LONG-TERM WATER SUPPLY STUDY

DESIGN MEMORANDUM #2

MOORE COUNTY, NC

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

1.0 EXECUTIVE SUMMARY

This Design Memo #2 provides a detailed analysis of the future water supply alternatives deemed feasible in Design Memo #1:

- Drowning Creek
- Deep River (two locations)
- City of Sanford

Design Memo #1 included Harnett County as a recommended alternative to consider further. Through correspondence between Moore County and Harnett County (see appendices), Harnett County politely declined to participate in Moore County's efforts.

The capital cost of each alternative is summarized in Table 1 below:

Table 1: Summary of Preliminary, Estimated Capital Costs

Alternative	Phase 1 Budget	Phase 2 Budget	TOTAL CAPITAL BUDGET
Drowning Creek	$39,078,000	$78,381,000	$117,459,000
City of Sanford	$173,486,000	N/A	$173,486,000
Deep River, Robbins	$127,134,000	$22,650,000	$149,784,000
Deep River, Carbonton	$113,609,000	$22,650,000	$136,259,000
Harnett County	*Declined to Participate*		

The capital costs above and throughout this report are a snapshot of the current market conditions. It is recommended the budgets be updated regularly (annually) as the selected alternative is pursued so the County's financial planning team is using valid budgets.

The alternatives analysis prepared capital costs and annual operating costs for each alternative. The debt service for each alternative was included in the annual operating costs. For comparison, the total annual cost for each alternative is normalized on a per 1,000-gallon basis using the expected average daily volume of water supplied from each source, resulting in Figure 1 below. The per 1,000-gallon figures should only be used for comparing one alternative to another, they should not be used for rate analyses. It is recommended Moore County consult with a certified financial analyst to determine how the selected alternative will impact the rate payers.

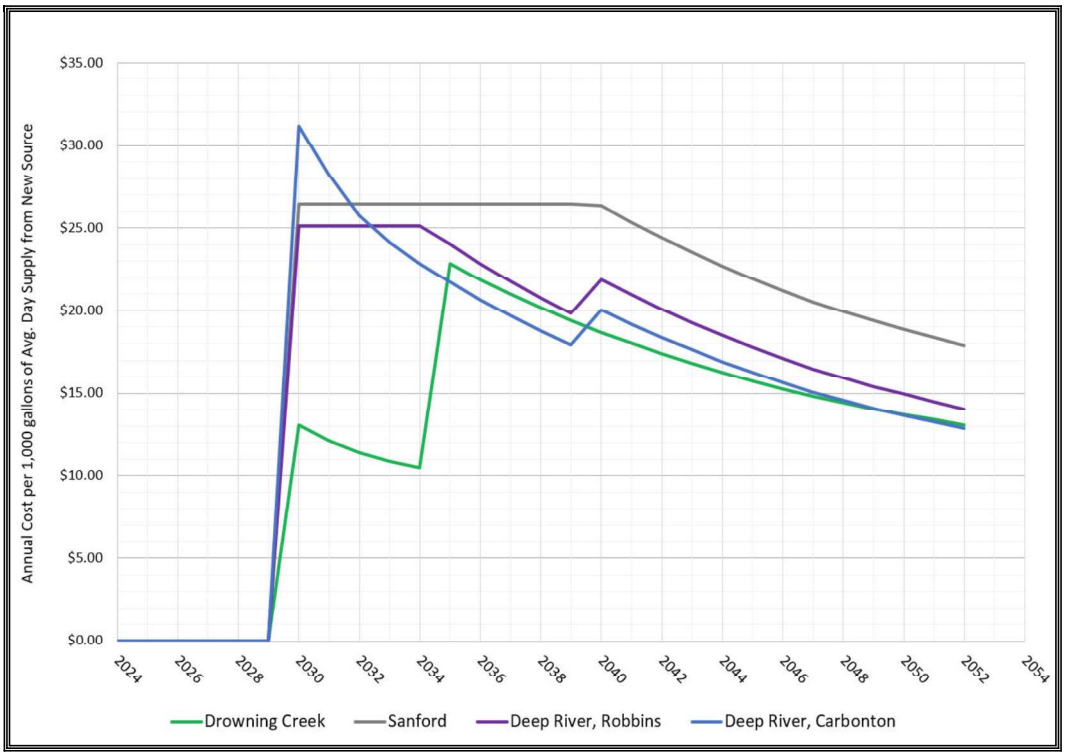


Figure 1: Annual Operating Costs, Including Debt, per 1,000 gallons of Water Supplied

The schedule is an important part of comparing one alternative to another. Table 2 below shows the expected schedule for each alternative:

Table 2: Schedule for Each Alternative

Alternative	Total Estimated Timeframe for Completion, Start to Finish
Drowning Creek, Phase 1	72 months
City of Sanford	72 months
Deep River, Robbins	84 months*
Deep River, Carbonton	84 months*

**timeframes do not account for the time require to obtain an IBT certificate.*

2.0 UPDATE TO EXISTING SUPPLY DATA FROM DESIGN MEMO #1

2.1 Town of Aberdeen Bulk Purchase

Staff from the Town of Aberdeen has indicated to Moore County that Aberdeen does not plan to renew the bulk purchase contract with the County that expires in 2025. The Town has indicated they will gladly sell water to the County on an as-needed basis, but they will not offer allocated capacity to the County. This results in a loss of 600,000 gallons per day of available supply capacity in 2025.

2.2 Town of Southern Pines Bulk Purchase

Moore County and Southern Pines entered into a new bulk purchase contract with Southern Pines in June of 2023. The contract allows the same 1,000,000 gal/day capacity as stipulated in the previous contract, and has a five-year term expiring in 2028. The contract automatically renews for two five-year terms unless one party decides to terminate the contract prior to the renewal. A copy of the contract can be found in the appendices.

For the purpose of this study, it is assumed the Southern Pines capacity of 1,000,000 gal/day will last through the year 2033 (one five-year renewal).

2.3 Correspondence with Harnett County

Design Memo #1 listed Harnett County as a potentially viable alternative and recommended a Harnett County alternative be evaluated as part of Design Memo #2. Through correspondence between the two counties, Harnett County politely declined to participate in this study, indicating they are facing their own capacity challenges. Harnett County is not interested in increasing bulk purchase relationships at this time.

As such, Harnett County is not included as an alternative in this design memo.

2.4 Necessary Future Water Supply Capacity

Figure 2 below shows the projected necessary future water supply updated from Design Memo #1 to reflect updates to the relationships with Aberdeen and Southern Pines. The gap between the available supply (red line) and the projected future supply, including an industrial reserve, is approximately 6.0 MGD. Based on the growth projections and excluding an industrial reserve component, the peak day supply is expected to exceed the County's available supply in year 2029.

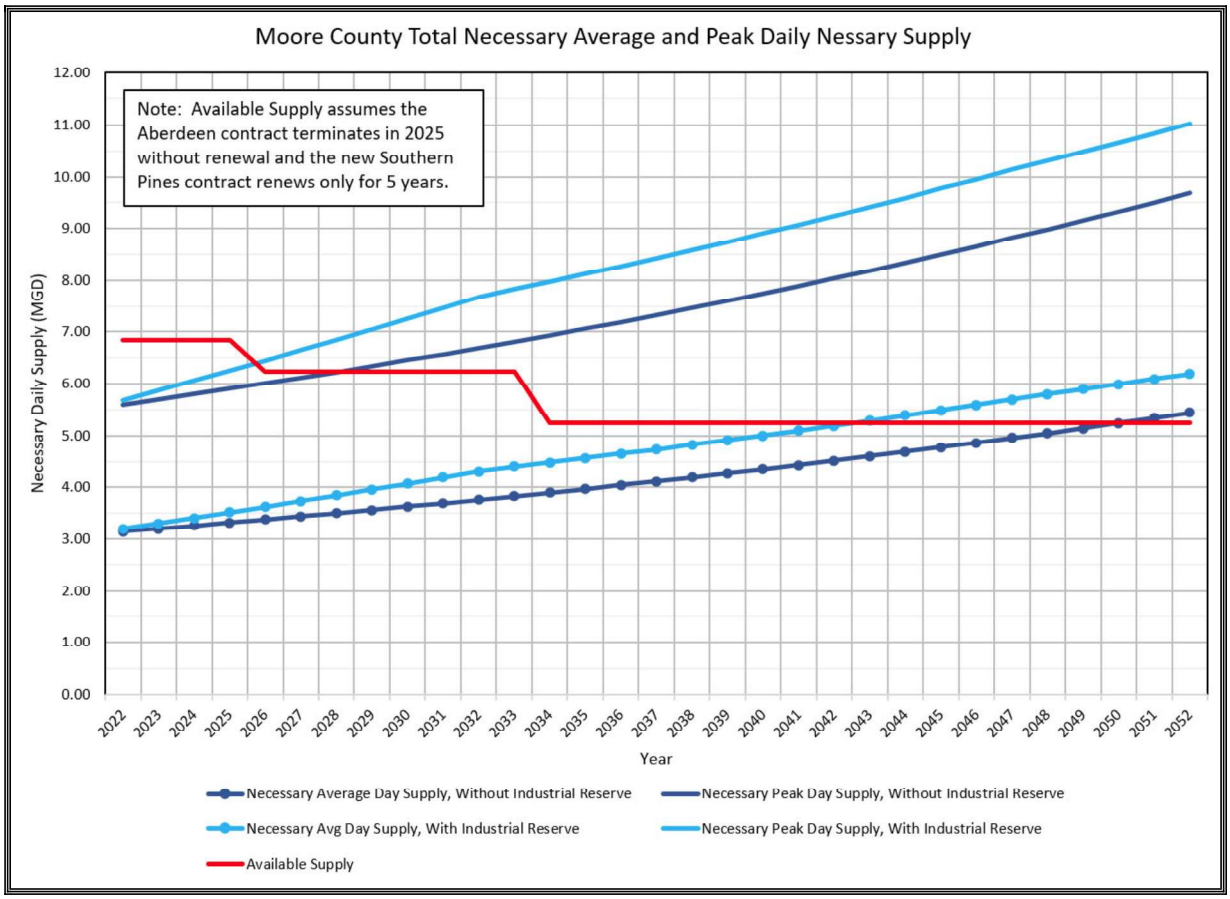


Figure 2: Projected Necessary Water Supply

3.0 ALTERNATIVE EVALUATION PROCESS

3.1 Project Scope for each Alternative

LKC developed a detailed scope for each alternative based on location, site constraints, capacity constraints, hydraulic calculations, sequencing, and relevant factors.

For each proposed pump station, both raw water and finished water, LKC prepared a preliminary hydraulic model to produce system curves showing head conditions at various pumping rates. The proposed pipe size was determined using the system curves and predicted head.

Pipeline routes generally follow NCDOT roads from start to finish, with some exceptions to navigate controlled access areas or to avoid crossing into other counties.

For the alternatives involving a new treatment plant or expansion to an existing plant, LKC prepared preliminary sizing for major processes and budgets for all major construction disciplines.

Each alternative features a slightly different termination point where the finished water is introduced into the existing distribution system. Each alternative will feature additional capital improvements to distribute finished water once it enters the existing system. In general, the improvements needed to the existing distribution system will be similar in scope across each alternative, and the improvements will be small in comparison to the overall alternative scope. Furthermore, the scope of internal distribution system upgrades will change over time as zoning changes occur and development takes form. As such those internal modifications are not a factor in comparing one alternative to another and are not included in this report.

3.2 Preliminary Cost Estimates (Capital Costs)

Once the scope of each alternative was clearly defined, LKC prepared detailed preliminary cost estimates for the capital cost of each alternative.

Pipeline cost estimates include unit prices for the pipe, estimates for where steel casing bores will be needed under roads and railroads, and estimated lengths for directional bores under creeks or swamps.

The preliminary estimate for each alternative includes budgets for contingency, engineering, and other soft costs like easement and property acquisition, attorney fees, and general planning and coordination services.

In the financial evaluation, the preliminary capital budget for each project is amortized to create a debt payment in the annual operating cost. For this report, a 25-year term and interest rate of 4.375% are used. In addition, a debt service coverage ratio of 1.4x is used to

account for potential bond rating requirements. (Meaning the annual payment inserted in the operating costs is 1.4x the calculated annual debt service payment.)

It is highly recommended that Moore County consult with their financial consultant about the financial planning and implications of each alternative, both relative to each other and holistically as an impact to the rate payers.

3.3 Annual Operating Costs

The methods of calculating the annual operating costs are described below. The charts in the appendix and later in this report normalize each cost on a "per 1,000 gallons of water supplied" basis. This is done by dividing each cost item by the volume of actual water projected to be supplied each year by the alternative, then converting to "per 1,000 gallons". This is done for the annual debt payments and each of the operating cost components described below.

3.3.1 Average Daily Demand for each Alternative

An important piece of calculating variable operating costs for each alternative (energy consumption, chemicals, sludge handing, etc.) is the calculation of the average daily volume to be supplied each year by each alternative. This data follows the projection trends developed in Design Memo #1 and assumes the following:

- The full 12-hour pumping capacity of the Pinehurst wells is supplied each day;
- An average daily volume of 1.5 MGD is purchased from Harnett County under the existing contract;
- On an average daily basis, no water would be purchased through the Southern Pines bulk purchase contract. This would only be used to satisfy peak demands.

Some of the alternatives feature long lengths of finished water pipe. For those alternatives, a minimum average daily volume was used in the early years of the alternative to avoid long residence times and water quality concerns.

3.3.2 Energy Consumption

For each major pumping station, both raw water and finished water, the average daily demand by year and the planned pumping rate are used to calculate the hours per day the pump will need to operate. A nominal rate of $0.10 per kilowatt-hour is used to calculate the annual energy cost for each pump.

3.3.3 Water Treatment Plant Fixed Annual Costs

For the alternatives featuring a new water treatment plant, annual fixed costs were included to account for the following:

- Personnel salaries and benefits
- Contract services like maintenance, engineering, and rentals
- Repairs and lubricants
- Vehicles
- Office supplies, computers, and IT
- Laboratory costs

- Capital outlay and short-lived asset reserves

For the alternatives analyses these costs are held constant for each year.

3.3.4 Water Treatment Plant Variable Costs

The variable costs of operating a water treatment facility include energy consumption, chemical usage, and sludge handling and disposal. The energy consumption of major pumping stations is calculated as discussed above.

The annual costs for chemical consumption and sludge handling are calculated by using the expected average daily volume supplied by the alternative in conjunction with nominal costs on a per MGD basis for chemicals and sludge handling.

3.4 Deep River Alternatives

This design memo presents two different alternatives for accessing the Deep River. However, as of the writing of this report, **the Deep River is not considered a viable alternative because of the interbasin transfer certificate requirement.** Under current legislation the Deep River is a separately regulated river basin, and an IBT certificate would be necessary in order for Moore County to use it to satisfy the long-term water supply needs.

It is technically possible to avoid the IBT certificate if Moore County would discharge treated wastewater into the Deep River Basin, balancing the water withdrawal and treated wastewater discharge such that the net transfer volume does not exceed 2.0 MGD on an average daily basis. However, this would require conveying wastewater from Moore County's main sewer service area north to the Deep River, including constructing a new wastewater treatment plant (or expanding the Robbins WWTP). Constructing such sewer infrastructure would double or triple the overall capital cost of either Deep River alternative, likely making an already difficult financial transaction almost impossible.

