VI. RECOMMENDATIONS

A. Supply Wells

The Monett water supply system relies heavily on production from Wells No. 9 and 12 to meet current demands. Whenever either of these wells must be taken off-line due to increased levels of turbidity in the water, the ability of the City to meet peak system demands is placed in doubt. Wells No. 9 and 12 not only produce significantly greater volumes of water than typical wells in the area, they also exhibit reduced drawdowns of the water in the wells during operation. All things considered, it appears that Monett's ability to meet current and future water demands requires the continued use of these two wells. As discussed in a later section of this report, treatment of the water from Wells 9 and 12 is recommended in order to insure that these sources are consistently available to meet the City's needs. Even with these two wells available to reliably supply approximately 1800 gpm (2.6 MGD) of the City's water demand, there remains a need to augment the supply capacity during the planning period.

The well located at the City's airport (Well No. 19), while not currently connected to the City's in-town water system, has the capacity to provide approximately 550 gpm to the system if equipped with an adequately sized pump and waterline. The incorporation of Well No. 19 into Monett's in-town water system would provide a total well capacity of 5125 gpm, and a well capacity, excluding Wells No. 9, 12, and 21, of 3325 gpm. Assuming a 10% reduction in well capacity by year 2030, this same 3325 gpm capacity would equate to a 3000 gpm well capacity by year 2030. For 16-hour-per-day operation of these wells, the year 2030 capacity would equal 2000 gpm (2.88 MGD). When added to a treated water capacity of 1800 gpm (2.6 MGD), assuming facilities are provided to treat the sometimes turbid waters produced by Wells No. 9 and 12, the total capacity of the wells would equal 3800 gpm (5.5 MGD). In effect, the construction of an 1800 GPM facility to treat the sometimes turbid water produced by Wells No. 9 and 12, combined with 16-hour per day operation of Wells No. 1, 4, 5, 11, 13, 15, 16, 17, 18, 19, and 20, would provide 5,472,000 GPD, which exceeds the estimated year 2030 peak monthly demand of 5,172,000 GPD. The year 2030 peak day demand of 6,034,000 GPD would require full time operation of the 1800 GPM water treatment plant plus 19-hour per day operation of the remaining wells, or consideration might be given to the future construction of an additional well or wells to reduce the required running time for existing deep well pumps during peak demand periods.

The construction of an interconnecting waterline from the airport well (No. 19) to the City system would not only supplement the water supply to the in-town system, it would also provide a redundant water supply to the airport property and to the 80-acre industrial development site planned immediately east of the airport. For each of the preceding reasons, it is recommended that a waterline be installed from the airport well to town. The estimated cost for construction of the waterline to allow utilization of Well No. 19 in-town is set forth as follows:

Construction Costs	
New Pump at Well No. 19	$50,000
12-inch DIP Waterline, 17,000 L.F.	680,000
Highway Crossing, 100 L.F.	35,000
Misc. Valves, Interconnects	35,000
Subtotal Construction	$800,000
Contingencies	80,000
Total Construction	$880,000
Engineering, Design & Construction	$130,000
Engineering Inspection	60,000
Legal, Administrative, etc.	40,000
Subtotal	$230,000
Total Project Cost	$1,110,000

It is noteworthy that while this report recommends the construction of a new facility to treat the water produced by Wells No. 9 and 12, the option of increasing the Monett water supply solely by constructing additional wells and associated waterlines has also been evaluated. A summary of this evaluation may be found in Appendix "F". The evaluation determined that this option would require the immediate installation of four new wells, each of 300 gpm capacity, in addition to the incorporation of the airport well into the in-town system. In order to meet future water demands, an additional eight wells would be needed through year 2030 to keep up with anticipated increases in water usage. The overall present worth increase in cost for providing water demands solely with new wells is estimated at approximately 70 percent of the cost associated with construction and operation of a new 2.6 MGD water treatment plant. This cost differential does not, however, recognize the uncertainties associated with the drilling of numerous additional deep wells in other areas. With the exception of Monett's Wells No. 9 and 12, the City wells have shown an ever-decreasing water level that raises questions about the long-term viability of the deep aquifer as a reliable water supply in southwest Missouri.

