

Utilities refers to the element of the Comprehensive Plan which projects the water and wastewater needs of the community to accommodate growth. In addition, this section also provides goals for the City of Bryan solid waste collection and disposal and electrical distribution systems.

10.1 Water System

To project the water distribution needs of the community, the current water distribution system model was updated and utilized to determine:

- areas of insufficient fire flow coverage (fire hydrants);
- pipe size inadequacies based upon fire flow demands;
- and future pipe improvements needed for growth.

10.1.1 Water System Modeling

System Demand and Growth

To determine the existing demand distribution, historic water demand data was utilized and projected by two methods. The first used a medium population growth rate of 1.5%, while the other method used a curve fit through the historical pumping data resulting in an increase of annual water usage of 1.08% over the past ten years. Utilizing this data, the system water demand has been estimated through the year 2060. It is important to note that if Bryan begins to experience water demand increases in excess of the historical average rates, these projections will be insufficient and must be modified.

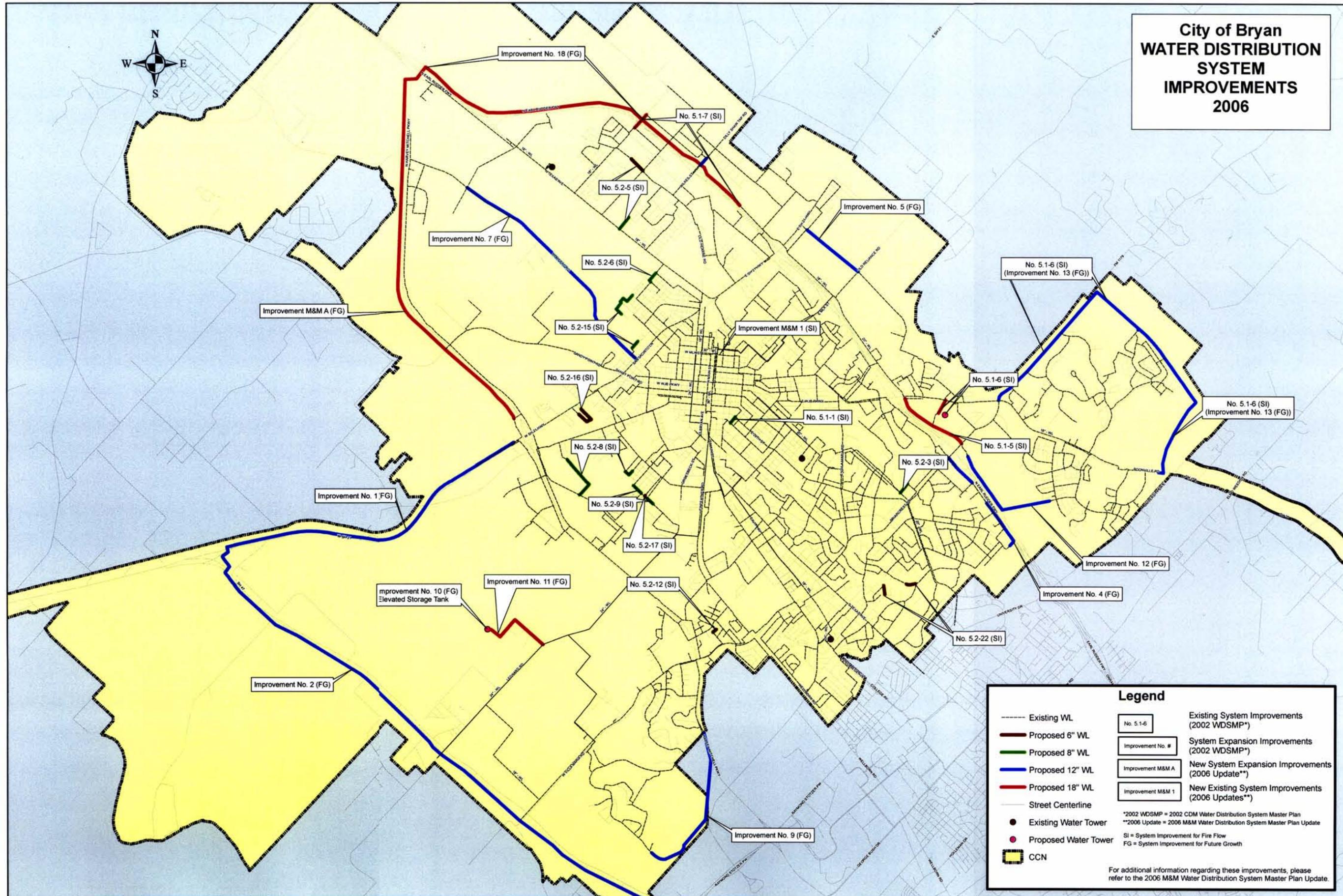
Peak day and peak hour water demand rates were based upon the City of Bryan Water Department pump data. This resulted in a peak day estimate at twice the average daily demand or 14,348 gallons per minute (20.66 million gallons per day) and a peak hour estimate of three times the average daily demand or 21,522 gallons per minute (30.99 million gallons per day) for the current system.

