WithersRavenel

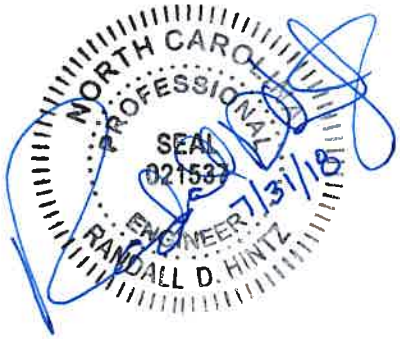
Our People. Your Success.

PRELIMINARY ENGINEERING REPORT AMENDMENT

Town of Weaverville – Water System Expansion

Prepared For:
Town of Weaverville
30 South Main Street
Weaverville, NC 28787

Prepared By:
WithersRavenel
84 Coxe Avenue, Suite 260
Asheville, NC 28801
828.255.0313
License No. C-0832



April 2018
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WR No. 02170809.00

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Appendices

1 INTRODUCTION

As development and population growth have increased water system demands, the Town of Weaverville has taken steps to plan for the eventual increase of the capacity of the water system. As directed by the Town, McGill Associates P.A. prepared a Preliminary Engineering Report titled "Upgrade and Expansion for the Water Treatment Plant" (dated September 2017) discussing the need to increase the water treatment plant capacity. Demand projections within that report demonstrated that the capacity of the existing water treatment plant would be inadequate in a few years' time. This report amendment shall present alternatives for water system expansion, as well as include a discussion of proposed project needs and details.

It is understood that the methodologies used in the original report to derive the demand projections have not and will not be independently verified, as Town staff aided in the development of the demand projections. In addition, the proposed improvements and associated costs of the water treatment plant expansion are assumed to be valid. However, the current bidding environment has indicated increased construction costs by 20% to 30% since the completion of the original report. As such, a 25% inflation factor has been applied to the construction costs for all project alternatives to account for these anticipated cost increases. This report amendment will use **By Others** when referencing material from "Upgrade and Expansion for the Water Treatment Plant". Reference the full report for the complete narrative.

2 DEMAND PROJECTIONS

Since the completion of the September 2017 report, officials from the Town of Mars Hill have been in discussions with the Town of Weaverville regarding the possibility of the Weaverville water system supplying 200,000-400,000 gallons per day through existing interconnection infrastructure. The Town of Weaverville has indicated that potential water sales to Mars Hill would likely begin after completion of the proposed expansion of the water system. The sale of water to Mars Hill would affect the demand projections and thus the O&M and lifecycle costs included in this report, however because sales would likely begin after expansion, the dates in which the projected demand will reach 80 and 90% of treatment plant capacity will remain unchanged. If water sales to Mars Hill started before the completion of the proposed water system expansion, it may limit the amount of allocations the Town of Weaverville can make within its system or accelerate the timeline in which demands reach 80 and 90% of the treatment plant capacity, necessitating improvements sooner.

3 EXISTING INTAKE CAPACITY

Prior correspondence between McGill Associates and NCDEHNR (now NCDEQ) indicates that the current Town of Weaverville water intake on the Ivy River has an allowable withdrawal of 4.0 MGD. NCDEQ-DWR has been recently contacted to reevaluate the prior approvals and current watershed ordinances and has not provided any information that contradicts the referenced 4.0 MGD allowable withdrawal. Therefore, it is believed that the Town of Weaverville will not have to take any measures to increase the allowable withdrawal from their existing water supply intake for the proposed improvements outlined in this report amendment. A copy of the original correspondence with NCDEHNR

and the recent follow-up with NCDEQ-DWR is located in the appendix. Prior to this development, the French Broad River was discussed as a potential water source for the Town, but will not be considered further, as the Town appears to have the capacity at their existing water system intake.

4 WATER LINE ALTERNATIVE SELECTION

****By Others****

The existing water main from the Ivy River WTP to Clarks Chapel Road is adequately sized to carry the design flow of 3.0 MGD for the expanded plant. However, the water line between North Buncombe High School and the Hamburg Mountain tank is only 10 inches in diameter and must be supplemented by an additional 12-inch water line in order to reduce pumping energy and discharge pressure.

Three alternatives for the new 12-inch water line route were outlined in the "Upgrade and Expansion for the Water Treatment Plant" Engineering Report, as seen below.

Table 4-1
Water Line Improvements Alternatives

Alternative	Route	LF of Proposed Water Lines	Total Construction Cost
A	North Buncombe School Road/US 19-23 Bypass	13,300	**$1,975,000**
B	Clark's Chapel Road	16,300	**$2,359,000**
C	Clark's Chapel Road/Ollie Weaver Road	17,600	**$2,533,000**

Based on discussions with Town staff, Alternative C is the preferred water line route as it will allow the expanded water system to deliver a larger volume of water to the Hamburg Mountain tank, provide a looped connection to a high growth area within the water distribution system west of I-26, as well as providing new water lines to currently unserved areas. The Engineering Report determined that the total cost for this alternative is $2,533,000. However, this cost will be adjusted based on the inflationary factor discussed above. The scope and cost for this water line alternative will be included as needed in the alternatives analysis as the water line improvements are critical to the effectiveness of the water system expansion.

5 ALTERNATIVES ANALYSIS

Four alternatives were considered for the expansion of the Town of Weaverville's water system to supply growing water system demands and service areas:

1) Intake and Water Treatment Plant Expansion
2) New Groundwater Wells and WTP Expansion

3) New Groundwater Wells with Onsite Treatment
4) Purchase Water from the City of Asheville

5.1 Alternative 1 – Intake and Water Treatment Plant Expansion

5.1.1 Description

****By Others****

The upgrade of the WTP would consist of the construction of a plant layout on the north east side of the current control/filter building and could include:

1. *Upgrade of the raw water pump station to increase the pumping capacity by the addition of a third pump*
2. *New mechanical pretreatment unit*
3. *Two new flocculation basins, and two new sedimentation basins.*
4. *Two new mixed media gravity filters with controls*
5. *Construction of a second clearwell*
6. *Construction of an additional 12-inch water main to the Hamburg Mountain tank*

5.1.2 Cost Estimate

The cost estimate for Alternative 1 is shown below. Costs for the water line upgrades were included with the treatment plant improvements in this amendment to present one total project cost as the water line upgrades are necessary to improve efficacy of the expanded water system. Line items, quantities and unit costs were all developed in the "Upgrade and Expansion for the Water Treatment Plant" Engineering Report (dated September 2017). As discussed previously, a 25% inflation factor has been applied to the construction costs to account for the rise in costs experienced since the completion of the 2017 report. Costs shown in the estimate are in 2018 dollars.