An ongoing study of groundwater issues in the area is being undertaken by the Tri-State Water Coalition. Preliminary indications are that the long-term water needs of the area will need to be met with surface water supplies due to the continued decline in deep groundwater levels caused by an ever-increasing demand on this aquifer.

Monett's Wells No. 9 and 12 have not experienced the decline in water levels typical of other wells in the area. It appears that the recharge of these wells takes place, at least partially, within the shallower aquifer. Even during recent periods of drought, these two wells have seen only slight drops in water level, while other City wells have seen water levels drop several hundred feet. In effect, so long as the water from Wells No. 9 and 12 is treated to provide a consistent water quality, these two wells appear to represent a more reliable water supply than the City's other wells. It is anticipated that any wells that produce the high quality water typical of the deep aquifer will face continuing questions of future water availability. It is for this reason that the construction of a water treatment facility is recommended instead of the drilling of approximately twelve new wells.

B. Storage Facilities

The previous analysis of Monett's water storage facilities revealed a present need for up to an additional 0.8 million gallons of usable storage volume. By the year 2030, system demands, combined with the anticipated demolition of the South Park Tank (417,000 gallons), will warrant the addition of from 1.9 to 3.0 million gallons capacity to the existing system.

As is discussed in subsequent sections of this report, construction of a new water treatment facility is proposed to resolve issues with the periodic development of high levels of turbidity in Wells No. 9 and 12. As a part of the proposed water treatment plant improvements, a ground storage reservoir will be needed to provide for filter backwash storage, chlorine detention, and storage for high service pumping from the plant to the distribution system. It is reasonable and cost-effective to incorporate additional capacity in such a ground storage reservoir to provide a portion of the added storage that will be needed in Monett. It is recommended that approximately 500,000 gallons of effective storage capacity be incorporated into the proposed water treatment plant clearwell.

It is further recommended that high service pumping facilities be constructed adjacent to one of the Industrial Park Tanks, thereby allowing approximately 700,000 gallons of presently unusable storage to be made available primarily for fire fighting

capability. Construction of a duplex, 1000 gpm booster pump station is estimated to cost approximately $300,000, including pumphouse, associated piping, electrical controls, engineering design, etc.

Construction of the proposed 0.5 MG ground storage tank at the water treatment plant, combined with a 0.7 MG increase in effective storage associated with the installation of high service pumps at the Industrial Park Tank, would leave a need for an additional 0.7 MG to 1.8 MG of water storage by the year 2030.

An additional water tower site should be acquired in anticipation of constructing a water tower of approximately 1.2 MG usable capacity. Given the topography, the location of the proposed water treatment plant, the need to operate a new tower at the higher system pressures typical of the Lowe's Water Tower, and the configuration of the distribution system, it would seem appropriate to locate a new water tower on a site of relatively high elevation in the northeast portion of the system. Future trends in development of the City may dictate otherwise, however, regardless of future location, it is recommended that a mechanism be in place to fund construction of future storage facilities. Current design and construction costs for a 1.5 MG tower that provides 1.2 MG usable capacity are estimated at $2,300,000. Assuming an inflation rate of 3 percent, this same tower will cost an estimated $4,200,000 twenty years hence.

C. Treatment Facilities

Monett's two largest producing wells, Numbers 9 and 12, face periodic issues with high water turbidity that bring into question each well's reliability as a water supplier. Well No. 21 also produces a significant amount of water, however the pumped water remains unusable due to high levels of turbidity, and the well has never been placed in service. The total capacity of these three wells with existing pumps is approximately 2500 gpm (3.6 MGD), which represents in excess of one-half of the City's estimated year 2030 peak day demand. Without Wells No. 9 and 12, the City would be unable to meet even current peak day demands.