The IBT hurdle was known during preparation of Design Memo #1. The two Deep River alternatives were developed so the scope and budget for the Deep River could be vetted and reviewed and compared against the other alternatives. The information may be valuable in the future if legislation changes the IBT thresholds or the Deep River sub-basin not being separately regulated.

4.0 DROWNING CREEK ALTERNATIVE

As discussed in Design Memo #1, a Drowning Creek raw water intake farther downstream of the existing Southern Pines intake is expected to have enough withdrawal capacity, when partnered with the existing Southern Pines reservoir, to satisfy Moore County's long-term supply need. Supply projections by river basin indicate a Drowning Creek alternative would not require an interbasin transfer certificate.

4.1 Scope – Drowning Creek

The Drowning Creek alternative features a new intake on Drowning Creek farther downstream where the low flow characteristics are more favorable. In addition, going farther downstream allows the County's wastewater treatment plant discharge volume to be captured in the stream flow. For this report, the proposed intake location on Drowning Creek is just downstream of the confluence with Quewhiffle Creek.

This alternative features a partnership with Southern Pines to utilize and expand their existing treatment plant facilities, including using the existing 140,000,000-gallon raw water reservoir. Preliminary discussions with Southern Pines' staff have been favorable on this topic, further conversations are necessary before a recommendation is made.

Phase 1 of a Drowning Creek alternative features the following:

- New raw water intake built for an ultimate capacity of 6 MGD, with pump sizes phased for near-term operations.
- Approximately 43,000 feet of 24" raw water pipe extending through a part of Hoke County, into Moore County terminating at the existing raw water reservoir owned and operated by the Town of Southern Pines.
- Expanding the Southern Pines water treatment plant from its current capacity of 8 MGD to 11 MGD:
    - Most of the Southern Pines WTP is sized for 11 MGD. LKC's preliminary analysis indicates achieving an 11 MGD capacity will require high-rating the old pulsator basin, modifying the two filter units and increasing the filtration rate, chemical feed system upgrades, upgrading the high service pump station, and improving solids handling.
    - Preliminary discussions with Southern Pines' staff indicate after the expansion from 8 to 11 MGD, 2 MGD of the new capacity would be offered to Moore County, with the 1 MGD kept for Southern Pines to use.

Phase 2 of this alternative would feature the following:

- Expand the Southern Pines WTP from 11 MGD to 17 MGD. Following this expansion, 6 MGD would be allocated for purchase by Moore County.
- Approximately 42,000 feet of 24" finished water pipe from the Southern Pines WTP north into Pinehurst, terminating at the existing elevated tank on Monticello Drive.

4.2 Capital Cost – Drowning Creek

The table below provides a summary of the capital cost for both Phase 1 and Phase 2:

Table 3: Drowning Creek Alternative, Summary of Capital Costs

DROWNING CREEK, PHASE 1	
Raw water intake and pump station	$6,500,000
43,000 feet of 24" raw water pipe	$18,977,000
Expand So. Pines WTP from 8 to 11 MGD	$6,505,000
Contingency, Engineering, and other soft costs	$7,096,000
TOTAL, PHASE 1	**$39,078,000**
DROWNING CREEK, PHASE 2	
Expand So. Pines WTP from 11 to 17 MGD	$48,000,000
24,000 feet of 24" finished water pipe	$16,776,000
Contingency, Engineering, and other soft costs	$13,605,000
TOTAL, PHASE 2	**$78,381,000**

4.3 Operational Cost – Drowning Creek

The annual cost of owning and operating the Drowning Creek alternative would consist of the following:

- Debt service payment for both Phase 1 and Phase 2.
- Energy consumption at the raw water pump station (owned/operated by Moore County).
- Bulk purchase payment to Southern Pines negotiated in an interlocal agreement.

Detailed estimates for the annual cost of ownership and operation, year-by-year, is included in Appendix C.

4.4 Preliminary Timeline – Drowning Creek

Table 4 below provides a summary of the preliminary timeline for Phase 1.

Table 4: Preliminary Timeline - Drowning Creek Alternative, Phase 1

Project Event / Milestone	Duration
Preliminary Engineering Report (10% design)	9 months
Environmental Planning/Permitting	18 months
Preliminary Design	12 months
Final Design and Permitting	6 months
Construction Procurement	6 months
Construction	18 months
Commissioning	3 months
TOTAL	**72 months**

The above timeframes assume an Environmental Impact Statement would not be necessary for the project. Not shown in the above are the interlocal agreement negotiations and property/easement acquisitions. Both of those could occur simultaneously with the Environmental Permitting and Preliminary Design phases.

Phase 2 would not take as long and could be implemented based on water supply monitoring and projections shortly after the completion of Phase 1. The projected future water supply needs shown in **Figure 3**, indicate Phase 2 would need to be completed by approximately 2034, and this schedule could vary based on actual growth rates as monitored throughout completion of Phase 1.

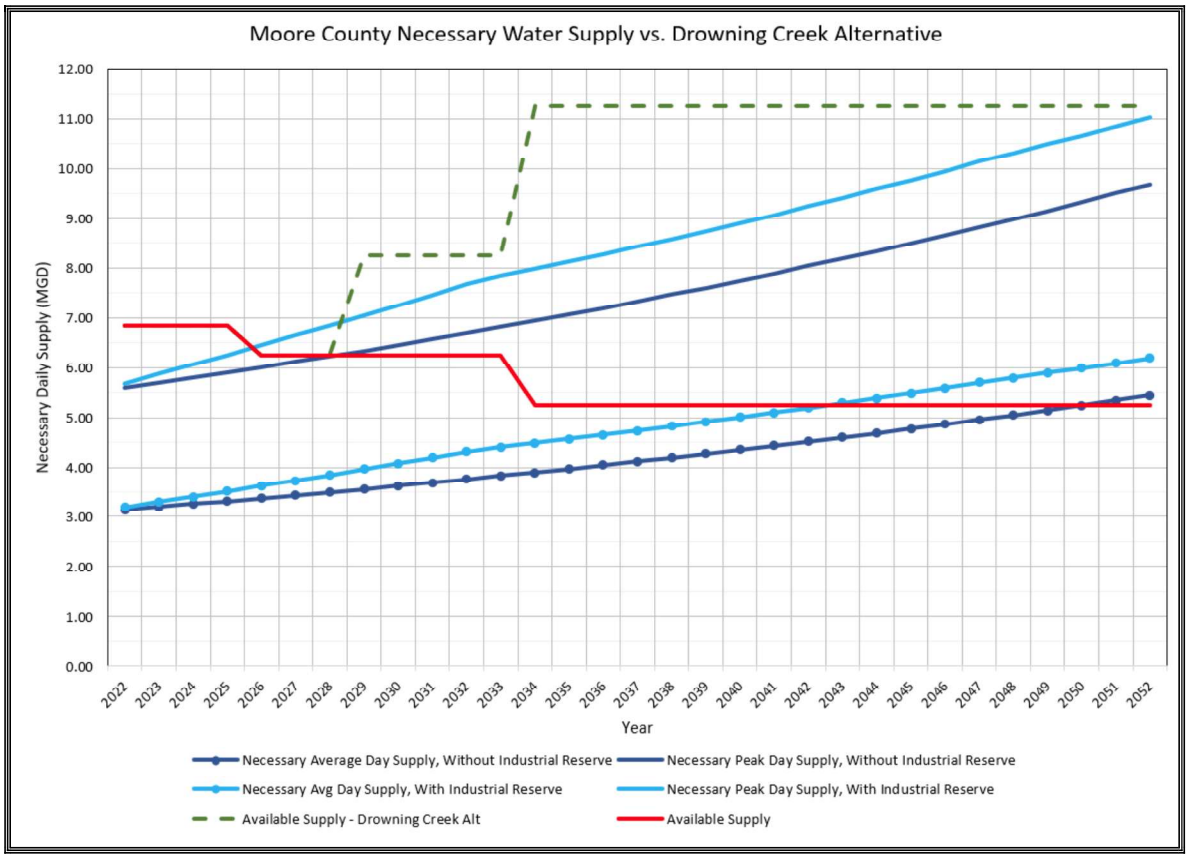


Figure 3: Necessary Water Supply and Drowning Creek Phasing

4.5 Preliminary Safe Yield Analysis for Southern Pines Reservior

When preparing Design Memo #2, LKC performed a preliminary safe-yield analysis on the existing 140,000,000-gallon reservoir at the Southern Pines water treatment plant. The target withdrawal rate is 17 MGD: 11 MGD for Southern Pines and 6 MGD for Moore County. Stream flow data was analyzed starting January 1, 1982 running through June 30, 2023.

Key parameters of the analysis include:

- The reservoir volume is 140,000,000 gallons when full.
- Southern Pines' withdrawal rates adhere to the January 5, 1996 letter from NCDEHNR to the Town:
    - So long as 56 cfs (cubic feet per second) flow-by is maintained at the US-1 stream gage, 14 MGD may be withdrawn;
    - When the flow-by is below 56 cfs, only 8 MGD may be withdrawn

The following assumptions were made for a potential Moore County withdrawal downstream of the Quewhiffle Creek confluence:

- If the US-1 stream gage has 56 cfs flow-by, Moore County could withdraw 6 MGD at the new location;

- If the US-1 stream gage is below 56 cfs, Moore County can only withdraw 4.84 MGD, which is conservatively calculated as 20% of the 7Q10 at this proposed withdrawal location.

The above assumptions would need to be studied further and vetted by NCDEQ Division of Water Resources and other regulatory agencies before the safe-yield analysis is finalized.

LKC used two different levels of water restrictions in the analysis. The first stipulated that in the event the reservoir volume dropped to 70% of its full volume, Southern Pines and the County would implement water use restrictions such that the reservoir withdrawal rate would be restricted to 70% of the target 17 MGD, or 11.9 MGD.

The results of this calculation are shown in **Figure 4** below. The calculation predicts that over the study period a withdrawal of 17 MGD results in 25 empty reservoir days, all of which occur during the 2002 drought.

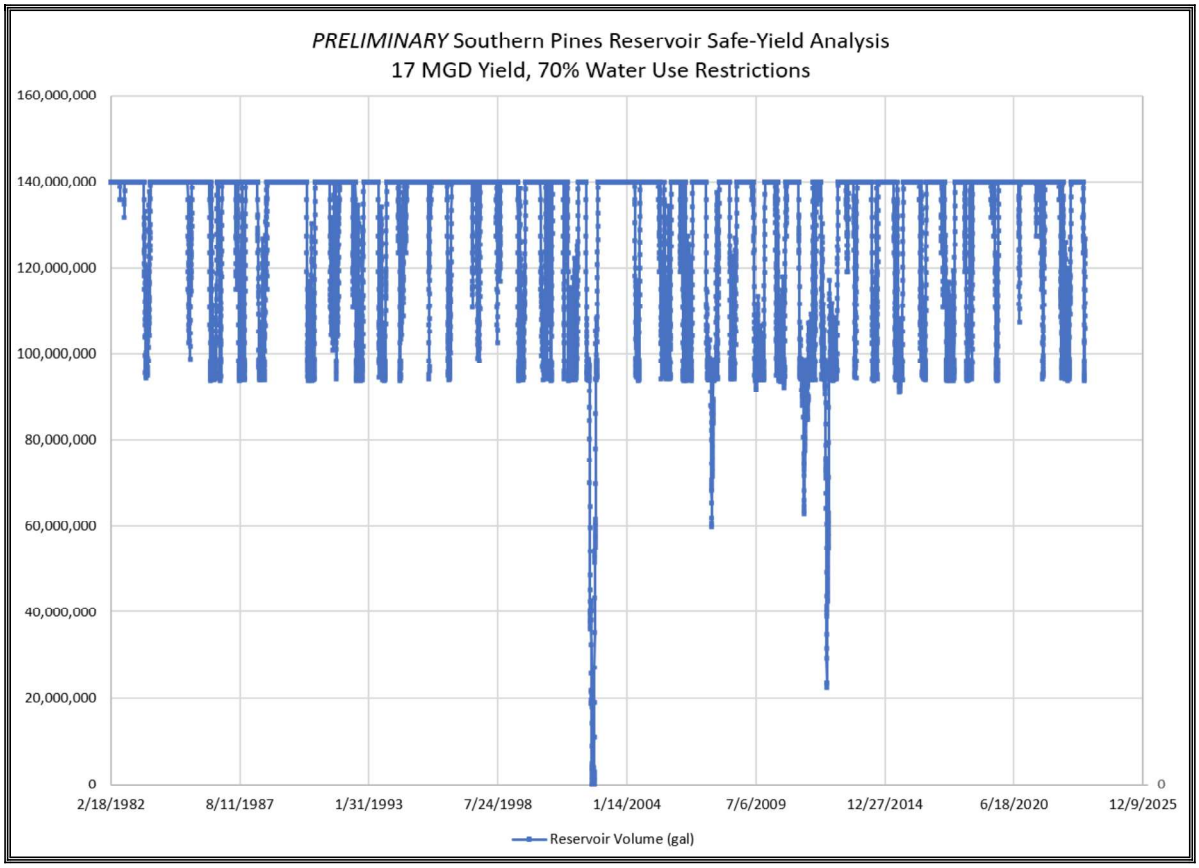


Figure 4: Preliminary Safe-Yield Analysis, 70% Water Use Restrictions

A second-tier water restriction was added to the calculation as 50%: if even after the 70% restriction the reservoir volume continued to drop, when it reaches 50% of the full volume additional water use restrictions are implemented such that Southern Pines and the County would limit the withdrawal rate to 50% of the target 17 MGD, or 8.5 MGD.