Table 5-1 Alternative #1 - Estimated Construction Costs				
Item Description	**Quantity**	**Unit**	**Unit Cost**	**Extended Cost**
WTP Expansion				
Mobilization	1	LS	$113,000.00	$113,000.00
Filter Media, Underdrain, Troughs, Agitators	1	LS	$270,000.00	$270,000.00
Filter Valves and Actuators	10	EA	$7,000.00	$70,000.00
Raw Water Pumps	2	EA	$150,000.00	$300,000.00
Finished Water Pumps	2	EA	$150,000.00	$300,000.00
Finished Water Pump Station	1	LS	$250,000.00	$250,000.00
Chemical Feed Modifications	1	LS	$100,000.00	$100,000.00
Flocculators	4	LS	$20,000.00	$80,000.00
Settling Basins, Flocculation Basins, and Filter Bays	1	LS	$475,000.00	$475,000.00
Backwash Sludge Basin	1	LS	$275,000.00	$275,000.00
0.250 MG Clearwell	1	LS	$390,000.00	$390,000.00
36'-6" Diameter Claricone Clarifier	1	LS	$850,000.00	$850,000.00
Yard Piping	1	LS	$100,000.00	$100,000.00
Electrical Improvements	1	LS	$300,000.00	$300,000.00
Water Line Improvements				
Mobilization	1	LS	$53,000.00	$53,000.00
12” DIP Water Line	17,600	LF	$100.00	$1,760,000.00
			Construction Sub-total	$5,686,000.00
			Contingency (20%)	$1,130,000.00
			Total Construction Cost	$6,816,000.00
			Technical Services (20%)	$1,370,000.00
			Inflation Factor (25%)	$1,421,500.00
			Total Project Cost Opinion	**$9,607,500.00**

5.1.3 Lifecycle and O&M Costs

Information provided by water treatment plant staff indicated that the Town spent $579,930 on operation and maintenance (O&M) costs for the water treatment plant in 2016-2017 fiscal year. Over the same period of time, the plant produced 216,363,000 gallons of finished water, equating to an O&M cost of $0.00268 per gallon. This value is applied to the flow projections developed in the "Upgrade and Expansion for the Water Treatment Plant" Engineering Report to estimate annual O&M costs as demands increase within the 50-year planning period. The future estimated O&M costs were then converted to present value based on the federal discount rate of 2%. The total project cost is calculated as the sum of the capital costs and the present value of the 50-year O&M costs.

Table 5-2
Alternative #1 - Estimated 50-Year Lifecycle Costs

Project Capital Costs	$9,607,500
Present Value of O&M Costs	$61,933,857
Total Project Lifecycle Costs	**$71,522,071**

5.2 Alternative 2 – New Groundwater Wells and WTP Expansion

5.2.1 Description

In lieu of expanding the raw water intake on the Ivy River, this alternative proposes the development of new groundwater wells to increase the amount of raw water available for treatment. In this alternative, the wells are assumed to be in close proximity to the water treatment plant, and raw water pumped from the wells is to be treated at the WTP. As part of this project, WTP equipment will be expanded to increase plant capacity to 3.0 MGD. The wells will be developed, capped, and brought online as needed as demand exceeds the existing WTP capacity of 1.5 MGD.

Based on local knowledge, the wells are assumed to have an average capacity of 40 gallons per minute, however well yields are difficult to predict and can greatly vary. The wells will be operated a maximum of 12 hours per day to help preserve the long-term yield of the wells.

5.2.2 Cost Estimate

The cost estimate for Alternative 2 (with 25% Inflation Factor and in 2018 dollars) is shown below. Line items, quantities and unit costs for treatment plant upgrades and water line improvements were all developed in the "Upgrade and Expansion for the Water Treatment Plant" Engineering Report. Costs for development of the wells and property acquisition have been added to complete the cost estimate for the total project scope.

Table 5-3 Alternative #2 - Estimated Construction Costs				
Item Description	**Quantity**	**Unit**	**Unit Cost**	**Extended Cost**
Well Development				
Mobilization	1	LS	$338,000.00	$338,000.00
Development of Groundwater Wells	55	EA	$100,000.00	$5,500,000.00
Raw Water Lines to Connect Wells to WTP	27,500	LF	$80.00	$2,200,000.00
WTP Expansion				
Mobilization	1	LS	$103,800.00	$103,800.00
Filter Media, Underdrain, Troughs, Agitators	1	LS	$270,000.00	$270,000.00
Filter Valves and Actuators	10	EA	$7,000.00	$70,000.00
Finished Water Pumps	2	EA	$150,000.00	$300,000.00
Finished Water Pump Station	1	LS	$250,000.00	$250,000.00
Chemical Feed Modifications	1	LS	$100,000.00	$100,000.00
Flocculators	4	LS	$20,000.00	$80,000.00
Settling Basins, Flocculation Basins, and Filter Bays	1	LS	$475,000.00	$475,000.00
Backwash Sludge Basin	1	LS	$275,000.00	$275,000.00
0.250 MG Clearwell	1	LS	$390,000.00	$390,000.00
36'-6" Diameter Claricone Clarifier	1	LS	$850,000.00	$850,000.00
Yard Piping	1	LS	$100,000.00	$100,000.00
Electrical Improvements	1	LS	$300,000.00	$300,000.00
Water Line Improvements				
Mobilization	1	LS	$53,000.00	$53,000.00
12” DIP Water Line	17,600	LF	$100.00	$1,760,000.00
			Construction Sub-total	$13,307,800.00
			Contingency (20%)	$1,330,800.00
			Total Construction Cost	$14,638,600.00
			Technical Services (20%)	$2,940,000.00
			Property Acquisition	$825,000.00
			Inflation Factor (25%)	$3,326,950.00
			Total Project Cost Opinion	**$21,730,550.00**

5.2.3 Lifecycle and O&M Costs

The O&M cost per gallon is applied to the flow projections, as all flow (existing surface water intake and groundwater from wells) will be treated at the water treatment plant. In addition, this report amendment assumes that new wells are brought online as necessary to supplement the surface water intake, to meet the increased water system demands. It is estimated that the annual O&M costs for each groundwater well are $2,000.