Calibration

Fire flow tests and system data (pumping, tank levels) were used to calibrate the model. Model parameters were calculated and the model was calibrated to duplicate the system pumping and elevated storage tank elevation in each of the fire flow test locations.

10.1.2 Review of the 2002 CDM Water Distribution System Master Plan & Production Recommendations

The proposed capacity improvements itemized in the *2002 CDM Water Distribution System Master Plan* were reviewed and categorized into completed, not recommended, recommended with a priority and an alternate recommended with a priority. There were also two additional recommendations added to the list. All of the improvements, the new recommendations and their costs are tabulated in the *2006 M&M Water Distribution System Master Plan Update* and graphically on Figure 10-1 in this document. The numbering system used on these graphics corresponds to the numbering system used in the *2002 CDM Water Distribution System Master Plan (WDSMP)*. In the 2002 WDSMP, improvements numbered 5.x-x were existing capacity improvements while those numbered 1 through 18 were system expansion improvements. The one additional existing capacity improvement recommended as part of this update is numbered M&M 1 and the one additional system expansion improvement is identified as M&M A.



**City of Bryan
WATER DISTRIBUTION
SYSTEM
IMPROVEMENTS
2006**

Legend

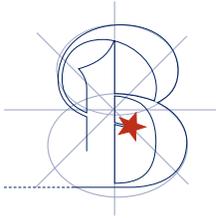
- Existing WL
- Proposed 6" WL
- Proposed 8" WL
- Proposed 12" WL
- Proposed 18" WL
- Street Centerline
- Existing Water Tower
- Proposed Water Tower
- CCN

No. 5.1-6	Existing System Improvements (2002 WDSMP*)
Improvement No. #	System Expansion Improvements (2002 WDSMP*)
Improvement M&M A	New System Expansion Improvements (2006 Update**)
Improvement M&M 1	New Existing System Improvements (2006 Updates**)

**2002 WDSMP = 2002 CDM Water Distribution System Master Plan
**2006 Update = 2006 M&M Water Distribution System Master Plan Update
SI = System Improvement for Fire Flow
FG = System Improvement for Future Growth

For additional information regarding these improvements, please refer to the 2006 M&M Water Distribution System Master Plan Update.

Figure 10-1 Water Distribution System Improvements 2006



Existing System Improvements

In the 2002 WDSMP there were recommendations for improvements to the existing water distribution system. These improvements consisted of increased line sizes, additional lines and additional storage facilities. Several of these recommendations were reevaluated and considered unnecessary based upon updated modeling. Others were modified and those with the most significant changes are in recommended improvements #5.1-6 and #5.1-7. Additional discussion regarding these improvements can be found in the 2006 M&M Water Distribution System Master Plan Update.

System Expansion Improvement

In the 2002 WDSMP there were also recommendations for improvements that would expand the water system into areas not currently served in order to facilitate growth. These improvements were also analyzed in the new model with additional demand added to the new service area then tested for effectiveness.

Additional Water Distribution System Recommendations Capacity Improvements

One additional capacity improvement was added to the original 2002 recommendations. This improvement included a new pump at the High Service Pump Station within the next year. Additional discussion regarding this improvement can be found in the *2006 M&M Water Distribution System Master Plan Update*.