It is clear that treatment facilities are needed to insure that the water produced by Wells Number 9 and 12 can be consistently and reliably used to meet local demands. Treatment of such well water requires a single-stage process, as established by State regulations. Treatment typically consists of chemical addition, followed by rapid mixing, flocculation, sedimentation, filtration, disinfection, and delivery to the system. A treatment facility with a capacity of 1800 gpm (2.6 MGD) would be adequate for the

current combined pumping rate from Wells No. 9 and 12. At an appropriate future date, Well No. 21 could be connected to the proposed water plant with a dedicated waterline, providing redundancy to the plant's water supply. The City's other wells, which have never experienced spikes in the level of turbidity, would continue to deliver water directly to the distribution system.

As a part of a contingency plan to address previous concerns about the water quality from Wells No. 9 and 12, the City acquired land in the northwest part of Monett, suitable for construction of a water treatment plant. The site is situated between Wells No. 9 and 12, and represents a location to which raw water can be delivered with a minimum of required water line construction.

1. Conventional Treatment:

A conventional single-stage water treatment facility would include a small rapid mix chamber followed by two parallel flocculation basins, each providing approximately 15 minutes' detention. Sedimentation basins would require a total of 4 hours' detention, and two units would be needed for redundancy. Filtration would employ four individual units designed for a filtering rate of 2 gpm/sq.ft., with one filter out of service, and would employ air/water backwash. Detention for disinfection would be provided in a 1.0 million gallon ground storage reservoir, which would also serve as a clearwell for the high service pumps and a supply of backwash water for the filters. Backwash waste storage facilities would be provided, along with facilities to decant clear water back to the treatment facility. The facility would be designed for gravity flow through all treatment units and into the ground storage reservoir. Chemical feed facilities, disinfection facilities, backwash pumps, high service pumps, and other related facilities would be included.

The estimated cost for construction of a conventional, single stage 2.6 MGD water treatment facility and 1.0 MG ground storage reservoir is set forth in the following tabulation.

Construction Costs – Treatment Facility (Conventional Single Stage)	
Rapid Mix, Including Equipment	$37,000
Flocculation Basins (2 @ 20' W x 20' L With 2 Flocculators)	290,000
Sedimentation Basins (2 @ 20' W x 100' L With Sludge Removal Equipment)	620,000
Filters (4 Units, Ea. 18' x 18', Including Controls, Media, etc.)	1,400,000
Chemical Feed & Storage	530,000
Yard Piping	450,000
Electrical & Instrumentation	600,000
Sitework	300,000
Control/Filter Building	1,080,000
Disinfection Equipment	130,000
Plant Site Lift Station	100,000
Clearwell (1.0 MG With Backwash & High Service Pumps)	1,050,000
Sludge Lagoons	350,000
Miscellaneous	363,000
Subtotal Construction	$7,300,000
Contingencies	730,000
Total Construction	$8,030,000
Engineering Design & Construction	$700,000
Engineering Inspection	300,000
Legal, Administrative, Etc.	70,000
Subtotal	$1,070,000
Total Project Cost	$9,100,000

In order for the facility to treat the water from Well No. 12, a new interconnecting raw water line and parallel finished water line will need to be constructed from Well No. 12 to the water plant site. The estimated cost for construction of these waterlines is estimated as follows:

Parallel 16" and 10" Waterlines, 6500 L.F.	$455,000
Highway Crossing, 150 L.F.	67,000
Miscellaneous	28,000
Subtotal Construction	550,000
Contingencies	55,000
Total Waterline Construction	$605,000
Engineering Design & Construction	90,000
Engineering Inspection	45,000
Legal, Administrative, Etc.	30,000
Subtotal	165,000
Total Waterline Cost	$770,000

2. Ballasted Flocculation Treatment:

As an alternative to the conventional treatment set forth previously, it would be possible to replace the rapid mix, flocculation, and sedimentation components of the conventional type facility with micro-sand ballasted flocculation equipment and a high-rate plate settler for clarification. The City of West Plains, Missouri utilizes this "Actiflo" system to treat turbid groundwater that appears to have similar characteristics to water from Monett's Wells No. 9 and 12. An Actiflo type treatment facility would include a coagulation tank and an injection tank, each providing a hydraulic retention time (HRT) of 1.6 minutes. These tanks would be followed by a maturation tank providing a 5 minute HRT, and a settling tank with a lamella settling area of 100 square feet and a rise rate of 19 gpm/sq.ft. at 2.6 MGD. The process would include facilities for feeding and re-using a fine-grained sand, polymer, and a coagulant. The effluent from the Actiflo system would require filtration and storage prior to the delivery of the finished water to the system, with these facilities being similar to those utilized with the conventional treatment system.