Table 5-4 **Alternative #2 - Estimated 50-Year Lifecycle Costs**	
Project Capital Costs	$21,730,550
Present Value of O&M Costs	$63,113,379
Total Project Lifecycle Costs	**$84,843,929**

5.3 Alternative 3 – New Groundwater Wells with Onsite Treatment

5.3.1 Description

Similar to Alternative 2, this alternative proposes the development of groundwater wells in place of expanding the capacity of the surface water intake. However, this alternative assumes that the new groundwater wells are not in close proximity to the WTP, and onsite treatment at each well will be provided. For the purposes of this report amendment, it is assumed that the ground water meets the quality standards of NCAC 18C and will require green sand filters, liquid chlorination, caustic/soda ash for final treatment before entering the water distribution system. The WTP will remain at its current capacity of 1.5 MGD, and additional wells will be brought online as necessary, as demand in the system exceeds the capacity of the plant.

Based on local knowledge, the wells are assumed to have an average capacity of 40 gallons per minute. The wells will be operated a maximum of 12 hours per day to preserve the long-term yield of the wells.

5.3.2 Cost Estimate

The cost estimate with 25% Inflation Factor (in 2018 dollars) for Alternative #3 is seen below.

Table 5-5
Alternative #3 - Estimated Construction Costs

Item Description	Quantity	Unit	Unit Cost	Extended Cost
Well Development				
Mobilization	1	LS	$211,200.00	$211,200.00
Development of Groundwater Wells	55	EA	$100,000.00	$5,500,000.00
On-Site Treatment at Wells	55	EA	$12,000.00	$660,000.00
Finished Water Lines to Connect Wells to System	11,000	LF	$80.00	$880,000.00
Water Line Improvements				
Mobilization	1	LS	$53,000.00	$53,000.00
12" DIP Water Line	17,600	LF	$100.00	$1,760,000.00
			Construction Sub-total	$9,064,200.00
			Contingency (20%)	$906,400.00
			Total Construction Cost	$9,970,600.00
			Technical Services (20%)	$2,005,000.00
			Property Acquisition	$825,000.00
			Inflation Factor (25%)	$2,266,050.00
			Total Project Cost Opinion	**$15,066,650.00**

5.3.3 Lifecycle and O&M Costs

The O&M cost per gallon is applied to demands up to 1.5 MGD, the maximum capacity of the water treatment plant. Demands exceeding 1.5 MGD will be supplied by groundwater wells with onsite treatment. The estimated annual O&M costs for a groundwater well with treatment are $9,000.

Table 5-6
Alternative #3 - Estimated 50-Year Lifecycle Costs

Project Capital Costs	$15,066,650
Present Value of O&M Costs	$51,627,778
Total Project Lifecycle Costs	**$66,694,428**

5.4 Alternative 4 – Purchase Water from the City of Asheville

5.4.1 Description

In order to supply growing water system demands, this alternative proposes to utilize the existing water system interconnection to purchase water from the City of Asheville. The water treatment plant will be used to its full capacity of 1.5 MGD and demands in excess will be supplied from the City of Asheville. However, the existing water line from the City of Asheville interconnection into Town is 8-inches in diameter and is not sufficient to deliver adequate system pressures when delivering the increased system demands described in this report amendment. Approximately 16,400 LF of new 12" DIP water line is proposed from the City of Asheville interconnection to Hamburg Mountain Road to provide a larger diameter water line to supply the system while leaving the existing 8" line in operation. A horizontal directional drill under Reems Creek is also included in the scope of this Alternative.

5.4.2 Cost Estimate

The cost estimate with 25% Inflation Factor (in 2018 dollars) for Alternative #4 is seen below.

Table 5-7
Alternative #3 - Estimated Construction Costs

Item Description	Quantity	Unit	Unit Cost	Extended Cost
Well Development				
Mobilization	1	LS	$53,000.00	$53,000.00
12" DIP Water Line	16,400	LF	$100.00	$1,640,000.00
Horizontal Directional Drill under Reems Creek	1	EA	$100,000.00	$100,000.00
			Construction Sub-total	$1,793,000.00
			Contingency (20%)	$358,600.00
			Total Construction Cost	$2,151,600.00
			Technical Services (20%)	$430,300.00
			Inflation Factor (25%)	$448,250.00
			Total Project Cost Opinion	**$5,181,750.00**

5.4.3 Lifecycle and O&M Costs

As demand surpasses the WTP capacity of 1.5 MGD, water will be purchased from the City of Asheville. WTP O&M costs will be capped at 1.5 MGD, and the current City of Asheville water rates will be applied to all demand exceeding 1.5 MGD. The current purchase agreement with the City of Asheville expires in 2037 and charges the Town of Weaverville $1.59 per 1,000 gallons. Asheville also charges a one-time capacity fee for

wholesale connections. It is assumed for this analysis that the cost per 1000 gallons will remain the same for the study period, however the City of Asheville water rates are subject to change.

Table 5-7 Alternative #4 - Estimated 50-Year Lifecycle Costs	
Project Capital Costs	$5,181,750
Present Value of O&M Costs	$55,563,399
Total Project Lifecycle Costs	**$60,745,149**

6 SELECTION OF AN ALTERNATIVE

A summary of the capital and lifecycle costs for each alternative is shown below.