System Expansion Improvements

One additional distribution line was recommended to provide service along the west side of FM 2818.

10.1.3 Fire hydrant spacing and fire flows

Fire hydrant spacing and fire flows were examined throughout the city. Areas of insufficient coverage and insufficient flow were identified and improvements were recommended to both hydrant spacing and pipe improvements to increase available flows. Additional discussion regarding these improvements can be found in the *2006 M&M Water Distribution System Master Plan Update*.

10.1.4 Water Supply

There have been two water supply reports completed in the last 7 years for the City of Bryan. The first study was authored by Malcolm-Pirnie and entitled City of Bryan Water Supply Study. This study discussed the City's desire to increase pumping supply from 22.3 million gallons per day (mgd) firm capacity to 30 mgd. The recommended alternative was to add three new wells, each with a pumping capacity of 3.5 mgd (since the Malcolm-Pirnie report, two additional wells have been added to the system). Based upon Malcolm-Pirnie's report these recommended improvements will supply peak day demands through the year 2030.

The second report was prepared in 2006 by HDR Engineering. This study was titled the *2006 Brazos G Regional Water Plan*, and was the result of a statewide water study undertaken to compel communities to work together to solve water supply problems. The report projected population, water use, and water availability for this region (37 counties) which was delineated roughly along the Brazos River Watershed Boundaries. Using available water supplies within the area, the report projected dates when communities would encounter insufficient water supply for their citizens and made recommendations to alleviate any future water shortages.

The Region G report estimated that the City of Bryan per capita demand is currently 147 gallons per person per day and by the year 2060 this demand would drop to 134 gallons per person per day. It is stated that this decrease is due to the requirement for water conservation plumbing fixtures in all new buildings. Population was also projected as 109,881 in 2060 for the City of Bryan. This

report states that given the population and per capita water demand projections, the City of Bryan will need a water supply of 14.72 mgd in 2060 to serve its population. The Region G area is so large and many areas within that planning area do not have sufficient water supply to serve them, it appears they will be using the Carrizo-Wilcox aquifer as well. Although this aquifer has a capacity of 224 mgd and Bryan's projected need is only 14.72 mgd in 2060, additional users of this aquifer will result in the City of Bryan experiencing water shortages in 2050.

Population projections and forecasted water demands within the *2006 M&M Water Distribution System Master Plan Update* varies significantly from the Region G study. If the growth of Bryan is closer to a 1.5% growth rate, and water allocations are made out of the Carrizo-Wilcox for areas currently using the Edwards Aquifer and other water sources, there is the potential that the City of Bryan may begin to experience shortages as early as 2029, nearly 21 years earlier than the Region G report projected.

The Brazos Valley Groundwater Conservation District was created in 2001 to protect and conserve the groundwater resources of Brazos and Robertson Counties. However, several other groundwater districts compete for the available water in our aquifer. The future availability of water for the City of Bryan cannot be defined until legislation is written to establish the priorities for water allocations amongst these various groundwater districts. This legislative situation should be closely monitored and the City of Bryan should take a lead role in those legislative discussions to ensure an ample future water supply for continued growth.

10.1.5 Conclusion

To date, the City of Bryan has completed approximately \$10.1 million in water improvements as recommended from the 2002 WDSMP. Based upon updated recommendations, there is still approximately \$8.2 million of existing system capacity improvements and another \$21.9 million of system expansion improvements to accomplish.

Based upon the existing water supply studies, once the Malcolm-Pirnie recommendations to add 3 wells have been completed, the City of Bryan has sufficient pumping capacity to supply the City of Bryan through the year 2030. According to the Region G report, the City of Bryan will have an adequate water supply through the year 2050. However, if a more moderate population growth rate of 1.5% per year occurs over the next 15 years, water supply shortages may be felt as early as 2029. As growth occurs, additional studies should be undertaken to ensure that water shortages do not occur sooner than anticipated.

10.1.6 Goals, Objectives and Action Statements

The following goals, objectives and action statements concerning water were developed during this Comprehensive Plan Update.