The estimated cost for construction of a water treatment facility utilizing ballasted flocculation and high rate settling is slightly less than that for the conventional facility, as set forth in the following tabulation.

Construction Costs – Treatment Facility (Ballasted Flocculation)

Actiflo Facilities	$1,000,000
Filters (4 Units, Each 18' x 18')	1,400,000
Chemical Storage	200,000
Yard Piping	400,000
Electrical and Instrumentation	550,000
Sitework 300,000	
Control/Filter Building	1,200,000
Disinfection Equipment	130,000
Plant Site Lift Station	100,000
Clearwell (1.0 MG With Backwash & High Service Pumps)	1,050,000
Sludge Lagoons	350,000
Miscellaneous	370,000
Subtotal Construction	$7,050,000
Contingencies	705,000
Total Construction	$7,755,000
Engineering and Legal Costs	
Engineering Design & Construction	$700,000
Engineering Inspection	300,000
Legal, Administrative, Etc.	70,000
Subtotal	$1,070,000
Total Project Cost	$8,825,000

As with the conventional treatment alternative, new interconnecting waterlines would be needed between Well No. 12 and the new water treatment plant, at an estimated cost, including engineering and construction, of $770,000.

3. Trident Facilities:

Although the Missouri Department of Natural Resources has not, to the author's knowledge, approved the proprietary Trident water treatment system for use in the State, Monett's rather unique situation may allow MDNR to approve such a system given adequate pilot testing of the process. Siemens Water Technologies offers the Trident system as a pre-manufactured treatment unit consisting of tube settlers, adsorption clarifiers, mixed media filters, and appurtenant equipment.

The sizing of the various plant components is not in conformance with the State guidelines, due to the unconventional nature of the process. At a design flowrate of 1800 GPM (2.6 MGD), the Trident Model HS-2800STR package treatment system utilizing two parallel tanks, would have a tube settler hydraulic loading of 3.2 gpm/sq.ft., an adsorption

clarifier hydraulic loading of 9.7 gpm/sq.ft., and a mixed media filter hydraulic loading of 2.6 gpm/sq.ft. with both filters in service. Detention for disinfection would be provided in a 1.0 million gallon ground storage reservoir, which would also serve as a clearwell for the high service pumps and as a supply of backwash water for the filters. Backwash waste storage facilities would be provided, along with facilities to decant clear water back to the treatment facility. Chemical feed facilities, disinfection facilities, backwash pumps, high service pumps, and other related facilities would be included. The entire treatment system would be installed within the control building.

The estimated cost for construction of the Trident treatment facility and ground storage reservoir is set forth in the following tabulation.

Construction Costs – Trident Facility

Trident System (Dual stainless steel tank construction with valves, pumps, control system, etc.	$2,300.00
Chemical Storage	200,000
Yard Piping	400,000
Electrical and Instrumentation	550,000
Sitework	300,000
Control Building	1,200,000
Disinfection Equipment	130,000
Plant Site Lift Station	100,000
Clearwell (1.0 MG with Backwash and High Service Pumps	1,050,000
Sludge Lagoons	350,000
Miscellaneous	320,000
Subtotal Construction	$6,900,000
Contingencies	690,000
Total Construction	$7,590,000
Engineering and Legal Costs	
Engineering Design & Construction	$700,000
Engineering Inspection	300,000
Legal, Administrative, etc.	70,000
Subtotal	$1,070,000
Total Project Cost	$8,660,000

As with the other treatment plant alternatives, new interconnecting waterlines would be needed between Well No. 12 and the new water treatment plant, at an estimated cost, including engineering and construction, of $770,000.