Table 6-1 Alternatives Analysis Summary			
Alternative	**Capital Costs**	**50-Year O&M Costs**	**Total Project Costs**
1) Intake and Water Treatment Plant Expansion	$9,607,500	$61,914,571	**$71,522,071**
2) New Groundwater Wells and Water Treatment Plant Expansion	$21,730,550	$63,113,379	**$84,843,292**
3) New Groundwater Wells with Onsite Treatment	$15,066,650	$51,627,778	**$66,694,428**
4) Purchase Water from the City of Asheville	$5,181,750	$55,563,399	**$60,745,149**

Based on the results of the alternatives analysis, Alternative 4) Purchase Water from the City of Asheville has been determined to be the alternative with the lowest total project costs. This alternative would allow the Town of Weaverville water system to supply future growth and development, however the Town may want to consider other options to expand the water system due to non-monetary factors. The ongoing legal battle over the ownership of the Asheville water system casts doubt on which entity Weaverville will be buying water from. Uncertainties in future water prices and the possible need to renegotiate/extend a water purchase agreement further cloud the issue. Furthermore, when the existing interconnection with Asheville has been used in the past, differences in

water chemistry has negatively affected sensitive water users in the vicinity of the interconnection. For these reasons, Alternative 4 has not been selected as the preferred alternative.

Of the remaining alternatives, Alternative 3) New Groundwater Wells with Onsite Treatment has the lowest total project cost. The Town has previously attempted to drill water supply wells in the past, but both developed wells were contaminated by chemicals from nearby industry. Though this is an isolated incident, uncertainties concerning well yields, property availability, water quality, the ability to receive funding for such a project scope, and the feasibility of having a large quantity of water supply wells cause this Alternative to be considered infeasible.

Alternative 1) Intake and Water Treatment Plant Expansion offers the next lowest total project cost. This alternative includes the expansion of existing infrastructure at the intake site and water treatment plant. Based on historical documentation, it appears that the Town has previously received authorization to increase its surface water withdrawals to meet the demands described throughout the planning period of the report. The Town would not have to purchase additional property for wells or manage water quality and maintenance at remote well sites. All treatment would occur centrally at the expanded water treatment plant. Therefore, Alternative 1 is determined to be the preferred alternative.

7 PROPOSED PROJECT

7.1.1 Phasing

Currently, flow is supplied to the area of Town west of I-26 through a single 6-inch water line on US-25/70 which is not looped into the rest of the system. Installing the water lines in a separate phase will give the Town a much-needed distribution loop as well as providing improved system capacity to a high growth area of the system. As such, the selected alternative will be split into two concurrent, parallel phases with the first phase including the water system improvements, and the second including the expansion of the water treatment plant. With the two components of the recommended project (line work and plant work) being phased but on a concurrent path, it is expected that the proposed project will allow work on the distribution system to be completed ahead of the WTP expansion to more immediately satisfy this need within the distribution system.

The cost estimate for Phase 1 (in 2018 dollars) is shown below.

Table 7-1
Proposed Project Phase 1 - Estimated Construction Costs

Item Description	Quantity	Unit	Unit Cost	Extended Cost
Water Line Improvements				
Mobilization	1	LS	$53,000.00	$53,000.00
12” DIP Water Line	17,600	LF	$100.00	$1,760,000.00
			Construction Sub-total	$1,813,000.00
			Contingency (20%)	$360,000.00
			Total Construction Cost	$2,173,000.00
			Technical Services (20%)	$435,000.00
			Inflation Factor	$362,600.00
			Total Project Cost Opinion	**$2,970,600.00**

The cost estimate for Phase 2 (in 2018 dollars) is shown below.

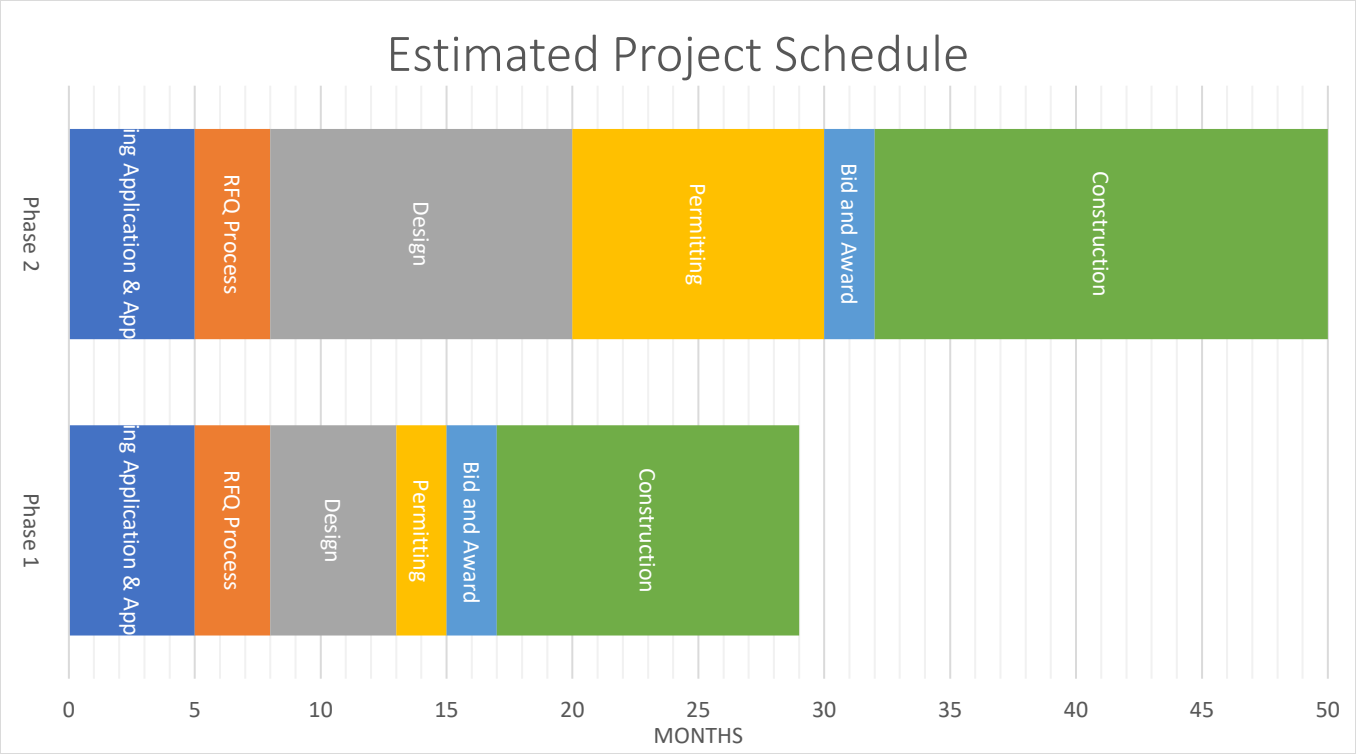
Table 7-2
Proposed Project Phase 2 - Estimated Construction Costs