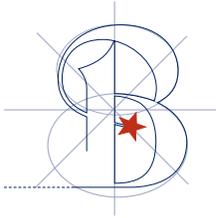
GOAL #1: Ensure available supplies of high quality water for growth and development.

Objective A: Protect and improve the quality and quantity of regional water resources.

Action Statement 1: Investigate reverse osmosis and other treatment methods to reduce salt content and incorporate this discussion and any rate increases to accomplish this treatment method in the annual drinking water report.

Action Statement 2: Schedule an update every 5 years to the City's water master plan.

Action Statement 3: Monitor the water per TCEQ guidelines and maintain the "superior" water rating status from TCEQ.



Objective B: Improve water delivery system in areas with deficient facilities.

Action Statement 1: Establish and maintain a proactive maintenance and improvement program for the water system.

Action Statement 2: Prioritize the CIP to consider improvements in critical commercial/industrial areas and redevelopment areas to ensure that the water supply systems in these areas are sufficient.

Objective C: Periodic reassessment of water supply and the 2001 Water Supply Study.

Action Statement: On a 5 year basis reassess the City's water system master plan and reestablish a 5 year CIP program.

Objective D: Support developed areas and planned growth by funding infrastructure improvements.

Action Statement 1: The City of Bryan should coordinate with all CCN holders within their city limits & ETJ to ensure they can meet the demands of the updated plan. Options should be explored to provide ultimate fire flow services and encourage improvements.

Action Statement 2: Actively pursue CCN rights for remainder of the city's annexed areas.

Objective E: Evaluate new technology for potential applications to meet water supply needs.

Action Statement 1: Continue to be involved in such public education and outreach programs as Earth Day and educate the public on water conservation.

Action Statement 2: The City of Bryan should provide a good example of water conservation by monitoring leaks in the domestic and public building irrigation systems.

Action Statement 3: Assure irrigation systems are adequately maintained and that they are not watering impervious areas. Assure public facility irrigation systems area only watering when needed versus a strict time schedule by incorporating rain sensors.

Objective F: Explore and maintain common design standards with the City of College Station.

Action Statement: Schedule an annual update of the unified design guidelines and explore more flexible design standards for water to facility innovative subdivision design.

10.2 Wastewater

The wastewater needs for the community has been estimated through the development of a wastewater model which analyzed both existing and proposed conditions in the wastewater collection system. In addition, wastewater treatment plant capacity was assessed to assure adequate treatment capacity for future growth. The wastewater model included all sewer lines twelve inches in diameter and larger and the treatment plant assessment included all three existing wastewater treatment plants: Burton Creek, Still Creek, and Turkey Creek. Model calibration was based upon measured dry and wet weather conditions and a future system model was projected based upon future land uses and their demand on the system. From this analysis, recommended wastewater collection and treatment system improvements were generated.

10.2.1 Wastewater Modeling

Existing Conditions

Flow Monitoring

To quantify the flows in the wastewater system for both dry and wet (rainfall) conditions two inflow and infiltration (I&I) studies were performed. One set of flow monitoring data was completed in the Turkey Creek basin in 2003 by Interra Hydro, Inc. A second set of flow monitoring was collected in the Burton and Still Creek basins by Pipeline Analysis during the fall of 2006.

Infiltration & Inflow

These results indicated for all sewer basins that there is significant rainfall dependent I&I that negatively impact the system. The pre-remediation condition in all basins illustrates that the peak flow during dry weather conditions is approximately two times the average daily flow and during wet weather conditions this peak flow is ten times the average daily flow. The initial monitoring during the Turkey Creek I&I Study was performed in 2003 and rehabilitation of several Turkey Creek subbasins occurred between 2003 and 2006. In June 2006, a final rehabilitation program report was produced. The conclusions in this report were written prior to the most recent improvements completed within this basin and the effectiveness of those improvements has yet to be quantified. In the areas where rehabilitation work was quantified, the program results indicated an effectiveness of a 32% overall reduction of rainfall dependent I&I. The initial monitoring in the Burton and Still Basins was performed during October of 2006 and the remediation process in these basins is currently underway.