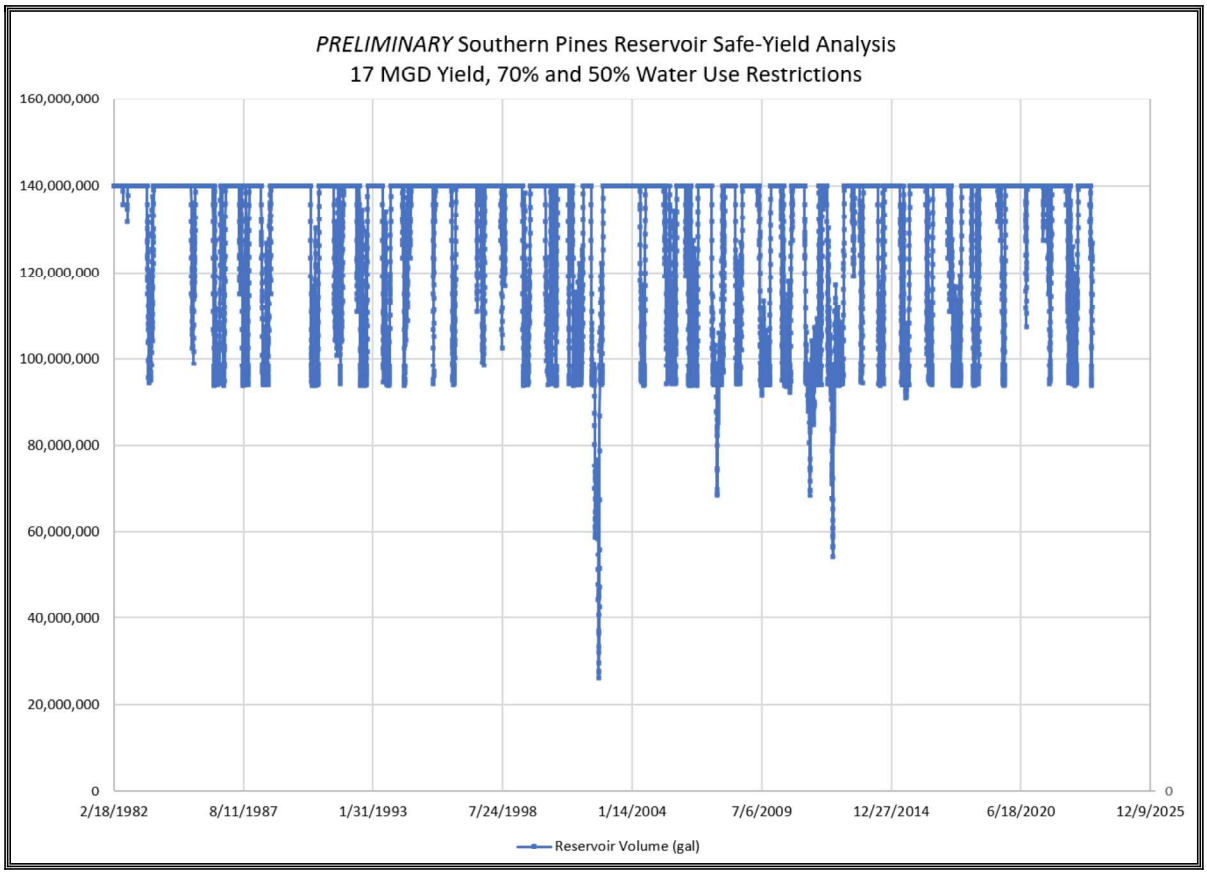


Figure 5: Preliminary Safe-Yield, 70% and 50% Water Use Restrictions

You can see in **Figure 5** that using both the 70% and 50% water use restrictions results in zero reservoir empty days within the study period.

The analyses above assume a withdrawal rate of 17 MGD every day, except when the 70% and 50% restrictions are in place. This is an overly-conservative approach, in reality the peak withdrawal rate would only occur for two or three consecutive days to satisfy a peak demand period.

4.6 Miscellaneous – Drowning Creek

A key component to this alternative is an interlocal agreement with Southern Pines, governing the capital projects, operation, and bulk purchase rates, that is fair and equitable for both Southern Pines and Moore County. Preliminary discussions with Southern Pines' staff indicate the Town is open to a relationship with Moore County, and that the separation of cost would be done in an equitable fashion.

Further discussion with Southern Pines is a critical component to the feasibility of this alternative.

5.0 SANFORD ALTERNATIVE

Sanford has a robust raw water supply withdrawing from the Cape Fear River. Conversations with Sanford staff indicate the City is interested in a partnership with Moore County. Sanford has recently executed interlocal agreements with significant bulk purchase customers (Holly Springs, Fuquay-Varina, and others), and they have experience in the process of similar partnerships. Supply projections by river basin indicate a Sanford alternative would not require an interbasin transfer certificate.

5.1 Scope – Sanford

The Sanford alternative would feature a bulk purchase relationship with the City of Sanford. Sanford's water treatment plant is located on the northeast side of the City (opposite side from Moore County). Preliminary discussions with Sanford's staff indicated they would be interested in a bulk purchase relationship should Moore County consider it the preferred alternative. Sanford's existing water treatment has a capacity of 12 MGD, and the City is expecting to begin construction in early 2024 on an expansion to 24 MGD. All the additional capacity is reserved between the City's future planning and bulk purchase relationships. As such this alternative would require an additional expansion to the Sanford water treatment plant.

The Sanford alternative would generally consist of the following components:

- 6 MGD expansion to Sanford's water treatment plant.
- A new high service pump station constructed at Sanford's water treatment plant to serve Moore County.
- Approximately 182,000 feet of 24" finished water line from Sanford's water treatment plant extending into Moore County terminating in the East Moore Water District.
- A new Intermediate Storage, Treatment, and Pumping station:
    - This is required because the elevation and distance are too great to pump the entire way in a single leg. Finished water would be pumped from Sanford and discharge into ground storage facilities.
    - The Intermediate station would feature two ground storage tanks, a small chemical feed system, and a high service pump station.
    - Finished water from Sanford could receive additional treatment then pump into the EMWD elevated tank(s).
- A new 1,500,000-gallon elevated storage tank in the EMWD service to receive the water from Sanford for distribution inside Moore County's systems.

Because much of the capital cost is water transmission pipelines between Sanford and Moore County, breaking this alternative into phases is challenging. Sanford's water treatment plant is oriented to be built in 6.0 MGD trains, and conversations with Sanford staff indicate they would require Moore County to construct an entire new train without phasing. The potential to phase the water plant expansion can be discussed further if Sanford is the preferred alternative.

Sanford staff indicated the most recent cost estimate for their current water plant expansion was $9.00 per gallon of capacity. For this report, a unit cost of $10.00 per gallon capacity is used.

5.2 Capital Cost – Sanford

The table below provides a summary of the capital cost for both Phase 1 and Phase 2:

Table 5: Sanford Alternative, Summary of Capital Costs

SANFORD ALTERNATIVE	
6 MGD Expansion to Sanford WTP	$60,000,000
Finished Water Pipe, WTP to Intermediate Station	$45,044,000
Intermediate Storage, Treatment, and Pumping Station	$10,510,000
Finished Water Pipe, Intermediate Station to EMWD	$25,576,000
1.5 MG Elevated Storage Tank	$7,500,000
Contingency, Engineering, and other soft costs	$19,856,000
TOTAL	**$173,486,000**

5.3 Operational Cost – Sanford

The annual cost of owning and operating the Sanford alternative would consist of the following:

- Debt service payment
- Energy consumption, chemical usage, and staffing / overhead costs at the Intermediate station
- Bulk purchase payment to Sanford negotiated in an interlocal agreement

Detailed estimates for the annual cost of ownership and operation, year-by-year, is included in Appendix D.

5.4 Preliminary Timeline – Sanford

Table 4 below provides a summary of the preliminary timeline for Phase 1.

Table 6: Preliminary Timeline – Sanford Alternative

Project Event / Milestone	Duration
Preliminary Engineering Report (10% design)	9 months
Environmental Planning/Permitting	6 months
Preliminary Design	12 months
Final Design and Permitting	12 months
Construction Procurement	6 months
Construction	24 months
Commissioning	3 months
TOTAL	**72 months**

The above timeframes assume an Environmental Impact Statement would not be necessary for the project. Not shown in the above are the interlocal agreement negotiations and property/easement acquisitions. Both of those could occur simultaneously with the Environmental Permitting and Preliminary Design phases.

5.5 Miscellaneous – Sanford

A key component to this alternative is an interlocal agreement with Sanford, governing the capital projects, operation, and bulk purchase rates for the finished water, that is fair and equitable for both Sanford and Moore County. Preliminary discussions with Sanford's staff indicate the City is open to a relationship with Moore County, and that the separation of cost would be done in an equitable fashion. Sanford recently executed similar agreements with Holly Springs, Fuquay-Varina, and other local governments for the project that is currently underway. As described by Sanford's staff, the annual costs are split as follows:

- Each entity pays their share of the capital cost separately
- Annual fixed costs are divided proportionately to the allocated capacity of each entity
- Annual variable costs are divided proportionately to the volume of water each entity actually purchases from the City

Further discussion with Sanford is a critical component to the feasibility of this alternative.

6.0 DEEP RIVER ROBBINS ALTERNATIVE

LKC evaluated two different Deep River alternatives, featuring intakes on different locations. This alternative features an intake south of the confluence with Bear Creek and would use the existing Town of Robbins reservoir in partnership with the Town.

6.1 Scope – Deep River Robbins

The Deep River Robbins alternative could be constructed in two phases.

Phase 1 generally consists of the following components:

- A new raw water intake on the Deep River, located downstream of the confluence with Bear Creek, near the NC-22 bridge crossing.
- Approximately 37,000 feet of 24" raw water pipe from the intake to the existing Robbins reservoir.
- A partnership with Robbins to use the existing raw water reservoir, either by purchasing the reservoir or through a lease agreement.
- A new 4.0 MGD water treatment plant located near the reservoir, including improvements to the existing reservoir.
- Approximately 86,000 feet of finished water pipe from the water treatment plant to the existing Moore County system in Seven Lakes.
- A new 1,500,000-gallon elevated storage tank located in the Seven Lakes area to feed the rest of the distribution system.

Phase 2 generally consists of the following components:

- Expand the water treatment plant from 4.0 MGD to 6.0 MGD.

Some additional distribution system improvements would be needed over time to move the water from Seven Lakes into the other County systems. Seven Lakes is the highest elevation gradient in the County, and some water will flow by gravity into the Pinehurst and EMWD systems. The two existing pump stations at NC-73 and NC-211 would likely be reversed to pump the opposite direction. Other distribution system improvements would be needed as growth corridors develop. Those are not part of this study and would be minor relative to the overall investment of the alternative.

6.2 Capital Cost – Deep River Robbins

Table 7 below provides a summary of the capital cost for both Phase 1 and Phase 2:

Table 7: Deep River Robbins Alternative, Summary of Capital Costs

DEEP RIVER ROBBINS, PHASE 1	
Raw water intake and pump station	$6,500,000
37,000 feet of 24" raw water pipe	$16,713,000
Purchase the Robbins reservoir (budget figure)	$2,000,000
4.0 MGD water treatment plant	$37,685,000
86,000 feet of 24" finished water line	$34,172,000
1.5-MG elevated storage tank in Seven Lakes	$7,500,000
Contingency, Engineering, and other soft costs	$22,564,000
TOTAL, PHASE 1	**$127,134,000**
DEEP RIVER ROBBINS, PHASE 2	
Expand the water plant from 4.0 to 6.0 MGD	$18,000,000
Contingency, Engineering, and other soft costs	$4,650,000
TOTAL, PHASE 2	**$22,650,000**

6.3 Operational Cost – Deep River Robbins

The annual cost of owning and operating the Deep River Robbins alternative would consist of the following:

- Debt service payment for Phase 1 and Phase 2
- Energy consumption at the raw water pump station
- Fixed costs at the water treatment plant (staffing, vehicles, IT, lab, capital outlay)
- Variable costs at the water treatment plant (energy, chemicals, sludge)

Detailed estimates for the annual cost of ownership and operation, year-by-year, is included in Appendix E.

6.4 Preliminary Timeline – Deep River Robbins

Table 8 below provides a summary of the preliminary timeline for Phase 1.

Table 8: Preliminary Timeline – Deep River, Robbins

Project Event / Milestone	Duration
Preliminary Engineering Report (10% design)	9 months
Environmental Planning/Permitting*	18 months
Preliminary Design	12 months
Final Design and Permitting	12 months
Construction Procurement	6 months
Construction	24 months
Commissioning	3 months
TOTAL	**84 months**

**The timelines above do not account for the interbasin transfer certificate process. This process could take as long as 5 years and a certificate is not guaranteed to be issued.*

The above timeframes assume an Environmental Impact Statement would not be necessary for the project. Not shown in the above are the interlocal agreement negotiations and property/easement acquisitions. Both of those could occur simultaneously with the Environmental Permitting and Preliminary Design phases.

Similar to the Drowning Creek alternative, Phase 2 could be planned by monitoring water supply growth during implementation of Phase 1. Phase 2 would not take as long as Phase 1 and could be implemented upon completion of Phase 1. The future water supply projections shown in **Figure 2**, indicate Phase 2 would need to be completed by year 2040.

6.5 Miscellaneous – Deep River Robbins

In this alternative Moore County would have complete ownership and control over the water supply assets and would not be privy to a bulk purchase relationship. There is long-term value in being able to control costs, water quality, and future investments in the infrastructure.

This alternative would feature a long (86,000 feet) finished water line connecting to the existing system in Seven Lakes. Water would then be transferred farther into the EMWD and Pinehurst systems. This creates the potential for water quality issues relative to water age and detention times. A minimum volume would need to be treated and pumped from the new water plant to keep the finished water lines fresh and reduce water age.

All Deep River alternatives would require an interbasin transfer certificate under the current basin transfer rules. Future changes to the regulations could change this. This is an important factor because of the length of time and risk of issuance for an IBT certificate.

7.0 DEEP RIVER CARBONTON ALTERNATIVE

The second Deep River option features an intake farther downstream on the Deep River, below the Carbonton Road bridge, immediately downstream of the confluence with Big Governor's Creek. The purpose of this additional alternative was to avoid the long finished water pipeline required in the Deep River Robbins alternative (86,000 feet of 24" pipe), instead pumping raw water for most of the distance to a new treatment plant. In this alternative, the intake farther downstream allows the water treatment plant to be located closer to the Moore County customers and growth areas. This would reduce both capital costs and water quality concerns due to water age. In this alternative the Robbins reservoir would not be used; rather, a new off-stream reservoir would be constructed.

7.1 Scope – Deep River Carbonton

The Deep River Carbonton alternative could be constructed in two phases.

Phase 1 generally consists of the following components:

- A new raw water intake on the Deep River, located downstream of the confluence with Big Governor's Creek, downstream of the Carbonton Rd bridge.
- Approximately 53,000 feet of 24" raw water pipe from the intake to the proposed water treatment plant.
- A new 4.0 MGD water treatment plant located north of Carthage (site to be determined), including a 90,000,000-gallon upland raw water reservoir.
- Approximately 47,000 feet of finished water pipe from the water treatment plant to the existing Moore County system in the EMWD.
- A new 1,500,000-gallon elevated storage tank located in the general proximity of the US 15/501 / McCaskill Rd intersection.

Phase 2 generally consists of the following components:

- Expand the water treatment plant from 4.0 MGD to 6.0 MGD, same as the Deep River Robbins alternative.

Some additional distribution system improvements would be needed over time to distribute water into the Pinehurst and Seven Lakes systems and to serve future growth corridors. Those are not part of this study and would be minor relative to the overall investment of the alternative.

7.2 Capital Cost – Deep River Carbonton

The table below provides a summary of the capital cost for both Phase 1 and Phase 2:

Table 9: Deep River Carbonton Alternative, Summary of Capital Costs

DEEP RIVER CARBONTON, PHASE 1	
Raw water intake and pump station	$6,500,000
53,000 feet of 24" raw water pipe	$22,781,000
4.0 MGD water treatment plant with reservoir	$39,275,000
47,000 feet of 24" finished water line	$15,618,000
1.5-MG elevated storage tank in Seven Lakes	$7,500,000
Contingency, Engineering, and other soft costs	$21,935,000
TOTAL, PHASE 1	**$113,609,000**
DEEP RIVER ROBBINS, PHASE 2	
Expand the water plant from 4.0 to 6.0 MGD	$18,000,000
Contingency, Engineering, and other soft costs	$4,650,000
TOTAL, PHASE 2	**$22,650,000**

7.3 Operational Cost – Deep River Carbonton

The annual cost of owning and operating the Deep River Robbins alternative would consist of the following:

- Debt service payment for Phase 1 and Phase 2
- Energy consumption at the raw water pump station
- Fixed costs at the water treatment plant (staffing, vehicles, IT, lab, capital outlay)
- Variable costs at the water treatment plant (energy, chemicals, sludge)

Detailed estimates for the annual cost of ownership and operation, year-by-year, is included in Appendix F.