Item Description	Quantity	Unit	Unit Cost	Extended Cost
WTP Expansion				
Mobilization	1	LS	$113,000.00	$113,000.00
Filter Media, Underdrain, Troughs, Agitators	1	LS	$270,000.00	$270,000.00
Filter Valves and Actuators	10	EA	$7,000.00	$70,000.00
Raw Water Pumps	2	EA	$150,000.00	$300,000.00
Finished Water Pumps	2	EA	$150,000.00	$300,000.00
Finished Water Pump Station	1	LS	$250,000.00	$250,000.00
Chemical Feed Modifications	1	LS	$100,000.00	$100,000.00
Flocculators	4	LS	$20,000.00	$80,000.00
Settling Basins, Flocculation Basins, and Filter Bays	1	LS	$475,000.00	$475,000.00
Backwash Sludge Basin	1	LS	$275,000.00	$275,000.00
0.250 MG Clearwell	1	LS	$390,000.00	$390,000.00
36'-6" Diameter Claricone Clarifier	1	LS	$850,000.00	$850,000.00
Yard Piping	1	LS	$100,000.00	$100,000.00
Electrical Improvements	1	LS	$300,000.00	$300,000.00
			Construction Sub-total	$3,873,000.00
			Contingency (20%)	$770,000.00
			Total Construction Cost	$4,643,000.00
			Technical Services (20%)	$935,000.00
			Inflation Factor	$1,058,900.00
			Total Project Cost Opinion	**$6,636,900.00**

The total cost of the project is estimated to be $9,607,500.

7.1.2 Schedule

The Town of Weaverville will likely pursue funding through grants and/or loans to finance the capital costs of the project. This will involve separate funding applications and subsequent PER submissions before design could begin. The figure below shows the anticipated project schedule for the two phases of the proposed project.



Work on both phases will begin at the same time and continue concurrently. The design and permitting portions for Phase 1 (water line improvements) is expected to be much shorter than that for Phase 2 (WTP improvements). As a result, construction on the water lines is expected to be completed before construction begins on the WTP expansion.

If the Town begins to pursue funding in 2018, construction on the WTP expansion is estimated to begin sometime in 2021, well ahead of the State mandate stating construction should start as demands reach 90% of treatment plant capacity (projected 2024). It should be noted that the State criteria for demand does not include allocated flows, but only metered usage reflective of the average daily production over a calendar year. Flow can continue to be allocated to future customers without contributing to the actual metered production, however, if the Town completes allocated projects in excess of the projected increases in demand, the 80 and 90% thresholds will arrive sooner than the projections indicate.

APPENDIX 1
DWR Correspondence

State of North Carolina
Department of Environment,
Health and Natural Resources
Division of Water Resources

James B. Hunt, Jr., Governor
Jonathan B. Howes, Secretary
John N. Morris, Director

July 2, 1993

Mr. Gary Davis
McGill Associates, P.A.
Consulting Engineers
P.O. Box 2259
Asheville, North Carolina 28802

Dear Mr. Davis:

This letter is a follow-up to our phone conversation of June 28, 1993 regarding water supply withdrawals at different locations on the Ivy River.

I discussed the alternative intake location on the Buncombe County fork of the Ivy River with Stephanie Goudreau, the N.C. Wildlife Resources Commission (WRC) Habitat Biologist for the mountain region. This intake would be located approximately 200 to 300 feet upstream of the confluence of the two forks of the Ivy River. Ms. Goudreau visited the site to evaluate habitat and compare the Buncombe County fork to the existing study site located downstream on the Ivy River. Based on her observations, the Division of Water Resources (DWR) and WRC have concluded that the results of the completed Ivy River instream flow study can be used to evaluate the upstream location on the Buncombe County fork.

The study conducted on the main stem of the Ivy River indicated that a continuous withdrawal of 4.0 million gallons per day (mgd) would be acceptable from an intake located at a drainage area of 112 square miles. This is equivalent to approximately 52% of the 7Q10 low flow. Ratioing by drainage area yields an acceptable continuous withdrawal of 2.1 mgd from the Buncombe County fork of the Ivy River where the drainage is 60.6 square miles.

The habitat between the confluence and the alternate intake location on the Buncombe County fork was rated good by the WRC, and includes a substantial cobble riffle that would be affected by reduced flows. A withdrawal of 4.0 mgd would constitute approximately 77% to 96% of the 7Q10 low flow in the Buncombe County fork. This magnitude of withdrawal would have undesirable adverse effects on aquatic habitat during low flow conditions.

Therefore, we recommend that 2.1 mgd should be the maximum withdrawal that can be made continuously from the Buncombe County fork intake location.

An additional 1.9 mgd (for a total of 4.0 mgd) could be withdrawn whenever flows at the intake are at or above a required instream flow. However, when flows at the intake are below the minimum criteria, the withdrawal would have to be reduced to 2.1 mgd. The remaining 1.9 mgd would then have to be obtained from offstream storage, alternate sources, transfers from other water systems, reduced demand through water conservation, or some combination of these options.

We are fortunate to have the results of the Ivy River instream flow study to evaluate this alternative intake location. Without the study, the withdrawal would be limited to 20% of the 7Q10, or approximately 1.0 mgd, until a potentially lengthy field study could be completed. We can also, at your request, use the study results to develop the instream flow criteria mentioned above for withdrawals greater than 2.1 mgd.

Please keep us informed as planning for this project progresses. We would be glad to answer any questions you or the local water systems might have.