Flow Data

Existing basin boundaries for Burton, Still, and Turkey were based on previous wastewater studies and the location of the existing sewer lines. Subbasins were created to study all sewer lines twelve inches (12") and greater in diameter. Once delineated, existing land uses within the sewer basins were determined from the Brazos County Appraisal District 2005 parcel data. Wastewater flowrates were generated using the B/CS Unified Design Guidelines land use flow rates which were modified to simulate the dry weather flows collected from the two I&I studies.

Future Conditions

Future Wastewater Basins

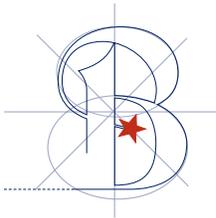
Future wastewater basins include all areas that may be serviceable by gravity to the existing Burton, Still, and Turkey Creek Wastewater Treatment Plants (WWTPs). No additional lift stations were proposed as part of this update. Areas to be pumped by lift station as proposed in the 2002 Black & Veatch Wastewater Master Plan were modified. In anticipation of the closure of the Turkey Creek WWTP and opening of the Thompson's Creek WWTP in the future, areas which gravity flow to this future treatment plant were also delineated.

Future Land Use

The 2006 *Comprehensive Plan Update Future Land Use Policy Map* was used to compute wastewater flowrates that would be generated for full development of the wastewater subbasins.

The following assumptions were made for the future conditions:

- Wastewater basin areas as identified in the 2002 Black & Veatch Wastewater Master Plan as Future Lift Stations 1 through 6 would each contribute a maximum of 0.5 MGD to the existing system. When the wastewater flows in these basins exceed this quantity, a treatment plant, or a series of smaller treatment plants within this basin would be constructed.
- Still Creek Wastewater Treatment Plant (WWTP) and the Turkey Creek WWTP will eventually be removed from service, and their flows treated at the Thompson's Creek WWTP.



Infiltration and Inflow (I&I) Remediation

From data obtained in the I&I studies, average I&I rates in each of these basins vary from approximately 2500 gallons per day per acre (gpda) to 5000 gpda in the system. These rates are extremely high and it is unwise to expend funds for pipe capacity to accommodate these extreme values and therefore remediation efforts by the City of Bryan are underway. To determine future system improvements, assumptions regarding the effectiveness of this remediation effort were made. The Turkey Creek I&I Study indicates that the national average for I&I reduction efforts is a reduction of 30-35%, so the analysis for the future system utilized a 33% assumed I&I reduction.

10.2.2 Review of 2002 CIP Program

The analysis shows that every sewer line in the network has sufficient capacity for the existing dry weather flows. With the ongoing I&I remediation program, it is not possible to assess the appropriate I&I rate to be used to size the future facilities. Using the assumptions stated above, four areas are still lacking capacity for existing wet weather flows. These four areas will need improvement regardless of the success of the I&I program, but the success of the remediation will affect the size of the proposed facilities. The following segments are identified and sized as stated above for budgeting purposes. These should be reviewed at the time of design to reevaluate the I&I component within the design assumptions.

The four areas of improvement are:

- **Carters Trunk.** The line from Old Reliance Road to the Burton Creek Wastewater Treatment Plant was identified during the 2002 Wastewater Master Plan by Black & Veatch, but sized to convey a very conservative peak flow. This line still should be paralleled in the future but sized based upon flowrates generated once I&I remediation has been completed.
- **MLK Trunk.** This line runs parallel and roughly one block north of Martin Luther King Drive from Military to Waco Street. The line is currently a ten inch (10") sewer line but will require upsizing to eighteen inches (18").
- **Colson Main.** This main runs parallel to and roughly one half block south of Colson from the East Bypass (SH6) to Clarks Lane. The line is currently a ten inch (10") sewer line but will require upsizing to a twelve inch (12") sewer line.
- **Coulter Main.** This main runs parallel to and roughly one block east of Coulter Drive between 29th and 27th Street. The line is currently eight and ten inches (8" and 10") in diameter but will require upsizing to twelve inches (12").