7.4 Preliminary Timeline – Deep River Carbonton

Table 10 below provides a summary of the preliminary timeline for Phase 1.

Table 10: Preliminary Timeline – Deep River Carbonton Alternative

Project Event / Milestone	Duration
Preliminary Engineering Report (10% design)	9 months
Environmental Planning/Permitting*	18 months
Preliminary Design	12 months
Final Design and Permitting	12 months
Construction Procurement	6 months
Construction	24 months
Commissioning	3 months
TOTAL	**84 months**

**The timelines above do not account for the interbasin transfer certificate process. This process could take as long as 5 years and a certificate is not guaranteed to be issued.*

The above timeframes assume an Environmental Impact Statement would not be necessary for the project. Not shown in the above are the interlocal agreement negotiations and property/easement acquisitions. Both of those could occur simultaneously with the Environmental Permitting and Preliminary Design phases.

Similar to the Drowning Creek and Deep River Robbins alternatives, Phase 2 could be planned by monitoring water supply growth during implementation of Phase 1. Phase 2 would not take as long as Phase 1 and could be implemented upon completion of Phase 1. The future water supply projections shown in **Figure 2** indicate Phase 2 would need to be completed by year 2040.

7.5 Miscellaneous – Deep River Carbonton

In this alternative Moore County would have complete ownership and control over the water supply assets and would not be privy to a bulk purchase relationship. There is long-term value in being able to control costs, water quality, and future investments in the infrastructure.

This alternative features a new upland raw water reservoir and require a noticeable amount of land for the water plant and reservoir site. While the cost of the land is included in the budget, identifying vacant land with a willing seller could prove difficult.

All Deep River alternatives would require an interbasin transfer certificate under the current basin transfer rules. Future changes to the regulations could change this. This is an important factor because of the length of time and risk of issuance for an IBT certificate.

8.0 ALTERNATIVE COMPARISON

There are several ways to compare one alternative to another, this report uses the following criteria:

1. Initial capital cost: this represents the County's capital cost to place the project online (Phase 1 cost for phased alternatives). This is critical because any government entity has a finite ability to issue debt, and Moore County has other capital projects outside the water/sewer utility department that must also be addressed. It is also difficult to service debt for a project meant to satisfy 30 years of growth using the revenue capacity of the existing customer base.
2. Annual operating cost, including debt: this will vary from one alternative to another due to items like energy consumption, bulk purchase rates, and staffing requirements. It is a more direct representation of the relative impact to the rate payers of one alternative versus another.
3. Schedule: the ability to complete the project inside the timeframe necessary.
4. Long-term control over the resource and recurring costs: with this project being Moore County's primary water source long-term, it is important to understand the risk of cost escalations for things like bulk purchase rates.
5. Expandability: is the supply source robust enough to allow for future expansion in capacity.

8.1 Initial Capital Cost

Figure 6 below provides a graphical representation of the upfront capital cost of each alternative. For the alternatives with multiple phases, only the Phase 1 cost is represented:

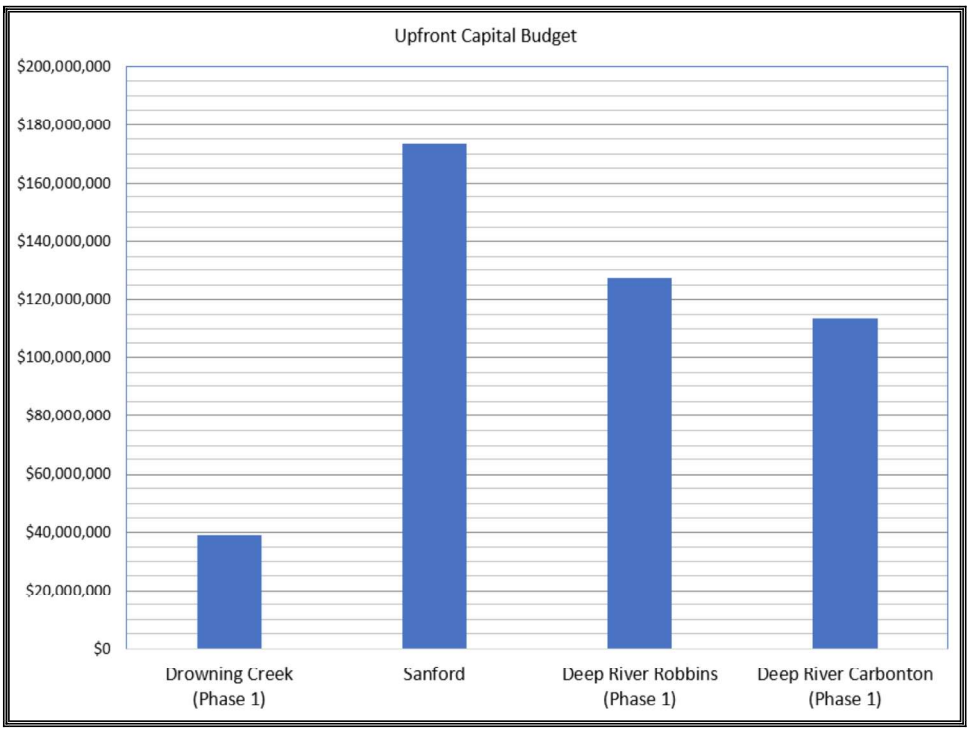


Figure 6: Initial Capital Cost Comparison

It is recommended that Moore County work with their financial consultant to discuss the process and feasibility for financing the project and how that would impact user rates over time.

8.2 Annual Operating Costs, Including Debt

Detailed calculations of the annual operating costs of each alternative, including the calculated debt payment, are included in the appendices. **Figure 7** below plots each of the total cost, including debt payments, for each alternative.

Figure 7: Annual Operating Costs, Including Debt, per 1,000 gallons

It is very important to note **Figure 7** is only intended to be a mechanism to compare each alternative to the others. The per 1,000 gallon figures should not be used to set user rates, Moore County should consult with a certified financial analyst to determine user rates.

Some key points from **Figure 7** are:

- The calculation assumes the project would be online starting in year 2030. It is possible there would be interest payments associated with the financing before this time. The County's financial analyst should provide this information.
- Each line trends down over time because a portion of the annual costs (numerator) is fixed (debt, staffing, etc.), and the water supplied each year (denominator) is increasing.
- The Sanford (gray) and Deep River, Robbins (purple) alternatives have flat lines for the first several years. This is because, due to water quality concerns, those

alternatives feature a minimum volume supplied each day to reduce water age. This is reflected in the calculation by both the numerator and denominator having constant values until the necessary volume each year exceeds the minimum amount, then the lines trend down as the denominator grows. This should not be interpreted as a lower overall cost. For those alternatives the County must produce the minimum amount from the new supply source, meaning other, less expensive supply sources, would be reduced.

8.3 Schedule

The sections above provide an expected timeline for each alternative. The timeframes range between 6 years and 7 years. The growth projections in **Figure 2** indicate, based on the growth rates, the peak day supply need would exceed the available sources in year 2029.

The major unknown lies with the two Deep River alternatives and the need for an IBT certificate under current regulations. Moore County's projected water supply needs shown in **Figure 2** do not allow for the expected timeframe to obtain an IBT certificate to transfer water out of the Deep River Basin. Unless the regulations are changed in the near future, the Deep River alternatives do not satisfy the schedule requirements.

8.4 Long-Term Control of the Resource

Having appropriate control of the water supply resource, including risk of cost elevations over time, is an important factor. For the two Deep River alternatives, Moore County would have complete ownership and control of the water supply assets, and would be able to track, budget, and implement changes in operating costs as needed over time.

Both the Drowning Creek and the Sanford alternatives would require interlocal agreements with other water systems. For the Sanford alternative, Moore County would essentially be a captive purchaser without much negotiating leverage for the interlocal agreement. This is a risky proposition with the potential for unexpected cost increases, especially when the proposed supply source would become Moore County's primary source over time.

In contrast to Sanford, for the Drowning Creek alternative, Moore County would be constructing a new water intake farther downstream on Drowning Creek and pumping raw water into the Southern Pines reservoir. This would benefit Southern Pines, providing them with a backup raw water supply source that would be more reliable in periods of drought because the intake would be farther downstream and it would capture volume discharged from the County's wastewater treatment plant. LKC believes it is more likely Moore County and Southern Pines could agree to an interlocal relationship with favorable terms to both parties and provided with long-term security over changes in cost over time, as opposed to the Sanford alternative.

8.5 Expandability

This criterion considers the ability of the supply source to satisfy Moore County's needs beyond the 30-year planning horizon. None of the alternatives discussed in this Design Memo should be considered to have significant expansion capability beyond the 6 MGD proposed.

For both Deep River alternatives and the Drowning Creek alternative, low-flow characteristics of the stream indicate Moore County's proposed withdrawal capacity of 6 MGD would exceed 20% of the 7Q10 flow rate of the stream. This will require use of an off-stream reservoir for storage during low flow events and consideration of environmental factors that will limit the withdrawal rates. As such, it is a safe assumption that the Deep River and Drowning Creek would not allow for significant capacity expansion after the 30-year planning horizon.

Sanford's raw water source is more robust could possibly allow for a capacity expansion beyond the 6 MGD discussed in this report. However, Sanford's own internal growth would be a factor, as it is likely they would protect their supply for their own needs. In addition, Sanford's planned bulk purchase customers are in high-growth regions (Holly Springs, Fuquay-Varina, and Chatham County), and it is possible each of those customers will request additional supply in the future. So, while Sanford's raw water source could have additional capacity, it is not a safe assumption that Moore County would be able to obtain additional capacity from Sanford.

APPENDIX A

Correspondence with Harnett County

J. Wayne Vest
County Manager

Janet Parris
Assistant County Manager

Mary Phillips
Administrative Assistant

Rich Smith
Capital Projects Manager

County of Moore
Administration

Tami Golden
Budget Manager/
Internal Auditor

Kris Klug
Assistant Budget
Manager/ Internal
Auditor

June 19, 2023

Mr. Brent Trout, County Manager
Harnett County, NC
455 McKinney Parkway
Lillington, NC 27546

Re: Moore County Long-Term Water Supply Plan
Harnett County as an Alternative

Dear Mr. Trout,

Moore County is embarking on a long-term water supply plan to assess our future water supply needs and develop a 30-year solution. We are thankful for our long-standing relationship with Harnett County and your willingness to sell us water, and we believe Harnett County could be a viable alternative to satisfy our long-term needs.

Our water supply projections compared to our available supplies in 30 years indicate we need to secure 6 MGD of additional water supply to satisfy our needs in 2052. The purpose of this letter is to ask for your consideration to allow Moore County and our consultant to work with your team to evaluate how your water system could provide an additional 6 MGD of water supply.

We understand this is a significant endeavor that would likely require significant capital improvements to your water system and water treatment plant. Moore County's expectation is that such capital improvements would be funded by Moore County and that the purchase rate charged by Harnett County for the water would reflect an equitable compensation for the operation and maintenance of the infrastructure.

We are in the conceptual study phase and a Harnett County alternative would be compared to other viable alternatives for consideration. Ultimately Moore County will select an alternative that is in the best interests of our citizens and water customers. If our study indicates a Harnett County solution is the best alternative, we will engage with you at that time to discuss and quantify the important details of an expanded relationship between our water systems.

If Harnett County is not interested in potentially expanding our water purchase relationship and you would prefer to not provide supporting information for our study, we respectfully ask that you provide a brief response to this letter indicating such.

If you are interested in potentially expanding our relationship and providing information for our study, we ask that you connect our staff and consultant with the appropriate members of your team to perform the evaluation.

You may contact me any time if you have questions at (phone number) or (email).

Sincerely,

J. Wayne Vest

J. Wayne Vest, County Manager

Recd 7/24/23 MP

Harnett COUNTY NORTH CAROLINA

Office of the County Manager

www.harnett.org

Brent Trout
County Manager

PO Box 759
455 McKinney Parkway
Lillington, NC 27546

ph: 910-893-7555

J. Wayne Vest
County Manager
P.O. Box 905
Carthage, NC 28327

Dear Mr. Vest,

I received your request for assistance related to Moore County's long-term water supply needs. I contacted the Director of Harnett Regional Water, Steve Ward, to determine whether there is capacity within our water system to support the request. Harnett County is a growing county as well and has growing water supply needs of its own. Our growth projections will push our population up significantly over the next 20 years and we need to ensure we have capacity for this growth. In addition, we have existing commitments to other towns and counties that use a portion of our capacity. We are currently planning for the construction of an additional water treatment plant to be ready to support this growth. Based on these factors we are not able to support your request for additional water supply. Our current and projected long-term county needs restrict us in our ability to assist you in your request. We look forward to continuing our current relationship and wish you success in finding a partner to fulfill your long term needs. If you have any questions please contact me.

Sincerely,

Brent Trout

Brent Trout
County Manager

APPENDIX B

Updated Bulk Purchase Agreement with Southern Pines

STATE OF NORTH CAROLINA

WATER PURCHASE CONTRACT

MOORE COUNTY

THIS CONTRACT for the sale and purchase of water is entered into as of the 14th day of June, 2023, between the TOWN OF SOUTHERN PINES (hereinafter referred to as "Seller"), and the COUNTY OF MOORE, (hereinafter referred to as "Purchaser").

WITNESSETH:

WHEREAS, the Purchaser is a body politic duly organized and existing under the laws of the State of North Carolina; and

WHEREAS, the Seller is a municipal organization duly organized and existing under the laws of the State of North Carolina; and

WHEREAS, the Purchaser, among its other functions, operates a water supply and distribution system serving water users within its boundaries, and is in need of an additional supply of treated water therefore: and

WHEREAS, the Seller owns a water supply and distribution system; and

WHEREAS, the Seller currently has available excess capacity of treated water sufficient to supply the request of the Purchaser as set forth in this contract and to satisfy the present and anticipated needs of its customers; and

WHEREAS, the Seller desires to sell to Purchaser and Purchaser desires to buy from Seller a supply of potable water as set forth herein: and

WHEREAS, the Seller and the Purchaser have agreed upon certain terms regarding the sale of water as mentioned above, and now desire to set forth the terms of their agreement; and

WHEREAS, by motion adopted by the Town Council of the Town of Southern Pines at its meeting on the _____th day of _____, 2023, the sale of said water to the Purchaser as provided herein was approved, and the execution of this Contract by the Seller was duly authorized; and

WHEREAS, by motion adopted by the Moore County Board of Commissioners at its meeting on June 06, 2023, the purchase of said water from the Seller as provided herein was approved, and the execution of this contract by Purchaser was duly authorized;

NOW TIIEREFORE, in consideration of the foregoing and the mutual agreements hereinafter set forth, the parties agree as follows:

A. SELLER'S OBLIGATIONS:

1. (Quality and Quantity) Subject to the remaining provisions of this contract, Seller shall furnish to the Purchaser at the point of delivery hereinafter specified, during the term of this contract or any renewal or extension thereof, potable treated water meeting applicable purity standards of the State of North Carolina, Rules Governing Public Water Systems, 15 NCAC 18C, in such quantity as may be required by the Purchaser not to exceed One Million (1,000,000) gallons per day. The annual minimum is Three Hundred Thousand (300,000) gallons per day, averaged over the preceding year or One Hundred Nine Million Five Hundred Thousand (109,500,000) gallons per year. For purposes of this Paragraph A.l, a "year" is defined as July 1st through June 30th. If Purchaser fails to purchase the required annual minimum, and no restrictions on the purchase of water have been imposed by Seller during such year, then Purchaser shall nevertheless be obligated to pay to Seller the difference between the amount paid by Purchaser for the water actually purchased during that year and the amount that Purchaser would have been obligated to pay had Purchaser purchased the 109,500,000 gallons minimum for the year.