Sincerely,

Jim Mead

Jim Mead
Environmental Specialist

cc: John Morris, DWR
John Wray, DWR
John Sutherland
Jessica Miles, DWR
Steve Reed, DWR
Jim Borawa, WRC
Stephanie Goudreau, WRC

Subject: Re: Weaverville's Supply
Date: Mon, 29 May 2000 10:59:26 -0400
From: Kenneth Ashe <Kenneth.Ashe@ncmail.net>
To: Jim Mead <Jim.Mead@ncmail.net>

Thanks Jim - I think I might tiptoe around this one a little bit
Ken

Jim Mead wrote:

> *The actual location of this intake was constantly changing before it was*
> *built.*
>
> *1. It was going to be downstream of the fork in the river with a 4 mgd*
> *withdrawal permitted.*
>
> *2. It was moved upstream of the fork to be on the Buncombe Co. arm and*
> *not result in watershed protection on the Madison Co. fork. This*
> *changed the withdrawal limit to 2 mgd.*
>
> *3. It was moved downstream to just barely above the confluence of the*
> *two forks and the max permitted withdrawal was revised to 4 mgd. This*
> *is the notes you found in the file and the last anybody in our section*
> *heard about it.*
>
> *4. I just forwarded an email Don Rayno sent me in February about the*
> *intake location. He's interested in this because he worked on this*
> *issue when he was in grad school. It appears they moved back to the*
> *original location (#1 above). This may also be related to some special*
> *legislation passed a few years ago that exmpted the Ivy River in Madison*
> *County from watershed protection regs. The location downstream of the*
> *forks also agrees with the description of the WTP location in the DEH*
> *database.*
>
> *Re-location #4 above was news to me, but the withdrawal limit of 4 mgd*
> *still applies based on the instream flow study. Be aware that this has*
> *been a political issue between Mars Hill and Weaverville. Mars Hill*
> *would like to use the Ivy someday but has no immediate plans. However,*
> *they are very sensitive to Weaverville being allowed to use all of the 4*
> *mgd yield that they consider "their" water. The current Weaverville*
> *capacity is just a portion (1.5 or 3 mgd?) of the 4 mgd total. The next*
> *increment is pretty much up for grabs for whoever needs it first and*
> *builds the plant capacity. But if all 4 mgd ends up going to*
> *Weaverville's plant, Mars Hill will likely be irate.*
>
> *Kenneth Ashe wrote:*
>
> > *Jim -*
> > *I was looking through Weaverville's files to verify the available*
> > *withdrawal rate and it what I found that seemed to be the most*
> > *recent document stated a withdrawal up to 4 mgd and the new*
> > *location was ok if 2 wildlife provisions were met. I just wanted*
> > *to check and make sure this was an ok number or to see if there*
> > *was something I was missing.*
> >
> > *Thanks*
> > *Ken*

WithersRavenel
Our People. Your Success.

March 22, 2018

NCDEQ Division of Water Resources
Mail Service Center 1611
Raleigh, NC 27699-1611

Attn: Fred Tarver

RE: WR Project # 06180146.00
Ivy River (Creek) Drinking Water Withdrawal Capacity
Town of Weaverville, NC

Dear Mr. Tarver:

Thank you for your assistance researching documentation regarding the Town of Weaverville drinking water intake on Ivy River (referred to as Ivy Creek in some locations). The following summarizes our current understanding. We request that this letter be added to the DWR file on Weaverville's Ivy River intake.

Weaverville's intake is located as shown on DEQ's watershed map approx. 2100' downstream of the confluence of Adkins Creek and Ivy Creek (and 1.3 miles downstream of the confluence of Little Ivy Creek and Ivy Creek [in some places referred to as "the Buncombe County Fork of the Ivy River"]).

The available documentation and a confirmation phone call with you indicate that this location provides an allowable withdrawal of 4mgd. The July 2, 1993 letter from NCDEHNR to McGill's Gary Davis, present in the DWR records, confirms this.

Another document in the DWR records, the May 29, 2000 internal email between DWR employees, mentions possible "special legislation" exempting Madison County from watershed regulations. This does not appear the case as Madison County's watershed ordinance is found here: http://www.madisoncountync.org/3354/ordinances/watershed.pdf

A phone conversation with DWR's Julie Ventaloro confirmed that the watershed and watershed ordinances were properly established.

With this documentation, it is our opinion that Weaverville has an established 4mgd withdrawal capacity at their intake on Ivy River and can therefore confidently move ahead with their planning for growth within their service area and potential expansion of their water treatment capacity.

If you disagree with any portion of this summary or wish to make clarifications, please let us know as soon as possible.

Sincerely,
WithersRavenel

James N. Johnston, PE
Project Manager

cc. Dale Pennell, PE, PLS, Town of Weaverville

APPENDIX 2
O&M Cost Calculations

Discount Rate	2.00%	**2017 O&M Costs**	$ 579,930.00	**Annual Well O&M (no treatment)**	$ 2,000.00	**Annual Well O&M (with treatment)**	$ 9,000.00
		2016-2017 Volume	$ 216,363,000.00				
		Cost per Gallon	$ 0.00268	**Average Well Yield**	37.9 gpm		