10.2.3 SH30 Wastewater Collection/Treatment Recommendations

In April 2006 a separate report entitled "SH 30 Sanitary Sewer Service Recommendations" by Mitchell & Morgan, LLP was issued detailing the options available to the City of Bryan to address sewer service along the SH 30 corridor. In the report, the option of pumping the wastewater flows from this corridor to the Burton Creek Wastewater Treatment plant was found to be the most cost effective solution until the area is sufficiently dense to support a separate treatment facility.

10.2.4 Wastewater Treatment Plant (WWTP) Recommendations

Using the reported average daily flows for the last seven years, all three of the existing wastewater treatment plants are currently in compliance with the requirements of TCEQ, but some of the plants are approaching limits.

Burton Creek WWTP

The Burton Creek WWTP is the largest in the city and treats roughly two thirds of the total sewerage generated within the City of Bryan. The reported data shows that the plant is currently operating within its permit limits for average daily flow and two hour discharge. However, plans to improve the lift station at the plant head works may solve problems in the wastewater collection system while at the same time increasing the peak two hour discharge. This corrective effort on the

head works has the potential to increase to the two hour discharge and should be monitored by the plant operators to ensure that the plant is operated within the prescribed limits. The cause of this problem is system I&I and remediation of this I&I should be aggressively pursued before any corrective action through permitting or storage is implemented.

Still Creek WWTP

The Still Creek WWTP is the second largest within the City of Bryan. The data for this plant is confusing because although there is growth in this basin occurring at a .9% annual rate, the wastewater flows to the plant are declining. A project to repair the trunk line where creek water entered it on dry days has been recently completed and may explain this anomaly. Because of this irregularity the plant flows should be closely monitored. The average daily flow has exceeded the allowable 75% of permit capacity twice (during 2002), but has not crossed the TCEQ threshold to require commencement of plant expansion design. The ongoing I&I remediation program should be able to reduce the peak flows to allow this plant to operate under the existing permit until it expires December 1, 2008. Because this basin has shown in excess of 2% growth in average daily sewerage flows, steps should be taken to begin the planning process for plant expansion as required to comply with the TCEQ requirements.

Turkey Creek WWTP

The Turkey Creek WWTP is the smallest plant in the City of Bryan and is experiencing the most significant growth of any of the three plants. The Turkey Creek WWTP is currently permitted at 0.75 MGD. However, this plant is already surrounded by residential development and room for expansion is extremely difficult. Additionally, this plant was originally constructed as a package plant with limited expandability and flexibility. With the development of the Texas A&M Health Science Center, the Brazos County Expo Center, and the Traditions development, more growth and wastewater flows are expected in this portion of the city. Additionally, the reported flows and growth calculations do not include the treated water which is utilized by the Traditions Golf Course because these flows do not aid the peak flow conditions at the plant. The average daily flow has exceeded the allowable 75% of the permit capacity more than ten times and for three consecutive months and because of this, planning efforts to resolve this capacity issue have begun on the new Thompson's Creek WWTP.

Thompson's Creek WWTP

Preliminary engineering and site selection has been completed and a permit has been approved for the Thompson's Creek WWTP. This site is near the Brazos River adjacent to both Thompson's and Turkey Creek. This location is ideal for a plant because it can service the Thompson's, Still, Cottonwood, and Turkey Creek Basins. Facilities are completed that extend lines from the Turkey Creek WWTP to near the Thompson's plant site.

Based upon projected growth rates in the Turkey Creek basin, this plant should be under construction by 2011. This will assure the Thompson's Creek WWTP will be on-line prior to the Turkey Creek WWTP exceeding permit capacity.

10.2.5 Recommendations

- At the completion of the ongoing I&I remediation effort the current system should be reviewed to determine the effectiveness of the I&I efforts and the future corrective actions.
- Based upon the effectiveness of the I&I remediation, review and construct the capital improvements outlined in the 2006 Wastewater Master Plan Update. A graphic of these improvements can be seen in Figure 10-2.
- Still Creek WWTP – Closely monitor for effectiveness of I&I remediation. If remediation efforts are not effective, commence planning for plant modifications.