2. (Point of Delivery and Pressure) Seller shall furnish water at a reasonably constant pressure from an existing main supply line owned by Seller. The point of delivery shall be at a meter facility owned by Seller and located at the Purchaser's booster pump station on Midland Road. If a greater pressure than that normally available at the point of delivery is required by the Purchaser, the cost of providing such greater pressure shall be borne by the Purchaser. Emergency failures of pressure, supply, or water quality due to main supply line breaks, power failure, water source contamination, flood, drought, fire and use of water to fight fire, earthquake or other cause beyond the control of the Seller shall excuse the Seller from this provision for such reasonable period of time as may be necessary to restore service.

3. (Metering Equipment) The metering equipment owned by Seller and located at the booster pump station on Midland Road described in Paragraph A.2 hereof shall be read by Seller on the last day of each month. An appropriate official of the Purchaser shall have access at all reasonable times to the meter for the purpose of verifying its readings.

4. (Billing Procedure) Seller shall provide to the Purchaser, between the twentieth (20^{th}) day and the twenty fifth (25th) day of each month, an itemized statement of the amount of water furnished the Purchaser during the preceding month. Water bills are due by the 10^{th} of the following month. Water bills are considered past due after 30 days from the date of current bill. After the 30 days, a five percent (5%) penalty will be added to the bill. If payment is not received by the Seller by the 10th of the following month, this shall constitute a material breach of this contract, and Seller may terminate this contract as provided in Paragraph C.6.

B. PURCHASER'S OBLIGATIONS:

1. (Rates and Payment Dates) See above A.4 for payment dates and penalties. The rate shall be $2.58 per 1,000 gallons. Beginning the 1^{st} day of July, 2023 the rate shall be $3.22 per 1,000 gallons. Beginning the 1^{st} day of July, 2024 the rate shall be $3.85 per 1,000 gallons or the rate established by the town for/as in-town rate per 1,000 gallons. Beginning July 1, 2025, the rate shall be adjusted per the provisions of Paragraph C.1. The annual minimum total payout will be calculated using109,500,000 minimum gallons and the effective rate per 1,000 gallons for the effective fiscal year.

2. (Water Availability) For amounts above 1,000,000 gallons per any given day during this contract, the Purchaser will need to have availability approved in advance by the Town Manager of THE TOWN OF SOUTHERN PINES. In the event the Seller finds it necessary to go elsewhere to purchase water, which Seller then re-sells to Purchaser, the Purchaser agrees to pay ten percent (10%) above the Seller's cost or Purchaser shall have the option to suspend the contract until sufficient water is available.

C. ANNUAL RATE ADJUSTMENTS

1. The Seller will adjust the rate per thousand gallons sold to the purchaser at the same rate as its regular in-town rate paying customer. For the purpose of this contract, the "same" means cost per 1,000 gallons volume charge. If regular in-town rates increase/decrease by a certain percentage, the bulk rate volume will increase/decrease at the same percentage rate.

2. The Seller will adjust the annual minimum total payout at the same rate of adjustment as its regular in-town rate paying customer. If regular in-town rates increase/decrease by a certain percentage, the minimum total payout will increase/decrease at the same percentage rate.

D. IT IS FURTHER AGREED BETWEEN THE SELLER AND THE PURCHASER AS FOLLOWS:

1. (Term of Contract) That this Contract shall extend for a term of five (5) years from the date of adoption of this Contract between the Seller and Purchaser by both parties and, thereafter may be renewed or extended for such term, or terms, as may be agreed upon by the Seller and Purchaser and shall supersede any existing water purchase contract between the parties. This contract will automatically extend for two (2) additional five (5) year terms unless either the Seller or Purchaser within one hundred eighty (180) days of the renewal date decide to make changes to or terminate the contract. Any changes to or termination notice are only valid if received by the other party in writing. For clarification of the one hundred eighty (180) day rule, if the renewal date is July 1st, then any notice to change or terminate would have to be received by the other party on or before December 31st.

2. (Emergency Services) That Seller and Purchaser shall endeavor to provide such quantities of water each to the other as may be needed in the case of emergency water needs, such as water source contamination, production facility failure, natural disaster, or other catastrophe. The cost of such water shall be at the rate described in Paragraph B.l

4. (Failure to Deliver) The Seller will, at all times, operate and maintain its system in an efficient manner and will take such action as may be necessary to furnish the Purchaser with quantities of water required under the terms of this Contract by the Purchaser. Temporary or partial failure to deliver water shall be remedied with all possible dispatch. Notwithstanding the foregoing, Seller retains the right to restrict the amount of water it furnishes under this contract. In the event of an extended shortage of water, or the supply of water available

to the Seller is otherwise diminished over an extended period of time, the supply of water to Purchaser shall be reduced or diminished in the same ratio or proportion as the supply to Seller's consumers is reduced or diminished. The Purchaser shall, upon written notice from the Town Manager of the Town of Southern Pines, shall initiate water shortage conservation measures in accordance with the Seller's Water Use Ordinance.

5. (Modification of Contract). That the provisions of the contract may be modified or altered by mutual written agreement of the parties.

6. (Termination) This contract may be terminated, for cause, by the non-breaching party notifying the breaching party of a substantial failure to perform in accordance with the provisions of this contract and if the failure is not corrected within ten (10) days of the receipt of the notification. Upon such termination, the parties shall be entitled to such additional rights and remedies as may be allowed by applicable law. Termination of this contract shall not form the basis of any claim for loss of anticipated profits by either party.

7. (Notices). Any notice required to be given hereunder by Seller to Purchaser shall be made by Seller in writing and mailed by first class mail, hand delivered, or transmitted by facsimile to the County Manager, County of Moore at the following address: Post Office Box 905, Carthage, NC 28327, or by facsimile to (910) 947-1874. Notice shall be effective upon receipt. Any notices required to be given hereunder by Purchaser to Seller shall be made by Purchaser in writing and mailed by first class mail, hand delivered, or transmitted by facsimile to the Town Manager, Town of Southern Pines, 125 S.E. Broad Street, Southern Pines, North Carolina 28387. Notice shall be effective upon receipt.

8. (Regulatory Agencies) This contract is subject to such rules, regulation, or laws as may be applicable to similar agreements in this State, and Seller and Purchaser will collaborate in obtaining such permits, certificates, or the like, as may be required to comply therewith.

9. (Governing Laws). This contract shall be governed by and in accordance with the laws of the State of North Carolina. All actions relating in any way to this contract shall be brought in the General Court of Justice in the County of Moore and the State of North Carolina.

IN WITNESS WHEREOF, the parties hereto, acting under authority of their respective governing bodies, have caused this contract to be duly executed in duplicate counterparts, each of which shall constitute an original.

The rest of this page is left intentionally blank.

Executed by the Town of Southern Pines this___ day of _____, 2023

TOWN OF SOUTHERN PINES

BY: _____
Carol Haney Mayor

ATTEST:

_____
Elizabeth Robertson, Town Clerk

Executed by the County of Moore, this 6th day of June, 2023.

BY: _____
Nick Picerno, Chairman

ATTEST:

_____
Laura M. Williams, Clerk to the Board

Pre-Audit Certification

This instrument has been preaudited in the manner required by the Local Government Budget and Fiscal Control Act.

_____
Moore County Finance Officer

APPENDIX C

Drowning Creek Alternative: Detailed Cost Estimates and Estimated Annual Operating Costs

MOORE COUNTY PUBLIC UTILITIES
WATER SUPPLY MASTER PLAN
DROWNING CREEK ALTERNATIVE
PRELIMINARY SUMMARY OF CAPITAL COSTS

Phase 1		
Raw Water Intake and Pump Station		$6,500,000
Raw Water Pipeline to Southern Pines WTP		$18,977,000
Southern Pines WTP Expansion, 8 to 11 MGD		$6,505,000
PHASE 1 CONSTRUCTION COST ESTIMATE		**$31,982,000**
Contingencies and Engineering (20%)		$6,396,000
Environmental Permitting		$200,000
Property and Easement Acquisition		$450,000
Intake site	$250,000	
Easements for Water Mains	$200,000	
Legal Fees		$50,000
PHASE 1 PROJECT BUDGET:		**$39,078,000**
Phase 2		
Southern Pines WTP Expansion, 11 to 17 MGD (budget)		$48,000,000
Finished Water Line from WTP to Pinehurst		$16,776,000
PHASE 2 CONSTRUCTION COST ESTIMATE		**$64,776,000**
Contingencies and Engineering (20%)		$12,955,000
Environmental Permitting		$300,000
Property and Easement Acquisition		$300,000
Easements for Water Mains	$300,000	
Legal Fees		$50,000
PHASE 2 PROJECT BUDGET:		**$78,381,000**

MOORE COUNTY
DROWNING CREEK ALTERNATIVE
RAW WATER LINE FROM DROWNING CREEK TO SOUTHERN PINES WTP
PRELIMINARY COST ESTIMATE

Estimate covers a raw water line starting at an intake on Drowning Creek just downstream of the confluents with Quewhiffle Creek and discharging into the Southern Pines raw water reservoir

	Item Description	Quantities	Units	Unit Cost	Extended Cost
1.	24" Class 250 DIP Raw Water Main	42,000	LF	$275.00	$11,550,000.00
2.	24" Class 250 Restrained Joint DIP Raw Water Main	1,000	LF	$350.00	$350,000.00
3.	36" Steel Casing Installed by Bore and Jack	700	LF	$2,600.00	$1,820,000.00
4.	24" RJDIP Installed by Directional Bore	1,500	LF	$1,800.00	$2,700,000.00
5.	Open Cut Blue Line Stream	1	LS	$125,000.00	$125,000.00
6.	Air Release Valve	12	EA	$12,000.00	$144,000.00
7.	24" Butterfly Valve with Concrete Collar	12	EA	$24,000.00	$288,000.00
8.	24" 90-Degree Bend	12	EA	$9,500.00	$114,000.00
9.	24" 45-Degree Bend	15	EA	$8,500.00	$127,500.00
10.	24" 22.5-Degree Bend	15	EA	$8,500.00	$127,500.00
11.	Blow-off Assembly	5	EA	$35,000.00	$175,000.00
12.	Rock Excavation	2,400	CY	$90.00	$216,000.00
13.	Select Backfill	1,800	CY	$35.00	$63,000.00
14.	Concrete Driveway Repair	2,000	SY	$75.00	$150,000.00
15.	Asphalt Replacement and Repair	2,000	SY	$65.00	$130,000.00
16.	Gravel Driveway Repair	4,000	TONS	$45.00	$180,000.00
17.	Pressure Testing	43,000	LF	$5.50	$236,500.00
18.	Erosion Control	43,000	LF	$2.00	$86,000.00
19.	Clearing and Grubbing	15	ACR	$20,000.00	$300,000.00
20.	Connection at termination point	1	LS	$30,000.00	$30,000.00
21.	Site Cleanup and Restoration	43,000	LF	$1.50	$64,500.00
				CONSTRUCTION ESTIMATE:	**$18,977,000**

MOORE COUNTY PUBLIC UTILITIES
DROWNING CREEK ALTERNATIVE
PHASE 1 EXPANSION TO THE SOUTHERN PINES WTP, 8 TO 11 MGD
PRELIMINARY COST ESTIMATE

Upgrade to Old Pulsator - add Settling Plates		**$930,000**
Demolition	$30,000	
Piping and concrete modifications	$250,000	
Plate settlers	$400,000	
Installation	$250,000	
Filter Unit Modifications - both filters		**$500,000**
Piping upgrades	$100,000	
Backwash trough changes	$250,000	
Coating systems	$50,000	
Electrical and controls	$100,000	
Chemical Feed Bulk Storage		**$685,000**
New alum and caustic bulk tanks	$300,000	
Installation	$100,000	
Mix and transfer pumps	$75,000	
Chemical feed piping	$100,000	
Installation and start-up	$60,000	
Electrical	$50,000	
Chemical Feed System		**$260,000**
Chemical feed pumps	$100,000	
Chemical day tanks	$40,000	
Installation and startup	$60,000	
Electrical	$60,000	
High Service Pump Station Upgrades		**$2,000,000**
Demolition	$200,000	
New pumps, motors, and accessories	$750,000	
Station piping and valves	$350,000	
Installation and startup	$400,000	
Coating systems	$100,000	
Electrical	$200,000	
Sludge Handling Upgrades		**$400,000**
Instrumentation, Analystical, and Metering		**$230,000**
Field instruments, analytical	$100,000	
Start-up	$50,000	
Installation/Electrical	$80,000	
Electrical Construction		**$700,000**
General electrical construction	$400,000	
Generator and transfer switch	$300,000	
Contractor's Overhead & Profit (14.0%)		**$800,000**
Total Construction Estimate		**$6,505,000**

MOORE COUNTY
DROWNING CREEK ALTERNATIVE
FINISHED WATER LINE FROM SOUTHERN PINES WTP TO PINEHURST
PRELIMINARY COST ESTIMATE

Estimate covers a finished water line starting at the Southern Pines WTP and extending north through Pine Bluff, following and discharging into an existing elevated storage tank on Monticello Drive

	Item Description	Quantities	Units	Unit Cost	Extended Cost
1.	24" Class 250 DIP Raw Water Main	41,000	LF	$275.00	$11,275,000.00
2.	24" Class 250 Restrained Joint DIP Raw Water Main	1,000	LF	$350.00	$350,000.00
3.	36" Steel Casing Installed by Bore and Jack	1,100	LF	$2,600.00	$2,860,000.00
4.	24" RJDIP Installed by Directional Bore	0	LF	$1,800.00	$0.00
5.	Open Cut Blue Line Stream	1	LS	$125,000.00	$125,000.00
6.	Air Release Valve	9	EA	$12,000.00	$108,000.00
7.	24" Butterfly Valve with Concrete Collar	10	EA	$24,000.00	$240,000.00
8.	24" 90-Degree Bend	15	EA	$9,500.00	$142,500.00
9.	24" 45-Degree Bend	18	EA	$8,500.00	$153,000.00
10.	24" 22.5-Degree Bend	18	EA	$8,500.00	$153,000.00
11.	Blow-off Assembly	4	EA	$35,000.00	$140,000.00
12.	Rock Excavation	1,600	CY	$90.00	$144,000.00
13.	Select Backfill	2,000	CY	$35.00	$70,000.00
14.	Concrete Driveway Repair	3,000	SY	$75.00	$225,000.00
15.	Asphalt Replacement and Repair	3,000	SY	$65.00	$195,000.00
16.	Gravel Driveway Repair	1,500	TONS	$45.00	$67,500.00
17.	Pressure Testing	42,000	LF	$5.50	$231,000.00
18.	Erosion Control	42,000	LF	$2.00	$84,000.00
19.	Clearing and Grubbing	6	ACR	$20,000.00	$120,000.00
20.	Connection at termination point	1	LS	$30,000.00	$30,000.00
21.	Site Cleanup and Restoration	42,000	LF	$1.50	$63,000.00
				CONSTRUCTION ESTIMATE:	**$16,776,000**