Cost per 1000 gallons (Asheville) $ 1.59

		WTP Expansion		Wells near WTP		Wells in System		Purchase Water		
	Expanded Service Area Average Day Demand	**Expanded Service Area O&M Costs**	**Present Value of O&M Costs**	**Expanded Service Area O&M Costs**	**Present Value of O&M Costs**	**Expanded Service Area O&M Costs**	**Present Value of O&M Costs**	**Expanded Service Area O&M Costs**	**Present Value of O&M Costs**	
2017	0.768	$ 751,357.57		$ 751,357.57		$ 751,357.57		$ 751,357.57		
2018	0.874	$ 855,060.57	$ 855,060.57	$ 855,060.57	$ 855,060.57	$ 855,060.57	$ 855,060.57	$ 855,060.57	$ 855,060.57	
2019	0.946	$ 925,500.34	$ 907,353.27	$ 925,500.34	$ 907,353.27	$ 925,500.34	$ 907,353.27	$ 925,500.34	$ 907,353.27	
2020	1.104	$ 1,080,076.50	$ 1,038,135.82	$ 1,080,076.50	$ 1,038,135.82	$ 1,080,076.50	$ 1,038,135.82	$ 1,080,076.50	$ 1,038,135.82	
2021	1.245	$ 1,218,021.06	$ 1,147,768.45	$ 1,218,021.06	$ 1,147,768.45	$ 1,218,021.06	$ 1,147,768.45	$ 1,218,021.06	$ 1,147,768.45	
2022	1.283	$ 1,255,197.60	$ 1,159,608.57	$ 1,255,197.60	$ 1,159,608.57	$ 1,255,197.60	$ 1,159,608.57	$ 1,255,197.60	$ 1,159,608.57	
2023	1.320	$ 1,291,395.82	$ 1,169,656.98	$ 1,291,395.82	$ 1,169,656.98	$ 1,291,395.82	$ 1,169,656.98	$ 1,291,395.82	$ 1,169,656.98	
2024	1.356	$ 1,326,615.71	$ 1,177,996.78	$ 1,326,615.71	$ 1,177,996.78	$ 1,326,615.71	$ 1,177,996.78	$ 1,326,615.71	$ 1,177,996.78	
2025	1.394	$ 1,363,792.25	$ 1,187,263.23	$ 1,363,792.25	$ 1,187,263.23	$ 1,363,792.25	$ 1,187,263.23	$ 1,363,792.25	$ 1,187,263.23	
2026	1.430	$ 1,399,012.14	$ 1,194,043.39	$ 1,399,012.14	$ 1,194,043.39	$ 1,399,012.14	$ 1,194,043.39	$ 1,399,012.14	$ 1,194,043.39	
2027	1.468	$ 1,436,188.69	$ 1,201,738.45	$ 1,436,188.69	$ 1,201,738.45	$ 1,436,188.69	$ 1,201,738.45	$ 1,436,188.69	$ 1,201,738.45	
2028	1.504	$ 1,471,408.57	$ 1,207,067.52	$ 1,473,408.57	$ 1,208,708.22	$ 1,476,495.25	$ 1,211,240.37	$ 1,497,417.98	$ 1,228,404.29	Has COA capacity
2029	1.541	$ 1,507,606.79	$ 1,212,512.42	$ 1,511,606.79	$ 1,215,729.47	$ 1,485,495.25	$ 1,194,728.93	$ 1,491,303.21	$ 1,199,400.05	charge (1 time)
2030	1.579	$ 1,544,783.33	$ 1,218,051.12	$ 1,550,783.33	$ 1,222,782.08	$ 1,494,495.25	$ 1,178,399.31	$ 1,513,369.11	$ 1,193,281.22	
2031	1.615	$ 1,580,003.22	$ 1,221,393.88	$ 1,590,003.22	$ 1,229,124.20	$ 1,512,495.25	$ 1,169,208.02	$ 1,534,273.66	$ 1,186,043.44	
2032	1.653	$ 1,617,179.77	$ 1,225,620.16	$ 1,629,179.77	$ 1,234,714.66	$ 1,521,495.25	$ 1,153,103.25	$ 1,556,339.57	$ 1,179,510.89	
2033	1.689	$ 1,652,399.65	$ 1,227,757.28	$ 1,666,399.65	$ 1,238,159.49	$ 1,530,495.25	$ 1,137,180.52	$ 1,577,244.11	$ 1,171,915.61	
2034	1.726	$ 1,688,597.87	$ 1,230,052.05	$ 1,706,597.87	$ 1,243,164.07	$ 1,548,495.25	$ 1,127,994.88	$ 1,598,729.34	$ 1,164,587.70	
2035	1.763	$ 1,724,796.09	$ 1,231,784.79	$ 1,744,796.09	$ 1,246,068.04	$ 1,557,495.25	$ 1,112,304.80	$ 1,620,214.57	$ 1,157,096.59	
2036	1.800	$ 1,760,994.30	$ 1,232,976.67	$ 1,782,994.30	$ 1,248,380.18	$ 1,566,495.25	$ 1,096,796.34	$ 1,641,699.80	$ 1,149,451.50	
2037	1.836	$ 1,796,214.19	$ 1,232,976.67	$ 1,822,214.19	$ 1,250,823.87	$ 1,584,495.25	$ 1,087,646.28	$ 1,662,604.34	$ 1,141,262.76	
2038	1.874	$ 1,833,390.73	$ 1,233,819.41	$ 1,861,390.73	$ 1,252,662.60	$ 1,593,495.25	$ 1,072,376.62	$ 1,684,670.25	$ 1,133,734.78	
2039	1.911	$ 1,869,588.95	$ 1,233,509.58	$ 1,901,588.95	$ 1,254,622.40	$ 1,611,495.25	$ 1,063,225.60	$ 1,706,155.48	$ 1,125,680.12	
2040	1.948	$ 1,905,787.17	$ 1,232,737.53	$ 1,939,787.17	$ 1,254,730.06	$ 1,620,495.25	$ 1,048,199.59	$ 1,727,640.71	$ 1,117,505.45	
2041	1.985	$ 1,941,985.38	$ 1,231,521.52	$ 1,977,985.38	$ 1,254,351.14	$ 1,629,495.25	$ 1,033,354.06	$ 1,749,125.93	$ 1,109,218.56	
2042	2.021	$ 1,977,205.27	$ 1,229,271.00	$ 2,017,205.27	$ 1,254,139.86	$ 1,647,495.25	$ 1,024,283.20	$ 1,770,030.48	$ 1,100,465.98	