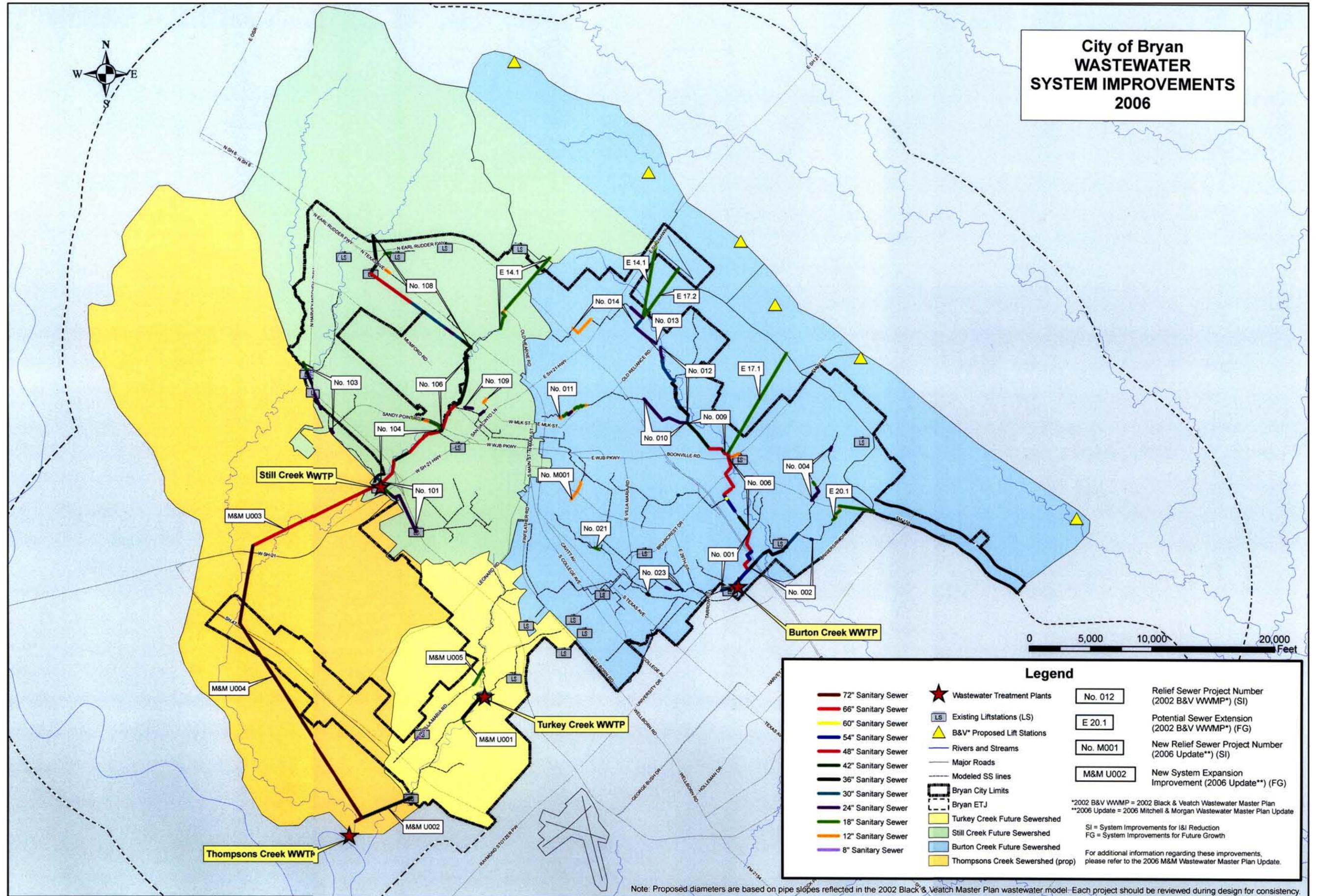
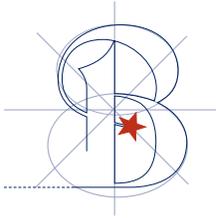


Figure 10-2 Wastewater System Improvements 2006

Note: Proposed diameters are based on pipe slopes reflected in the 2002 Black & Veatch Master Plan wastewater model. Each project should be reviewed during design for consistency.