MOORE COUNTY WATER SUPPLY

DROWNING CREEK ALTERNATIVE

Southern Pines Bulk Purchase Rate

$3.50 per 1,000 gal

		DEBT ANALYSIS - with coverage ratio			SYSTEM OPERATION ANALYSIS			
Year	Required Avg Day Supply (mgd) from New Source	Debt Payment - Phase 1 Infrastructure	Debt Payment - Phase 2 Infrastructure	Total Debt, per 1,000 gal Avg Day Supply	Raw Water Pumping Cost	Estimated Payment for Consent from Hoke County	Bulk Purchase Cost to Southern Pines	Total Operation Costs, per 1,000 gal Avg Day Supply
2022	0.00	$0	$0					
2023	0.00	$0	$0					
2024	0.00	$0	$0					
2025	0.00	$0	$0					
2026	0.00	$0	$0					
2027	0.00	$0	$0					
2028	0.00	$0	$0					
2029	0.00	$0	$0					
2030	1.08	$3,642,000	$0	$9.21	$49,000	$91,000	$1,384,000	$3.85
2031	1.20	$3,642,000	$0	$8.32	$54,000	$91,000	$1,532,000	$3.83
2032	1.32	$3,642,000	$0	$7.58	$60,000	$91,000	$1,682,000	$3.81
2033	1.41	$3,642,000	$0	$7.08	$64,000	$91,000	$1,800,000	$3.80
2034	1.49	$3,642,000	$0	$6.70	$68,000	$91,000	$1,904,000	$3.79
2035	1.57	$3,642,000	$7,305,000	$19.07	$71,000	$91,000	$2,009,000	$3.78
2036	1.66	$3,642,000	$7,305,000	$18.11	$75,000	$91,000	$2,116,000	$3.77
2037	1.74	$3,642,000	$7,305,000	$17.22	$79,000	$91,000	$2,226,000	$3.77
2038	1.83	$3,642,000	$7,305,000	$16.39	$83,000	$91,000	$2,337,000	$3.76
2039	1.92	$3,642,000	$7,305,000	$15.63	$87,000	$91,000	$2,451,000	$3.75
2040	2.01	$3,642,000	$7,305,000	$14.92	$91,000	$91,000	$2,568,000	$3.75
2041	2.10	$3,642,000	$7,305,000	$14.26	$95,000	$91,000	$2,687,000	$3.74
2042	2.20	$3,642,000	$7,305,000	$13.64	$100,000	$91,000	$2,808,000	$3.74
2043	2.30	$3,642,000	$7,305,000	$13.07	$104,000	$91,000	$2,932,000	$3.73
2044	2.39	$3,642,000	$7,305,000	$12.53	$109,000	$91,000	$3,058,000	$3.73
2045	2.50	$3,642,000	$7,305,000	$12.02	$113,000	$91,000	$3,188,000	$3.72
2046	2.60	$3,642,000	$7,305,000	$11.54	$118,000	$91,000	$3,319,000	$3.72
2047	2.70	$3,642,000	$7,305,000	$11.09	$123,000	$91,000	$3,454,000	$3.72
2048	2.80	$3,642,000	$7,305,000	$10.69	$127,000	$91,000	$3,583,000	$3.71
2049	2.90	$3,642,000	$7,305,000	$10.34	$132,000	$91,000	$3,705,000	$3.71
2050	3.00	$3,642,000	$7,305,000	$10.01	$136,000	$91,000	$3,829,000	$3.71
2051	3.10	$3,642,000	$7,305,000	$9.68	$141,000	$91,000	$3,956,000	$3.70
2052	3.20	$3,642,000	$7,305,000	$9.38	$145,000	$91,000	$4,087,000	$3.70

APPENDIX D

Sanford Alternative: Detailed Cost Estimates and Estimated Annual Operating Costs

MOORE COUNTY PUBLIC UTILITIES
WATER SUPPLY MASTER PLAN
SANFORD ALTERNATIVE
PRELIMINARY SUMMARY OF CAPITAL COSTS

High Service Pump Station at Sanford WTP		$5,000,000
Finished Water Pipe Section 1		$45,044,000
Intermediate Storage, Treatment, and Pumping Station		$10,510,000
Finished Water Pipe Section 2		$25,576,000
1.5 MG Elevated Storage Tank		$7,500,000
CONSTRUCTION COST ESTIMATE		**$93,630,000**
Contingencies and Engineering (20%)		$18,726,000
Capacity Charge to City of Sanford		$60,000,000
Planning and Environmental		$300,000
Property and Easement Acquisition		$700,000
Intermediate and Tank Sites	$300,000	
Easements for Water Mains	$400,000	
Legal Fees		$100,000
Permitting		$30,000
TOTAL PROJECT BUDGET:		**$173,486,000**

MOORE COUNTY PUBLIC UTILITIES
SANFORD ALTERNATIVE
INTERMEDIATE STORAGE, TREATMENT, AND PUMP STATION
PRELIMINARY COST ESTIMATE

Site Work		**$610,000**
Clearing and mass grading	$150,000	
Plant piping, manholes, chemical injection points	$250,000	
Gravel Entrance and Parking	$100,000	
Fencing	$50,000	
Landscaping	$60,000	
Two 1.0-MG Clearwells		**$3,500,000**
High Service Pump Station		**$2,515,000**
Excavation	$15,000	
Concrete	$100,000	
Equipment - pumps, motors, valves, controls	$650,000	
Installation	$400,000	
Pump station building	$750,000	
Internal Piping	$200,000	
Coating systems	$50,000	
Mechanical and plumbing	$75,000	
Electrical and controls	$275,000	
Chemical Feed Bulk Storage		**$1,330,000**
Concrete	$95,000	
Building with containment and removable walls	$750,000	
Bulk storage tanks and accessories	$200,000	
Mix and transfer pumps	$50,000	
Chemical feed piping	$75,000	
Installation and start-up	$60,000	
Electrical	$100,000	
Chemical Feed System		**$205,000**
Chemical feed pumps	$50,000	
Chemical day tanks	$45,000	
Installation and startup	$50,000	
Electrical	$60,000	
Operations Building		**$400,000**
Instrumentation, Analystical, and Metering		**$210,000**
Field instruments, analytical	$100,000	
Start-up	$30,000	
Installation/Electrical	$80,000	
Electrical Construction		**$450,000**
General electrical construction	$200,000	
Generator and transfer switch	$250,000	
Contractor's Overhead & Profit (14.0%)		**$1,290,000**
Total Construction Estimate		**$10,510,000**

MOORE COUNTY
SANFORD ALTERNATIVE
FINSHED WATER LINE SECTION 1
PRELIMINARY COST ESTIMATE

Estimate covers the segment of finished water pipeline from the Sanford WTP to the Intermediate Storage and Pumping Facility.

	Item Description	Quantities	Units	Unit Cost	Extended Cost
1.	24" Class 250 DIP Raw Water Main	120,000	LF	$275.00	$33,000,000.00
2.	24" Class 250 Restrained Joint DIP Raw Water Main	2,000	LF	$350.00	$700,000.00
3.	36" Steel Casing Installed by Bore and Jack	1,700	LF	$2,600.00	$4,420,000.00
4.	24" RJDIP Installed by Directional Bore	1,000	LF	$1,800.00	$1,800,000.00
5.	Open Cut Blue Line Stream	1	LS	$125,000.00	$125,000.00
6.	Air Release Valve	20	EA	$12,000.00	$240,000.00
7.	24" Butterfly Valve with Concrete Collar	30	EA	$24,000.00	$720,000.00
8.	24" 90-Degree Bend	20	EA	$9,500.00	$190,000.00
9.	24" 45-Degree Bend	25	EA	$8,500.00	$212,500.00
10.	24" 22.5-Degree Bend	25	EA	$8,500.00	$212,500.00
11.	Blow-off Assembly	15	EA	$35,000.00	$525,000.00
12.	Rock Excavation	9,100	CY	$90.00	$819,000.00
13.	Select Backfill	10,000	CY	$35.00	$350,000.00
14.	Concrete Driveway Repair	2,000	SY	$75.00	$150,000.00
15.	Asphalt Replacement and Repair	2,000	SY	$65.00	$130,000.00
16.	Gravel Driveway Repair	2,500	TONS	$45.00	$112,500.00
17.	Pressure Testing	123,000	LF	$5.50	$676,500.00
18.	Erosion Control	123,000	LF	$2.00	$246,000.00
19.	Clearing and Grubbing	10	ACR	$20,000.00	$200,000.00
20.	Connection at termination point	1	LS	$30,000.00	$30,000.00
21.	Site Cleanup and Restoration	123,000	LF	$1.50	$184,500.00
				CONSTRUCTION ESTIMATE:	**$45,044,000**

MOORE COUNTY
SANFORD ALTERNATIVE
FINISHED WATER LINE SECTION 2
PRELIMINARY COST ESTIMATE

Estimate covers a finished water line from the Intermediate station to the proposed elevated storage tank in the EMWD service area.

	Item Description	Quantities	Units	Unit Cost	Extended Cost
1.	24" Class 250 DIP Raw Water Main	55,000	LF	$275.00	$15,125,000.00
2.	24" Class 250 Restrained Joint DIP Raw Water Main	1,000	LF	$350.00	$350,000.00
3.	36" Steel Casing Installed by Bore and Jack	900	LF	$2,600.00	$2,340,000.00
4.	24" RJDIP Installed by Directional Bore	3,000	LF	$1,800.00	$5,400,000.00
5.	Open Cut Blue Line Stream	1	LS	$125,000.00	$125,000.00
6.	Air Release Valve	18	EA	$12,000.00	$216,000.00
7.	24" Butterfly Valve with Concrete Collar	10	EA	$24,000.00	$240,000.00
8.	24" 90-Degree Bend	10	EA	$9,500.00	$95,000.00
9.	24" 45-Degree Bend	12	EA	$8,500.00	$102,000.00
10.	24" 22.5-Degree Bend	12	EA	$8,500.00	$102,000.00
11.	Blow-off Assembly	5	EA	$35,000.00	$175,000.00
12.	Rock Excavation	3,300	CY	$90.00	$297,000.00
13.	Select Backfill	4,000	CY	$35.00	$140,000.00
14.	Concrete Driveway Repair	1,000	SY	$75.00	$75,000.00
15.	Asphalt Replacement and Repair	1,000	SY	$65.00	$65,000.00
16.	Gravel Driveway Repair	1,500	TONS	$45.00	$67,500.00
17.	Pressure Testing	59,000	LF	$5.50	$324,500.00
18.	Erosion Control	59,000	LF	$2.00	$118,000.00
19.	Clearing and Grubbing	5	ACR	$20,000.00	$100,000.00
20.	Connection at termination point	1	LS	$30,000.00	$30,000.00
21.	Site Cleanup and Restoration	59,000	LF	$1.50	$88,500.00
				CONSTRUCTION ESTIMATE:	**$25,576,000**

MOORE COUNTY WATER SUPPLY

SANFORD ALTERNATIVE

Sanford Bulk Purchase Rate

$3.50 per 1,000 gal

		DEBT ANALYSIS - with coverage ratio						
Year	Required Avg Day Supply (mgd) from New Source	Debt Payment - Phase 1 Infrastructure	Total Debt, per 1,000 gal Avg Day Supply	Bulk Purchase Cost to Sanford	Intermediate Station Fixed Annual Costs	Intermediate Station Chemical Costs	Intermediate Station Energy Costs	Total Operation Costs, per 1,000 gal Avg Day Supply
2022	0.00	$0						
2023	0.00	$0						
2024	0.00	$0						
2025	0.00	$0						
2026	0.00	$0						
2027	0.00	$0						
2028	0.00	$0						
2029	0.00	$0						
2030	2.00	$16,170,000	$22.15	$2,555,000	$479,000	$24,000	$79,000	$4.30
2031	2.00	$16,170,000	$22.15	$2,555,000	$479,000	$24,000	$79,000	$4.30
2032	2.00	$16,170,000	$22.15	$2,555,000	$479,000	$24,000	$79,000	$4.30
2033	2.00	$16,170,000	$22.15	$2,555,000	$479,000	$24,000	$79,000	$4.30
2034	2.00	$16,170,000	$22.15	$2,555,000	$479,000	$24,000	$79,000	$4.30
2035	2.00	$16,170,000	$22.15	$2,555,000	$479,000	$24,000	$79,000	$4.30
2036	2.00	$16,170,000	$22.15	$2,555,000	$479,000	$24,000	$79,000	$4.30
2037	2.00	$16,170,000	$22.15	$2,555,000	$479,000	$24,000	$79,000	$4.30
2038	2.00	$16,170,000	$22.15	$2,555,000	$479,000	$24,000	$79,000	$4.30
2039	2.00	$16,170,000	$22.15	$2,555,000	$479,000	$24,000	$79,000	$4.30
2040	2.01	$16,170,000	$22.04	$2,568,000	$479,000	$24,000	$80,000	$4.29
2041	2.10	$16,170,000	$21.06	$2,687,000	$479,000	$25,000	$84,000	$4.27
2042	2.20	$16,170,000	$20.15	$2,808,000	$479,000	$26,000	$87,000	$4.24
2043	2.30	$16,170,000	$19.30	$2,932,000	$479,000	$28,000	$91,000	$4.21
2044	2.39	$16,170,000	$18.50	$3,058,000	$479,000	$29,000	$95,000	$4.19
2045	2.50	$16,170,000	$17.76	$3,188,000	$479,000	$30,000	$99,000	$4.17
2046	2.60	$16,170,000	$17.05	$3,319,000	$479,000	$31,000	$103,000	$4.15
2047	2.70	$16,170,000	$16.39	$3,454,000	$479,000	$33,000	$107,000	$4.13
2048	2.80	$16,170,000	$15.80	$3,583,000	$479,000	$34,000	$111,000	$4.11
2049	2.90	$16,170,000	$15.28	$3,705,000	$479,000	$35,000	$115,000	$4.09
2050	3.00	$16,170,000	$14.78	$3,829,000	$479,000	$36,000	$119,000	$4.08
2051	3.10	$16,170,000	$14.30	$3,956,000	$479,000	$37,000	$123,000	$4.06
2052	3.20	$16,170,000	$13.85	$4,087,000	$479,000	$39,000	$127,000	$4.05

APPENDIX E

Deep River Robbins Alternative: Detailed Cost Estimates and Estimated Annual Operating Costs

MOORE COUNTY PUBLIC UTILITIES
WATER SUPPLY MASTER PLAN
DEEP RIVER (ROBBINS) ALTERNATIVE
PRELIMINARY SUMMARY OF CAPITAL COSTS