4. Treatment Facility Operation and Maintenance:

Construction of a water treatment facility carries with it the additional cost of operating and maintaining the facility. Operators would need to be hired, and costs would be incurred for chemicals, power, waste sludge management, equipment repairs, and the like. O & M costs will be impacted by raw water quality, with increased chemical usage required for more turbid waters. It is estimated that the operating costs associated with production of water through the treatment plant would be about $400,000 per year, or approximately $0.39 per thousand gallons of water sold. Other costs, such as depreciation and administration, would add to this production cost.

D. Distribution System

The capacity of Monett's water distribution system is generally adequate for current and anticipated system demands, however the elevations of the four original standpipe type water storage tanks result in relatively low system pressures in the northeast and south parts of the system. With the new Lowe's water tower constructed to a higher elevation, it is now possible to extend this high pressure zone to the northeast and southwest, thereby eliminating the low pressure areas, and improving fire flow capabilities.

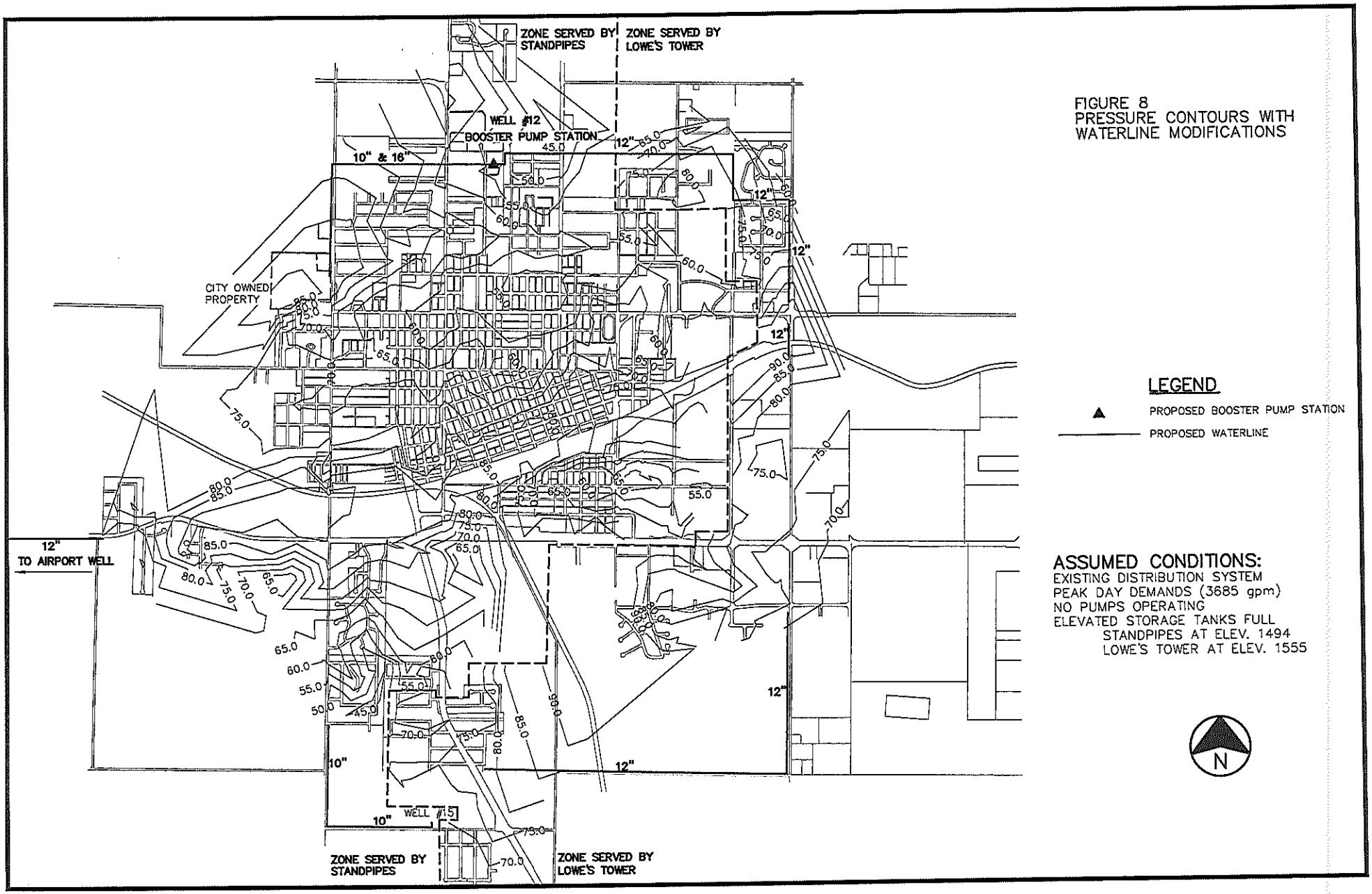
To this end, it is recommended that approximately 11,000 lineal feet of 12-inch waterline be constructed from the distribution system near Well No. 20, south along Farm Road 1090, then west along Farm Road 2020, to a tie-in with the existing 8-inch waterline located east of Highway 37. It is also proposed that appropriate valves and piping be installed at Well No. 15 and its tank to allow the tank to remain on the lower pressure side of the system while Well No. 15 can be used to deliver water to either the low or high pressure zones.