- Turkey Creek WWTP – This plant has reached the state mandated point to initiate the design process for improvements. The City has begun that planning process through the acquisition, planning and permitting of the new Thompson’s Creek WWTP. Construction on the Thompson’s WWTP should commence by 2011.

10.2.6 Conclusion

The City of Bryan wastewater system is experiencing significant I&I and efforts have been undertaken to reduce this undesired flow into the system. It appears that a significant percentage of the system problems are attributable to this I&I. Analysis shows that the existing wastewater lines and treatment plants have sufficient capacity for dry weather flow and a reasonable quantity of I&I. Therefore, the remediation efforts should be the highest priority for system improvements. Once this phase of remediation is complete, the system should be reevaluated to determine the remaining corrective action.

The next priority should be to assure that the construction of the Thompson’s WWTP commences by the year 2011 to alleviate the plant capacity shortfall in the Turkey Creek WWTP. In addition, the concerns with the other wastewater treatment plants should be monitored as the I&I process is completed.

10.2.7 Goals, Objectives and Action Statements:

The following goals, objectives and action statements concerning Wastewater were developed during this Comprehensive Plan Update.

GOAL #1: Provide a superior and economical sanitary sewage collection and treatment system that will serve the future needs of the City.

Objective A: Continuously evaluate the wastewater collection system.

Action Statement 1: Create an on-going maintenance and line cleaning program of existing facilities.

Action Statement 2: Budget for and construct wastewater line improvements per the wastewater master plan.

Action Statement 3: Prioritize the CIP to consider improvements in critical commercial/industrial areas, redevelopment areas and repair I&I problems to ensure that the waste water collection systems in these areas are sufficient.

Action Statement 4: Explore with the City of College Station the ability of a BVSWMA like entity to own and maintain wastewater treatment facilities.

Action Statement 5: Explore the ability to educate and assist where feasible, those with private sewer line I&I problems that are contributing to the problems with the public system.

Objective B: Consider cooperation and participation in a regional wastewater treatment plant system.

Action Statement: Addressed above.

Objective C: Continue to review development design standards in concert with College Station and Brazos County.

Action Statement: Schedule an annual update of the unified design guidelines and explore more flexible design standards for wastewater to facilitate innovative subdivision design.

Objective D: Consider and develop innovative methods for acquiring and financing infrastructure.

Action Statement: Explore new and innovative methods for acquiring and financing infrastructure.

10.3 Solid Waste

Solid waste collection is currently provided by the City of Bryan. Existing solid waste collection services include the collection of yard waste, residential and commercial waste, brushy and bulky items, and street sweeping. In addition to these services they also provide recycling programs which include a city compost facility, Christmas tree recycling, household hazardous waste collection events, and drive-in and drop-off recycling facilities. To continue to provide and expand these services, the following goals, objective and action statements were developed during this Comprehensive Plan Update.

Goal #1: Provide an efficient and environmentally safe system for solid waste collection and disposal.

Objective A: Provide adequate route coverage to assure quality residential and commercial solid waste collection.

Action Statement 1: Monitor route coverage and assure the provision of quality solid waste collection.

Objective B: Encourage and expand the successful recycling program.

Action Statement 1: Explore the cost effectiveness of various recycling programs such as curbside recycling, school-based recycling centers and assistance for elderly/disabled citizens. Programs should either be enacted or information disseminated to the public discussing why it is not feasible.

Action Statement 2: Continually explore additional markets for recycled materials.

10.4 Electrical

Bryan Texas Utilities (BTU) currently provides electrical supply to the citizens of Bryan and its extraterritorial jurisdiction (ETJ). To continue to provide and expand these services, the following goals, objective and action statements were developed during this Comprehensive Plan Update.

Goal #1: Provide electricity in the most safe, efficient and aesthetic way possible.

Objective A: Assist in the improvement of the appearance and safety of the City.

Action Statement 1: Work with BTU to explore ways to improve the appearance of electrical lines. When feasible, electrical lines should be placed underground. When not feasible, utility poles should blend in as much as possible – alternative style pole. Prioritize areas, identify public and private projects that the city can partner with to bury the existing lines and provide incentives if necessary.