V. ASSESSMENT OF FUTURE DEMAND VERSUS PRESENT SYSTEM CAPACITY

A. Supply Wells

As noted previously in this report, during 2007, approximately 6 percent more water was pumped from the City's wells than was accounted for by metered water sales, municipal use, and system flushing. During the years of 2003 through 2007, the loss ranged from 6.3 percent to 8.3 percent. Initiation of a water loss prevention program several years ago has helped keep system losses fairly low. For the purposes of this report, it will be assumed that system losses will be limited to approximately 8 percent in the future. The City is encouraged to continue with efforts to locate and rectify sources of water loss from the system.

Based upon previous estimates of water usage, and given an assumed 8 percent average annual water loss rate, the future demands on the Monett water supply system are listed as follows:

	Total Estimated System Demand (GPD)		
	Present	Year 2020	Year 2030
Average Day	3,076,000	3,786,000	4,310,000
Weekday	3,537,000	4,355,000	4,957,000
Peak Day	4,306,000	5,300,000	6,034,000
Peak Month	3,691,000	4,544,000	5,172,000

It should be recognized that the wells now in use will likely experience a decrease in capacity as groundwater levels continue to drop in southwest Missouri. It is realistic to estimate that production from the existing wells will decline by ten percent by the year 2030. It is noteworthy, however, that an ongoing study of groundwater resources in southwest Missouri paints a grimmer picture. Increasing demands on the deep aquifers are placing in question the ability of groundwater to meet the needs of area communities in the long term. While no surface water supply is currently available in the area to replace the dwindling groundwater supply, regional efforts are ongoing to address the situation.

The capabilities of the existing in-town wells are summarized as follows. Well No. 19 has ample capacity to meet the demands at the airport, and is not included in the following tabulation. The current total in-town well capacity in Monett is approximately 4575 gpm (6.588 MGD). Assuming a 10 percent decline in well production, the capacity of the existing wells would drop to nearer 4118 gpm (5.930 MGD) by the year 2030.

Well No.	Current Delivery (GPM)	Future Delivery @ 90% (GPM)
1	250	225
4	300	270
5	300	270
9	1150	1035
11	300	270
12	650	585
13	230	207
15	300	270
16	75	68
17	170	153
18	300	270
20	550	495
TOTAL	4575	4118

It is important that the capacity of, and water quality from, the City's water supply wells remains adequate to meet peak day demands. It is prudent to assume that not all of the City's wells will be operational during a peak demand period. Loss of Well No. 9, due to either mechanical malfunction or a muddying of the well, would reduce the City's current water supply capacity to 3425 gpm (4.932 MGD). The loss of Wells No. 9 and No. 12 would reduce the City's current water supply capability to 2775 gpm (4.0 MGD), making it impossible for the City to deliver current peak day water demands. Given the history of turbidity increases at Wells No. 9 and 12, and the time that is typically required to re-establish a flow of clear water from these wells, the long-term loss of Wells No. 9 and 12 represents the most significant threat to Monett's ability to meet the local demand for water.

A sustained delivery of 2570 gpm is required to meet present peak month water demands. Given Monett's current total well capacity of 4575 gpm, 56 percent of the well capacity must be utilized to meet current peak month demands. On average, this requires that all pumps be operated 13.5 hours per day. In reality, several pumps are operated continuously to meet the water system demands.

It is wise to limit "average" pump operation to no more than 16 hours per day (two-thirds of the time) during peak month periods. This is not to infer that Wells No. 9 or 12 should be operated only 16 hours per day. It is recognized that these wells have unique operating characteristics, and continuous operation may be preferable.

In order to meet the peak day demand of 4190 gpm (6.034 MGD) anticipated by the year 2030, the City needs to either significantly increase its water supply capability; provide treatment facilities to insure that the water from Wells No. 9 and 12 can be utilized; or use some combination of these options. If we assume that water treatment facilities are installed to assure the continued use of Wells No. 9 and 12, and also that future well capacity drops to ninety percent of current capacity, the estimated year 2030 peak day demand of 4190 gpm (6.034) MGD) will exceed available well capacity by 72 gpm (4190 gpm peak day demand less 4118 gpm future well delivery). In order to limit the average well pump operation to 16 hours per day during peak month periods, a total well capacity of 5390 gpm is needed by the year 2030. To provide a total well capacity of 5390 gpm requires an additional 1272 gpm of well capacity.

The City drilled Well No. 21 in 2006, however even after an extensive period of pumping the well in an effort to clear up the water, the well continues to produce only turbid water. For this reason, the well has not yet been connected to the City's water system. The well appears to have a significant capacity and has been pumped for extended periods of time at flow rates as high as 850 gpm, with less than 200 feet of drawdown. In order to be used to meet Monett's water supply needs, the water from Well No. 21 will require treatment to remove turbidity.

B. Storage

The City of Monett has four elevated storage tanks of a standpipe design and one elevated composite type water tower with a combined capability to store a total of 5.75 MG of water. The usable capacity of the standpipes is limited, however by a need to maintain 35 psi residual pressure at the tanks, therefore the total usable elevated storage in the City is nearer 2.425 MG. Two ground storage reservoirs with high service pumps provide an additional 1.075 MG of storage, for a total usable capacity of 3.5 MG.

Elevated storage is an important component of any water system, as it provides a positive means of delivering water to the system during power outages or when pumping facilities might otherwise be inoperable. The combination of ground storage

and elevated storage serves to meet peak hourly demands, while also providing capacity required by the City's fire department.