To resolve pressure problems in the northeast part of the system, it is recommended that approximately 6,000 lineal feet of 12-inch waterline be constructed along Chapel Drive (Farm Road 1090) from the existing 12-inch waterline south of the railroad tracks, north and somewhat west to a point of connection with the existing 8-inch line along North 16th Street, north of Hemingway Drive. Assuming that a new water treatment facility is built to insure consistent use of the water from Wells No. 9 and 12, a booster pump station and approximately 4,000 lineal feet of 12-inch waterline is recommended from the North Park tank to a point of connection with the previously proposed waterline.

To allow for the continued use of the South Tank near Well No. 15 as a part of the lower pressure distribution system, while also improving fireflows in the area, construction of approximately 5,000 lineal feet of 10-inch diameter waterline is recommended from the South Tank, west along Farm Road 2022, then north along Eisenhower Street to a tie-in with the existing waterline at Brandermill Street.

The preceding recommendations are intended to address current low pressure situations in the northeast and southwest parts of the distribution system. These proposed waterlines, combined with the waterlines that are a part of the recommended water treatment plant and the interconnection to the Airport Well (No. 19), are shown in Figure 8.

The estimated cost of the improvements intended to address low-pressure problems is set forth in the following tabulation. The estimated costs for waterline improvements associated with the proposed water treatment plant and Well No. 19 are provided in other sections of this report.



Construction Costs – Waterlines

Northeast Improvements	
Booster Pump Station	$250,000
12" Waterline, 4000 L.F.	160,000
Highway Crossing, 100 L.F.	30,000
Miscellaneous	10,000
	$450,000
12" Waterline, 6,000 L.F.	240,000
RR & Highway Crossings, 250 L.F.	75,000
Miscellaneous	35,000
	$350,000
Southeast Improvements	
12" Waterline, 11,000 L.F.	$440,000
RR Crossing, 100 L.F.	30,000
Miscellaneous	30,000
	$500,000
Southwest Improvements	
10" Waterline, 5,000 L.F.	$175,000
Miscellaneous	25,000
	$200,000
Subtotal Construction	$1,500,000
Contingencies (10%)	150,000
Total Waterline Construction	$1,650,000
Engineering Design & Construction	$200,000
Engineering Inspection	140,000
Legal, Administrative, Etc.	60,000
Subtotal	$400,000
Total Waterline Cost	$2,050,000

E. Summary of Costs

1. Capital:

The previously recommended water system improvements are summarized, along with their associated capital costs in the following tabulation.