Phase 1: 4.0 MGD Capacity		
Raw Water Intake on Deep River		$6,500,000
Raw Water Pipe from Deep River to Reservoir		$16,713,000
4.0 MGD Water Treatment Plant		$37,685,000
Finished Water Tranmission Main to Seven Lakes		$34,172,000
1.5 MG Elevated Storage Tank in Seven Lakes		$7,500,000
PHASE 1 CONSTRUCTION COST ESTIMATE		**$102,570,000**
Contingencies and Engineering (20%)		$20,514,000
Purchase Reservoir from Robbins (Budget)		$2,000,000
Planning and Environmental		$300,000
Property and Easement Acquisition		$1,100,000
Intake site	*$250,000*	
Treatment plant site	*$600,000*	
Easements for pipe lines	*$250,000*	
Legal Fees		$100,000
Permitting including R/R crossings		$50,000
Electrical Service to the WTP Site (budget)		$500,000
PHASE 1 PROJECT BUDGET:		**$127,134,000**
Phase 2: Water Plant Expansion to 6.0 MGD		
Water Plant Expansion		$18,000,000
CONSTRUCTION COST ESTIMATE		**$18,000,000**
Contingencies and Engineering (25%)		$4,500,000
Planning and Environmental		$100,000
Legal Fees		
Permitting		$50,000
PHASE 2 TOTAL PROJECT BUDGET:		**$22,650,000**

MOORE COUNTY PUBLIC UTILITIES
DEEP RIVER ALTERNATIVE
4.0 MGD WATER TREATMENT PLANT
PRELIMINARY COST ESTIMATE

Site Work		**$3,300,000**
Clearing and mass grading	$650,000	
Plant piping, manholes, chemical injection points	$1,750,000	
Paving, curbs, gutters, and sidewalks	$400,000	
Fencing	$250,000	
Landscaping	$250,000	
Upgrades to Robbins Raw Water Reservoir, including Pump Station		**$7,050,000**
Clearing around reservoir dam	$300,000	
Dam repairs due to flood plain	$2,800,000	
Excavation and export	$800,000	
Yard piping and valve modifications	$400,000	
Pump station structure	$1,100,000	
Pumps, piping, and valves	$850,000	
Installation and startup	$400,000	
Coating systems	$50,000	
Miscellaneous Metals	$100,000	
Electrical	$250,000	
Flash Mix Basin		**$365,000**
Flash mixer and splitter box gates	$95,000	
Concrete for flash mix tank	$80,000	
Raw water flow controller	$25,000	
Bridge support for flash mixer	$15,000	
Miscellanous metals	$35,000	
Installation	$50,000	
Electrical	$65,000	
Flocculation/Sedimentation Basin and Sludge Removal		**$2,810,000**
Superpulsator with accessory equipment	$850,000	
Concrete	$900,000	
Piping	$250,000	
Metals	$75,000	
Installation	$550,000	
Coating systems	$75,000	
Electrical	$110,000	
Filters		**$3,310,000**
Concrete	$550,000	
Valves and in-building piping	$650,000	
Filter equipment	$600,000	
Filter piping and valves	$600,000	
Air blowers, piping, etc	$250,000	
Media	$50,000	
Installation	$350,000	
Coating systems	$60,000	
Miscellaneous Metals	$50,000	
Electrical	$150,000	
Two 0.75-MG Clearwells		**$2,800,000**
High Service Pump Station		**$2,810,000**
Excavation	$15,000	
Concrete	$100,000	
Equipment - pumps, motors, valves, controls	$850,000	
Installation	$400,000	
Pump station building	$750,000	
Internal Piping	$250,000	
Coating systems	$80,000	
Mechanical and plumbing	$90,000	
Electrical and controls	$275,000	

MOORE COUNTY PUBLIC UTILITIES
DEEP RIVER ALTERNATIVE
4.0 MGD WATER TREATMENT PLANT
PRELIMINARY COST ESTIMATE

Chemical Feed Bulk Storage		**$1,655,000**
Concrete	$95,000	
Building with containment and removable walls	$850,000	
Bulk storage tanks and accessories	$300,000	
Mix and transfer pumps	$100,000	
Chemical feed piping	$150,000	
Installation and start-up	$60,000	
Electrical	$100,000	
Chemical Feed System		**$515,000**
Alum pumps with automatic controls	$50,000	
Hypochlorite with automatic controls	$50,000	
Caustic with automatic controls	$50,000	
Polymer pumps with automatic controls	$50,000	
Chemical day tanks	$45,000	
Polymer wet/dry wetting system	$80,000	
Installation and startup	$90,000	
Electrical	$100,000	
Operations Building and Laboratory		**$2,100,000**
Instrumentation, Analystical, and Metering		**$1,250,000**
Field instruments, analytical	$900,000	
Start-up	$100,000	
Installation/Electrical	$250,000	
Sludge Handling		**$3,330,000**
Sludge holding tank with mixer	$850,000	
Piping	$200,000	
Transfer pump station	$400,000	
Dewatering building	$650,000	
Belt press equipment (press, polymer, screw conveyor)	$550,000	
Installation	$350,000	
Coating systems	$80,000	
Electrical, mechanical, plumbing	$250,000	
Electrical Construction		**$2,350,000**
General electrical construction	$2,000,000	
Generator and transfer switch	$350,000	
Contractor's Overhead & Profit (12.0%)		**$4,040,000**
Total Construction Estimate		**$37,685,000**

MOORE COUNTY
DEEP RIVER ALTERNATIVE
RAW WATER LINE FROM DEEP RIVER TO ROBBINS RESERVOIR
PRELIMINARY COST ESTIMATE

	Item Description	Quantities	Units	Unit Cost	Extended Cost
1.	24" Class 250 DIP Raw Water Main	34,000	LF	$275.00	$9,350,000.00
2.	24" Class 250 Restrained Joint DIP Raw Water Main	1,000	LF	$350.00	$350,000.00
3.	36" Steel Casing Installed by Bore and Jack	500	LF	$2,600.00	$1,300,000.00
4.	24" RJDIP Installed by Directional Bore	2,000	LF	$1,800.00	$3,600,000.00
5.	Open Cut Blue Line Stream	1	LS	$125,000.00	$125,000.00
6.	Air Release Valve	12	EA	$12,000.00	$144,000.00
7.	24" Butterfly Valve with Concrete Collar	3	EA	$24,000.00	$72,000.00
8.	24" 90-Degree Bend	10	EA	$9,500.00	$95,000.00
9.	24" 45-Degree Bend	15	EA	$8,500.00	$127,500.00
10.	24" 22.5-Degree Bend	15	EA	$8,500.00	$127,500.00
11.	Blow-off Assembly	6	EA	$35,000.00	$210,000.00
12.	Rock Excavation	2,100	CY	$90.00	$189,000.00
13.	Select Backfill	3,000	CY	$35.00	$105,000.00
14.	Concrete Driveway Repair	2,000	SY	$75.00	$150,000.00
15.	Asphalt Replacement and Repair	4,000	SY	$65.00	$260,000.00
16.	Gravel Driveway Repair	1,000	TONS	$45.00	$45,000.00
17.	Pressure Testing	37,000	LF	$5.50	$203,500.00
18.	Erosion Control	37,000	LF	$2.00	$74,000.00
19.	Clearing and Grubbing	5	ACR	$20,000.00	$100,000.00
20.	Connection at termination point	1	LS	$30,000.00	$30,000.00
21.	Site Cleanup and Restoration	37,000	LF	$1.50	$55,500.00
				CONSTRUCTION ESTIMATE:	**$16,713,000**

MOORE COUNTY
DEEP RIVER ALTERNATIVE
FINISHED WATER LINE FROM NEW WTP TO SEVEN LAKES
PRELIMINARY COST ESTIMATE

	Item Description	Quantities	Units	Unit Cost	Extended Cost
1.	24" Class 250 DIP Raw Water Main	83,000	LF	$275.00	$22,825,000.00
2.	24" Class 250 Restrained Joint DIP Raw Water Main	1,000	LF	$350.00	$350,000.00
3.	36" Steel Casing Installed by Bore and Jack	1,200	LF	$2,600.00	$3,120,000.00
4.	24" RJDIP Installed by Directional Bore	2,000	LF	$1,800.00	$3,600,000.00
5.	Open Cut Blue Line Stream	2	LS	$125,000.00	$250,000.00
6.	Air Release Valve	10	EA	$12,000.00	$120,000.00
7.	24" Butterfly Valve with Concrete Collar	16	EA	$24,000.00	$384,000.00
8.	24" 90-Degree Bend	15	EA	$9,500.00	$142,500.00
9.	24" 45-Degree Bend	20	EA	$8,500.00	$170,000.00
10.	24" 22.5-Degree Bend	20	EA	$8,500.00	$170,000.00
11.	Blow-off Assembly	10	EA	$35,000.00	$350,000.00
12.	Rock Excavation	9,600	CY	$90.00	$864,000.00
13.	Select Backfill	10,500	CY	$35.00	$367,500.00
14.	Concrete Driveway Repair	2,000	SY	$75.00	$150,000.00
15.	Asphalt Replacement and Repair	4,000	SY	$65.00	$260,000.00
16.	Gravel Driveway Repair	1,000	TONS	$45.00	$45,000.00
17.	Pressure Testing	86,000	LF	$5.50	$473,000.00
18.	Erosion Control	86,000	LF	$2.00	$172,000.00
19.	Clearing and Grubbing	10	ACR	$20,000.00	$200,000.00
20.	Connection at termination point	1	LS	$30,000.00	$30,000.00
21.	Site Cleanup and Restoration	86,000	LF	$1.50	$129,000.00
				CONSTRUCTION ESTIMATE:	**$34,172,000**

MOORE COUNTY WATER SUPPLY

DEEP RIVER (ROBBINS)ALTERNATIVE

		DEBT ANALYSIS - with coverage ratio			SYSTEM OPERATION ANALYSIS			
Year	Required Avg Day Supply (mgd) from New Source	Debt Payment - Phase 1	Debt Payment - Phase 2	Total Debt, per 1,000 gal Avg Day Supply	Raw Water Pumping Cost	Water Plant Fixed Cost	Water Plant Variable Cost	Total Operation Costs, per 1,000 gal Avg Day Supply
2022	1.50	$0	$0		$0	$0	$0	
2023	1.50	$0	$0		$0	$0	$0	
2024	1.50	$0	$0		$0	$0	$0	
2025	1.50	$0	$0		$0	$0	$0	
2026	1.50	$0	$0		$0	$0	$0	
2027	1.50	$0	$0		$0	$0	$0	
2028	1.50	$0	$0		$0	$0	$0	
2029	1.50	$0	$0		$0	$0	$0	
2030	1.50	$11,849,000	$0	$21.64	$91,000	$1,447,000	$377,000	$3.50
2031	1.50	$11,849,000	$0	$21.64	$91,000	$1,447,000	$377,000	$3.50
2032	1.50	$11,849,000	$0	$21.64	$91,000	$1,447,000	$377,000	$3.50
2033	1.50	$11,849,000	$0	$21.64	$91,000	$1,447,000	$377,000	$3.50
2034	1.50	$11,849,000	$0	$21.64	$91,000	$1,447,000	$377,000	$3.50
2035	1.57	$11,849,000	$0	$20.65	$95,000	$1,447,000	$396,000	$3.38
2036	1.66	$11,849,000	$0	$19.60	$100,000	$1,447,000	$417,000	$3.25
2037	1.74	$11,849,000	$0	$18.63	$105,000	$1,447,000	$439,000	$3.13
2038	1.83	$11,849,000	$0	$17.74	$111,000	$1,447,000	$461,000	$3.02
2039	1.92	$11,849,000	$0	$16.92	$116,000	$1,447,000	$484,000	$2.92
2040	2.01	$11,849,000	$2,111,000	$19.03	$122,000	$1,447,000	$506,000	$2.83
2041	2.10	$11,849,000	$2,111,000	$18.19	$127,000	$1,447,000	$529,000	$2.74
2042	2.20	$11,849,000	$2,111,000	$17.40	$133,000	$1,447,000	$553,000	$2.66
2043	2.30	$11,849,000	$2,111,000	$16.66	$139,000	$1,447,000	$577,000	$2.58
2044	2.39	$11,849,000	$2,111,000	$15.98	$145,000	$1,447,000	$602,000	$2.51
2045	2.50	$11,849,000	$2,111,000	$15.33	$151,000	$1,447,000	$627,000	$2.44
2046	2.60	$11,849,000	$2,111,000	$14.72	$157,000	$1,447,000	$653,000	$2.38
2047	2.70	$11,849,000	$2,111,000	$14.15	$164,000	$1,447,000	$681,000	$2.32
2048	2.80	$11,849,000	$2,111,000	$13.64	$170,000	$1,447,000	$706,000	$2.27
2049	2.90	$11,849,000	$2,111,000	$13.19	$175,000	$1,447,000	$729,000	$2.22
2050	3.00	$11,849,000	$2,111,000	$12.76	$181,000	$1,447,000	$754,000	$2.18
2051	3.10	$11,849,000	$2,111,000	$12.35	$187,000	$1,447,000	$779,000	$2.13
2052	3.20	$11,849,000	$2,111,000	$11.96	$194,000	$1,447,000	$805,000	$2.09

APPENDIX F

Deep River Carbonton Alternative: Detailed Cost Estimates and Estimated Annual Operating Costs

MOORE COUNTY PUBLIC UTILITIES
WATER SUPPLY MASTER PLAN
DEEP RIVER ALTERNATIVE - CARBONTON INTAKE
PRELIMINARY SUMMARY OF CAPITAL COSTS

Phase 1: 4.0 MGD Capacity		
Raw Water Intake on Deep River		$6,500,000
Raw Water Pipe from Carbonton to WTP north of Carthage		$22,781,000
4.0 MGD Water Treatment Plant including Reservoir		$39,275,000
Finished Water Tranmission Main EMWD Tank		$15,618,000
1.5 MG Elevated Storage Tank in Seven Lakes		$7,500,000
PHASE 1 CONSTRUCTION COST ESTIMATE		**$91,674,000**
Contingencies and Engineering (20%)		$18,335,000
Planning and Environmental		$300,000
Property and Easement Acquisition		$2,650,000
Intake site	*$350,000*	
Treatment plant site	*$2,000,000*	
Easements for pipe lines	*$300,000*	
Legal Fees		$100,000
Permitting including R/R crossings		$50,000
Electrical Service to the WTP Site (budget)		$500,000
PHASE 1 PROJECT BUDGET:		**$113,609,000**
Phase 2: Water Plant Expansion to 6.0 MGD		
Water Plant Expansion		$18,000,000
CONSTRUCTION COST ESTIMATE		**$18,000,000**
Contingencies and Engineering (25%)		$4,500,000
Planning and Environmental		$100,000
Legal Fees		
Permitting		$50,000
PHASE 2 TOTAL PROJECT BUDGET:		**$22,650,000**

MOORE COUNTY PUBLIC UTILITIES
DEEP RIVER ALTERNATIVE - CARBONTON INTAKE SITE
4.0 MGD WATER TREATMENT PLANT
PRELIMINARY COST ESTIMATE