It is normally recommended that the total storage volume in a water system be no less than the average weekday demand of the system, and preferably equal to peak day demand. Monett has a current weekday demand of approximately 3.5 mgd, and a peak day demand of nearer 4.3 mgd, therefore adequate storage is available to meet the "average weekday" criteria. An added 0.8 MG is currently needed to comply with the preferred "peak day" storage criteria.

By the year 2030, Monett's average weekday demand is expected to be 5.0 MGD, and the peak day demand is projected at 6.0 MGD. In order to provide storage equal to the average weekday demand, the City would need to add 1.5 MG of storage to its current system. To provide capacity equal to year 2030 peak day demands, the City would need to add approximately 2.5 MG of usable storage capacity.

The most obvious way to provide additional water storage is to construct additional elevated and/or ground storage facilities. An alternate means would be to install high service pumps at existing standpipes to allow delivery of water from the tanks to the system during periods of low system pressure. Such pumps could effectively utilize the storage capacity in the lower portion of the standpipes, so long as the water supply facilities and distribution system were capable of refilling the tank following a peak demand period. The benefit of installation of high service pumps at the standpipes would be primarily related to firefighting capabilities of the system. It is doubtful that installation of such pumps would significantly improve the City's capability to meet typical peak hourly demands.

C. Distribution System

As discussed previously in this report, Monett's water system was modeled and analyzed with the WaterCad computer program. Results of modeling peak day demands were plotted in Figure 3 for an assumed condition wherein system demands in the lower pressure zone were being met by the City's four standpipes, and demands in the higher pressure zone to the southeast were being met by the Lowe's Tower. Scenarios were also run for assumed fireflow conditions and various pumping configurations. Results of the Watercad analysis have been compiled and bound as a separate document from this report due to the volume of data involved.

Conditions in the model were then altered to reflect year 2030 demands on the system. The system was again analyzed to determine water pressures throughout the City during peak demand periods, and to ascertain fireflow capabilities. The increased demands were applied in a manner that reflected anticipated growth patterns. The majority of the industrial growth was allocated to the area in southeast and east Monett near current industrial development. Commercial growth was spread primarily over the area along U.S. Highway 60 in southeast Monett. Residential development was assigned to areas south and west of the golf course, north of town, and to other areas generally covering the entire City.

Distribution system modeling and observations from the day-to-day operation of the system reflect relatively low water distribution system pressures in the northeast part of the system and in the vicinity of Well No. 15 south and west of the City golf course. Each of these areas is situated on areas of relatively high ground elevations resulting in the low water system pressures. Adequate system pressures are presently being maintained in the area around Well No. 16 by running this well 24 hours per day and by throttling a valve on the receiving waterline near Valley View Estates.

With the construction of the Lowe's water tower in 2005, and the corresponding establishment of a higher water level in the area served by this tower, it is now possible, through the construction of several new waterlines, to extend the "high pressure" zone of the water system to the northeast and south, thereby increasing the system pressures in these areas of historically low pressure.

Because of the relatively low system pressures (40-45 psi) and limited fireflow capabilities of the distribution system south and west of the golf course, the Watercad model was revised to reflect a new 10-inch diameter waterline from the tower at Well No. 15, west along Farm Road 2022 to Eisenhower Street, and then north along Eisenhower to a tie-in with the existing 8-inch main near Brandermill Street (approximately 5000 lineal feet). The resulting increase in system pressures in the area is minimal (generally 2 to 5 psi), however fire flow capability in the area is significantly increased. Also, construction of the line allows the standpipe at Well No. 15 to be retained on the low pressure side of the distribution system, thereby facilitating its continued use even after the high pressure zone is extended to serve the areas of higher elevation near Well No. 15.

The Watercad model was also used to evaluate the possible construction of a 12-inch waterline 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 waterline east of

Highway 37 (approximately 11,000 lineal feet). The analysis verified that such an interconnect would allow the current low pressure areas located south and west of the golf course to operate as a part of the higher pressure system controlled by the Lowe's water tower. System operating pressures in this area were significantly improved, as were fireflow capabilities.

Solutions to the low pressure problems in the northeast part of Monett's water system were also evaluated using the Watercad model. The model was revised to reflect construction of a new 12-inch waterline along Chapel Drive from the system's high pressure zone south of the railroad tracks, north to the residential subdivisions along Chapel Drive and near Well No. 16. The analysis verified that adequate fireflows and system pressures would be provided by the interconnect, however the expansion of the high pressure zone and the accompanying water demands would require additional water supply to this high pressure area. For this reason, the system was further analyzed with a possible booster pump station near the North Park Tank, delivering up to 1000 gallons per minute to the high pressure system via an extension of the 12-inch waterline noted previously.

As discussed in following sections of this report, the installation of a booster pump station near the North Park Tank is only plausible if an adequate supply of water is available at the tank. If a water treatment facility is installed to treat the sometimes turbid water from Wells No. 9 and 12, a large waterline would be constructed from the plant to the North Park Tank to insure that adequate water was available to meet booster pump requirements, as well as the demands of the lower pressure system. If a water treatment plant was not constructed, the additional water supply needed as a result of the possible expansion of the high pressure portion of the distribution system would need to be provided by constructing additional wells to serve this area, or by construction of additional waterlines and a booster pump station at an alternate location.