total economic output for Maury County in 2018 (2020 dollars) was \$12.69 billion.

Total Value of Output by the Residential Construction Sector - Current (2018) and Forecasted under the Unconstrained Water Supply Scenario (2020 dollars)

Sector	2018	2024	2029	2034	2040
SFR Structures	\$67,406,731	\$80,957,566	\$94,308,879	\$109,862,057	\$131,947,723
MFR Structures	\$15,289,445	\$16,838,781	\$18,249,169	\$19,777,688	\$ 21,781,835
Other Residential Structures	\$63,223,239	\$72,912,894	\$82,112,764	\$92,473,438	\$106,646,008
Total	\$145,919,415	\$170,709,241	\$194,670,812	\$222,113,184	\$260,375,566

Source: Projections based on IMPLAN historical data base for Maury County

The economic benefit analysis modeled each of three constrained water supply scenarios for the years 2024 to 2040 assuming a 25 percent, 50 percent, and 100 percent reduction in household growth and residential housing construction. Specifically, the forecasted value of residential construction for a modeled year (e.g., 2024) was reduced by 25 percent, 50 percent, or 100 percent, depending on the scenario, and the value was entered into the IMPLAN model to calculate the economic impacts of that reduction compared to the unconstrained scenario.

In accordance with the Tennessee Antidegradation Statement (Rule 0400-40-03-.06), the Division has determined that greater than *de minimis* degradation is necessary to accommodate important economic or social development in the area because of existing and projected water demand resulting from population growth and industrial expansion.

For more information, please reference Tennessee's Antidegradation Statement which is found in Chapter 0400-40-03 of the Rules of the Tennessee Department of Environment and Conservation.

Reference Documents

Frequency_Statistics_report_03599500 DUCK RIVER AT COLUMBIA, TN

Program SWStat U.S. GEOLOGICAL SURVEY Seq 00001
Ver. 5.0 Log-Pearson & Pearson Type III Statistics Run Date / Time
03/13/2018 based on USGS Program A193 8/8/2023 11:22 AM

Notice -- Log-Pearson Type III or Pearson Type III distributions are used
for these computations. Users are responsible for assessment
and interpretation.

Description: 03599500 DUCK RIVER AT COLUMBIA, TN
Year Boundaries: April 1 - March 31
Period in report: April 1, 1992 - March 31, 2023
Parameter: 7-day low
Non-zero values: 30
Zero values: 0
Negative values: 1 (ignored)

Input time series (zero and negative values not included in listing.)

195.290	158.140	186.570	194.570	148.290	164.710	143.860	164.000
212.860	167.570	212.570	244.710	168.140	162.140	125.140	123.860
153.570	133.000	144.710	123.570	177.000	168.710	192.710	129.570
319.860	190.430	162.430	214.860	241.860	176.140		

LOG PEARSON TYPE III Frequency Curve Parameters
(based on logs of the non-zero values)

Mean (logs)	2.237
Variance (logs)	0.009
Standard Deviation (logs)	0.096
Skewness (logs)	0.653
Standard Error of Skewness (logs)	0.427
Serial Correlation Coefficient (logs)	0.174
Coefficient of Variation (logs)	0.043

Frequency Curve - Parameter values at selected probabilities

Non- exceedance Probability	Recurrence Interval	Parameter Value	Variance of Estimate	95-Pct Confidence Intervals	
				Lower	Upper
0.1000	10.00	132.590	1.003	119.510	142.810

↑

Frequency_Statistics_report_03601600 DUCK RIVER NEAR SHADY GROVE

Program SWStat U.S. GEOLOGICAL SURVEY Seq 00001
 Ver. 5.0 Log-Pearson & Pearson Type III Statistics Run Date / Time
 03/13/2018 based on USGS Program A193 4/12/2023 12:08 PM

Notice -- Log-Pearson Type III or Pearson Type III distributions are used
 for these computations. Users are responsible for assessment
 and interpretation.

Description: 03601600 DUCK RIVER NEAR SHADY GROVE, TN.
 Year Boundaries: April 1 - March 31
 Period in report: April 1, 2016 - March 31, 2023
 Parameter: 7-day low
 Non-zero values: 7
 Zero values: 0
 Negative values: 0 (ignored)

Input time series (zero and negative values not included in listing.)

193.570 414.140 292.570 235.430 349.430 369.140 244.140

LOG PEARSON TYPE III Frequency Curve Parameters
 (based on logs of the non-zero values)

Mean (logs)	2.463
Variance (logs)	0.014
Standard Deviation (logs)	0.120
Skewness (logs)	-0.178
Standard Error of Skewness (logs)	0.794
Serial Correlation Coefficient (logs)	-0.570
Coefficient of Variation (logs)	0.049

Frequency Curve - Parameter values at selected probabilities

Non- exceedance Probability	Recurrence Interval	Parameter Value	Variance of Estimate	95-Pct Confidence Intervals	
				Lower	Upper
0.1000	10.00	202.900	1.006	118.120	256.400

↑