2043	2.059	$ 2,014,381.81	$ 1,227,827.90	$ 2,056,381.81	$ 1,253,428.20	$ 1,656,495.25	$ 1,009,684.99	$ 1,792,096.39	$ 1,092,338.07	
2044	2.095	$ 2,049,601.70	$ 1,224,799.52	$ 2,093,601.70	$ 1,251,093.01	$ 1,665,495.25	$ 995,265.46	$ 1,813,000.93	$ 1,083,411.80	
2045	2.133	$ 2,086,778.25	$ 1,222,564.17	$ 2,134,778.25	$ 1,250,685.55	$ 1,683,495.25	$ 986,295.97	$ 1,835,066.84	$ 1,075,096.01	
2046	2.169	$ 2,121,998.13	$ 1,218,821.73	$ 2,171,998.13	$ 1,247,540.46	$ 1,692,495.25	$ 972,126.20	$ 1,855,971.39	$ 1,066,022.74	
2047	2.206	$ 2,158,196.35	$ 1,215,306.92	$ 2,210,196.35	$ 1,244,588.76	$ 1,701,495.25	$ 958,132.92	$ 1,877,456.61	$ 1,057,218.93	
2048	2.244	$ 2,195,372.90	$ 1,212,001.47	$ 2,251,372.90	$ 1,242,917.44	$ 1,719,495.25	$ 949,283.27	$ 1,899,522.52	$ 1,048,671.09	
2049	2.280	$ 2,230,592.78	$ 1,207,299.35	$ 2,288,592.78	$ 1,238,691.62	$ 1,728,495.25	$ 935,541.09	$ 1,920,427.07	$ 1,039,423.41	
2050	2.318	$ 2,267,769.33	$ 1,203,353.93	$ 2,327,769.33	$ 1,235,191.93	$ 1,737,495.25	$ 921,972.84	$ 1,942,492.98	$ 1,030,751.47	
2051	2.354	$ 2,302,989.21	$ 1,198,081.15	$ 2,366,989.21	$ 1,231,375.79	$ 1,755,495.25	$ 913,259.06	$ 1,963,397.52	$ 1,021,415.80	
2052	2.391	$ 2,339,187.43	$ 1,193,051.47	$ 2,405,187.43	$ 1,226,713.33	$ 1,764,495.25	$ 899,942.28	$ 1,984,882.75	$ 1,012,346.11	
2053	2.428	$ 2,375,385.65	$ 1,187,758.42	$ 2,445,385.65	$ 1,222,760.35	$ 1,782,495.25	$ 891,296.85	$ 2,006,367.98	$ 1,003,239.39	
2054	2.465	$ 2,411,583.86	$ 1,182,214.24	$ 2,483,583.86	$ 1,217,510.31	$ 1,791,495.25	$ 878,232.45	$ 2,027,853.21	$ 994,100.59	
2055	2.502	$ 2,447,782.08	$ 1,176,430.83	$ 2,521,782.08	$ 1,211,996.03	$ 1,800,495.25	$ 865,337.70	$ 2,049,338.43	$ 984,934.45	
2056	2.539	$ 2,483,980.29	$ 1,170,419.69	$ 2,561,980.29	$ 1,207,172.29	$ 1,818,495.25	$ 856,851.66	$ 2,070,823.66	$ 975,745.58	
2057	2.576	$ 2,520,178.51	$ 1,164,191.99	$ 2,600,178.51	$ 1,201,147.84	$ 1,827,495.25	$ 844,208.18	$ 2,092,308.89	$ 966,538.37	
2058	2.613	$ 2,556,376.73	$ 1,157,758.52	$ 2,638,376.73	$ 1,194,895.53	$ 1,836,495.25	$ 831,731.10	$ 2,113,794.11	$ 957,317.09	
2059	2.650	$ 2,592,574.94	$ 1,151,129.75	$ 2,678,574.94	$ 1,189,314.63	$ 1,854,495.25	$ 823,414.83	$ 2,135,279.34	$ 948,085.83	
2060	2.687	$ 2,628,773.16	$ 1,144,315.81	$ 2,716,773.16	$ 1,182,622.57	$ 1,863,495.25	$ 811,187.18	$ 2,156,764.57	$ 938,848.52	
2061	2.724	$ 2,664,971.38	$ 1,137,326.51	$ 2,754,971.38	$ 1,175,735.70	$ 1,872,495.25	$ 799,122.46	$ 2,178,249.80	$ 929,608.95	
2062	2.760	$ 2,700,191.26	$ 1,129,762.02	$ 2,794,191.26	$ 1,169,091.69	$ 1,890,495.25	$ 790,984.61	$ 2,199,154.34	$ 920,127.80	
2063	2.762	$ 2,702,147.92	$ 1,108,412.44	$ 2,796,147.92	$ 1,146,970.94	$ 1,890,495.25	$ 775,475.11	$ 2,200,315.71	$ 902,562.47	
2064	2.834	$ 2,772,587.69	$ 1,115,006.48	$ 2,870,587.69	$ 1,154,417.54	$ 1,908,495.25	$ 767,508.48	$ 2,242,124.80	$ 901,678.85	
2065	2.871	$ 2,808,785.91	$ 1,107,415.42	$ 2,910,785.91	$ 1,147,630.79	$ 1,926,495.25	$ 759,556.12	$ 2,263,610.02	$ 892,469.81	
2066	2.909	$ 2,845,962.46	$ 1,100,071.52	$ 2,949,962.46	$ 1,140,271.43	$ 1,935,495.25	$ 748,141.71	$ 2,285,675.93	$ 883,499.71	
2067	2.945	$ 2,881,182.34	$ 1,091,848.37	$ 2,987,182.34	$ 1,132,017.96	$ 1,944,495.25	$ 736,882.89	$ 2,306,580.48	$ 874,098.14	
2068	2.983	$ 2,918,358.89	$ 1,084,251.70	$ 3,028,358.89	$ 1,125,119.76	$ 1,962,495.25	$ 729,121.70	$ 2,328,646.39	$ 865,157.06	
2069	3.019	$ 2,953,578.78	$ 1,075,820.46	$ 3,065,578.78	$ 1,116,615.68	$ 1,971,495.25	$ 718,103.39	$ 2,349,550.93	$ 855,807.53	
2070	3.056	$ 2,989,776.99	$ 1,067,652.36	$ 3,105,776.99	$ 1,109,076.07	$ 1,989,495.25	$ 710,450.75	$ 2,371,036.16	$ 846,699.39	
		Total Present Value of O&M Costs	$ 61,914,571.20	Total Present Value of O&M Costs	$ 63,113,379.03	Total Present Value of O&M Costs	$ 51,627,778.49	Total Present Value of O&M Costs	$ 55,563,399.40	