Recommended Improvements	Estimated Costs
Replacement Pump in Well No. 19 and Construction of Interconnecting Waterline	$1,110,000
New 2.6 MGD Water Treatment Plant, Including 1.0 MG Ground Storage	$9,100,000
Construction of Interconnecting Waterlines From Well No. 12 to WTP	$770,000
Other Distribution System Improvements, Including Booster Stations	$2,350,000
Total Project Capital Cost	$13,330,000

While each of the preceding recommendations is an important element of an improvement program intended to insure Monett's ability to adequately meet current and future water demands, the components can be prioritized as follows. Construction of a water treatment plant and the interconnecting waterlines from Well No. 12 represent the highest priority recommendation, given the system's reliance on the water supply capacity of Wells No. 9 and 12. Construction of the water treatment facility without the other system improvements would insure that adequate high quality water could be produced to meet demands projected through the year 2020.

The replacement of the pump in the airport well (No. 19) and the construction of an interconnecting waterline to the in-town water system, would logically be viewed as the next most important improvement, as it supplements the City's water supply while also providing some benefit to distribution system pressures.

The other improvements to the distribution system that are intended to resolve low pressure problems are of slightly lower priority than the other recommended improvements. While low water pressures remain an inconvenience for users in several areas, this issue is not as critical as the need to maintain an adequate water supply.

2. Operation and Maintenance:

The operation and maintenance of Monett's water supply, storage, and distribution system for the 2008/2009 fiscal year has a budgeted cost of approximately $2,043,000, excluding depreciation of facilities. The budgeted cost includes $195,000 for anticipated capital improvements, and $183,000 for payments-in-lieu-of-taxes. Depreciation, if included in the budget, would be approximately $250,000, yielding a total estimated water system cost of $2,293,000 for 2008/2009. During this same time

period, approximately 1.02 billion gallons of water is expected to be sold, resulting in a cost of approximately $2.25 per thousand gallons of water sold.

Construction of the recommended water treatment plant and booster pump station will result in significant increases in water system O & M costs, as additional personnel are hired to operate the facilities and added costs are incurred for power, chemicals, etc. The annual "increase" in O & M costs associated with a new water treatment plant are estimated as follows:

Personnel (3) Including Fringes	$156,000
Power, 60 HP @ $0.10/kwh	40,000
Chemicals	60,000
Maintenance & Equipment Repair	40,000
Replacement	50,000
Other	54,000
Total Annual O, M & R Cost Increase	$400,000

The preceding estimate of the operation, maintenance, and replacement cost increase does not include payments-in-lieu-of-taxes nor depreciation.

3. Financing:

Financing of capital costs for major municipal projects is typically accomplished through the sale of Revenue or General Obligation Bonds. Payment of the debt is normally from revenues generated by user fees, however property taxes or capital improvements sales taxes can also be used for debt retirement if approved by the voters.

The State of Missouri has established a leveraged loan program for water improvements projects that provides loans for qualifying projects at an interest rate of less than one-half the interest rate available via Revenue Bonds. The State Revolving Fund (SRF) program has been used successfully by the City of Monett for several wastewater projects.

Construction of the water treatment plant and distribution system improvements recommended previously in this report has an estimated capital cost of $13,330,000 as shown below.

Recommended Improvement	Capital Cost
Water Treatment Plant (2.6 MGD)	$9,100,000
Associated Waterlines	770,000
Airport Well and Waterline	1,110,000
NE, SE, and SW Waterlines	2,350,000
Total Capital Cost	$13,330,000

For an assumed 2.5 percent interest rate with an SRF, 20-year loan, an annual debt service cost of approximately $855,000 is needed to retire the $13,330,000 loan. When added to the estimated annual O, M & R cost increase of $400,000, the total estimated increase in annual costs for the recommended improvements equals $1,255,000 per year. For annual water sales of 1.02 billion gallons, the $1,255,000 per year annual cost increase equates to $1.23 per thousand gallons. Alternative means of generating the revenues required to fund construction and operation of the recommended improvements could include property taxes or sales taxes, however an increase in user fees would represent the most direct method of funding water system improvements.