Site Work		**$3,300,000**
Clearing and mass grading	$650,000	
Plant piping, manholes, chemical injection points	$1,750,000	
Paving, curbs, gutters, and sidewalks	$400,000	
Fencing	$250,000	
Landscaping	$250,000	
New Upland Reservoir		**$8,470,000**
Clearing and grubbing	$150,000	
Mass grading	$3,500,000	
Clay liner	$1,600,000	
Yard piping and valves	$400,000	
Pump station structure	$1,100,000	
Pumps, piping, and valves	$850,000	
Installation and startup	$400,000	
Coating systems	$70,000	
Miscellaneous Metals	$100,000	
Electrical	$300,000	
Flash Mix Basin		**$365,000**
Flash mixer and splitter box gates	$95,000	
Concrete for flash mix tank	$80,000	
Raw water flow controller	$25,000	
Bridge support for flash mixer	$15,000	
Miscellanous metals	$35,000	
Installation	$50,000	
Electrical	$65,000	
Flocculation/Sedimentation Basin and Sludge Removal		**$2,810,000**
Superpulsator with accessory equipment	$850,000	
Concrete	$900,000	
Piping	$250,000	
Metals	$75,000	
Installation	$550,000	
Coating systems	$75,000	
Electrical	$110,000	
Filters		**$3,310,000**
Concrete	$550,000	
Valves and in-building piping	$650,000	
Filter equipment	$600,000	
Filter piping and valves	$600,000	
Air blowers, piping, etc	$250,000	
Media	$50,000	
Installation	$350,000	
Coating systems	$60,000	
Miscellaneous Metals	$50,000	
Electrical	$150,000	
Two 0.75-MG Clearwells		**$2,800,000**
High Service Pump Station		**$2,810,000**
Excavation	$15,000	
Concrete	$100,000	
Equipment - pumps, motors, valves, controls	$850,000	
Installation	$400,000	
Pump station building	$750,000	
Internal Piping	$250,000	
Coating systems	$80,000	
Mechanical and plumbing	$90,000	
Electrical and controls	$275,000	

MOORE COUNTY PUBLIC UTILITIES
DEEP RIVER ALTERNATIVE - CARBONTON INTAKE SITE
4.0 MGD WATER TREATMENT PLANT
PRELIMINARY COST ESTIMATE

Chemical Feed Bulk Storage		**$1,655,000**
Concrete	$95,000	
Building with containment and removable walls	$850,000	
Bulk storage tanks and accessories	$300,000	
Mix and transfer pumps	$100,000	
Chemical feed piping	$150,000	
Installation and start-up	$60,000	
Electrical	$100,000	
Chemical Feed System		**$515,000**
Alum pumps with automatic controls	$50,000	
Hypochlorite with automatic controls	$50,000	
Caustic with automatic controls	$50,000	
Polymer pumps with automatic controls	$50,000	
Chemical day tanks	$45,000	
Polymer wet/dry wetting system	$80,000	
Installation and startup	$90,000	
Electrical	$100,000	
Operations Building and Laboratory		**$2,100,000**
Instrumentation, Analystical, and Metering		**$1,250,000**
Field instruments, analytical	$900,000	
Start-up	$100,000	
Installation/Electrical	$250,000	
Sludge Handling		**$3,330,000**
Sludge holding tank with mixer	$850,000	
Piping	$200,000	
Transfer pump station	$400,000	
Dewatering building	$650,000	
Belt press equipment (press, polymer, screw conveyor)	$550,000	
Installation	$350,000	
Coating systems	$80,000	
Electrical, mechanical, plumbing	$250,000	
Electrical Construction		**$2,350,000**
General electrical construction	$2,000,000	
Generator and transfer switch	$350,000	
Contractor's Overhead & Profit (12.0%)		**$4,210,000**
Total Construction Estimate		**$39,275,000**

MOORE COUNTY

DEEP RIVER ALTERNATIVE - CARBONTON INTAKE

RAW WATER LINE FROM DEEP RIVER TO PROPOSED RESERVOIR NORTH OF CARTHAGE

PRELIMINARY COST ESTIMATE

Estimate covers a raw water pipe from the proposed intake location on the Deep River downstream of Big Governor's Creek, extending south along Glendon Carthage Rd to a proposed water treatment plant site.

	Item Description	Quantities	Units	Unit Cost	Extended Cost
1.	24" Class 250 DIP Raw Water Main	49,100	LF	$275.00	$13,502,500.00
2.	24" Class 250 Restrained Joint DIP Raw Water Main	1,000	LF	$350.00	$350,000.00
3.	36" Steel Casing Installed by Bore and Jack	390	LF	$2,600.00	$1,014,000.00
4.	24" RJDIP Installed by Directional Bore	2,700	LF	$1,800.00	$4,860,000.00
5.	Open Cut Blue Line Stream	3	LS	$125,000.00	$375,000.00
6.	Air Release Valve	11	EA	$12,000.00	$132,000.00
7.	24" Butterfly Valve with Concrete Collar	10	EA	$24,000.00	$240,000.00
8.	24" 90-Degree Bend	15	EA	$9,500.00	$142,500.00
9.	24" 45-Degree Bend	20	EA	$8,500.00	$170,000.00
10.	24" 22.5-Degree Bend	20	EA	$8,500.00	$170,000.00
11.	Blow-off Assembly	10	EA	$35,000.00	$350,000.00
12.	Rock Excavation	3,000	CY	$90.00	$270,000.00
13.	Select Backfill	3,000	CY	$35.00	$105,000.00
14.	Concrete Driveway Repair	2,000	SY	$75.00	$150,000.00
15.	Asphalt Replacement and Repair	4,000	SY	$65.00	$260,000.00
16.	Gravel Driveway Repair	1,000	TONS	$45.00	$45,000.00
17.	Pressure Testing	52,800	LF	$5.50	$290,400.00
18.	Erosion Control	52,800	LF	$2.00	$105,600.00
19.	Clearing and Grubbing	7	ACR	$20,000.00	$140,000.00
20.	Connection at termination point	1	LS	$30,000.00	$30,000.00
21.	Site Cleanup and Restoration	52,800	LF	$1.50	$79,200.00
				CONSTRUCTION ESTIMATE:	**$22,781,000**

MOORE COUNTY

DEEP RIVER ALTERNATIVE - CARBONTON INTAKE

FINISHED WATER LINE FROM WTP NORTH OF CARTHAGE TO EMWD ELEVATED TANK

PRELIMINARY COST ESTIMATE

Estimate covers a finished water pipeline from the proposed water plant site south to the general area where US 15/501 and McCaskill Road intersect.

	Item Description	Quantities	Units	Unit Cost	Extended Cost
1.	24" Class 250 DIP Raw Water Main	42,900	LF	$275.00	$11,797,500.00
2.	24" Class 250 Restrained Joint DIP Raw Water Main	1,000	LF	$350.00	$350,000.00
3.	36" Steel Casing Installed by Bore and Jack	855	LF	$2,600.00	$2,223,000.00
4.	24" RJDIP Installed by Directional Bore	3,000	LF	$1,800.00	$5,400,000.00
5.	Open Cut Blue Line Stream	1	LS	$125,000.00	$125,000.00
6.	Air Release Valve	13	EA	$12,000.00	$156,000.00
7.	24" Butterfly Valve with Concrete Collar	7	EA	$24,000.00	$168,000.00
8.	24" 90-Degree Bend	18	EA	$9,500.00	$171,000.00
9.	24" 45-Degree Bend	22	EA	$8,500.00	$187,000.00
10.	24" 22.5-Degree Bend	22	EA	$8,500.00	$187,000.00
11.	Blow-off Assembly	8	EA	$35,000.00	$280,000.00
12.	Rock Excavation	3,500	CY	$90.00	$315,000.00
13.	Select Backfill	4,000	CY	$35.00	$140,000.00
14.	Concrete Driveway Repair	1,800	SY	$75.00	$135,000.00
15.	Asphalt Replacement and Repair	1,800	SY	$65.00	$117,000.00
16.	Gravel Driveway Repair	2,500	TONS	$45.00	$112,500.00
17.	Pressure Testing	46,900	LF	$5.50	$257,950.00
18.	Erosion Control	46,900	LF	$2.00	$93,800.00
19.	Clearing and Grubbing	4	ACR	$20,000.00	$80,000.00
20.	Connection at termination point	2	LS	$30,000.00	$60,000.00
21.	Site Cleanup and Restoration	46,900	LF	$1.50	$70,350.00
				CONSTRUCTION ESTIMATE:	**$22,426,000**

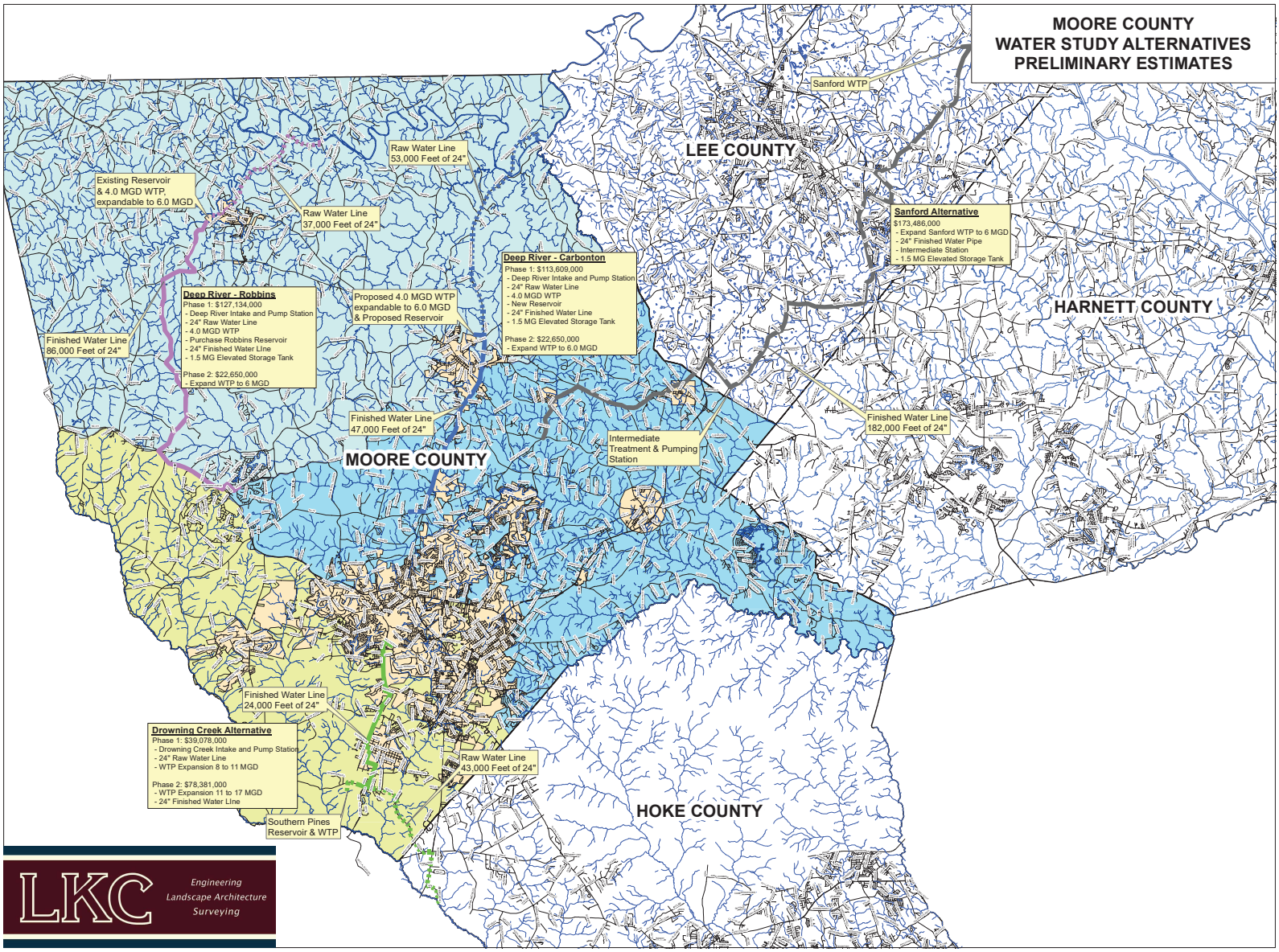
MOORE COUNTY WATER SUPPLY

DEEP RIVER (CARBONTON) ALTERNATIVE

		DEBT ANALYSIS - with coverage ratio			SYSTEM OPERATION ANALYSIS			
Year	Required Avg Day Supply (mgd) from New Source	Debt Payment - Phase 1	Debt Payment - Phase 2	Total Debt, per 1,000 gal Avg Day Supply	Raw Water Pumping Cost	Water Plant Fixed Cost	Water Plant Variable Cost	Total Operation Costs, per 1,000 gal Avg Day Supply
2022	0.00	$0	$0		$0	$0	$0	
2023	0.00	$0	$0		$0	$0	$0	
2024	0.00	$0	$0		$0	$0	$0	
2025	0.00	$0	$0		$0	$0	$0	
2026	0.00	$0	$0		$0	$0	$0	
2027	0.00	$0	$0		$0	$0	$0	
2028	0.00	$0	$0		$0	$0	$0	
2029	0.00	$0	$0		$0	$0	$0	
2030	1.08	$10,589,000	$0	$26.78	$46,000	$1,447,000	$246,000	$4.40
2031	1.20	$10,589,000	$0	$24.19	$51,000	$1,447,000	$271,000	$4.04
2032	1.32	$10,589,000	$0	$22.04	$56,000	$1,447,000	$296,000	$3.74
2033	1.41	$10,589,000	$0	$20.58	$60,000	$1,447,000	$316,000	$3.54
2034	1.49	$10,589,000	$0	$19.47	$63,000	$1,447,000	$332,000	$3.39
2035	1.57	$10,589,000	$0	$18.45	$67,000	$1,447,000	$351,000	$3.25
2036	1.66	$10,589,000	$0	$17.51	$70,000	$1,447,000	$370,000	$3.12
2037	1.74	$10,589,000	$0	$16.65	$74,000	$1,447,000	$389,000	$3.00
2038	1.83	$10,589,000	$0	$15.86	$78,000	$1,447,000	$409,000	$2.90
2039	1.92	$10,589,000	$0	$15.12	$82,000	$1,447,000	$429,000	$2.80
2040	2.01	$10,589,000	$2,111,000	$17.31	$86,000	$1,447,000	$449,000	$2.70
2041	2.10	$10,589,000	$2,111,000	$16.54	$89,000	$1,447,000	$470,000	$2.61
2042	2.20	$10,589,000	$2,111,000	$15.83	$94,000	$1,447,000	$490,000	$2.53
2043	2.30	$10,589,000	$2,111,000	$15.16	$98,000	$1,447,000	$512,000	$2.46
2044	2.39	$10,589,000	$2,111,000	$14.53	$102,000	$1,447,000	$534,000	$2.38
2045	2.50	$10,589,000	$2,111,000	$13.95	$106,000	$1,447,000	$556,000	$2.32
2046	2.60	$10,589,000	$2,111,000	$13.39	$111,000	$1,447,000	$579,000	$2.25
2047	2.70	$10,589,000	$2,111,000	$12.87	$115,000	$1,447,000	$604,000	$2.19
2048	2.80	$10,589,000	$2,111,000	$12.41	$119,000	$1,447,000	$626,000	$2.14
2049	2.90	$10,589,000	$2,111,000	$12.00	$123,000	$1,447,000	$647,000	$2.09
2050	3.00	$10,589,000	$2,111,000	$11.61	$128,000	$1,447,000	$669,000	$2.05
2051	3.10	$10,589,000	$2,111,000	$11.23	$132,000	$1,447,000	$691,000	$2.01
2052	3.20	$10,589,000	$2,111,000	$10.88	$136,000	$1,447,000	$714,000	$1.97

APPENDIX G

Alternatives Map



LKC
Engineering
Landscape Architecture
Surveying